

PAPER

2

FINAL COURSE
STUDY MATERIAL
GROUP-I

ADVANCED FINANCIAL MANAGEMENT



Board of Studies (Academic)
**The Institute of Chartered
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BEFORE WE BEGIN.....

The contents of the study material for the paper Advanced Financial Management have been designed and developed by the Board of Studies (Academic), ICAI with an objective to synchronize the syllabus with the International Education Standards (IESs) to instill and enhance the necessary pre-requisites for becoming a well-rounded, competent, and globally competitive Accounting Professional.

This study material also lays emphasis on National Education Policy 2020 (NEP 2020) initiatives like conceptual clarity rather than rote learning and new pedagogical and curriculum restructuring based on the use of technology while teaching.

The liberalization and globalization of our economic policies need to be compatible with the global changes and converged to bring in various important developments taking place in the field of finance. The topic of finance has acquired critical significance now-a-days, due to recent surge in massive cross border flow of capital. The study of this subject opens new opportunities for Chartered Accountancy students. The paper stresses the importance of applying the knowledge and techniques of financial management to planning, operating and monitoring of the finance function in particular as well as the organization in general.

Keeping in view the dynamic nature of the paper the students are required to refer academic updates in 'Students Journal' published by the Board of Studies, the monthly journal 'The Chartered Accountant', and at least one financial newspaper such as Economic Times, Mint, Business Line, Financial Chronicle and Business Standards on daily basis. This will help the students to keep them updated about the latest developments taking place in the economy as well as well globally. Not only that students are also advised to refer to the Supplement contents related to the paper being hosted on ICAI Website on regular basis.

Requirement of Professional Knowledge and Skills

After Intermediate Level and before appearing in Final Level, you are expected to not only acquire professional knowledge but also the ability to apply such knowledge in addressing issues and solving practical problems. The integrated process of learning through academic education and practical training with help you to inculcate the requisite technical competence, professional skills and professional values, ethics and attitudes necessary for achieving the desired level of professional competence.

Framework of Chapters – Uniform Structure comprising of specific components

Efforts have been made to present the contents in a lucid manner. Care has been taken to present the chapters in a logical sequence to facilitate easy understanding by the students.

Each chapter of the Study Material has been structured uniformly comprising of the following components:

	Components of each Chapter	About the component
1.	Learning Outcomes	Learning outcomes which you need to demonstrate after learning each topic have been detailed in the first page of each chapter. Demonstration of these learning outcomes would help you to achieve the desired level of technical competence
2.	Content	The concepts and contents of Advanced Financial Management are explained in student-friendly manner.
3.	Test Your Knowledge	The exercise questions and answers would help you to understand the topics covered in the paper and apply the same in problem solving, thus, sharpening your application skills.

For the benefits of the students in the Appendix of the Study Module, following tables have been incorporated:

- (i) Exponential (e power) Value Table
- (ii) Natural Log Table with base e
- (iii) Area Under Normal Curve

We hope that these student-friendly features in the Study Material makes your learning process more enjoyable, enriches your knowledge and sharpens your application and Interpretational skills.

Happy Reading and Best Wishes!

SYLLABUS

PAPER 2: ADVANCED FINANCIAL MANAGEMENT

(One paper – Three hours – 100 marks)

Objective:

To acquire the ability to apply financial management theories and techniques in strategic decision making.

Contents:

Section I

(1) Financial Policy and Corporate Strategy

- (i) Advanced role of CFO in various matters including Value Creation
- (ii) Strategic decision making framework
- (iii) Interface of Financial Policy and strategic management
- (iv) Balancing financial goals vis-à-vis sustainable growth.

(2) Risk Management

- (i) Identification of types of Risk faced by an organisation
- (ii) Evaluation of Financial Risks
- (iii) Value at Risk (VAR)
- (iv) Evaluation of appropriate method for the identification and management of financial risk.

(3) Advanced Capital Budgeting Decisions

- (i) Current trends in Capital Budgeting
 - ◆ Impact of Inflation on Capital Budgeting Decisions.
 - ◆ Impact of change in technology on Capital Budgeting

- ◆ Impact of change in Government Policies on Capital Budgeting
- (ii) Dealing with Risk in Investment Decisions
- (iii) Internal and External Factors affecting capital budgeting decision
- (iv) Methods of incorporating risk in Capital Budgeting
- (v) Adjusted Present Value
- (vi) Optimum Replacement Cycle

Section II

(4) Security Analysis

- (i) Fundamental Analysis
- (ii) Technical Analysis
 - a) Meaning
 - b) Assumptions
 - c) Theories and Principles
 - d) Charting Techniques
 - e) Efficient Market Hypothesis (EMH) Analysis
- (iii) Equity Research and tools available

(5) Security Valuation

- (i) Theory of Valuation
- (ii) Return Concepts
- (iii) Equity Risk Premium
- (iv) Required Return on Equity
- (v) Discount Rate Selection in Relation to Cash Flows

- (vi) Approaches to Valuation of Equity Shares
- (vii) Valuation of Preference Shares
- (viii) Valuation of Debentures/ Bonds
- (ix) Role and Responsibilities of Valuers
- (x) Precautions need to be taken by a Valuer before accepting any valuation assignment.

(6) Portfolio Management

- (i) Portfolio Analysis
- (ii) Portfolio Selection
- (iii) Capital Market Theory
- (iv) Portfolio Revision
- (v) Portfolio Evaluation
- (vi) Asset Allocation
- (vii) Fixed Income Portfolio
- (viii) Risk Analysis of Investment in Distressed Securities
- (ix) Alternative Investment Avenues
 - Real Estate
 - Gold
 - Private Equity
 - REITs
 - Hedge Funds
 - ETFs
 - Mutual Funds
 - Commodities

Section III**(7) Securitization**

- (i) Introduction
- (ii) Concept and Definition
- (iii) Benefits of Securitization
- (iv) Participants in Securitization
- (v) Mechanism of Securitization
- (vi) Problems in Securitization
- (vii) Securitization Instruments
- (viii) Pricing of Securitization Instruments
- (ix) Risks in Securitization
- (x) Tokenization
- (xi) Securitization in India

(8) Mutual Fund

- (i) Meaning
- (ii) Types
- (iii) Advantages and Disadvantages of Mutual Funds
- (iv) Evaluation of Mutual Funds
- (v) Role of Fund Manager in Mutual Funds
- (vi) Hedge Funds
- (vii) Role of FIIs in Mutual Funds

(9) Derivatives Analysis and Valuation

- (i) Introduction to Forwards, Futures and Options
- (ii) Futures Market
- (iii) Pricing of Forwards and Futures
- (iv) Hedging using Futures
- (v) Options
 - ❖ Option Pricing
 - ❖ Option Greeks
 - ❖ Exotic Options
- (vi) Credit Derivatives
- (vii) Real Options
- (viii) Derivative Mishaps and Lessons
- (ix) Swaps
- (x) Commodity Derivatives
- (xi) Weather Derivatives
- (xii) Electricity Derivatives

Section IV**(10) Foreign Exchange Exposure and Risk Management**

- (i) Factors affecting foreign exchange rate
- (ii) Role of SWIFT in Foreign Exchange
- (iii) National and International Payment Gateways
- (iv) Exchange rate determination

- (v) Foreign currency market
- (vi) Management of Foreign Exchange Risk

(11) International Financial Management

- (i) International Capital Budgeting
 - Offshore Investment Strategies vis-à-vis Domestic Capital Budgeting
 - Project vis-à-vis Parent Cash Flows
 - Discounting Rate and Adjusting Cash Flows
 - Adjusted Present Value
- (ii) Raising funds from International Sources
- (iii) Sovereign Funds
- (iv) International Financial Centre (GIFT City)
- (v) International Working Capital Management
 - a) Multinational Cash Management
 - Objectives of Effective Cash Management
 - Optimization of Cash Flows/ Needs
 - b) Multinational Receivable Management
 - c) Multinational Inventory Management

(12) Interest Rate Risk Management

- (i) Benchmark Rates
- (ii) Hedging Interest Rate Risk
 - a) Traditional Methods
 - Asset and Liability Management (ALM)
 - Forward Rate Agreement (FRA)

- b) Modern Methods including Interest Rate Derivatives
 - Interest Rate Futures
 - Interest Rate Options
 - Swaps
 - Swaptions

Section V

(13) Business Valuation

- (i) Conceptual Framework of Valuation
- (ii) Approaches/ Methods of Valuation
 - a) Assets Based Valuation Model
 - b) Earning Based Models
 - c) Cash Flow Based Models
 - d) Measuring Cost of Equity
 - Capital Asset Pricing Model (CAPM)
 - Arbitrage Pricing Theory
 - Estimating Beta of an unlisted company
 - e) Relative Valuation
 - Steps involved in Relative Valuation
 - Equity Valuation Multiples
 - Enterprise Valuation Multiple
 - f) Other Approaches to Value Measurement
 - Economic Value Added (EVA)

- Market Value Added (MVA)
- Shareholder Value Analysis (SVA)
- g) Arriving at Fair Value
- (iii) Going concern and Non Going concern valuation
- (iv) Valuation of Distressed Companies
- (v) Valuation of Start ups
- (vi) Valuation of Digital Platforms
- (vii) Valuation of Professional/ Consultancy Firms
- (viii) Impact of ESG on valuation

(14) Mergers, Acquisitions and Corporate Restructuring

- (i) Conceptual Framework
- (ii) Rationale
- (iii) Forms
- (iv) Mergers and Acquisitions
 - a) Financial Framework
 - b) Takeover Defensive Tactics
 - c) Reverse Merger
- (v) Divestitures
 - a) Partial Sell off
 - b) Demerger
 - c) Equity Carve outs

- (vi) Ownership Restructuring
 - a) Going Private
 - b) Management/ Leveraged Buyouts
- (vii) Unlocking the value through Mergers & Acquisitions and Business Restructuring
- (viii) Cross Border Mergers
- (ix) Special Purpose Acquisition Companies (SPACs)

Section VI

(15) Startup Finance

- (i) Introduction including Pitch Presentation
- (ii) Concept of Unicorn
- (iii) Startup Initiative of GOI
- (iv) Sources of Funding
- (v) Succession planning in Business

CONTENTS

CHAPTER 1 – FINANCIAL POLICY AND CORPORATE STRATEGY

1.	Advanced role of CFO in various matters including Value Creation	1.1
2.	Strategic Financial Decision Making Framework	1.2
3.	Strategy at Different Hierarchy Levels.....	1.4
4.	Financial Planning.....	1.5
5.	Interface of Financial Policy and Strategic Management.....	1.6
6.	Balancing Financial Goals vis-à-vis Sustainable Growth.....	1.8

CHAPTER 2 – RISK MANAGEMENT

1.	Identification of types of Risk faced by an organization.....	2.1
2.	Evaluation of Financial Risk	2.4
3.	Value-at-Risk (VAR).....	2.4
4.	Appropriate Methods for Identification and Management of Financial Risk	2.6

CHAPTER 3 – ADVANCED CAPITAL BUDGETING DECISIONS

1.	Current trends in Capital Budgeting	3.1
2.	Dealing with Risk in Investment Decisions	3.9
3.	Internal and External Factors affecting Capital Budgeting Decision.....	3.10
4.	Methods of incorporating risk in Capital Budgeting	3.11
5.	Replacement Decision	3.35
6.	Adjusted Present Value	3.39

CHAPTER 4 – SECURITY ANALYSIS

1.	Fundamental Analysis	4.2
2.	Technical Analysis	4.14
3.	Difference between Fundamental Analysis and Technical Analysis	4.29
4.	Efficient Market Theory	4.29
5.	Equity Research and tools available	4.33

CHAPTER 5 – SECURITY VALUATION

1.	Overview of Valuation	5.1
2.	Return Concepts	5.2
3.	Equity Risk Premium	5.4
4.	Required Return on Equity	5.5
5.	Discount rate selection in relation to cash flows.....	5.5
6.	Valuation of Equity Shares	5.6
7.	Valuation of Preference Shares	5.14
8.	Valuation of Debentures and Bonds.....	5.15
9.	Role and Responsibilities of Valuers	5.28
10.	Precautions need to be taken by a Valuer before accepting any valuation assignment.....	5.31

CHAPTER 6 – PORTFOLIO MANAGEMENT

1.	Introduction.....	6.2
2.	Phases of Portfolio Management	6.4
3.	Portfolio Theories.....	6.7
4.	Risk Analysis	6.9
5.	Markowitz Model of Risk-Return Optimization	6.29

6.	Capital Market Theory	6.32
7.	Single Index Model	6.33
8.	Capital Asset Pricing Model	6.37
9.	Arbitrage Pricing Theory Model	6.45
10.	Portfolio Evaluation Methods	6.46
11.	Sharpe's Optimal Portfolio	6.49
12.	Formulation of Portfolio Strategy	6.50
13.	Portfolio Revision and Rebalancing	6.54
14.	Asset Allocation Strategies	6.57
15.	Fixed Income Portfolio	6.58
16.	Alternative Investment Avenues	6.60

CHAPTER 7 – SECURITIZATION

1.	Introduction	7.1
2.	Concept and Definition	7.2
3.	Benefits of Securitization	7.2
4.	Participants in Securitization	7.3
5.	Mechanism of Securitization	7.5
6.	Problems in Securitization	7.6
7.	Securitization Instruments	7.7
8.	Pricing of the Securitized Instruments	7.9
9.	Risks in Securitization	7.9
10.	Tokenization	7.10
11.	Securitization in India	7.13

CHAPTER 8 – MUTUAL FUNDS

1.	Introduction	8.1
2.	Classification of Mutual Funds	8.4
3.	Types of Schemes.....	8.8
4.	Advantages of Mutual Fund	8.13
5.	Drawbacks of Mutual Fund	8.14
6.	Terms associated with Mutual Funds	8.15
7.	Evaluation of Mutual Funds	8.18
8.	Role of Fund Managers in Mutual Funds	8.20
9.	Role of FIIs in Mutual Funds	8.21

CHAPTER 9 – DERIVATIVES ANALYSIS AND VALUATION

1.	Introduction	9.2
2.	Forward Contract	9.3
3.	Future Contract	9.4
4.	Pricing / Valuation of Forward / Future Contracts	9.5
5.	Types of Futures Contracts	9.9
6.	Options	9.17
7.	Option Valuation Techniques	9.21
8.	Credit Derivatives.....	9.33
9.	Real Options	9.37
10.	Commodity Derivatives.....	9.44
11.	Weather Derivatives	9.51

12.	Electricity Derivatives	9.52
13.	Derivative Mishaps and Lessons	9.54

CHAPTER 10 – FOREIGN EXCHANGE EXPOSURE AND RISK MANAGEMENT

1.	Introduction	10.1
2.	Role of SWIFT in Foreign Exchange	10.3
3.	National and International Payment Gateways	10.5
4.	Nostro, Vostro and Loro Accounts	10.6
5.	Exchange Rate Quotation	10.8
6.	Exchange Rate Forecasting	10.14
7.	Exchange Rate Determination	10.14
8.	Exchange Rate Theories	10.15
9.	Foreign Exchange Market	10.20
10.	Foreign Exchange Exposure	10.21
11.	Hedging Currency Risk	10.25
12.	Forward Contract	10.28
13.	Future Contracts	10.40
14.	Option Contracts	10.41
15.	Swap Contracts	10.42
16.	Popular Derivative Products	10.44
17.	Strategies for Exposure Management	10.47
18.	Conclusion	10.49

CHAPTER 11 – INTERNATIONAL FINANCIAL MANAGEMENT

1.	International Capital Budgeting	11.1
2.	International Sources of Finance	11.15

3.	International Financial Centre (GIFT City)	11.20
4.	Sovereign Funds	11.22
5.	International Working Capital Management	11.23

CHAPTER 12 – INTEREST RATE RISK MANAGEMENT

1.	Introduction	12.1
2.	Benchmark Rates	12.2
3.	Interest Rate Risk	12.3
4.	Hedging Interest Rate Risk	12.6

CHAPTER 13 – BUSINESS VALUATION

1.	Conceptual Framework of Valuation	13.1
2.	Important terms associated with Valuation	13.3
3.	Approaches/ Methods of Valuation	13.5
4.	Measuring Cost of Equity	13.10
5.	Relative Valuation	13.14
6.	Other Approaches to Value Measurement	13.18
7.	Arriving at Fair Value	13.26
8.	Going concern and Non-Going concern valuation	13.27
9.	Valuation of Distressed Companies	13.27
10.	Valuation of Start ups	13.29
11.	Valuation of Digital Platforms	13.35
12.	Valuation of Professional/ Consultancy Firms	13.39
13.	Impact of ESG on valuation	13.39

CHAPTER 14 – MERGERS, ACQUISITIONS AND CORPORATE RESTRUCTURING

1.	Conceptual Framework.....	14.2
2.	Rationale for Mergers and Acquisitions.....	14.4
3.	Forms (Types) of Mergers	14.6
4.	Financial Framework	14.8
5.	Takeover Defensive Tactics.....	14.10
6.	Reverse Merger	14.12
7.	Divestiture.....	14.13
8.	Financial Restructuring.....	14.16
9.	Ownership Restructuring	14.19
10.	Unlocking the value through Mergers & Acquisitions and Business Restructuring	14.22
11.	Premium and Discount	14.22
12.	Mergers and Acquisitions Failures	14.23
13.	Acquisition through Shares	14.24
14.	Cross-Border M&A	14.29
15.	Special Purpose Acquisition Companies	14.29

CHAPTER 15 – STARTUP FINANCE

1.	The Basics of Startup Financing	15.1
2.	Some of the Innovative Ways to Finance a Startup	15.2
3.	Pitch Presentation	15.3
4.	Concept of Unicorn	15.6
5.	Modes of Financing for Startups	15.10
6.	Venture Capital Funds in India.....	15.16

7.	Startup India Initiative.....	15.18
8.	Succession planning in Business	15.21

APPENDIX

1.	Exponential Table	A.1
2.	Natural Log Table.....	A.2
3.	Cumulative Area under Standard Normal Distribution	A.4

FINANCIAL POLICY AND CORPORATE STRATEGY



LEARNING OUTCOMES

After reading this chapter student shall be able to understand:

- Advanced role of CFO in various matters including value creation
- Strategic Financial Decision Making Framework
- Strategy at Different Hierarchy Levels
- Financial Planning
- Interface of Financial Policy and Strategic Management
- Balancing Financial Goals vis-à-vis Sustainable Growth

1. **ADVANCED ROLE OF CFO IN VARIOUS MATTERS INCLUDING VALUE CREATION**

Traditionally, the main role of CFO was concentrated to wealth maximisation for shareholders by taking care of financial health of an organization and overseeing and implementing adequate financial controls.

However, in recent time because of globalization, growth in information and communications, pandemic situation etc. their range of responsibilities has been drastically expanded, driven by complexity and changing expectations.

Now a days in addition to fulfilling traditional role relating to governance, compliances and controls, and business ethics as a part of the leadership of role CFOs are also expected to contribute their support in strategic and operational decision making.

In post-pandemic time their role has been advanced in the following areas in addition to traditional role:

a. Risk Management: Now a days the CFOs are expected to look after the overall functioning of the framework of Risk Management system of an organisation.

b. Supply Chain: Post pandemic supply chain management system has been posing the challenge for the company to maintain the sustainable growth. Since CFOs are care takers of finance of the company, considering the financial viability of the Supply Chain Management their role has now become more critical.

c. Mergers, acquisitions, and Corporate Restructuring: Since in recent period to maintain the growth and capture the market share there has been a spate of Mergers and Acquisitions and hence the role of CFOs has become more crucial because these are strategic decision and any error in them can lead to collapse of the whole business.

d. Environmental, Social and Governance (ESG) Financing: With the evolving of the concept of ESG their role has been shifted from traditional financing to sustainability financing.

Thus, from above discussion it can be concluded that in today's time CFOs are taking a leadership role in Value Creation for the organisation and that too on sustainable basis for a longer period.



2. STRATEGIC FINANCIAL DECISION-MAKING FRAMEWORK

Capital investment is the springboard for wealth creation. In a world of economic uncertainty, the investors want to maximize their wealth by selecting optimum investment and financial opportunities that will give them maximum expected returns at minimum risk. Since management is ultimately responsible to the investors, the objective of corporate financial management should implement investment and financing decisions which should satisfy the shareholders by placing them all in an equal, optimum financial position. The satisfaction of the interests of the shareholders should be perceived as a means to an end, namely maximization of shareholders' wealth. Since capital is the limiting factor, the problem that the management will face is the strategic allocation of limited funds between alternative uses in such a manner, that the companies have the ability to sustain or increase investor returns through a continual search for investment opportunities that generate funds for their business and are more favourable for the investors. Therefore, all businesses need to have the following three fundamental essential elements:

- A clear and realistic **strategy**,
- The **financial** resources, controls and systems to see it through and

- The right **management** team and processes to make it happen.

We may summarise this by saying that:

Strategy + Finance + Management = Fundamentals of Business

Strategy may be defined as the long-term direction and scope of an organization to achieve competitive advantage through the configuration of resources within a changing environment for the fulfilment of stakeholder's aspirations and expectations. In an idealized world, management is ultimately responsible to the investors. Investors maximize their wealth by selecting optimum investment and financing opportunities, using financial models that maximize expected returns in absolute terms at minimum risk. What concerns the investors is not simply maximum profit but also the likelihood of it arising: a risk-return trade-off from a portfolio of investments, with which they feel comfortable and which may be unique for each individual.

2.1 Meaning of Strategic Financial Management

We call this overall approach as strategic financial management and define it as being the application of financial management techniques to strategic decisions in order to help achieve the decision-maker's objectives. Although linked with accounting, the focus of strategic financial management is different. *Strategic financial management combines the backward-looking, report-focused discipline of (financial) accounting with the more dynamic, forward-looking subject of financial management.* It is basically about the identification of the possible strategies capable of maximizing an organization's market value. It involves the allocation of scarce capital resources among competing opportunities. It also encompasses the implementation and monitoring of the chosen strategy so as to achieve agreed objectives.

2.2 Functions of Strategic Financial Management

Strategic Financial Management is the portfolio constituent of the corporate strategic plan that embraces the optimum investment and financing decisions required to attain the overall specified objectives. In this connection, it is necessary to distinguish between strategic, tactical and operational financial planning. While strategy is a long-term course of action, tactics are intermediate plan, while operations are short-term functions. Senior management decides strategy, middle level decides tactics and operational are looked after line management.

Irrespective of the time horizon, the investment and financial decisions involve the following functions¹:

- Continual search for best investment opportunities;
- Selection of the best profitable opportunities;

¹ Strategic Financial Management: Exercises, Robert Alan Hill.

- Determination of optimal mix of funds for the opportunities;
- Establishment of systems for internal controls; and
- Analysis of results for future decision-making.

Since capital is the limiting factor, the strategic problem for financial management is how limited funds are allocated between alternative uses.

The key decisions falling within the scope of financial strategy are as follows:

- 1. Financing decisions:** These decisions deal with the mode of financing or mix of equity capital and debt capital.
- 2. Investment decisions:** These decisions involve the profitable utilization of firm's funds especially in long-term projects (capital projects). Since the future benefits associated with such projects are not known with certainty, investment decisions necessarily involve risk. The projects are therefore evaluated in relation to their expected return and risk.
- 3. Dividend decisions:** These decisions determine the division of earnings between payments to shareholders and reinvestment in the company.
- 4. Portfolio decisions:** These decisions involve evaluation of investments based on their contribution to the aggregate performance of the entire corporation rather than on the isolated characteristics of the investments themselves.

You have already, learnt about the Financing, Investment and Dividend decisions in your Intermediate curriculum, while Portfolio decisions would be taken in detail later in this Study Material.



3. STRATEGY AT DIFFERENT HIERARCHY LEVELS

Strategies at different levels are the outcomes of different planning needs. There are three levels of Strategy – Corporate level; Business unit level; and Functional or departmental level.

3.1 Corporate Level Strategy

Corporate level strategy fundamentally is concerned with selection of businesses in which a company should compete and with the development and coordination of that portfolio of businesses.

Corporate level strategy should be able to answer three basic questions:	
<i>Suitability</i>	Whether the strategy would work for the accomplishment of common objective of the company.
<i>Feasibility</i>	Determines the kind and number of resources required to formulate and implement the strategy.
<i>Acceptability</i>	It is concerned with the stakeholders' satisfaction and can be financial and non-financial.

3.2 Business Unit Level Strategy

Strategic business unit (SBU) may be any profit centre that can be planned independently from the other business units of a corporation. At the business unit level, the strategic issues are about practical coordination of operating units and developing and sustaining a competitive advantage for the products and services that are produced.

3.3 Functional Level Strategy

The functional level is the level of the operating divisions and departments. The strategic issues at this level are related to functional business processes and value chain. Functional level strategies in R&D, operations, manufacturing, marketing, finance, and human resources involve the development and coordination of resources through which business unit level strategies can be executed effectively and efficiently. Functional units of an organization are involved in higher level strategies by providing input to the business unit level and corporate level strategy, such as providing information on customer feedback or on resources and capabilities on which the higher level strategies can be based. Once the higher-level strategy is developed, the functional units translate them into discrete action plans that each department or division must accomplish for the strategy to succeed.

Among the different functional activities viz production, marketing, finance, human resources and research and development, finance assumes highest importance during the top down and bottom up interaction of planning. Corporate strategy deals with deployment of resources and financial strategy is mainly concerned with mobilization and effective utilization of money, the most critical resource that a business firm likes to have under its command. Truly speaking, other resources can be easily mobilized if the firm has adequate monetary base. To go into the details of this interface between financial strategy and corporate strategy and financial planning and corporate planning let us examine the basic issues addressed under financial planning.

4. FINANCIAL PLANNING

Financial planning is the backbone of the business planning and corporate planning. It helps in defining the feasible area of operation for all types of activities and thereby defines the overall planning framework. Financial planning is a systematic approach whereby the financial planner helps the customer to maximize his existing financial resources by utilizing financial tools to achieve his financial goals.

There are 3 major components of Financial planning:

- Financial Resources (FR)
- Financial Tools (FT)
- Financial Goals (FG)

$$\text{Financial Planning} = \text{FR} + \text{FT} + \text{FG}$$

For an individual, financial planning is the process of meeting one's life goals through proper management of the finances. These goals may include buying a house, saving for children's education or planning for retirement. It is a process that consists of specific steps that helps in taking a big-picture look at where you financially are. Using these steps, you can work out where you are now, what you may need in the future and what you must do to reach your goals.

Outcomes of the financial planning are the financial objectives, financial decision-making and financial measures for the evaluation of the corporate performance. Financial objectives are to be decided at the very outset so that rest of the decisions can be taken accordingly. The objectives need to be consistent with the corporate mission and corporate objectives. Financial decision making helps in analyzing the financial problems that are being faced by the corporate and accordingly deciding the course of action to be taken by it. The financial measures like ratio analysis, analysis of cash flow statement are used to evaluate the performance of the Company. The selection of these measures again depends upon the Corporate objectives.

5. INTERFACE OF FINANCIAL POLICY AND STRATEGIC MANAGEMENT

The interface of strategic management and financial policy will be clearly understood if we appreciate the fact that the starting point of an organization is money and the end point of that organization is also money. No organization can run an existing business and promote a new expansion project without a suitable internally mobilized financial base or both i.e. internally and externally mobilized financial base.

Sources of finance and capital structure are the most important dimensions of a strategic plan. The need for fund mobilization to support the expansion activity of firm is very vital for any organization. The generation of funds may arise out of ownership capital and or borrowed capital. A company may issue equity shares and/or preference shares for mobilizing ownership capital and debentures to raise borrowed capital. Public deposits, for a fixed time period, have also become a major source of short and medium-term finance. Organizations may offer higher rates of interest than banking institutions to attract investors and raise fund. The overdraft, cash credits, bill discounting, bank loan and trade credit are the other sources of short-term finance.

Along with the mobilization of funds, policy makers should decide on the capital structure to indicate the desired mix of equity capital and debt capital. There are some norms for debt equity ratio which need to be followed for minimizing the risks of excessive loans. For instance, in case of public sector organizations, the norm is 1:1 ratio and for private sector firms, the norm is 2:1 ratio. However, this ratio in its ideal form varies from industry to industry. It also depends on the planning mode of the organization. For capital intensive industries, the proportion of debt to equity is much higher. Similar is the case for high cost projects in priority sectors and for projects in underdeveloped regions.

Another important dimension of strategic management and financial policy interface is the investment and fund allocation decisions. A planner has to frame policies for regulating investments in fixed assets and for restraining of current assets. Investment proposals mooted by different business units may be divided into three groups. One type of proposal will be for addition of a new product by the firm. Another type of proposal will be to increase the level of operation of an existing product through either an increase in capacity in the existing plant or setting up of another plant for meeting additional capacity requirement. The last is for cost reduction and efficient utilization of resources through a new approach and/or closer monitoring of the different critical activities. Now, given these three types of proposals a planner should evaluate each one of them by making within group comparison in the light of capital budgeting exercise. In fact, project evaluation and project selection are the two most important jobs under fund allocation. Planner's task is to make the best possible allocation under resource constraints.

Dividend policy is yet another area for making financial policy decisions affecting the strategic performance of the company. A close interface is needed to frame the policy to be beneficial for all. Dividend policy decision deals with the extent of earnings to be distributed as dividend and the extent of earnings to be retained for future expansion scheme of the firm. From the point of view of long-term funding of business growth, dividend can be considered as that part of total earnings, which cannot be profitably utilized by the company. Stability of the dividend payment is a desirable consideration that can have a positive impact on share prices. The alternative policy of paying a constant percentage of the net earnings may be preferable from the point of view of both flexibility of the firm and ability of the firm. It also gives a message of lesser risk for the investors. Yet some other companies follow a different alternative. They pay a minimum dividend per share and additional dividend when earnings are higher than the normal earnings. In actual practice, investment opportunities and financial needs of the firm and the shareholders preference for dividend against capital gains resulting out of share are to be taken into consideration for arriving at the right dividend policy. Alternatives like cash dividend and stock dividend are also to be examined while working out an ideal dividend policy that supports and promotes the corporate strategy of the company.

Thus, the financial policy of a company cannot be worked out in isolation of other functional policies. It has a wider appeal and closer link with the overall organizational performance and direction of growth. These policies being related to external awareness about the firm, especially the awareness of the investors about the firm, in respect of its internal performance. There is always a process of evaluation active in the minds of the current and future stake holders of the company. As a result preference and patronage for the company depends significantly on the financial policy framework. Hence, attention of the corporate planners must be drawn while framing the financial policies not at a later stage but during the stage of corporate planning itself. The nature of interdependence is the crucial factor to be studied and modelled by using an in-depth analytical approach. This is a very difficult task compared to usual cause and effect study because

corporate strategy is the cause and financial policy is the effect and sometimes financial policy is the cause and corporate strategy is the effect.

6. BALANCING FINANCIAL GOALS VIS-A-VIS SUSTAINABLE GROWTH

The concept of sustainable growth can be helpful for planning healthy corporate growth. This concept forces managers to consider the financial consequences of sales increases and to set sales growth goals that are consistent with the operating and financial policies of the firm. Often, a conflict can arise if growth objectives are not consistent with the value of the organization's sustainable growth. Question concerning right distribution of resources may take a difficult shape if we take into consideration the rightness not for the current stakeholders but for the future stakeholders also. To take an illustration, let us refer to fuel industry where resources are limited in quantity and a judicious use of resources is needed to cater to the need of the future customers along with the need of the present customers. One may have noticed the save fuel campaign, a demarketing campaign that deviates from the usual approach of sales growth strategy and preaches for conservation of fuel for their use across generation. This is an example of stable growth strategy adopted by the oil industry as a whole under resource constraints and the long run objective of survival over years. Incremental growth strategy, profit strategy and pause strategy are other variants of stable growth strategy.

Sustainable growth is important to enterprise long-term development. Too fast or too slow growth will go against enterprise growth and development, so financial should play important role in enterprise development, adopt suitable financial policy initiative to make sure enterprise growth speed close to sustainable growth ratio and have sustainable healthy development.

What makes an organisation financially sustainable?

To be financially sustainable, an organisation must:

- have more than one source of income;
- have more than one way of generating income;
- do strategic, action and financial planning regularly;
- have adequate financial systems;
- have a good public image;
- be clear about its values (value clarity); and
- have financial autonomy.

Source: CIVICUS "Developing a Financing Strategy".

Sustainable Growth Rate

The sustainable growth rate (SGR), concept by Robert C. Higgins, of a firm is the maximum rate of growth in sales that can be achieved, given the firm's profitability, asset utilization, and desired dividend payout and debt (financial leverage) ratios. The sustainable growth rate is a measure of how much a firm can grow without borrowing more money. After the firm has passed this rate, it must borrow funds from another source to facilitate growth. Variables typically include the net profit margin on new and existing revenues; the asset turnover ratio, which is the ratio of sales revenues to total assets; the assets to equity ratio; and the retention rate, which is defined as the fraction of earnings retained in the business.

$$\text{SGR} = \text{ROE} \times (1 - \text{Dividend payment ratio})$$

Sustainable growth models assume that the business wants to:

- 1) maintain a target capital structure without issuing new equity;
- 2) maintain a target dividend payment ratio; and
- 3) increase sales as rapidly as market conditions allow.

Since the asset to beginning of period equity ratio is constant and the firm's only source of new equity is retained earnings, sales and assets cannot grow any faster than the retained earnings plus the additional debt that the retained earnings can support. The sustainable growth rate is consistent with the observed evidence that most corporations are reluctant to issue new equity. If, however, the firm is willing to issue additional equity, there is in principle no financial constraint on its growth rate. Indeed, the sustainable growth rate formula is directly predicted on return on equity.

Economists and business researchers contend that achieving sustainable growth is not possible without paying heed to twin cornerstones:

- ❖ growth strategy and
- ❖ growth capability.

Companies that pay inadequate attention to one aspect or the other are doomed to fail in their efforts to establish practices of sustainable growth (though short-term gains may be realized). After all, if a company has an excellent growth strategy in place but has not put the necessary infrastructure in place to execute that strategy, long-term growth is impossible. The reverse is also true.

The very weak idea of sustainability requires that the overall stock of capital assets should remain constant. The weak version of sustainability refers to preservation of critical resources to ensure support for all, over a long-time horizon. The strong concept of sustainability is concerned with the preservation of resources under the primacy of ecosystem functioning. These are in line with the definition provided by the economists in the context of sustainable development at macro level.

What makes an organisation sustainable?

In order to be sustainable, an organisation must:

- have a clear strategic direction;
- be able to scan its environment or context to identify opportunities for its work;
- be able to attract, manage and retain competent staff;
- have an adequate administrative and financial infrastructure;
- be able to demonstrate its effectiveness and impact in order to leverage further resources; and
- get community support for, and involvement in its work.

Source: CIVICUS "Developing a Financing Strategy".

The sustainable growth model is particularly helpful in situations in which a borrower requests additional financing. The need for additional loans creates a potentially risky situation of too much debt and too little equity. Either additional equity must be raised, or the borrower will have to reduce the rate of expansion to a level that can be sustained without an increase in financial leverage.

Mature firms often have actual growth rates that are less than the sustainable growth rate. In these cases, management's principal objective is finding productive uses for the cash flows that exist in excess of their needs. Options available to business in such cases includes returning the money to shareholders through increased dividends or common stock repurchases, reducing the firm's debt load, or increasing possession of lower earning liquid assets. These actions serve to decrease the sustainable growth rate. Alternatively, these firms can attempt to enhance their actual growth rates through the acquisition of rapidly growing companies.

Growth can come from two sources: increased volume and inflation. The inflationary increase in assets must be financed as though it were real growth. Inflation increases the amount of external financing required and increases the debt-to-equity ratio when this ratio is measured on a historical cost basis. Thus, if creditors require that a firm's historical cost debt-to-equity ratio stay constant, inflation lowers the firm's sustainable growth rate.

Mitsubishi Corporation (MC): New Strategic Direction (charting a new path toward sustainable growth)

Mitsubishi Corporation has abolished its traditional "*midterm management plan*" concept of committing to fixed financial targets three years in the future, in favour of a long-term, circa 2020 growth vision. The "*New Strategic Direction*" consists of basic concepts on management policy together with business and market strategies. It seeks to recognize the Company's value and upside potential as a *sogo shosha* capable of "*providing stable earnings throughout business cycles by managing a portfolio diversified by business model, industry, market and geography*".

MC remains dedicated to sustainable growth but as evidenced by its guiding philosophy, the

"Three Corporate Principles", its business activities are even more committed to helping solve problems in Japan and around the world. Its chief goal is to contribute to sustainable societal growth on a global scale.

The summary of this New Strategic Direction is:

- Future pull approach eyeing 2020 with a vision to double the business by building a diversified but focussed portfolio.
- Clear portfolio strategy: Select winning businesses through proactive reshaping of portfolio.
- Grow business and deliver returns while maintaining financial discipline.

TEST YOUR KNOWLEDGE

Theoretical Questions

1. Explain the Interface of Financial Policy and Strategic Management.
2. Write a short note on Balancing Financial Goals vis-a-vis Sustainable Growth.

Answers to Theoretical Questions

1. Please refer paragraph 5.
2. Please refer paragraph 6.

NOTES

RISK MANAGEMENT



LEARNING OUTCOMES

After going through the chapter student shall be able to understand:

- Identification of types of Risk faced by an organization
- Evaluation of Financial Risks
- Value at Risk (VAR)
- Evaluation of appropriate method for the identification and management of financial risk.

1. IDENTIFICATION OF TYPES OF RISK FACED BY AN ORGANIZATION

A business organization faces many types of risks. Important among them are discussed as below:

1.1 Strategic Risk

A successful business always needs a comprehensive and detailed business plan. Everyone knows that a successful business needs a comprehensive, well-thought-out business plan but it's also a fact of life that, if things change, even the best-laid plans can become outdated if it cannot keep pace with the latest trends. This is what is called as strategic risk. So, strategic risk is a risk in which a company's strategy becomes less effective and it struggles to achieve its goal. It could be due to technological changes, a new competitor entering the market, shifts in customer demand, increase in the costs of raw materials, or any number of other large-scale changes.

We can take the example of Kodak which was able to develop a digital camera by 1975 but it considers this innovation as a threat to its core business model, and failed to develop it. However, it paid the price because when digital camera was ultimately discovered by other companies, it failed to develop it and left behind. Similar example can be given in case of Nokia when it failed to upgrade its technology to develop touch screen mobile phones. That delay enables Samsung to become a market leader in touch screen mobile phones.

However, a positive example can be given in the case of Xerox which invented photocopy machine. When laser printing was developed, Xerox was quick to lap up this opportunity and changes its business model to develop laser printing. So, it survived the strategic risk and escalated its profits further.

1.2. Compliance Risk

Every business needs to comply with rules and regulations. For example with the advent of Companies Act, 2013, and continuous updating of SEBI guidelines, each business organization has to comply with plethora of rules, regulations and guidelines. Non-compliance leads to penalties in the form of fine and imprisonment.

However, when a company ventures into a new business line or a new geographical area, the real problem then occurs. For example, a company pursuing cement business likely to venture into sugar business in a different state but laws applicable to the sugar mills in that state are different. So, that poses a compliance risk. If the company fails to comply with laws related to a new area or industry or sector, it will pose a serious threat to its survival.

1.3 Operational Risk

This type of risk relates to internal risk. It also relates to failure on the part of the company to cope with day to day operational problems. Operational risk relates to 'people' as well as 'process'. We will take an example to illustrate this. For example, an employee paying out ₹ 1,00,000 from the account of the company instead of ₹ 10,000.

This is a people as well as a process risk. An organization can employ another person to check the work of that person who has mistakenly paid ₹ 1,00,000 or it can install an electronic system that can flag off an unusual amount.

1.4 Financial Risk

Financial Risk is referred as the unexpected changes in financial conditions such as prices, exchange rate, Credit rating, and interest rate etc. Though political risk is not a financial risk in direct sense but same can be included as any unexpected political change in any foreign country may lead to country risk which may ultimately may result in financial loss.

Accordingly, the broadly Financial Risk can be divided into following categories.

1.4.1 Counter Party Risk

This risk occurs due to non-honoring of obligations by the counter party which can be failure to deliver the goods for the payment already made or vice-versa or repayment of borrowings and interest etc. Thus, this risk also covers the credit risk i.e. default by the counter party.

1.4.2 Political Risk

Generally this type of risk is faced by and overseas investors, as the adverse action by the government of host country may lead to huge losses. This can be on any of the following form.

- Confiscation or destruction of overseas properties.
- Rationing of remittance to home country.
- Restriction on conversion of local currency of host country into foreign currency.
- Restriction as to borrowings.
- Invalidation of Patents
- Price control of products

1.4.3. Interest Rate Risk

This risk occurs due to change in interest rate resulting in change in asset and liabilities. This risk is more important for banking companies as their balance sheet's items are more interest sensitive and their base of earning is spread between borrowing and lending rates.

As we know that the interest rates are of two types i.e. fixed and floating. The risk in both of these types is inherent. If any company has borrowed money at floating rate then with increase in floating the liability under fixed rate shall remain the same. This fixed rate, with falling floating rate the liability of company to pay interest under fixed rate shall comparatively be higher.

1.4.4 Currency Risk

This risk mainly affects the organization dealing with foreign exchange as their cash flows changes with the movement in the currency exchange rates. This risk can affect cash flow both adversely or favorably. For example, if rupee depreciates vis-à-vis US\$ receivables will stand to gain vis-à-vis to the importer who has the liability to pay bill in US\$. The best case we can quote Infosys (Exporter) and Indian Oil Corporation Ltd. (Importer).

1.4.5 Liquidity Risk

Broadly liquidity risk can be defined as inability of organization to meet its liabilities whenever they become due.

This risk mainly arises when organization is unable to generate adequate cash or there may be some mismatch in period of cash flow generation.

This type of risk is more prevalent in banking business where there may be mismatch in maturities and receiving fresh deposits pattern.

2. EVALUATION OF FINANCIAL RISK

The financial risk can be evaluated from different point of views as follows:

- (a) From stakeholder's point of view: Major stakeholders of a business are equity shareholders and they view financial gearing i.e. ratio of debt in capital structure of company as risk since in event of winding up of a company they will be least prioritized.

Even for a lender, existing gearing is also a risk since company having high gearing faces more risk in default of payment of interest and principal repayment.

- (b) From Company's point of view: From company's point of view if a company borrows excessively or lend to someone who defaults, then it can be forced to go into liquidation.
- (c) From Government's point of view: From Government's point of view, the financial risk can be viewed as failure of any bank or (like Lehman Brothers) down grading of any financial institution leading to spread of distrust among society at large. Even this risk also includes wilful defaulters. This can also be extended to sovereign debt crisis.

3. VALUE-AT-RISK (VAR)

As per Wikipedia, VAR is a measure of risk of investment. Given the normal market condition in a set of period, say, one day it estimates how much an investment might lose. This investment can be a portfolio, capital investment or foreign exchange etc., VAR answers two basic questions -

- (i) What is worst case scenario?
 (ii) What will be loss?

It was first applied in 1922 in New York Stock Exchange, entered the financial world in 1990s and become world's most widely used measure of financial risk.

3.1 Features of VAR

Following are main features of VAR

- (i) *Components of Calculations:* VAR calculation is based on following three components :
- (a) Time Period
 (b) Confidence Level – Generally 95% and 99%
 (c) Loss in percentage or in amount
- (ii) *Statistical Method:* It is a type of statistical tool based on Standard Deviation.

- (iii) *Time Horizon*: VAR can be applied for different time horizons say one day, one week, one month and so on.
- (iv) *Probability*: Assuming the values are normally attributed, probability of maximum loss can be predicted.
- (v) *Risk Control*: Risk can be controlled by setting limits for maximum loss.
- (vi) *Z Score*: Z Score indicates how many standard Deviations is away from Mean value of a population. When it is multiplied with Standard Deviation it provides VAR.

3.2 Application of VAR

VAR can be applied

- (a) to measure the maximum possible loss on any portfolio or a trading position.
- (b) as a benchmark for performance measurement of any operation or trading.
- (c) to fix limits for individuals dealing in front office of a treasury department.
- (d) to enable the management to decide the trading strategies.
- (e) as a tool for Asset and Liability Management especially in banks.

3.3 Example:

The concept of VAR can be understood in a better manner with help of following example:

Suppose you hold worth ₹ 2 crore shares of X Ltd. whose market price standard deviation is 2% per day. Assuming 252 trading days a year, determine maximum loss level over the period of 1 trading day and 10 trading days with 99% confidence level.

Answer

Assuming share prices are normally distributed for level of 99%, the equivalent Z score from Normal table of Cumulative Area shall be 2.33.

Volatility in terms of rupees shall be:

$$2\% \text{ of } ₹ 2 \text{ Crore} = ₹ 4 \text{ lakh}$$

The maximum loss for 1 day at 99% Confidence Level shall be:

$$₹ 4 \text{ lakh} \times 2.33 = ₹ 9.32 \text{ lakh,}$$

and expected maximum loss for 10 trading days shall be:

$$\sqrt{10} \times ₹ 9.32 \text{ lakh} = 29.47 \text{ lakhs}$$



4. APPROPRIATE METHODS FOR IDENTIFICATION AND MANAGEMENT OF FINANCIAL RISK

As we have classified financial risk in 4 categories, we shall discuss identification and management of each risk separately under same category.

4.1 Counter Party risk

The various hints that may provide counter party risk are as follows:

- (a) Failure to obtain necessary resources to complete the project or transaction undertaken.
- (b) Any regulatory restrictions from the Government.
- (c) Hostile action of foreign government.
- (d) Let down by third party.
- (e) Have become insolvent.

The various techniques to manage this type of risk are as follows:

- (1) Carrying out Due Diligence before dealing with any third party.
- (2) Do not over commit to a single entity or group or connected entities.
- (3) Know your exposure limits.
- (4) Review the limits and procedure for credit approval regularly.
- (5) Rapid action in the event of any likelihood of defaults.
- (6) Use of performance guarantee, insurance or other instruments.

4.2 Political risk

From the following actions by the Governments of the host country this risk can be identified:

1. Insistence on resident investors or labour.
2. Restriction on conversion of currency.
3. Expropriation of foreign assets by the local govt.
4. Price fixation of the products.

Since this risk mainly relates to investments in foreign country, company should assess country risk

- (1) By referring political ranking published by different business magazines.
- (2) By evaluating country's macro-economic conditions.
- (3) By analysing the popularity of current government and assess their stability.

(4) By taking advises from the embassies of the home country in the host countries.

Further, following techniques can be used to mitigate this risk.

- (i) Local sourcing of raw materials and labour.
- (ii) Entering into joint ventures
- (iii) Local financing
- (iv) Prior negotiations

4.3 Interest Rate Risk

Generally, interest rate Risk is mainly identified from the following:

1. Monetary Policy of the Government.
2. Any action by Government such as demonetization etc.
3. Economic Growth
4. Release of Industrial Data
5. Investment by foreign investors
6. Stock market changes

The management of Interest risk has been discussed in detail in separate chapter later on.

4.4 Currency Risk

Just like interest rate risk the currency risk is dependent on the Government action and economic development. Some of the parameters to identify the currency risk are as follows:

- (1) Government Action: The Government action of any country has visual impact in its currency. For example, the UK Govt. decision to divorce from European Union i.e. Brexit brought the pound to its lowest since 1980's.
- (2) Nominal Interest Rate: As per interest rate parity (IRP) the currency exchange rate depends on the nominal interest of that country.
- (3) Inflation Rate: Purchasing power parity theory discussed in later chapters impact the value of currency.
- (4) Natural Calamities: Any natural calamity can have negative impact.
- (5) War, Coup, Rebellion etc.: All these actions can have far reaching impact on currency's exchange rates.
- (6) Change of Government: The change of government and its attitude towards foreign investment also helps to identify the currency risk.

So far as the management of currency risk is concerned, it has been covered in a detailed manner in a separate chapter.

TEST YOUR KNOWLEDGE

Theoretical Questions

1. Explain the significance of VAR.
2. The Financial Risk can be viewed from different perspective. Explain.

Practical Questions

1. Consider a portfolio consisting of a ₹ 200,00,000 investment in share XYZ and a ₹ 200,00,000 investment in share ABC. The daily standard deviation of both shares is 1% and that the coefficient of correlation between them is 0.3. You are required to determine the 10-day 99% value at risk for the portfolio?

ANSWERS/ SOLUTIONS

Answers to Theoretical Questions

1. Please refer paragraph 3.2.
2. Please refer paragraph 2.

Answers to the Practical Questions

1. The standard deviation of the daily change in the investment in each asset is ₹ 2,00,000 i.e. 2 lakhs. The variance of the portfolio's daily change is

$$V = 2^2 + 2^2 + 2 \times 0.3 \times 2 \times 2 = 10.4$$

$$\sigma \text{ (Standard Deviation)} = \sqrt{10.4} = ₹ 3.22 \text{ lakhs}$$

Alternatively, it can also be computed as follows:

$$= (1)^2(0.50)^2 + (1)^2(0.50)^2 + 2(1)(1)(0.3)(0.50)(0.50)$$

$$= 0.25 + 0.25 + 0.15 = 0.65\%$$

$$\sigma \text{ (Standard Deviation)} = \sqrt{0.65} = 0.80623\%$$

$$\sigma \text{ (Standard Deviation) in Amount} = ₹ 400 \text{ lakhs} \times 0.80623\% = ₹ 3.22 \text{ lakhs}$$

Accordingly, the standard deviation of the 10-day change is

$$₹ 3.22 \text{ lakhs} \times \sqrt{10} = ₹ 10.18 \text{ lakh}$$

From the Normal Table we see that z score for 1% is 2.33. This means that 1% of a normal distribution lies more than 2.33 standard deviations below the mean. The 10-day 99 percent value at risk is therefore

$$2.33 \times ₹ 10.18 \text{ lakh} = ₹ 23.72 \text{ lakh}$$

ADVANCED CAPITAL BUDGETING DECISIONS



LEARNING OUTCOMES

After going through the chapter student shall be able to understand

- ❑ Current trends in Capital Budgeting
- ❑ Dealing with Risk in Investment Decisions
- ❑ Internal and External Factors affecting capital budgeting decision
- ❑ Methods of incorporating risk in Capital Budgeting
- ❑ Adjusted Present Value
- ❑ Optimum Replacement Cycle



1. CURRENT TRENDS IN CAPITAL BUDGETING

While discussing the capital budgeting or investment evaluation techniques at Intermediate Level, we have assumed that the investment proposals do not involve any risk and cash flows of the project are known with certainty. This assumption was taken to simplify the understanding of the capital budgeting techniques. However, in practice, this assumption is not correct. In-fact, investment projects are exposed to various types of factors some of which are as follows:

- (i) Inflation
- (ii) Change in technology
- (iii) Change in Government Policies

Now let us discuss the impact of each factor in a detailed manner.

1.1 Impact of Inflation on Capital Budgeting Decisions

Adjustment for inflation is a necessity for capital investment appraisal. This is because inflation will raise the revenues & costs of the project. The net revenues after adjustment for inflation shall be equal to net revenues in current terms. The considerations, which cause distortion, are:

(1) Depreciation charges are based on historical costs. Tax benefits accruing from depreciation charges do not keep parity with inflation.

As annual after-tax cash inflow of a project is equal to

$$(R - C - D)(1 - T) + D = (R - C)(1 - T) + DT$$

Where,

R → Revenue from project

C → Costs (apart from depreciation) relating to the project

D → Depreciation charges

T → Tax Rate

Here $(R - C)(1 - T)$ tends to move in line with inflation as inflation influences revenues & costs similarly. DT does not depend on inflation as depreciation charges are based on historical costs. The effect of inflation is to reduce the actual rate of return.

Example:

Initial outlay of a project	– ₹ 80,000
Expected life	– 4 years
Salvage value	– Nil
Annual revenues	– ₹ 60,000
Annual costs other than depreciation	– ₹ 20,000
Tax Rate	– 50%

Depreciation on straight-line basis presuming as if there is no inflation.

Year	1	2	3	4
Revenues	₹ 60,000	₹ 60,000	₹ 60,000	₹ 60,000
Costs other than depreciation	₹ 20,000	₹ 20,000	₹ 20,000	₹ 20,000
Depreciation	₹ 20,000	₹ 20,000	₹ 20,000	₹ 20,000
Taxable profit	₹ 20,000	₹ 20,000	₹ 20,000	₹ 20,000
Tax	₹ 10,000	₹ 10,000	₹ 10,000	₹ 10,000
Profit after tax	₹ 10,000	₹ 10,000	₹ 10,000	₹ 10,000
Net cash inflow	₹ 30,000	₹ 30,000	₹ 30,000	₹ 30,000

If there is inflation @ 10% applicable to revenues & cost of project.

Year	1	2	3	4
Revenues	₹ 66,000	₹ 72,600	₹ 79,860	₹ 87,846
Costs other than depreciation	₹ 22,000	₹ 24,200	₹ 26,620	₹ 29,282
Depreciation	₹ 20,000	₹ 20,000	₹ 20,000	₹ 20,000
Taxable profit	₹ 24,000	₹ 28,400	₹ 33,240	₹ 38,564
Tax	₹ 12,000	₹ 14,200	₹ 16,620	₹ 19,282
Profit after tax	₹ 12,000	₹ 14,200	₹ 16,620	₹ 19,282
Net cash inflow	₹ 32,000	₹ 34,200	₹ 36,620	₹ 39,282

The actual net cash flow stream after deflating for inflation rate of 10% .

Real Net Cash Flow	₹ 29,091	₹ 28,264	₹ 27,513	₹ 26,830
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So actual net cash flows are less than net cash flow if there is no inflation.

(2) Costs of capital considered for investment appraisals contain a premium for anticipated inflation. Due to inflation investors require the nominal rate of return to be equal to:

Required Rate of Return in real terms plus Rate of Inflation.

Formula

$$R_N = R_R + P$$

R_N → Required rate of return in nominal terms.

R_R → Required rate of return in real terms.

P → Anticipated inflation rate.

If cost of capital (required rate of return) contains a premium for anticipated inflation, the inflation factor has to be reflected in the projected cash flows.

If there is no inflation, then it has to be discounted at required rate of return in real terms.

Illustration 1

Determine NPV of the project with the following information:

Initial Outlay of project	₹ 40,000
Annual revenues (Without inflation)	₹ 30,000
Annual costs excluding depreciation (Without inflation)	₹ 10,000
Useful life	4 years
Salvage value	Nil
Tax Rate	50%

Cost of Capital (Including inflation premium of 10%)

12%

Solution

Annual Cash Flow of project is

$$(\text{₹ } 30,000 - \text{₹ } 10,000) (1 - 0.50) + \text{₹ } 10,000 \times 0.50 = \text{₹ } 15,000$$

It would be inconsistent to discount these real cash flows at 12% (nominal rate of return).

There are two alternatives:

- (i) Either to restate the cash flow in nominal term and discount at 12% or
- (ii) Restate the discount rate in real terms and use this to discount the real cash flows.

NPV using (i) approach

Since inflation rate is 10% a year, real cash flows may be stated in nominal cash flows as follows:

$$\text{Nominal Cash Flow} = (1 + \text{Inflation Rate}) \text{ Real Cash Flows}$$

Year	Real Cash Flows	Nominal Cash flows
1	15000	$15,000 \times 1.10 = 16,500$
2	15,000	$15,000 \times (1.10)^2 = 18,150$
3	15,000	$15,000 \times (1.10)^3 = 19,965$
4	15,000	$15,000 \times (1.10)^4 = 21,962$

NPV using nominal discounting rate 12%

$$\frac{16,500}{(1.12)} + \frac{18,150}{(1.12)^2} + \frac{19,965}{(1.12)^3} + \frac{21,962}{(1.12)^4} - 40,000$$

$$= \text{₹ } 14,732 + \text{₹ } 14,469 + \text{₹ } 14,211 + \text{₹ } 13,957 - \text{₹ } 40,000$$

$$= \text{₹ } 17,369 \text{ (Approx)}$$

NPV using (ii) approach

To compute NPV using (ii) approach, we shall need real discount rate, which shall be computed as follows:

$$\text{Real Discount Rate} = \frac{1 + \text{Nominal Discount Rate}}{1 + \text{Inflation Rate}} - 1$$

$$\text{Real Discount Rate} = \frac{1 + 0.12}{1 + 0.10} - 1 = 0.0182 \text{ i.e. } 1.8\%$$

$$\text{NPV} = \sum_{t=1}^n \text{cf}_t - I_0$$

Where t = Time Period

cf_t = Annual Cash Flow

l_0 = Initial Outlay

Accordingly NPV of the project

$$\frac{15,000}{(1.0182)} + \frac{15,000}{(1.0182)^2} + \frac{15,000}{(1.0182)^3} + \frac{15,000}{(1.0182)^4} - 40,000$$

$$= ₹ 14,732 + ₹ 14,469 + ₹ 14,210 + ₹ 13,956 - ₹ 40,000$$

$$= ₹ 57,367 - ₹ 40,000 = ₹ 17,367(\text{Approx})$$

NPV based on consideration that inflation rate for revenue and cost are different shall be computed as follows:

$$N.P.V. = \sum_{t=1}^n \{ [R_t(1+i_r) - C_t(1+i_c)] (1-T) + D_tT \} / (1+k)^t - l_0$$

R_t → revenues for the year 't' with no inflation.

i_r → annual inflation rate in revenues for 'r th' year.

C_t → costs for year 't' with no inflation.

i_c → annual inflation rate of costs for year 'r'.

T → tax rate.

D_t → depreciation charge for year 't'.

l_0 → initial outlay.

k → cost of capital (with inflation premium).

Illustration 2

XYZ Ltd. requires ₹ 8,00,000 for an unit. Useful life of project - 4 years. Salvage value - Nil. Depreciation Charge ₹ 2,00,000 p.a. Expected revenues & costs (excluding depreciation) ignoring inflation.

Year	1	2	3	4
Revenues	₹ 6,00,000	₹ 7,00,000	₹ 8,00,000	₹ 8,00,000
Costs	₹ 3,00,000	₹ 4,00,000	₹ 4,00,000	₹ 4,00,000

Tax Rate 60% cost of capital 10% (including inflation premium).

Calculate NPV of the project if inflation rates for revenues & costs are as follows:

Year	Revenues	Costs
1	10%	12%

2	9%	10%
3	8%	9%
4	7%	8%

Solution**Computation of Annual Cash Flow**

(i) Inflation adjusted Revenues

Year	Revenues (₹)	Revenues (Inflation Adjusted) (₹)
1	6,00,000	6,00,000(1.10) = 6,60,000
2	7,00,000	7,00,000(1.10)(1.09) = 8,39,300
3	8,00,000	8,00,000(1.10)(1.09)(1.08) = 10,35,936
4	8,00,000	8,00,000(1.10)(1.09)(1.08)(1.07) = 11,08,452

(ii) Inflation adjusted Costs

Year	Revenues (₹)	Revenues (Inflation Adjusted) (₹)
1	3,00,000	3,00,000(1.12) = 3,36,000
2	4,00,000	4,00,000(1.12)(1.10) = 4,92,800
3	4,00,000	4,00,000(1.12)(1.10)(1.09) = 5,37,172
4	4,00,000	4,00,000(1.12)(1.10)(1.09)(1.08) = 5,80,124

(iii) Tax Benefit on Depreciation = ₹ 2,00,000 x 0.60 = ₹ 1,20,000

(iv) Net Profit after Tax

Year	Revenues (Inflation Adjusted) (₹) (1)	Costs (Inflation Adjusted) (₹) (2)	Net Profit (₹) (3) = (1) - (2)	Tax (₹) (4) = 60% of (3)	Net after Profit (₹) (3) - (4)
1	6,60,000	3,36,000	3,24,000	1,94,400	1,29,600
2	8,39,300	4,92,800	3,46,500	2,07,900	1,38,600
3	10,35,936	5,37,172	4,98,764	2,99,258	1,99,506
4	11,08,452	5,80,124	5,28,328	3,16,997	2,11,331

(iv) Present Value of Cash Inflows

Year	Net after Profit (₹)	Tax Benefit on Depreciation (₹)	Cash Inflow (₹)	PVF@ 10%	PV (₹)

1	1,29,600	1,20,000	2,49,600	0.909	2,26,886
2	1,38,600	1,20,000	2,58,600	0.826	2,13,604
3	1,99,506	1,20,000	3,19,506	0.751	2,39,949
4	2,11,331	1,20,000	3,31,331	0.683	2,26,299
					9,06,738

$$NPV = ₹ 9,06,738 - ₹ 8,00,000 = ₹ 1,06,738$$

1.2 Impact of change in technology on Capital Budgeting Decisions

Generally it has been observed that those making capital Budgeting decision evaluates the proposals in monetary terms i.e. quantitative values and normally fails to consider critical factors i.e. qualitative factor that can affect the future cash flows one of such factor is technology. It is important to note that here we are not simply talking about decision to replace existing machinery with new machine having improved technology rather we are talking about the impact of technology change on capital budgeting. Now the question arises why it is important to analyze the impacts of change in technology it is because of following reason:

- ❖ Change in technology can significantly alter production process.
- ❖ Changes can also yield benefits such as improved quality, delivery time greater flexibility, etc.
- ❖ Changed technology can also result in reduction in cost of capital
- ❖ Improved cash inflows can be achieved through technological changes.
- ❖ There may be need to incur additional cost in the form of additional capital expenditure.
- ❖ The sale volume can be impacted as the anticipated life cycle of the product can be shortened because of change in consumer preference.

Now next question arises how to incorporate impact in capital budgeting decision. For this purpose it is very necessary that once the project has been launched it should be reviewed on continuous basis and if required it need to be revised in light of changes in the technology.

The various ways in which the impact of change in technology can be incorporated in capital Budgeting decisions are as follows.

1. At the time of making Capital Budgeting decisions the risk of change in technology should be considered using various techniques such as sensitivity analysis, Scenario Analysis, Simulation Analysis etc. (discussed later in this chapter)
2. Once project has been launched analyze the impact of change in technology both positive or negative and revise estimates in monetary terms.
3. If continuation of project is proving to be unviable then look for abandonment option and evaluate the same (discussed later).

4. Suitably adjusting the discounting rate.

1.3 Impact of change in Government Policies on Capital Budgeting Decisions

Government Policies are important external factors that impacts the capital budgeting decision because directly or indirectly they affect the future cash flows of the firm that forms the basis of capital budgeting decisions. It might be possible that Government Policy may not affect us, but it may affect our supplier, buyers, customers, service providers etc.

The impact of changes in these policies can be positive as well as negative. What is more important is that the impact of such should be analysed and if required the estimation should be revised adequately. If required, the firm should consider the option to abandon the project (discussed in later chapter of study material).

The change in Government Policy can be analysed under two headings:

- i. Impact of change of Policies on Domestic Capital Budgeting Decision.
- ii. Impact of change of Policies on International Capital Budgeting Decision.

While some Government policies are changed after a longer period, say five to ten years, some change from quarter to a year. The impact of each policy may vary from each other. For example, the policies such as New Industrial Policy 1991, might had drastically impacted the Capital Budgeting decisions of various firms in the beginning period of 1990s due to opening of the doors of the Indian Economy for the Global world. However, such types of policies normally come out after a longer period. On the other hand, there are some policies of the Government that are announced/ reviewed within a period of one year. Some of these are as follows:

- ❖ **Fiscal policy:** The use of government spending, taxation and borrowing to influence both the pattern of economic activity and level of growth of aggregate demand, output and employment.
- ❖ **Monetary Policy:** Monetary policy refers to the use of monetary policy instruments which are at the disposal of the central bank to regulate the availability, cost and use of money and credit to promote economic growth, price stability, optimum levels of output and employment, balance of payments equilibrium, stable currency or any other goal of government's economic policy.

Generally, the change in monetary policy depends on the economic status of the nation. In India, the monetary policy includes decisions on open market operations, variation in reserve requirements, selective credit controls, supply of currency, bank rates (Repo Rates) and other rates.

Since in India members of Monetary Policy Committee (MPC) are required to meet at least four times in a year generally changes in the policies related to above mentioned matters takes at least two to three times in a year.

Now let us discuss how changes in Government Policies affect the Capital Budgeting decision under two broad heads:

1.3.1 Impact of changes in Government Policies on Domestic Capital Budgeting Decision.

- (a) Since the change in interest rate are decided by Government through its Monetary Policy. This can affect the Cost of Capital because the Cost of Debt is normally dependent on the bank rate of interest as they are considered as one of the important factors to compute YTM. Though this rate change may not much affect Capital Budgeting decision because they are financed from long term source of finance but they may impact working capital decisions to a great extent. The main reason behind is that the Bank Overdraft as one of the important constituents of Working Capital and it may lead to change in cash flow estimation. Hence, it is important that though small change in Bank Interest can be ignored but a major change say about 100 basis points or so can impact cash flows of the firm and may call for revision of estimations.
- (b) Another important change (Government Policy) is related to Fiscal Policy, Since Fiscal Policy forms the basis of Tax Rate and Annual Cash Flows are dependent on Rate of Depreciation of Tax Rate, any drastic change in any of these two items may call for revision of estimated cash flows.

1.3.2 Impact of changes in Government Policies on International Capital Budgeting Decision.

- (a) In International Capital Budgeting Decisions, the foreign exchange rate play a very important role. As mentioned above the change in bank rate and money supply is decided as per Monetary Policy, the change in any of these two impacts the rate of Foreign Exchange and it may call for revision of estimates.
- (b) Change in Tax Rates relating to Foreign Income or changes in provisions of Double Tax Avoiding Agreement (DTAA) as decided in Fiscal Policy may call revision of estimates.

Thus, from above discussion it can be concluded that while estimating future cash inflows change in the policies be forecasted and a proper provision should be incorporated in the expected cash flows.

2. DEALING WITH RISK IN INVESTMENT DECISIONS

While discussing the capital budgeting or investment evaluation techniques at Intermediate Level in the paper of Financial Management, we have assumed that the investment proposals do not involve any risk and cash flows of the project are known with certainty. This assumption was taken to simplify the understanding of the capital budgeting techniques. However, in practice, this assumption is not correct. In-fact, investment projects are exposed to various degrees of risk.

There can be three types of decision making:

- (i) Decision making under certainty: When cash flows are certain.
- (ii) Decision making involving risk: When cash flows involves risk and probability can be assigned.
- (iii) Decision making under uncertainty: When the cash flows are uncertain and probability cannot be assigned.

2.1 Risk and Uncertainty

Risk is the variability in terms of actual returns comparing with the estimated returns. Most common techniques of risk measurement are Standard Deviation and Coefficient of Variation. There is a thin difference between risk and uncertainty. In case of risk, probability distribution of cash flow is known. When no information is known to formulate probability distribution of cash flows, the situation is referred as uncertainty. However, these two terms are used interchangeably.

2.2 Reasons for adjustment of Risk in Capital Budgeting decisions

Main reasons for considering risk in capital budgeting decisions are as follows:

1. There is an opportunity cost involved while investing in a project for the level of risk. Adjustment of risk is necessary to help make the decision as to whether the returns out of the project are proportionate with the risks borne and whether it is worth investing in the project over the other investment options available.
2. Risk adjustment is required to know the real value of the Cash Inflows. Higher risk will lead to higher risk premium and also expectation of higher return.

3. INTERNAL AND EXTERNAL FACTORS AFFECTING CAPITAL BUDGETING DECISION

Risk arises from different factors, depending on the type of investment being considered, as well as the circumstances and the industry in which the organisation is operating. Accordingly it these factors can be divided following two broad categories:

3.1 Internal Factors

These factors are internal to the company, and they can further be divided into following categories:

3.1.1 Project-specific risk

Risks which are related to a particular project and affects the project's cash flows. It includes completion of the project in scheduled time, error of estimation in resources and allocation, estimation of cash flows etc. For example, a nuclear power project of a power generation company has different risks than hydel projects.

3.1.2 Company-specific risk

Risk which arise due to company specific factors like downgrading of credit rating, changes in key managerial persons, cases for violation of intellectual property rights (IPR) and other laws and regulations, dispute with workers etc. All these factors affect the cash flows of an entity and access to funds for capital investments. For example, two banks have different exposure to default risk.

3.2 External Factors

These factors are external to the company, and they can further be divided into following categories:

3.2.1 Industry-specific risk

These are the risks which effect the whole industry in which the company operates. These risks include regulatory restrictions on industry, changes in technologies etc. For example, regulatory restriction imposed on leather and breweries industries.

3.2.2 Market risk

The risk which arise due to market related conditions like entry of substitute, changes in demand conditions, availability and access to resources etc. For example, a thermal power project gets affected if the coal mines are unable to supply coal requirements of a thermal power company etc.

3.2.3 Competition risk

These are risks related with competition in the market in which a company operates. These risks are risk of entry of rival, product dynamism and change in taste and preference of consumers etc.

3.2.4 Risk due to Economic conditions

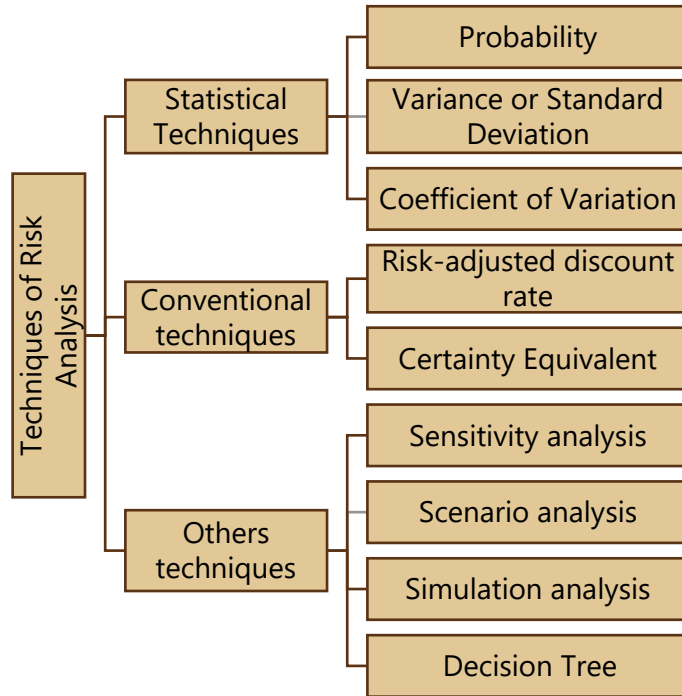
These are the risks which are related with macro-economic conditions like changes in monetary policies by central banks, changes in fiscal policies like introduction of new taxes and cess, inflation, changes in GDP, changes in savings and net disposable income etc.

3.2.5 International risk

These are risk which are related with conditions which are caused by global economic conditions like restriction on free trade, restrictions on market access, recessions, bilateral agreements, political and geographical conditions etc. For example, restriction on outsourcing of jobs to overseas markets.

4. METHODS OF INCORPORATING RISK IN CAPITAL BUDGETING

Techniques of risk analysis in capital budgeting can be classified as below:



4.1 Statistical Techniques

4.1.1 Probability

Probability is a measure about the chances that an event will occur. When an event is certain to occur, probability will be 1 and when there is no chance of happening an event, probability will be 0.

Example:

Assumption	Cash Flows (₹)	Probability
Best guess	3,00,000	0.3
High guess	2,00,000	0.6
Low guess	1,20,000	0.1

In the above example chances that cash flow will be ₹ 3,00,000, ₹ 2,00,000 and ₹ 1,00,000 are 30%, 60% and 10% respectively.

(i) Expected Net Cash Flows

Expected Net Cash flows are calculated as the sum of the likely Cash flows of the Project multiplied by the probability of cash flows. Expected Cash flows are calculated as below:

$$E(R)/ENCF = \sum_{i=1}^n NCF_i \times P_i$$

Where, $E(R)/ENCF$ = Expected Net Cash flows
 P_i = Probability of Cash flows
 NCF_i = Net Cash flows

Example:

Assumption (1)	Cash Flows (₹) (2)	Probability (3)	Expected cash flow (₹) (2×3)
Best guess	3,00,000	0.3	3,00,000 × 0.3 = 90,000
High guess	2,00,000	0.6	2,00,000 × 0.6 = 1,20,000
Low guess	1,20,000	0.1	1,20,000 × 0.1 = 12,000
Expected Net cash flow (ENCF)			2,22,000

(ii) **Expected Net Present Value**

Expected net present value =

$$ENPV = \sum_{t=1}^n \frac{ENCF}{(1+k)^t}$$

Where, ENPV = Expected Net Present Value

ENCF = Expected Net Cash Flows(including both inflows and outflows)

t = Period

k = Discount rate.

(a) Expected Net Present Value - Single period

Let us understand the calculation of Expected Net Present Value (ENPV) for a single period through an illustration as follows:

Illustration 3

Possible net cash flows of Projects A and B at the end of first year and their probabilities are given below. Discount rate is 10 per cent. For both the projects, initial investment is ₹ 10,000. Calculate the expected net present value for each project. State which project is preferable?

Possible Event	Project A		Project B	
	Cash Flow (₹)	Probability	Cash Flow (₹)	Probability
A	8,000	0.10	24,000	0.10
B	10,000	0.20	20,000	0.15

C	12,000	0.40	16,000	0.50
D	14,000	0.20	12,000	0.15
E	16,000	0.10	8,000	0.10

Solution**Calculation of Expected Value for Project A and Project B**

Project A				Project B		
Possible Event	Cash Flow (₹)	Probability	Expected Value (₹)	Cash Flow (₹)	Probability	Expected Value (₹)
A	8,000	0.10	800	24,000	0.10	2,400
B	10,000	0.20	2,000	20,000	0.15	3,000
C	12,000	0.40	4,800	16,000	0.50	8,000
D	14,000	0.20	2,800	12,000	0.15	1,800
E	16,000	0.10	1,600	8,000	0.10	800
ENCF			12,000			16,000

The Net Present Value for Project A is $(0.909 \times ₹ 12,000 - ₹ 10,000) = ₹ 908$

The Net Present Value for Project B is $(0.909 \times ₹ 16,000 - ₹ 10,000) = ₹ 4,544$.

(b) Expected Net Present Value- Multiple period

Let us understand the calculation of Expected Net Present Value (ENPV) for multiple periods through an illustration as follows:

Illustration 4

Probabilities for net cash flows for 3 years of a project are as follows:

Year 1		Year 2		Year 3	
Cash Flow (₹)	Probability	Cash Flow (₹)	Probability	Cash Flow (₹)	Probability
2,000	0.1	2,000	0.2	2,000	0.3
4,000	0.2	4,000	0.3	4,000	0.4
6,000	0.3	6,000	0.4	6,000	0.2
8,000	0.4	8,000	0.1	8,000	0.1

Calculate the expected net present value of the project using 10 per cent discount rate if the Initial Investment of the project is ₹ 10,000.

Solution

Calculation of Expected Value

Year 1			Year 2			Year 3		
Cash Flow (₹)	Prob.	Expected Value (₹)	Cash Flow (₹)	Prob.	Expected Value (₹)	Cash Flow (₹)	Prob.	Expected Value (₹)
2,000	0.1	200	2,000	0.2	400	2,000	0.3	600
4,000	0.2	800	4,000	0.3	1200	4,000	0.4	1,600
6,000	0.3	1,800	6,000	0.4	2400	6,000	0.2	1,200
8,000	0.4	3,200	8,000	0.1	800	8,000	0.1	800
ENCF		6,000			4,800			4,200

The present value of the expected value of cash flow at 10 per cent discount rate has been determined as follows:

$$\begin{aligned}
 \text{Present Value of cash flow} &= \frac{ENCF_1}{(1+k)^1} + \frac{ENCF_2}{(1+k)^2} + \frac{ENCF_3}{(1+k)^3} \\
 &= \frac{6,000}{(1.1)} + \frac{4,800}{(1.1)^2} + \frac{4,200}{(1.1)^3} \\
 &= (6,000 \times 0.909) + (4,800 \times 0.826) + (4,200 \times 0.751) \\
 &= ₹ 12,573
 \end{aligned}$$

$$\begin{aligned}
 \text{Expected Net Present value} &= \text{Present Value of cash flow} - \text{Initial Investment} \\
 &= ₹ 12,573 - ₹ 10,000 = ₹ 2,573.
 \end{aligned}$$

4.1.2 Variance

Variance is a measurement of the degree of dispersion between numbers in a data set from its average. In very simple words, variance is the measurement of difference between the average of the data set from every number of the data set. Variance is calculated as below:

$$\text{Variance}(\sigma^2) = \sum_{j=1}^n (NCF_j - ENCF)^2 P_j$$

Where, NCF_j = Net Cash Flow

ENCF = Expected Net Cash Flow

P_j = Probability

Variance measures the uncertainty of a value from its average. Thus, variance helps an organization to understand the level of risk it might face on investing in a project. A variance value of zero would indicate that the cash flows that would be generated over the life of the project would be same. This might happen in a case where the company has entered into a contract of providing services in return of a specific sum. A large variance indicates that there will be a large variability between the cash flows of the different years. This can happen in a case where the project being undertaken is very innovative and would require a certain time frame to market the product and enable to develop a customer base and generate revenues. A small variance would indicate that the cash flows would be somewhat stable throughout the life of the project. This is possible in case of products which already have an established market.

4.1.3 Standard Deviation

Standard Deviation (SD) is a degree of variation of individual items of a set of data from its average. The square root of variance is called Standard Deviation. For Capital Budgeting decisions, Standard Deviation is used to calculate the risk associated with the estimated cash flows from the project.

Importance of Variance and Standard Deviation in Capital Budgeting: For making capital budgeting decisions, these two concepts are important to measure the volatility in estimated cash flows and profitability in an investment proposal. Both the concepts measures the difference between the expected cash flows and estimated cash flows (mean or average). Variance measures the range of variability (difference) in cash flows data while Standard deviation determines risk in an investment proposal. An investment proposal in which expected cash flows are close to the estimated net cash flow are seen as less risky and has the potential to make profit.

Standard deviation and Variance are two different statistical concepts but are closely interrelated. Standard deviation is calculated as square root of variance, hence, variance is prerequisite for calculation of SD.

Illustration 5

Calculate Variance and Standard Deviation of Project A and Project B on the basis of following information:

Possible Event	Project A		Project B	
	Cash Flow (₹)	Probability	Cash Flow (₹)	Probability
A	8,000	0.10	24,000	0.10
B	10,000	0.20	20,000	0.15
C	12,000	0.40	16,000	0.50
D	14,000	0.20	12,000	0.15
E	16,000	0.10	8,000	0.10

Solution

Calculation of Expected Value for Project A and Project B

Project A				Project B		
Possible Event	Cash Flow (₹)	Probability	Expected Value (₹)	Cash Flow (₹)	Probability	Expected Value (₹)
A	8,000	0.10	800	24,000	0.10	2,400
B	10,000	0.20	2,000	20,000	0.15	3,000
C	12,000	0.40	4,800	16,000	0.50	8,000
D	14,000	0.20	2,800	12,000	0.15	1,800
E	16,000	0.10	1,600	8,000	0.10	800
ENCF			12,000			16,000

Project A:

$$\begin{aligned} \text{Variance } (\sigma^2) &= (8,000 - 12,000)^2 \times (0.1) + (10,000 - 12,000)^2 \times (0.2) + (12,000 - 12,000)^2 \times (0.4) \\ &\quad + (14,000 - 12,000)^2 \times (0.2) + (16,000 - 12,000)^2 \times (0.1) \\ &= 16,00,000 + 8,00,000 + 0 + 8,00,000 + 16,00,000 = 48,00,000 \end{aligned}$$

$$\text{Standard Deviation } (\sigma) = \sqrt{\text{Variance}(\sigma^2)} = \sqrt{48,00,000} = 2,190.90$$

Project B:

$$\begin{aligned} \text{Variance}(\sigma^2) &= (24,000 - 16,000)^2 \times (0.1) + (20,000 - 16,000)^2 \times (0.15) + (16,000 - 16,000)^2 \times (0.5) \\ &\quad + (12,000 - 16,000)^2 \times (0.15) + (8,000 - 16,000)^2 \times (0.1) \\ &= 64,00,000 + 24,00,000 + 0 + 24,00,000 + 64,00,000 = 1,76,00,000 \end{aligned}$$

$$\text{Standard Deviation } (\sigma) = \sqrt{\text{Variance}(\sigma^2)} = \sqrt{1,76,00,000} = 4195.23$$

4.1.4 The Coefficient of Variation

The standard deviation is a useful measure of calculating the risk associated with the estimated cash inflows from an Investment. However, in Capital Budgeting decisions, the management is several times faced with choosing between many investments' avenues. Under such situations, it becomes difficult for the management to compare the risk associated with different projects using Standard Deviation as each project has different estimated cash flow values. In such cases, the Coefficient of Variation becomes useful.

The Coefficient of Variation calculates the risk borne for every percent of expected return. It is calculated as:

$$\text{Coefficient of variation} = \frac{\text{Standard Deviation}}{\text{Expected Return/ Expected Cash Flow}}$$

The Coefficient of Variation enables the management to calculate the risk borne by the concern for every unit of estimated return from a particular investment. Simply put, the investment avenue which has a lower ratio of standard deviation to expected return will provide a better risk – return trade off. Thus, when a selection has to be made between two projects, the management would select a project which has a lower Coefficient of Variation.

Illustration 6

Calculate Coefficient of Variation of Project A and Project B based on the following information:

Possible Event	Project A		Project B	
	Cash Flow (₹)	Probability	Cash Flow (₹)	Probability
A	10000	0.10	26,000	0.10
B	12,000	0.20	22,000	0.15
C	14,000	0.40	18,000	0.50
D	16,000	0.20	14,000	0.15
E	18,000	0.10	10,000	0.10

Solution

Calculation of Expected Value for Project A and Project B

Possible Event	Project A			Project B		
	Cash Flow (₹)	Probability	Expected Value (₹)	Cash Flow (₹)	Probability	Expected Value (₹)
A	10,000	0.10	1,000	26,000	0.10	2,600
B	12,000	0.20	2,400	22,000	0.15	3,300
C	14,000	0.40	5,600	18,000	0.50	9,000
D	16,000	0.20	3,200	14,000	0.15	2,100
E	18,000	0.10	1,800	10,000	0.10	1,000
ENCF			14,000	18,000		

Project A

$$\text{Variance } (\sigma^2) = (10,000 - 14,000)^2 \times (0.1) + (12,000 - 14,000)^2 \times (0.2) + (14,000 - 14,000)^2 \times (0.4)$$

$$\begin{aligned}
 &+ (16,000 - 14,000)^2 \times (0.2) + (18,000 - 14,000)^2 \times (0.1) \\
 &= 16,00,000 + 8,00,000 + 0 + 8,00,000 + 16,00,000 = 48,00,000
 \end{aligned}$$

$$\text{Standard Deviation } (\sigma) = \sqrt{\text{Variance}(\sigma^2)} = \sqrt{48,00,000} = 2,190.90$$

Project B:

$$\begin{aligned}
 \text{Variance}(\sigma^2) &= (26,000 - 18,000)^2 \times (0.1) + (22,000 - 18,000)^2 \times (0.15) + (18,000 - 18,000)^2 \times (0.5) \\
 &+ (14,000 - 18,000)^2 \times (0.15) + (10,000 - 18,000)^2 \times (0.1) \\
 &= 64,00,000 + 24,00,000 + 0 + 24,00,000 + 64,00,000 = 1,76,00,000
 \end{aligned}$$

$$\text{Standard Deviation } (\sigma) = \sqrt{\text{Variance}(\sigma^2)} = \sqrt{1,76,00,000} = 4195.23$$

Projects	Coefficient of variation	Risk	Expected Value
A	$\frac{2190.90}{14000} = 0.1565$	Less	Less
B	$\frac{4195.23}{18000} = 0.2331$	More	More

In project A, risk per rupee of cash flow is ₹ 0.16 while in project B, it is ₹ 0.23. Therefore, Project A is better than Project B.

4.2 Conventional Techniques

4.2.1 Risk Adjusted Discount Rate

The use of risk adjusted discount rate (RADR) is based on the concept that investors demand higher returns from the risky projects. The required rate of return on any investment should include compensation for delaying consumption plus compensation for inflation equal to risk free rate of return, plus compensation for any kind of risk taken. If the risk associated with any investment project is higher than risk involved in a similar kind of project, discount rate is adjusted upward in order to compensate this additional risk borne. Under this method, NPV is calculated as follows:

$$\text{NPV} = \sum_{t=1}^n \frac{\text{NCF}}{(1+k)^t} - I$$

- Where,
- NCF_t = Net cash flow
 - k = Risk adjusted discount rate (RADR)
 - I = Initial Investment
 - t = Period

A risk adjusted discount rate is a **sum of risk-free rate and risk premium**. The Risk Premium depends on the perception of risk by the investor of a particular investment and risk aversion of the Investor.

So, Risk adjusted discount rate (RADR) = Risk free rate + Risk premium

Risk Free Rate: It is the rate of return on Investments that bear no risk. For e.g., Government securities yield a return of 6% and bear no risk. In such case, 6% is the risk-free rate.

Risk Premium: It is the rate of return over and above the risk free rate, expected by the Investors as a reward for bearing extra risk. For high risk projects, the risk premium will be high and for low risk projects, the risk premium would be lower.

Illustration 7

An enterprise is investing ₹ 100 lakhs in a project. The risk-free rate of return is 7%. Risk premium expected by the Management is 7%. The life of the project is 5 years. Following are the cash flows that are estimated over the life of the project:

Year	Cash flows (₹ in lakhs)
1	25
2	60
3	75
4	80
5	65

Calculate Net Present Value of the project based on Risk free rate and also on the basis of Risks adjusted discount rate.

Solution

The Present Value of the Cash Flows for all the years by discounting the cash flow at 7% is calculated as below:

Year	Cash flows (₹ in lakhs)	Discounting Factor @ 7%	Present value of Cash Flows (₹ In Lakhs)
1	25	0.935	23.38
2	60	0.873	52.38
3	75	0.816	61.20
4	80	0.763	61.04
5	65	0.713	46.35
Total of Present value of Cash flows			244.34
Less: Initial investment			100.00
Net Present Value (NPV)			144.34

Now, when the risk-free rate is 7% and the risk premium expected by the Management is 7%, then

risk adjusted discount rate is $7\% + 7\% = 14\%$.

Discounting the above cash flows using the Risk Adjusted Discount Rate would be as below:

Year	Cash flows (₹ in Lakhs)	Discounting Factor @ 14%	Present Value of Cash Flows (₹ in lakhs)
1	25	0.877	21.93
2	60	0.769	46.14
3	75	0.675	50.63
4	80	0.592	47.36
5	65	0.519	33.74
Total of Present value of Cash flows			199.79
Less: Initial investment			100.00
Net present value (NPV)			99.79

Advantages of Risk-adjusted discount rate

- (1) It is easy to understand.
- (2) It incorporates risk premium in the discounting factor.

Limitations of Risk-adjusted discount rate

- (1) Difficulty in finding risk premium and risk-adjusted discount rate.
- (2) Though NPV can be calculated but it is not possible to calculate Standard Deviation of a given project.

4.2.2 Certainty Equivalent (CE)

As per CIMA terminology, "Certainty Equivalent is an approach dealing with risk in a capital budgeting context. It involves expressing risky future cash flows in terms of the certain cashflow which would be considered, by the decision maker, as their equivalent, that is the decision maker would be indifferent between the risky amount and the (lower) riskless amount considered to be its equivalent."

The certainty equivalent is a guaranteed return that the management would accept rather than accepting a higher but uncertain return. This approach allows the decision maker to incorporate his or her utility function into the analysis. In this approach a set of risk less cash flow is generated in place of the original cash flows.

Steps in the Certainty Equivalent (CE) approach

Step 1: Remove risks by substituting equivalent certain cash flows from risky cash flows. This can be done by multiplying each risky cash flow by the appropriate α_t value (CE coefficient)

$$\alpha_1 = \frac{\text{Certain cash flow}}{\text{Risky or expected cash flow}_t}$$

Suppose on tossing out a coin, if it comes head, you will win ₹ 10,000 and if it comes out to be tail, you will win nothing. Thus, you have 50% chance of winning and expected value is ₹ 5,000 (₹ 10,000 × 0.50). In such case, if you are indifferent at receiving ₹ 3,000 for a certain amount and not playing then ₹ 3,000 will be certainty equivalent and 0.3 (i.e. ₹ 3,000/₹ 10,000) will be certainty equivalent coefficient.

Step 2: Discounted value of cash flow is obtained by applying risk less rate of interest. Since you have already accounted for risk in the numerator using CE coefficient, using the cost of capital to discount cash flows will tantamount to double counting of risk.

Step 3: After that, normal capital budgeting method is applied except in case of IRR method, where IRR is compared with risk free rate of interest rather than the firm's required rate of return.

Certainty Equivalent Coefficient transforms expected values of uncertain flows into their Certainty Equivalents. It is important to note that the value of Certainty Equivalent Coefficient lies between 0 & 1. Certainty Equivalent Coefficient 1 indicates that the cash flow is certain or management is risk neutral. In industrial situation, cash flows are generally uncertain and managements are usually risk averse. Under this method, NPV is calculated as follows:

$$NPV = \sum_{t=1}^n \frac{\alpha_t \times NCF_t}{(1+k)^t} - I$$

Where,

α_t = Risk-adjustment factor or the certainly equivalent coefficient

NCF_t = Forecasts of net cash flow for year 't' without risk-adjustment

k = Risk free rate assumed to be constant for all periods

I = Initial Investment

Illustration 8

If Investment proposal costs ₹ 45,00,000 and risk free rate is 5%, calculate net present value under certainty equivalent technique.

Year	Expected cash flow (₹)	Certainty Equivalent coefficient
1	10,00,000	0.90
2	15,00,000	0.85
3	20,00,000	0.82
4	25,00,000	0.78

Solution

$$\begin{aligned} \text{NPV} &= \frac{10,00,000 \times (0.90)}{(1.05)} + \frac{15,00,000 \times (0.85)}{(1.05)^2} + \frac{20,00,000 \times (0.82)}{(1.05)^3} + \frac{25,00,000 \times (0.78)}{(1.05)^4} - 45,00,000 \\ &= ₹ 5,34,570 \end{aligned}$$

Advantages of Certainty Equivalent Method

1. The certainty equivalent method is **simple and easy** to understand and apply.
2. It can **easily be calculated for different risk levels** applicable to different cash flows. For example, if in a particular year, a higher risk is associated with the cash flow, it can be easily adjusted and the NPV can be recalculated accordingly.

Disadvantages of Certainty Equivalent Method

1. There is **no objective** or mathematical method to estimate certainty equivalents. Certainty Equivalents are subjective and vary as per each individual's estimate.
2. Certainty equivalents are decided by the management based on their perception of risk. However, the **risk perception of the shareholders** who are the money lenders for the project is **ignored**. Hence, it is not used often in corporate decision making.

Risk-adjusted Discount Rate Vs. Certainty-Equivalent

Certainty Equivalent Method is superior to Risk Adjusted Discount Rate Method as it does not assume that risk increases with time at constant rate. Each year's Certainty Equivalent Coefficient is based on level of risk impacting its cash flow. Despite its soundness, it is not preferable like Risk Adjusted Discount Rate Method. It is difficult to specify a series of Certainty Equivalent Coefficients but simple to adjust discount rates.

4.3 Other Techniques**4.3.1 Sensitivity Analysis**

As per CIMA terminology, "Sensitivity Analysis a modelling and risk assessment procedure in which changes are made to significant variables in order to determine the effect of these changes on the planned outcome. Particular attention is thereafter paid to variables identified as being of special significance".

Sensitivity analysis put in simple terms is a modelling technique which is used in Capital Budgeting decisions, to study the impact of changes in the variables on the outcome of the project. In a project, several variables like weighted average cost of capital, consumer demand, price of the product, cost price per unit etc. operate simultaneously. The changes in these variables impact the outcome of the project. Therefore, it becomes very difficult to assess, change in which variable impacts the project outcome in a significant way. In Sensitivity Analysis, the project outcome is studied after taking into account change in only one variable. The more sensitive is the NPV (or IRR), the more critical is that variable. So, Sensitivity analysis is a way of finding impact on the project's NPV (or IRR) for a given change in one of the variables.

Steps involved in Sensitivity Analysis

Sensitivity Analysis is conducted by following the steps as below:

1. Finding variables, which have an influence on the NPV (or IRR) of the project.
2. Establishing mathematical relationship between the variables.
3. Analysing the effect of the change in each of the variables on the NPV (or IRR) of the project.

Illustration 9

X Ltd. is considering its new project with the following details:

Sr. No.	Particulars	Figures
1	Initial capital cost	₹ 400 Cr.
2	Annual unit sales	5 Cr.
3	Selling price per unit	₹ 100
4	Variable cost per unit	₹ 50
5	Fixed costs per year	₹ 50 Cr.
6	Discount Rate	6%

Required:

1. Calculate the NPV of the project.
2. Compute the impact on the project's NPV considering a 2.5 per cent adverse variance in each variable. Which variable is having maximum effect?

Consider Life of the project as 3 years.

Solution

1. Calculation of Net Cash Inflow per year

	Particulars	Amount (₹)
A	Selling price per unit	100
B	Variable cost per unit	50
C	Contribution per unit (A - B)	50
D	Number of units sold per year	5 Cr.
E	Total Contribution (C × D)	₹ 250 Cr.
F	Fixed cost per year	₹ 50 Cr.
G	Net cash inflow per year (E - F)	₹ 200 Cr.

Calculation of Net Present Value (NPV) of the Project

Year	Year Cash Flow (₹ in Cr.)	PV factor @ 6%	Present Value (PV) (₹ in Cr.)
0	(400.00)	1.000	(400.00)
1	200.00	0.943	188.60
2	200.00	0.890	178.00
3	200.00	0.840	168.00
Net Present Value			134.60

Here, NPV represent the most likely outcomes and not the actual outcomes. The actual outcome can be lower or higher than the expected outcome.

2. Sensitivity Analysis considering 2.5 % Adverse Variance in each variable

	Particulars	Base	Initial capital cost increased to ₹ 410 crore	Selling Price per Unit Reduced to ₹ 97.5	Variable Cost Per Unit increased to ₹ 51.25	Fixed Cost Per Unit increased to ₹ 51.25	Units sold per year reduced to 4.875 crore
		(₹)	(₹)	(₹)	(₹)	(₹)	(₹)
A	Selling price per unit	100	100	97.5	100	100	100
B	Variable cost per unit	50	50	50	51.25	50	50
C	Contribution per unit (A - B)	50	50	47.5	48.75	50	50
		(₹ in Cr.)	(₹ in Cr.)	(₹ in Cr.)	(₹ in Cr.)	(₹ in Cr.)	(₹ in Cr.)
D	Number of units sold per year (units in Crores)	5	5	5	5	5	4.875
E	Total Contribution (C × D)	250	250	237.5	243.75	250	243.75
F	Fixed cost per year	50	50	50	50	51.25	50

G	Net Cash Inflow per year (E - F)	200	200	187.5	193.75	198.75	193.75
H	PV of Net cash Inflow per year (G × 2.673)	534.60	534.60	501.19	517.89	531.26	517.89
I	Initial capital cost	400	410	400	400	400	400
J	NPV (H - I)	134.60	124.60	101.19	117.89	131.26	117.89
K	Percentage Change in NPV	-	-7.43%	-24.82%	-12.41%	-2.48%	-12.41%

The above table shows that by changing one variable at a time by 2.5% (adverse) while keeping the others constant, the impact in percentage terms on the NPV of the project can be calculated. Thus, the change in selling price has the maximum effect on the NPV by 24.82%.

Advantages of Sensitivity Analysis:

Following are the main advantages of Sensitivity Analysis:

- (1) **Critical Issues:** This analysis identifies critical factors that impinge on a project's success or failure.
- (2) **Simplicity:** It is a simple technique.

Disadvantage of Sensitivity Analysis

Following are the main disadvantages of Sensitivity Analysis:

- (1) **Assumption of Independence:** This analysis assumes that all variables are independent i.e. they are not related to each other, which is unlikely in real life.
- (2) **Ignore probability:** This analysis does not look to the probability of changes in the variables.

4.3.2 Scenario Analysis

Although sensitivity analysis is probably the most widely used risk analysis technique, it does have limitations. Therefore, we need to extend sensitivity analysis to deal with the probability distributions of the inputs. In addition, it would be useful to vary more than one variable at a time so we could see the combined effects of changes in the variables.

Scenario analysis provides answer to these situations of extensions. This analysis brings in the probabilities of changes in key variables and also allows us to change more than one variable at a time.

This analysis begins with base case or most likely set of values for the input variables. Then, go for worst case scenario (low unit sales, low sale price, high variable cost, etc.) and best case scenario

(high unit sales, high sale price, low variable cost, etc.). Alternatively, Scenarios analysis is possible where some factors are changed positively and some factors are changed negatively.

So, in a nutshell Scenario analysis examine the risk of investment, to analyse the impact of alternative combinations of variables, on the project's NPV (or IRR).

Illustration 10

XYZ Ltd. is considering a project "A" with an initial outlay of ₹ 14,00,000 and the possible three cash inflow attached with the project as follows:

Particulars	Year 1	Year 2	Year 3
Worst case	450	400	700
Most likely	550	450	800
Best case	650	500	900

Assuming the cost of capital as 9%, determine NPV in each scenario. If XYZ Ltd is certain about the most likely result in first two years but uncertain about the third year's cash flow, analyze what will be the NPV expecting worst scenario in the third year.

Solution

The possible outcomes will be as follows:

Year	PVF @ 9%	Worst Case		Most likely		Best case	
		Cash Flow	PV	Cash Flow	PV	Cash Flow	PV
		(₹ '000)	(₹ '000)	(₹ '000)	(₹ '000)	(₹ '000)	(₹ '000)
0	1	(1,400)	(1,400)	(1,400)	(1,400)	(1,400)	(1,400)
1	0.917	450	412.65	550	504.35	650	596.05
2	0.842	400	336.80	450	378.90	500	421.00
3	0.772	700	540.40	800	617.60	900	694.80
NPV			-110.15		100.85		311.85

If XYZ Ltd. is certain about the most likely result in first two years but uncertain about the third year's cash flow, then, NPV expecting worst case scenario is expected in the third year will be as follows:

$$\begin{aligned}
 &= - ₹ 14,00,000 + \frac{₹ 5,50,000}{(1+0.09)} + \frac{₹ 4,50,000}{(1+0.09)^2} + \frac{₹ 7,00,000}{(1+0.09)^3} \\
 &= - ₹ 14,00,000 + ₹ 5,04,587 + ₹ 3,78,756 + ₹ 5,40,528 = ₹ 23,871
 \end{aligned}$$

Scenario Analysis Vs Sensitivity Analysis

- ❖ Sensitivity analysis and Scenario analysis both help to understand the impact of the change in input variable on the outcome of the project. However, there are certain basic differences between the two.
- ❖ Sensitivity analysis calculates the impact of the change of a single input variable on the outcome of the project viz., NPV or IRR. The sensitivity analysis thus enables to identify that single critical variable which can impact the outcome in a huge way and the range of outcomes of the project given the change in the input variable.
- ❖ Scenario analysis, on the other hand, is based on a scenario. The scenario may be recession or a boom wherein depending on the scenario, all input variables change. Scenario Analysis calculates the outcome of the project considering this scenario where the variables have changed simultaneously. Similarly, the outcome of the project would also be considered for the normal and recessionary situation. The variability in the outcome under the three different scenarios would help the management to assess the risk a project carries. Higher deviation in the outcome can be assessed as higher risk and lower to medium deviation can be assessed accordingly.
- ❖ Scenario analysis is far more complex than sensitivity analysis because in scenario analysis all inputs are changed simultaneously, considering the situation in hand while in sensitivity analysis, only one input is changed and others are kept constant.

4.3.3 Simulation Analysis (Monte Carlo)

Simulation is the exact replica of the actual situation. To simulate an actual situation, a model shall be prepared. The simulation Analysis is a technique, in which infinite calculations are made to obtain the possible outcomes and probabilities for any given action.

Monte Carlo simulation ties together sensitivities and probability distributions. The method came out of the work of first nuclear bomb and was so named because it was based on mathematics of Casino gambling. Fundamental appeal of this analysis is that it provides decision makers with a probability distribution of NPVs rather than a single point estimates of the expected NPV.

This analysis starts with carrying out a simulation exercise to model the investment project. It involves identifying the key factors affecting the project and their inter relationships. It involves modelling of cash flows to reveal the key factors influencing both cash receipt and payments and their inter relationship.

This analysis specifies a range for a probability distribution of potential outcomes for each of model's assumptions.

4.3.3.1 Steps for Simulation Analysis:

1. Modelling the project: The model shows the relationship of NPV with parameters and exogenous variables. (Parameters are input variables specified by decision maker and held

constant over all simulation runs. Exogenous variables are input variables, which are stochastic in nature and outside the control of the decision maker).

2. Specify values of parameters and probability distributions of exogenous variables.
3. Select a value at random from probability distribution of each of the exogenous variables.
4. Determine NPV corresponding to the randomly generated value of exogenous variables and pre-specified parameter variables.
5. Repeat steps (3) & (4) a large number of times to get a large number of simulated NPVs.
6. Plot probability distribution of NPVs and compute a mean and Standard Deviation of returns to gauge the project's level of risk.

Example: Uncertainty associated with two aspects of the project: Annual Net Cash Flow & Life of the project. NPV model for the project is

$$\sum_{t=1}^n [CF_t / (1+i)^t] - I$$

Where $i \rightarrow$ Risk free interest rate, $I \rightarrow$ initial investment are parameters, $CF =$ Annual Cash Flow

With $i = 10\%$, $I = ₹ 1,30,000$, CF_t & n stochastic exogenous variables with the following distribution will be as under:

Annual Cash Flow		Project Life	
Value (₹)	Probability	Value (Year)	Probability
10,000	0.02	3	0.05
15,000	0.03	4	0.10
20,000	0.15	5	0.30
25,000	0.15	6	0.25
30,000	0.30	7	0.15
35,000	0.20	8	0.10
40,000	0.15	9	0.03
		10	0.02

Ten manual simulation runs are performed for the project. To perform this operation, values are generated at random for the two exogenous variables viz., Annual Cash Flow and Project Life. For this purpose, we take following steps

- (1) set up correspondence between values of exogenous variables and random numbers
- (2) choose some random number generating device.

Correspondence between Values of Exogenous Variables and two Digit Random Numbers:

Annual Cash Flow				Project Life			
Value (₹)	Probability	Cumulative Probability	Two Digit Random No.	Value (Year)	Probability	Cumulative Probability	Two Digit Random No.
10,000	0.02	0.02	00 – 01	3	0.05	0.05	00 – 04
15,000	0.03	0.05	02 – 04	4	0.10	0.15	05 – 14
20,000	0.15	0.20	05 – 19	5	0.30	0.45	15 – 44
25,000	0.15	0.35	20 – 34	6	0.25	0.70	45 – 69
30,000	0.30	0.65	35 – 64	7	0.15	0.85	70 – 84
35,000	0.20	0.85	65 – 84	8	0.10	0.95	85 – 94
40,000	0.15	1.00	85 - 99	9	0.03	0.98	95 – 97
				10	0.02	1.00	98 - 99

Random Number

53479	81115	98036	12217	59526
97344	70328	58116	91964	26240
66023	38277	74523	71118	84892
99776	75723	03172	43112	83086
30176	48979	92153	38416	42436
81874	83339	14988	99937	13213
19839	90630	71863	95053	55532
09337	33435	53869	52769	18801
31151	58295	40823	41330	21093
67619	52515	03037	81699	17106

For random numbers, we can begin from any-where taking at random from the table and read any pair of adjacent columns, column/row wise. For the first simulation run we need two digit random numbers (1) For Annual Cash Flow (2) For Project Life. The numbers are 53 & 97 and corresponding value of Annual Cash Flow and Project Life are ₹ 3,000 and 9 years respectively.

Simulation Results

Annual Cash Flow			Project Life			
Run	Random No.	Corres. Value of Annual Cash Flow (1)	Random No.	Corres. Value of Project Life	PVAF @ 10% (2)	NPV (1)x(2) – 1,30,000

1	53	30,000	97	9	5.759	42,770
2	66	35,000	99	10	6.145	85,075
3	30	25,000	81	7	4.868	(8,300)
4	19	20,000	09	4	3.170	(66,600)
5	31	25,000	67	6	4.355	(21,125)
6	81	35,000	70	7	4.868	40,380
7	38	30,000	75	7	4.868	16,040
8	48	30,000	83	7	4.868	16,040
9	90	40,000	33	5	3.791	21,640
10	58	30,000	52	6	4.355	650

4.3.3.2. Advantages of Simulation Analysis: Strength lies in Variability.

- (1) We can predict all type of bad market situation beforehand.
- (2) Handle problems characterised by:
 - (a) numerous exogenous variables following any kind of distribution.
 - (b) complex inter-relationships among parameters, exogenous variables and endogenous variables. Such problems defy capabilities of analytical methods.
 - (c) compels decision maker to explicitly consider the inter-dependencies and uncertainties featuring the project.

4.3.3.3 Shortcomings

- (1) Difficult to model the project and specify probability distribution of exogenous variables.
- (2) Simulation is inherently imprecise. Provides rough approximation of probability distribution of NPV Due to its imprecision, simulation probability distribution may be misleading when a tail of distribution is critical.
- (3) Realistic simulation model being likely to be complex would probably be constructed by management expert and not by the decision maker. Decision maker lacking understanding of the model may not use it.
- (4) Determine NPV in simulation run, risk free discount rate is used. It is done to avoid pre-judging risk, which is reflected in the dispersion of the distribution of N.P.V. This derived measure of NPV takes a different meaning from its original value, and, therefore, is difficult to interpret.

4.3.4. Decision Tree Analysis

Till now we have discussed simple accept-or-reject decisions which view current investments in isolation of subsequent decisions. However, practically investment decisions may have implications for future or further investment decisions and may also impact future decision and events. Such situation can be handled by taking a sequence of decisions over a period. The technique to handle this type of sequential decisions is done through “Decision Tree” technique.

Basically, decision tree is a graphic display of the relationship between a present decision and future events, future decision, and their consequences.

This approach assumes that there are only two types of situations that a finance manager has to face. The first situation is where the manager has control or power to determine what happens next. This is known as “Decision”, as he can do what he desires to do.

The second situation is where finance manager has no control over what happens next. This is known as “Event”. Since the outcome of the events is not known, a probability distribution needs to be assigned to the various outcomes or consequences. It should, however, be noted when a finance manager faced with a decision situation, he is assumed to act rationally. For example, in a commercial business, he will choose the most profitable course of action and in non-profit organization, the lowest cost may be rational choice.

Steps involved in Decision Tree analysis:

Step 1- Define Investment: Decision tree analysis can be applied to a variety of business decision-making scenarios. Normally it includes following types of decisions.

- Whether or not to launch a new product, if so, whether this launch should be local, national, or international.
- Whether extra production requirement should be met by extending the factory or by outsourcing it to an external supplier.
- Whether to dig for oil or not if so, upto what height and continue to dig even after finding no oil upto a certain depth.

Step 2- Identification of Decision Alternatives: It is very essential to clearly identify decision alternatives. For example if a company is planning to introduce a new product, it may be local launch, national launch or international launch.

Step 3- Drawing a Decision Tree: After identifying decision alternatives, at the relevant data such as the projected cash flows, probability distribution expected present value etc. should be put in diagrammatic form called decision tree.

While drawing a decision tree, it should be noted that NPVs etc. should be placed on the branches of decision tree, coming out of the decisions identified.

While drawing a decision tree, it should be noted that the:-

- The decision point (traditionally represented by square) is the option available for manager to take or not to take - in other words action at these points.
- The event or chance or outcome (traditionally represented by circle) which are dependent on chance process, along with the probabilities thereof, and monetary value associated with them.
- This diagram is drawn from left to right.

Step 4- Evaluating the Alternatives: After drawing out the decision the next step is the evaluation of alternatives. The various alternatives can be evaluated as follows:

- (i) This procedure is carried out from the last decision in the sequence (extreme right) and goes on working back to the first (left) for each of the possible decision.
- (ii) At each final stage decision point, select the alternative which has the highest NPV and truncate the other alternatives. Each decision point is assigned a value equal to the NPV of the alternative selected at the decision point.
- (iii) Proceed backward in the same manner calculating the NPV at chance or event or outcome points (○) selecting the decisions alternative which has highest NPV at various decision points [□] rejecting the inferior decision option, assigning NPV to the decision point, till the first decision point is reached.

In Capital Budgeting, the decision taker has to identify and find out the various alternatives available to an investment decision. By drawing a decision tree, the alternatives are highlighted through a diagram, giving the range of possible outcomes. The stages set for drawing a decision tree is based on the following rules.

1. It begins with a decision point, also known as decision node, represented by a rectangle while the outcome point, also known as chance node, denoted by a circle.
2. Decision alternatives are shown by a straight line starting from the decision node.
3. The Decision Tree Diagram is drawn from left to right. Rectangles and circles have to be sequentially numbered.
4. Values and Probabilities for each branch are to be incorporated next.

The Value of each circle and each rectangle is computed by evaluating from right to left. This procedure is carried out from the last decision in the sequence and goes on working back to the first for each of the possible decisions. The following rules have been set for such evaluation.

- (a) The expected monetary value (EMV) at the chance node with branches emanating from a circle is the aggregate of the expected values of the various branches that emanate from the chance node.

- (b) The expected value at a decision node with branches emanating from a rectangle is the highest amongst the expected values of the various branches that emanate from the decision node.

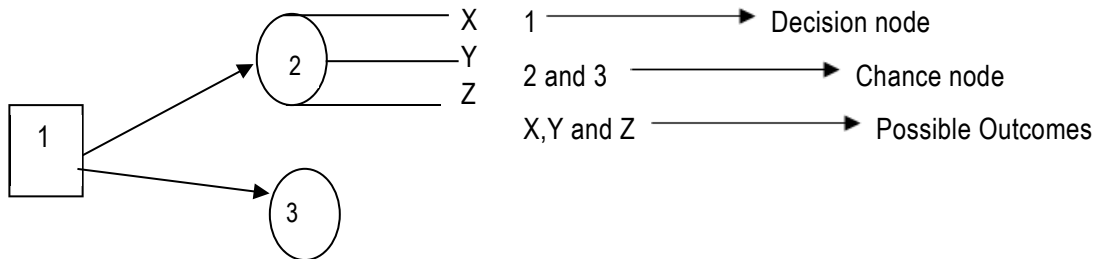
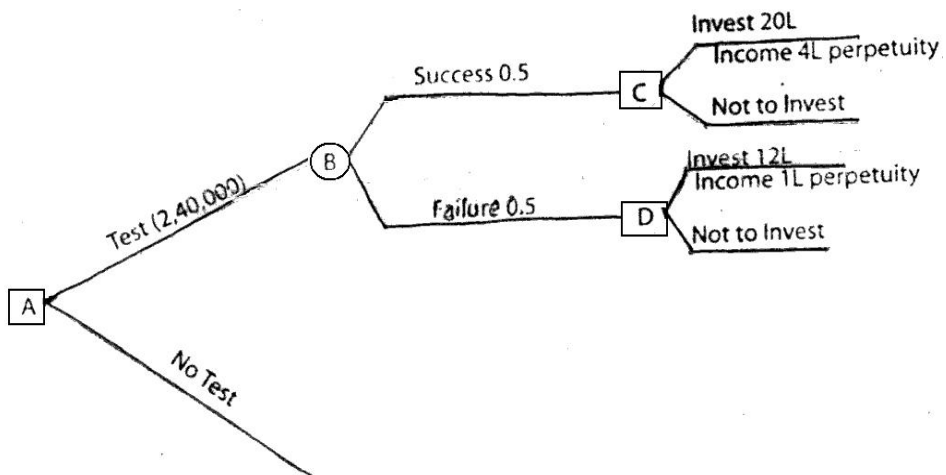


Illustration 11

L & R Limited wishes to develop new virus-cleaner software. The cost of the pilot project would be ₹ 2,40,000. Presently, the chances of the product being successfully launched on a commercial scale are rated at 50%. In case it does succeed, L&R can invest a sum of ₹ 20 lacs to market the product. Such an effort can generate perpetually, an annual net after tax cash income of ₹ 4 lacs. Even if the commercial launch fails, they can make an investment of a smaller amount of ₹ 12 lacs with the hope of gaining perpetually a sum of ₹ 1 lac. Evaluate the proposal, adopting decision tree approach. The discount rate is 10%.

Solution

Decision tree diagram is given below:



Evaluation

At Decision Point C: The choice is between investing ₹ 20 lacs for a perpetual benefit of ₹ 4 lacs and not to invest. The preferred choice is to invest, since the capitalized value of benefit of ₹ 4 lacs (at 10%) adjusted for the investment of ₹ 20 lacs, yields a net benefit of ₹ 20 lacs.

At Decision Point D: The choice is between investing ₹ 12 lacs, for a similar perpetual benefit of ₹ 1 lac. and not to invest. Here the invested amount is greater than capitalized value of benefit at ₹ 10 lacs. There is a negative benefit of ₹ 2 lacs. Therefore, it would not be prudent to invest.

At Outcome Point B: Evaluation of EMV is as under (₹ in lacs).

Outcome	Amount (₹)	Probability	Result (₹)
Success	20.00	0.50	10.00
Failure	0.00	0.50	00.00
Net result			10.00

EMV at B is, therefore, ₹10 lacs.

At A: Decision is to be taken based on preferences between two alternatives. The first is to test, by investing ₹ 2,40,000 and reap a benefit of ₹ 10 lacs. The second is not to test, and thereby losing the opportunity of a possible gain.

The preferred choice is, therefore, investing a sum of ₹ 2,40,000 and undertaking the test.

5. REPLACEMENT DECISION

Capital budgeting refers to the process we use to make decisions concerning investments in the long-term assets of the firm. The general idea is that the capital, or long-term funds, raised by the firms are used to invest in assets that will enable the firm to generate revenues several years into the future. Often the funds raised to invest in such assets are not unrestricted, or infinitely available; thus the firm must budget how these funds are invested. Among various capital budgeting decision, Replacement decision is one of the most important classifications of capital budgeting. The replacement decision can be divided into following two types of decisions:

5.1 Replacement of Existing Machine

This is a decision concerning whether an existing asset should be replaced by a newer version of the same machine or even a different type of machine that has the same functionality as the existing machine. Such replacements are generally made to maintain existing levels of operations, although profitability might change due to changes in expenses (that is, the new machine might be either more expensive or cheaper to operate than the existing machine).

Evaluation of replacement projects is slightly more complicated comparing expansion projects because an existing asset is being replaced. When identifying the cash flows for replacement projects, keep in mind that the cash flows associated with the existing (replaced) asset will no longer exist if the new asset is purchased. Therefore, we must not only determine the cash flows that the new asset will generate, but we must also determine the effect of eliminating the cash flows generated by the replaced asset. For example, if a new asset that will produce cash sales equal to ₹ 100,000 per year is purchased to replace an existing asset that is generating cash sales equal to ₹ 75,000, then the incremental, or marginal, cash flow related to sales is ₹ 25,000. Likewise, if the

asset that is replaced can be sold for ₹ 350,000, then the purchase price of the new asset effectively is ₹ 350,000 less than its invoice price. In other words, for replacement decisions, we must determine the overall net effect of purchasing a new asset to replace an existing asset—the cash flows associated with the old asset will be replaced with the cash flows associated with the new asset. Two items that you must remember to include when determining the incremental cash flows are depreciation — not because it is a cash flow, but because it affects cash flows through taxes and taxes — both of which generally change when an older asset is replaced with a newer asset.

Therefore analysis of replacement decision follows certain steps:

Step I. Net cash outflow (assumed at current time / [Present value of cost]):

- a. $(\text{Book value of old equipment} - \text{market value of old equipment}) \times \text{Tax Rate} = \text{Tax payable/savings from sale}$
- b. $\text{Cost of new equipment} - [\text{Tax payable/savings from sale} + \text{market value of old equipment}] = \text{Net cash outflow}$

Step II. Estimate change in cash flow per year, if replacement decision is implemented.

$\text{Change in cash flow} = [(\text{Change in sales} \pm \text{Change in operating costs}) - \text{Change in depreciation}] (1 - \text{tax rate}) + \text{Change in depreciation}$

Step III. Present value of benefits = Present value of yearly cash flows + Present value of estimated salvage of new system

Step IV. Net present value = Present value of benefits – Present value of costs

Step V. Decision rule. Accept when present value of benefits > present value of costs.

Reject when the opposite is true.

Illustration 12

A Company named Roby's cube decided to replace the existing Computer system of their organisation. Original cost of old system was ₹ 25,000 and it was installed 5 years ago. Current market value of old system is ₹ 5,000. Depreciation of the old system was charged with life of 10 years with Estimated Salvage value as Nil. Depreciation of the new system will be charged with life over 5 years. Present cost of the new system is ₹ 50,000. Estimated Salvage value of the new system is ₹ 1,000. Estimated cost savings with new system is ₹ 5,000 per year. Increase in sales with new system is assumed at 10% per year based on original total sales of ₹ 10,00,00. Company follows straight line method of depreciation. Cost of capital of the company is 10% whereas tax rate is 30%.

Solution

Step I. Net cash outflow (assumed at current time) [Present values of cost]:

- a. $(\text{Book value of old system} - \text{market value of old system}) \times \text{Tax Rate}$

$$\begin{aligned}
 &= \text{Tax payable/savings from sale} \\
 &= [(\text{₹ } 25,000 - 5 \times \text{₹ } 2,500) - \text{₹ } 5,000] \times 0.30 = \text{₹ } 7,500 \times 0.30 \\
 &= \text{₹ } 2,250
 \end{aligned}$$

b. Cost of new system – [Tax payable/savings from sale + Market value of old system] =
 Net cash outflow
 Or, $\text{₹ } 50,000 - [\text{₹ } 2,250 + \text{₹ } 5,000] = \text{₹ } 42,750$

Step II. Estimated change in cash flows per year if replacement decision is implemented.

Change in cash flow = [(Change in sales ± Change in operating costs)-Change in depreciation] (1-tax rate) + Change in depreciation

$$\begin{aligned}
 &= [\text{₹ } 1,00,000 \times 0.1 + \text{₹ } 5,000 - (\text{₹ } 49,000/5 - \text{₹ } 25,000/10)] (1-0.30) + (\text{₹ } 49,000/5 - \\
 &\quad \text{₹ } 25,000/10) \\
 &= \text{₹ } 12,690
 \end{aligned}$$

Step III. Present value of benefits = Present value of yearly cash flows + Present value of estimated salvage of new system

$$\begin{aligned}
 &= \text{₹ } 12,690 \times \text{PVIFA } (10\%, 5) + \text{₹ } 1,000 \times \text{PVIF } (10\%, 5) \\
 &= \text{₹ } 48,723
 \end{aligned}$$

Step IV. Net present value = Present value of benefits - Present value of costs

$$\begin{aligned}
 &= \text{₹ } 48,723 - \text{₹ } 42,750 \\
 &= \text{₹ } 5,973
 \end{aligned}$$

Step V. Decision rule: Since NPV is positive we should accept the proposal to replace the machine.

5.2 Optimum Replacement Cycle

Case discussed above is a simple example replacement decision based on NPV. This decision was based on assumption that the projects do not form part of continuous replacement cycle.

However, sometimes, project may involve continuous replacement cycle. In such cases NPV decision rules needs modification. To determine optimal replacement cycle, concept of Equivalent Annual Cost (EAC), discussed at Intermediate (IPC) Level is used.

The formula to compute EAC is as follows:

$$\frac{\text{PV of Cash Outflow}}{\text{PVAF}}$$

This decision is based on assumption that as the machine (asset) becomes older its efficiency decreases and leading to increase in operating cost and reduction in resale value.

Illustration 13

X Ltd. is a taxi operator. Each taxi cost to company ₹ 4,00,000 and has a useful life of 3 years. The taxi's operating cost for each of 3 years and salvage value at the end of year is as follows:

	Year 1	Year 2	Year 3
Operating Cost	₹ 1,80,000	₹ 2,10,000	₹ 2,38,000
Resale Value	₹ 2,80,000	₹ 2,30,000	₹ 1,68,000

You are required to determine the optimal replacement period of taxi if cost of capital of X Ltd. is 10%.

Solution**NPV if taxi is kept for 1 Year**

$$= - ₹ 4,00,000 - ₹ 1,80,000 (0.909) + ₹ 2,80,000 (0.909)$$

$$= - ₹ 3,09,100$$

NPV if taxi is kept for 2 Year

$$= - ₹ 4,00,000 - ₹ 1,80,000 \times 0.909 + ₹ 20,000 \times 0.826$$

$$= - ₹ 5,47,100$$

NPV if taxi is kept for 3 Year

$$= - ₹ 4,00,000 - ₹ 1,80,000 \times 0.909 - ₹ 2,10,000 \times 0.826 - ₹ 70,000 \times 0.751$$

$$= - ₹ 7,89,650$$

Since above NPV figures relate to different periods, there are not comparable. to make them comparable we shall use concept of EAC as follows:

EAC of 1 year

$$\frac{3,09,100}{0.909} = ₹ 3,40,044$$

EAC of 2 year

$$\frac{5,47,100}{1.735} = ₹ 3,15,331$$

EAC of 3 year

$$\frac{7,89,650}{2.486} = ₹ 3,17,639$$

Since lowest EAC incur if taxi for 2 year; Hence the optimum replacement cycle to replace taxi in 2 years.

6. ADJUSTED PRESENT VALUE

As we are well aware that to evaluate a capital project we discount the expected cash flows by overall Cost of Capital i.e. WACC. Further, as discussed earlier to incorporate risk in the evaluation of any project we can adjust the same discount rate.

However instead of adjusting the cost of capital we can use an alternative approach called Adjusted Present Value (APV) Method. This approach separates the investment decision and financing decision.

Following formula is used to evaluate a project as per this approach:

Base Case NPV + PV of Tax Benefit on Interest

Base Case NPV is calculated using cost of equity assuming the company is unlevered i.e., all equity financed. Now question arises how to calculate the Unlevered Cost of Equity. It has been discussed in the chapter of Business Valuation of this Study Material.

Since viability of the project is partly dependent on how project is financed the PV of Tax Benefits on Interest payment allows for such adjustment. Thus, this method provides a broader view to evaluate a project considering the benefit of increased use of debt in financing of any project.

TEST YOUR KNOWLEDGE

Theoretical Questions

1. Write short note on Certainty Equivalent Approach.
2. What is the sensitivity analysis in Capital Budgeting?
3. Write a note on project appraisal under inflationary conditions.
4. Explain the steps involved in Simulation Analysis.

Practical Questions

1. Skylark Airways is planning to acquire a light commercial aircraft for flying class clients at an investment of ₹ 50,00,000. The expected cash flow after tax for the next three years is as follows: (₹)

Year 1		Year 2		Year 3	
CFAT	Probability	CFAT	Probability	CFAT	Probability
14,00,000	0.1	15,00,000	0.1	18,00,000	0.2
18,00,000	0.2	20,00,000	0.3	25,00,000	0.5
25,00,000	0.4	32,00,000	0.4	35,00,000	0.2
40,00,000	0.3	45,00,000	0.2	48,00,000	0.1

The Company wishes to take into consideration all possible risk factors relating to airline

operations. The company wants to know:

- (i) The expected NPV of this venture assuming independent probability distribution with 6 per cent risk free rate of interest.
- (ii) The possible deviation in the expected value.
- (iii) How would standard deviation of the present value distribution help in Capital Budgeting decisions?

2. Cyber Company is considering two mutually exclusive projects. Investment outlay of both the projects is ₹ 5,00,000 and each is expected to have a life of 5 years. Under three possible situations their annual cash flows and probabilities are as under:

Situation	Probabilities	Cash Flow (₹)	
		Project A	Project B
Good	0.3	6,00,000	5,00,000
Normal	0.4	4,00,000	4,00,000
Worse	0.3	2,00,000	3,00,000

The cost of capital is 7 per cent, which project should be accepted? Explain with workings.

3. A company is considering Projects X and Y with following information:

Project	Expected NPV (₹)	Standard deviation
X	1,22,000	90,000
Y	2,25,000	1,20,000

- (i) Which project will you recommend based on the above data?
 - (ii) Explain whether your opinion will change, if you use coefficient of variation as a measure of risk.
 - (iii) Which measure is more appropriate in this situation and why?
4. KLM Ltd., is considering taking up one of the two projects-Project-K and Project-So Both the projects having same life require equal investment of ₹ 80 lakhs each. Both are estimated to have almost the same yield. As the company is new to this type of business, the cash flow arising from the projects cannot be estimated with certainty. An attempt was therefore, made to use probability to analyse the pattern of cash flow from other projects during the first year of operations. This pattern is likely to continue during the life of these projects. The results of the analysis are as follows:

Project K		Project S	
Cash Flow (in ₹)	Probability	Cash Flow (in ₹)	Probability
11	0.10	09	0.10
13	0.20	13	0.25

15	0.40	17	0.30
17	0.20	21	0.25
19	0.10	25	0.10

Required:

- (i) Calculate variance, standard deviation and co-efficient of variance for both the projects.
 - (ii) Which of the two projects is riskier?
5. Project X and Project Y are under the evaluation of XY Co. The estimated cash flows and their probabilities are as below:

Project X : Investment (year 0) ₹ 70 lakhs

Probability weights	0.30	0.40	0.30
Years	₹ lakhs	₹ lakhs	₹ lakhs
1	30	50	65
2	30	40	55
3	30	40	45

Project Y: Investment (year 0) ₹ 80 lakhs.

Probability weighted	Annual cash flows through life
	₹ lakhs
0.20	40
0.50	45
0.30	50

- (a) Which project is better based on NPV, criterion with a discount rate of 10%?
 - (b) Compute the standard deviation of the present value distribution and analyse the inherent risk of the projects.
6. Shivam Ltd. is considering two mutually exclusive projects A and B. Project A costs ₹ 36,000 and project B ₹ 30,000. You have been given below the net present value probability distribution for each project.

Project A		Project B	
NPV estimates (₹)	Probability	NPV estimates (₹)	Probability
15,000	0.2	15,000	0.1
12,000	0.3	12,000	0.4
6,000	0.3	6,000	0.4
3,000	0.2	3,000	0.1

- (i) Compute the expected net present values of projects A and B.
- (ii) Compute the risk attached to each project i.e. standard deviation of each probability distribution.
- (iii) Compute the profitability index of each project.
- (iv) Which project do you recommend? State with reasons.

7. Following are the estimates of the net cash flows and probability of a new project of M/s X Ltd.:

	Year	P = 0.3	P = 0.5	P = 0.2
Initial investment	0	4,00,000	4,00,000	4,00,000
Estimated net after tax cash inflows per year	1 to 5	1,00,000	1,10,000	1,20,000
Estimated salvage value (after tax)	5	20,000	50,000	60,000

Required rate of return from the project is 10%. Find:

- (i) The expected NPV of the project.
- (ii) The best case and the worst case NPVs.
- (iii) The probability of occurrence of the worst case if the cash flows are perfectly dependent overtime and independent overtime.
- (iv) Standard deviation and coefficient of variation assuming that there are only three streams of cash flow, which are represented by each column of the table with the given probabilities.
- (v) Coefficient of variation of X Ltd. on its average project which is in the range of 0.95 to 1.0. If the coefficient of variation of the project is found to be less risky than average, 100 basis points are deducted from the Company's cost of Capital

Should the project be accepted by X Ltd?

8. XY Ltd. has under its consideration a project with an initial investment of ₹ 1,00,000. Three probable cash inflow scenarios with their probabilities of occurrence have been estimated as below:

Annual cash inflow (₹)	20,000	30,000	40,000
Probability	0.1	0.7	0.2

The project life is 5 years and the desired rate of return is 20%. The estimated terminal values for the project assets under the three probability alternatives, respectively, are ₹ 0, 20,000 and 30,000.

You are required to:

- (i) Find the probable NPV;
- (ii) Find the worst-case NPV and the best-case NPV; and
- (iii) State the probability occurrence of the worst case, if the cash flows are perfectly positively correlated over time.

9. XYZ Ltd. is considering a project for which the following estimates are available:

	₹
Initial Cost of the project	10,00,000
Sales price/unit	60
Cost/unit	40
Sales volumes	
Year 1	20000 units
Year 2	30000 units
Year 3	30000 units

Discount rate is 10% p.a.

You are required to measure the sensitivity of the project in relation to each of the following parameters:

- (a) Sales Price/unit
- (b) Unit cost
- (c) Sales volume
- (d) Initial outlay and
- (e) Project lifetime

Taxation may be ignored.

10. From the following details relating to a project, analyse the sensitivity of the project to changes in initial project cost, annual cash inflow and cost of capital:

Initial Project Cost (₹)	1,20,000
Annual Cash Inflow (₹)	45,000
Project Life (Years)	4
Cost of Capital	10%

To which of the three factors, the project is most sensitive? (Use annuity factors: for 10% 3.169 and 11% 3.103).

11. Red Ltd. is considering a project with the following Cash flows:

₹

Years	Cost of Plant	Recurring Cost	Savings
0	10,000		
1		4,000	12,000
2		5,000	14,000

The cost of capital is 9%. Measure the sensitivity of the project to changes in the levels of plant value, running cost and savings (considering each factor at a time) such that the NPV becomes zero. The P.V. factor at 9% are as under:

<u>Year</u>	<u>Factor</u>
0	1
1	0.917
2	0.842

Which factor is the most sensitive to affect the acceptability of the project?

12. The Easygoing Company Limited is considering a new project with initial investment, for a product "Survival". It is estimated that IRR of the project is 16% having an estimated life of 5 years.

Financial Manager has studied that project with sensitivity analysis and informed that annual fixed cost sensitivity is 7.8416%, whereas cost of capital (discount rate) sensitivity is 60%.

Other information available are:

Profit Volume Ratio (P/V) is 70%,

Variable cost ₹ 60/- per unit

Annual Cash Flow ₹ 57,500/-

Ignore Depreciation on initial investment and impact of taxation.

Calculate

- Initial Investment of the Project
- Net Present Value of the Project
- Annual Fixed Cost
- Estimated annual unit of sales
- Break Even Units

Cumulative Discounting Factor for 5 years

8%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%
3.993	3.890	3.791	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127

13. Unnat Ltd. is considering investing ₹ 50,00,000 in a new machine. The expected life of machine is five years and has no scrap value. It is expected that 2,00,000 units will be produced and sold each year at a selling price of ₹ 30.00 per unit. It is expected that the variable costs to be ₹ 16.50 per unit and fixed costs to be ₹ 10,00,000 per year. The cost of capital of Unnat Ltd. is 12% and acceptable level of risk is 20%.

You are required to measure the sensitivity of the project's net present value to a change in the following project variables:

- (a) sale price;
- (b) sales volume;
- (c) variable cost;
- (d) On further investigation it is found that there is a significant chance that the expected sales volume of 2,00,000 units per year will not be achieved. The sales manager of Unnat Ltd. suggests that sales volumes could depend on expected economic states which could be assigned the following probabilities:

State of Economy	Annual Sales (in Units)	Prob.
Poor	1,75,000	0.30
Normal	2,00,000	0.60
Good	2,25,000	0.10

Calculate expected net present value of the project and give your decision whether company should accept the project or not.

14. The Textile Manufacturing Company Ltd., is considering one of two mutually exclusive proposals, Projects M and N, which require cash outlays of ₹ 8,50,000 and ₹ 8,25,000 respectively. The certainty-equivalent (C.E) approach is used in incorporating risk in capital budgeting decisions. The current yield on government bonds is 6% and this is used as the risk free rate. The expected net cash flows and their certainty equivalents are as follows:

Year-end	Project M		Project N	
	Cash Flow ₹	C.E.	Cash Flow ₹	C.E.
1	4,50,000	0.8	4,50,000	0.9
2	5,00,000	0.7	4,50,000	0.8
3	5,00,000	0.5	5,00,000	0.7

Present value factors of ₹ 1 discounted at 6% at the end of year 1, 2 and 3 are 0.943, 0.890 and 0.840 respectively.

Required:

- (i) Which project should be accepted?
- (ii) If risk adjusted discount rate method is used, which project would be appraised with a higher rate and why?

15. Determine the risk adjusted net present value of the following projects:

	X	Y	Z
Net cash outlays (₹)	2,10,000	1,20,000	1,00,000
Project life	5 years	5 years	5 years
Annual Cash inflow (₹)	70,000	42,000	30,000
Coefficient of variation	1.2	0.8	0.4

The Company selects the risk-adjusted rate of discount on the basis of the coefficient of variation:

Coefficient of Variation	Risk-Adjusted Rate of Return	P.V. Factor 1 to 5 years At risk adjusted rate of discount
0.0	10%	3.791
0.4	12%	3.605
0.8	14%	3.433
1.2	16%	3.274
1.6	18%	3.127
2.0	22%	2.864
More than 2.0	25%	2.689

16. New Projects Ltd. is evaluating 3 projects, P-I, P-II, P-III. Following information is available in respect of these projects:

	P-I	P-II	P-III
Cost	₹ 15,00,000	₹ 11,00,000	₹ 19,00,000
Inflows-Year 1	6,00,000	6,00,000	4,00,000
Year 2	6,00,000	4,00,000	6,00,000
Year 3	6,00,000	5,00,000	8,00,000
Year 4	6,00,000	2,00,000	12,00,000
Risk Index	1.80	1.00	0.60

Minimum required rate of return of the firm is 15% and applicable tax rate is 40%. The risk free interest rate is 10%.

Required:

- (i) Find out the risk-adjusted discount rate (RADR) for these projects.
- (ii) Which project is the best?

17. A firm has projected the following cash flows from a project under evaluation:

Year	₹ lakhs
0	(70)
1	30
2	40
3	30

The above cash flows have been made at expected prices after recognizing inflation. The firm's cost of capital is 10%. The expected annual rate of inflation is 5%.

Show how the viability of the project is to be evaluated.

18. Shashi Co. Ltd has projected the following cash flows from a project under evaluation:

Year	0	1	2	3
₹ (in lakhs)	(72)	30	40	30

The above cash flows have been made at expected prices after recognizing inflation. The firm's cost of capital is 10%. The expected annual rate of inflation is 5%. Show how the viability of the project is to be evaluated. PVF at 10% for 1-3 years are 0.909, 0.826 and 0.751.

19. KLM Ltd. requires ₹ 15,00,000 for a new project.

Useful life of project is 3 years.

Salvage value - NIL.

Depreciation is ₹ 5,00,000 p.a.

Given below are projected revenues and costs (excluding depreciation) ignoring inflation:

Year →	1	2	3
Revenues in ₹	10,00,000	13,00,000	14,00,000
Costs in ₹	5,00,000	6,00,000	6,50,000

Applicable tax rate is 35%. Assume cost of capital to be 14% (after tax). The inflation rates for revenues and costs are as under:

Year	Revenues %	Costs %
1	9	10

2	8	9
3	6	7

PVF at 14%, for 3 years =0.877, 0.769 and 0.675

Show amount to the nearest rupee in calculations.

You are required to calculate net present value of the project.

20. A firm has an investment proposal, requiring an outlay of ₹ 80,000. The investment proposal is expected to have two years economic life with no salvage value. In year 1, there is a 0.4 probability that cash inflow after tax will be ₹ 50,000 and 0.6 probability that cash inflow after tax will be ₹ 60,000. The probability assigned to cash inflow after tax for the year 2 is as follows:

The cash inflow year 1	₹ 50,000	₹ 60,000
The cash inflow year 2	Probability	Probability
	₹ 24,000 0.2	₹ 40,000 0.4
	₹ 32,000 0.3	₹ 50,000 0.5
	₹ 44,000 0.5	₹ 60,000 0.1

The firm uses a 10% discount rate for this type of investment.

Required:

- Construct a decision tree for the proposed investment project and calculate the expected net present value (NPV).
 - What net present value will the project yield, if worst outcome is realized? What is the probability of occurrence of this NPV?
 - What will be the best outcome and the probability of that occurrence?
 - Will the project be accepted?
- (Note: 10% discount factor 1 year 0.909; 2 year 0.826)
21. Jumble Consultancy Group has determined relative utilities of cash flows of two forthcoming projects of its client company as follows:

Cash Flow in ₹	-15000	-10000	-4000	0	15000	10000	5000	1000
Utilities	-100	-60	-3	0	40	30	20	10

The distribution of cash flows of project A and Project B are as follows:

Project A

Cash Flow (₹)	-15000	- 10000	15000	10000	5000
Probability	0.10	0.20	0.40	0.20	0.10

Project B

Cash Flow (₹)	- 10000	-4000	15000	5000	10000
Probability	0.10	0.15	0.40	0.25	0.10

Which project should be selected and why ?

22. A & Co. is contemplating whether to replace an existing machine or to spend money on overhauling it. A & Co. currently pays no taxes. The replacement machine costs ₹ 90,000 now and requires maintenance of ₹ 10,000 at the end of every year for eight years. At the end of eight years it would have a salvage value of ₹ 20,000 and would be sold. The existing machine requires increasing amounts of maintenance each year and its salvage value falls each year as follows:

Year	Maintenance (₹)	Salvage (₹)
Present	0	40,000
1	10,000	25,000
2	20,000	15,000
3	30,000	10,000
4	40,000	0

The opportunity cost of capital for A & Co. is 15%.

Required:

When should the company replace the machine?

(Notes: Present value of an annuity of Re. 1 per period for 8 years at interest rate of 15% : 4.4873; present value of Re. 1 to be received after 8 years at interest rate of 15% : 0.3269).

23. A company has an old machine having book value zero – which can be sold for ₹ 50,000. The company is thinking to choose one from following two alternatives:
- To incur additional cost of ₹ 10,00,000 to upgrade the old existing machine.
 - To replace old machine with a new machine costing ₹ 20,00,000 plus installation cost ₹ 50,000.

Both above proposals envisage useful life to be five years with salvage value to be nil.

The expected after tax profits for the above three alternatives are as under :

Year	Old existing Machine (₹)	Upgraded Machine (₹)	New Machine (₹)
1	5,00,000	5,50,000	6,00,000
2	5,40,000	5,90,000	6,40,000
3	5,80,000	6,10,000	6,90,000
4	6,20,000	6,50,000	7,40,000
5	6,60,000	7,00,000	8,00,000

The tax rate is 40 per cent.

The company follows straight line method of depreciation. Assume cost of capital to be 15 per cent.

P.V.F. of 15%, 5 = 0.870, 0.756, 0.658, 0.572 and 0.497. You are required to advise the company as to which alternative is to be adopted.

24. Company X is forced to choose between two machines A and B. The two machines are designed differently but have identical capacity and do exactly the same job. Machine A costs ₹ 1,50,000 and will last for 3 years. It costs ₹ 40,000 per year to run. Machine B is an 'economy' model costing only ₹ 1,00,000, but will last only for 2 years, and costs ₹ 60,000 per year to run. These are real cash flows. The costs are forecasted in rupees of constant purchasing power. Ignore tax. Opportunity cost of capital is 10 per cent. Which machine company X should buy?
25. Company Y is operating an elderly machine that is expected to produce a net cash inflow of ₹ 40,000 in the coming year and ₹ 40,000 next year. Current salvage value is ₹ 80,000 and next year's value is ₹ 70,000. The machine can be replaced now with a new machine, which costs ₹ 1,50,000, but is much more efficient and will provide a cash inflow of ₹ 80,000 a year for 3 years. Company Y wants to know whether it should replace the equipment now or wait a year with the clear understanding that the new machine is the best of the available alternatives and that it in turn be replaced at the optimal point. Ignore tax. Take opportunity cost of capital as 10 per cent. Advise with reasons.
26. A machine used on a production line must be replaced at least every four years. Costs incurred to run the machine according to its age are:

	Age of the Machine (years)				
	0	1	2	3	4
Purchase price (in ₹)	60,000				
Maintenance (in ₹)		16,000	18,000	20,000	20,000
Repair (in ₹)		0	4,000	8,000	16,000
Scrap Value (in ₹)		32,000	24,000	16,000	8,000

Future replacement will be with identical machine with same cost. Revenue is unaffected by the age of the machine. Ignoring inflation and tax, determine the optimum replacement cycle. PV factors of the cost of capital of 15% for the respective four years are 0.8696, 0.7561, 0.6575 and 0.5718.

27. Trouble Free Solutions (TFS) is an authorized service center of a reputed domestic air conditioner manufacturing company. All complaints/service related matters of Air conditioner are attended by this service center. The service center employs a large number of mechanics, each of whom is provided with a motor bike to attend the complaints. Each mechanic travels approximately 40000 kms per annum. TFS decides to continue its present policy of always buying a new bike for its mechanics but wonders whether the present policy of replacing the bike every three year is optimal or not. It is of believe that as new models are entering into market on yearly basis, it wishes to consider whether a replacement of either one year or two years would be better option than present three year period. The fleet of bike is due for replacement shortly in near future.

The purchase price of latest model bike is ₹ 55,000. Resale value of used bike at current prices in market is as follows:

Period	₹
1 Year old	35,000
2 Year old	21,000
3 Year old	9,000

Running and Maintenance expenses (excluding depreciation) are as follows:

Year	Road Taxes Insurance etc. (₹)	Petrol Repair Maintenance etc. (₹)
1	3,000	30,000
2	3,000	35,000
3	3,000	43,000

Using opportunity cost of capital as 10% you are required to determine optimal replacement period of bike.

ANSWERS/ SOLUTIONS

Answers to Theoretical Questions

1. This approach recognizes risk in capital budgeting analysis by adjusting estimated cash flows and employs risk free rate to discount the adjusted cash-flows. Under this method, the expected cash flows of the project are converted to equivalent riskless amounts. The greater

the risk of an expected cash flow, the smaller the certainty equivalent values for receipts and longer the CE value for payment. This approach is superior to the risk adjusted discounted approach as it can measure risk more accurately.

This is yet another approach for dealing with risk in capital budgeting to reduce the forecasts of cash flows to some conservative levels. In certainty Equivalent approach we incorporate risk to adjust the cash flows of a proposal so as to reflect the risk element. The certainty Equivalent approach adjusts future cash flows rather than discount rates. This approach explicitly recognizes risk, but the procedure for reducing the forecasts of cash flows is implicit and likely to be inconsistent from one investment to another.

2. Sensitivity analysis is used in Capital budgeting for more precisely measuring the risk. It helps in assessing information as to how sensitive are the estimated parameters of the project such as cash flows, discount rate, and the project life to the estimation errors. Future being always uncertain and estimations are always subject to error, sensitivity analysis takes care of estimation errors by using a number of possible outcomes in evaluating a project. The methodology adopted in sensitivity analysis is to evaluate a project by using a number of estimated cash flows so as to provide to the decision maker an insight into the variability of outcome. Thus, it is a technique of risk analysis which studies the responsiveness of a criterion of merit like NPV or IRR to variation in underlying factors like selling price, quantity sold, returns from an investment etc.

Sensitivity analysis answers questions like,

- (i) What happens to the present value (or some other criterion of merit) if flows are, say ₹ 50,000 than the expected ₹ 80,000?
- (ii) What will happen to NPV if the economic life of the project is only 3 years rather than expected 5 years?

Therefore, wherever there is an uncertainty, of whatever type, the sensitivity analysis plays a crucial role. However, it should not be viewed as the method to remove the risk or uncertainty, it is only a tool to analyse and measure the risk and uncertainty. In terms of capital budgeting the possible cash flows are based on three assumptions:

- (a) Cash flows may be worst (pessimistic)
- (b) Cash flows may be most likely.
- (c) Cash flows may be most optimistic.

Sensitivity analysis involves three steps

- (1) Identification of all those variables having an influence on the project's NPV or IRR.
- (2) Definition of the underlying quantitative relationship among the variables.
- (3) Analysis of the impact of the changes in each of the variables on the NPV of the

project.

The decision maker, in sensitivity analysis always asks himself the question – what if?

3. Project Appraisal normally involves feasibility evaluation from technical, commercial, economic and financial aspects. It is generally an exercise in measurement and analysis of cash flows expected to occur over the life of the project. The project cash outflows usually occur initially and inflows come in the future.

During inflationary conditions, the project cost increases on all heads viz. labour, raw material, fixed assets such as equipments, plant and machinery, building material, remuneration of technicians and managerial personnel etc. Beside this, inflationary conditions erode purchasing power of consumers and affect the demand pattern. Thus, not only cost of production but also the projected statement of profitability and cash flows are affected by the change in demand pattern. Even financial institutions and banks may revise their lending rates resulting in escalation in financing cost during inflationary conditions. Under such circumstances, project appraisal has to be done generally keeping in view the following guidelines which are usually followed by government agencies, banks and financial institutions.

- (i) It is always advisable to make provisions for cost escalation on all heads of cost, keeping in view the rate of inflation during likely period of delay in project implementation.
- (ii) The various sources of finance should be carefully scrutinized with reference to probable revision in the rate of interest by the lenders and the revision which could be affected in the interest-bearing securities to be issued. All these factors will push up the cost of funds for the organization.
- (iii) Adjustments should be made in profitability and cash flow projections to take care of the inflationary pressures affecting future projections.
- (iv) It is also advisable to examine the financial viability of the project at the revised rates and assess the same with reference to economic justification of the project. The appropriate measure for this aspect is the economic rate of return for the project which will equate the present value of capital expenditures to net cash flows over the life of the projects. The rate of return should be acceptable which also accommodates the rate of inflation per annum.
- (v) In an inflationary situation, projects having early payback periods should be preferred because projects with long payback period are riskier.

Under conditions of inflation, the project cost estimates that are relevant for a future date will suffer escalation. Inflationary conditions will tend to initiate the measurement of future cash flows. Either of the following two approaches may be used while appraising projects under such conditions:

- (a) Adjust each year's cash flows to an inflation index, recognizing selling price increases and cost increases annually; or
- (b) Adjust the 'Acceptance Rate' (cut-off) suitably retaining cash flow projections at current price levels.

An example of approach (ii) above can be as follows:

Normal Acceptance Rate	:	15.0%
Expected Annual Inflation	:	5.0%
Adjusted Discount Rate	:	15.0 × 1.05 or 15.75%

It must be noted that measurement of inflation has no standard approach nor is easy. This makes the job of appraisal a difficult one under such conditions.

4. Please refer paragraph 4.3.3

Answers to the Practical Questions

1. (i) Expected NPV

(₹ in lakhs)

Year I			Year II			Year III		
CFAT	P	CF×P	CFAT	P	CF×P	CFAT	P	CF×P
14	0.1	1.4	15	0.1	1.5	18	0.2	3.6
18	0.2	3.6	20	0.3	6.0	25	0.5	12.5
25	0.4	10.0	32	0.4	12.8	35	0.2	7.0
40	0.3	12.0	45	0.2	9	48	0.1	4.8
	\bar{x} or \overline{CF}	<u>27.0</u>		\bar{x} or \overline{CF}	<u>29.3</u>			\bar{x} or \overline{CF} <u>27.9</u>

NPV	PV factor @ 6%	Total PV
27	0.943	25.461
29.3	0.890	26.077
27.9	0.840	<u>23.436</u>
	PV of cash inflow	74.974
	Less: Cash outflow	<u>50.000</u>
	NPV	<u>24.974</u>

(ii) Possible deviation in the expected value

Year I				
$X - \bar{X}$	$X - \bar{X}$	$(X - \bar{X})^2$	P_1	$(X - \bar{X})^2 P_1$
14 - 27	-13	169	0.1	16.9
18 - 27	-9	81	0.2	16.2

25 - 27	-2	4	0.4	1.6
40 - 27	13	169	0.3	<u>50.7</u>
				<u>85.4</u>

$$\sigma_1 = \sqrt{85.4} = 9.241$$

Year II				
X - \bar{X}	X - \bar{X}	(X - \bar{X}) ²	P ₂	(X - \bar{X}) ² × P ₂
15-29.3	-14.3	204.49	0.1	20.449
20-29.3	-9.3	86.49	0.3	25.947
32-29.3	2.7	7.29	0.4	2.916
45-29.3	15.7	246.49	0.2	49.298
				<u>98.61</u>

$$\sigma_2 = \sqrt{98.61} = 9.930$$

Year III				
X - \bar{X}	X - \bar{X}	(X - \bar{X}) ²	P ₃	(X - \bar{X}) ² × P ₃
18-27.9	-9.9	98.01	0.2	19.602
25-27.9	-2.9	8.41	0.5	4.205
35-27.9	7.1	50.41	0.2	10.082
48-27.9	20.1	404.01	0.1	<u>40.401</u>
				<u>74.29</u>

$$\sigma_3 = \sqrt{74.29} = 8.619$$

Standard deviation about the expected value:

$$\sigma = \sqrt{\frac{85.4}{(1.06)^2} + \frac{98.61}{(1.06)^4} + \frac{74.29}{(1.06)^6}} = 14.3696$$

- (iii) Standard deviation is a statistical measure of dispersion; it measures the deviation from a central number i.e. the mean.

In the context of capital budgeting decisions especially where we take up two or more projects giving somewhat similar mean cash flows, by calculating standard deviation in such cases, we can measure in each case the extent of variation. It can then be used to identify which of the projects is least risky in terms of variability of cash flows.

A project, which has a lower coefficient of variation will be preferred if sizes are heterogeneous.

Besides this, if we assume that probability distribution is approximately normal we are able to calculate the probability of a capital budgeting project generating a net present value less than or more than a specified amount.

2. Project A

Expected Net Cash flow (ENCF)

$$0.3 (6,00,000) + 0.4 (4,00,000) + 0.3 (2,00,000) = 4,00,000$$

$$\sigma^2 = 0.3 (6,00,000 - 4,00,000)^2 + 0.4 (4,00,000 - 4,00,000)^2 + 0.3 (2,00,000 - 4,00,000)^2$$

$$\sigma = \sqrt{24,00,00,00,000}$$

$$\sigma = 1,54,919.33$$

$$\text{Present Value of Expected Cash Inflows} = 4,00,000 \times 4.100 = 16,40,000$$

$$\text{NPV} = 16,40,000 - 5,00,000 = 11,40,000$$

Project B

$$\text{ENCF} = 0.3 (5,00,000) + 0.4 (4,00,000) + 0.3 (3,00,000) = 4,00,000$$

$$\sigma^2 = 0.3 (5,00,000 - 4,00,000)^2 + 0.4 (4,00,000 - 4,00,000)^2 + 0.3 (3,00,000 - 4,00,000)^2$$

$$\sigma = \sqrt{6,00,00,00,000}$$

$$\sigma = 77,459.66$$

$$\text{Present Value of Expected Cash Inflows} = 4,00,000 \times 4.100 = 16,40,000$$

$$\text{NPV} = 16,40,000 - 5,00,000 = 11,40,000$$

Recommendation: NPV in both projects being the same, the project should be decided on the basis of standard deviation and hence project 'B' should be accepted having lower standard deviation, means less risky.

3. (i) On the basis of standard deviation project X be chosen because it is less risky than Project Y having higher standard deviation.

$$(ii) \quad CV_x = \frac{SD}{ENPV} = \frac{90,000}{1,22,000} = 0.738$$

$$CV_y = \frac{1,20,000}{2,25,000} = 0.533$$

On the basis of Co-efficient of Variation (C.V.) Project X appears to be riskier and hence Y should be accepted.

(iii) However, the NPV method in such conflicting situation is best because the NPV method is in compatibility of the objective of wealth maximisation in terms of time value.

4. Calculation of Variance and Standard Deviation

Project K

Expected Net Cash Flow

$$= (0.10 \times 11) + (0.20 \times 13) + (0.40 \times 15) + (0.20 \times 17) + (0.10 \times 19)$$

$$= 1.1 + 2.6 + 6 + 3.4 + 1.9 = 15$$

$$\sigma^2 = 0.10(11 - 15)^2 + 0.20(13 - 15)^2 + 0.40(15 - 15)^2 + 0.20(17 - 15)^2 + 0.10(19 - 15)^2$$

$$= 1.6 + 0.8 + 0 + 0.8 + 1.6 = 4.8$$

$$\sigma = \sqrt{4.8} = 2.19$$

Project S

Expected Net Cash Flow

$$= (0.10 \times 9) + (0.25 \times 13) + (0.30 \times 17) + (0.25 \times 21) + (0.10 \times 25)$$

$$= 0.9 + 3.25 + 5.1 + 5.25 + 2.5 = 17$$

$$\sigma^2 = 0.1(9 - 17)^2 + 0.25(13 - 17)^2 + 0.30(17 - 17)^2 + 0.25(21 - 17)^2 + 0.10(25 - 17)^2$$

$$= 6.4 + 4 + 0 + 4 + 6.4 = 20.8$$

$$\sigma = \sqrt{20.8} = 4.56$$

Calculation of Coefficient of Variation

$$\text{Coefficient of Variation} = \frac{\text{Standard Deviation}}{\text{Mean}}$$

$$\text{Project K} = \frac{2.19}{15} = 0.146$$

$$\text{Project S} = \frac{4.56}{17} = 0.268$$

Project S is riskier as it has higher Coefficient of Variation.

5. (a) Calculation of NPV of XY Co.:

Project X		Cash flow	PVF	PV
Year				
1	$(30 \times 0.3) + (50 \times 0.4) + (65 \times 0.3)$	48.5	0.909	44.09

2	$(30 \times 0.3) + (40 \times 0.4) + (55 \times 0.3)$	41.5	0.826	34.28
3	$(30 \times 0.3) + (40 \times 0.4) + (45 \times 0.3)$	38.5	0.751	<u>28.91</u>
				<u>107.28</u>
	NPV: $(107.28 - 70.00) =$			(+) <u>37.28</u>

Project Y (For 1-3 Years)

1-3	$(40 \times 0.2) + (45 \times 0.5) + (50 \times 0.3)$	45.5	2.487	<u>113.16</u>
	NPV $(113.16 - 80.00)$			(+) <u>33.16</u>

(b) Calculation of Standard deviation σ

As per Hiller's model

$$M = \sum_{i=0}^n (1+r)^{-1} M_i$$

$$\sigma^2 = \sum_{i=0}^n (1+r)^{-2i} \sigma_i^2$$

Hence

Project X

Year

$$1 \quad \sqrt{(30 - 48.5)^2 0.30 + (50 - 48.5)^2 0.40 + (65 - 48.5)^2 0.30} = \sqrt{185.25} = 13.61$$

$$2 \quad \sqrt{(30 - 41.5)^2 0.30 + (40 - 41.5)^2 0.40 + (55 - 41.5)^2 0.30} = \sqrt{95.25} = 9.76$$

$$3 \quad \sqrt{(30 - 38.5)^2 0.30 + (40 - 38.5)^2 0.40 + (45 - 38.5)^2 0.30} = \sqrt{35.25} = 5.94$$

Standard Deviation about the expected value

$$= \sqrt{\frac{185.25}{(1+0.10)^2} + \frac{95.25}{(1+0.10)^4} + \frac{35.25}{(1+0.10)^6}}$$

$$= \sqrt{\frac{185.25}{1.21} + \frac{95.25}{1.4641} + \frac{35.25}{1.7716}} = \sqrt{153.10+65.06+19.90}$$

$$= \sqrt{238.06} = 15.43$$

Project Y (For 1-3 Years)

$$\sqrt{(40 - 45.5)^2 \cdot 0.20 + (45 - 45.5)^2 \cdot 0.50 + (50 - 45.5)^2 \cdot 0.30} = \sqrt{12.25} = 3.50$$

Standard Deviation about the expected value

$$= \sqrt{\frac{12.25}{(1 + 0.10)^2} + \frac{12.25}{(1 + 0.10)^4} + \frac{12.25}{(1 + 0.10)^6}}$$

$$= \sqrt{\frac{12.25}{1.21} + \frac{12.25}{1.4641} + \frac{12.25}{1.7716}} = \sqrt{10.12 + 8.37 + 6.91}$$

$$= \sqrt{25.4} = 5.03$$

Analysis: Project Y is less risky as its Standard Deviation is less than Project X.

6. (i) Statement showing computation of expected net present value of Projects A and B:

Project A			Project B		
NPV Estimate (₹)	Probability	Expected Value	NPV Estimate	Probability	Expected Value
15,000	0.2	3,000	15,000	0.1	1,500
12,000	0.3	3,600	12,000	0.4	4,800
6,000	0.3	1,800	6,000	0.4	2,400
3,000	0.2	600	3,000	0.1	300
	1.0	EV = 9,000		1.0	EV = 9,000

(ii) Computation of Standard deviation of each project

Project A

P	X	(X - EV)	P (X - EV) ²
0.2	15,000	6,000	72,00,000
0.3	12,000	3,000	27,00,000
0.3	6,000	- 3,000	27,00,000
0.2	3,000	- 6,000	<u>72,00,000</u>
			Variance = <u>1,98,00,000</u>

Standard Deviation of Project A = $\sqrt{1,98,00,000} = ₹ 4,450$

Project B

P	X	(X - EV)	P (X - EV) ²
0.1	15,000	6,000	36,00,000

0.4	12,000	3,000	36,00,000
0.4	6,000	- 3,000	36,00,000
0.1	3,000	- 6,000	<u>36,00,000</u>
			Variance = <u>1,44,00,000</u>

Standard Deviation of Project A = $\sqrt{1,44,00,000} = ₹ 3,795$

(iii) Computation of profitability of each project

Profitability index = Discount cash inflow / Initial outlay

$$\text{In case of Project A : PI} = \frac{9,000 + 36,000}{36,000} = \frac{45,000}{36,000} = 1.25$$

$$\text{In case of Project B : PI} = \frac{9,000 + 30,000}{30,000} = \frac{39,000}{30,000} = 1.30$$

- (iv)** Measurement of risk is made by the possible variation of outcomes around the expected value and the decision will be taken in view of the variation in the expected value where two projects have the same expected value, the decision will be the project which has smaller variation in expected value. In the selection of one of the two projects A and B, Project B is preferable because the possible profit which may occur is subject to less variation (or dispersion). Much higher risk is lying with project A.

7. (a)(i) Expected cash flows:-

Year			Net cash flows	P.V.	PV. @ 10%
0	(4,00,000 x 1)	=	(-)4,00,000	1.000	(-)4,00,000
1 to 4	(1,00,000x0.3+1,10,000x0.5 + 1,20,000 x 0.2)	=	1,09,000	3.170	3,45,530
5	[1,09,000 + (20,000 x 0.3 + 50,000 x 0.5 + 60,000 x 0.2)]	=	1,52,000	0.621	94,392
			NPV=		39,922

(ii) ENPV of the worst case

1,00,000 x 3.790 = ₹ 3,79,000 (Students may have 3.791 also the values will change accordingly)

20,000 x 0.621 = ₹ 12,420/-

ENPV = (-) 4,00,000 + 3,79,000 + 12,420 = (-) ₹ 8,580/-

ENPV of the best case

ENPV = (-) 4,00,000 + 1,20,000 x 3.790 + 60,000 x 0.621 = ₹ 92,060/-.

- (iii) (a) Required probability = 0.3
 (b) Required probability = $(0.3)^5 = 0.00243$
- (iv) The base case NPV = $(-) 4,00,000 + (1,10,000 \times 3.79) + (50,000 \times 0.621)$
 $= ₹ 47,950/-$

ENPV = $0.30 \times (-) 8580 + 0.5 \times 47950 + 92060 \times 0.20 = ₹ 39,813/-$

Therefore,

$\sigma_{ENPV} = \sqrt{0.3(-8580 - 39,813)^2 + 0.5(47950 - 39,813)^2 + 0.2(92,060 - 39,813)^2} = ₹ 35,800/-$

Therefore, CV = $35,800/39,813 = 0.90$

- (v) Risk adjusted out of cost of capital of X Ltd. = $10\% - 1\% = 9\%$.

NPV

Year	Expected net cash flow	PV @ 9%	
0	(-) 4,00,000	1.000	(-) 4,00,000
1 to 4	1,09,000	3.240	3,53,160
5	1,52,000	0.650	<u>98,800</u>
		ENPV =	<u>51,960</u>

Therefore, the project should be accepted.

8. The expected cash flows of the project are as follows:

Year	Pr = 0.1	Pr = 0.7	Pr = 0.2	Total
	₹	₹	₹	₹
0	-10,000	-70,000	-20,000	-1,00,000
1	2,000	21,000	8,000	31,000
2	2,000	21,000	8,000	31,000
3	2,000	21,000	8,000	31,000
4	2,000	21,000	8,000	31,000
5	2,000	21,000	8,000	31,000
5	0	14,000	6,000	20,000

- (i) NPV based on expected cash flows would be as follows:

$= -₹ 1,00,000 + \frac{₹ 31,000}{(1+0.20)^1} + \frac{₹ 31,000}{(1+0.20)^2} + \frac{₹ 31,000}{(1+0.20)^3} + \frac{₹ 31,000}{(1+0.20)^4} + \frac{₹ 31,000}{(1+0.20)^5} + \frac{₹ 20,000}{(1+0.20)^5}$

$= - ₹ 1,00,000 + ₹ 25,833.33 + ₹ 21,527.78 + ₹ 17,939.81 + ₹ 14,949.85 + ₹ 12,458.20 +$

₹ 8,037.55

NPV = ₹ 746.52

- (ii) For the worst case, the cash flows from the cash flow column farthest on the left are used to calculate NPV

$$= - ₹ 100,000 + \frac{₹ 20,000}{(1+0.20)^1} + \frac{₹ 20,000}{(1+0.20)^2} + \frac{₹ 20,000}{(1+0.20)^3} + \frac{₹ 20,000}{(1+0.20)^4} + \frac{₹ 20,000}{(1+0.20)^5}$$

$$= - ₹ 100,000 + ₹ 16,666.67 + ₹ 13,888.89 + ₹ 11,574.07 + ₹ 9,645.06 + ₹ 8,037.76$$

NPV = - ₹ 40,187.76

For the best case, the cash flows from the cash flow column farthest on the right are used to calculate NPV

$$= - ₹ 100,000 + \frac{₹ 40,000}{(1+0.20)^1} + \frac{₹ 40,000}{(1+0.20)^2} + \frac{₹ 40,000}{(1+0.20)^3} + \frac{₹ 40,000}{(1+0.20)^4} + \frac{₹ 40,000}{(1+0.20)^5} + \frac{₹ 30,000}{(1+0.20)^5}$$

$$= - ₹ 1,00,000 + ₹ 33,333.33 + ₹ 27,777.78 + ₹ 23,148.15 + ₹ 19,290.12 + ₹ 16,075.10 + ₹ 12,056.33$$

NPV = ₹ 31,680.81

- (iii) If the cash flows are perfectly dependent, then the low cash flow in the first year will mean a low cash flow in every year. Thus, the possibility of the worst case occurring is the probability of getting ₹ 20,000 net cash flow in year 1 is 10%.

9. Calculation of NPV

$$NPV = - 10,00,000 + \frac{20,000 \times 20}{1.1} + \frac{30,000 \times 20}{1.21} + \frac{30,000 \times 20}{1.331}$$

$$= - 10,00,000 + 3,63,636 + 4,95,868 + 4,50,789$$

$$= 13,10,293 - 10,00,000$$

$$= ₹ 3,10,293/-$$

Measurement of sensitivity is as follows:

(a) Sales Price:-

Let the sale price/Unit be S so that the project would break even with 0 NPV.

$$\therefore 10,00,000 = \frac{20,000 \times (S - 40)}{1.1} + \frac{30,000 \times (S - 40)}{1.21} + \frac{30,000 \times (S - 40)}{1.331}$$

$$S - 40 = 10,00,000/65,514$$

$$S - 40 = ₹ 15.26$$

$$S = ₹ 55.26 \text{ which represents a fall of } (60-55.26)/60$$

$$\text{Or } 0.079 \text{ or } 7.9\%$$

Alternative Method

$$\frac{10,00,000 \times 20}{13,10,293} = ₹ 15.26$$

$$S = ₹ 40 + ₹ 15.26$$

$$= ₹ 55.26$$

Alternative Solution

If sale Price decreased by say 10%, then NPV (at Sale Price of ₹ 60 – ₹ 6 = ₹ 54)

$$\text{NPV} = -10,00,000 + \frac{20000 \times 14}{(1.1)^1} + \frac{30000 \times 14}{(1.1)^2} + \frac{30000 \times 14}{(1.1)^3}$$

$$= -10,00,000 + 2,54,545 + 3,47,107 + 3,15,552$$

$$= -82,796$$

$$\text{NPV decrease (\%)} = \frac{3,10,293 - (-82,796)}{3,10,293} \times 100 = 126.68\%$$

(b) Unit Cost:-

If sales price = ₹ 60 the cost price required to give a margin of ₹ 15.26 is (₹ 60 – ₹ 15.26) or

$$₹ 44.74 \text{ which would represent a rise of } 11.85\% \text{ i.e., } \left(\frac{44.74 - 40}{40} \times 100 \right)$$

Alternative Solution

If unit cost increased by say 10%. The new NPV will be as follows:

$$\text{NPV} = -10,00,000 + \frac{20000 \times 16}{(1.1)^1} + \frac{30000 \times 16}{(1.1)^2} + \frac{30000 \times 16}{(1.1)^3}$$

$$= -10,00,000 + 2,90,909 + 3,96,694 + 3,60,631$$

$$= 48,234$$

$$\text{NPV decrease (\%)} = \frac{3,10,293 - (48,234)}{3,10,293} \times 100 = 84.46\%$$

(c) Sales volume:-

The requisite percentage fall is:-

$$3,10,293/13,10,293 \times 100 = 23.68\%$$

Alternative Solution

If sale volume decreased by say 10%. The new NPV will be as follows:

$$\begin{aligned} \text{NPV} &= -10,00,000 + \frac{18000 \times 20}{(1.1)^1} + \frac{27000 \times 20}{(1.1)^2} + \frac{27000 \times 20}{(1.1)^3} \\ &= -10,00,000 + 3,27,272 + 4,46,281 + 4,05,710 \\ &= 1,79,263 \end{aligned}$$

$$\text{NPV decrease (\%)} = \frac{3,10,293 - 1,79,263}{3,10,293} \times 100 = 42.22\%$$

(d) **Since PV of inflows remains at ₹13,10,293 the initial outlay must also be the same.**

$$\therefore \text{Percentage rise} = 3,10,293/10,00,000 \times 100 = 31.03\%$$

Alternative Solution

If initial outlay increased by say 10%. The new NPV will be as follows:

$$\begin{aligned} \text{NPV} &= -11,00,000 + \frac{20000 \times 20}{(1.1)^1} + \frac{30000 \times 20}{(1.1)^2} + \frac{30000 \times 20}{(1.1)^3} \\ &= -11,00,000 + 3,63,636 + 4,95,868 + 4,50,789 = 2,10,293 \end{aligned}$$

$$\text{NPV decrease (\%)} = \frac{3,10,293 - 2,10,293}{3,10,293} \times 100 = 32.22\%$$

(e) **Present value for 1st two years.**

$$\begin{aligned} &= -10,00,000 + 4,00,000 \times 0.909 + 6,00,000 \times 0.826 \\ &= -10,00,000 + 3,63,600 + 4,95,600 \\ &= -10,00,000 + 8,59,200 \\ &= -1,40,800 \end{aligned}$$

\therefore The project needs to run for some part of the third year so that the present value of return is ₹ 1,40,800. It can be computed as follows:

(i) $30,000 \text{ units} \times ₹ 20 \times 0.751 = ₹ 4,50,600$

(ii) Per day Production in (₹) assuming a year of 360 days =

$$\frac{₹ 4,50,600}{360} = ₹ 1,252$$

(iii) Days needed to recover ₹1,40,800 = $\frac{₹ 1,40,800}{₹ 1,252} = 112$

Thus, if the project runs for 2 years and 112 days then break even would be achieved representing a fall of $\frac{(3 - 2.311)}{3} \times 100 = 22.97\%$.

10. CALCULATION OF NPV

	₹
PV of cash inflows (₹ 45,000 x 3.169)	1,42,605
Initial Project Cost	<u>1,20,000</u>
NPV	<u>22,605</u>
If initial project cost is varied adversely by 10%*	
NPV (Revised) (₹ 1,42,605 - ₹ 1,32,000)	₹ 10,605
Change in NPV (₹ 22,605 – ₹ 10,605) / ₹ 22,605 i.e.	53.08 %
If annual cash inflow is varied adversely by 10%*	
Revised annual inflow	₹ 40,500
NPV (Revised) (₹ 40,500 x 3.169) – (₹ 1,20,000)	(+) ₹ 8,345
Change in NPV (₹ 22,605 – ₹ 8,345) / ₹ 22,605	63.08 %
If cost of capital is varied adversely by 10%*	
NPV (Revised) (₹ 45,000 x 3.103) – ₹ 1,20,000	(+) ₹ 19,635
Change in NPV (₹ 22,605 – ₹ 19,635) / ₹ 22,605	13.14 %

Conclusion: Project is most sensitive to 'annual cash inflow'.

*Note: Students may please note that they may assume any other percentage rate other than 10 % say 15%, 20 % 25 % etc.

11. P.V. of Cash Flows

Year 1	Running Cost	₹ 4,000 x 0.917	= (₹ 3,668)
	Savings	₹ 12,000 x 0.917	= ₹ 11,004
Year 2	Running Cost	₹ 5,000 x 0.842	= (₹ 4,210)
	Savings	₹ 14,000 x 0.842	<u>= ₹ 11,788</u>
			₹ 14,914
Year 0	Less: P.V. of Cash Outflow	₹ 10,000 x 1	₹ <u>10,000</u>
	NPV		<u>₹ 4,914</u>

Sensitivity Analysis

- (i) Increase of Plant Value by ₹ 4,914

$$\therefore \frac{4,914}{10,000} \times 100 = 49.14\%$$

- (ii) Increase of Running Cost by ₹ 4,914

$$\frac{4,914}{3,668 + 4,210} = \frac{4,914}{7,878} \times 100 = 62.38\%$$

- (iii) Fall in Saving by ₹ 4,914

$$\frac{4,914}{11,004 + 11,788} = \frac{4,914}{22,792} \times 100 = 21.56\%$$

Hence, savings factor is the most sensitive to affect the acceptability of the project as in comparison of other two factors a slight % change in this fact shall more affect the NPV than others.

Alternative Solution**P.V. of Cash Flows**

Year 1	Running Cost	₹ 4,000 x 0.917	= (₹ 3,668)
	Savings	₹ 12,000 x 0.917	= ₹ 11,004
Year 2	Running Cost	₹ 5,000 x 0.842	= (₹ 4,210)
	Savings	₹ 14,000 x 0.842	= ₹ 11,788
			₹ 14,914
Year 0	Less: P.V. of Cash Outflow	₹ 10,000 x 1	₹ 10,000
		NPV	<u>₹ 4,914</u>

Sensitivity Analysis

- (i) If the initial project cost is varied adversely by say 10%*.

$$\text{NPV (Revised)} (\text{₹ } 4,914 - \text{₹ } 1,000) = \text{₹ } 3,914$$

$$\text{Change in NPV} \frac{\text{₹ } 4,914 - \text{₹ } 3,914}{\text{₹ } 4,914} = 20.35\%$$

- (ii) If Annual Running Cost is varied by say 10%*.

$$\text{NPV (Revised)} (\text{₹ } 4,914 - \text{₹ } 400 \times 0.917 - \text{₹ } 500 \times 0.843)$$

$$= \text{₹ } 4,914 - \text{₹ } 367 - \text{₹ } 421 = \text{₹ } 4,126$$

$$\text{Change in NPV} = \frac{\text{₹ } 4,914 - \text{₹ } 4,126}{\text{₹ } 4,914} = 16.04\%$$

(iii) If Saving is varied by say 10%*.

$$\begin{aligned} \text{NPV (Revised)} &= (\text{₹ } 4,914 - \text{₹ } 1,200 \times 0.917 - \text{₹ } 1,400 \times 0.843) \\ &= \text{₹ } 4,914 - \text{₹ } 1,100 - \text{₹ } 1,180 = \text{₹ } 2,634 \end{aligned}$$

$$\text{Change in NPV} = \frac{\text{₹ } 4,914 - \text{₹ } 2,634}{\text{₹ } 4,914} = 46.40\%$$

Hence, savings factor is the most sensitive to affect the acceptability of the project.

* Any percentage of variation other than 10% can also be assumed.

12. (i) Initial Investment

IRR = 16% (Given)

At IRR, NPV shall be zero, therefore

$$\begin{aligned} \text{Initial Cost of Investment} &= \text{PVAF (16\%, 5)} \times \text{Cash Flow (Annual)} \\ &= 3.274 \times \text{₹ } 57,500 \\ &= \text{₹ } 1,88,255 \end{aligned}$$

(ii) Net Present Value (NPV)

$$\text{Let Cost of Capital be } X, \text{ then } \frac{16 - X}{X} = 60\% \quad X = 10\%$$

Thus NPV of the project

$$\begin{aligned} &= \text{Annual Cash Flow} \times \text{PVAF (10\%, 5)} - \text{Initial Investment} \\ &= \text{₹ } 57,500 \times 3.791 - \text{₹ } 1,88,255 \\ &= \text{₹ } 2,17,982.50 - \text{₹ } 1,88,255 = \text{₹ } 29,727.50 \end{aligned}$$

(iii) Annual Fixed Cost

Let change in the Fixed Cost which makes NPV zero is X. Then,

$$\text{₹ } 29,727.50 - 3.791X = 0$$

$$\text{Thus } X = \text{₹ } 7,841.60$$

Let original Fixed Cost be Y then,

$$Y \times 7.8416\% = \text{₹ } 7,841.60$$

$$Y = \text{₹ } 1,00,000$$

Thus Fixed Cost is equal to ₹ 1,00,000

(iv) **Estimated Annual Units of Sales**

$$\text{Selling Price per unit} = \frac{\text{₹ } 60}{100\% - 70\%} = \text{₹ } 200$$

$$\frac{\text{Annual Cash Flow} + \text{Fixed Cost}}{\text{P/V Ratio}} = \text{Sales Value}$$

$$\frac{\text{₹ } 57,500 + \text{₹ } 1,00,000}{0.70} = \text{₹ } 2,25,000$$

$$\text{Sales in Units} = \frac{\text{₹ } 2,25,000}{\text{₹ } 200} = 1,125 \text{ units}$$

(v) **Break Even Units**

$$\frac{\text{Fixed Cost}}{\text{Contribution Per Unit}} = \frac{1,00,000}{140} = 714.285 \text{ units}$$

13. Calculation of NPV

$$= - \text{₹ } 50,00,000 + [2,00,000 (\text{₹ } 30 - \text{₹ } 16.50) - \text{₹ } 10,00,000] \text{ PVIAF } (12\%, 5)$$

$$= - \text{₹ } 50,00,000 + [2,00,000 (\text{₹ } 13.50) - \text{₹ } 10,00,000] 3.605$$

$$= - \text{₹ } 50,00,000 + [\text{₹ } 27,00,000 - \text{₹ } 10,00,000] 3.605$$

$$= - \text{₹ } 50,00,000 + \text{₹ } 61,28,500 = \text{₹ } 11,28,500$$

Measurement of Sensitivity Analysis

(a) **Sales Price:-**

Let the sale price/Unit be S so that the project would break even with 0 NPV.

$$\therefore \text{₹ } 50,00,000 = [2,00,000 (S - \text{₹ } 16.50) - \text{₹ } 10,00,000] \text{ PVIAF } (12\%, 5)$$

$$\text{₹ } 50,00,000 = [2,00,000S - \text{₹ } 33,00,000 - \text{₹ } 10,00,000] 3.605$$

$$\text{₹ } 50,00,000 = [2,00,000S - \text{₹ } 43,00,000] 3.605$$

$$\text{₹ } 13,86,963 = 2,00,000S - \text{₹ } 43,00,000$$

$$\text{₹ } 56,86,963 = 2,00,000S$$

$$S = \text{₹ } 28.43 \text{ which represents a fall of } (30 - 28.43)/30 \text{ or } 0.0523 \text{ or } 5.23\%$$

(b) Sales volume:-

Let V be the sale volume so that the project would break even with 0 NPV.

$$\therefore ₹ 50,00,000 = [V (₹ 30 - ₹ 16.50) - ₹ 10,00,000] PVIAF (12\%,5)$$

$$₹ 50,00,000 = [V (₹ 13.50) - ₹ 10,00,000] PVIAF (12\%,5)$$

$$₹ 50,00,000 = [₹ 13.50V - ₹ 10,00,000] 3.605$$

$$₹ 13,86,963 = ₹ 13.50V - ₹ 10,00,000$$

$$₹ 23,86,963 = ₹ 13.50V$$

V = 1,76,812 which represents a fall of (2,00,000 - 1,76,812)/2,00,000 or 0.1159 or 11.59%

(c) Variable Cost:

Let the variable cost be V so that the project would break even with 0 NPV.

$$\square ₹ 50,00,000 = [2,00,000(₹ 30 - V) - ₹ 10,00,000] PVIAF(12\%,5)$$

$$₹ 50,00,000 = [₹ 60,00,000 - 2,00,000 V - ₹ 10,00,000] 3.605$$

$$₹ 50,00,000 = [₹ 50,00,000 - 2,00,000 V] 3.605$$

$$₹ 13,86,963 = ₹ 50,00,000 - 2,00,000 V$$

$$₹ 36,13,037 = 2,00,000V$$

V = ₹ 18.07 which represents a fall of (18.07 - 16.50)/16.50 or 0.0951 or 9.51%

(d) Expected Net Present Value

$$(1,75,000 \times 0.30) + (2,00,000 \times 0.60) + (2,25,000 \times 0.10) = 1,95,000$$

$$NPV = [1,95,000 \times ₹ 13.50 - ₹ 10,00,000] 3.605 - ₹ 50,00,000 = ₹ 8,85,163$$

Further NPV in worst and best cases will be as follows:

Worst Case:

$$[1,75,000 \times ₹ 13.50 - ₹ 10,00,000] 3.605 - ₹ 50,00,000 = - ₹ 88,188$$

Best Case:

$$[2,25,000 \times ₹ 13.50 - ₹ 10,00,000] 3.605 - ₹ 50,00,000 = ₹ 23,45,188$$

Thus, there are 30% chances that the rise will be a negative NPV and 70% chances of positive NPV. Since acceptable level of risk of Unnat Ltd. is 20% and there are 30% chances of negative NPV hence project should not be accepted.

14. (i) Statement Showing the Net Present Value of Project M

Year end	Cash Flow (₹)	C.E. (b)	Adjusted Cash flow (₹)	Present value factor at 6%	Total Present value (₹)
	(a)		(c) = (a) × (b)	(d)	(e) = (c) × (d)

1	4,50,000	0.8	3,60,000	0.943	3,39,480
2	5,00,000	0.7	3,50,000	0.890	3,11,500
3	5,00,000	0.5	2,50,000	0.840	<u>2,10,000</u>
					8,60,980
Less: Initial Investment					<u>8,50,000</u>
Net Present Value					<u>10,980</u>

Statement Showing the Net Present Value of Project N

Year end	Cash Flow (₹)	C.E.	Adjusted Cash flow (₹)	Present value factor	Total Present value (₹)
	(a)	(b)	(c) = (a) × (b)	(d)	(e) = (c) × (d)
1	4,50,000	0.9	4,05,000	0.943	3,81,915
2	4,50,000	0.8	3,60,000	0.890	3,20,400
3	5,00,000	0.7	3,50,000	0.840	<u>2,94,000</u>
					9,96,315
Less: Initial Investment					<u>8,25,000</u>
Net Present Value					<u>1,71,315</u>

Decision: Since the net present value of Project N is higher, so the project N should be accepted.

- (ii) Certainty - Equivalent (C.E.) Co-efficient of Project M (2.0) is lower than Project N (2.4). This means Project M is riskier than Project N as "higher the riskiness of a cash flow, the lower will be the CE factor". If risk adjusted discount rate (RADR) method is used, Project M would be analysed with a higher rate.

RADR is based on the premise that riskiness of a proposal may be taken care of, by adjusting the discount rate. The cash flows from a more risky proposal should be discounted at a relatively higher discount rate as compared to other proposals whose cash flows are less risky. Any investor is basically risk averse. However, he may be ready to take risk provided he is rewarded for undertaking risk by higher returns. So, more risky the investment is, the greater would be the expected return. The expected return is expressed in terms of discount rate which is also the minimum required rate of return generated by a proposal if it is to be accepted. Therefore, there is a positive correlation between risk of a proposal and the discount rate.

15. Statement showing the determination of the risk adjusted net present value

Projects	Net cash outlays	Coefficient of variation	Risk adjusted	Annual cash inflow	PV factor 1-5 years	Discounted cash inflow	Net present value
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			discount rate				
	₹			₹		₹	₹
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii) = (v) × (vi)	(viii) = (vii) – (ii)
X	2,10,000	1.20	16%	70,000	3.274	2,29,180	19,180
Y	1,20,000	0.80	14%	42,000	3.433	1,44,186	24,186
Z	1,00,000	0.40	12%	30,000	3.605	1,08,150	8,150

16. (i) The risk free rate of interest and risk factor for each of the projects are given. The risk adjusted discount rate (RADR) for different projects can be found on the basis of CAPM as follows:

Required Rate of Return = $I_{RF} + (k_o - I_{RF}) \text{ Risk Factor}$

For P-I : RADR = $0.10 + (0.15 - 0.10) 1.80 = 19\%$

For P-II : RADR = $0.10 + (0.15 - 0.10) 1.00 = 15\%$

For P-III : RADR = $0.10 + (0.15 - 0.10) 0.60 = 13\%$

- (ii) The three projects can now be evaluated at 19%, 15% and 13% discount rate as follows:

Project P-I

Annual Inflows	₹ 6,00,000
PVAF (19 %, 4)	2.639
PV of Inflows (₹ 6,00,000 x 2.639)	₹ 15,83,400
Less: Cost of Investment	₹ 15,00,000
Net Present Value	₹ 83,400

Project P-II

Year	Cash Inflow (₹)	PVF (15%,n)	PV (₹)
1	6,00,000	0.870	5,22,000
2	4,00,000	0.756	3,02,400
3	5,00,000	0.658	3,29,000
4	2,00,000	0.572	<u>1,14,400</u>
Total Present Value			12,67,800
Less: Cost of Investment			<u>11,00,000</u>
Net Present Value			<u>1,67,800</u>

Project P-III

Year	Cash Inflow (₹)	PVF (13%,n)	PV (₹)
1	4,00,000	0.885	3,54,000
2	6,00,000	0.783	4,69,800
3	8,00,000	0.693	5,54,400
4	12,00,000	0.613	<u>7,35,600</u>
Total Present Value			21,13,800
Less: Cost of Investment			<u>19,00,000</u>
Net Present Value			<u>2,13,800</u>

Project P-III has highest NPV. So, it should be accepted by the firm

17. It is stated that the cash flows have been adjusted for inflation; hence they are “nominal”. The cost of capital or discount rate is “real”. In order to be compatible, the cash flows should be converted into “real flow”. This is done as below:

Year	Nominal cash flows	Adjusted Inflation* factor	Real cash flows	PVF @ 10%	PV of cash flows
0	(70)	—	(70)	1.000	(70)
1	30	0.952	28.56	0.909	25.96
2	40	0.907	36.28	0.826	29.97
3	30	0.864	25.92	0.751	<u>19.47</u>
				Total	75.40
Less: Cash out flow					<u>70.00</u>
NPV (+)					<u>5.40</u>

* $1/1.05$; $1/(1.05)^2$; $1/(1.05)^3$;

Advise: With positive NPV, the project is financially viable.

Alternatively, instead of converting cash flows into real terms, the discount rate can be converted into nominal rate. Result will be the same.

An alternative solution is presented herewith

Alternative solution:

Year	Nominal cash flows	PVF @ 15.50% adjusted by the inflation factor i.e. 5%*	PV of cash flows
1	30	0.866	25.98
2	40	0.749	29.96

3	30	0.649	<u>19.47</u>
		Cash inflow	75.41
		Less: Cash out flow	<u>70.00</u>
		Net present value	<u>5.41</u>

$$* \frac{0.909}{1.05} = 0.866, \frac{0.826}{1.1025} = 0.749, \frac{0.751}{1.1576} = 0.649$$

Advise: With positive NPV, the project is financially viable.

18. Here the given cash flows have to be adjusted for inflation. Alternatively, the discount rate can be converted into nominal rate, as follows:-

$$\text{Year 1} = \frac{0.909}{1.05} = 0.866; \quad \text{Year 2} = \frac{0.826}{(1.05)^2} \text{ or } \frac{0.826}{1.1025} = 0.749$$

$$\text{Year 3} = \frac{0.751}{(1.05)^3} = \frac{0.751}{1.1576} = 0.649$$

Year	Nominal Cash Flows (₹ in lakhs)	Adjusted PVF as above	PV of Cash Flows (₹ in lakhs)
1	30	0.866	25.98
2	40	0.749	29.96
3	30	0.649	<u>19.47</u>
	Cash Inflow		75.41
	Less: Cash Outflow		<u>72.00</u>
	Net Present Value		<u>3.41</u>

With positive NPV, the project is financially viable.

Alternative Solution

Assumption: The cost of capital given in the question is "Real".

Nominal cost of capital = $(1.10)(1.05) - 1 = 0.155 = 15.50\%$

DCF Analysis of the project

(₹ Lakhs)

	Period	PVF @15.50%	CF	PV
Investment	0	1	-72	-72.00
Operation	1	0.866	30	+25.98

---do---	2	0.750	40	+30.00
---do---	3	0.649	30	<u>+19.47</u>
NPV				<u>+3.45</u>

The proposal may be accepted as the NPV is positive.

19. (i) Inflation adjusted Revenues

Year	Revenues (₹)	Revenues (Inflation Adjusted) (₹)
1	10,00,000	10,00,000(1.09) = 10,90,000
2	13,00,000	13,00,000(1.09)(1.08) = 15,30,360
3	14,00,000	14,00,000(1.09)(1.08)(1.06) = 17,46,965

(ii) Inflation adjusted Costs

Year	Costs (₹)	Costs (Inflation Adjusted) (₹)
1	5,00,000	5,00,000(1.10) = 5,50,000
2	6,00,000	6,00,000(1.10)(1.09) = 7,19,400
3	6,50,000	6,50,000(1.10)(1.09)(1.07) = 8,33,905

(iii) Tax Benefit on Depreciation = ₹ 5,00,000 x 0.35 = ₹ 1,75,000

(iv) Net Profit after Tax

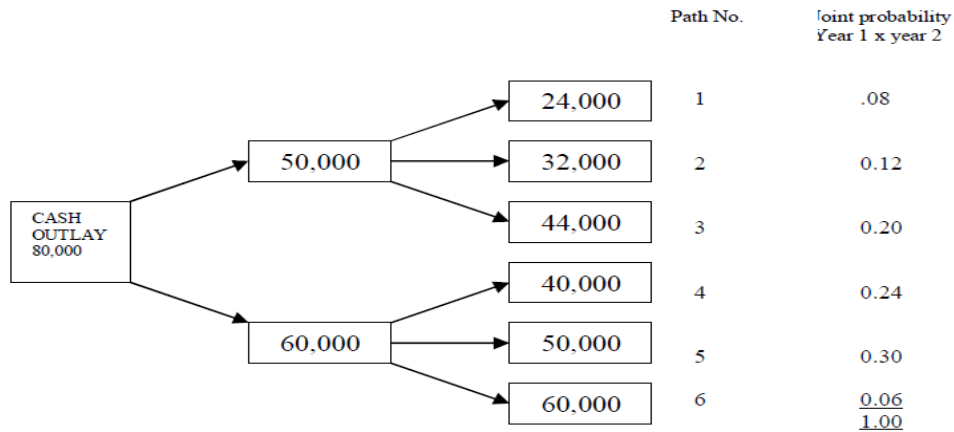
Year	Revenues (Inflation Adjusted) (₹) (1)	Costs (Inflation Adjusted) (₹) (2)	Net Profit (₹) (3) = (1) - (2)	Tax (₹) (4) = 35% of (3)	Profit after Tax (₹) (3) - (4)
1	10,90,000	5,50,000	5,40,000	1,89,000	3,51,000
2	15,30,360	7,19,400	8,10,960	2,83,836	5,27,124
3	17,46,965	8,33,905	9,13,060	3,19,571	5,93,489

(v) Present Value of Cash Inflows

Year	Net Profit after tax (₹)	Tax Benefit on Depreciation (₹)	Cash Inflow (₹)	PVF@ 14%	PV (₹)
1	3,51,000	1,75,000	5,26,000	0.877	4,61,302
2	5,27,124	1,75,000	7,02,124	0.769	5,39,933
3	5,93,489	1,75,000	7,68,489	0.675	5,18,730
					15,19,965

NPV = ₹ 15,19,965 – ₹ 15,00,000 = ₹ 19,965

20. (i) The decision tree diagram is presented in the chart, identifying various paths and outcomes, and the computation of various paths/outcomes and NPV of each path are presented in the following tables:



The Net Present Value (NPV) of each path at 10% discount rate is given below:

Path	Year 1 Cash Flows (₹)	Year 2 Cash Flows (₹)	Total Cash Inflows (PV) (₹)	Cash Inflows NPV (₹) (₹)	
1	50,000 × .909 = 45,450	24,000 × .826 = 19,824	65,274	80,000	(-) 14,726
2	45,450	32,000 × .826 = 26,432	71,882	80,000	(-) 8,118
3	45,450	44,000 × .826 = 36,344	81,794	80,000	1,794
4	60,000 × .909 = 54,540	40,000 × .826 = 33,040	87,580	80,000	7,580
5	54,540	50,000 × .826 = 41,300	95,840	80,000	15,840
6	54,540	60,000 × .826 = 49,560	1,04,100	80,000	24,100

Statement showing Expected Net Present Value

z	NPV (₹)	Joint Probability	Expected NPV
1	-14,726	0.08	-1,178.08
2	-8,118	0.12	-974.16
3	1,794	0.20	358.80
4	7,580	0.24	1,819.20
5	15,840	0.30	4,752.00

6	24,100	0.06	<u>1,446.00</u>
			<u>6,223.76</u>

- (ii) If the worst outcome is realized the project will yield NPV of – ₹ 14,726. The probability of occurrence of this NPV is 8% and a loss of ₹ 1,178 (path 1).
- (iii) The best outcome will be path 6 when the NPV is at ₹ 24,100. The probability of occurrence of this NPV is 6% and a expected profit of ₹ 1,446.
- (iv) The project should be accepted because the expected NPV is positive at ₹ 6,223.76 based on joint probability.

21. Evaluation of project utilizes of Project A and Project B

Cash flow (in ₹)	Project A		
	Probability	Utility	Utility value
-15,000	0.10	-100	-10
-10,000	0.20	-60	-12
15,000	0.40	40	16
10,000	0.20	30	6
5,000	0.10	20	<u>2</u>
			<u>2</u>

Cash flow (in ₹)	Project B		
	Probability	Utility	Utility value
-10,000	0.10	-60	-6
-4,000	0.15	-3	-0.45
15,000	0.40	40	16
5,000	0.25	20	5
10,000	0.10	30	<u>3</u>
			<u>17.55</u>

Project B should be selected as its expected utility is more.

22. A & Co.

Equivalent cost of (EAC) of new machine

		₹
(i)	Cost of new machine now	90,000
	Add: PV of annual repairs @ ₹ 10,000 per annum for 8 years (₹ 10,000 × 4.4873)	<u>44,873</u>
		1,34,873

Less: PV of salvage value at the end of 8 years (₹20,000×0.3269)	6,538
	<u>1,28,335</u>
Equivalent annual cost (EAC) (₹ 1,28,335/4.4873)	<u>28,600</u>

PV of cost of replacing the old machine in each of 4 years with new machine

Scenario	Year	Cash Flow	PV @ 15%	PV
		(₹)		(₹)
Replace Immediately	0	(28,600)	1.00	(28,600)
		40,000	1.00	<u>40,000</u>
				<u>11,400</u>
Replace in one year	1	(28,600)	0.870	(24,882)
	1	(10,000)	0.870	(8,700)
	1	25,000	0.870	<u>21,750</u>
				<u>(11,832)</u>
Replace in two years	1	(10,000)	0.870	(8,700)
	2	(28,600)	0.756	(21,622)
	2	(20,000)	0.756	(15,120)
	2	15,000	0.756	<u>11,340</u>
				<u>(34,102)</u>
Replace in three years	1	(10,000)	0.870	(8,700)
	2	(20,000)	0.756	(15,120)
	3	(28,600)	0.658	(18,819)
	3	(30,000)	0.658	(19,740)
	3	10,000	0.658	<u>6,580</u>
				<u>(55,799)</u>
Replace in four years	1	(10,000)	0.870	(8,700)
	2	(20,000)	0.756	(15,120)
	3	(30,000)	0.658	(19,740)
	4	(28,600)	0.572	(16,359)
	4	(40,000)	0.572	<u>(22,880)</u>
				<u>(82,799)</u>

Advice: The company should replace the old machine immediately because the PV of cost of replacing the old machine with new machine is least.

Alternatively, optimal replacement period can also be computed using the following table:

Scenario	Year	Cashflow	PV at 15%	PV
Replace immediately	0	(40,000)	1	(40,000)
	1 to 4	28,600	2.855	81,652
				41,652
Replace after 1 year	1	10,000	0.870	8,696
	1	(25,000)	0.870	(21,739)
	2 to 4	28,600	1.985	56,783
				43,739
Replace after 2 years	1	10,000	0.870	8,696
	2	20,000	0.756	15,123
	2	(15,000)	0.756	(11,342)
	3 and 4	28,600	1.229	35,157
				47,633
Replace after 3 years	1	10,000	0.870	8,696
	2	20,000	0.756	15,123
	3	30,000	0.658	19,725
	3	(10,000)	0.658	(6,575)
	4	28,600	0.572	16,352
				53,321
Replace after 4 years	1	10,000	0.870	8,696
	2	20,000	0.756	15,123
	3	30,000	0.658	19,725
	4	40,000	0.572	22,870
				66,414

23.

(A)	Cash Outflow	₹
(i)	In case machine is upgraded: Upgradation Cost	<u>10,00,000</u>
(ii)	In case new machine installed: Cost	20,00,000
	Add: Installation cost	<u>50,000</u>
	Total Cost	20,50,000
	Less: Disposal of old machine ₹ 50,000 – 40% tax	<u>30,000</u>
	Total Cash Outflow	<u>20,20,000</u>

Working Note:

(iv) Depreciation – in case machine is upgraded

$$₹ 10,00,000 \div 5 = ₹ 2,00,000$$

(ii) Depreciation – in case new machine is installed

$$₹ 20,50,000 \div 5 = ₹ 4,10,000$$

(iii) Old existing machine – Book Value is zero. So, no depreciation.

(B) Cash Inflows after Taxes (CFAT)

Year	Old Existing Machine	Upgraded Machine			
	(i) EAT/CFAT ₹	(ii) EAT ₹	(iii) DEP ₹	(iv) CFAT ₹	= (iv)-(i) Incremental CFAT ₹
1	5,00,000	5,50,000	2,00,000	7,50,000	2,50,000
2	5,40,000	5,90,000	2,00,000	7,90,000	2,50,000
3	5,80,000	6,10,000	2,00,000	8,10,000	2,30,000
4	6,20,000	6,50,000	2,00,000	8,50,000	2,30,000
5	6,60,000	7,00,000	2,00,000	9,00,000	2,40,000

Cash Inflow after Taxes (CFAT)

Year	New Machine			
	(vi) EAT ₹	(vii) DEP ₹	(viii) CFAT ₹	(ix) = (viii) – (i) Incremental CFAT (₹)
1	6,00,000	4,10,000	10,10,000	5,10,000
2	6,40,000	4,10,000	10,50,000	5,10,000
3	6,90,000	4,10,000	11,00,000	5,20,000
4	7,40,000	4,10,000	11,50,000	5,30,000
5	8,00,000	4,10,000	12,10,000	5,50,000

P.V. AT 15% - 5 Years – on Incremental CFAT

Year	Upgraded Machine			New Machine		
	Incremental CFAT ₹	PVF	Total P.V. ₹	Incremental CFAT	PVF	Total PV ₹
1	2,50,000	0.870	2,17,500	5,10,000	0.870	4,43,700
2	2,50,000	0.756	1,89,000	5,10,000	0.756	3,85,560
3	2,30,000	0.658	1,51,340	5,20,000	0.658	3,42,160
4	2,30,000	0.572	1,31,560	5,30,000	0.572	3,03,160
5.	2,40,000	0.497	<u>1,19,280</u>	5,50,000	0.497	<u>2,73,350</u>
Total P.V. of CFAT			8,08,680			17,47,930
Less: Cash Outflows			<u>10,00,000</u>			<u>20,20,000*</u>
N.P.V. =			<u>-1,91,320</u>			<u>-2,72,070</u>

*Acquisition Cost (including installation cost) ₹ 20,50,000

Less: Salvage Value of existing machine net of Tax ₹ 30,000

₹ 20,20,000

As the NPV in both the new (alternative) proposals is negative, the company should continue with the existing old Machine.

24. Statement showing the evaluation of two machines

Machines	A	B
Purchase cost (₹): (i)	1,50,000	1,00,000
Life of machines (years)	3	2
Running cost of machine per year (₹): (ii)	40,000	60,000
Cumulative present value factor for 1-3 years @ 10% (iii)	2.486	—
Cumulative present value factor for 1-2 years @ 10% (iv)	—	1.735
Present value of running cost of machines (₹): (v)	99,440	1,04,100
	[(ii) × (iii)]	[(ii) × (iv)]
Cash outflow of machines (₹): (vi) = (i) + (v)	2,49,440	2,04,100
Equivalent present value of annual cash outflow	1,00,338	1,17,637
	[(vi) ÷ (iii)]	[(vi) ÷ (iv)]

Decision: Company X should buy machine A since its equivalent cash outflow is less than machine B.

25. Statement showing present value of cash inflow of new machine when it replaces elderly machine now

NPV of New Machine

PV of Cash Inflow (80000 x 2.486)	₹ 1,98,880
Less: Purchase Cost of New Machine	₹ <u>1,50,000</u>
	₹ <u>48,880</u>

Since NPV of New Machine is positive, it should be purchased.

Timing Decision

Replace Now

Current Realizable Value	₹ 80,000
NPV of New Machine	₹ <u>48,880</u>
Total NPV	₹ <u>1,28,880</u>

Replace after 1 Year

Cash Inflow for Year 1	₹ 40000
Realisable Value of Old Machine	₹ 70000

NPV of New Machine	₹ 48,880
Total NPV after 1 Year	₹ 1,58,880
PV of Total NPV (158880/1.1)	₹ 1,44,436

Advise: Since Total NPV is higher in case of Replacement after one year Machine should be replaced after 1 year.

26. Working Notes

First of all, we shall calculate cash flows for each replacement cycle as follows:

One Year Replacement Cycle

Year	Replacement Cost	Maintenance & Repair	Residual Value	Net cash Flow
0	(60,000)	-	-	(60,000)
1	-	(16,000)	32,000	16,000

Two Years Replacement Cycle

Year	Replacement Cost	Maintenance & Repair	Residual Value	Net cash Flow
0	(60,000)	-	-	(60,000)
1	-	(16,000)	-	(16,000)
2	-	(22,000)	24,000	2,000

Three Years Replacement Cycle

Year	Replacement Cost	Maintenance & Repair	Residual Value	Net cash Flow
0	(60,000)	-	-	(60,000)
1	-	(16,000)	-	(16,000)
2	-	(22,000)	-	(22,000)
3	-	(28,000)	16,000	(12,000)

Four Years Replacement Cycle

Year	Replacement Cost	Maintenance & Repair	Residual Value	Net cash Flow
0	(60,000)	-	-	(60,000)
1	-	(16,000)	-	(16,000)
2	-	(22,000)	-	(22,000)
3	-	(28,000)	-	(28,000)
4	-	(36,000)	8,000	(28,000)

Now we shall calculate NPV for each replacement cycles

		1 Year		2 Years		3 Years		4 Years	
Year	PVF@ 15%	Cash Flows	PV	Cash Flows	PV	Cash Flows	PV	Cash Flows	PV
0	1	-60,000	-60,000	-60,000	-60,000	-60,000	-60,000	-60,000	-60,000
1	0.8696	16,000	13,914	-16,000	-13,914	-16,000	-13,914	-16,000	-13,914
2	0.7561	-	-	2,000	1,512	-22,000	-16,634	-22,000	-16,634
3	0.6575	-	-	-	0	-12,000	-7,890	-28,000	-18,410
4	0.5718	-	-	-	0	-	0	-28,000	-16,010
			-46,086		-72,402		-98,438		-1,24,968

Replacement Cycles		EAC (₹)
1 Year	$\frac{46,086}{0.8696}$	52,997
2 Years	$\frac{72,402}{1.6257}$	44,536
3 Years	$\frac{98,438}{2.2832}$	43,114
4 Years	$\frac{1,24,968}{2.855}$	43,772

Since EAC is least in case of replacement cycle of 3 years hence machine should be replaced after every three years.

Note: Alternatively, Answer can also be computed by excluding initial outflow as there will be no change in final decision.

27. In this question the effect of increasing running cost and decreasing resale value have to be weighted upto against the purchase cost of bike. For this purpose, we shall compute Equivalent Annual Cost (EAC) of replacement in different years shall be computed and compared.

Year	Road Taxes (₹)	Petrol etc. (₹)	Total (₹)	PVF @10%	PV (₹)	Cumulative PV (₹)	PV of Resale Price (₹)	Net Outflow (₹)
1	3,000	30,000	33,000	0.909	29,997	29,997	31,815	(1,818)
2	3,000	35,000	38,000	0.826	31,388	61,385	17,346	44,039
3	3,000	43,000	46,000	0.751	34,546	95,931	6,759	89,172

Computation of EACs

Year*	Purchase Price of Bike (₹)	Net Outflow (₹)	Total Outflow (₹)	PVAF @ 10%	EAC* (₹)
1	55,000	(1,818)	53,182	0.909	58,506
2	55,000	44,039	99,039	1.735	57,083
3	55,000	89,172	1,44,172	2.486	57,993

Thus, from above table it is clear that EAC is least in case of 2 years, hence bike should be replaced every two years.

* Assume these periods are the periods from which bike shall be kept in use.

* EAC is used to bring Cash Flows occurring for different periods at one point of Time.

SECURITY ANALYSIS



LEARNING OUTCOMES

After going through the chapter student shall be able to understand:

- Fundamental Analysis
- Technical Analysis
 - (a) Meaning
 - (b) Assumptions
 - (c) Theories and Principles
 - (d) Charting Techniques
- Efficient Market Hypothesis (EMH) Analysis
- Equity Research and tools available



INTRODUCTION

Investment decision depends on securities to be bought, held or sold. Buying security is based on highest return per unit of risk or lowest risk per unit of return. Selling security does not depend on any such requirement. A security considered for buying today may not be attractive tomorrow due to management policy changes in the company or economic policy changes adopted by the government. The reverse is also true. Therefore, analysis of the security on a continuous basis is a must.

Security Analysis involves a systematic analysis of the risk return profiles of various securities which is to help a rational investor to estimate a value for a company from all the price sensitive information/data so that he can make purchases when the market under-prices some of them and thereby earn a reasonable rate of return.

Two approaches viz. fundamental analysis and technical analysis are in vogue for carrying out Security Analysis. In fundamental analysis, factors affecting risk-return characteristics of securities are looked into while in technical analysis, demand/ supply position of the securities along with prevalent share price trends are examined.



1. FUNDAMENTAL ANALYSIS

Fundamental Analysis is based on the assumption that the share prices depend upon the future dividends expected by the shareholders. The present value of the future dividends can be calculated by discounting the cash flows at an appropriate discount rate and is known as the '*intrinsic value of the share*'. The intrinsic value of a share, according to a fundamental analyst, depicts the true value of a share. A share that is priced below the intrinsic value must be bought, while a share quoting above the intrinsic value must be sold.

Thus, it can be said that the price the shareholders are prepared to pay for a share is nothing but the present value of the dividends they expect to receive on the share and this is the price at which they expect to sell it in the future.

As a first step, to arrive at a compact expression, let us make a simple assumption, that the company is expected to pay a uniform dividend of ₹ D per share every year, i.e.,

$$D(1) = D(2) = D(3) = \dots = D, \quad (1)$$

The Eq., would then become:

$$P(0) = \frac{D}{(1+k)} + \frac{D}{(1+k)^2} + \frac{D}{(1+k)^3} + \dots + \dots \quad (2)$$

$$\text{and } P(0) = \frac{D}{k} \quad (3)$$

But it is unrealistic to assume that dividends remain constant over time. In case of most shares, the dividends per share (DPS) grow because of the growth in the earnings of the firm. Most companies, as they identify new investment opportunities for growth, tend to increase their DPS over a period of time.

Let us assume that on an average the DPS of the company grows at the compounded rate of g per annum, so that dividend $D(1)$ at the end of the first period grows to $D(1)(1+g)$, $D(1)(1+g)^2$, etc, at the end of second period, third period, etc. respectively. So we must have:

$$P(0) = \frac{D(1)}{(1+k)} + \frac{D(1)(1+g)}{(1+k)^2} + \frac{D(1)(1+g)^2}{(1+k)^3} + \dots + \dots \quad (4)$$

which is a perpetual geometric series.

If growth rate in dividends, g , is less than the desired rate of return on share, k , we must have:

$$P(0) = \frac{D(1)}{(k-g)} \quad (5)$$

or

$$P(0) = \frac{D(0)(1+g)}{(k-g)} \quad (6)$$

Since $D(1)$ may be approximated as $D(0)(1+g)$, $D(0)$ being the DPS in the current period (0).

When growth rate in dividends, g , is equal to or greater than the desired rate of return on share, k , the above model is not valid, since the geometric series leads to an infinite price. The condition that g be less than k is not very restrictive, since the long-term growth in dividends is unlikely to exceed the rate of return expected by the market on the share.

The above result [Eq.(5)] is also known as Gordon's dividend growth model for stock valuation, named after the model's originator, Myron J. Gordon. This is one of the most well-known models in the genre of fundamental analysis.

In equation (6), if "g" is set at zero, we get back equation (3).

1.1 Dividend Growth Model and the PE Multiple

Financial analysts tend to relate price to earnings via the P/E multiples (the ratio between the market price and earnings per share).

If a company is assumed to pay out a fraction b of its earnings as dividends on an average (i.e. the Dividend Payout Ratio = b), $D(1)$ may be expressed as $b E(1)$, where $E(1)$ is the earning per share (EPS) of the company at the end of the first period. Equation (5) then becomes:

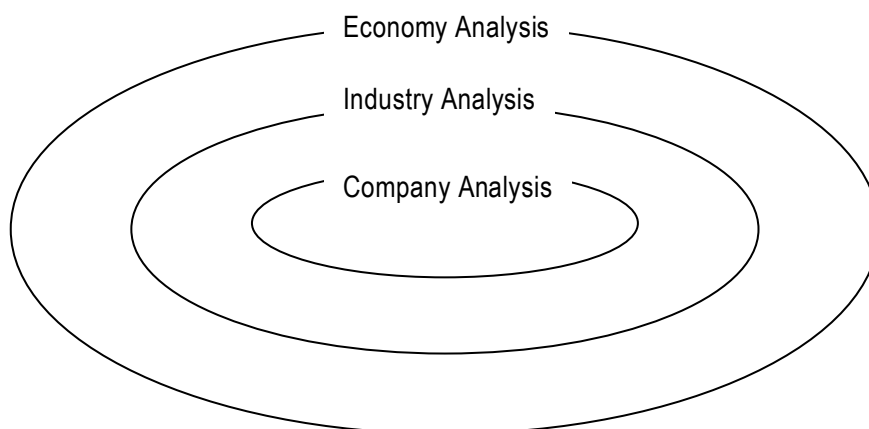
$$P(0) = \frac{bE(1)}{(k-g)} \quad (7)$$

or

$$P(0) = \frac{bE(0)(1+g)}{(k-g)} \quad (8)$$

The fundamental analysts use the above models or some of their variations, for estimating the fundamental or intrinsic price or the fundamental price-earnings multiple of a security. Towards this end, they devote considerable effort in assessing the impact of various kinds of information on a company's future profitability and the expected return of the shareholders. If the prevailing price or the P/E multiple of a security is higher than the estimated fundamental value (i.e. if the security appears to be overpriced), they recommend a selling stance with respect to that security, since once the information becomes common knowledge, the price of the security may be expected to fall. On the other hand, if the security is underpriced in the market, the prevailing price (or the P/E multiple) of the security being lower than the estimated fundamental value, they recommend buying the security, counting upon a price rise.

Because of these inherent complex interrelationships in the production processes, the fortunes of each industry are closely tied to those of other industries and to the performance of the economy as a whole. Within an industry, the prospects of a specific company depend not only on the prospects of the industry to which it belongs, but also on its operating and competitive position within that industry. The key variables that an investor must monitor in order to carry out his fundamental analysis are economy wide factors, industry wide factors and company specific factors. In other words, fundamental analysis encompasses economic, industrial and company analyses. They are depicted by three concentric circles and constitute the different stages in an investment decision making process.



1.2 Economic Analysis

Macro-economic factors e.g. historical performance of the economy in the past/ present and expectations in future, growth of different sectors of the economy in future with signs of stagnation/degradation at present to be assessed while analyzing the overall economy. Trends in peoples' income and expenditure reflect the growth of a particular industry/company in future. Consumption affects corporate profits, dividends and share prices in the market.

1.2.1 Factors Affecting Economic Analysis

Some of the economy wide factors are discussed as under:

- (a) **Growth Rates of National Income and Related Measures:** For most purposes, what is important is the difference between the nominal growth rate quoted by GDP and the 'real' growth after taking inflation into account. The estimated growth rate of the economy would be a pointer to the prospects for the industrial sector, and therefore to the returns investors can expect from investment in shares.
- (b) **Growth Rates of Industrial Sector:** This can be further broken down into growth rates of various industries or groups of industries if required. The growth rates in various industries are estimated based on the estimated demand for its products.
- (c) **Inflation:** Inflation is measured in terms of either wholesale prices (the Wholesale Price Index or WPI) or retail prices (Consumer Price Index or CPI). The demand in some industries, particularly the consumer products industries, is significantly influenced by the inflation rate. Therefore, firms in these industries make continuous assessment about inflation rates likely to prevail in the near future so as to fine-tune their pricing, distribution and promotion policies to the anticipated impact of inflation on demand for their products.
- (d) **Monsoon:** Because of the strong forward and backward linkages, monsoon is of great concern to investors in the stock market too.

1.2.2 Techniques Used in Economic Analysis

Economic analysis is used to forecast national income with its various components that have a bearing on the concerned industry and the company in particular. Gross National Product (GNP) is used to measure national income as it reflects the growth rate in economic activities and has been regarded as a forecasting tool for analyzing the overall economy along with its various components during a particular period.

Some of the techniques used for economic analysis are:

- (a) **Anticipatory Surveys:** They help investors to form an opinion about the future state of the economy. It incorporates expert opinion on construction activities, expenditure on plant and machinery, levels of inventory – all having a definite bearing on economic activities. Also future spending habits of consumers are taken into account.

In spite of valuable inputs available through this method, it has certain drawbacks:

- (i) Survey results do not guarantee that intentions surveyed would materialize.
- (ii) They are not regarded as forecasts per se, as there can be a consensus approach by the investor for exercising his opinion.

Continuous monitoring of this practice is called for to make this technique popular.

(b) Barometer/Indicator Approach: Various indicators are used to find out how the economy shall perform in the future. The indicators have been classified as under:

- (i) *Leading Indicators:* They lead the economic activity in terms of their outcome. They relate to the time series data of the variables that reach high/low points in advance of economic activity.
- (ii) *Roughly Coincidental Indicators:* They reach their peaks and troughs at approximately the same in the economy.
- (iii) *Lagging Indicators:* They are time series data of variables that lag behind in their consequences vis-a- vis the economy. They reach their turning points after the economy has reached its own already.

All these approaches suggest direction of change in the aggregate economic activity but nothing about its magnitude. The various measures obtained from such indicators may give conflicting signals about the future direction of the economy. To avoid this limitation, use of diffusion/composite index is suggested whereby combining several indicators into one index to measure the strength/weaknesses in the movement of a particular set of indicators. Computation of diffusion indices is no doubt difficult notwithstanding the fact it does not eliminate irregular movements.

Money supply in the economy also affects investment decisions. Rate of change in money supply in the economy affects GNP, corporate profits, interest rates and stock prices. Increase in money supply fuels inflation. As investment in stocks is considered as a hedge against inflation, stock prices go up during inflationary period.

(c) Economic Model Building Approach: In this approach, a precise and clear relationship between dependent and independent variables is determined. GNP model building or sectoral analysis is used in practice through the use of national accounting framework. The steps used are as follows:

- (i) Hypothesize total economic demand by measuring total income (GNP) based on political stability, rate of inflation, changes in economic levels.
- (ii) Forecasting the GNP by estimating levels of various components viz. consumption expenditure, gross private domestic investment, government purchases of goods/services, net exports.
- (iii) After forecasting individual components of GNP, add them up to obtain the forecasted GNP.

- (iv) Comparison is made of total GNP thus arrived at with that from an independent agency for the forecast of GNP and then the overall forecast is tested for consistency. This is carried out for ensuring that both the total forecast and the component wise forecast fit together in a reasonable manner.

1.3 Industry Analysis

When an economy grows, it is very unlikely that all industries in the economy would grow at the same rate. So it is necessary to examine industry specific factors, in addition to economy-wide factors.

First of all, an assessment has to be made regarding all the conditions and factors relating to demand of the particular product, cost structure of the industry and other economic and Government constraints on the same. Since the basic profitability of any company depends upon the economic prospects of the industry to which it belongs, an appraisal of the particular industry's prospects is essential.

1.3.1 Factors Affecting Industry Analysis

The following factors may particularly be kept in mind while assessing the factors relating to an industry.

- (a) **Product Life-Cycle:** An industry usually exhibits high profitability in the initial and growth stages, medium but steady profitability in the maturity stage and a sharp decline in profitability in the last stage of growth.
- (b) **Demand Supply Gap:** Excess supply reduces the profitability of the industry because of the decline in the unit price realization, while insufficient supply tends to improve the profitability because of higher unit price realization.
- (c) **Barriers to Entry:** Any industry with high profitability would attract fresh investments. The potential entrants to the industry, however, face different types of barriers to entry. Some of these barriers are innate to the product and the technology of production, while other barriers are created by existing firms in the industry.
- (d) **Government Attitude:** The attitude of the government towards an industry is a crucial determinant of its prospects.
- (e) **State of Competition in the Industry:** Factors to be noted are- firms with leadership capability and the nature of competition amongst them in foreign and domestic market, type of products manufactured viz. homogeneous or highly differentiated, demand prospects through classification viz customer-wise/area-wise, changes in demand patterns in the long/immediate/ short run, type of industry the firm is placed viz. growth, cyclical, defensive or decline.

- (f) **Cost Conditions and Profitability:** The price of a share depends on its return, which in turn depends on profitability of the firm. Profitability depends on the state of competition in the industry, cost control measures adopted by its units and growth in demand for its products.

Factors to be considered are:

- (i) Cost allocation among various heads e.g. raw material, labours and overheads and their controllability. Overhead cost for some may be higher while for others labour may be so. Labour cost which depends on wage level and productivity needs close scrutiny.
- (ii) Product price.
- (iii) Production capacity in terms of installation, idle and operating.
- (iv) Level of capital expenditure required for maintenance / increase in productive efficiency.

Investors are required to make a thorough analysis of profitability. This is carried out by the study of certain ratios such as G.P. Ratio, Operating Profit Margin Ratio, R.O.E., Return on Total Capital etc.

- (g) **Technology and Research:** They play a vital role in the growth and survival of a particular industry. Technology is subject to change very fast leading to obsolescence. Industries which update themselves have a competitive advantage over others in terms of quality, price etc.

Things to be probed in this regard are:

- (i) Nature and type of technology used.
- (ii) Expected changes in technology for new products leading to increase in sales.
- (iii) Relationship of capital expenditure and sales over time. More capital expenditure means increase in sales.
- (iv) Money spent in research and development. Whether this amount relates to redundancy or not?
- (v) Assessment of industry in terms of sales and profitability in short, immediate and long run.

1.3.2 Techniques Used in Industry Analysis

The techniques used for analyzing the industry wide factors are:

- (a) **Regression Analysis:** Investor diagnoses the factors determining the demand for output of the industry through product demand analysis. Factors to be considered are GNP, disposable income, per capita consumption / income, price elasticity of demand. For identifying factors affecting demand, statistical techniques like regression analysis and correlation are used.

- (b) **Input – Output Analysis:** It reflects the flow of goods and services through the economy, intermediate steps in production process as goods proceed from raw material stage through final consumption. This is carried out to detect changing patterns/trends indicating growth/decline of industries.

1.4 Company Analysis

Economic and industry framework provides the investor with proper background against which shares of a particular company are purchased. This requires careful examination of the company's quantitative and qualitative fundamentals.

- (a) **Net Worth and Book Value:** Net Worth is sum of equity share capital, preference share capital and free reserves less intangible assets and any carry forward of losses. The total net worth divided by the number of shares is the much talked about book value of a share. Though the book value is often seen as an indication of the intrinsic worth of the share, this may not be so for two major reasons. First, the market price of the share reflects the future earnings potential of the firm which may have no relationship with the value of its assets. Second, the book value is based upon the historical costs of the assets of the firm and these may be gross underestimates of the cost of the replacement or resale values of these assets.
- (b) **Sources and Uses of Funds:** The identification of sources and uses of funds is known as Funds Flow Analysis. One of the major uses of funds flow analysis is to find out whether the firm has used short-term sources of funds to finance long-term investments. Such methods of financing increases the risk of liquidity crunch for the firm, as long-term investments, because of the gestation period involved may not generate enough surpluses in time to meet the short-term liabilities incurred by the firm. Many a firm has come to grief because of this mismatch between the maturity periods of sources and uses of funds.
- (c) **Cross-Sectional and Time Series Analysis:** One of the main purposes of examining financial statements is to compare two firms, compare a firm against some benchmark figures for its industry and to analyze the performance of a firm over time. The techniques that are used to do such proper comparative analysis are: common-sized statement, and financial ratio analysis.
- (d) **Size and Ranking:** A rough idea regarding the size and ranking of the company within the economy, in general, and the industry, in particular, would help the investment manager in assessing the risk associated with the company. In this regard the net capital employed, the net profits, the return on investment and the sales figures of the company under consideration may be compared with similar data of other companies in the same industry group. It may also be useful to assess the position of the company in terms of technical know-how, research and development activity and price leadership.
- (e) **Growth Record:** The growth in sales, net income, net capital employed and earnings per share of the company in the past few years should be examined. The following three growth

indicators may be particularly looked into: (a) Price earnings ratio, (b) Percentage growth rate of earnings per annum, and (c) Percentage growth rate of net block.

The price earnings ratio is an important indicator for the investment manager since it shows the number of times the earnings per share are covered by the market price of a share. Theoretically, this ratio should be the same for two companies with similar features. However, this is not so in practice due to many factors. Hence, by a comparison of this ratio pertaining to different companies the investment manager can have an idea about the image of the company and can determine whether the share is under-priced or over-priced.

Consider the following example:

		<i>Company A</i>	<i>Company B</i>
(a)	Market price of share of ₹ 100	150	250
(b)	Earnings per share	25	25
(c)	Price earnings ratio [(a) ÷ (b)]	6	10

It is obvious that the purchaser of company A's shares pays 6 times its annual earnings while the purchaser of company B's shares pays 10 times. If other factors (intrinsic value of share, growth potential, etc.) are quite similar, it is obvious that the shares of company A are preferable. In practice, however, the other factors are never similar in the case of two companies. The investment manager must try to ascertain why the EPS in company B is comparatively low – may be some factors are not apparent. EPS calculation cannot be the sole basis of deciding about an investment. Yet it is one of the most important factors on the basis of which the investment manager takes a decision to purchase the shares. This is because it relates the market price of the shares and the earnings per share.

The percentage growth rate of net blocks shows how the company has been developing its capacity levels. Obviously, a dynamic company will keep on expanding its capacities and diversify its business. This will enable it to enter new and profitable lines and avoid stagnation in its growth.

In this context, an evaluation of future growth prospects of the company should be carefully made. This requires an analysis of existing capacities and their utilisation, proposed expansion and diversification plans and the nature of the company's technology. The existing capacity utilisation levels can be known from the quantitative information given in the published profit and loss accounts of the company. The plans of the company, in terms of expansion or diversification, can be known from the Directors' Reports, the Chairman's statements and from the future capital commitments as shown by way of notes in the balance sheets. The nature of technology of a company should be seen with reference to technological developments in the concerned fields, the possibility of its product being superseded or the possibility of emergence of a more effective method of manufacturing.

Growth is the single most important factor in company analysis for the purpose of investment management. A company may have a good record of profits and performance in the past; but if it does not have growth potential, its shares cannot be rated high from the investment point of view.

(f) Financial Analysis: An analysis of its financial statements for the past few years would help the investment manager in understanding the financial solvency and liquidity, the efficiency with which the funds are used, the profitability, the operating efficiency and the financial and operating leverages of the company. For this purpose, certain fundamental ratios have to be calculated.

From the investment point of view, the most important figures are earnings per share, price earning ratios, yield, book value and the intrinsic value of the share. These five elements may be calculated for the past 10 years or so and compared with similar ratios computed from the financial accounts of other companies in the industry and with the average ratios for the industry as a whole. The yield and the asset backing of a share are important considerations in a decision regarding whether the particular market price of the share is proper or not.

Various other ratios to measure profitability, operating efficiency and turnover efficiency of the company may also be calculated. The return on owners' investment, capital turnover ratio and the cost structure ratios may also be worked out.

To examine the financial solvency or liquidity of the company, the investment manager may work out current ratio, liquidity ratio, debt-equity ratio, etc. These ratios will provide an overall view of the company to the investment analyst. He can analyse its strengths and weaknesses and see whether it is worth the risk or not.

(g) Competitive Advantage: Another business consideration for investors is competitive advantage. A company's long-term success is driven largely by its ability to maintain its competitive advantage. Powerful competitive advantages, such as Apple's brand name and Samsung's domination of the mobile market, create a shield around a business that allows it to keep competitors at a distance.

(h) Quality of Management: This is an intangible factor. Yet it has a very important bearing on the value of the shares. Every investment manager knows that the shares of certain business houses command a higher premium than those of similar companies managed by other business houses. This is because of the quality of management, the confidence that investors have in a particular business house, its policy vis-a-vis its relationship with the investors, dividend and financial performance record of other companies in the same group, etc. This is perhaps the reason that an investment manager always gives a close look to the management of a company in whose shares he is to invest. Quality of management has to be seen with reference to the experience, skills and integrity of the persons at the helm of affairs of the company. The policy of the management regarding relationship with the shareholders is an important factor since certain business houses believe in very generous dividend and bonus distributions while others are rather conservative.

However, an average investor is at a disadvantage when compared with a large investor. They do not get the facility to meet the top executives of the company, but the fund managers interested in investing huge amount of money generally get to meet the top brasses of an organization.

It is true that every listed company give detailed information about its management. But, the information they give is always positive. This is because; no company will host any negative information about itself. So, the question is how to find the dirt inside the management. The remedy is to have a look out for the conference calls hosted by the company's CEO and CFO. After reading the company's financial results, they take question and answers session from the investors. That's where one can pick something that can indicate about the true position about the company.

Some other ways to judge the management of the company is to read the Management Discussion and Analysis Report. Further, it helps when top management people are also the shareholders. If the large scale unloading of their shares are taking place and something else is communicated to the media, then it is a sign that something is wrong. Another way to judge the effectiveness of the management is to see the past performance of the executives, say, for five years.

(i) Corporate Governance: Following factors are to be kept in mind while judging the effectiveness of corporate governance of an organization:

- Whether company is complying with all aspects of SEBI (LODR) Regulations 2015?
- How well corporate governance policies serve stakeholders?
- Quality and timeliness of company financial disclosures.
- Whether quality independent directors are inducted?

(j) Regulation: Regulations plays an important role in maintaining the sanctity of the corporate form of organization. In Indian listed companies, Companies Act, Securities Contract and Regulation Act and SEBI Act basically look after regulatory aspects of a company. A listed company is also continuously monitored by SEBI which through its guidelines and regulations protect the interest of investors.

Further, a company which is dealing with companies outside India, needs to comply with Foreign Exchange Management Act (FEMA) also. In this scenario, the Reserve Bank of India (RBI) does a continuous monitoring.

(k) Location and Labour-Management Relations: The locations of the company's manufacturing facilities determines its economic viability which depends on the availability of crucial inputs like power, skilled labour and raw-materials, etc. Nearness to markets is also a factor to be considered.

In the past few years, the investment manager has begun looking into the state of labour-management relations in the company under consideration and the area where it is located.

(l) Pattern of Existing Stock Holding: An analysis of the pattern of existing stock holdings of the company would also be relevant. This would show the stake of various parties in the company.

An interesting case in this regard is that of the Punjab National Bank in which the Life Insurance Corporation and other financial institutions had substantial holdings. When the bank was nationalised, the residual company proposed a scheme whereby those shareholders, who wish to opt out, could receive a certain amount as compensation in cash. It was only at the instance and the bargaining strength, of institutional investors that the compensation offered to the shareholders, who wished to opt out of the company, was raised considerably.

(m) Marketability of the Shares: Another important consideration for an investment manager is the marketability of the shares of the company. Mere listing of a share on the stock exchange does not automatically mean that the share can be sold or purchased at will. There are many shares which remain inactive for long periods with no transactions being affected. To purchase or sell such scrips is a difficult task. In this regard, dispersal of shareholding with special reference to the extent of public holding should be seen. The other relevant factors are the speculative interest in the particular scrip, the particular stock exchange where it is traded and the volume of trading.

Techniques Used in Company Analysis

Through the use of statistical techniques the company wide factors can be analyzed. Some of the techniques are discussed as under:

(a) Correlation & Regression Analysis: Simple regression is used when inter relationship covers two variables. For more than two variables, multiple regression analysis is followed. Here the inter relationship between variables belonging to economy, industry and company are found out. The main advantage in such analysis is the determination of the forecasted values along with testing the reliability of the estimates.

(b) Trend Analysis: The relationship of one variable is tested over time using regression analysis. It gives an insight to the historical behavior of the variable.

(c) Decision Tree Analysis: Information relating to the probability of occurrence of the forecasted value is considered useful. A range of values of the variable with probabilities of occurrence of each value is taken up. The limitations are reduced through decision tree analysis and use of simulation techniques.

In decision tree analysis, the decision is taken sequentially with probabilities attached to each sequence. To obtain the probability of final outcome, various sequential decisions given along with probabilities, the probabilities of each sequence is to be multiplied and them summed up.

Thus, fundamental analysis is basically an examination of the economic and financial aspects of a company with the aim of estimating future earnings and dividend prospects. It includes an analysis of the macro-economic and political factors which will have an impact on the performance of the company. After having analysed all the relevant information about the company and its relative strength vis-a-vis other companies in the industry, the investor is expected to decide whether he should buy or sell the securities.

Apart from these, the Group Analysis has also become an important factor. SEBI, in particular, emphasizes the need for disclosure, in public offer documents, of all relevant parameters – especially the financial health and promise versus performance of the group companies. RBI has also been focusing more and more on the Group Exposure Norms of commercial Banks.

2. TECHNICAL ANALYSIS

2.1 Meaning

Technical Analysis is a method of share price movements based on a study of price graphs or charts on the assumption that share price trends are repetitive, that since investor psychology follows a certain pattern, what is seen to have happened before is likely to be repeated. The technical analyst is concerned with the fundamental strength or weakness of a company or an industry; he studies investor and price behaviour.

A technical analyst attempts to answer two basic questions:

- (i) Is there a discernible trend in the prices?
- (ii) If there is, then are there indications that the trend would reverse?

The methods used to answer these questions are visual and statistical. The visual methods are based on examination of a variety of charts to make out patterns, while the statistical procedures analyse price and return data to make trading decisions.

2.2 Assumptions

Technical Analysis is based on the following assumptions:

- (i) The market value of stock depends on the supply and demand for a security.
- (ii) The supply and demand are actually governed by several factors which can be rational or irrational. For instance, recent initiatives taken by the Government to reduce the Non-Performing Assets (NPA) burden of banks may result in the demand for banking stocks.
- (iii) Stock prices generally move in trends which continue for a substantial period of time. Therefore, if there is a bull market going on, there is every possibility that there will soon be a substantial correction which will provide an opportunity to the investors to buy shares at that time.
- (iv) Technical analysis relies upon chart analysis which shows the past trends in stock prices rather than the information in the financial statements like balance sheet or profit and loss account.

2.3 Principles of Technical Analysis

Technical analysis is based on the following three principals:

- a. The market discounts everything.
 - b. Price moves in trends.
 - c. History tends to repeat itself.
- a. **The Market Discounts Everything:** Although many experts criticize technical analysis because it only considers price movements and ignores fundamental factors but the Efficient Market Hypothesis (discussed later in detail) contradicts it according to which a company's share price already reflects everything that has or could affect a company and it includes fundamental factors. So, technical analysts generally have the view that a company's share price includes everything including the fundamentals of a company.
 - b. **Price Moves in Trends:** Technical analysts believe that prices move in trends. In other words, a stock price is more likely to continue a past trend than move in a different direction.
 - c. **History Tends to Repeat Itself:** Technical analysts believe that history tends to repeat itself. Technical analysis uses chart patterns to analyze subsequent market movements to understand trends. While many form of technical analysis have been used for many years, they are still considered to be significant because they illustrate patterns in price movements that often repeat themselves.

2.4 Theories of Technical Analysis

2.4.1 The Dow Theory

The Dow Theory is one of the oldest and most famous technical theories. It was originated by Charles Dow, the founder of Dow Jones Company in late nineteenth century. It is a helpful tool for determining the relative strength of the stock market. It can also be used as a barometer of business.

The Dow Theory is based upon the movements of two indices, constructed by Charles Dow, Dow Jones Industrial Average (DJIA) and Dow Jones Transportation Average (DJTA). These averages reflect the aggregate impact of all kinds of information on the market. The movements of the market are divided into three classifications, all going at the same time; the primary movement, the secondary movement, and the daily fluctuations. The primary movement is the main trend of the market, which lasts from one year to 36 months or longer. This trend is commonly called bear or bull market. The secondary movement of the market is shorter in duration than the primary movement, and is opposite in direction. It lasts from two weeks to a month or more. The daily fluctuations are the narrow movements from day-to-day. These fluctuations are not part of the Dow Theory interpretation of the stock market. However, daily movements must be carefully studied, along with primary and secondary movements, as they go to make up the longer movement in the market.

Thus, the Dow Theory's purpose is to determine where the market is and where is it going, although not how far or high. The theory, in practice, states that if the cyclical swings of the stock market averages are successively higher and the successive lows are higher, then the market trend is up

and a bullish market exists. Contrarily, if the successive highs and successive lows are lower, then the direction of the market is down and a bearish market exists.

Charles Dow proposed that the primary uptrend would have three moves up, the *first* one being caused by accumulation of shares by the far-sighted, knowledgeable investors, the *second* move would be caused by the arrival of the first reports of good earnings by corporations, and the last move up would be caused by widespread report of financial well-being of corporations. The *third* stage would also see rampant speculation in the market. Towards the end of the third stage, the far-sighted investors, realizing that the high earnings levels may not be sustained, would start selling, starting the first move down of a downtrend, and as the non-sustainability of high earnings is confirmed, the second move down would be initiated and then the third move down would result from distress selling in the market.

2.4.2 Elliot Wave Theory

Inspired by the Dow Theory and by observations found throughout nature, Ralph Elliot formulated Elliot Wave Theory in 1934. This theory was based on analysis of 75 years stock price movements and charts. From his studies, he defined price movements in terms of waves. Accordingly, this theory was named Elliot Wave Theory. Elliot found that the markets exhibited certain repeated patterns or waves. As per this theory wave is a movement of the market price from one change in the direction to the next change in the same direction. These waves are resulted from buying and selling impulses emerging from the demand and supply pressures on the market. Depending on the demand and supply pressures, waves are generated in the prices.

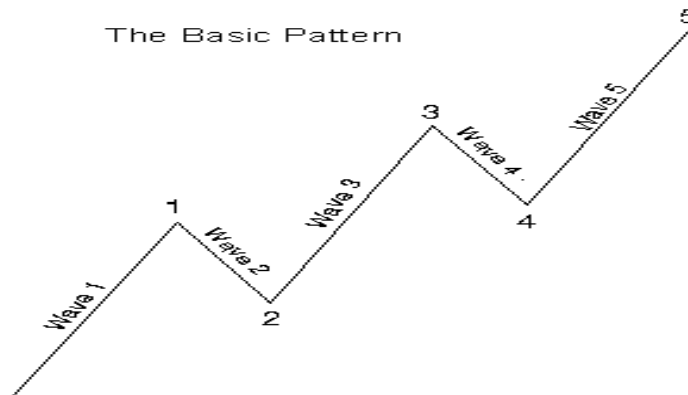
As per this theory, waves can be classified into two parts:-

- Impulsive patterns
- Corrective patterns

Let us discuss each of these patterns.

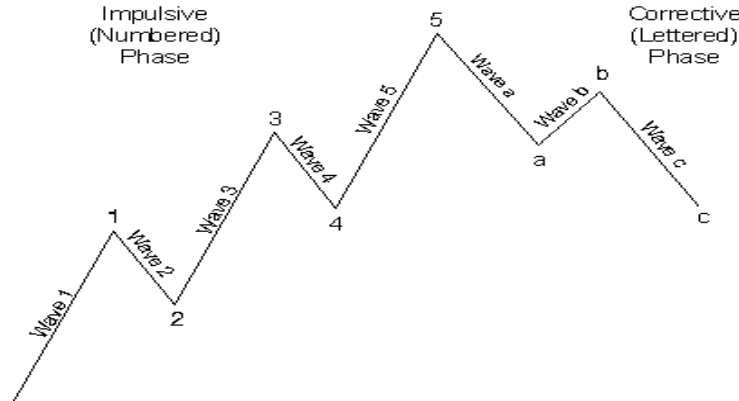
- (a) Impulsive Patterns-(Basic Waves)** - In this pattern there will be 3 or 5 waves in a given direction (going upward or downward). These waves shall move in the direction of the basic movement. This movement can indicate bull phase or bear phase.
- (b) Corrective Patterns- (Reaction Waves)** - These 3 waves are against the basic direction of the basic movement. Correction involves correcting the earlier rise in case of bull market and fall in case of bear market.

As shown in the following diagram waves 1, 3 and 5 are directional movements, which are separated or corrected by wave 2 & 4, termed as corrective movements.



Source: <http://elliottwave.net/>

Complete Cycle -As shown in following figure five-wave impulses is following by a three-wave correction (a,b & c) to form a complete cycle of eight waves.



Source: <http://elliottwave.net/>

One complete cycle consists of waves made up of two distinct phases, bullish and bearish. On completion of full one cycle i.e. termination of 8 waves movement, the fresh cycle starts with similar impulses arising out of market trading.

2.4.3 Random Walk Theory

While discussing the Dow Jones theory, we have seen that the theory is based on the assumption that the behaviour of stock market itself contains trends which give clues to the future behaviour of stock market prices. Thus, supporters of the theory argue that market prices can be predicted if their patterns can be properly understood. *Such analysis of stock market patterns is called technical analysis.* Apart from this theory there are many approaches to technical analysis. Most of them, however, involve a good deal of subjective judgment.

Many investment managers and stock market analysts believe that stock market prices can never be predicted because they are not a result of any underlying factors but are mere statistical ups and downs. This hypothesis is known as Random Walk hypothesis which states that the behaviour of

stock market prices is unpredictable and that there is no relationship between the present prices of the shares and their future prices. Proponents of this hypothesis argue that stock market prices are independent. A British statistician, M. G. Kendall, found that changes in security prices behave nearly as if they are generated by a suitably designed roulette wheel for which each outcome is statistically independent of the past history. In other words, the fact that there are peaks and troughs in stock exchange prices is a mere statistical happening – successive peaks and troughs are unconnected. In the layman's language it may be said that prices on the stock exchange behave exactly the way a drunk would behave while walking in a blind lane, i.e., up and down, with an unsteady way going in any direction he likes, bending on the side once and on the other side the second time.

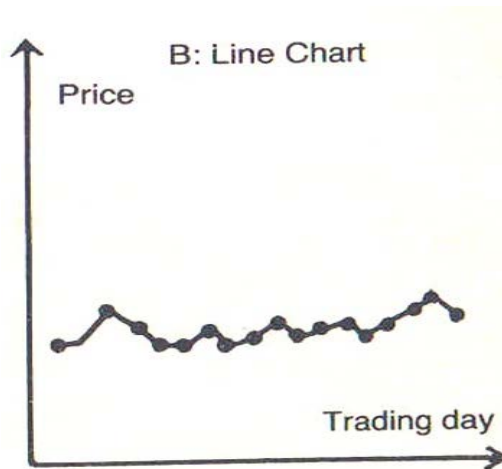
The supporters of this theory put out a simple argument. It follows that:

- (a) Prices of shares in stock market can never be predicted.
- (b) The reason is that the price trends are not the result of any underlying factors, but that they represent a statistical expression of past data.
- (c) There may be periodical ups or downs in share prices, but no connection can be established between two successive peaks (high price of stocks) and troughs (low price of stocks).

2.5 Charting Techniques

Broadly technical analysts use four types of charts for analyzing data. They are as follows:

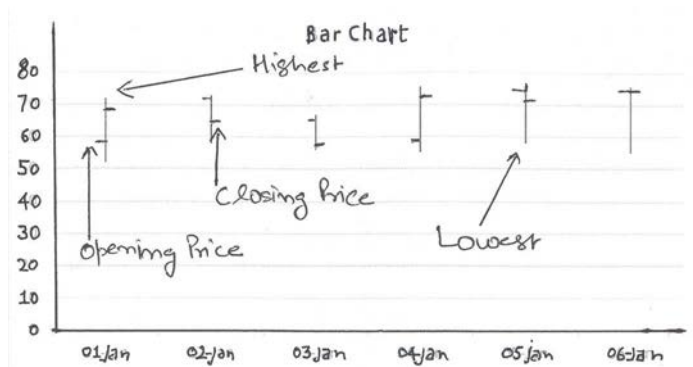
- (i) **Line Chart:** In a line chart, lines are used to connect successive day's prices. The closing price for each period is plotted as a point. These points are joined by a line to form the chart. The period may be a day, a week or a month.



- (ii) **Bar Chart:** In a bar chart, a vertical line (Bar) represents the lowest to the highest price, with a short horizontal line protruding from the bar representing both the opening and closing prices for the period. For example, the prices of share of A Ltd. for 6 days are as follows:

Days	Opening Price (₹)	High Price (₹)	Low Price (₹)	Closing Price (₹)
01-Jan	58	72	52	68
02-Jan	71	73	58	64.30
03-Jan	66	67	56	57
04-Jan	58.50	75.50	55	72
05-Jan	73.50	75	58	71
06-Jan	74.50	76	55	74.50

The above-mentioned prices shall be depicted in Bar Chart as follows:



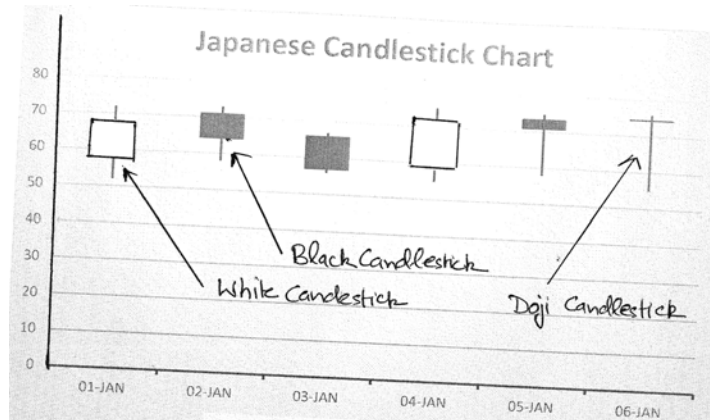
(iii) **Japanese Candlestick Chat:** Like Bar chart this chart also shows the same information i.e. Opening, Closing, Highest and Lowest prices of any stock on any day but this chart more visualizes the trend as change in the opening and closing prices is indicated by the color of the candlestick.

While Black candlestick indicates closing price is lower than the opening price the white candlestick indicates its opposite i.e. closing price is higher than the opening price. Another possibility of no change in opening and closing prices or very near is shown by 'Doji Candlestick'.

Thus, a white Candlestick indicates a Bullish trend and a black Candlestick indicates a bearish trend.

The lowest and highest prices are indicated by vertical bar and opening and closing prices are shown in the form of rectangular (as per above-mentioned color scheme) placed in between this bar. In case of Doji Candlestick it is indicated by a simple bar.

Continuing the above example the prices of share of A Ltd. as per Candlestick chart is shown below:



(iv) **Point and Figure Chart:** Point and Figure charts are more complex than line or bar charts. They are used to detect reversals in a trend. For plotting a point and figure chart, we have to first decide the box size and the reversal criterion. The box size is the value of each box on the chart, for example each box could be ₹ 1, ₹ 2 or ₹ 0.50. The smaller the box size, the more sensitive would the chart be to price change. The reversal criterion is the number of boxes required to be retraced to record prices in the next column in the opposite direction.

Period	Price
1	24
2	26
3	27
4	26
5	28
6	27
7	26
8	25
9	26
10	23

30							
29							
28	X						
27	X						
26	X						
25	X	O					
24	X	O					
23		O					
22							

2.6 Market Indicators

(i) **Breadth Index:** It is an index that covers all securities traded. It is computed by dividing the net advances or declines in the market by the number of issues traded. The breadth index either supports or contradicts the movement of the Dow Jones Averages. If it supports the movement of the Dow Jones Averages, this is considered sign of technical strength and if it does not support the

averages, it is a sign of technical weakness i.e. a sign that the market will move in a direction opposite to the Dow Jones Averages. The breadth index is an addition to the Dow Theory and the movement of the Dow Jones Averages.

(ii) **Volume of Transactions:** The volume of shares traded in the market provides useful clues on how the market would behave in the near future. A rising index/price with increasing volume would signal buy behaviour because the situation reflects an unsatisfied demand in the market. Similarly, a falling market with increasing volume signals a bear market and the prices would be expected to fall further. A rising market with decreasing volume indicates a bull market while a falling market with dwindling volume indicates a bear market. Thus, the volume concept is best used with another market indicator, such as the Dow Theory.

(iii) **Confidence Index:** It is supposed to reveal how willing the investors are to take a chance in the market. It is the ratio of high-grade bond yields to low-grade bond yields. It is used by market analysts as a method of trading or timing the purchase and sale of stock, and also, as a forecasting device to determine the turning points of the market. A rising confidence index is expected to precede a rising stock market, and a fall in the index is expected to precede a drop in stock prices. A fall in the confidence index represents the fact that low-grade bond yields are rising faster or falling more slowly than high grade yields. The confidence index is usually, but not always a leading indicator of the market. Therefore, it should be used in conjunction with other market indicators.

(iv) **Relative Strength Analysis:** The relative strength concept suggests that the prices of some securities rise relatively faster in a bull market or decline more slowly in a bear market than other securities i.e. some securities exhibit relative strength. Investors will earn higher returns by investing in securities which have demonstrated relative strength in the past because the relative strength of a security tends to remain undiminished over time.

Relative strength can be measured in several ways. Calculating rates of return and classifying those securities with historically high average returns as securities with high relative strength is one of them. Even ratios like security relative to its industry and security relative to the entire market can also be used to detect relative strength in a security or an industry.

(v) **Odd - Lot Theory:** This theory is a contrary - opinion theory. It assumes that the average person is usually wrong and that a wise course of action is to pursue strategies contrary to popular opinion. The odd-lot theory is used primarily to predict tops in bull markets, but also to predict reversals in individual securities.

2.7 Support and Resistance Levels

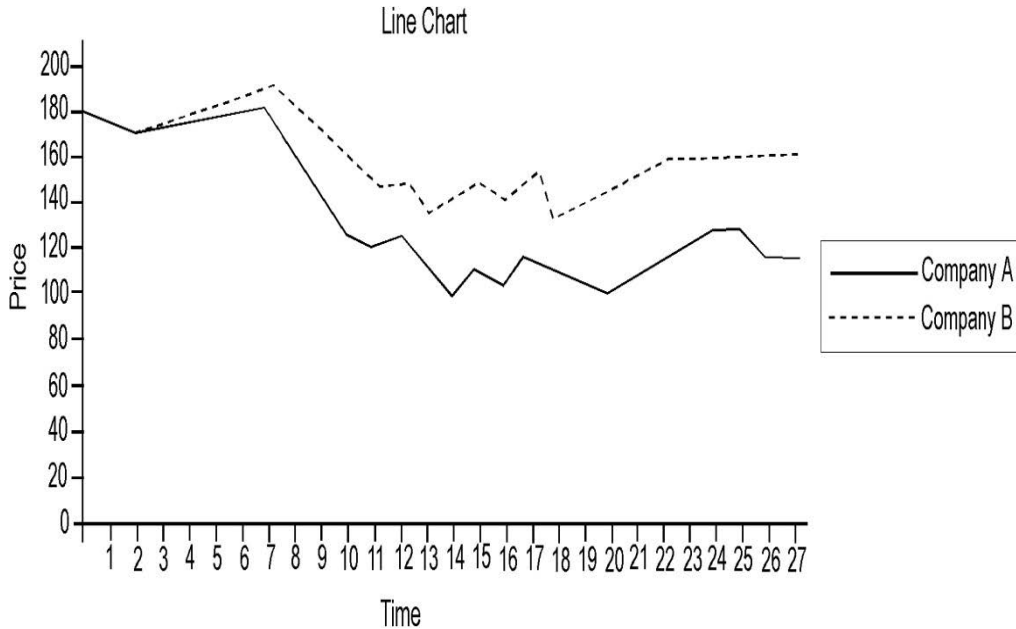
When the index/price goes down from a peak, the peak becomes the resistance level. When the index/price rebounds after reaching a trough subsequently, the lowest value reached becomes the support level. The price is then expected to move between these two levels. Whenever the price approaches the resistance level, there is a selling pressure because all investors who failed to sell at the high would be keen to liquidate, while whenever the price approaches the support level, there

is a buying pressure as all those investors who failed to buy at the lowest price would like to purchase the share. A breach of these levels indicates a distinct departure from status quo, and an attempt to set newer levels. Let us get a better understanding about these levels by using price data for about two months for shares of companies A and B given in the following Table:

Date	A	B
Dec. 1, 2005	177	177
5	171	171.50
7	172	175.50
12	174	177
13	177.50	181
14	181	184
15	180	186.50
18	163	176
19	142	162.50
20	127	156
22	123	147
25	124	147
Jan. 3, 2006	107.50	137.50
4	97.50	140
8	105	145
10	102.50	143.75
12	108.75	150
15	100	142.50
25	95	135
26	91.25	133.75
Feb. 1	97.50	138.75
2	106.25	147.50
5	113.75	152.50
6	120	155

7	120	152.50
8	113.75	150
9	113.75	147.50

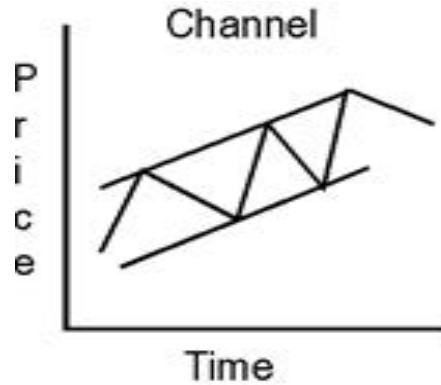
The line charts for Company A and Company B shares are shown in the graph below. From the charts, it appears that the support level and resistance level for Company A at that time were about ₹ 100 and ₹ 125, while these levels for Company B were ₹ 140 and ₹ 160.



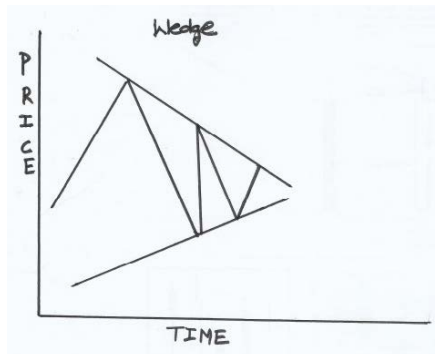
2.8 Interpreting Price Patterns

There are numerous price patterns documented by technical analysts but only a few and important of them have been discussed here:

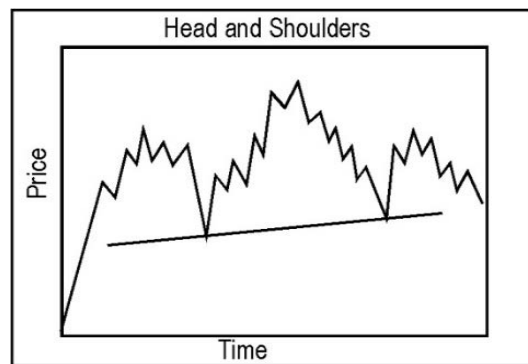
(a) **Channel:** A series of uniformly changing tops and bottoms gives rise to a channel formation. A downward sloping channel would indicate declining prices and an upward sloping channel would imply rising prices.



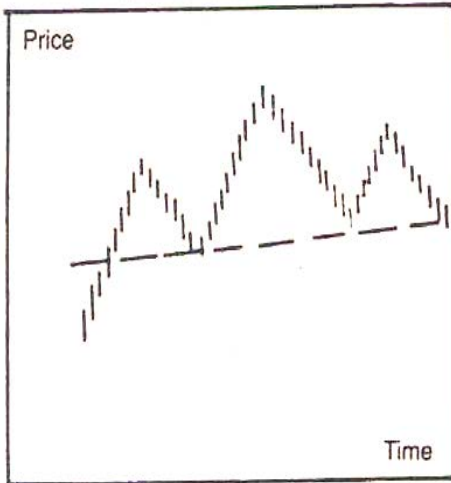
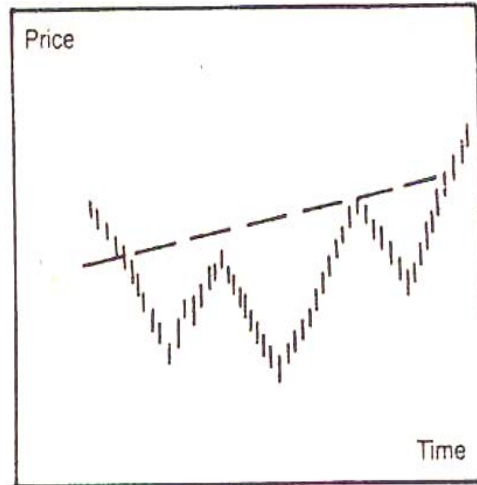
(b) **Wedge:** A wedge is formed when the tops (resistance levels) and bottoms (support levels) change in opposite direction (that is, if the tops, are decreasing then the bottoms are increasing and vice versa), or when they are changing in the same direction at different rates over time.



(c) **Head and Shoulders:** It is a distorted drawing of a human form, with a large lump (for head) in the middle of two smaller humps (for shoulders). This is perhaps the single most important pattern to indicate a reversal of price trend. The neckline of the pattern is formed by joining points where the head and the shoulders meet. The price movement after the formation of the second shoulder is crucial. If the price goes below the neckline, then a drop in price is indicated, with the drop expected to be equal to the distance between the top of the head and the neckline.

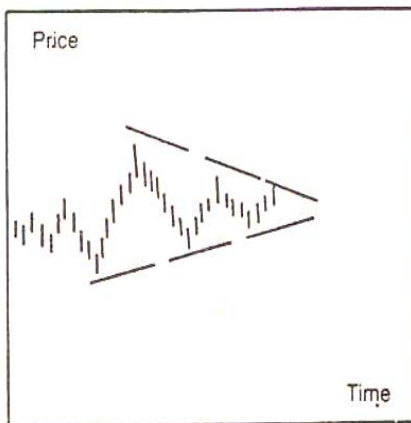
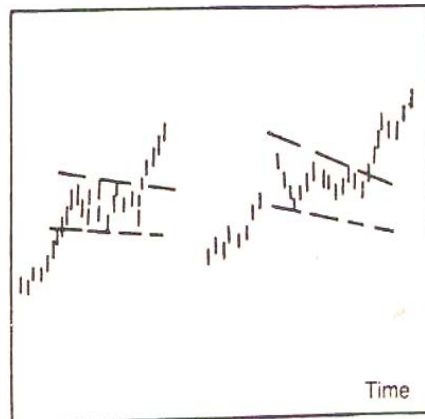


- (i) *Head and Shoulder Top Pattern*: This has a left shoulder, a head and a right shoulder. Such formation represents bearish development. If the price falls below the neck line (line drawn tangentially to the left and right shoulders) a price decline is expected. Hence it's a signal to sell.
- (ii) *Inverse Head and Shoulder Pattern*: As the name indicates this formation, it is an inverse of head and shoulder top formation. Hence it reflects a bullish development. The price rise to above the neck line suggests price rise is imminent and a signal to purchase.

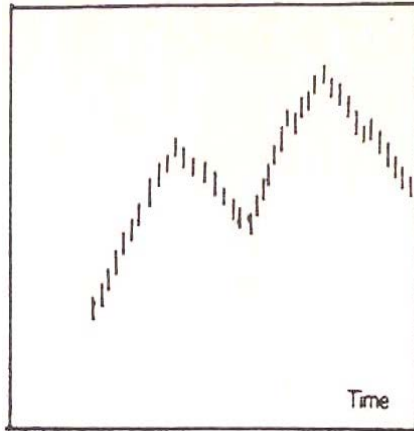
**HEAD & SHOULDERS****INVERSE HEAD & SHOULDERS**

- (d) **Triangle or Coil Formation**: This formation represents a pattern of uncertainty and is difficult to predict which way the price will break out.

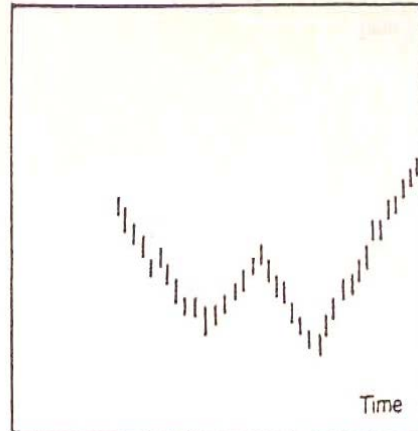
- (e) **Flags and Pennants Form**: This form signifies a phase after which the previous price trend is likely to continue.

**TRIANGLE OR COIL****FLAG & PENNANT**

- (f) **Double Top Form:** This form represents a bearish development signaling that price is expected to fall.
- (g) **Double Bottom Form:** This form represents bullish development signaling price is expected to rise.



DOUBLE TOP



DOUBLE BOTTOM

- (h) **Gap:** A gap is the difference between the opening price on a trading day and the closing price of the previous trading day. The wider the gap the stronger the signal for a continuation of the observed trend. On a rising market, if the opening price is considerably higher than the previous closing price, it indicates that investors are willing to pay a much higher price to acquire the scrip. Similarly, a gap in a falling market is an indicator of extreme selling pressure.

2.9 Decision Using Data Analysis

Technical analysts have developed rules based on simple statistical analysis of price data. Moving Averages is one of the more popular methods of data analysis for decision making.

- (a) **Moving Averages:** Moving averages are frequently plotted with prices to make buy and sell decisions. The two types of moving averages used by chartists are the Arithmetic Moving Average (AMA) and the Exponential Moving Average (EMA). An n -period AMA, at period t , is nothing but the simple average of the last n period prices.

$$AMA_{n,t} = 1/n[P_t + P_{t-1} + \dots + P_{t-(n-1)}]$$

To identify trend, technical analysts use moving average analysis:

- (i) A 200 day's moving average of daily prices or a 30 week moving of weekly price for identifying a long term trend.
- (ii) A 60 day's moving average of daily price to discern an intermediate term trend.
- (iii) A 10 day's moving average of daily price to detect a short term trend.

For example Moving Average is calculated by considering the most recent observation for which the closing price of a stock on '10' successive trading days are taken into account for the calculation of a 5 -day moving average of daily closing prices.

<i>Trading day</i>	<i>Closing prices</i>	<i>Sum of 5 most recent closing price</i>	<i>Two-item Centered Total</i>	<i>Moving Average</i>
1	25.00			
2	26.00			
3	25.50			
4	24.50			
5	26.00	127.00		
6	26.00	128.00	255.00	25.50
7	26.50	128.50	256.50	25.65
8	26.50	129.50	258.00	25.80
9	26.00	131.00	260.50	26.05
10	27.00	132.00	263.00	26.30

Buy and Sell Signals Provided by Moving Average Analysis

<i>Buy Signal</i>	<i>Sell Signal</i>
(a) Stock price line rise through the moving average line when graph of the moving average line is flatter out.	(a) Stock price line falls through moving average line when graph of the moving average line is flatter out.
(b) Stock price line falls below moving average line which is rising.	(b) Stock price line rises above moving average line which is falling.
(c) Stock price line which is above moving average line falls but begins to rise again before reaching the moving average line	(c) Stock price line which is slow moving average line rises but begins to fall again before reaching the moving average line.

(b) Exponential Moving Average: Unlike the AMA, which assigns equal weight of $1/n$ to each of the n prices used for computing the average, the Exponential Moving Average (EMA) assigns decreasing weights, with the highest weight being assigned to the latest price. The weights decrease

exponentially, according to a scheme specified by the exponential smoothing constant, also known as the exponent, a .

$$EMA_t = aP_t + (1-a)(EMA_{t-1})$$

Where, a (exponent) = $\frac{2}{n+1}$

P_t = Price of today

EMA_{t-1} = Previous day's EMA

Or

$EMA_t = (\text{Closing Price of the day} - \text{EMA of Previous Day}) \times \text{Exponent} + \text{Previous day EMA}$

n = Number of days for which average is to be calculated.

2.10 Evaluation of Technical Analysis

Technical Analysis has several supporters as well several critics. The advocates of technical analysis offer the following interrelated argument in their favour:

- (a) Under influence of crowd psychology trend persist for some time. Tools of technical analysis help in identifying these trends early and help in investment decision making.
- (b) Shift in demand and supply are gradual rather than instantaneous. Technical analysis helps in detecting this shift rather early and hence provides clues to future price movements.
- (c) Fundamental information about a company is observed and assimilated by the market over a period of time. Hence price movement tends to continue more or less in same direction till the information is fully assimilated in the stock price.

Detractors of technical analysis believe that it is a useless exercise; their arguments are as follows:

- (a) Most technical analysts are not able to offer a convincing explanation for the tools employed by them.
- (b) Empirical evidence in support of random walk hypothesis cast its shadow over the usefulness of technical analysis.
- (c) By the time an uptrend and down trend may have been signalled by technical analysis it may already have taken place.
- (d) Ultimately technical analysis must be a self-defeating proposition. With more and more people employing it, the value of such analysis tends to decline.

In a nutshell, it may be concluded that in a rational, well ordered and efficient market, technical analysis may not work very well. However, with imperfection, inefficiency and irrationalities that characterizes the real-world market, technical analysis may be helpful. If technical analysis is used

in conjunction with fundamental analysis, it might be useful in providing proper guidance to investment decision makers.



3. DIFFERENCES BETWEEN FUNDAMENTAL ANALYSIS AND TECHNICAL ANALYSIS

Although a successful investor uses both Fundamental and Technical Analysis but following are some major differences between them:

S. No.	Basis	Fundamental Analysis	Technical Analysis
1	Method	Prospects are measured by analyzing economy's macro factors such as Country's GDP, Inflation Rate, Interest Rate, Growth Rate etc. and company's micro factors like its Sales, Profitability, Solvency, Asset & Liabilities and Cash position etc.	Predicts future prices and their direction using purely historical market data and information such as their Price Movements, Volume, Open Interest etc.
2	Rule	Prices of a share discounts everything.	Price captures everything
3	Usefulness	For Long-Term Investing	For Short-term Investing



4. EFFICIENT MARKET THEORY (EFFICIENT MARKET HYPOTHESIS)

Efficient Market Theory was developed by University of Chicago professor Eugen Fama in the 1960s. As per this theory, at any given time, all available price sensitive information is fully reflected in securities' prices. Thus, this theory implies that no investor can consistently outperform the market as every stock is appropriately priced based on available information.

Stating otherwise this theory states that no one can "beat the market" hence making it impossible for investors to either purchase undervalued stocks or sell stocks for inflated prices as stocks are always traded at their fair value on stock exchanges. Hence it is impossible to outperform the overall market through expert stock selection or market timing and that the only way an investor can possibly obtain higher returns is by purchasing risky investments.

4.1 Search for Theory

When empirical evidence in favour of Random walk hypothesis seemed overwhelming, researchers wanted to know about the Economic processes that produced a Random walk. They concluded that randomness of stock price was a result of efficient market that led to the following view points:

- Information is freely and instantaneously available to all market participants.
- Keen competition among the market participants more or less ensures that market will reflect intrinsic values. This means that they will fully impound all available information.
- Price change only response to new information that is unrelated to previous information and therefore unpredictable.

4.2 Misconception about Efficient Market Theory

Efficient Market Theory implies that market prices factor in all available information and as such it is not possible for any investor to earn consistent long term returns from market operations.

Although price tends to fluctuate they cannot reflect fair value. This is because the future is uncertain. The market springs surprises continually and as prices reflect the surprises they fluctuate.

Inability of institutional portfolio managers to achieve superior investment performance implies that they lack competence in an efficient market. It is not possible to achieve superior investment performance since market efficiency exists due to portfolio managers doing this job well in a competitive setting.

The random movement of stock prices suggests that stock market is irrational. Randomness and irrationality are two different things, if investors are rational and competitive, price changes are bound to be random.

4.3 Level of Market Efficiency

That price reflects all available information, the highest order of market efficiency. According to Eugene Fama, there exist three levels of market efficiency:-

- (i) *Weak form efficiency* – Price reflects all information found in the record of past prices and volumes.
- (ii) *Semi – Strong efficiency* – Price reflects not only all information found in the record of past prices and volumes but also all other publicly available information.
- (iii) *Strong form efficiency* – Price reflects all available information public as well as private.

4.4 Empirical Evidence on Weak form of Efficient Market Theory

According to the Weak form Efficient Market Theory current price of a stock reflect all information found in the record of past prices and volumes. This means that there is no relationship between the past and future price movements.

Three types of tests have been employed to empirically verify the weak form of Efficient Market Theory- Serial Correlation Test, Run Test and Filter Rule Test.

(a) *Serial Correlation Test*: To test for randomness in stock price changes, one has to look at serial correlation. For this purpose, price change in one period has to be correlated with price change in some other period. Price changes are considered to be serially independent. Serial correlation studies employing different stocks, different time lags and different time period have been conducted to detect serial correlation but no significant serial correlation could be discovered. These studies were carried on short term trends viz. daily, weekly, fortnightly and monthly and not in long term trends in stock prices as in such cases. Stock prices tend to move upwards.

(b) *Run Test*: Given a series of stock price changes each price change is designated + if it represents an increase and – if it represents a decrease. The resulting series may be -, +, -, -, -, +, +.

A run occurs when there is no difference between the sign of two changes. When the sign of change differs, the run ends and new run begins.

$$\frac{++}{1} / \frac{---}{2} / \frac{+-}{3} / \frac{-+}{4} / \frac{--}{5} / \frac{++}{6} / \frac{---}{1} / \frac{+-}{2} / \frac{-+}{3} / \frac{--}{4} / \frac{++}{5} / \frac{---}{6}$$

To test a series of price change for independence, the number of runs in that series is compared with a number of runs in a purely random series of the size and in the process determines whether it is statistically different. By and large, the result of these studies strongly supports the Random Walk Model.

(c) *Filter Rules Test*: If the price of stock increases by at least N% buy and hold it until its price decreases by at least N% from a subsequent high. When the price decreases at least N% or more, sell it. If the behaviour of stock price changes is random, filter rules should not apply in such a buy and hold strategy. By and large, studies suggest that filter rules do not out perform a single buy and hold strategy particular after considering commission on transaction.

4.5 Empirical Evidence on Semi-strong Efficient Market Theory

Semi-strong form efficient market theory holds that stock prices adjust rapidly to all publicly available information. By using publicly available information, investors will not be able to earn above normal rates of return after considering the risk factor. To test semi-strong form efficient market theory, a number of studies was conducted which lead to the following queries: Whether it was possible to earn on the above normal rate of return after adjustment for risk, using only publicly available information and how rapidly prices adjust to public announcement with regard to earnings, dividends, mergers, acquisitions, stock-splits?

Several studies support the Semi-strong form Efficient Market Theory. Fama, Fisher, Jensen and Roll in their adjustment of stock prices to new information examined the effect of stock split on return of 940 stock splits in New York Stock Exchange during the period 1957-1959 They found that prior to the split, stock earns higher returns than predicted by any market model.

Boll and Brown in an empirical evaluation of accounting income numbers studied the effect of annual earnings announcements. They divided the firms into two groups. First group consists of firms whose earnings increased in relation to the average corporate earnings while second group consists of firms whose earnings decreased in relation to the average corporate earnings. They found that before the announcement of earnings, stock in the first group earned positive abnormal returns while stock in the second group earned negative abnormal returns after the announcement of earnings. Stock in both the groups earned normal returns.

There have been studies which have been empirically documented showing the following inefficiencies and anomalies:

- Stock price adjust gradually not rapidly to announcements of unanticipated changes in quarterly earnings.
- Small firms' portfolio seemed to outperform large firms' portfolio.
- Low price earning multiple stock tend to outperform high price earning multiple stock.
- Monday's return is lower than return for the other days of the week.

4.6 Empirical Evidence on Strong form of Efficient Market Theory

According to the Efficient Market Theory, all available information, public or private, is reflected in the stock prices. This represents an extreme hypothesis.

To test this theory, the researcher analysed returns earned by certain groups viz. corporate insiders, specialists on stock exchanges, mutual fund managers who have access to internal information (not publicly available), or possess greater resource or ability to intensively analyse information in the public domain. They suggested that corporate insiders (having access to internal information) and stock exchange specialists (having monopolistic exposure) earn superior rate of return after adjustment of risk.

Mutual Fund managers do not on an average earn a superior rate of return. No scientific evidence has been formulated to indicate that investment performance of professionally managed portfolios as a group has been any better than that of randomly selected portfolios. This was the finding of Burton Malkiel in his Random Walk Down Wall Street, New York.

4.7 Challenges to the Efficient Market Theory

(a) **Information inadequacy** – Information is neither freely available nor rapidly transmitted to all participants in the stock market. There is a calculated attempt by many companies to circulate misinformation.

(b) **Limited information processing capabilities** – Human information processing capabilities are sharply limited. According to Herbert Simon every human organism lives in an environment which

generates millions of new bits of information every second but the bottlenecks of the perceptual apparatus does not admit more than thousand bits per seconds and possibly much less.

David Dreman maintained that under conditions of anxiety and uncertainty, with a vast interacting information grid, the market can become a giant.

(c) Irrational Behaviour – It is generally believed that investors' rationality will ensure a close correspondence between market prices and intrinsic values. But in practice this is not true. J. M. Keynes argued that all sorts of consideration enter into the market valuation which is in no way relevant to the prospective yield. This was confirmed by L. C. Gupta who found that the market evaluation processes work haphazardly almost like a blind man firing a gun. The market seems to function largely on hit or miss tactics rather than on the basis of informed beliefs about the long term prospects of individual enterprises.

(d) Monopolistic Influence – A market is regarded as highly competitive. No single buyer or seller is supposed to have undue influence over prices. In practice, powerful institutions and big operators wield great influence over the market. The monopolistic power enjoyed by them diminishes the competitiveness of the market.



5. EQUITY RESEARCH AND TOOLS AVAILABLE

Equity Research is that area of finance or Investment Banking that involves the analysis of company's financial performance and other factors to determine whether the equity share of the same company should be bought, sold or continued to be hold. This research can also be applied in any merger and acquisition to decide about the swap or exchange ratio.

People involved in performing equity research are called Equity Research Analysts. Earlier equity research used to be paper based, and analysts needed to refer various reports, data, and graphs etc. However, with the advent of internet now a days most analysts use various tools available online.

Some of the Equity Research tool available on internet are as follows:

S. No.	Name	Founded in	Website
1	Bloomberg Terminal	1981	https://www.bloomberg.com/professional/solution/bloomberg-terminal/
2	Benzinga Pro	2010	https://pro.benzinga.com
3	Refinitiv EIKON	2010	https://www.refinitiv.com
4	MarketXLS	2015	https://marketxls.com
5	Stockopedia	2010	https://www.stockopedia.com

6	Koyfin	2016	https://www.koyfin.com
7	Finbox.io	2014	https://finbox.com
8	GuruFocus	2004	https://www.gurufocus.com
9	Business Quant	2014	https://businessquant.com
10	Ycharts	2009	https://get.ycharts.com

Note: Students are advised to refer basic details of the tools available by referring the respective websites without subscribing and making any type of payment.

TEST YOUR KNOWLEDGE

Theoretical Questions

1. Explain the Efficient Market Theory in and what is major misconception about this theory?
2. Explain Dow theory.
3. Explain the Elliot Wave Theory of technical analysis.
4. Explain the various indicators that can be used to assess the performance of an economy.

Practical Questions

1. Closing values of NSE Nifty from 6th to 17th day of the month of January of the year 2020 were as follows:

Days	Date	Day	Sensex
1	6	THU	14522
2	7	FRI	14925
3	8	SAT	No Trading
4	9	SUN	No Trading
5	10	MON	15222
6	11	TUE	16000
7	12	WED	16400
8	13	THU	17000
9	14	FRI	No Trading
10	15	SAT	No Trading
11	16	SUN	No Trading
12	17	MON	18000

Calculate Exponential Moving Average (EMA) of Sensex during the above period. The previous day exponential moving average of Sensex can be assumed as 15,000. The value of exponent for 31 days EMA is 0.062.

Give detailed analysis on the basis of your calculations.

2. The closing value of a Stock Market Index for the month of October, 2007 is given below:

Date Closing	Index Value
1.10.07	2800
3.10.07	2780
4.10.07	2795
5.10.07	2830
8.10.07	2760
9.10.07	2790
10.10.07	2880
11.10.07	2960
12.10.07	2990
15.10.07	3200
16.10.07	3300
17.10.07	3450
19.10.07	3360
22.10.07	3290
23.10.07	3360
24.10.07	3340
25.10.07	3290
29.10.07	3240
30.10.07	3140
31.10.07	3260

You are required to test the weak form of efficient market hypothesis by applying the run test at 5% and 10% level of significance.

Following values can be used:

Value of t at 5% is 2.101 at 18 degrees of freedom

Value of t at 10% is 1.734 at 18 degrees of freedom

Answers to Theoretical Questions

1. Please refer paragraph 4.
2. Please refer paragraph 2.4.1.
3. Please refer paragraph 2.4.2.
4. Please refer paragraph 1.2.2.

Answers to the Practical Questions

1.

Date	1 Sensex	2 EMA for Previous day	3 1-2	4 3×0.062	5 EMA $2 + 4$
6	14522	15000	(478)	(29.636)	14970.364
7	14925	14970.364	(45.364)	(2.812)	14967.55
10	15222	14967.55	254.45	15.776	14983.32
11	16000	14983.32	1016.68	63.034	15046.354
12	16400	15046.354	1353.646	83.926	15130.28
13	17000	15130.28	1869.72	115.922	15246.202
17	18000	15246.202	2753.798	170.735	15416.937

Conclusion – The market is bullish. The market is likely to remain bullish for short term to medium term if other factors remain the same. On the basis of this indicator (EMA) the investors/brokers can take long position.

2.

Date	Closing Index	Sign of Price Charge
1.10.07	2800	
3.10.07	2780	-
4.10.07	2795	+

5.10.07	2830	+
8.10.07	2760	-
9.10.07	2790	+
10.10.07	2880	+
11.10.07	2960	+
12.10.07	2990	+
15.10.07	3200	+
16.10.07	3300	+
17.10.07	3450	+
19.10.07	3360	-
22.10.07	3290	-
23.10.07	3360	+
24.10.07	3340	-
25.10.07	3290	-
29.10.07	3240	-
30.10.07	3140	-
31.10.07	3260	+

Total of sign of price changes (r) = 8

No of Positive changes = $n_1 = 11$

No. of Negative changes = $n_2 = 8$

$$\mu_r = \frac{2n_1n_2}{n_1+n_2} + 1$$

$$\mu = \frac{2 \times 11 \times 8}{11+8} + 1 = 176/19 + 1 = 10.26$$

$$\hat{\sigma}_r = \sqrt{\frac{2n_1n_2(2n_1n_2 - n_1 - n_2)}{(n_1+n_2)^2(n_1+n_2-1)}}$$

$$\hat{\sigma}_r = \sqrt{\frac{(2 \times 11 \times 8)(2 \times 11 \times 8 - 11 - 8)}{(11+8)^2(11+8-1)}} = \sqrt{\frac{176 \times 157}{(19)^2(18)}} = \sqrt{4.252} = 2.06$$

Since too few runs in the case would indicate that the movement of prices is not random. We employ a two-tailed test the randomness of prices.

Test at 5% level of significance at 18 degrees of freedom using t-table

The lower limit

$$= \mu - t \times \hat{\sigma}_r = 10.26 - 2.101 \times 2.06 = 5.932$$

Upper limit

$$= \mu + t \times \hat{\sigma}_r = 10.26 + 2.101 \times 2.06 = 14.588$$

At 10% level of significance at 18 degrees of freedom

Lower limit

$$= 10.26 - 1.734 \times 2.06 = 6.688$$

Upper limit

$$= 10.26 + 1.734 \times 2.06 = 13.832$$

As seen r lies between these limits. Hence, the market exhibits weak form of efficiency.

*For a sample of size n , the t distribution will have $n-1$ degrees of freedom.

SECURITY VALUATION



LEARNING OUTCOMES

After reading this chapter student shall be able to understand:

- Overview of Valuation
- Return Concepts
- Equity Risk Premium
- Required Return on Equity
- Discount Rate Selection in Relation to Cash Flows
- Valuation of Equity Shares
- Valuation of Preference Shares
- Valuation of Debentures/ Bonds
- Role and Responsibilities of Valuers
- Precautions need to be taken by a Valuer before accepting any valuation assignment.

1. OVERVIEW OF VALUATION

The definition of an Investment is – Investment involves commitment of funds with an objective to obtain a return that would pay off the investor for the time during which the funds are invested or locked, for the expected rate of inflation over the investment horizon, and for the risk involved. Most investments are expected to have future cash flows and a stated market price (e.g., price of a

common stock), and one must estimate a value for the investment to determine if its current market price is consistent with his estimated intrinsic value. Investment returns can take many forms, including earnings, cash flows, dividends, interest payments, interest on interest payments or capital gains (increases in value) during an investment horizon.

Knowing what an asset is worth and what determines its value is a pre-requisite for making intelligent investment decisions while choosing investments for a portfolio or in deciding an appropriate price to pay or receive in a business takeover and in making investment, financing and dividend choices when running a business. We can make reasonable estimates of value for most assets, and that the fundamental principles determining the values of all types of assets whether real or financial, are the same. Some assets may be easier to be valued than others and for different assets the details of valuation and the uncertainty associated with their value estimates may vary. However, the core principles of valuation always remain the same.

2. RETURN CONCEPTS

A sound investment decision depends on the correct use and evaluation of the rate of return. Some of the different concepts of return are given as below:

2.1 Required Rate of Return

Required rate of return is the minimum rate of return that the investor is expected to receive while making an investment in an asset over a specified period of time. This is also called Opportunity Cost or Cost of Capital because it is the highest level of expected return forgone which is available elsewhere from investment of similar risks. Many times required rate of return and expected return are used interchangeably.

2.2 Discount Rate

Discount Rate is the rate used to calculate present value of future cash flows. Discount rate depends on the risk-free rate and risk premium of an investment. Actually, each cash flow stream coming from different assets can be discounted at a different discount rate. This is because of variation in risk premium which may be due to expected inflation rate, different maturity levels and probability of defaults. This can be explained with the help of term structure of interest rates. For instance, in upward sloping term structure of interest rates, interest rates increase with the maturity as longer maturity may mean more inflation risk, more liquidity risk or more default risk.

Though future cash flows can be discounted at different discount rate, one may use the same discount rate to get the same present value of a stream of cash flows. When a single discount rate is applied instead of many discount rates, many individual discount rates can be replaced with an equivalent single discount rate which eventually gives the same present value.

Example: Cash flows and discount rates for each year of cash flows at different maturities have been given as below:-

	1 st year	2 nd year	3 rd year	4 th year	5 th year
Cash flows	₹100	₹200	₹300	₹400	₹500
Discount rates	2.0%	3.2%	3.6%	4.8%	5.0%

The present value of this stream of cash flows, by discounting each cash flow with the respective discount rate, is ₹ 1,278.99.

The single discount rate that approximately equates the present value of the stream of cash flows to ₹1278.99 is 4.4861% (any difference is due to rounding).

2.3 Internal Rate of Return

Internal Rate of Return is defined as that discount rate which equates the present value of future cash flows of a security to its market price. The IRR is viewed as the average annual rate of return that investors earn over their investment time period assuming that the cash flows are reinvested at the IRR. This can be explained with the help of an example as follows:

Example

Suppose you are recommended to invest ₹ 20,000 now in an asset that offers a cash flow ₹ 3,000 one year from now and ₹ 23,000 two years from now. You want to estimate the IRR of the investment. For this purpose you must find the discount rate that equates the present value of cash inflows to ₹ 20,000, the value of the initial investment.

	Time 0	1 st year	2 nd year
Cash flows	(₹ 20,000)	₹ 3,000	₹ 23,000

We solve the following equation for r which denotes IRR and get 15%.

$$20000 = 3000/(1+r) + 23000/(1+r)^2$$

$$\Rightarrow r = 15\%$$

Thus, our IRR is 15%, which implies that we earn on an average 15% on the investment per annum. Now let's assume that when we receive ₹ 3,000, we reinvest it at 10% for one year and after one year we receive total ₹ 26,300, ₹ 3,300 of which is attributable to reinvestment of ₹ 3,000. Since we receive total cash ₹26300 we can estimate the IRR of the investment.

$$(26300/20000)^{1/2} - 1 = 0.1467 \text{ or } 14.67\%$$

Annual return is now at 14.67% if reinvested at 10%, which is actually less than what was expected to be earned before investment. The reason is that the cash flow was reinvested at a rate (10%) which is less than our expected IRR (15%).

If we had a chance to reinvest ₹ 3,000 at 15%, we would receive ₹ 26,450 at the end of 2nd year, and the IRR of the investment would be equal to exactly 15% as calculated below:

$$(26450/20,000)^{1/2} - 1 = 0.15 \text{ or } 15\%$$

3. EQUITY RISK PREMIUM

Equity risk premium is the excess return that an investment in equity shares provides over a risk free rate, such as return from tax free government bonds. This excess return compensates investors for taking on the higher risk of investing in equity shares of a company. The size of the premium will change depending upon the level of risk in a particular portfolio and will also change over time as market risk fluctuates. Generally, high-risk investments are compensated with a higher premium.

The equity risk premium is based on the idea of the risk-reward trade-off. However, equity risk premium is a theoretical concept because it is difficult to predict that how a particular stock or the stock market as a whole will perform in the future. It can only be estimated by observing stock market and government bond market over a specified period of time, for instance from 1990 to the present period. Further, estimates may vary depending on the time frame and method of calculation.

3.1 Explanation of Equity Risk Premium

Investment in equity shares of a company is a high risk investment. If an investor is investing in equity shares of a company, he wants some risk premium over the risk-free investment avenues such as government bonds. For example, if an investor could earn a 7% return on a Government Bond (which is generally considered as risk free investment), a company's share should earn 7% return plus an additional return (the equity risk premium) in order to attract the investor.

Equity investors try to achieve a balance between risk and return. If a company wants to pursue investors to put their money into its stock, it must provide a stimulus in the form of a premium to attract the equity investors. If the stock gives a 15% return, in the example mentioned in the previous paragraph, the equity risk premium would be 8% (15% - 7% risk free rate). However, practically, the price of a stock, including the equity risk premium, moves with the market. Therefore, the investors use the equity risk premium to look at historical values, risks, and returns on investments.

3.2 Calculating the Equity Risk Premium

To calculate the equity risk premium, we can use the Capital Asset Pricing Model (CAPM), which is usually written:

$$R_x = R_f + \beta_x (R_m - R_f)$$

Where:

R_x = expected return on equity investment in "x"(company x)

R_f = risk-free rate of return

β_x = beta of "x"

R_m = expected return of market

Now, if we assume that x is identical to the Market Index, m, then $R_x = R_m$. Beta is a measure of a stock's systematic risk ; and if $x = m$, then $\beta_x = \beta_m = 1$. Whereas $R_m - R_f$ is known as the Market

5.1 Concept of Nominal Cash Flow and Real Cash Flow

Nominal cash flow is the amount of future revenues the company expects to receive and expenses it expects to pay out, without any adjustments for inflation. For instance, a company which wants to invest in a utility plant wants to forecast its future revenues and expenses it has to incur while earning its income (i.e. wages to labour, electricity, water, gas pipeline etc.).

On the other hand, Real cash flow shows a company's cash flow with adjustments for inflation. Since inflation reduces the spending power of money over time, the real cash flow shows the effects of inflation on a company's cash flow.

In the short term and under conditions of low inflation, the nominal and real cash flows are almost same. However, in conditions of high inflation rates, the nominal cash flows will be higher than the real cash flows.

5.2 Discount rate selection in Equity Valuation

From the above discussion, it can be concluded that cash flows can be nominal or real. When cash flows are stated in real terms, then they are adjusted for inflation. However, in case of nominal cash flow, inflation is not adjusted.

For nominal cash flow, nominal rate of discount is used and for real cash flow, real rate of discount is used. While valuing equity shares, only nominal cash flows are considered. Therefore, only nominal discount rate is considered. The reason is that the tax applying to corporate earnings is generally stated in nominal terms. Therefore, using nominal cash flow in equity valuation is the right approach because it reflects taxes accurately.

Moreover, when the cash flows are available to equity shareholders only, nominal discount rate applicable in case of equity is used. And, the nominal after tax weighted average cost of capital is used when the cash flows are available to all the company's capital providers.

6. VALUATION OF EQUITY SHARES

In order to undertake equity valuations, an analyst can use different approaches, some of which are classified as follows:

- (1) Dividend Based Models
- (2) Earning Based Models
- (3) Cash Flows Based Model

6.1 Dividend Based Models

As we know that dividend is the reward for the provider of equity capital, the same can be used to value equity shares. Valuation of equity shares based on dividend are based on the following assumptions:

- a. Dividend to be paid annually.
- b. Payment of first dividend shall occur at the end of first year.
- c. Sale of equity shares occur at the end of a year and that to at ex-dividend price.

The value of any asset depends on the discounted value of cash streams expected from the same asset. Accordingly, the value of equity shares can be determined on the basis of stream of dividend expected at Required Rate of Return or Opportunity Cost i.e. K_e (Cost of Equity).

Value of equity share can be determined based on holding period as follows:

(1) Valuation Based holding period of One Year : If an investor holds the share for one year then the value of equity share is computed as follows:

$$P_0 = \frac{D_1}{(1 + K_e)^1} + \frac{P_1}{(1 + K_e)^1} = \frac{D_1 + P_1}{(1 + K_e)^1}$$

Example: Share of X Ltd. is expected to be sold at ₹ 36 with a dividend of ₹ 6 after one year. If required rate of return is 20% then what will be the share price?

Answer

The expected share price shall be computed as follows:

$$P_0 = \frac{6}{(1+0.20)^1} + \frac{36}{(1+0.20)^1} = ₹ 35$$

(2) Valuation Based on Multi Holding Period: In this type of holding following three types of dividend pattern can be analyzed.

(i) *Zero Growth:* Also, called as No Growth Model, as dividend amount remains same over the years infinitely. The value of equity can be found as follows:

$$P_0 = \frac{D}{K_e}$$

(ii) *Constant Growth:* Constant Dividend assumption is quite an unrealistic assumption. Accordingly, one very common model used is based on Constant Growth in dividend for infinitely long period. In such situation, the value of equity shares can be found by using following formula:

$$P_0 = \frac{D_1}{K_e - g} \text{ or } \frac{D_0(1+g)}{(K_e - g)}$$

It is important to observe that the above formula is based on Gordon Growth Model of Calculation of Cost of Equity.

(iii) *Variable Growth in Dividend:* Just like no growth in dividend assumption, the constant growth assumption also appears to be unrealistic. Accordingly, valuation of equity shares can be done on

the basis of variable growth in dividends. It should however be noted that though we can assume multiple growth rates but one growth rate should be assumed for infinity, only then we can find value of equity shares.

Although stages of Company's growth fall into following categories such as Growth, Transition and Maturity Phase but for Valuation the multiple dividend growth can be divided into following two categories.

(a) Two Stage Dividend Discount Model: While simple two stage model assumes extraordinary growth (or supernormal growth) shall continue for finite number of years, the normal growth shall prevail for infinite period. Accordingly, the formula for computation of Share Price or equity value shall be as follows:

$$P_0 = \left[\frac{D_0(1+g_1)}{(1+K_e)^1} + \frac{D_0(1+g_1)^2}{(1+K_e)^2} + \dots + \frac{D_0(1+g_1)^n}{(1+K_e)^n} \right] + \frac{P_n}{(1+K_e)^n}$$

$$P_n = \frac{D_0(1+g_1)^n(1+g_2)}{(K_e - g_2)}$$

Where, D_0 = Dividend Just Paid

g_1 = Finite or Super Growth Rate

g_2 = Normal Growth Rate

K_e = Required Rate of Return on Equity

P_n = Price of share at the end of Super Growth i.e. beginning of Normal Growth Period

(b) Three Stage Dividend Discount Model: As per one version there are three phases for valuations: extraordinary growth period, transition period and stable growth period.

In the initial phase, a firm grows at an extraordinarily high rate, after which its advantage gets depleted due to competition leading to a gradual decline in its growth rate. This phase is the transition phase, which is followed by the phase of a stable growth rate.

Accordingly, the value of equity share shall be computed, as in case of two stage growth model by adding discounted value of Dividends for two growth periods and finally discounted value of share price at the beginning of sustainable or stable growth period.

There is another version of three stage growth model called H Model. In the first stage dividend grows at high growth rate for a constant period, then in second stage it declines for some constant period and finally grow at sustainable growth rate.

H Model is based on the assumption that before extraordinary growth rate reach to normal growth it declines lineally for period $2H$.

Though the situation is complex but the formula for calculation of equity share shall be as follows which is sum of value on the normal growth rate and premium due to abnormal growth rate:

$$P_0 = \frac{D_0(1 + g_n)}{r - g_n} + \frac{D_0H_1(g_c - g_n)}{r - g_n}$$

Where g_n = Normal Growth Rate Long Run

g_c = Current Growth Rate i.e. initial short term growth rate

H_1 = Half of duration of the transition growth period

These variants of models can also be applied to Free Cash Flow to Equity Model discussed later.

6.2 Earning Based Models

Above mentioned models are based on Dividends. However, nowadays an investor might be willing to forego cash dividend in lieu of higher earnings on retained earning ultimately leading to higher growth in dividend.

Hence, these investors may be interested in determination of value of equity share based on Earning rather than Dividend. The different models based on earnings are as follows:

(a) *Gordon's Model*: This model is based on following broad assumptions:

- (i) Return on Retained earnings remains the same.
- (ii) Retention Ratio remains the same.

Valuation as per this model shall be

$$\frac{EPS_1(1 - b)}{K_e - br}$$

Where, r = Return on Equity

b = Retention Ratio

(b) *Walter's Approach*: This approach is based on Walter Model discussed at Intermediated Level in the Financial Management Paper. As per this model, the value of equity share shall be:

$$\frac{D + (E - D) \frac{r}{K_e}}{K_e}$$

(c) *Price Earning Ratio or Multiplier Approach*: This is one of the common valuation approaches followed. Since, Price Earning (PE) Ratio is based on the ratio of Share Price and EPS, with a given PE Ratio and EPS, the share price or value can simply be determined as follows:

$$\text{Value} = \text{EPS} \times \text{PE Ratio}$$

Now, the question arises how to estimate the PE Ratio. This ratio can be estimated for a similar type of company or of industry after making suitable adjustment in light of specific features pertaining to the company under consideration. It should further be noted that EPS should be of equity shares. Accordingly, it should be computed after payment of preference dividend as follows:

$$\text{EPS} = \frac{\text{Profit after tax} - \text{Preference Dividend}}{\text{Number of Equity Shares}}$$

6.3 Cash Flow Based Models

In the case of Dividend Discounting Valuation model (DDM) the cash flows are dividend which are to be distributed among equity shareholders. This cash flow does not take into consideration the cash flows which can be utilised by the business to meet its long-term capital expenditure requirements and short-term working capital requirement. Hence dividend discount model does not reflect the true free cash flow available to a firm or the equity shareholders after adjusting for its capex and working capital requirement.

Free cash flow valuation models discount the cash flows available to a firm and equity shareholders after meeting its long term and short-term capital requirements. Based on the perspective from which valuations are done, the free cash flow valuation models are classified as:

- Free Cash Flow to Firm Model (FCFF)
- Free Cash Flow to Equity Model (FCFE)

In the case of FCFF model, the discounting factor is the cost of capital (K_o) whereas in the case of FCFE model the cost of equity (K_e) is used as the discounting factor.

FCFE along with DDM is used for valuation of the equity whereas FCFF model is used to find out the overall value of the firm.

6.3.1 Calculation of Free Cash Flow to Firm (FCFF): FCFF can be calculated as follows:

(a) *Based on its Net Income:*

$$\text{FCFF} = \text{Net Income} + \text{Interest expense} \times (1 - \text{tax}) + \text{Depreciation} -/+ \text{Capital Expenditure} -/+ \text{Change in Non-Cash Net Working Capital}$$

(b) *Based on Operating Income or Earnings Before Interest and Tax (EBIT):*

$$\text{FCFF} = \text{EBIT} \times (1 - \text{tax rate}) + \text{Depreciation} -/+ \text{Capital Expenditure} -/+ \text{Change in Non-Cash Net Working Capital}$$

(c) *Based on Earnings before Interest, Tax, Depreciation and Amortisation (EBITDA):*

$$\text{FCFF} = \text{EBITDA} \times (1 - \text{Tax}) + \text{Depreciation} \times (\text{Tax Rate}) -/+ \text{Capital Expenditure} -/+ \text{Change in Non-Cash Net Working Capital}$$

(d) *Based on Free Cash Flow to Equity (FCFE):*

$$\text{FCFF} = \text{FCFE} + \text{Interest} \times (1 - t) + \text{Principal Prepaid} - \text{New Debt Issued} + \text{Preferred Dividend}$$

(e) *Based on Cash Flows:*

$$\text{FCFF} = \text{Cash Flow from Operations (CFO)} + \text{Interest (1-t)} -/+ \text{Capital Expenditure}$$

Capital Expenditure or Capex for a single year is calculated as Purchase of Fixed Asset current year - Sale of Fixed Asset current year taken from Cash Flow from Investing Activities.

Change in Non- Cash Working Capital is calculated as:

Step 1: Calculate Working Capital for the current year: Working Capital = Current Asset - Current Liability

Step 2: Calculate Non-Cash Net Working Capital for the current year: Current Assets – Cash and Bank Balance – Current Liabilities

Step 3: In a similar way calculate Working Capital for the previous year

Step 4: Calculate change in Non-Cash Working Capital as: Non-Cash Working Capital for the current year - Non-Cash Working Capital for the previous year

Step 5: If change in Non-Cash Working Capital is positive, it means an increase in the working capital requirement of a firm and hence is reduced to derive at free cash flow to a firm.

Based on the type of model discussed above the value of Firm can be calculated as follows:

- (a) For one stage Model: Intrinsic Value = Present Value of Stable Period Free Cash Flows to Firm
- (b) For two stage Model: Intrinsic Value = Present value of Explicit Period Free Cash Flows to Firm + Present Value of Stable Period Free Cash Flows to a Firm, or
 Intrinsic Value = Present Value of Transition Period Free Cash Flows to Firm + Present Value of Stable Period Free Cash Flows to a Firm
- (c) For three stage Model: Intrinsic Value = Present value of Explicit Period Free Cash Flows to Firm + Present Value of Transition Period Free Cash Flows to Firm + Present Value of Stable Period Free Cash Flows to Firm

6.3.2 Calculation of Free Cash Flow to Equity (FCFE): Free Cash flow to equity is used for measuring the intrinsic value of the stock for equity shareholders. The cash that is available for equity shareholders after meeting all operating expenses, interest, net debt obligations and re-investment requirements such as working capital and capital expenditure. It is computed as:

$$\text{Free Cash Flow to Equity (FCFE)} = \text{Net Income} - \text{Capital Expenditures} + \text{Depreciation} -/+ \text{Change in Non-cash Net Working Capital} + \text{New Debt Issued} - \text{Debt Repayments} + \text{Net issue of Preference Shares} - \text{Preference Share Dividends}$$

or

$FCFE = \text{Net Profit} + \text{depreciation} - \Delta\text{NWC} - \text{CAPEX} + \text{New Debt} - \text{Debt Repayment} + \text{Net issue of Preference Shares} - \text{Preference Share Dividends}$

ΔNWC = changes in Net Working Capital.

CAPEX = Addition in fixed assets to sustain the basis.

FCFE can also be used to value share as per Multistage Growth Model approach.

6.4 Dividend Discount Model versus Free Cash Flow to Equity Model

In the dividend discount model the analyst considers the stream of expected dividends to value the company's stock. It is assumed that the company follows a consistent dividend payout ratio which can be less than the actual cash available with the firm.

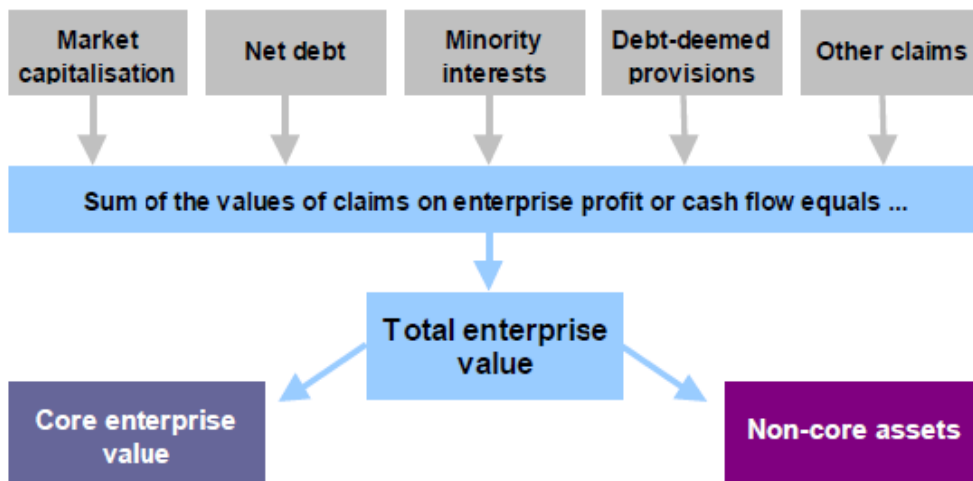
Dividend discount model values a stock based on the cash paid to shareholders as dividend.

A stock's intrinsic value based on the dividend discount model may not represent the fair value for the shareholders because dividends are distributed in the form of cash from profits. In case the company is maintaining healthy cash in its balance sheet then it means that dividend pay-outs is low which could result in undervaluation of the stock.

In the case of free cash flow to equity model a stock is valued on the cash flow available for distribution after all the reinvestment needs of capex and incremental working capital are met. Thus, using the free cash flow to equity model provides a better measure for valuations in comparison to the dividend discount model.

6.5 Enterprise Value

Enterprise Value is the true economic value of a company. It is calculated by adding market capitalization, Long term Debt, Minority Interest minus cash and cash equivalents. (Also Minus like Equity investments like affiliates, investment in any company and also Long term investments.)



Enterprise Value is of three types: Total, Operating and Core EV. Total Enterprise Value is the value of all the business activities; it is the summation of market capitalization, Debt (Interest Bearing), Minority Interest “minus “cash. The operating Enterprise value is the value of all operating activities, and to get this we have to deduct “market value of non- operating assets” which includes Investments and shares (in associates) from the total enterprise value.

Core enterprise value is the value which does not include the value of operations which are not the part of core activities. To get this we deduct the value of non-core assets from the operating enterprise value.

Enterprise value measures the business as a whole and gives its true economic value. It is more comprehensive than equity multiples. Enterprise value considers both equity and debt in its valuation of the firm and is least affected by its capital structure. Enterprise multiples are more reliable than equity multiples because Equity multiples focus only on equity claim.

There are different Enterprise Value multiples which can be calculated as per the requirement (which requirement). If we take the EV as numerator then the denominator must represent the claims of all the claimholders on enterprise cash flow.

6.5.1 Enterprise Value to Sales: This multiple is suitable for the corporates who maintain negative cash flows or negative earnings as cyclical firms. Corporate like technological firms generally use this multiple. Sales are the least manipulative top line for any business and least affected by accounting policies.

6.5.2 Enterprise Value to EBITDA: EBITDA, which is commonly known as the proxy of cash flow, is the amount available to debt and equity holders of a company. This multiple is used for valuing capital intensive companies, which generally have substantial depreciation and amortization expenses. This multiple is used for acquisitions as it incorporates debts as well equity of the business. An analyst prefers this multiple because it is not affected by depreciation policy and changes in capital structure. The inverse of this multiple explains cash return on total investment.

6.6 Valuation of Rights

As we know that company offers right shares to the existing shareholders. Immediately after the right issue, the price of share is called Ex Right Price or Theoretical Ex-Right Price (TERP) which is computed as follows:

$$\frac{nP_0 + S}{n + n_1}$$

n = No. of existing equity shares

P₀ = Price of Share Pre-Right Issue

S = Subscription amount raised from Right Issue

n₁ = No. of new shares offered

However, theoretical value of a right can be calculated as follows:

Ex- Right Price – Subscription Price

$$\text{Value of Per Shareholding} = \frac{\text{Ex-Right Price} - \text{Subscription Price}}{\text{Exiting Number of Shares}}$$

7. VALUATION OF PREFERENCE SHARES

Preference shares, like debentures, are usually subject to fixed rate of dividend. In case of non-redeemable preference shares, their valuation is similar to perpetual bonds.

Valuation of Redeemable preference share

The value of redeemable preference share is the present value of all the future expected dividend payments and the maturity value, discounted at the required return on preference shares. Therefore, Value of Redeemable Preference Share shall be:

$$= \frac{\text{Dividend}_1}{(1+r)^1} + \frac{\text{Dividend}_2}{(1+r)^2} + \dots + \frac{(\text{Dividend}_n + \text{Maturity value})}{(1+r)^n}$$

and Value of Non-Redeemable Preference Share shall be:

$$\text{Irredeemable Preference share value} = \frac{\text{Dividend}}{\text{Required return on Preference share}}$$

Example

The face value of the preference share is ₹ 10,000 and the stated dividend rate is 10%. The shares are redeemable after 3 years period. Calculate the value of preference shares if the required rate of return is 12%.

$$\text{Annual dividend} = ₹10000 \times 10\% = ₹1000$$

Redeemable Preference share value

$$\begin{aligned} &= \frac{1,000}{(1+0.12)} + \frac{1,000}{(1+0.12)^2} + \frac{1,000+10,000}{(1+0.12)^3} \\ &= \frac{1,000}{(1.12)} + \frac{1,000}{(1.12)^2} + \frac{11,000}{(1.12)^3} \\ &= 892.86 + 797.19 + 7829.58 \\ &= 9519.63 \end{aligned}$$

Solving the above equation, we get the value of the preference shares as ₹ 9519.63

8. VALUATION OF DEBENTURES AND BONDS

8.1 Some Basics of a Bond

- (a) **Par Value:** Value stated on the face of the bond of maturity.
- (b) **Coupon Rate and Frequency of Payment:** A bond carries a specific interest rate known as the Coupon Rate. The coupon can be paid monthly, quarterly, half-yearly or annually.
- (c) **Maturity Period:** Total time till maturity.
- (d) **Redemption:** Bullet i.e. one shot repayment of principal at par or premium.

8.2 Bond Valuation Model

The value of a bond is:

$$V = \sum_{t=1}^n \frac{I}{(1+k_d)^t} + \frac{F}{(1+k_d)^n}$$

$$V = I (PVIFA_{k_d, n}) + F (PVIF_{k_d, n})$$

Where,

V = value of the bond

I = annual interest payable on the bond

F = principal amount (par value) of the bond repayable at the time of maturity

n = maturity period of the bond

k_d = Yield to Maturity (YTM) or Required Rate of Return on same type of Bonds.

8.3 Bond Value Theorems

Some basic rules, which should be remembered with regard to bonds, are:

CAUSE	EFFECT
Required rate of return or YTM = coupon rate	Bond sells at par value
Required rate of return or YTM > coupon rate	Bond sells at a discount
Required rate of return or YTM < coupon rate	Bond sells at a premium
Longer the maturity of a bond	Greater the bond price change with a given change in the required rate of return.

8.4 Yield to Maturity (YTM)

The YTM is defined as that discount rate (“ k_d ”) at which the present value of future cash flows from a Bond equals its Market Price.

8.5 Bond Value with Semi-Annual Interest

The basic bond valuation equation thus becomes:

$$V = \sum_{t=1}^{2n} \frac{\frac{I}{2}}{\left(1 + \frac{k_d}{2}\right)^t} + \frac{F}{\left(1 + \frac{k_d}{2}\right)^{2n}}$$

$$= I/2(PVIFA_{k_d/2, 2n}) + F(PVIF_{k_d/2, 2n})$$

Where,

V = Value of the bond

$I/2$ = Semi-annual interest payment

$k_d/2$ = Discount rate applicable to a half-year period

F = Par value of the bond repayable at maturity

$2n$ = Maturity period expressed in terms of half-yearly periods.

8.6 Price Yield Relationship

A basic property of a bond is that its price varies inversely with yield. The reason is - as the required yield increases, the present value of the cash flow decreases; hence the price decreases and vice versa.

8.7 Relationship between Bond Price and Time

The price of a bond must equal its par value at maturity (assuming that there is no risk of default), because bond prices change with passage of time and they approach to the par value. It means that if a bond is trading at premium, its price will decrease over time and if a bond is trading at a discount, its price will increase over time.

8.8 Duration of Bond

Duration is the weighted average time within which an investor gets back the promised principal and the promised YTM. Investment coupon bearing bond always has a duration which is lesser than its maturity. Higher the coupon rate, lesser would be the duration and higher the yield-to-maturity, lower will be the duration of a bond.

It measures how quickly a bond will repay its true cost. The longer the time it takes the greater exposure the bond has to changes in the interest rate environment and hence, higher interest rate risk. Duration is also a measure of interest rate risk – higher duration implies higher interest rate risk

and lower duration means lower interest rate risk. Following are some of factors that affect bond's duration:

- (i) **Time to maturity:** The shorter-maturity bond would have a lower duration and less interest rate risk and vice versa.
- (ii) **Coupon rate:** Coupon payment is a key factor in calculation of duration of bonds. The higher the coupon, the lower is the duration and vice versa.
- (iii) **Yield-to-Maturity (YTM):** Higher yield-to-maturity means lower duration and hence, lower interest rate risk and vice versa.

Although there are many formulae to calculate the duration. However, following are commonly used methods:

(a) **Macaulay Duration:** This formula measures the number of years required to recover the true cost of a bond, considering the present value of all coupon and principal payments received in the future. The formula for Macaulay duration is as follows:

$$\text{Macaulay Duration} = \frac{\sum_{t=1}^n \frac{t \cdot c}{(1+i)^t} + \frac{n \cdot M}{(1+i)^n}}{P}$$

Where,

n = Time to maturity

C = Cash flows (Coupon Amount)

i = Required yield

M = Maturity (par) value

P = Bond price

(b) **Modified Duration:** This is a modified version of Macaulay duration which takes into account the interest rate changes because the changes in interest rates affect duration as the yield gets affected each time the interest rate varies.

The formula for modified duration is as follows:

$$\text{Modified Duration} = \left[\frac{\text{Macaulay Duration in years}}{\left(1 + \frac{\text{YTM}}{n}\right)} \right]$$

Where

n = Number of compounding periods per year

YTM = Yield to Maturity

8.9 Immunization

We know that when interest rate goes up though the reinvestment income improves but the value of bond falls and vice versa. Thus, the interest rate risk of a bond is subject to following two risks:

- (a) Price Risk
- (b) Reinvestment Risk

Further, with change in interest rates these two risks move in opposite direction. Through the process of immunization, selection of bonds shall be in such a manner that the effect of above two risks shall offset each other. It means that immunization takes place when the changes in the YTM in market has no effect on the promised rate of return on a bond i.e., a portfolio of bond is said to be immunized if the value of the portfolio at the end of a holding period is insensitive to interest rate changes. If the duration of a bond is equal to its holding period, then we ensure immunization of the same and hence, the bond is not having interest rate risk.

8.10 Yield Curve

The term structure of interest rates, also known as Yield Curve, shows how yield to maturity is related to term to maturity for bonds that are similar in all respects, except maturity.

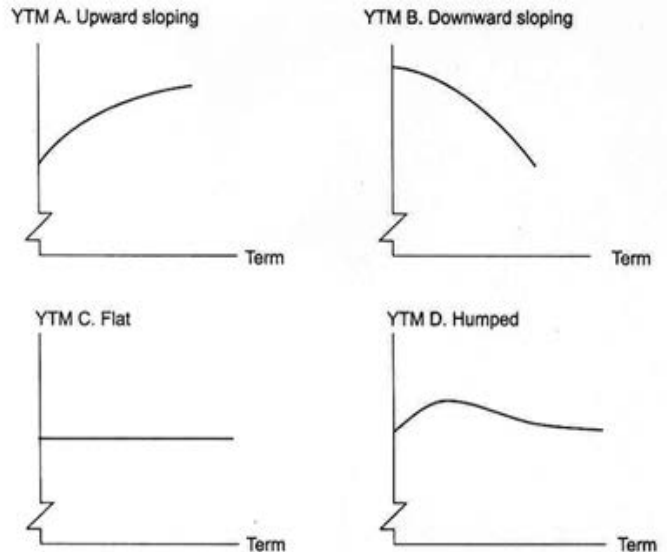
Consider the following data for Government securities:

<i>Face Value</i>	<i>Coupon Rate (%)</i>	<i>Maturity (years)</i>	<i>Current Price</i>	<i>Yield to Maturity (%)</i>
10,000	12.40	1	9,987	12.546
10,000	12.75	2	9,937	13.128
10,000	13.50	3	10,035	13.351
10,000	13.50	4	9,971	13.599
10,000	13.75	5	9,948	13.901

The yield curve for the above bonds is shown in the diagram. It slopes upwards indicating that long-term rates are greater than short-term rates.

Yield curves, however, do not have to necessarily slope upwards. They may follow different pattern. Four patterns are depicted in the given diagram:

Types of Yield Curve



Another perspective on the term structure of interest rates is provided by the forward interest rates, viz., the interest rates applicable to bonds in the future.

To get forward interest rates, begin with the one-year Zero Coupon Bond:

$$8,897 = 10,000 / (1 + r_1)$$

Where,

r_1 is the one-year spot rate i.e. the discount rate applicable to a risk less cash flow receivable a year hence.

Solving for r_1 , we get $r_1 = 0.124$.

Next, consider the two-year government security and split its benefits into two parts, the interest of ₹ 1,275 receivable at the end of year 1 and ₹ 11,275 (representing the interest and principal repayment) receivable at the end of year 2. The present value of the first part is:

$$\frac{11,275}{(1+r_1)(1+f_2)} = \frac{11,275}{1.124(1+f_2)}$$

To get the present value of the second year's cash flow of ₹ 11,275, discount it twice at r_1 (the discount rate for year 1) and f_2 (the discount rate for year 2) (please use f notation for the forward rate so as to make a distinction between the spot rate and forward rate)

$$\frac{1,275}{(1+r_1)(1+f_2)} = \frac{1,275}{1.124(1+f_2)}$$

f_2 is called the 'forward rate' for after one for next one year i.e., the current expected estimate of the next year's one-year spot interest rate. Since r_1 , the market price of the bond, and the cash flow associated with the bond are known the following equation can be set up:

$$9,937 = \frac{1,275}{(1.124)} + \frac{11,275}{(1.124)(1+r_2)}$$

$$9,937(1.124)(1+r_2) = 1,275(1+r_2) + 11,275$$

$$11,169 + 11,169 r_2 = 1,275 + 1,275 r_2 + 11,275$$

$$11,169 r_2 - 1,275 r_2 = 11,275 - 11,169 + 1,275$$

$$9,894 r_2 = 1,381$$

$$r_2 = \frac{1,381}{9,894} = 0.1396$$

Thus solving this equation we get $r_2 = 0.1396$ say 14%

To get the forward rate for year 3 (r_3), set up the equation for the value of the three year bond:

$$10,035 = \frac{1,350}{(1+r_1)} + \frac{1,350}{(1+r_1)(1+r_2)} + \frac{11,350}{(1+r_1)(1+r_2)(1+r_3)}$$

$$10,035 = \frac{1,350}{(1.124)} + \frac{1,350}{(1.124)(1.140)} + \frac{11,350}{(1.124)(1.140)(1+r_3)}$$

$$10,035 = \frac{1,350}{1.124} + \frac{1,350}{1.28136} + \frac{11,350}{1.28136(1+r_3)}$$

$$10,035 = 1,201 + 1,054 + \frac{11,350}{1.28136(1+r_3)}$$

$$7780 = \frac{11,350}{1.28136(1+r_3)}$$

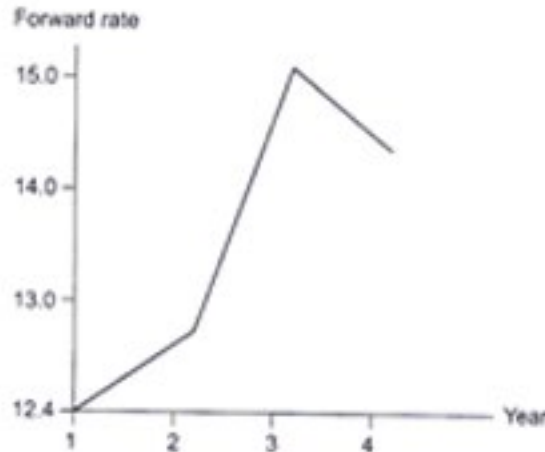
$$1+r_3 = 1.13853$$

$$r_3 = 0.13853$$

Solving this equation we get $r_3 = 0.13853$. This is the forward rate for year three. Continuing in a similar fashion, set up the equation for the value of the four-year bond:

$$9,971 = \frac{1,350}{(1+r_1)} + \frac{1,350}{(1+r_1)(1+r_2)} + \frac{1,350}{(1+r_1)(1+r_2)(1+r_3)} + \frac{11,350}{(1+r_1)(1+r_2)(1+r_3)(1+r_4)}$$

Solving this equation we get $r_4 = 0.1462$ (approx.). The following diagram plots the one-year spot rate and forward rates f_2, f_3, f_4 . It can be noted that while the current spot rate and forward rates are known, the future spot rates are not known – they will be revealed as the future unfolds.

Forward Rates

Thus, on the basis of above it can be said that though YTM and Forward Rates are two distinct measures but used equivalent way of evaluating a riskless cash flows.

$$\text{Discount at the yield to maturity : } (R_t) \text{ PV [CF(t)]} = \frac{\text{CF(t)}}{(1+R_t)^t}$$

Discount by the product of a spot rate plus the forward rates

$$\text{PV [CF(t)]} = \frac{\text{CF(t)}}{(1+r_1)(1+r_2)\dots(1+r_t)}$$

8.11 Term Structure Theories

The term structure theories explain the relationship between interest rates or bond yields and different terms or maturities. The different term structures theories are as follows:

(a) *Expectation Theory*: As per this theory the long-term interest rates can be used to forecast short-term interest rates in the future as long-term interest rates are assumed to unbiased estimator of the short term interest rate in future.

(b) *Liquidity Preference Theory*: As per this theory investors are risk averse and they want a premium for taking risk. Long-term bonds have higher interest rate risk because of higher maturity, hence, long-term interest rates should have a premium for such a risk. Further, people prefer liquidity and if they are forced to sacrifice the same for a longer period, they need a higher compensation for the same. Hence, as per this theory, the normal shape of a yield curve is Positive sloped one.

(c) *Preferred Habitat Theory (Market Segmentation Theory)*: This theory states that though different investors may be having different preference for shorter and longer maturity periods and therefore, they have their own preferred habitat. Hence, the interest rate structure depends on the

demand and supply of fund for different maturity periods for different market segments. In case there is a mismatch between these forces, the players of a particular segment should be compensated at a higher rate to pull them out from their preferred habitat; hence, that will determine the shape of the yield curve. Accordingly, shape of yield curve will be determined which can be sloping upward, falling or flat.

8.12 Convexity Adjustment

As mentioned above duration is a good approximation of the percentage change in price due to percentage change for a small change in interest rate. However, the change cannot be estimated so accurately due to convexity effect as duration base estimation assumes a linear relationship.

This estimation can be improved by adjustment to the duration formula on account of 'convexity' as follows:

$$C^* \times (\Delta y)^2 \times 100$$

$$C^* = \frac{V_+ + V_- - 2V_0}{2V_0(\Delta y)^2}$$

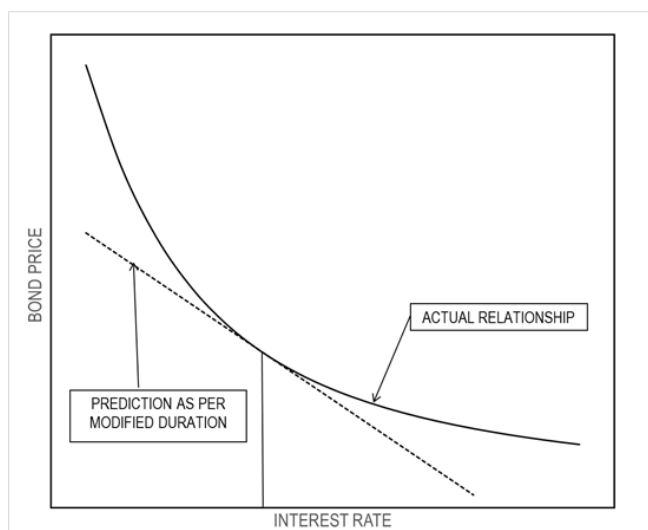
Δy = Change in Yield

V_0 = Initial Price of bond

V_+ = price of Bond if yield increases by Δy

V_- = price of Bond if yield decreases by Δy

The convexity effect has been shown in the following diagram:



8.13 Convertible Debentures

Convertible Debentures are those debentures which are converted in equity shares after certain period of time. The number of equity shares for each convertible debenture are called Conversion Ratio and price paid for the equity share is called 'Conversion Price'.

Further, conversion value of debenture is equal to Price per Equity Share x Converted No. of Shares per Debenture.

8.14 Valuation of Warrants

A warrant is a right that entitles a holder to subscribe equity shares during a specific period at a stated price. These are generally issued to sweeten the debenture issue.

Although both convertible Debentures and Warrants appeared to one and same thing but following are major differences.

- (i) In warrant, option of conversion is detachable while in convertible it is not so. Due to this reason, warrants can be separately traded.
- (ii) Warrants are exercisable for cash payment while convertible debenture does not involve any such cash payment.

Theoretical value of warrant can be found as follows:

$$(MP - E) \times n$$

MP = Current Market Price of Share

E = Exercise Price of Warrant

n = No. of equity shares convertible with one warrant

8.15 Zero Coupon Bond

As name indicates these bonds do not pay any coupon during the life of the bonds. Instead, Zero Coupon Bonds (ZCBs) are issued at discounted price to their face value, which is the amount a bond will be worth when it matures or comes due. When a ZCB matures, the investor will receive one lump sum (face value) equal to the initial investment plus interest that has been accrued on the investment made. The maturity dates on ZCBs are usually long term. These maturity dates allow an investor for a long-range planning. ZCBs issued by banks, government and private sector companies. However, bonds issued by corporate sector carry a potentially higher degree of risk, depending on the financial strength of the issuer and longer maturity period, but they also provide an opportunity to achieve a higher return.

8.16 Refunding of Bonds

Generally, Bonds issuer may refund bonds prior to its maturity date especially when interest rates are falling. Under this scheme by issuing fresh bonds at lower coupon rates company can refund the

existing bonds issued earlier at higher interest or coupon rate. Therefore, company prefers to issue bonds with call features as it gives them the right or choice to redeem bonds before their due date of maturity especially when market conditions are favourable to them, and new bonds can be issued at lower interest rate. However, this call feature is not free of cost because companies are supposed to repay higher amount than the face value of bonds which is called 'Call Premium'.

It is a type of strategic financial decision, and the Capital Budgeting method is used to evaluate the decision to refund the exiting bonds and issuing new bonds of an equivalent amount. Generally, the Net Present Value (NPV) method is used to evaluate such types of Bond Refunding decisions. If the Present Value of Cash Inflows (in form of net cash saving) exceeds the Present Value of cash outflow (call premium, interest during transition period etc.) then exiting bonds can be refunded and new bonds carrying lower coupon interest rate can be issued resulting in overall saving of cash outflows.

8.17 Money Market Instruments

Similar to Bonds, the money market instruments are important source of finance to industry, trade, commerce and the government sector for meeting their short-term requirement for both national and international trade. These financial instruments also provide an investment opportunity to the banks and others to deploy their surplus funds so as to reduce their cost of liquidity and earn some income.

The instruments of money market are characterised by:

- (a) Short duration.
- (b) Large volume.
- (c) De-regulated interest rates.
- (d) The instruments are highly liquid.
- (e) They are safe investments owing to issuers inherent financial strength.

The traditional short-term money market instruments consist of mainly call money and notice money with limited players, treasury bills and commercial bills. The new money market instruments were introduced giving a wider choice to short term holders of money to reap yield on funds even for a day to earn a little more by parking funds through instruments for a few days more or until such time till they need it for lending at a higher rate. The various types of instruments of money market are discussed in the following paragraphs:

8.17.1 Call/Notice money: Call money market, or inter-bank call money market, is a segment of the money market where scheduled commercial banks lend or borrow on call (i.e., overnight) or at short notice (i.e., for periods upto 14 days) to manage the day-to-day surpluses and deficits in their cash-flows.

When money is borrowed on overnight basis or for 1 day it is termed as 'Call Money'. However, under notice money market, funds are transacted for a period between two days and fourteen days. These day-to-day surpluses and deficits arise due to the varying nature of their operations and the peculiar nature of the portfolios of their assets and liabilities.

8.17.2 Treasury Bills (TBs): Among money market instruments TBs provide a temporary outlet for short-term surplus as also provide financial instruments of varying short-term maturities to facilitate a dynamic asset-liabilities management. The interest received on them is the discount which is the difference between the price at which they are issued and their redemption value. They have assured yield and negligible risk of default. The TBs are short-term promissory notes issued by Government of India at a discount.

More relevant to the money market is the introduction of 14 days, 28 days, 91 days and 364 days TBs on auction basis.

However, at present, the RBI issues Treasury Bills of three maturities i.e. 91 days, 182 days and 364 days.

TBs are issued at discount and their yields can be calculated with the help of the following formula:

$$Y = \left[\frac{F - P}{P} \right] \times \frac{365}{M} \times 100$$

where Y = Yield,

F = Face Value,

P = Issue Price/Purchase Price,

M = Actual days to Maturity.

8.17.3 Commercial Bills: A commercial bill is one which arises out of a genuine trade transaction, i.e. credit transaction. As soon as goods are sold on credit, the seller draws a bill on the buyer for the amount due. The buyer accepts it immediately agreeing to pay amount mentioned therein after a certain specified date. Thus, a bill of exchange contains a written order from the creditor to the debtor, to pay a certain sum, to a certain person, after a creation period. A bill of exchange is a 'self-liquidating' paper and negotiable; it is drawn always for a short period ranging between 3 months and 6 months.

Bill financing is the core component of meeting working capital needs of corporates in developed countries. Such a mode of financing facilitates an efficient payment system. The commercial bill is instrument drawn by a seller of goods on a buyer of goods. RBI has pioneered its efforts in developing bill culture in India, keeping in mind the distinct advantages of commercial bills, like, self-liquidating in nature, recourse to two parties, knowing exact date transactions, transparency of transactions etc.

Example

If a bank re-discounted a commercial bill with a face value of ₹ 100/- @ 15% for 2 months will fetch ₹ 97.50, on the basis of the following calculation.

$$\text{Discount} = 100 \times \frac{15}{100} \times \frac{2}{12} = ₹ 2.50$$

However, as the discount amount is paid at front-end.

Example

The yield to the investor or cost to the borrower will be higher than the discount rate in view of the fact that the discounter can deploy the amount of discount received for earning further income. This can be calculated with the following formula:

$$D = \frac{FV - SV}{SV} \times \frac{\text{Days or months in a year}}{M} \times 100$$

where

D = Effective Discounting Rate

FV = Face Value

SV = Sale Value

M = Period of Discount

Accordingly, the Yield as per the data given in the example will be:

$$\frac{100 - 97.50}{97.50} \times \frac{12}{2} \times 100 = 15.385\%$$

8.17.4 Certificate of Deposit: The Certificate of Deposits (CDs) are negotiable term-deposits accepted by commercial bank from bulk depositors at market related rates. CDs are usually issued in Demat form or as a Usance Promissory Note.

Just like Commercial Bills, Certificate of Deposit (CD) is a front-ended negotiable instrument, issued at a discount and the face value is payable at maturity by the issuing bank.

Example

Amount of Issue – ₹ 100

Period - 6 months

Rate of discount – 20%

$$\text{Discount} = 100 \times \frac{20}{100} \times \frac{6}{12} = ₹ 10.00$$

Hence CD will be issued for ₹ 100 – 10 = ₹ 90.00. The effective rate to the bank will, however, be calculated on the basis of the following formula:

$$E = \frac{FV - SV}{SV} \times \frac{\text{Days or months in a year}}{M} \times 100$$

where

E = Effective Yield

FV = Face Value

SV = Sale Value

M = Period of Discount

Accordingly, the Yield as per the data given in the example will be:

$$\frac{100-90}{90} \times \frac{12}{6} \times 100 = 22.22\%$$

8.17.5 Commercial Paper: Commercial Paper (CP) has its origin in the financial markets of America and Europe. The concept of CPs was originated in USA in early 19th century when commercial banks monopolised and charged high rate of interest on loans and advances. In India, the CP was introduced in January 1990 on the recommendation of Vaghul Committee subject to various conditions. When the process of financial dis-intermediation started in India in 1990, RBI allowed issue of two instruments, viz., the Commercial Paper (CP) and the Certificate of Deposit (CD) as a part of reform in the financial sector. A notable feature of RBI Credit Policy announced on 16.10.1993 was the liberalisation of terms of issue of CP. At present it provides cheap source of funds for corporate sector and has caught the fancy of corporate sector and banks. Its market has picked up considerably in India due to interest rate differentials in the inter-bank and commercial lending rates.

CPs are unsecured and negotiable promissory notes issued by high rated corporate entities to raise short-term funds for meeting working capital requirements directly from the market instead of borrowing from banks. Its period ranges from 7 days to 1 year. CP is issued at discount to face value. The issue of CP seeks to by-pass the intermediary role of the banking system through the process of securitisation.

It partly replaces the working capital limits enjoyed by companies with the commercial banks and there will be no net increase in their borrowing by issue of CP. Generally, CP has to be issued at a discount to face value. Yield on CP is freely determined by the market.

The yield on CP can be calculated as follows:

$$Y = \frac{FV-SV}{SV} \times \frac{\text{Days or months in a year}}{M} \times 100$$

where

Y = Yield

FV = Face Value

SV = Sale Value

M = Period of Discount

8.17.6 Repurchase Options (Repo.) and Reverse Repurchase Agreement (Reverse Repo): The term Repurchase Agreement (Repo) and Reverse Repurchase Agreement (Reverse Repo) refer to a type of transaction in which money market participant raises funds by selling securities and simultaneously agreeing to repurchase the same after a specified time generally at a specified price, which typically includes interest at an agreed upon rate. Sometimes it is also called *Ready Forward Contract* as it involves funding by selling securities (held on Spot i.e. Ready Basis) and repurchasing them on a forward basis.

Following are major differences between Repo and Reverse Repo:

- (a) Repo rate is the rate at which Reserve Bank of India (RBI) lends to Commercial Banks for a short period of time against Government Securities. On the other hand, Reverse Repo is the rate at which Commercial Banks lend to RBI.
- (b) A transaction is called a Repo when viewed from the perspective of the seller of securities (the party acquiring funds) and Reverse Repo when described from the point of view of the supplier of funds. Thus, whether a given agreement is termed a Repo or a Reverse Repo depends largely on which party initiated the transaction.
- (c) The purpose of Repo is to fulfill the deficiency of funds. While the purpose of Reverse repo is to reduce excess liquidity in the economy.
- (d) The Repo rate is comparatively high in comparison to Reverse Repo rate.
- (e) The Repo rate strives to contain inflation in the economy. The Reverse repo aims to control money supply in the economy.

9. ROLE AND RESPONSIBILITIES OF VALUERS

9.1 Role of Valuers

The role of Valuers has increased a lot due to increased statutory and information requirements. The valuations made by a Valuers are required statutorily for the following purposes: -

(a) Mergers/Acquisitions/ De-Mergers/Takeovers: Valuation is mandated in cases of Mergers/ Acquisitions/ De-Mergers/ Takeovers by the Income Tax Act, 1961 for the purpose of determining the tax (if any) payable in such cases.

(b) Slump Sale/ Asset Sale/ IPR Sale: Valuation is required by Insolvency and Bankruptcy Code, 2016 in case of liquidation of company and sale of assets of corporate debtor for the purpose of ascertaining fair value or liquidation value.

(c) Conversion of Debt/ Security: Valuation is a necessitated by RBI for Inbound Foreign Investment, Outbound Foreign Investment and other business transactions.

(d) Capital Reduction: SEBI regulations such as ICDR/ LODR/ Preferential Allotment etc. also require valuations to be made for listed securities for various purposes on a period basis.

(e) Strategic Financial Restructuring: Various statutes such as Companies Act, 2013, SARFAESI Act, 2002, Arbitration and Conciliation Act 1996 etc., warrant valuations to be made for meeting various statutory requirements. Valuation is also made for fulfilling IND AS purposes and may also be made on Court Orders.

9.2 Responsibilities of Valuers

Under Rule 12(e) of the Companies (Registered Valuers and Valuation) Rules, 2017 the Model Code of Conduct for Registered Valuers is as follows:

Integrity and Fairness

1. A valuer should in the conduct of his/its business follow high standards of integrity and fairness in all his/its dealings with his/its clients and other valuers.
2. A valuer should maintain integrity by being honest, straightforward, and forthright in all professional relationships.
3. A valuer should endeavour to ensure that he/it provides true and adequate information and shall not misrepresent any facts or situations.
4. A valuer should refrain from being involved in any action that would bring disrepute to the profession.

Professional Competence and Due Care

5. A valuer should render at all times high standards of service, exercise, due diligence, ensure proper care and exercise independent professional judgment.
6. A valuer should carry out professional services in accordance with the relevant technical and professional standards that may be specified from time to time
7. A valuer should continuously maintain professional knowledge and skill to provide competent professional service based on up-to-date developments in practice, prevailing regulations/guidelines and techniques.
8. In the preparation of a valuation report, the valuer should not disclaim liability for his/its expertise or deny his/its duty of care, except to the extent that the assumptions are statements of fact provided by the company and not generated by the valuer.
9. A valuer should have a duty to carry out with care and skill, the instructions of the client insofar as they are compatible with the requirements of integrity, objectivity and independence.

Independence and Disclosure of Interest

10. A valuer should act with objectivity in his/its professional dealings by ensuring that his/its decisions are made without the presence of any bias, conflict of interest, coercion, or undue influence of any party, whether directly connected to the valuation assignment or not.
11. A valuer should not take up an assignment under the Act/Rules if he/it or any of his/its relatives or associates is not independent in relation to the company and assets being valued.
12. A valuer should maintain complete independence in his/its professional relationships and shall conduct the valuation independent of external influences.

13. A valuer should wherever necessary disclose to the clients, possible sources of conflicts of duties and interests, while providing unbiased services.

14. A valuer should not deal in securities of any subject company after any time when he/it first becomes aware of the possibility of his/its association with the valuation, and in accordance with the SEBI (Prohibition of Insider Trading) Regulations, 2015.

15. A valuer should not indulge in “mandate snatching” or “convenience valuations” in order to cater to the company’s needs or client needs. A valuer should communicate in writing with a prior valuer if there is knowledge of any prior valuer having been appointed before accepting the assignment.

16. As an independent valuer, the valuer should not charge success fee.

17. In any fairness opinion or independent expert opinion submitted by a valuer, if there has been a prior engagement in an unconnected transaction, the valuer should declare the past association with the company.

Confidentiality

18. A valuer should not use or divulge to other clients or any other party any confidential information about the subject company, which has come to his/its knowledge without proper and specific authority or unless there is a legal or professional right or duty to disclose.

Information Management

19. A valuer should ensure that he/ it maintains written contemporaneous records for any decision taken, the reasons for taking the decision, and the information and evidence in support of such decision. This should be maintained so as to sufficiently enable a reasonable person to take a view on the appropriateness of his/its decisions and actions.

20. A valuer should appear, co-operate and be available for inspections and investigations carried out by the Registration Authority, any person authorised by the Registration Authority, the Valuation Professional Organisation with which he/it is registered or any other statutory regulatory body.

21. A valuer should provide all information and records as may be required by the Registration Authority, the Tribunal, Appellate Tribunal, the Valuation Professional Organisation with which he/it is registered, or any other statutory regulatory body.

22. A valuer while respecting the confidentiality of information acquired during the course of performing professional services, should maintain proper working papers for a period of three years, for production before a regulatory authority or for a peer review. In the event of a pending case before the Tribunal or Appellate Tribunal, the record should be maintained till the disposal of the case.

Gifts and hospitality

23. A valuer, or his/its relative should not accept gifts or hospitality which undermines or affects his independence as a valuer.

24. A valuer should not offer gifts or hospitality or a financial or any other advantage to a public servant or any other person, intending to obtain or retain work for himself/ itself, or to obtain or retain an advantage in the conduct of profession for himself/ itself.

Remuneration and Costs

25. A valuer should provide services for remuneration which is charged in a transparent manner, is a reasonable reflection of the work necessarily and properly undertaken and is not inconsistent with the applicable rules.

26. A valuer should not accept any fees or charges other than those which are disclosed to and approved by the persons fixing his/ its remuneration.

Occupation, employability and restrictions

27. A valuer should refrain from accepting too many assignments, if he/it is unlikely to be able to devote adequate time to each of his/ its assignments.

28. A valuer should not engage in any employment, except when he has temporarily surrendered his certificate of membership with the Valuation professional Organisation with which he is registered.

29. A valuer should not conduct business which in the opinion of the Registration Authority is inconsistent with the reputation of the profession.

10. PRECAUTIONS NEED TO BE TAKEN BY A VALUER BEFORE ACCEPTING ANY VALUATION ASSIGNMENT

It should be evidently clear to the valuation professional as well as to the end consumer that a good valuation is much more than just numbers. While it is critical to get the maths and application right-however it is equally important to have a comprehensive understanding of the narrative behind the valuation. Attention should be given to the following points while making a valuation:

1. A good valuation does not provide a precise estimate of value. A valuation by necessity involves many assumptions and is a professional estimate of value. The quality and veracity of a good valuation model does not depend just on number crunching. The quality of a valuation will be directly proportional to the time spent in collecting the data and in understanding the firm being valued.

2. Valuing a company is much more than evaluating the financial statements of a company and estimating an intrinsic value based on numbers. This concept is getting more and more critical in today's day and age where most emerging business are valued not on their historical performances captured in the financial statement but rather on a narrative driven factors like scalability, ease of replication, growth potential, cross sell opportunities etc.

3. More often than not, investors/users tend to focus on either numbers or the story without attempting to reach a middle ground. In both these cases, investors will fail to capture opportunities that could have been unlocked had they been willing to reach some middle ground between the two concepts.

4. While it is true that a robust intrinsic value calculation using financial statements data and an error-free model makes investing a more technical subject, in reality, emotions play a massive role in moving stocks higher or lower. Not accounting for this fact, therefore, could become an obstacle in consistently getting the valuation right.

TEST YOUR KNOWLEDGE

Theoretical Questions

1. Why should the duration of a coupon carrying bond always be less than the time to its maturity?
2. Write short notes on Zero Coupon Bonds.

Practical Questions

1. A company has a book value per share of ₹ 137.80. Its return on equity is 15% and it follows a policy of retaining 60% of its earnings. If the Opportunity Cost of Capital is 18%, compute the price of the share today using both Dividend Growth Model and Walter's Model.
2. ABC Limited's shares are currently selling at ₹ 13 per share. There are 10,00,000 shares outstanding. The firm is planning to raise ₹ 20 lakhs to Finance a new project.

Required:

What are the ex-right price of shares and the value of a right, if

- (i) The firm offers one right share for every two shares held.
 - (ii) The firm offers one right share for every four shares held.
 - (iii) How does the shareholders' wealth (holding 100 shares) change from (i) to (ii)? How does right issue increases shareholders' wealth?
3. MNP Ltd. has declared and paid annual dividend of ₹ 4 per share. It is expected to grow @ 20% for the next two years and 10% thereafter. The required rate of return of equity investors is 15%. Compute the current price at which equity shares should sell.

Note: Present Value Interest Factor (PVIF) @ 15%:

For year 1 = 0.8696;

For year 2 = 0.7561

4. On the basis of the following information:

Current dividend (D_0) = ₹ 2.50

Discount rate (k) = 10.5%

Growth rate (g) = 2%

- (i) Calculate the present value of stock of ABC Ltd.
- (ii) Is its stock overvalued if stock price is ₹ 35, ROE = 9% and EPS = ₹ 2.25? Show detailed calculation. Using PE Multiple Approach and Earning Growth Model.
5. X Limited, just declared a dividend of ₹ 14.00 per share. Mr. B is planning to purchase the share of X Limited, anticipating increase in growth rate from 8% to 9%, which will continue for three years. He also expects the market price of this share to be ₹ 360.00 after three years.

You are required to determine:

- (i) the maximum amount Mr. B should pay for shares, if he requires a rate of return of 13% per annum.
- (ii) the maximum price Mr. B will be willing to pay for share, if he is of the opinion that the 9% growth can be maintained indefinitely and require 13% rate of return per annum.
- (iii) the price of share at the end of three years, if 9% growth rate is achieved and assuming other conditions remaining same as in (ii) above.

Calculate rupee amount up to two decimal points.

	Year-1	Year-2	Year-3
FVIF @ 9%	1.090	1.188	1.295
FVIF @ 13%	1.130	1.277	1.443
PVIF @ 13%	0.885	0.783	0.693

6. Piyush Loonker and Associates presently pay a dividend of Re. 1.00 per share and has a share price of ₹ 20.00.
- (i) If this dividend were expected to grow at a rate of 12% per annum forever, what is the firm's expected or required return on equity using a dividend-discount model approach?
- (ii) Instead of this situation in part (i), suppose that the dividends were expected to grow at a rate of 20% per annum for 5 years and 10% per year thereafter. Now what is the firm's expected, or required, return on equity?

7. Capital structure of Sun Ltd., as at 31.3.2003 was as under:

	(₹ in lakhs)
Equity share capital (₹ 100 each)	80
8% Preference share capital	40
12% Debentures	64
Reserves	32

Sun Ltd., earns a profit of ₹ 32 lakhs annually on an average before deduction of income-tax, which works out to 35%, and interest on debentures.

Normal return on equity shares of companies similarly placed is 9.6% provided:

- Profit after tax covers fixed interest and fixed dividends at least 3 times.
- Capital gearing ratio is 0.75.
- Yield on share is calculated at 50% of profits distributed and at 5% on undistributed profits.

Sun Ltd., has been regularly paying equity dividend of 8%.

Compute the value per equity share of the company assuming:

- 1% for every one time of difference for Interest and Fixed Dividend Coverage.
- 2% for every one time of difference for Capital Gearing Ratio.

8. ABC Ltd. has been maintaining a growth rate of 10 percent in dividends. The company has paid dividend @ ₹ 3 per share. The rate of return on market portfolio is 12 percent and the risk free rate of return in the market has been observed as 8 percent. The Beta co-efficient of company's share is 1.5.

You are required to calculate the expected rate of return on company's shares as per CAPM model and equilibrium price per share by dividend growth model.

9. A Company pays a dividend of ₹ 2.00 per share with a growth rate of 7%. The risk free rate is 9% and the market rate of return is 13%. The Company has a beta factor of 1.50. However, due to a decision of the Finance Manager, beta is likely to increase to 1.75. Find out the present as well as the likely value of the share after the decision.
10. Calculate the value of share from the following information:

Profit after tax of the company	₹ 290 crores
Equity capital of company	₹ 1,300 crores
Par value of share	₹ 40 each

Debt ratio of company (Debt/ Debt + Equity)	27%
Long run growth rate of the company	8%
Beta 0.1; risk free interest rate	8.7%
Market returns	10.3%
Capital expenditure per share	₹ 47
Depreciation per share	₹ 39
Change in Working capital	₹ 3.45 per share

11. Shares of Voyage Ltd. are being quoted at a price-earning ratio of 8 times. The company retains ₹ 5 per share which is 45% of its Earning Per Share.

You are required to compute

- (i) The cost of equity to the company if the market expects a growth rate of 15% p.a.
 - (ii) If the anticipated growth rate is 16% per annum, calculate the indicative market price with the same cost of capital.
 - (iii) If the company's cost of capital is 20% p.a. & the anticipated growth rate is 19% p.a., calculate the market price per share.
12. Following Financial data are available for PQR Ltd. for the year 2008:

	(₹ in lakh)
8% debentures	125
10% bonds (2007)	50
Equity shares (₹ 10 each)	100
Reserves and Surplus	300
Total Assets	600
Assets Turnovers ratio	1.1
Effective interest rate	8%
Effective tax rate	40%
Operating margin	10%
Dividend payout ratio	16.67%
Current market Price of Share	₹ 14
Required rate of return of investors	15%

You are required to:

- (i) Draw income statement for the year
 - (ii) Calculate its sustainable growth rate of earnings
 - (iii) Calculate the fair price of the Company's share using dividend discount model, and
 - (iv) What is your opinion on investment in the company's share at current price?
13. M/s X Ltd. has paid a dividend of ₹ 2.50 per share on a face value of ₹ 10 in the financial year ending on 31st March, 2009. The details are as follows:
- | | |
|---------------------------------------|------|
| Current market price of share | ₹ 60 |
| Growth rate of earnings and dividends | 10% |
| Beta of share | 0.75 |
| Average market return | 15% |
| Risk free rate of return | 9% |
- Calculate the intrinsic value of the share.
14. Mr. A is thinking of buying shares at ₹ 500 each having face value of ₹ 100. He is expecting a bonus at the ratio of 1: 5 during the fourth year. Annual expected dividend is 20% and the same rate is expected to be maintained on the expanded capital base. He intends to sell the shares at the end of seventh year at an expected price of ₹ 900 each. Incidental expenses for purchase and sale of shares are estimated to be 5% of the market price. He expects a minimum return of 12% per annum.
- Should Mr. A buy the share? If so, what maximum price should he pay for each share? Assume no tax on dividend income and capital gain.
15. The risk free rate of return R_f is 9 percent. The expected rate of return on the market portfolio R_m is 13 percent. The expected rate of growth for the dividend of Platinum Ltd. is 7 percent. The last dividend paid on the equity stock of firm A was ₹ 2.00. The beta of Platinum Ltd. equity stock is 1.2.
- (i) What is the equilibrium price of the equity stock of Platinum Ltd.?
 - (ii) How would the equilibrium price change when
 - The inflation premium increases by 2 percent?
 - The expected growth rate increases by 3 percent?
 - The beta of Platinum Ltd. equity rises to 1.3?
16. SAM Ltd. has just paid a dividend of ₹ 2 per share and it is expected to grow @ 6% p.a. After paying dividend, the Board declared to take up a project by retaining the next three annual

dividends. It is expected that this project is of same risk as the existing projects. The results of this project will start coming from the 4th year onward from now. The dividends will then be ₹ 2.50 per share and will grow @ 7% p.a.

An investor has 1,000 shares in SAM Ltd. and wants a receipt of at least ₹ 2,000 p.a. from this investment.

Show that the market value of the share is affected by the decision of the Board. Also show as to how the investor can maintain his target receipt from the investment for first 3 years and improved income thereafter, given that the cost of capital of the firm is 8%.

17. XYZ Ltd. paid a dividend of ₹ 2 for the current year. The dividend is expected to grow at 40% for the next 5 years and at 15% per annum thereafter. The return on 182 days T-bills is 11% per annum and the market return is expected to be around 18% with a variance of 24%.

The co-variance of XYZ's return with that of the market is 30%. You are required to calculate the required rate of return and intrinsic value of the stock.

18. Rahul Ltd. has surplus cash of ₹ 100 lakhs and wants to distribute 27% of it to the shareholders. The company decides to buy back shares. The Finance Manager of the company estimates that its share price after re-purchase is likely to be 10% above the buyback price-if the buyback route is taken. The number of shares outstanding at present is 10 lakhs and the current EPS is ₹ 3.

You are required to determine:

- (i) The price at which the shares can be re-purchased, if the market capitalization of the company should be ₹ 210 lakhs after buyback,
 - (ii) The number of shares that can be re-purchased, and
 - (iii) The impact of share re-purchase on the EPS, assuming that *net income is the same*.
19. Nominal value of 10% bonds issued by a company is ₹100. The bonds are redeemable at ₹ 110 at the end of year 5. Determine the value of the bond if required yield is (i) 5%, (ii) 5.1%, (iii) 10% and (iv) 10.1%.

20. An investor is considering the purchase of the following Bond:

Face value	₹ 100
Coupon rate	11%
Maturity	3 years

- (i) If he wants a yield of 13% what is the maximum price, he should be ready to pay for?
- (ii) If the Bond is selling for ₹ 97.60, what would be his yield?

21. Calculate Market Price of:
- 10% Government of India security currently quoted at ₹ 110, but yield is expected to go up by 1%.
 - A bond with 7.5% coupon interest, Face Value ₹ 10,000 & term to maturity of 2 years, presently yielding 6%. Interest payable half yearly.
22. A convertible bond with a face value of ₹ 1,000 is issued at ₹ 1,350 with a coupon rate of 10.5%. The conversion rate is 14 shares per bond. The current market price of bond and share is ₹ 1,475 and ₹ 80 respectively. What is the premium over conversion value?
23. Saranam Ltd. has issued convertible debentures with coupon rate 12%. Each debenture has an option to convert to 20 equity shares at any time until the date of maturity. Debentures will be redeemed at ₹ 100 on maturity of 5 years. An investor generally requires a rate of return of 8% p.a. on a 5-year security. As an investor when will you exercise conversion for given market prices of the equity share of (i) ₹ 4, (ii) ₹ 5 and (iii) ₹ 6.

Cumulative PV factor for 8% for 5 years : 3.993

PV factor for 8% for year 5 : 0.681

24. The data given below relates to a convertible bond :

Face value	₹ 250
Coupon rate	12%
No. of shares per bond	20
Market price of share	₹ 12
Straight value of bond	₹ 235
Market price of convertible bond	₹ 265

Calculate:

- Stock value of bond.
 - The percentage of downside risk.
 - The conversion premium
 - The conversion parity price of the stock.
25. ABC Ltd. has ₹ 300 million, 12 per cent bonds outstanding with six years remaining to maturity. Since interest rates are falling, ABC Ltd. is contemplating of refunding these bonds with a ₹ 300 million issue of 6 year bonds carrying a coupon rate of 10 per cent. Issue cost of the new bond will be ₹ 6 million and the call premium is 4 per cent. ₹ 9 million being the unamortized portion of issue cost of old bonds can be written off no sooner the old bonds are

called off. Marginal tax rate of ABC Ltd. is 30 per cent. You are required to analyse the bond refunding decision.

26. The following data are available for a bond

Face value	₹ 1,000
Coupon Rate	16%
Years to Maturity	6
Redemption value	₹ 1,000
Yield to maturity	17%

What is the current market price, duration and volatility of this bond? Calculate the expected market price, if increase in required yield is by 75 basis points.

27. Mr. A will need ₹ 1,00,000 after two years for which he wants to make one time necessary investment now. He has a choice of two types of bonds. Their details are as below:

	Bond X	Bond Y
Face value	₹ 1,000	₹ 1,000
Coupon	7% payable annually	8% payable annually
Years to maturity	1	4
Current price	₹ 972.73	₹ 936.52
Current yield	10%	10%

Advice Mr. A whether he should invest all his money in one type of bond or he should buy both the bonds and, if so, in which quantity? Assume that there will not be any call risk or default risk.

28. RBI sold a 91-day T-bill of face value of ₹ 100 at an yield of 6%. What was the issue price?
29. Wonderland Limited has excess cash of ₹ 20 lakhs, which it wants to invest in short term marketable securities. Expenses relating to investment will be ₹ 50,000.

The securities invested will have an annual yield of 9%.

The company seeks your advice

- as to the period of investment so as to earn a pre-tax income of 5%. (discuss)
 - the minimum period for the company to breakeven its investment expenditure overtime value of money.
30. Z Co. Ltd. issued commercial paper worth ₹10 crores as per following details:
Date of issue : 16th January, 2019

Date of maturity:	17 th April, 2019
No. of days:	91
Interest rate:	12.04% p.a.

What was the net amount received by the company on issue of CP? (Charges of intermediary may be ignored)

31. Bank A enter into a Repo for 14 days with Bank B in 10% Government of India Bonds 2028 @ 5.65% for ₹ 8 crore. Assuming that clean price (the price that does not have accrued interest) be ₹ 99.42 and initial Margin be 2% and days of accrued interest be 262 days. You are required to determine
- Dirty Price
 - Repayment at maturity. (Consider 360 days in a year)

ANSWERS/SOLUTIONS

Answers to Theoretical Questions

- Please refer paragraph 8.8.
- Please refer paragraph 8.15.

Answers to the Practical Questions

- The company earnings and dividend per share after a year are expected to be:

$$\text{EPS} = ₹ 137.8 \times 0.15 = ₹ 20.67$$

$$\text{Dividend} = 0.40 \times 20.67 = ₹ 8.27$$

The growth in dividend would be:

$$g = 0.6 \times 0.15 = 0.09$$

- As per Dividend Growth Model

$$\text{Perpetual growth model Formula: } P_0 = \frac{\text{Dividend}}{K_e - g}$$

$$P_0 = \frac{8.27}{0.18 - 0.09}$$

$$P_0 = ₹ 91.89$$

- Walter's approach showing relationship between dividend and share price can be expressed by the following formula

$$V_c = \frac{D + \frac{R_a}{R_c}(E - D)}{R_c}$$

Where,

V_c = Market Price of the ordinary share of the company.

R_a = Return on internal retention i.e. the rate company earns on retained profits.

R_c = Capitalisation rate i.e. the rate expected by investors by way of return from particular category of shares.

E = Earnings per share.

D = Dividend per share.

Hence,

$$V_c = \frac{8.27 + \frac{0.15}{0.18}(20.67 - 8.27)}{0.18} = \frac{18.60}{0.18}$$

= ₹ 103.35

2. (i) Number of shares to be issued : 5,00,000

Subscription price ₹ 20,00,000 / 5,00,000 = ₹ 4

$$\text{Ex-right Price} = \frac{\text{₹ } 1,30,00,000 + \text{₹ } 20,00,000}{15,00,000} = \text{₹ } 10$$

Value of a Right = ₹ 10 – ₹ 4 = ₹ 6

$$\text{Value of a Right Per Share Basis} = \frac{\text{₹ } 10 - \text{₹ } 4}{2} = \text{₹ } 3$$

- (ii) Subscription price ₹ 20,00,000 / 2,50,000 = ₹ 8

$$\text{Ex-right Price} = \frac{\text{₹ } 1,30,00,000 + \text{₹ } 20,00,000}{12,50,000} = \text{₹ } 12$$

Value of a Right = ₹ 12 – ₹ 8 = ₹ 4

$$\text{Value of a Right Per Share} = \frac{\text{₹ } 12 - \text{₹ } 8}{4} = \text{₹ } 1$$

- (iii) Calculation of effect of right issue on wealth of Shareholder's wealth who is holding 100 shares.

Since, Actual Stock Price is higher, hence it is overvalued.

(B) Value of the Stock under the Earnings Growth Model

Particulars	
Actual Stock Price	₹ 35.00
Return on equity	9%
EPS	₹ 2.25
Growth Rate	2%
Market Price per Share $[EPS \times (1+g)] / (K_e - g)$ = ₹ 2.25 × 1.02/0.07	₹ 32.79

Since, Actual Stock Price is higher, hence it is overvalued.

5. (i) Expected dividend for next 3 years.

Year 1 (D_1) ₹ 14.00 (1.09) = ₹ 15.26

Year 2 (D_2) ₹ 14.00 (1.09)² = ₹ 16.63

Year 3 (D_3) ₹ 14.00 (1.09)³ = ₹ 18.13

Required rate of return = 13% (K_e)

Market price of share after 3 years = (P_3) = ₹ 360

The present value of share

$$P_0 = \frac{D_1}{(1+ke)} + \frac{D_2}{(1+ke)^2} + \frac{D_3}{(1+ke)^3} + \frac{P_3}{(1+ke)^3}$$

$$P_0 = \frac{15.26}{(1+0.13)} + \frac{16.63}{(1+0.13)^2} + \frac{18.13}{(1+0.13)^3} + \frac{360}{(1+0.13)^3}$$

$$P_0 = 15.26(0.885) + 16.63(0.783) + 18.13(0.693) + 360(0.693)$$

$$P_0 = 13.50 + 13.02 + 12.56 + 249.48$$

$$P_0 = ₹ 288.56$$

- (ii)** If growth rate 9% is achieved for indefinite period, then maximum price of share should Mr. A willing be to pay is

$$P_0 = \frac{D_1}{(ke-g)} = \frac{₹ 15.26}{0.13-0.09} = \frac{₹ 15.26}{0.04} = ₹ 381.50$$

- (iii)** Assuming that conditions mentioned above remain same, the price expected after 3 years will be:

$$P_3 = \frac{D_4}{k_e - g} = \frac{D_3(1.09)}{0.13 - 0.09} = \frac{18.13 \times 1.09}{0.04} = \frac{19.76}{0.04} = ₹ 494$$

**6. (i) Firm's Expected or Required Return on Equity
(Using a dividend discount model approach)**

According to Dividend discount model approach the firm's expected or required return on equity is computed as follows:

$$K_e = \frac{D_1}{P_0} + g$$

Where,

K_e = Cost of equity share capital or (Firm's expected or required return on equity share capital)

D_1 = Expected dividend at the end of year 1

P_0 = Current market price of the share.

g = Expected growth rate of dividend.

Now, $D_1 = D_0 (1 + g)$ or ₹ 1 (1 + 0.12) or ₹ 1.12, $P_0 = ₹ 20$ and $g = 12\%$ per annum

$$\text{Therefore, } K_e = \frac{₹ 1.12}{₹ 20} + 12\%$$

$$\text{Or, } K_e = ₹ 17.6\%$$

(ii) Firm's Expected or Required Return on Equity

(If dividends were expected to grow at a rate of 20% per annum for 5 years and 10% per year thereafter)

Since in this situation if dividends are expected to grow at a super normal growth rate g_s , for n years and thereafter, at a normal, perpetual growth rate of g_n beginning in the year $n + 1$, then the cost of equity can be determined by using the following formula:

$$P_0 = \sum_{t=1}^n \frac{\text{Div}_0 (1 + g_s)^t}{(1 + K_e)^t} + \frac{\text{Div}_{n+1}}{K_e - g_n}$$

Where,

g_s = Rate of growth in earlier years.

g_n = Rate of constant growth in later years.

P_0 = Discounted value of dividend stream.

K_e = Firm's expected, required return on equity (cost of equity capital).

Now,

$$g_s = 20\% \text{ for 5 years, } g_n = 10\%$$

Therefore,

$$P_0 = \sum_{t=1}^n \frac{D_0 (1+0.20)^t}{(1+K_e)^t} + \frac{\text{Div}_{5+1}}{K_e - 0.10} \times \frac{1}{(1+K_e)^t}$$

$$P_0 = \frac{1.20}{(1+k_e)^1} + \frac{1.44}{(1+k_e)^2} + \frac{1.73}{(1+k_e)^3} + \frac{2.07}{(1+k_e)^4} + \frac{2.49}{(1+k_e)^5} + \frac{2.49(1+0.10)}{k_e - 0.10} \times \frac{1}{(1+k_e)^5}$$

$$\text{or } P_0 = ₹ 1.20 (\text{PVF}_1, K_e) + ₹ 1.44 (\text{PVF}_2, K_e) + ₹ 1.73 (\text{PVF}_3, K_e) + ₹ 2.07$$

$$(\text{PVF}_4, K_e) + ₹ 2.49 (\text{PVF}_5, K_e) + \frac{\text{Rs. } 2.74 (\text{PVF}_5, K_e)}{K_e - 0.10}$$

By trial and error we are required to find out K_e

Now, assume $K_e = 18\%$ then we will have

$$P_0 = ₹ 1.20 (0.8475) + ₹ 1.44 (0.7182) + ₹ 1.73 (0.6086) + ₹ 2.07 (0.5158) + ₹ 2.49 (0.4371) + ₹ 2.74 (0.4371) \times \frac{1}{0.18 - 0.10}$$

$$= ₹ 1.017 + ₹ 1.034 + ₹ 1.053 + ₹ 1.068 + ₹ 1.09 + ₹ 14.97 = ₹ 20.23$$

Since the present value of dividend stream is more than required it indicates that K_e is greater than 18%.

Now, assume $K_e = 19\%$ we will have

$$P_0 = ₹ 1.20 (0.8403) + ₹ 1.44 (0.7061) + ₹ 1.73 (0.5934) + ₹ 2.07 (0.4986) + ₹ 2.49 (0.4190) + ₹ 2.74 (0.4190) \times \frac{1}{0.19 - 0.10}$$

$$= ₹ 1.008 + ₹ 1.017 + ₹ 1.026 + ₹ 1.032 + ₹ 1.043 + ₹ 12.76$$

$$= ₹ 17.89$$

Since the market price of share (expected value of dividend stream) is ₹ 20. Therefore, the discount rate is closer to 18% than it is to 19%, we can get the exact rate by interpolation by using the following formula:

$$K_e = LR + \frac{\text{NPV at LR}}{\text{NPV at LR} - \text{NPV at HR}} \times \Delta r$$

Where,

LR = Lower Rate

NPV at LR = Present value of share at LR

NPV at HR = Present value of share at Higher Rate

Δr = Difference in rates

$$\begin{aligned} K &= 18\% + \frac{(\text{₹ } 20.23 - \text{₹ } 20)}{\text{₹ } 20.23 - \text{₹ } 17.89} \times 1\% \\ &= 18\% + \frac{\text{₹ } 0.23}{\text{₹ } 2.34} \times 1\% \\ &= 18\% + 0.10\% = 18.10\% \end{aligned}$$

Therefore, the firm's expected, or required, return on equity is 18.10%. At this rate the present discounted value of dividend stream is equal to the market price of the share.

7. (a) Calculation of Profit after tax (PAT)

	₹
Profit before interest and tax (PBIT)	32,00,000
Less: Debenture interest (₹ 64,00,000 × 12/100)	<u>7,68,000</u>
Profit before tax (PBT)	24,32,000
Less: Tax @ 35%	<u>8,51,200</u>
Profit after tax (PAT)	15,80,800
Less: Preference Dividend	
(₹ 40,00,000 × 8/100)	3,20,000
Equity Dividend (₹ 80,00,000 × 8/100)	<u>6,40,000</u>
Retained earnings (Undistributed profit)	<u>6,20,800</u>

Calculation of Interest and Fixed Dividend Coverage

$$\begin{aligned} &= \frac{\text{PAT} + \text{Debenture interest}}{\text{Debenture interest} + \text{Preference dividend}} \quad \text{or} \quad \frac{\text{PAT} + \text{Debenture Interest Net of Tax}}{\text{Debenture interest} + \text{Preference dividend}} \\ &= \frac{15,80,800 + 7,68,000}{7,68,000 + 3,20,000} \quad \text{or} \quad \frac{15,80,800 + 4,99,200}{7,68,000 + 3,20,000} \\ &= \frac{23,48,800}{10,88,000} \quad \text{or} \quad \frac{20,80,000}{10,88,000} = 2.16 \text{ times or } 1.91 \text{ times} \end{aligned}$$

(b) Calculation of Capital Gearing Ratio

$$\text{Capital Gearing Ratio} = \frac{\text{Fixed interest bearing funds}}{\text{Equity shareholders' funds}}$$

$$= \frac{\text{Preference Share Capital} + \text{Debentures}}{\text{Equity Share Capital} + \text{Reserves}} = \frac{40,00,000 + 64,00,000}{80,00,000 + 32,00,000} = \frac{1,04,00,000}{1,12,00,000} = 0.93$$

(c) Calculation of Yield on Equity Shares:

Yield on equity shares is calculated at 50% of profits distributed and 5% on undistributed profits:

	(₹)
50% on distributed profits (₹ 6,40,000 × 50/100)	3,20,000
5% on undistributed profits (₹ 6,20,800 × 5/100)	<u>31,040</u>
Yield on equity shares	<u>3,51,040</u>

$$\begin{aligned} \text{Yield on equity shares \%} &= \frac{\text{Yield on shares}}{\text{Equity share capital}} \times 100 \\ &= \frac{3,51,040}{80,00,000} \times 100 = 4.39\% \text{ or, } 4.388\%. \end{aligned}$$

Calculation of Expected Yield on Equity shares

- (a) Interest and fixed dividend coverage of Sun Ltd. is 2.16 times but the industry average is 3 times. Therefore, risk premium is added to Sun Ltd. Shares @ 1% for every 1 time of difference.

$$\text{Risk Premium} = 3.00 - 2.16 (1\%) = 0.84 (1\%) = 0.84\%$$

- (b) Capital Gearing ratio of Sun Ltd. is 0.93 but the industry average is 0.75 times. Therefore, risk premium is added to Sun Ltd. shares @ 2% for every 1 time of difference.

$$\text{Risk Premium} = (0.75 - 0.93) (2\%) = 0.18 (2\%) = 0.36\%$$

	(%)
Normal return expected	9.60
Add: Risk premium for low interest and fixed dividend coverage	0.84
Add: Risk premium for high interest gearing ratio	<u>0.36</u>
	<u>10.80</u>

Value of Equity Share

$$= \frac{\text{Actual yield}}{\text{Expected yield}} \times \text{Paid-up value of share} = \frac{4.39}{10.80} \times 100 = ₹ 40.65$$

8. CAPM formula for calculation of Expected Rate of Return is :

$$\begin{aligned} \text{ER} &= R_f + \beta (R_m - R_f) \\ &= 8 + 1.5 (12 - 8) \end{aligned}$$

$$\begin{aligned}
 &= 8 + 1.5 (4) \\
 &= 8 + 6 \\
 &= 14\% \text{ or } 0.14
 \end{aligned}$$

Applying Dividend Growth Model for the calculation of per share equilibrium price:

$$ER = \frac{D_1}{P_0} + g$$

$$0.14 = \frac{3(1.10)}{P_0} + 0.10$$

$$0.14 - 0.10 = \frac{3.30}{P_0}$$

$$0.04 P_0 = 3.30$$

$$P_0 = \frac{3.30}{0.04} = ₹ 82.50$$

Per share equilibrium price will be ₹ 82.50.

9. In order to find out the value of a share with constant growth model, the value of K_e should be ascertained with the help of 'CAPM' model as follows:

$$K_e = R_f + \beta (K_m - R_f)$$

Where,

K_e = Cost of equity

R_f = Risk free rate of return

β = Portfolio Beta i.e. market sensitivity index

K_m = Expected return on market portfolio

By substituting the figures, we get

$$K_e = 0.09 + 1.5 (0.13 - 0.09) = 0.15 \text{ or } 15\%$$

and the value of the share as per constant growth model is

$$P_0 = \frac{D_1}{(k_e - g)}$$

Where,

P_0 = Price of a share

D_1 = Dividend at the end of the year 1

K_e = Cost of equity

g = growth

$$P_0 = \frac{2.00}{(k_e - g)}$$

$$P_0 = \frac{2.00}{0.15 - 0.07} = ₹ 25.00$$

Alternatively, it can also be found as follows:

$$\frac{2.00 (1.07)}{0.15 - 0.07} = ₹ 26.75$$

However, if the decision of finance manager is implemented, the beta (β) factor is likely to increase to 1.75 therefore, K_e would be

$$K_e = R_f + \beta (K_m - R_f) \\ = 0.09 + 1.75 (0.13 - 0.09) = 0.16 \text{ or } 16\%$$

The value of share is

$$P_0 = \frac{D_1}{(k_e - g)}$$

$$P_0 = \frac{2.00}{0.16 - 0.07} = ₹ 22.22$$

Alternatively, it can also be found as follows:

$$\frac{2.00 (1.07)}{0.16 - 0.07} = ₹ 23.78$$

10. No. of Shares = $\frac{₹ 1,300 \text{ crores}}{₹ 40} = 32.5 \text{ Crores}$

$$\text{EPS} = \frac{\text{PAT}}{\text{No. of shares}}$$

$$\text{EPS} = \frac{₹ 290 \text{ crores}}{32.5 \text{ crores}} = ₹ 8.923$$

$$\text{FCFE} = \text{Net income} - [(1-b) (\text{capex} - \text{dep}) + (1-b) (\Delta \text{WC})]$$

$$\text{FCFE} = 8.923 - [(1-0.27) (47-39) + (1-0.27) (3.45)]$$

$$= 8.923 - [5.84 + 2.5185] = 0.5645$$

$$\text{Cost of Equity} = R_f + \beta (R_m - R_f)$$

$$= 8.7 + 0.1 (10.3 - 8.7) = 8.86\%$$

$$P_0 = \frac{FCFE(1+g)}{K_e - g} = \frac{0.5645(1.08)}{0.0886 - .08} = \frac{0.60966}{0.0086} = ₹ 70.89$$

11. (i) Cost of Capital

Retained earnings (45%)	₹ 5 per share
Dividend (55%)	₹ 6.11 per share
EPS (100%)	₹ 11.11 per share
P/E Ratio	8 times
Market price	₹ 11.11 × 8 = ₹ 88.88

Cost of equity capital

$$= \left(\frac{\text{Div}}{\text{Price}} \times 100 \right) + \text{Growth \%} = \frac{₹ 6.11}{₹ 88.88} \times 100 + 15\% = 21.87\%$$

$$(ii) \text{ Market Price} = \left(\frac{\text{Dividend}}{\text{Cost of Capital(\%)} - \text{Growth Rate(\%)}} \right)$$

$$= \frac{₹ 6.11}{(21.87-16)\%} = ₹ 104.08 \text{ per share}$$

$$(iii) \text{ Market Price} = \frac{₹ 6.11}{(20-19)\%} = ₹ 611.00 \text{ per share}$$

12. Workings:

Asset turnover ratio	= 1.1
Total Assets	= ₹ 600
Turnover ₹ 600 lakhs × 1.1	= ₹ 660 lakhs
Effective interest rate	= $\frac{\text{Interest}}{\text{Liabilities}} = 8\%$
Liabilities	= ₹ 125 lakhs + 50 lakhs = 175 lakh
Interest	= ₹ 175 lakhs × 0.08 = ₹ 14 lakh
Operating Margin	= 10%
Hence operating cost	= (1 - 0.10) ₹ 660 lakhs = ₹ 594 lakh
Dividend Payout	= 16.67%
Tax rate	= 40%

(i) Income statement

	(₹ Lakhs)
Sale	660
Operating Exp	<u>594</u>
EBIT	66
Interest	<u>14</u>
EBT	52
Tax @ 40%	<u>20.80</u>
EAT	31.20
Dividend @ 16.67%	<u>5.20</u>
Retained Earnings	<u>26.00</u>

(ii) SGR = ROE (1-b)

$$ROE = \frac{PAT}{NW} \text{ and } NW = ₹ 100 \text{ lakh} + ₹ 300 \text{ lakh} = 400 \text{ lakh}$$

$$ROE = \frac{₹ 31.2 \text{ lakhs}}{₹ 400 \text{ lakhs}} \times 100 = 7.8\%$$

$$SGR = 0.078(1 - 0.1667) = 6.5\% \text{ or } \frac{0.078 \times 0.8333}{1 - 0.078 \times 0.8333} = 6.95\%$$

(iii) Calculation of fair price of share using dividend discount model

$$P_0 = \frac{D_0(1+g)}{k_e - g}$$

$$\text{Dividends} = \frac{₹ 5.2 \text{ lakhs}}{₹ 10 \text{ lakhs}} = ₹ 0.52$$

$$\text{Growth Rate} = 6.5\% \text{ or } 6.95\%$$

$$\text{Hence } P_0 = \frac{₹ 0.52(1+0.065)}{0.15-0.065} = \frac{₹ 0.5538}{0.085} = ₹ 6.51 \text{ or } \frac{0.52(1+0.0695)}{0.15-0.0695}$$

$$= \frac{0.5561}{0.0805} = ₹ 6.91$$

(iv) Since the current market price of share is ₹ 14, the share is overvalued. Hence the investor should not invest in the company.

$$13. \text{ Intrinsic Value } P_0 = \frac{D_1}{k-g}$$

Using CAPM

$$k = R_f + \beta (R_m - R_f)$$

R_f = Risk Free Rate

β = Beta of Security

R_m = Market Return

$$= 9\% + 0.75 (15\% - 9\%) = 13.5\%$$

$$P = \frac{2.5 \times 1.1}{0.135 - 0.10} = \frac{2.75}{0.035} = ₹ 78.57$$

14. P.V. of dividend stream and sales proceeds

Year	Divd. /Sale	PVF (12%)	PV (₹)
1	₹ 20/-	0.893	17.86
2	₹ 20/-	0.797	15.94
3	₹ 20/-	0.712	14.24
4	₹ 24/-	0.636	15.26
5	₹ 24/	0.567	13.61
6	₹ 24/	0.507	12.17
7	₹ 24/	0.452	10.85
7	₹ 1026/- (₹ 900 x 1.2 x 0.95)	0.452	<u>463.75</u>
			₹ 563.68
	Less : - Cost of Share (₹ 500 x 1.05)		<u>₹ 525.00</u>
	Net gain		<u>₹ 38.68</u>

Since Mr. A is gaining ₹ 38.68 per share, he should buy the share.

Maximum price Mr. A should be ready to pay is ₹ 563.68 which will include incidental expenses. So the maximum price should be ₹ 563.68 x 100/105 = ₹ 536.84

15. (i) Equilibrium price of Equity using CAPM

$$= 9\% + 1.2(13\% - 9\%)$$

$$= 9\% + 4.8\% = 13.8\%$$

$$P = \frac{D_1}{k_e - g} = \frac{2.00(1.07)}{0.138 - 0.07} = \frac{2.14}{0.068} = ₹ 31.47$$

(ii) New Equilibrium price of Equity using CAPM

$$= 9.18\% + 1.3(13\% - 9.18\%)$$

$$= 9.18\% + 4.966\% = 14.146\%$$

$$P = \frac{D_1}{k_e - g} = \frac{2.00(1.10)}{0.14146 - 0.10} = \frac{2.20}{0.04146} = ₹ 53.06$$

Alternatively, it can also be computed as follows:

$$= 11\% + 1.3(15\% - 11\%)$$

$$= 11\% + 5.2\% = 16.20\%$$

$$P = \frac{D_1}{k_e - g} = \frac{2.00(1.10)}{0.162 - 0.10} = ₹ 35.48$$

Alternatively, if all the factors are taken separately then solution will be as follows:

(i) Inflation Premium increase by 2%. This raises R_x to 15.80%. Hence, new equilibrium price will be:

$$= \frac{2.00(1.07)}{0.158 - 0.07} = ₹ 24.32$$

(ii) Expected Growth rate increases by 3%. Hence, revised growth rate stands at 10%:

$$= \frac{2.00(1.10)}{0.138 - 0.10} = ₹ 57.89$$

(iii) Beta rises to 1.3. Hence, revised cost of equity shall be:

$$= 9\% + 1.3(13\% - 9\%)$$

$$= 9\% + 5.2\% = 14.2\%$$

As a result, New Equilibrium price shall be:

$$P = \frac{D_1}{k_e - g} = \frac{2.00(1.07)}{0.142 - 0.07} = ₹ 29.72$$

$$\begin{aligned} 16. \quad \text{Value of share at present} &= \frac{D_1}{k_e - g} \\ &= \frac{2(1.06)}{0.08 - 0.06} = ₹ 106 \end{aligned}$$

However, if the Board implement its decision, no dividend would be payable for 3 years and the dividend for year 4 would be ₹ 2.50 and growing at 7% p.a. The price of the share, in this case, now would be:

$$P_0 = \frac{2.50}{0.08 - 0.07} \times \frac{1}{(1 + 0.08)^3} = ₹ 198.46$$

So, the price of the share is expected to increase from ₹ 106 to ₹ 198.45 after the announcement of the project. The investor can take up this situation as follows:

$$\text{Expected market price after 3 years} = \frac{2.50}{0.08 - 0.07} = ₹ 250.00$$

$$\text{Expected market price after 2 years} = \frac{2.50}{0.08 - 0.07} \times \frac{1}{(1 + 0.08)} = ₹ 231.48$$

$$\text{Expected market price after 1 years} = \frac{2.50}{0.08 - 0.07} \times \frac{1}{(1 + 0.08)^2} = ₹ 214.33$$

In order to maintain his receipt at least ₹ 2,000 for first 3 year, he would sell

10 shares in first year @ ₹ 214.33 for ₹ 2,143.30

9 shares in second year @ ₹ 231.48 for ₹ 2,083.32

8 shares in third year @ ₹ 250 for ₹ 2,000.00

At the end of 3rd year, he would be having 973 shares valued @ ₹ 250 each i.e. ₹ 2,43,250.

On these 973 shares, his dividend income for year 4 would be @ ₹ 2.50 i.e. ₹ 2,432.50.

So, if the project is taken up by the company, the investor would be able to maintain his receipt of at least ₹ 2,000 for first three years and would be getting increased income thereafter.

$$17. \quad \beta = \frac{\text{Covariance of Market Return and Security Return}}{\text{Variance of Market Return}}$$

$$\beta = \frac{30\%}{24\%} = 1.25$$

$$\text{Expected Return} = R_f + \beta(R_m - R_f)$$

$$= 11\% + 1.25(18\% - 11\%) = 11\% + 8.75\% = 19.75\%$$

Intrinsic Value

Year	Dividend (₹)	PVF (19.75%,n)	Present Value (₹)
1	2.80	0.835	2.34
2	3.92	0.697	2.73
3	5.49	0.582	3.19
4	7.68	0.486	3.73
5	10.76	0.406	4.37
			16.36

$$\text{PV of Terminal Value} = \frac{10.76(1.15)}{0.1975 - 0.15} \times 0.406 = ₹ 105.77$$

$$\text{Intrinsic Value} = ₹ 16.36 + ₹ 105.77 = ₹ 122.13$$

18. (i) Let P be the buyback price decided by Rahul Ltd.

Market Capitalisation after Buyback

1.1P (Original Shares – Shares Bought Back)

$$= 1.1P \left(10 \text{ lakhs} - \frac{27\% \text{ of } 100 \text{ lakhs}}{P} \right)$$

$$= 11 \text{ lakhs} \times P - 27 \text{ lakhs} \times 1.1 = 11 \text{ lakhs } P - 29.7 \text{ lakhs}$$

Again, 11 lakhs P – 29.7 lakhs

$$\text{or } 11 \text{ lakhs } P = 210 \text{ lakhs} + 29.7 \text{ lakhs}$$

$$\text{or } P = \frac{239.7}{11} = ₹ 21.79 \text{ per share}$$

(ii) Number of Shares to be Bought Back :-

$$\frac{₹ 27 \text{ lakhs}}{₹ 21.79} = 1.24 \text{ lakhs (Approx.) or } 123910 \text{ share}$$

(iii) New Equity Shares:-

$$10 \text{ lakhs} - 1.24 \text{ lakhs} = 8.76 \text{ lakhs or } 1000000 - 123910 = 876090 \text{ shares}$$

$$\therefore \text{EPS} = \frac{3 \times 10 \text{ lakhs}}{8.76 \text{ lakhs}} = ₹ 3.43$$

Thus, EPS of Rahul Ltd., increases to ₹ 3.43.

19. Case (i) Required yield rate = 5%

Year	Cash Flow ₹	DF (5%)	Present Value ₹
1-5	10	4.3295	43.295
5	110	0.7835	86.185
Value of bond			129.48

Case (ii) Required yield rate = 5.1%

Year	Cash Flow ₹	DF (5.1%)	Present Value ₹
1-5	10	4.3175	43.175
5	110	0.7798	85.778
Value of bond			128.953

Case (iii) Required yield rate = 10%

Year	Cash Flow ₹	DF (10%)	Present Value ₹
1-5	10	3.7908	37.908
5	110	0.6209	68.299
Value of bond			106.207

Case (iv) Required yield rate = 10.1%

Year	Cash Flow ₹	DF (10.1%)	Present Value ₹
1-5	10	3.7811	37.811
5	110	0.6181	67.991
Value of bond			105.802

20. (i) **Calculation of Maximum price**

$$\begin{aligned}
 B_0 &= ₹ 11 \times PVIFA (13\%, 3) + ₹ 100 \times PVIF (13\%, 3) \\
 &= ₹ 11 \times 2.361 + ₹ 100 \times 0.693 = ₹ 25.97 + ₹ 69.30 = ₹ 95.27
 \end{aligned}$$

(ii) **Calculation of yield**

$$\begin{aligned}
 \text{At 12\% the value} &= ₹ 11 \times PVIFA (12\%, 3) + 100 \times PVIF (12\%, 3) \\
 &= ₹ 11 \times 2.402 + ₹ 100 \times 0.712 = ₹ 26.42 + ₹ 71.20 = ₹ 97.62
 \end{aligned}$$

It the bond is selling at ₹ 97.60 which is more than the fair value, the YTM of the bond would be less than 13%. This value is almost equal to the amount price of ₹ 97.60. Therefore, the YTM of the bond would be 12%.

Alternatively

$$\text{YTM} = \frac{₹ 11 + \frac{(₹ 100 - ₹ 97.60)}{3}}{\frac{(₹ 100 + ₹ 97.60)}{2}} = 0.1194 \text{ or } 11.94\% \text{ say } 12\%$$

21. (i) Current yield = (Coupon Interest / Market Price) X 100
 $(10/110) \times 100 = 9.09\%$
 If current yield go up by 1% i.e. 10.09 the market price would be
 $10.09 = 10 / \text{Market Price} \times 100$
 Market Price = ₹ 99.11

(ii) Market Price of Bond = P.V. of Interest + P.V. of Principal
 $= ₹ 1,394 + ₹ 8,885 = ₹ 10,279$

22. Conversion rate is 14 shares per bond. Market price of share ₹ 80
 Conversion Value $14 \times ₹ 80 = ₹ 1120$
 Market price of bond = ₹ 1475

Premium over Conversion Value $(₹ 1475 - ₹ 1120) = \frac{355}{1120} \times 100 = 31.7\%$

23. If Debentures are not converted its value is as under: -

	PVF @ 8 %	₹
Interest - ₹ 12 for 5 years	3.993	47.916
Redemption - ₹ 100 in 5 th year	0.681	<u>68.100</u>
		<u>116.016</u>

Value of equity shares:-

Market Price	No.	Total
₹ 4	20	₹ 80
₹ 5	20	₹ 100
₹ 6	20	₹ 120

Hence, unless the market price is ₹ 6 conversion should not be exercised.

24. (i) **Stock value or conversion value of bond**

$12 \times 20 = ₹ 240$

- (ii) **Percentage of the downside risk**

$\frac{₹ 265 - ₹ 235}{₹ 235} = 0.1277$ or 12.77% or $\frac{₹ 265 - ₹ 235}{₹ 265} = 0.1132$ or 11.32%

This ratio gives the percentage price decline experienced by the bond if the stock becomes worthless.

(iii) Conversion Premium

$$\frac{\text{Market Price} - \text{Conversion Value}}{\text{Conversion Value}} \times 100$$

$$\frac{\text{₹ } 265 - \text{₹ } 240}{\text{₹ } 240} \times 100 = 10.42\%$$

(iv) Conversion Parity Price

$$\frac{\text{Bond Price}}{\text{No. of Shares on Conversion}}$$

$$\frac{\text{₹ } 265}{20} = \text{₹ } 13.25$$

This indicates that if the price of shares rises to ₹ 13.25 from ₹ 12 the investor will neither gain nor lose on buying the bond and exercising it. Observe that ₹ 1.25 (₹ 13.25 – ₹ 12.00) is 10.42% of ₹ 12, the Conversion Premium.

25. (i) Calculation of initial outlay:-

	₹ (million)
a. Face value	300
Add:-Call premium	<u>12</u>
Cost of calling old bonds	<u>312</u>
b. Gross proceed of new issue	300
Less: Issue costs	<u>6</u>
Net proceeds of new issue	<u>294</u>
c. Tax savings on call premium	
and unamortized cost 0.30 (12 + 9)	6.3
∴ Initial outlay = ₹ 312 million – ₹ 294 million – ₹ 6.3 million = ₹ 11.7 million	

(ii) Calculation of net present value of refunding the bond:-

Saving in annual interest expenses	₹ (million)
[300 x (0.12 – 0.10)]	6.00
Less:- Tax saving on interest and amortization	
0.30 x [6 + (9-6)/6]	<u>1.95</u>
Annual net cash saving	<u>4.05</u>

PVIFA (7%, 6 years)	4.766
∴ Present value of net annual cash saving	₹ 19.30 million
Less:- Initial outlay	<u>₹ 11.70 million</u>
Net present value of refunding the bond	<u>₹ 7.60 million</u>

Decision: The bonds should be refunded

26. (a) Calculation of Market price:

$$= 160 (PVIFA\ 17\%,6) + 1,000 (PVIF\ 17\%,6)$$

$$= 160 (3.589) + 1,000 (0.390) = 574.24 + 390 = 964.24$$

(b) Duration

Year	Cash flow	P.V. @ 17%		Proportion of bond value	Proportion of bond value x time (years)
1	160	0.855	136.80	0.142	0.142
2	160	0.731	116.96	0.121	0.246
3	160	0.624	99.84	0.103	0.309
4	160	0.534	85.44	0.089	0.356
5	160	0.456	72.96	0.076	0.380
6	1160	0.390	<u>452.40</u>	<u>0.469</u>	<u>2.814</u>
			<u>964.40</u>	<u>1.000</u>	<u>4.247</u>

Duration of the Bond is 4.247 years

Alternatively, it can also be calculated as follows:

Year	Cash flow	P.V. @ 17%		P.V. x Year
1	160	0.855	136.80	136.80
2	160	0.731	116.96	233.92
3	160	0.624	99.84	299.52
4	160	0.534	85.44	341.76
5	160	0.456	72.96	364.80
6	1160	0.390	<u>452.40</u>	<u>2714.40</u>
			<u>964.40</u>	<u>4091.20</u>

$$D = \frac{\sum_{t=1}^n t \times \text{PV of } CF_t}{P_0}$$

$$D = \frac{4091.20}{964.40} = 4.242 \text{ years}$$

Alternatively, as per Short Cut Method

$$D = \frac{1 + \text{YTM}}{\text{YTM}} - \frac{(1 + \text{YTM}) + t(c - \text{YTM})}{c[(1 + \text{YTM})^t - 1] + \text{YTM}}$$

Where YTM = Yield to Maturity

c = Coupon Rate

t = Years to Maturity

$$= \frac{1.17}{0.17} - \frac{1.17 + 6(0.16 - 0.17)}{0.16[(1.17)^6 - 1] + 0.17}$$

$$D = 4.24 \text{ years}$$

(c) **Volatility**

$$\text{Volatility of the bonds} = \frac{\text{Duration}}{(1 + \text{yields})} = \frac{4.247}{1.17} = 3.63 \text{ Or } = \frac{4.2422}{1.17} = 3.6258$$

(d) **The expected market price if increase in required yield is by 75 basis points.**

$$= ₹ 960.26 \times .75 (3.63/100) = ₹ 26.142$$

$$\text{Hence expected market price is } ₹ 960.26 - ₹ 26.142 = ₹ 934.118$$

Hence, the market price will decrease

This portion can also be alternatively done as follows

$$= ₹ 964.40 \times .75 (3.63/100) = ₹ 26.26$$

$$\text{then the market price will be } = ₹ 964.40 - 26.26 = ₹ 938.14$$

27. **Duration of Bond X**

Year	Cash flow	P.V. @ 10%		Proportion of bond value	Proportion of bond value x time (years)
1	1070	0.909	972.63	1.000	1.000

Duration of the Bond is 1 year

Duration of Bond Y

Year	Cash flow	P.V. @ 10%		Proportion of bond value	Proportion of bond value x time (years)
1	80	0.909	72.72	0.077	0.077
2	80	0.826	66.08	0.071	0.142
3	80	0.751	60.08	0.064	0.192
4	1080	0.683	<u>737.64</u>	<u>0.788</u>	<u>3.152</u>
			<u>936.52</u>	<u>1.000</u>	<u>3.563</u>

Duration of the Bond is 3.563 years

Let x_1 be the investment in Bond X and therefore investment in Bond Y shall be $(1 - x_1)$. Since the required duration is 2 years the proportion of investment in each of these two securities shall be computed as follows:

$$2 = x_1 + (1 - x_1) 3.563$$

$$x_1 = 0.61$$

Accordingly, the proportion of investment shall be 61% in Bond X and 39% in Bond Y respectively.

Amount of investment

Bond X	Bond Y
PV of ₹ 1,00,000 for 2 years @ 10% x 61%	PV of ₹ 1,00,000 for 2 years @ 10% x 39%
= ₹ 1,00,000 (0.826) x 61%	= ₹ 1,00,000 (0.826) x 39%
= ₹ 50,386	= ₹ 32,214
No. of Bonds to be purchased	No. of Bonds to be purchased
= ₹ 50,386/₹ 972.63 = 51.80 i.e. approx. 52 bonds	= ₹ 32,214/₹ 936.52 = 34.40 i.e. approx. 34 bonds

Note: The investor has to keep the money invested for two years. Therefore, the investor can invest in both the bonds with the assumption that Bond X will be reinvested for another one year on same returns.

Further, in the above computation, Modified Duration can also be used instead of Duration.

28. Let the issue price be X

By the terms of the issue of the T-bills:

$$6\% = \frac{100 - x}{x} \times \frac{365}{91} \times 100$$

$$\frac{6 \times 91 \times x}{36,500} = (100 - x)$$

$$0.01496 x = 100 - x$$

$$x = \frac{100}{1.01496} = ₹ 98.53$$

29. (i) Pre-tax Income required on investment of ₹ 20,00,000

Let the period of Investment be 'P' and return required on investment ₹ 1,00,000
(₹ 20,00,000 x 5%)

Accordingly,

$$\left(₹ 20,00,000 \times \frac{9}{100} \times \frac{P}{12} \right) - ₹ 50,000 = ₹ 1,00,000$$

$$P = 10 \text{ months}$$

(ii) Break-Even its investment expenditure

$$\left(₹ 20,00,000 \times \frac{9}{100} \times \frac{P}{12} \right) - ₹ 50,000 = 0$$

$$P = 3.33 \text{ months}$$

30. The company had issued commercial paper worth ₹10 crores

No. of days Involves = 91 days

Interest rate applicable = 12.04 % p.a.

$$\text{Interest for 91 days} = 12.04\% \times \frac{91 \text{ Days}}{365 \text{ Days}} = 3.002\%$$

$$= \text{or } ₹ 10 \text{ crores} \times \frac{3.002}{100 + 3.002} = ₹ 29,14,507$$

$$= \text{or } ₹ 29.14507 \text{ Lakhs}$$

∴ Net amount received at the time of issue:- ₹ 10.00 Crores – ₹ 0.29151 Crores = ₹ 9.70849 Crores

Alternatively, it can also be computed as follows:

$$\text{Price} = \frac{\text{₹ 10 Crores}}{\left(1 + 12.04\% \times \frac{91 \text{ Days}}{365 \text{ Days}}\right)} = \text{₹ 9.70855 Crores}$$

31. (i) Dirty Price

= Clean Price + Interest Accrued

$$= 99.42 + 100 \times \frac{10}{100} \times \frac{262}{360} = 106.70$$

(ii) First Leg (Start Proceed)

$$= \text{Nominal Value} \times \frac{\text{Dirty Price}}{100} \times \frac{100 - \text{Initial Margin}}{100}$$

$$= \text{₹}8,00,00,000 \times \frac{106.70}{100} \times \frac{100 - 2}{100} = \text{₹}8,36,52,800$$

$$\text{Second Leg (Repayment at Maturity)} = \text{Start Proceed} \times \left(1 + \text{Repo rate} \times \frac{\text{No. of days}}{360}\right)$$

$$= \text{₹}8,36,52,800 \times \left(1 + 0.0565 \times \frac{14}{360}\right) = \text{₹}8,38,36,604$$

PORTFOLIO MANAGEMENT



LEARNING OUTCOMES

After going through the chapter student shall be able to understand

- Activities in Portfolio Management
- Objectives of Portfolio Management
- Phases of Portfolio Management
 - (1) Security Analysis
 - (2) Portfolio Analysis
 - (3) Portfolio Selection
 - (4) Portfolio Revision
 - (5) Portfolio Evaluation
- Portfolio Theories
 - (1) Traditional Approach
 - (2) Modern Approach (Markowitz Model or Risk-Return Optimization)
- Risk Analysis
 - (1) Types of Risk
 - (2) Diversification of Risk

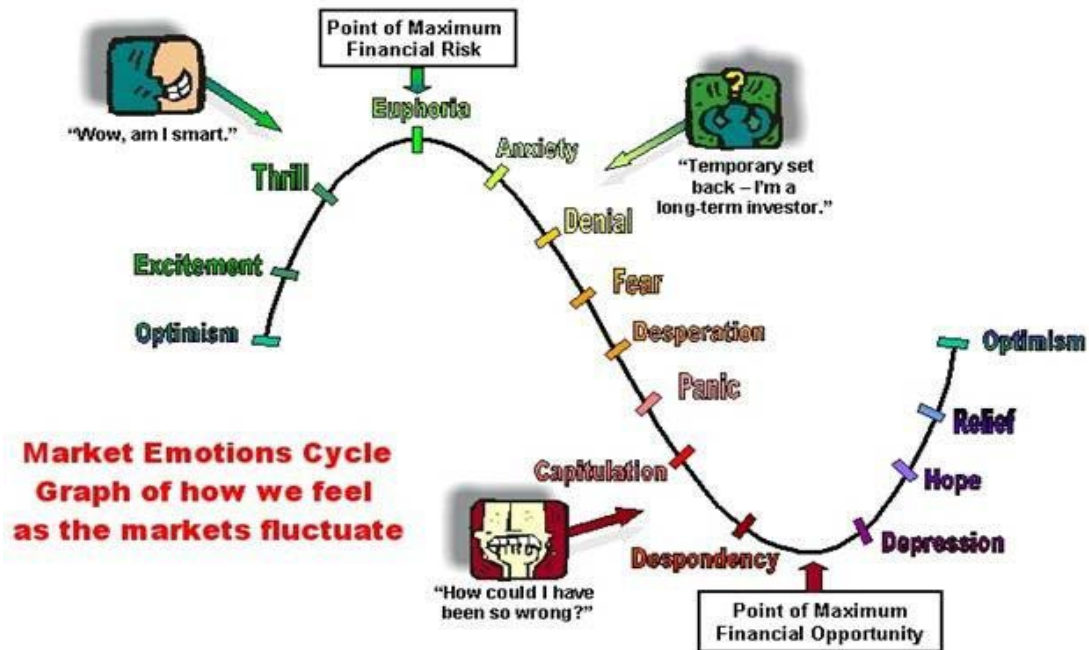
- (3) Risk & Return
- (4) Portfolio Analysis
- Markowitz Model of Risk-Return Optimization
- Capital Market Theory
- Sharpe Index Model (Single Index Model)
- Capital Asset Pricing Model (CAPM)
- Arbitrage Pricing Theory Model (APT)
- Portfolio Evaluation Methods
- Sharpe's Optimal Portfolio
- Formulation of Portfolio Strategy
- Portfolio Revision and Rebalancing
- Asset Allocation Strategies
- Fixed Income Portfolio
- Alternative Investment Avenues

1. INTRODUCTION

Investment in the securities such as bonds, debentures and shares etc. is lucrative as well as exciting for the investors. Though investment in these securities may be rewarding, it is also fraught with risk. Therefore, investment in these securities requires a good amount of scientific and analytical skills. As per the famous principle of not putting all eggs in the same basket, an investor never invests his entire investable funds in one security. He invests in a well diversified portfolio of a number of securities which will optimize the overall risk-return profile. Investment in a portfolio can reduce risk without diluting the returns. An investor, who is expert in portfolio analysis, may be able to generate trading profits on a sustained basis.

Every investment is characterized by return and risk. The concept of risk is intuitively understood by investors. In general, it refers to the possibility of the rate of return from a security or a portfolio of securities deviating from the corresponding expected/average rate and can be measured by the standard deviation/variance of the rate of return.

How different type of Investors react in different situations



Source: www.missiassaughsale.com

1.1 Activities in Portfolio Management

The following three major activities are involved in the formation of an Optimal Portfolio suitable for any given investor:

- Selection of securities.
- Construction of all Feasible Portfolios with the help of the selected securities.
- Deciding the weights/proportions of the different constituent securities in the portfolio so that it is an Optimal Portfolio for the concerned investor.

The activities are directed to achieve an Optimal Portfolio of investments commensurate with the risk appetite of the investor.

1.2 Objectives of Portfolio Management

Some of the important objectives of portfolio management are:

- Security/Safety of Principal Amount:** Security not only involves keeping the principal sum intact but also its purchasing power.

- (ii) **Stability of Income:** To facilitate planning more accurately and systematically the reinvestment or consumption of income.
- (iii) **Capital Growth:** It can be attained by reinvesting in growth securities or through purchase of growth securities.
- (iv) **Marketability i.e. the case with which a security can be bought or sold:** This is essential for providing flexibility to investment portfolio.
- (v) **Liquidity i.e. nearness to money:** It is desirable for the investor so as to take advantage of attractive opportunities upcoming in the market.
- (vi) **Diversification:** The basic objective of building a portfolio is to reduce the risk of loss of capital and/or income by investing in various types of securities and over a wide range of industries.
- (vii) **Favourable Tax Status:** The effective yield an investor gets from his investment depends on tax to which it is subjected to. By minimising the tax burden, yield can be effectively improved.



2. PHASES OF PORTFOLIO MANAGEMENT

Portfolio management is a process and broadly it involves following five phases and each phase is an integral part of the whole process and the success of portfolio management depends upon the efficiency in carrying out each of these phases.

2.1 Security Analysis

The securities available to an investor for investment are numerous in number and of various types. The securities are normally classified on the basis of ownership of securities such as equity shares, preference shares, debentures and bonds, In recent times a number of new securities with innovative features are available in the market e.g. Convertible Debentures, Deep Discount Bonds, Zero Coupon Bonds, Flexi Bonds, Floating Rate Bonds, Global Depository Receipts, Euro-currency Bonds, etc. are some examples of these new securities. Among this vast group of securities, an investor has to choose those ones which he considers worthwhile to be included in his investment portfolio. This requires a detailed analysis of the all securities available for making investment.

Security analysis constitutes the initial phase of the portfolio formation process and consists of examining the risk-return characteristics of individual securities and also the correlation among them. A simple strategy in securities investment is to buy under-priced securities and sell overpriced securities. But the basic problem is how to identify under-priced and overpriced securities and this is what security analysis is all about.

As discussed in the chapter of Security Analysis, there are two alternative approaches to analyse any security viz. Fundamental Analysis and Technical Analysis. They are based on different premises and follow different techniques. Fundamental analysis, the older of the two approaches, concentrates on the fundamental factors affecting the company such as

- ❑ the EPS of the company,
- ❑ the dividend pay-out ratio,
- ❑ the competition faced by the company,
- ❑ the market share, quality of management, etc.
- ❑ fundamental factors affecting the industry to which the company belongs.

The Fundamental Analyst compares this intrinsic value (true worth of a security based on its fundamentals) with the current market price. If the current market price is higher than the intrinsic value, the share is said to be overpriced and vice versa. This mispricing of securities gives an opportunity to the investor to acquire the share or sell off the share profitably. An intelligent investor would buy those securities which are under-priced and sell those securities which are overpriced. Thus, it can be said that fundamental analysis helps to identify fundamentally strong companies whose shares are worthy to be included in the investor's portfolio.

The second approach to security analysis is 'Technical Analysis'. As per this approach the share price movements are systematic and exhibit certain consistent patterns. Therefore, properly studied past movements in the prices of shares help to identify trends and patterns in security prices and efforts are made to predict the future price movements by looking at the patterns of the immediate past. Thus, Technical Analyst concentrates more on price movements and ignores the fundamentals of the shares.

In order to construct well diversified portfolios, so that Unsystematic Risk can be eliminated or substantially mitigated, an investor would like to select securities across diverse industry sectors which should not have strong positive correlation among themselves.

The Random Walk Theory holds that the share price movements are random and not systematic. Consequently, neither Fundamental Analysis nor Technical Analysis is of value in generating trading gains on a sustained basis. The Efficient Market Hypothesis (EMH) does not subscribe to the belief that it is possible to book gains in the long term on a sustained basis from trading in the stock market. Markets, though becoming increasingly efficient everywhere with the passage of time, are never perfectly efficient. So, there are opportunities all the time although their durations are decreasing and only the smart investors can look forward to booking gains consistently out of stock market deals.

2.2 Portfolio Analysis

Once the securities for investment have been identified, the next step is to combine these to form a suitable portfolio. Each such portfolio has its own specific risk-return characteristics which are not just the aggregates of the characteristics of the individual securities constituting it. The return and risk of each portfolio can be computed mathematically based on the Risk-Return profiles for the constituent securities and the pair-wise correlations among them.

From any chosen set of securities, an indefinitely large number of portfolios can be constructed by varying the fractions of the total investable resources allocated to each one of them. All such portfolios that can be constructed out of the set of chosen securities are termed as Feasible Portfolios. Detailed discussion on Risk- Return concept has been covered later in this chapter.

2.3 Portfolio Selection

The goal of a rational investor is to identify the Efficient Portfolios out of the whole set of Feasible Portfolios mentioned above and then to zero in on the Optimal Portfolio suiting his risk appetite. An Efficient Portfolio has the highest return among all Feasible Portfolios having same or lower Risk or has the lowest Risk among all Feasible Portfolios having same or higher Return. Harry Markowitz's portfolio theory (Modern Portfolio Theory) outlines the methodology for locating the Optimal Portfolio for an investor out of efficient portfolios. Detailed discussion on Markowitz's Portfolio Theory has been covered later in this chapter.

2.4 Portfolio Revision

Once an optimal portfolio has been constructed, it becomes necessary for the investor to constantly monitor the portfolio to ensure that it does not lose its optimality. Since the economy and financial markets are dynamic in nature, changes take place in these variables almost on a daily basis and securities which were once attractive may cease to be so with the passage of time. New securities with expectations of high returns and low risk may emerge. In light of these developments in the market, the investor now has to revise his portfolio. This revision leads to addition (purchase) of some new securities and deletion (sale) of some of the existing securities from the portfolio. The nature of securities and their proportion in the portfolio changes as a result of the revision.

This portfolio revision may also be necessitated by some investor-related changes such as availability of additional funds for investment, change in risk appetite, need of cash for other alternative use, etc.

Portfolio revision is not a casual process to be taken lightly and needs to be carried out with care, scientifically and objectively so as to ensure the optimality of the revised portfolio. Hence, in the entire process of portfolio management, portfolio revision is as important as portfolio analysis and selection.

2.5 Portfolio Evaluation

This process is concerned with assessing the performance of the portfolio over a selected period of time in terms of return and risk and it involves quantitative measurement of actual return realized and the risk borne by the portfolio over the period of investment. The objective of constructing a portfolio and revising it periodically is to maintain its optimal risk-return characteristics. Various types of alternative measures of performance evaluation have been developed for use by investors and portfolio managers.

This step provides a mechanism for identifying weaknesses in the investment process and for improving these deficient areas.

It should however be noted that the portfolio management process is an ongoing process. It starts with security analysis, proceeds to portfolio construction, and continues with portfolio -revision and ends with portfolio evaluation. Superior performance is achieved through continual refinement of portfolio management skill. Detailed discussion on the techniques of Portfolio Evaluation has been covered later in this chapter.

3. PORTFOLIO THEORIES

Portfolio theory forms the basis for portfolio management. Portfolio management deals with the selection of securities and their continuous shifting in the portfolio to optimise returns to suit the objectives of an investor. This, however, requires financial expertise in selecting the right mix of securities in changing market conditions to get the best out of the stock market. In India as well as in a number of Western countries, portfolio management service has assumed the role of a specialised service and a number of professional investment bankers/fund managers compete aggressively to provide the best options to high net-worth clients, who have little time to manage their own investments. The idea is catching on with the growth of the capital market and an increasing number of people want to earn profits by investing their hard-earned savings in a planned manner.

A portfolio theory guides investors about the method of selecting and combining securities that will provide the highest expected rate of return for any given degree of risk or that will expose the investor to the lowest degree of risk for a given expected rate of return. Portfolio theory can be discussed under the following heads:

3.1 Traditional Approach

The traditional approach to portfolio management concerns itself with the investor, definition of portfolio objectives, investment strategy, diversification and selection of individual investment as detailed below:

- (i) Investor's study includes an insight into his –
 - (a) age, health, responsibilities, other assets, portfolio needs;
 - (b) need for income, capital maintenance, liquidity;
 - (c) attitude towards risk; and
 - (d) taxation status;
- (ii) Portfolio objectives are defined with reference to maximising the investors' wealth which is subject to risk. The higher the level of risk borne, the more the expected returns.
- (iii) Investment strategy covers examining a number of aspects including:

- (a) Balancing fixed interest securities against equities;
 - (b) Balancing high dividend payout companies against high earning growth companies as required by investor;
 - (c) Finding the income of the growth portfolio;
 - (d) Balancing income tax payable against capital gains tax;
 - (e) Balancing transaction cost against capital gains from rapid switching; and
 - (f) Retaining some liquidity to seize upon bargains.
- (iv) Diversification reduces volatility of returns and risks and thus adequate equity diversification is sought. Balancing of equities against fixed interest bearing securities is also sought.
- (v) Selection of individual investments is made on the basis of the following principles:
- (a) Methods for selecting sound investments by calculating the true or intrinsic value of a share and comparing that value with the current market value (i.e. by following the fundamental analysis) or trying to predict future share prices from past price movements (i.e., following the technical analysis);
 - (b) Expert advice is sought besides study of published accounts to predict intrinsic value;
 - (c) Inside information is sought and relied upon to move to diversified growth companies, switch quickly to winners than loser companies;
 - (d) Newspaper tipsters about good track record of companies are followed closely;
 - (e) Companies with good asset backing, dividend growth, good earning record, high quality management with appropriate dividend paying policies and leverage policies are traced out constantly for making selection of portfolio holdings.

In India, most of the share and stock brokers follow the above traditional approach for selecting a portfolio for their clients.

The Traditional Approach suggests that one should not put all money in one basket, instead an investor should diversify by investing in different securities and assets. As long as an investor invests in different assets and securities, he shall get the advantage of diversification. Markowitz questioned this wisdom of the Traditional Approach and proved that putting money in particular kinds of securities or assets will give the investor advantage of diversification. Therefore, one should not go blindly picking up securities and assets to make portfolio.

3.2 Modern Approach (Markowitz Model or Risk-Return Optimization)

Originally developed by Harry Markowitz in the early 1950's, Portfolio Theory - sometimes referred to as Modern Portfolio Theory - provides a logical/mathematical framework in which investors can optimise their risk and return. The central plank of the theory is that diversification through portfolio

formation by adding securities whose returns are having low correlation or negative correlation into portfolio can reduce risk, and second, one can get higher return by taking higher risk.

Harry Markowitz is regarded as the father of Modern Portfolio Theory. According to him, investors are mainly concerned with two properties of an asset: risk and return. The essence of his theory is that risk of an individual asset hardly matters to an investor. What really matters is the contribution it makes to the investor's overall risk. By turning his principle into a useful technique for selecting the right portfolio from a range of different assets, he developed the 'Mean Variance Analysis' in 1952.

We shall discuss this theory in detail later in this chapter.

4. RISK ANALYSIS

Before proceeding further it will be better if the concept of risk and return is discussed. A person makes an investment in the expectation of getting some return in the future, but the future is uncertain and so is the uncertain future return. It is this uncertainty associated with the returns from an investment that introduces risk for an investor.

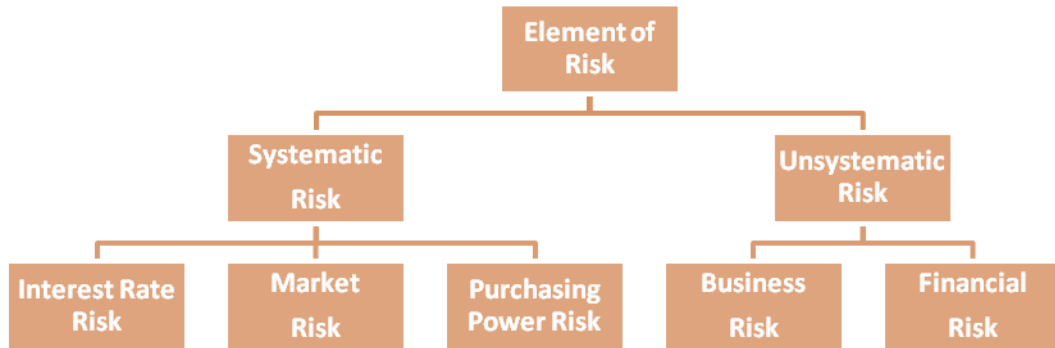
It is important here to distinguish between the expected return and the realized return from an investment. The expected future return is what an investor expects to get from his investment. On the other hand, the realized return is what an investor actually obtains from his investment at the end of the investment period. The investor makes the investment decision based on the expected return from the investment. However, the actual return realized from the investment may not correspond to the expected return. This possible variation of the actual return from the expected return is termed as risk. If actual realizations correspond to expectations exactly, there would be no risk. Risk arises where there is a probability of variation between expectations and realizations with regard to an investment.

Thus, risk arises from the variability in returns. An investment whose returns are fairly stable is considered to be a low-risk investment, whereas an investment whose returns fluctuate significantly is considered to be a highly risky investment. Government securities whose returns are fairly stable and which are free from default are considered to possess low risk whereas equity shares whose returns are likely to fluctuate widely around their mean are considered risky investments.

The essence of risk in an investment is the variation in its returns. This variation in returns is caused by a number of factors. These factors which produce variations in the returns from an investment constitute different types of risk.

4.1 Types of Risk

Let us consider the risk in holding equity securities. The elements of risk may be broadly classified into two groups as shown in the following diagram.



The first group i.e. systematic risk comprises factors that are external to a company (macro in nature) and affect a large number of securities simultaneously. These are mostly uncontrollable in nature. The second group i.e. unsystematic risk includes those factors which are internal to companies (micro in nature) and affect only those particular companies. These are controllable to a great extent.

The total variability in returns of a security is due to the total risk of that security. Hence,

Total risk = Total Systematic risk + Total Unsystematic risk

4.1.1 Systematic Risk

Due to dynamic nature of an economy, the changes occur in the economic, political and social conditions constantly. These changes have an influence on the performance of companies and thereby on their stock prices but in varying degrees. For example, economic and political instability adversely affects all industries and companies. When an economy moves into recession, corporate profits will shift downwards, and stock prices of most companies may decline. Thus, the impact of economic, political and social changes is system-wide and that portion of total variability in security returns caused by such macro level factors is referred to as systematic risk. Systematic risk can be further subdivided into interest rate risk, market risk and purchasing power risk.

(i) **Interest Rate Risk:** This arises due to variability in the interest rates from time to time and its impact on security prices. A change in the interest rates establishes an inverse relationship with the price of security i.e. price of securities tends to move inversely with change in rate of interest, long term securities show greater variability in the price with respect to interest rate changes than short term securities.

(ii) **Purchasing Power Risk:** It is also known as inflation risk, as it also emanates from the very fact that inflation affects the purchasing power adversely. Nominal return contains both the real return component and an inflation premium in a transaction involving risk of the above type to compensate for inflation over an investment holding period. Inflation rates vary over time and investors are caught unaware when rate of inflation changes unexpectedly causing erosion in the value of realised rate of return and expected return.

Purchasing power risk is more in inflationary conditions especially in respect of bonds and fixed income securities. It is not desirable to invest in such securities during inflationary periods. Purchasing power risk is however, less in flexible income securities like equity shares or common stock where rise in dividend income off-sets increase in the rate of inflation and provides advantage of capital gains.

(iii) **Market risk:** This is a type of systematic risk that affects prices of a share that moves up or down consistently for some time periods in line with other shares in the market. A general rise in share prices is referred to as a bullish trend, whereas a general fall in share prices is referred to as a bearish trend. In other words, the share market moves between the bullish phase and the bearish phase. The market movements can be easily seen in the movement of share price indices such as the BSE Sensitive Index, BSE National Index, NSE Index etc.

4.1.2 Unsystematic Risk

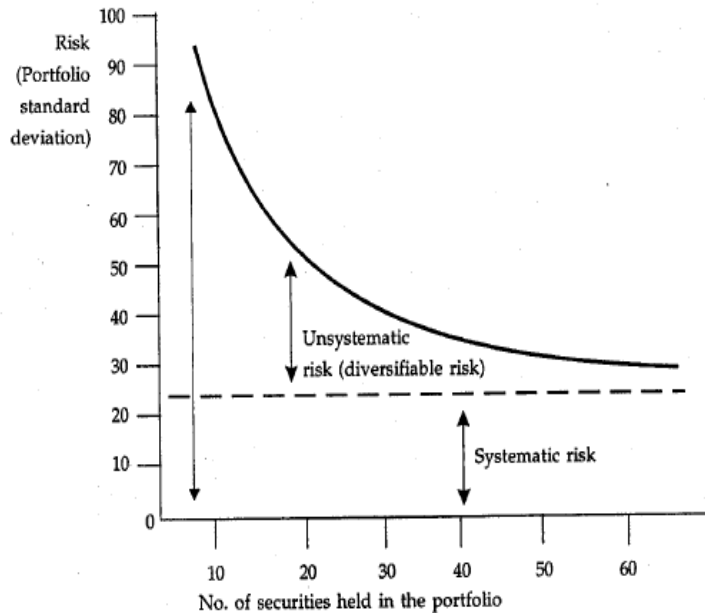
Also called 'idiosyncratic risk' the return from a security of any company may vary because of certain factors particular to that company. Variability in returns of the security on account of these factors (micro in nature), is known as unsystematic risk. It should be noted that this risk is in addition to the systematic risk affecting all the companies. Unsystematic risk can be further subdivided into business risk and financial risk.

(i) **Business Risk:** Business risk emanates variability in the operating profits of a company – higher the variability in the operating profits of a company, higher is the business risk. Such a risk can be measured using operating leverage.

(ii) **Financial Risk:** It arises due to presence of debt in the capital structure of the company. It is also known as leveraged risk and expressed in terms of debt-equity ratio. Excess of debt vis-à-vis equity in the capital structure indicates that the company is highly geared and hence, has higher financial risk. Although a leveraged company's earnings per share may be more but dependence on borrowings exposes it to the risk of winding-up for its inability to honour its commitments towards lenders/creditors. This risk is known as leveraged or financial risk of which investors should be aware of and portfolio managers should be very careful.

4.2 Diversion of Risk

As discussed above, the total risk of an individual security consists of two risks systematic risk and unsystematic risk. It should be noted that by combining many securities in a portfolio the unsystematic risk can be avoided or diversified which is attached to any particular security. The following diagram depicts how the risk can be reduced with the increase in the number of securities.



From the above diagram it can be seen that total risk is reducing with the increase in the number of securities in the portfolio. However, ultimately when the size of the portfolio reaches certain limit, it will contain only the systematic risk.

4.3 Risk & Return

It is very common that an intelligent investor would attempt to anticipate the kind of risk that he/she is likely to face and would also attempt to estimate the extent of risk associated with different investment proposals. In other words an attempt is made by him/her to measure or quantify the risk of each investment under consideration before making the final selection. Thus quantification of risk is necessary for analysis of any investment.

As risk is attached with return its risk cannot be measured without reference to return. The return, in turn, depends on the cash inflows to be received from the investment. Let us take an example of purchase of a share. With an investment in an equity share, an investor expects to receive future dividends declared by the company. In addition, he expects to receive capital gain in the form of difference between the selling price and purchase price, when the share is finally sold.

Suppose a share of X Ltd. is currently selling at ₹ 12.00. An investor who is interested in the share anticipates that the company will pay a dividend of ₹ 0.50 in the next year. Moreover, he expects to sell the share at ₹ 17.50 after one year. The expected return from the investment in share will be as follows:

$$R = \frac{\text{Forecasted dividend} + \text{Forecasted end of the period stock price}}{\text{Initial investment}} - 1$$

$$R = \frac{₹ 0.50 + ₹ 17.50}{₹ 12.00} - 1 = 0.5 \text{ or } 50 \text{ per cent}$$

It is important to note that here the investor expects to get a return of 50 per cent in the future, which is uncertain. It might be possible that the dividend declared by the company may turn out to be either more or less than the figure anticipated by the investor. Similarly, the selling price of the share may be less than the price expected by the investor at the time of investment. It may sometimes be even more. Hence, there is a possibility that the future return may be more than 50 per cent or less than 50 per cent. Since the future is uncertain the investor has to consider the probability of several other possible returns. The expected returns may be 20 per cent, 30 per cent, 50 per cent, 60 per cent or 70 per cent. The investor now has to assign the probability of occurrence of these possible alternative returns as given below:

Possible returns (in per cent) X_i	Probability of occurrence $p(X_i)$
20	0.20
30	0.20
50	0.40
60	0.10
70	0.10

The above table gives the probability distribution of possible returns from an investment in shares. Such distribution can be developed by the investor with the help of analysis of past data and modifying it appropriately for the changes he expects to occur in a future period of time.

With the help of available probability distribution two statistical measures one expected return and the other risk of the investment can be calculated.

4.3.1 Expected Return

- a. In case the data is given with probabilities: The expected return of the investment is the probability weighted average of all the possible returns. If the possible returns are denoted by X_i and the related probabilities are $p(X_i)$ the expected return may be represented as \bar{X} and can be calculated as:

$$\bar{X} = \sum_{i=1}^n x_i p(X_i)$$

It is the sum of the products of possible returns with their respective probabilities.

The expected return of the share in the example given above can be calculated as shown below:

Example

Calculation of Expected Return

Possible returns X_i	Probability $p(X_i)$	$X_i p(X_i)$
0.20	0.20	0.04
0.30	0.20	0.06
0.40	0.40	0.16
0.50	0.10	0.05
0.60	0.10	0.06
	$\sum_{i=1}^n X_i p(X_i)$	0.37

Hence the expected return is 0.37 i.e. 37%

- b. In case the historical data is given:

$$\bar{x} = \frac{X_1 + X_2 + X_3 + \dots + X_n}{n}$$

i.e. Simple average or Arithmetic Mean of the historical data series

Example

Suppose the total return from shares of X Ltd. for a period of last five years is as follows:

Year	Total Return % (x)
1	9.50
2	7.00
3	11.00
4	-6.00
5	2.50
	$\sum x_i = 24.00$

The Average Return of the share will be = $\frac{24.00}{5} = 4.80$

4.3.2 Risk

As risk is attached with every return hence calculation of only expected return is not sufficient for decision making. Therefore risk aspect should also be considered along with the expected return. The most popular measure of risk is the variance or standard deviation of the probability distribution of possible returns.

Risk can be defined as deviation of actual/possible return from expected return i.e. Mean return.

Variance of each security is generally denoted by σ^2 and is calculated by using the following formula:

- a. In case the data is given with probabilities:

$$\sigma^2 = \sum_{i=1}^n [(X_i - \bar{X})^2 p(X_i)]$$

Continuing our earlier example the following table provides calculations required to calculate the risk i.e. Variance or Standard Deviation (SD).

Possible returns X_i	Probability $p(X_i)$	Deviation $(X_i - \bar{X})$	Deviation squared $(X_i - \bar{X})^2$	Product $(X_i - \bar{X})^2 p(X_i)$
0.20	0.20	-0.17	0.0289	0.00578
0.30	0.20	-0.07	0.0049	0.00098
0.40	0.40	0.03	0.0009	0.00036
0.50	0.10	0.13	0.0169	0.00169
0.60	0.10	0.23	0.0529	0.00529
			Var (σ^2)	0.0141

Variance = 0.0141

Standard Deviation of the return will be the positive square root of the variance and is generally represented by σ . Accordingly, the standard deviation of return in the above example will be $\sqrt{0.0141} = 0.1187$ i.e. 11.87%.

- b. In case the historical data is given:

$$\sigma^2 = \sum_{i=1}^n \frac{(x_i - \bar{x})^2}{n}$$

Thus, keeping the above formulae same, instead of multiplying with probabilities, we need to divide it by no of observations.

Continuing our earlier example the following table provides calculations required to calculate the risk i.e. Variance or Standard Deviation (SD).

Year	Total Return % (x)	Deviation (x _i - \bar{x})	Deviation squared (x _i - \bar{x}) ²
1	9.50	4.70	22.09
2	7.00	2.20	4.84
3	11.00	6.20	38.44
4	-6.00	-10.80	116.64
5	2.50	-2.30	5.29
	$\sum x_i = 24.00$		187.30
Mean	4.80		

$$\text{Variance} = \frac{187.30}{5} = 37.46$$

Standard Deviation of the return will be the positive square root of the variance and is generally represented by σ . Accordingly, the standard deviation of return in the above example will be $\sqrt{37.46} = 6.12$ i.e. 6.12%.

The basic purpose to calculate the variance and standard deviation is to measure the extent of variability of possible returns from the expected return. Several other measures such as range, semi-variance and mean absolute deviation can also be used to measure risk, but standard deviation has been the most popularly accepted measure.

For example, if a security has a return of 11% and Standard Deviation i.e. risk of 3%, then it can be concluded that as per the given conditions, the return's range can be expected from 8% to 14% i.e. 11% - 3% would be the lower range and 11% + 3% would be the upper range.

The method described above is widely used for assessing risk.

The standard deviation or variance, however, provides a measure of the total risk associated with a security. As we know, the total risk comprises two components, namely systematic risk and unsystematic risk. Unsystematic risk is the risk specific or unique to a company. Unsystematic risk associated with the security of a particular company can be eliminated/reduced by combining it with another security having negative correlation. This process is known as diversification of unsystematic risk. As a means of diversification the investment is spread over a group of securities with different characteristics. This collection of diverse securities is called a Portfolio.

As unsystematic risk can be reduced or eliminated through diversification, it is not very important for an investor to consider. The risk that is relevant in investment decisions is the systematic risk because it is not diversifiable. Hence, the main interest of the investor lies in the measurement of systematic risk of a security.

4.3.3 Measurement of Systematic Risk

As discussed earlier, systematic risk is the variability in security returns caused by changes in the economy or the market and all securities are affected by such changes to some extent. Some securities exhibit greater variability in response to market changes and some may exhibit less response. Securities that are more sensitive to changes in factors are said to have higher systematic risk. The average effect of a change in the economy can be represented by the change in the stock market index. The systematic risk of a security can be measured by relating that security's variability vis-à-vis variability in the stock market index. A higher variability would indicate higher systematic risk and vice versa.

The systematic risk of a security is measured by a statistical measure which is called Beta (β). The main input data required for the calculation of beta of any security are the historical data of returns of the individual security and corresponding return of a representative market return (stock market index). There are two statistical methods i.e. correlation method and the regression method, which can be used for the calculation of Beta.

4.3.3.1 Correlation Method : Correlation measures the extent to which two variables are related. In respect to Beta, it means how market returns and security returns are related. Using this method beta (β) can be calculated from the historical data of returns by the following formula:

$$\beta_i = \frac{r_{im} \sigma_i}{\sigma_m}$$

Where

r_{im} = Correlation coefficient between the returns of the stock i and the returns of the market index.

σ_i = Standard deviation of returns of stock i

σ_m = Standard deviation of returns of the market index.

4.3.3.2 Regression Method : The regression model is based on the postulation that there exists a linear relationship between a dependent variable and an independent variable. The model helps to calculate the values of two constants, namely alfa (α) and beta (β). β measures the change in the dependent variable in response to unit change in the independent variable, while α measures the value of the dependent variable even when the independent variable has zero value. The formula of the regression equation is as follows:

$$Y = \alpha + \beta X$$

where

Y = Dependent variable

X = Independent variable

α and β are constants.

$$\alpha = Y - \beta X$$

The formula used for the calculation of α and β are given below.

$$\beta = \frac{n \sum XY - (\sum X)(\sum Y)}{n \sum X^2 - (\sum X)^2}$$

where

n = Number of items.

Y = Dependent variable scores.

X = Independent variable scores.

For the purpose of calculation of β , the return of the individual security is taken as the dependent variable and the return of the market index is taken as the independent variable.

Here it is very important to note that a security can have betas that are positive, negative or zero.

- Positive Beta- indicates that security's return is dependent on the market return and moves in the direction in which market moves.
- Negative Beta- indicates that security's return is dependent on the market return but moves in the opposite direction in which market moves.
- Zero Beta- indicates that security's return is independent of the market return.

Further as beta measures the volatility of a security's returns relative to the market, the larger the beta, the more volatile the security.

- A beta of 1.0 indicates that a security has risk as that of the market.
- A stock with beta greater than 1.0 has above average risk i.e. its returns would be more volatile than the market returns. For example, when market returns move up by 6%, a stock with beta of 2 would find its returns moving up by 12% (i.e. 6% x 2). Similarly, decline in market returns by 6% would produce a decline of 12% (i.e. 6% x 2) in the return of that security.
- A stock with beta less than 1.0 would have below market risk. Variability in its returns would be less than the market variability.

Beta is calculated from historical data of returns to measure the systematic risk of a security. It is a historical measure of systematic risk. In using this beta for investment decision making, the investor is assuming that the relationship between the security variability and market variability will continue to remain the same in future also.

4.4 Portfolio Analysis

Till now we have discussed the risk and return of a single security. Let us now discuss the return and risk of a portfolio of securities.

4.4.1 Portfolio Return

For a portfolio analysis an investor first needs to specify the list of securities eligible for selection or inclusion in the portfolio. Then he has to generate the risk-return expectations for these securities. The expected return for the portfolio is expressed as the mean of its rates of return over the time horizon under consideration and risk for the portfolio is the variance or standard deviation of these rates of return around the mean return.

The expected return of a portfolio of assets is simply the weighted average of the returns of the individual securities constituting the portfolio. The weights to be applied for calculation of the portfolio return are the fractions of the portfolio invested in such securities.

Let us consider a portfolio of two equity shares A and B with expected returns of 16 per cent and 22 per cent respectively.

The formula for the calculation of expected portfolio return may be expressed as shown below:

$$\bar{r}_p = \sum_{i=1}^n X_i \bar{r}_i$$

\bar{r}_p = Expected return of the portfolio.

X_i = Proportion of funds invested in security i

\bar{r}_i = Expected return of security i.

n = Number of securities in the portfolio.

If 40 per cent of the total funds is invested in share A and the remaining 60 per cent in share B, then the expected portfolio return will be:

$$\text{Return on the portfolio} = (0.40 \times 16) + (0.60 \times 22) = 19.6 \text{ per cent}$$

4.4.2 Portfolio Risk

As discussed earlier, the variance of return and standard deviation of return are statistical measures that are used for measuring risk in investment. The variance of a portfolio can be written down as the sum of 2 terms, one containing the aggregate of the weighted variances of the constituent securities and the other containing the weighted co-variances among different pairs of securities.

Covariance (a statistical measure) between two securities or two portfolios or a security and a portfolio indicates how the rates of return for the two concerned entities behave relative to each other.

The covariance between two securities A and B may be calculated using the following formula:

$$\text{COV}_{AB} = \frac{\sum [R_A - \bar{R}_A][R_B - \bar{R}_B]}{N}$$

where

COV_{AB} = Covariance between A and B

R_A = Return of security A

R_B = Return of security B

\bar{R}_A = Expected or mean return of security A

\bar{R}_B = Expected or mean return of security B

N = Number of observations.

The calculation of covariance can be understood with the help of following table:

Calculation of Covariance

Year	R_x	Deviation $R_x - \bar{R}_x$	R_y	Deviation $R_y - \bar{R}_y$	$[R_x - \bar{R}_x][R_y - \bar{R}_y]$
1	11	-4	18	5	-20
2	13	-2	14	1	-2
3	17	2	11	-2	-4
4	19	4	9	-4	-16
	$\bar{R}_x = 15$		$\bar{R}_y = 13$		-42

$$\text{Cov}_{xy} = \frac{\sum_{i=1}^n [R_x - \bar{R}_x][R_y - \bar{R}_y]}{n} = \frac{-42}{4} = -10.5$$

From the above table it can be seen that the covariance is a measure of how returns of two securities move together. In case the returns of the two securities move in the same direction consistently the covariance is said to be positive (+). Contrarily, if the returns of the two securities move in opposite directions consistently the covariance would be negative (-). If the movements of returns are independent of each other, covariance would be close to zero (0).

The coefficient of correlation is expressed as:

$$r_{AB} = \frac{\text{Cov}_{AB}}{\sigma_A \sigma_B}$$

where

r_{AB} = Coefficient of correlation between A and B

Cov_{AB} = Covariance between A and B

σ_A = Standard deviation of A

σ_B = Standard deviation of B

It may be noted on the basis of above formula the covariance can be expressed as the product of correlation between the securities and the standard deviation of each of the securities as shown below:

$$\text{Cov}_{AB} = \sigma_A \sigma_B r_{AB}$$

It is very important to note that the correlation coefficients may range from -1 to 1.

- A value of -1 indicates perfect negative correlation between the two securities' returns.
- A value of +1 indicates a perfect positive correlation between them.
- A value of zero indicates that the returns are independent.

The calculation of the variance (or risk) of a portfolio is not simply a weighted average of the variances of the individual securities in the portfolio as in the calculation of the return of portfolio. The variance of a portfolio with only two securities in it can be calculated with the following formula.

$$\sigma_p^2 = x_1^2 \sigma_1^2 + x_2^2 \sigma_2^2 + 2x_1 x_2 (r_{12} \sigma_1 \sigma_2)$$

where

σ_p^2 = Portfolio variance.

x_1 = Proportion of funds invested in the first security.

x_2 = Proportion of funds invested in the second security ($x_1 + x_2 = 1$).

σ_1^2 = Variance of first security.

σ_2^2 = Variance of second security.

σ_1 = Standard deviation of first security.

σ_2 = Standard deviation of second security.

r_{12} = Correlation coefficient between the returns of the first and second securities.

As the standard deviation is the square root of the variance the portfolio standard deviation can be obtained by taking the square root of portfolio variance.

Let us take an example to understand the calculation of portfolio variance and portfolio standard deviation. Two securities A and B generate the following sets of expected returns, standard deviations and correlation coefficient:

	A	B
$\bar{r} =$	20%	25%
$\sigma =$	50%	30%
$r_{ab} =$		-0.60

Now suppose a portfolio is constructed with 40 per cent of funds invested in A and the remaining 60 per cent of funds in B (i.e. $P = 0.4A + 0.6B$).

Using the formula of portfolio return the expected return of the portfolio will be:

$$R_p = (0.40 \times 20) + (0.60 \times 25) = 23\%$$

And the Variance and Standard Deviation of the portfolio will be:

Variance

$$\sigma_p^2 = (0.40)^2 (50)^2 + (0.60)^2 (30)^2 + 2(0.40)(0.60)(-0.60)(50)(30) = 400 + 324 - 432 = 292$$

Standard deviation

$$\sigma_p = \sqrt{292} = 17.09 \text{ per cent.}$$

The return and risk of a portfolio depends on following two sets of factors:

- Returns and risks of individual securities and the covariance between securities forming the portfolio
- Proportion of investment in each of securities.

As the first set of factors is parametric in nature for the investor in the sense that he has no control over the returns, risks and co-variances of individual securities. The second set of factors is choice factor or variable for the investors in the sense that they can choose the proportions of each security in the portfolio.

4.4.3 Reduction or Dilution of Portfolio Risk through Diversification

The process of combining more than one security in to a portfolio is known as diversification. The main purpose of this diversification is to reduce the total risk by eliminating or substantially mitigating the unsystematic risk, without sacrificing portfolio return. As shown in the example mentioned above, diversification has helped to reduce risk. The portfolio standard deviation of 17.09% is lower than the standard deviation of either of the two securities taken separately which were 50% and 30% respectively. Incidentally, such risk reduction is possible even when the two constituent securities

are uncorrelated. In case, however, these have the maximum positive correlation between them, no reduction of risk can be achieved.

In order to understand the mechanism and power of diversification, it is necessary to consider the impact of covariance or correlation on portfolio risk more closely. We shall discuss following three cases taking two securities in the portfolio:

- (a) Securities' returns are perfectly positively correlated,
- (b) Securities' returns are perfectly negatively correlated, and
- (c) Securities' returns are not correlated i.e. they are independent.

4.4.3.1 Perfectly Positively Correlated : In case two securities returns are perfectly positively correlated the correlation coefficient between these securities will be +1 and the returns of these securities then move up or down together.

The variance of such portfolio can be calculated by using the following formula:

$$\sigma_p^2 = x_1^2 \sigma_1^2 + x_2^2 \sigma_2^2 + 2x_1 x_2 r_{12} \sigma_1 \sigma_2$$

As $r_{12} = 1$, this may be rewritten as:

$$\sigma_p^2 = x_1^2 \sigma_1^2 + x_2^2 \sigma_2^2 + 2x_1 x_2 \sigma_1 \sigma_2$$

or

$$\sigma_p^2 = (x_1 \sigma_1 + x_2 \sigma_2)^2$$

Hence Standard Deviation will become

$$\sigma_p = x_1 \sigma_1 + x_2 \sigma_2$$

In other words this is simply the weighted average of the standard deviations of the individual securities.

Taking the above example we shall now calculate the portfolio standard deviation when correlation coefficient is +1.

Standard deviation of security A = 40%

Standard deviation of security B = 25%

Proportion of investment in A = 0.4

Proportion of investment in B = 0.6

Correlation coefficient = +1.0

Portfolio standard deviation maybe calculated as:

$$\sigma_p = (0.4) (40) + (0.6) (25) = 31$$

Thus it can be seen that the portfolio standard deviation will lie between the standard deviations of the two individual securities. It will vary between 40 and 25 as the proportion of investment in each security changes.

Now suppose, if the proportion of investment in A and B are changed to 0.75 and 0.25 respectively; portfolio standard deviation of the portfolio will become:

$$\sigma_p = (0.75)(40) + (0.25)(25) = 36.25$$

It is important to note that when the security returns are perfectly positively correlated, diversification provides only risk averaging and no risk reduction because the portfolio risk cannot be reduced below the individual security risk. Hence, reduction of risk is not achieved when the constituent securities' returns are perfectly positively correlated.

4.4.3.2 Perfectly Negatively Correlated : When two securities' returns are perfectly negatively correlated, two returns always move in exactly opposite directions and correlation coefficient between them becomes -1. The variance of such negatively correlated portfolio may be calculated as:

$$\sigma_p^2 = x_1^2\sigma_1^2 + x_2^2\sigma_2^2 - 2x_1x_2(r_{12}\sigma_1\sigma_2)$$

As $r_{12} = -1$, this may be rewritten as:

$$\sigma_p^2 = (x_1\sigma_1 - x_2\sigma_2)^2$$

Hence Standard Deviation will become

$$\sigma_p = x_1\sigma_1 - x_2\sigma_2$$

Taking the above example we shall now calculate the portfolio standard deviation when correlation coefficient is -1.

$$\sigma_p = (0.4)(40) - (0.6)(25) = 1$$

Thus, from above it can be seen that the portfolio risk has become very low in comparison of risk of individual securities. By changing the weights it can even be reduced to zero. For example, if the proportion of investment in A and B are 0.3846 and 0.6154 respectively, portfolio standard deviation becomes:

$$= (0.3846)(40) - (0.6154)(25) = 0$$

Although in above example the portfolio contains two risky assets, the portfolio has no risk at all. Thus, the portfolio may become entirely risk-free when security returns are perfectly negatively correlated. Therefore, diversification can substantially reduce or even eliminate risk when securities are perfectly negatively correlated. However, in real life it is very rare to find securities that are perfectly negatively correlated.

4.4.3.3 Returns are uncorrelated or independent : When the returns of two securities are entirely uncorrelated, the coefficient of correlation of these two securities would be zero and the formula for portfolio variance will be as follows:

$$\sigma_p^2 = x_1^2 \sigma_1^2 + x_2^2 \sigma_2^2 + 2x_1 x_2 r_{12} \sigma_1 \sigma_2$$

As $r_{12} = 0$, this may be rewritten as:

$$\sigma_p^2 = x_1^2 \sigma_1^2 + x_2^2 \sigma_2^2$$

Hence Standard Deviation will become

$$\sigma_p = \sqrt{x_1^2 \sigma_1^2 + x_2^2 \sigma_2^2}$$

Taking the above example we shall now calculate the portfolio standard deviation when correlation coefficient is 0.

$$\sigma_p = \sqrt{(0.4)^2 (40)^2 + (0.6)^2 (25)^2}$$

$$\sigma_p = \sqrt{256 + 225}$$

$$\sigma_p = 21.93$$

Thus, it can be observed that the portfolio standard deviation is less than the standard deviations of individual securities in the portfolio. Therefore, when security returns are uncorrelated, diversification can reduce risk .

We may now tabulate the portfolio standard deviations of our illustrative portfolio having two securities A and B, for different values of correlation coefficients between them. The proportion of investments in A and B are 0.4 and 0.6 respectively. The individual standard deviations of A and B are 40 and 25 respectively.

Portfolio Standard Deviations

Correlation coefficient	Portfolio Standard Deviation
1.00	31
0.60	27.73
0	21.93
-0.60	13.89
-1.00	1.00

Summarily it can be concluded that diversification reduces risk in all cases except when the security returns are perfectly positively correlated. With the decline of correlation coefficient from +1 to -1, the portfolio standard deviation also declines. But the risk reduction is greater when the security returns are negatively correlated.

4.4.4 Portfolio with more than two securities

So far we have considered a portfolio with only two securities. The benefits from diversification increase as more and more securities with less than perfectly positively correlated returns are included in the portfolio. As the number of securities added to a portfolio increases, the standard deviation of the portfolio becomes smaller and smaller. Hence, an investor can make the portfolio risk arbitrarily small by including a large number of securities with negative or zero correlation in the portfolio.

But, in reality, securities rarely show negative or even zero correlation. Typically, securities show some positive correlation, that is above zero but less than the perfectly positive value (+1). As a result, diversification (that is, adding securities to a portfolio) results in some reduction in total portfolio risk but not in complete elimination of risk. Moreover, the effects of diversification are exhausted fairly rapidly. That is, *most* of the reduction in portfolio standard deviation occurs by the time the portfolio size increases to 25 or 30 securities. Adding securities beyond this size brings about only marginal reduction in portfolio standard deviation.

Adding securities to a portfolio reduces risk because securities are not perfectly positively correlated. But the effects of diversification are exhausted rapidly because the securities are still positively correlated to each other though not perfectly correlated. Had they been negatively correlated, the portfolio risk would have continued to decline as portfolio size increased. Thus, in practice, the benefits of diversification are limited.

4.4.5 Calculation of Return and Risk of Portfolio with more than two securities

The expected return of a portfolio is the weighted average of the returns of individual securities in the portfolio, the weights being the proportion of investment in each security. The formula for calculation of expected portfolio return is the same for a portfolio with two securities and for portfolios with more than two securities. The formula is:

$$\bar{r}_p = \sum_{i=1}^n x_i \bar{r}_i$$

Where

\bar{r}_p = Expected return of portfolio.

x_i = Proportion of funds invested in each security.

\bar{r}_i = Expected return of each security.

n = Number of securities in the portfolio.

Let us consider a portfolio with four securities having the following characteristics:

Security	Returns (per cent)	Proportion of investment
P	11	0.3
Q	16	0.2
R	22	0.1
S	20	0.4

The expected return of this portfolio may be calculated using the formula:

$$\bar{r}_p = (0.3)(11) + (0.2)(16) + (0.1)(22) + (0.4)(20) = 16.7 \text{ per cent}$$

The portfolio variance and standard deviation depend on the proportion of investment in each security as also the variance and covariance of each security included in the portfolio.

Let us take the following example to understand how we can compute the risk of multiple asset portfolio.

Security	x_i	σ_i	Correlation Coefficient
X	0.25	16	X and Y = 0.7
Y	0.35	7	X and Z = 0.3
Z	0.40	9	Y and Z = 0.4

It may be noted that correlation coefficient between X and X, Y and Y, Z and Z is 1.

A convenient way to obtain the result is to set up the data required for calculation in the form of a variance-covariance matrix.

As per data given in the example, the first cell in the first row of the matrix represents X and X the second cell in the first row represents securities X and Y, and so on. The variance or covariance in each cell has to be multiplied by the weights of the respective securities represented by that cell. These weights are available in the matrix at the left side of the row and the top of the column containing the cell.

This process may be started from the first cell in the first row and continued for all the cells till the last cell of the last row is reached as shown below:

Weights ↓	→			
		0.25	0.35	0.40
		X	Y	Z
0.25	X	1 x 16 x 16	0.7 x 16 x 7	0.3 x 16 x 9
0.35	Y	0.7 x 7 x 16	1 x 7 x 7	0.4 x 7 x 9
0.40	Z	0.3 x 9 x 16	0.4 x 9 x 7	1 x 9 x 9

Once the variance-covariance matrix is set up, the computation of portfolio variance is a comparatively simple operation. Each cell in the matrix represents a pair of two securities.

When all these products are summed up, the resulting figure is the portfolio variance. The square root of this figure gives the portfolio standard deviation.

Thus the variance of the portfolio given in the example above can now be calculated.

$$\begin{aligned}\sigma_p^2 &= (0.25 \times 0.25 \times 1 \times 16 \times 16) + (0.25 \times 0.35 \times 0.7 \times 16 \times 7) + (0.25 \times 0.40 \times 0.3 \times 16 \times 9) + \\ & (0.35 \times 0.25 \times 0.7 \times 7 \times 16) + (0.35 \times 0.35 \times 1 \times 7 \times 7) + (0.35 \times 0.40 \times 0.4 \times 7 \times 9) + (0.40 \times \\ & 0.25 \times 0.3 \times 9 \times 16) + (0.40 \times 0.35 \times 0.4 \times 9 \times 7) + (0.40 \times 0.40 \times 1 \times 9 \times 9) \\ &= 16 + 6.86 + 4.32 + 6.86 + 6.0025 + 3.528 + 4.32 + 3.528 + 12.96 = 64.3785\end{aligned}$$

The portfolio standard deviation is:

$$\sigma_p = \sqrt{64.3785} = 8.0236$$

Hence, the formula for computing Portfolio Variance may also be stated as follows:

$$\sigma_p^2 = \sum_{i=1}^n \sum_{j=1}^n x_i x_j r_{ij} \sigma_i \sigma_j$$

Or

$$\sigma_p^2 = \sum_{i=1}^n \sum_{j=1}^n x_i x_j \sigma_{ij}$$

where

σ_p^2 = Portfolio variance.

x_i = Proportion of funds invested in security i (the first of a pair of securities).

x_j = Proportion of funds invested in security j (the second of a pair of securities).

σ_i = Standard Deviation of security i

σ_j = Standard Deviation of security j

r_{ij} = The co-efficient of correlation between the pair of securities i and j

σ_{ij} = The covariance between the pair of securities i and j

n = Total number of securities in the portfolio.

Thus from above discussion it can be said that a portfolio is a combination of assets. From a given set of 'n' securities, any number of portfolios can be created. These portfolios may comprise of two securities, three securities, all the way up to 'n' securities. A portfolio may contain the same securities as another portfolio but with different weights. A new portfolios can be created either by changing the securities in the portfolio or by changing the proportion of investment in the existing securities.

Thus summarily it can be concluded that each portfolio is characterized by its expected return and risk. Determination of expected return and risk (variance or standard deviation) of each portfolio that can be used to create a set of selected securities which is the first step in portfolio management and called portfolio analysis.



5. MARKOWITZ MODEL OF RISK-RETURN OPTIMIZATION

Unlike the CAPM, the Optimal Portfolio as per Markowitz Theory is investor specific. The portfolio selection problem can be divided into two stages:

- (1) finding the mean-variance efficient portfolios and
- (2) selecting one such portfolio.

Investors do not like risk and the greater the riskiness of returns on an investment, the greater will be the returns expected by investors. There is a trade-off between risk and return which must be reflected in the required rates of return on investment opportunities. The standard deviation (or variance) of return measures the total risk of an investment. It is not necessary for an investor to accept the total risk of an individual security. Investors can diversify to reduce risk. As number of holdings approach larger, a good deal of total risk is removed by diversification.

5.1 Assumptions of the Model

It is a common phenomenon that the diversification of investments in the portfolio leads to reduction in variance of the return, even for the same level of expected return. This model has taken into account risks associated with investments - using variance or standard deviation of the return. This model is based on the following assumptions. :

- (i) The return on an investment adequately summarises the outcome of the investment.
- (ii) The investors can visualise a probability distribution of rates of return.
- (iii) The investors' risk estimates are proportional to the variance of return they perceive for a security or portfolio.
- (iv) Investors base their investment decisions on two criteria i.e. expected return and variance of return.
- (v) Investors are assumed to be rational in so far as they would prefer greater returns to lesser ones given equal or smaller risk and are risk averse. Risk aversion in this context means merely that, as between two investments with equal expected returns, the investment with the smaller risk would be preferred.
- (vi) Though 'Expected Return' could be a suitable measure of monetary inflows like NPV but yield in different scenarios is the most commonly used measure of return. The standard deviation of return is referred to as deviation of yields from its expected value or return.

5.2 Efficient Frontier

Markowitz has formalised the risk return relationship and developed the concept of efficient frontier using the Mean-Variance Dominance Principle. For selection of a portfolio, comparison between combinations of portfolios is essential. As a rule, a portfolio is dominating another portfolio in terms of mean and variance if there is another portfolio with:

- (a) A lower expected value of return and same or higher standard deviation (risk).
- (b) The same or higher standard deviation (risk) but a lower expected return.

Markowitz has defined the diversification as the process of combining assets that are less than perfectly positively correlated in order to reduce portfolio risk without sacrificing any portfolio returns. If an investors' portfolio is not efficient he may:

- (i) Increase the expected value of return without increasing the risk.
- (ii) Decrease the risk without decreasing the expected value of return, or
- (iii) Obtain some combination of increase of expected return and decrease risk.

This is possible by switching to a portfolio on the efficient frontier.

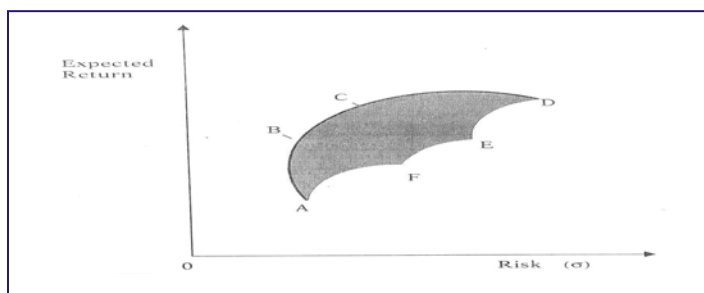


Fig. 1: Markowitz Efficient Frontier

If all the investments are plotted on the risk-return space, individual securities would be dominated by portfolios, and the efficient frontier would be containing all Efficient Portfolios (An Efficient Portfolio has the highest return among all portfolios with identical risk and the lowest risk among all portfolios with identical return). Fig – 1 depicts the boundary of possible investments in securities, A, B, C, D, E and F; and B, C, D, are lying on the efficient frontier.

The best combination of expected value of return and risk (standard deviation) depends upon the investors' utility function. The individual investor will want to hold that portfolio of securities which places him on the highest indifference curve, choosing from the set of available portfolios. The dark line at the top of the set is the line of efficient combinations, or the efficient frontier. The optimal portfolio for an investor lies at the point where the indifference curve for the concerned investor touches the efficient frontier. This point reflects the risk level acceptable to the investor in order to achieve a desired return and provide maximum return for the bearable level of risk. The concept of efficient frontier and the location of the optimal portfolio are explained with help of Fig-2.

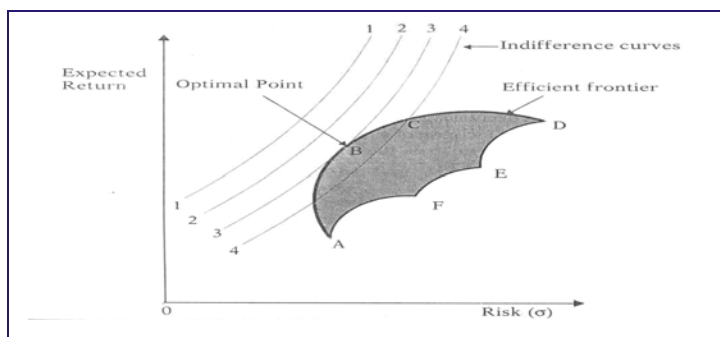


Fig. 2 : Optimal Investment under Markowitz Model

In Fig-2 A, B, C, D, E and F define the boundary of all possible investments out of which investments in B, C and D are the efficient portfolios lying on the efficient frontier. The attractiveness of the investment proposals lying on the efficient frontier depends on the investors' attitude to risk. At point B, the level of risk and return is at optimum level. The returns are highest at point D, but simultaneously it carries higher risk than any other investment.

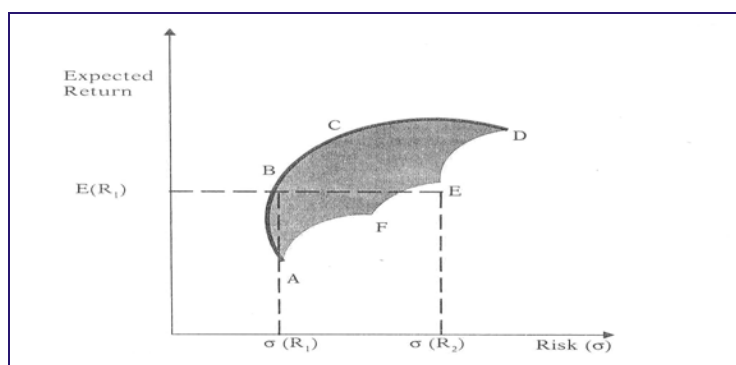


Fig.3 : Selection of Portfolios

The shaded area in Fig-3 represents all attainable or feasible portfolios, that is all the combinations of risk and expected return which may be achieved with the available securities. The efficient frontier contains all possible efficient portfolios and any point on the frontier dominates any point to the right of it or below it.

Consider the portfolios represented by points B and E. B and E promise the same expected return $E(R_1)$ but the risk associated with B is $\sigma(R_1)$ whereas the associated with E is $\sigma(R_2)$. Investors, therefore, prefer portfolios on the efficient frontier rather than interior portfolios given the assumption of risk aversion; obviously, point A on the frontier represents the portfolio with the least possible risk, whilst D represents the portfolio with the highest possible rate of return with highest risk.

The investor has to select a portfolio from the set of efficient portfolios lying on the efficient frontier. This will depend upon his risk-return preference. As different investors have different preferences, the optimal portfolio of securities will vary from one investor to another.

6. CAPITAL MARKET THEORY

The above figure 2 portrays the relationship between risk and return for efficient portfolio graphically. Point B represents the market portfolio and if a line tangent to this point is drawn and extended upto y-axis the point at which it will touch will be the riskless rate of interest. This is shown in Fig 4.

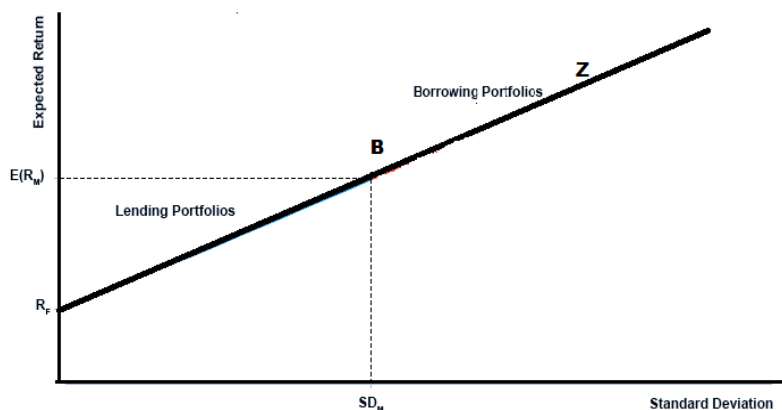


Fig.4 : Selection of Portfolios

Preferred investment strategies plot along line R_fBZ , representing alternative combinations of risk and return obtainable by combining the market portfolio with borrowing or lending. This is known as the Capital Market Line (CML). Portfolio lying on line from R_f to B shall be lending portfolio as it will involve some investment in risk-free securities and some investment in market portfolio. Portfolios lying from B to Z will be borrowing portfolio as it will be an investment in market portfolio by borrowing the same amount.

The slope of the capital market line can be regarded as the reward per unit of risk borne and it is computed as follows:

$$\text{Slope} = \frac{R_M - R_f}{\sigma_M}$$

Where R_M = Market Return

R_f = Risk Free Rate of Return

σ_M = Standard Deviation of Market

From the Capital Market Line the expected return of a portfolio can be found as follows:

$$E(R) = R_f + \frac{R_M - R_f}{\sigma_M} \times \sigma_P$$

Where σ_P = Standard Deviation of Portfolio

7. SINGLE INDEX MODEL (SHARPE INDEX MODEL)

This model assumes that co-movement between stocks is due to change or movement in the market index. Casual observation of the stock prices over a period of time reveals that most of the stock prices move with the market index. When the Sensex increases, stock prices also tend to increase and vice-versa. This indicates that some underlying factors affect the market index as well as the stock prices. Stock prices are related to the market index and this relationship could be used to estimate the return on stock. Towards this purpose, the following equation can be used:

$$R_i = \alpha_i + \beta_i R_m + \epsilon_i$$

Where,

R_i = expected return on security i

α_i = intercept of the straight line or alpha co-efficient

β_i = slope of straight line or beta co-efficient

R_m = the rate of return on market index

ϵ_i = error term or return expected on account of unsystematic risk

According to the equation, the return of a stock can be divided into two components, the return due to the market and the return independent of the market. β_i indicates the sensitiveness of the stock return to the changes in the market return. For example, β_i of 1.5 means that the stock return is expected to increase by 1.5% when the market index return increases by 1% and vice-versa. Likewise, β_i of 0.5 expresses that the individual stock return would change by 0.5 per cent when there is a change of 1 per cent in the market return. β_i of 1 indicates that the market return and the security return are moving in tandem. The estimates of β_i and α_i are obtained from regression analysis.

The single index model is based on the assumption that stocks vary together because of the common movement in the stock market and there are no effects beyond the market (i.e. any fundamental factor effects) that accounts for the stocks co-movement. The expected return, standard deviation and co-variance of the single index model represent the joint movement of securities. The mean return is:

$$R_i = \alpha_i + \beta_i R_m + \epsilon_i$$

The variance of security's return:

$$\sigma^2 = \beta_i^2 \sigma_m^2 + \sigma_{\epsilon_i}^2$$

The covariance of returns between securities i and j is:

$$\sigma_{ij} = \beta_i \beta_j \sigma_m^2$$

The variance of the security has two components namely, systematic risk or market risk and unsystematic risk or unique risk. The variance explained by the index is referred to as systematic risk. The unexplained variance is called Residual Variance or Unsystematic Risk.

The systematic risk can be calculated by using following formula:

Systematic risk = $\beta_i^2 \times$ variance of market index

$$= \beta_i^2 \sigma_m^2$$

Unsystematic risk = Total variance - Systematic risk.

$$\epsilon_i^2 = \sigma_i^2 - \text{Systematic risk.}$$

Thus, the total risk = Systematic risk + Unsystematic risk.

$$= \beta_i^2 \sigma_m^2 + \epsilon_i^2.$$

From this, the portfolio variance can be derived

$$\sigma_p^2 = \left[\left(\sum_{i=1}^N X_i \beta_i \right)^2 \sigma_m^2 \right] + \left[\left(\sum_{i=1}^N X_i^2 \epsilon_i^2 \right) \right]$$

Where,

σ_p^2 = variance of portfolio

σ_m^2 = expected variance of index

ϵ_i^2 = variation in security's return not related to the market index

X_i = the portion of stock i in the portfolio.

β_i = Beta of stock i in the portfolio

Likewise expected return on the portfolio also can be estimated. For each security α_i and β_i should be estimated.

$$R_p = \sum_{i=1}^N x_i (\alpha_i + \beta_i R_m)$$

β_i = Value of the beta for security i

x_i = Proportion of the investment on security i

α_i = Value of alpha for security i

N = The number of securities in the portfolio

Portfolio return is the weighted average of the estimated return for each security in the portfolio. The weights are the respective stocks' proportions in the portfolio.

A portfolio's alpha value is the weighted average of the alpha values for its component securities using the proportion of the investment in a security as weight.

$$\alpha_P = \sum_{i=1}^N x_i \alpha_i$$

α_P = Value of the alpha for the portfolio

Similarly, a portfolio's beta value is the weighted average of the beta values of its component stocks using relative share of them in the portfolio as weights.

$$\beta_P = \sum_{i=1}^N x_i \beta_i$$

Where,

β_P = Value of the beta for the portfolio.

Illustration 1

The following details are given for X and Y companies' stocks and the Bombay Sensex for a period of one year. Calculate the systematic and unsystematic risk for the companies' stocks. If equal amount of money is allocated for the stocks what would be the portfolio risk?

	X Stock	Y Stock	Sensex
Average return	0.15	0.25	0.06
Variance of return	6.30	5.86	2.25
β	0.71	0.685	
Correlation Co-efficient	0.424		
Co-efficient of determination (r^2)	0.18		

Solution

The co-efficient of determination (r^2) i.e. square of Coefficient of Correlation gives the percentage of the variation in the security's return that is explained by the variation of the market index return. In the X company stock return, 18 per cent of variation is explained by the variation of the index and 82 per cent is not explained by the index.

According to Sharpe, the variance explained by the index is the systematic risk. The unexplained variance or the residual variance is the unsystematic risk.

Company X:

$$\begin{aligned}\text{Systematic risk} &= \beta_i^2 \times \text{Variance of market index} \\ &= (0.71)^2 \times 2.25 = 1.134\end{aligned}$$

$$\begin{aligned}\text{Unsystematic risk}(\epsilon_i^2) &= \text{Total variance of security return} - \text{Systematic Risk} \\ &= 6.30 - 1.134 \\ &= 5.166\end{aligned}$$

or

$$\begin{aligned}&= \text{Variance of Security Return} (1-r^2) \\ &= 6.30 \times (1-0.18) = 6.3 \times 0.82 = 5.166\end{aligned}$$

$$\begin{aligned}\text{Total risk} &= \beta_i^2 \times \sigma_m^2 + \epsilon_i^2 \\ &= \text{Systematic Risk} + \text{Unsystematic Risk} \\ &= 1.134 + 5.166 = 6.30\end{aligned}$$

Company Y:

$$\begin{aligned}\text{Systematic risk} &= \beta_i^2 \times \sigma_m^2 \\ &= (0.685)^2 \times 2.25 = 1.056\end{aligned}$$

$$\begin{aligned}\text{Unsystematic risk} &= \text{Total variance of the security return} - \text{systematic risk.} \\ &= 5.86 - 1.056 = 4.804\end{aligned}$$

Portfolio Risk

$$\begin{aligned}\sigma_p^2 &= \left[\left(\sum_{i=1}^N X_i \beta_i \right)^2 \sigma_m^2 \right] + \left[\left(\sum_{i=1}^N X_i^2 \epsilon_i^2 \right) \right] \\ &= [(0.5 \times 0.71 + 0.5 \times 0.685)^2 \times 2.25] + [(0.5)^2(5.166) + (0.5)^2(4.804)] \\ &= [(0.355 + 0.3425)^2 \times 2.25] + [(1.292 + 1.201)] \\ &= 1.0946 + 2.493 = 3.5876\end{aligned}$$

8. CAPITAL ASSET PRICING MODEL (CAPM)

The CAPM distinguishes between risk of holding a single asset and holding a portfolio of assets. There is a trade-off between risk and return. Modern portfolio theory concentrates on risk and stresses on risk management rather than on return management. Risk may be security risk involving danger of loss of return from an investment in a single financial or capital asset. Security risk differs from portfolio risk, which is the probability of loss from investment in a portfolio of assets. Portfolio risk is comprised of unsystematic risk and systematic risk. Unsystematic risks can be averted through diversification and is related to random variables. Systematic risk is market related component of portfolio risk. It is commonly measured by regression coefficient Beta or the Beta coefficient. Low Beta reflects low risk and high Beta reflects high risk.

As the unsystematic risk can be diversified by building a portfolio, the relevant risk for determining the prices of securities is the non-diversifiable component of the total risk. As mentioned earlier, it can be measured by using Beta (β) a statistical parameter which measures the market sensitivity of returns. The beta for the market is equal to 1.0. Beta explains the systematic relationship between the return on a security and the return on the market by using a simple linear regression equation. The return on a security is taken as a dependent variable and the return on market is taken as independent variable then $R_j = R_f + \beta (R_m - R_f)$. The beta parameter (β) in this William Sharpe model represents the slope of the above regression relationship and measures the sensitivity or responsiveness of the security returns to the general market returns. The portfolio beta is merely the weighted average of the betas of individual securities included in the portfolio.

Portfolio Beta (β_P) = \sum Proportion of Security \times Beta for Security.

CAPM provides a conceptual framework for evaluating any investment decision where capital is committed with a goal of producing future returns. CAPM is based on certain assumptions to provide conceptual framework for evaluating risk and return. Some of the important assumptions are discussed below:

- (i) **Efficient market:** It is the first assumption of CAPM. Efficient market refers to the existence of competitive market where financial securities and capital assets are bought and sold with full information of risk and return available to all participants. In an efficient market, the price of individual assets will reflect a real or intrinsic value of a share as the market prices will adjust quickly to any new situation, John J. Hampton has remarked in "Financial decision making" that although efficient capital market is not much relevant to capital budgeting decisions, but CAPM would be useful to evaluate capital budgeting proposal because the company can compare risk and return to be obtained by investment in machinery with risk and return from investment in securities.
- (ii) **Rational investment goals:** Investors desire higher return for any acceptable level of risk or the lowest risk for any desired level of return. Such a rational choice is made on logical and consistent ranking of proposals in order of preference for higher good to lower good and this

is the scale of the marginal efficiency of capital. Beside, transactive preferences and certainty equivalents are other parameters of rational choice.

- (iii) Risk aversion in efficient market is adhered to although at times risk seeking behaviour is adopted for gains.
- (iv) CAPM assumes that all assets are divisible and liquid assets.
- (v) Investors are able to borrow freely at a risk less rate of interest i.e. borrowings can fetch equal return by investing in safe Government securities.
- (vi) Securities can be exchanged without payment of brokerage, commissions or taxes and without any transaction cost.
- (vii) Securities or capital assets face no bankruptcy or insolvency.
- (viii) CAPM assumes that the Capital Market is in equilibrium.

Based on above assumptions the CAPM is developed with the main goal to formulate the return required by investors from a single investment or a portfolio of assets. The required rate of return is defined as the minimum expected return needed so that investors will purchase and hold an asset.

Risk and return relationship in this model stipulates higher return for higher level of risk and *vice versa*. However, there may be exception to this general rule where markets are not efficient.

Three aspects are worth consideration:

- (a) Stock market is not concerned with diversifiable risk
- (b) It is not concerned with an investor having a diversified portfolio
- (c) Compensation paid is restricted to non-diversifiable risk.

Thus, an investor has to look into the non-diversifiable portion of risk on one side and returns on the other side. To establish a link between the two, the required return one expects to get for a given level of risk has been mandated by the Capital Asset Pricing Model.

If the risk free investment R_f is 5%, an investor can earn this return of 5% by investing in risk free investment. Again if the stock market earns a rate of return R_m which is 15% then an investor investing in stocks constituting the stock market index will earn also 15%. Thus, the excess return earned over and above the risk free return is called the market risk premium ($R_m - R_f$) i.e. $(15\% - 5\%) = 10\%$ which is the reward for undertaking risk. So, if an investment is as risky as the stock market, the risk premium to be earned is 10%.

If an investment is 30% riskier than the stock market, it would carry risk premium i.e. 30% more than the risk premium of the stock market i.e. $10\% + 30\% \text{ of } 10\% = 10\% + 3\% = 13\%$. β identifies how much more risky is an investment with reference to the stock market. Hence the risk premium that a stock should earn is β times the risk premium from the market [$\beta \times (R_m - R_f)$]. The total return from

an investment is the risk free rate of return plus the risk premium. So the required return from a stock would be $R_j = R_f + [\beta \times (R_m - R_f)]$. In the above example $5\% + 1.3 \times (15\% - 5\%) = 18\%$

The risk premium on a stock varies in direct proportion to its Beta. If the market risk premium is 6% and β of a stock is 1.2 then the risk premium for that stock shall be 7.2% ($6\% \times 1.2$)

Illustration 2

A company's beta is 1.40. The market return is 14% and the risk free rate is 10%.

- (i) What is the expected return of the company's stock based on CAPM.
- (ii) If the risk premium on the market goes up by 2.50% points, what would be the revised expected return on this stock?

Solution

- (i) Computation of expected return based on CAPM

$$R_j = R_f + \beta (R_m - R_f) = 10\% + 1.40 (14\% - 10\%) = 10\% + 5.6\% = 15.6\%$$

- (ii) Computation of expected return if the market risk premium goes up by 2.50% points

The return from the market goes up by 2.50% i.e. $14\% + 2.50\% = 16.50\%$

Expected Return based on CAPM is given by

$$R_j = 10\% + 1.40 (16.5\% - 10\%) = 10\% + 1.40 \times 6.5\% = 10\% + 9.10\% = 19.10\%$$

A graphical representation of CAPM is the Security Market Line, (SML). This line indicates the rate of return required to compensate at a given level of risk. Plotting required return on Y axis and Beta on the X-axis we get an upward sloping line which is given by $(R_m - R_f)$, the risk premium.

The higher the Beta value of a security, higher would be the risk premium relative to the market. This upward sloping line is called the Security Market Line. It measures the relationship between systematic risk and return.

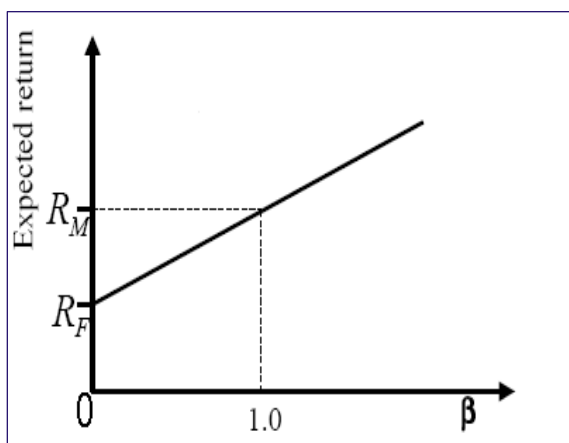


Illustration 3

The risk premium for the market is 10%. Assuming Beta values of Security K are 0, 0.25, 0.42, 1.00 and 1.67. Compute the risk premium on Security K.

Solution

Market Risk Premium is 10%

β Value of K	Risk Premium of K
0.00	0%
0.25	2.50%
0.42	4.20%
1.00	10.00%
1.67	16.70%

Illustration 4

Treasury Bills give a return of 5%. Market Return is 13%

- (i) What is the market risk premium
 (ii) Compute the β Value and required returns for the following combination of investments.

Treasury Bill	100	70	30	0
Market	0	30	70	100

Solution

Risk Premium $R_m - R_f = 13\% - 5\% = 8\%$

β is the weighted average investing in portfolio consisting of market $\beta = 1$ and treasury bills ($\beta = 0$)

Portfolio	Treasury Bills: Market	β	$R_j = R_f + \beta \times (R_m - R_f)$
1	100:0	0	$5\% + 0(13\% - 5\%) = 5\%$
2	70:30	$0.7(0) + 0.3(1) = 0.3$	$5\% + 0.3(13\% - 5\%) = 7.40\%$
3	30:70	$0.3(0) + 0.7(1) = 0.7$	$5\% + 0.7(13\% - 5\%) = 10.60\%$
4	0:100	1	$5\% + 1.0(13\% - 5\%) = 13\%$

8.1 Risk free Rate of Return

In CAPM, there is only one risk free rate. It presumes that the returns on a security include both dividend payments and capital appreciation. These require to be factored in judging the value of Beta and in computing the required rate of return.

Illustration 5

Pearl Ltd. expects that considering the current market prices, the equity shareholders as per Moderate Approach, should get a return of at least 15.50% while the current return on the market is 12%. RBI has closed the latest auction for ₹ 2500 crores of 182 day bills for the lowest bid of 4.3% although there were bidders at a higher rate of 4.6% also for lots of less than ₹ 10 crores. What is Pearl Ltd's Beta?

Solution

Determining Risk free rate: Two risk free rates are given. The aggressive approach would be to consider 4.6% while the conservative approach would be to take 4.3%. If we take the moderate value then the simple average of the two i.e. 4.45% would be considered

Application of CAPM

$$R_j = R_f + \beta (R_m - R_f)$$

$$15.50\% = 4.45\% + \beta (12\% - 4.45\%)$$

$$\beta = \frac{15.50\% - 4.45\%}{12\% - 4.45\%} = \frac{11.05}{7.55}$$

$$= 1.464$$

Illustration 6

The following information is available with respect of Jaykay Ltd.

Year	Jay Kay Limited		Market		Return on Govt. Bonds
	Average Share Price (₹)	DPS (₹)	Average Index	Dividend Yield (%)	
2002	242	20	1812	4	6
2003	279	25	1950	5	5
2004	305	30	2258	6	4
2005	322	35	2220	7	5

Compute Beta Value of the company as at the end of 2005. What is your observation?

Solution**Computation of Beta Value****Calculation of Returns**

$$\text{Returns} = \frac{D_1 + (P_1 - P_0)}{P_0} \times 100$$

Year	Returns
2002 – 2003	$\frac{25 + (279 - 242)}{242} \times 100 = 25.62\%$
2003 – 2004	$\frac{30 + (305 - 279)}{279} \times 100 = 20.07\%$
2004 – 2005	$\frac{35 + (322 - 305)}{305} \times 100 = 17.05\%$

Calculation of Returns from market Index

Year	% of Index Appreciation	Dividend Yield %	Total Return %
2002 – 2003	$\frac{1950 - 1812}{1812} \times 100 = 7.62\%$	5%	12.62%
2003 – 2004	$\frac{2258 - 1950}{1950} \times 100 = 15.79\%$	6%	21.79%
2004 – 2005	$\frac{2220 - 2258}{2258} \times 100 = (-)1.68\%$	7%	5.32%

Computation of Beta

Year	X	Y	XY	Y ²
2002-2003	25.62	12.62	323.32	159.26
2003-2004	20.07	21.79	437.33	474.80
2004-2005	17.05	5.32	90.71	28.30
	62.74	39.73	851.36	662.36

$$\bar{X} = \frac{62.74}{3} = 20.91, \quad \bar{Y} = \frac{39.73}{3} = 13.24$$

$$\begin{aligned} \beta &= \frac{\sum XY - n \bar{X} \bar{Y}}{\sum Y^2 - n(\bar{Y})^2} \\ &= \frac{851.36 - 3(20.91)(13.24)}{662.36 - 3(13.24)^2} \\ &= \frac{851.36 - 830.55}{662.36 - 525.89} = \frac{20.81}{136.47} = 0.15 \end{aligned}$$

8.2 Under Valued and Over Valued Stocks

The CAPM model can be practically used to buy, sell or hold stocks. CAPM provides the required rate of return on a stock after considering the risk involved in an investment. Based on current market

price or any other judgmental factors (benchmark) one can identify as to what would be the expected return over a period of time. By comparing the required return as per CAPM with the expected return the following investment decisions are available:

- (a) **When required return as per CAPM < Actual Return – Buy:** This is due to the stock being undervalued i.e. the stock gives more return than what it should give.
- (b) **When required return as per CAPM > Actual Return – Sell:** This is due to the stock being overvalued i.e. the stock gives less return than what it should give.
- (c) **When required return as per CAPM = Actual Return – Hold:** This is due to the stock being correctly valued i.e. the stock gives same return than what it should give.

From another angle, if the current market price is considered as a basis of CAPM then:

- (i) Actual Market Price < Market Price using CAPM, stock is undervalued
- (ii) Actual market Price > Market Price using CAPM, stock is overvalued
- (iii) Actual market Price = Market Price using CAPM, stock is correctly valued.

Illustration 7

Information related to an investment is as follows:

Risk free rate	10%
Market Return	15%
Beta	1.2

- (i) What would be the return from this investment?
- (ii) If the projected return is 18%, is the investment rightly valued?
- (iii) What is your strategy?

Solution

- (i) Required rate of Return as per CAPM is given by

$$R_j = R_f + \beta (R_m - R_f)$$

$$= 10 + 1.2 (15 - 10) = 16\%$$
- (ii) Since projected return is 18%, the stock is not rightly valued rather undervalued as return as per CAPM less than Projected Return.
- (iii) Had this Project Return is considered as expected return, the decision should be to BUY the share.

Illustration 8

The expected returns and Beta of three stocks are given below

Stock	A	B	C
Expected Return (%)	18	11	15
Beta Factor	1.7	0.6	1.2

If the risk free rate is 9% and the expected rate of return on the market portfolio is 14% which of the above stocks are over, under or correctly valued in the market? What shall be the strategy?

Solution

Required Rate of Return is given by

$$R_j = R_f + \beta (R_m - R_f)$$

For Stock A, $R_j = 9 + 1.7 (14 - 9) = 17.50\%$

Stock B, $R_j = 9 + 0.6 (14 - 9) = 12.00\%$

Stock C, $R_j = 9 + 1.2 (14 - 9) = 15.00\%$

Required Return %	Expected Return %	Valuation	Decision
17.50%	18.00%	Under Valued	Buy
12.00%	11.00%	Over Valued	Sell
15.00%	15.00%	Correctly Valued	Hold

8.3 Advantages and Limitations of CAPM

The advantages of CAPM can be listed as:

- (i) *Risk Adjusted Return*: It provides a reasonable basis for estimating the required return on an investment which has risk inbuilt into it. Hence, it can also be used as Risk Adjusted Discount Rate in Capital Budgeting.
- (ii) *No Dividend Company*: It is useful in computing the cost of equity of a company which does not declare dividend.

There are certain limitations of CAPM as well, which are discussed as follows:

- (a) *Reliability of Beta*: Statistically reliable Beta might not exist for shares of many firms. It may not be possible to determine the cost of equity of all firms using CAPM. All shortcomings that apply to Beta value applies to CAPM too.
- (b) *Other Risks*: By emphasising on systematic risk only, the unsystematic risk that are of importance too does not find place in a diversified portfolio.
- (c) *Information Available*: It is extremely difficult to obtain important information on risk free interest rate and expected return on market portfolio because depending upon the situations there can be multiple risk free rates and market being volatile its return varies from time to time.

9. ARBITRAGE PRICING THEORY MODEL (APT)

Arbitrage pricing theory (APT) is used as an alternative to Capital Assets Pricing Model (CAPM). While the CAPM formula helps to calculate the market's expected return, APT uses the risky asset's expected return and the risk premium of a number of macroeconomic factors.

In a simplistic way, if a particular asset, say a stock, has its major influencers factors then the stocks' return would be calculated by using the Arbitrage Pricing Theory (APT) in the following manner:

- (a) Calculate the risk premium for these risk factors (beta for the risk factor 1 – interest rate, and beta of the risk factor 2 – sector growth rate; etc. Conceptually risk premium is compensation over and above risk free rate of return that an investor expects/ requires for bearing that risk.
- (b) Adding the risk free rate of return.

Thus, the formula for APT is represented as –

$$E(R_i) = R_f + \lambda_1\beta_1 + \lambda_2\beta_2 + \lambda_3\beta_3 + \dots + \lambda_n\beta_n$$

Where,

R_f = Risk Free Rate

λ_n = nth factor price or risk premium

β_n = Sensitivity of the Factor n

The above formula provides the expected return in efficient market when equilibrium is reached.

Illustration 9

With the help of following data determine the return on the security X.

Factor	Risk Premium associated with the Factor	β_i
Market	4%	1.3
Growth Rate of GDP	1%	0.3
Inflation	-4%	0.2

Risk Free Rate of Return is 8%.

Solution

$$\begin{aligned}
 \text{Expected Return} &= R_f + \lambda_1\beta_1 + \lambda_2\beta_2 + \lambda_3\beta_3 \\
 &= 8\% + 1.3 \times 4\% + 0.3 \times 1\% + 0.2 \times (-4\%) \\
 &= 8\% + 5.2\% + 0.3\% - 0.8\% \\
 &= 12.7\%
 \end{aligned}$$

As mentioned earlier while CAPM concentrates on one factor (market risk) in its Model, APT does not specifically require any particular type of factor to be concentrated upon. Though Stephen Ross identified change in the following factors:

- ❖ Inflation
- ❖ Level of Industrial Production
- ❖ Risk Premium
- ❖ Term Structure of Interest Rates

Further according to Ross, if no surprise happens to these macro-economic factors then actual returns shall be equal to expected. In case, if any unanticipated change happens in these factors, then formula of APT shall be as follows:

$$E(R) = R_f + \beta_1 (EV_1 - AV_1) + \beta_2 (EV_2 - AV_2) + \dots + \beta_n (EV_n - AV_n)$$

Where

$(EV_n - AV_n)$ = Surprise Factor due to change in the Value of Factor

R_f = Risk Free Rate of Return

β_n = Sensitivity of corresponding Macro-economic factor

10. PORTFOLIO EVALUATION METHODS

Following three ratios are used to evaluate the portfolio:

10.1 Sharpe Ratio

Sharpe Ratio measures the Risk Premium per unit of Total Risk for a security or a portfolio of securities. The formula is as follows:

$$S = \frac{R_i - R_f}{\sigma_i}$$

Where,

R_i = Return on Security/Portfolio

R_f = Risk Free Rate of Return

σ_i = Standard Deviation of Return of Security/Portfolio

S = Sharpe Ratio

Example

Let's assume that we look at a one year period of time where an index fund earned 11% Treasury bills earned 6%. The standard deviation of the index fund was 20%

Therefore $S = (0.11 - 0.06) / 0.20 = 25\%$

The Sharpe ratio is an appropriate measure of performance for an overall portfolio particularly when it is compared to another portfolio, or another index such as the S&P 500, Small Cap index, etc.

That said however, it is not often provided in most rating services.

Example

Consider two Portfolios A and B. Let return of A be 30% and that of B be 25%. On the outset, it appears that A has performed better than B. Let us now incorporate the risk factor and find out the Sharpe ratios for the portfolios. Let risk of A and B be 11% and 5% respectively. This means that the standard deviation of returns - or the volatility of returns of A is much higher than that of B.

If risk free rate is assumed to be 8%,

Sharpe ratio for portfolio A = $(30\% - 8\%) / 11\% = 2$ and

Sharpe ratio for portfolio B = $(25\% - 8\%) / 5\% = 3.4$

Higher the Sharpe Ratio, better is the portfolio on a risk adjusted return metric. Hence, our primary judgment based solely on returns was erroneous. Portfolio B provides better risk adjusted returns than Portfolio A and hence is the preferred investment. Producing healthy returns with low volatility is generally preferred by most investors to high returns with high volatility. Sharpe ratio is a good tool to use to determine a portfolio that is suitable to such investors.

10.2 Treynor Ratio

This ratio is same as Sharpe ratio with only difference that it measures the Risk Premium per unit of Systematic Risk (β) for a security or a portfolio of securities. The formula is as follows:

$$T = \frac{R_i - R_f}{\beta_i}$$

Where,

R_i = Return on Security/Portfolio

R_f = Risk Free Rate of Return

β_i = Beta of Security or Portfolio

T = Treynor Ratio

Treynor ratio is based on the premise that unsystematic or specific risk can be diversified and hence, only incorporates the systematic risk (beta) to gauge the portfolio's performance. It measures the returns earned in excess of those that could have been earned on a riskless investment per unit of market risk assumed.

In above example if beta of Portfolio A and B are 1.5 and 1.1 respectively,

Treynor ratio for Portfolio A= $(30\%-8\%)/1.5=14.67\%$

Treynor ratio for Portfolio B= $(25\%-8\%)/1.1= 15.45\%$

The results are in line with that of the Sharpe ratio results.

Both Sharpe ratio and Treynor ratio measure risk adjusted returns. The difference lies in how risk is defined in either case. In Sharpe ratio, risk is determined as the degree of volatility in returns - the variability in month-on-month or period-on-period returns - which is expressed through the standard deviation of the stream of returns you are considering.

In Treynor ratio, you look at the beta of the portfolio or security - the degree of "momentum" that has been built into the portfolio by the fund manager in order to derive his excess returns. High momentum - or high beta (where beta is > 1) implies that the portfolio will move faster (up as well as down) than the market.

While Sharpe ratio measures total risk (as the degree of volatility in returns captures all elements of risk - systematic as well as unsystematic), the Treynor ratio captures only the systematic risk in its computation.

When one has to evaluate the funds which are sector specific, Sharpe ratio would be more meaningful. This is due to the fact that unsystematic risk would be present in sector specific funds. Hence, a true measure of evaluation would be to judge the returns based on the total risk.

On the contrary, if we consider diversified equity funds, the element of unsystematic risk would be very negligible as these funds are expected to be well diversified by virtue of their nature. Hence, Treynor ratio would be more apt here.

It is widely found that both ratios usually give similar rankings. This is based on the fact that most of the portfolios are fully diversified. To summarize, we can say that when the fund is not fully diversified, Sharpe ratio would be a better measure of performance and when the portfolio is fully diversified, Treynor ratio would better justify the performance of a fund.

Example: In 2019-20 where Fidelity Magellan had earned about 18%. Many bond funds had earned 13%. Which is better? In absolute numbers, 18% beats 13%. But if we then state that the bond funds had about half the market risk, now which is better? We don't even need to do the formula for that analysis. But that is missing in almost all reviews by all brokers. For clarification, we do not suggest they put all the money into either one- just that they need to be aware of the implications.

10.3 Jensen Alpha

This is the difference between a portfolio's actual return and those that could have been made on a benchmark portfolio with the same risk- i.e. Beta. It measures the ability of active management to increase returns above those that are purely a reward for bearing market risk. However, caveat applies it will only produce meaningful results if it is used to compare two portfolios which have similar betas. The formula is given as follows:

Alpha = Actual Return on portfolio – Expected Return on portfolio.

Assume Two Portfolios

	A	B	Market Return
Return	12	14	12
Beta	0.7	1.2	1.0

Risk Free Rate = 9%

The return expected as per CAPM

= Risk Free Return + Beta portfolio (Return of Market - Risk Free Return)

Hence, the expected return of Portfolio A using CAPM

= $0.09 + 0.7 (0.12 - 0.09) = 0.09 + 0.021 = 0.111$

Alpha = Return of Portfolio - Expected Return

= $0.12 - 0.111 = 0.009$

As long as “apples are compared to apples”- in other words a computer sector fund A to computer sector fund B - it is a viable number. But if taken out of context, it loses meaning. Alphas are found in many rating services but are not always developed the same way- so you can't compare an alpha from one service to another. However, we have usually found that their relative position in the particular rating service is to be viable. Short-term alphas are not valid. Minimum time frames are one year- three year is more preferable.

Alpha can also be used to assess the performance of a Portfolio or a Fund Manager. While a positive alpha indicates that the Fund Manager is doing well, a negative alpha indicates that Portfolio Manager is not doing well in comparison of market return.

11. SHARPE'S OPTIMAL PORTFOLIO

William Sharpe has developed a simplified variant of Markowitz model that reduces substantially its data and computational requirements.

This model is based on desirability of an investor for excess return of risk free rate of return to beta. Accordingly, the ranking of securities shall be based on the Sharpe Ratio and unique cut off point C* discussed below.

The steps for finding out the stocks to be included in the optimal portfolio are given below:

- Find out the “excess return to beta” ratio for each stock under consideration i.e. Treynor's ratio.
- Rank them from the highest to the lowest.

- (c) Proceed to calculate C_i for all the stocks according to the ranked order using the following formula:

$$C_i = \frac{\sigma_m^2 \sum_{i=1}^N \frac{(R_i - R_f) \beta_i}{\sigma_{ei}^2}}{1 + \sigma_m^2 \sum_{i=1}^N \frac{\beta_i^2}{\sigma_{ei}^2}}$$

Where,

σ_m^2 = variance of the market index

σ_{ei}^2 = variance of a stock's movement that is not associated with the movement of market index i.e. stock's unsystematic risk.

- (d) Compute the cut-off point which the highest value of C_i and is taken as C^* . The stock whose excess-return to risk ratio is above the cut-off ratio are selected and all whose ratios are below are rejected. The main reason for this selection is that since securities are ranked from highest excess return to Beta to lowest, and if particular security belongs to optimal portfolio all higher ranked securities also belong to optimal portfolio.
- (e) Once we came to know which securities are to be included in the optimum portfolio, we shall calculate the percent to be invested in each security by using the following formula:

$$X_i^0 = \frac{Z_i}{\sum_{j=1}^N Z_j}$$

where

$$Z_i = \frac{B_i}{\sigma_{ei}^2} \left(\frac{R_i - R_0}{B_i} - C^* \right)$$

The first portion determines the weight each stock and total comes to 1 to ensure that all funds are invested and second portion determines the relative investment in each security.

12. FORMULATION OF PORTFOLIO STRATEGY

Two broad choices are required for the formulation of an appropriate Portfolio Strategy. They are Active Portfolio Strategy and Passive Portfolio Strategy.

12.1 Active Portfolio Strategy (APS)

An APS is followed by most investment professionals and aggressive investors who strive to earn superior return after adjustment for risk. The vast majority of funds (or schemes) available in India

follow an “active” investment approach, wherein fund managers of “active” funds spend a great deal of time on researching individual companies, gathering extensive data about financial performance, business strategies and management characteristics. In other words, “active” fund managers try to identify and invest in stocks of those companies that they think will produce better returns and beat the overall market (or Index).

There are four principles of an active strategy. These are:

(a) Market Timing : This involves departing from the normal i.e. strategy for long run asset mix to reflect assessment of the prospect of various assets in the near future. Market timing is based on an explicit or implicit forecast of general market movement. A variety of tools are employed for market timing analysis namely business cycle analysis, moving average analysis, advance-decline analysis, Econometric models. The forecast for the general market movement derived with the help of one or more of these tools is tempered by the subjective judgment of the investors. In most cases investors may go largely by their market sense. Those who reveal the fluctuation in the market may be tempted to play the game of market timing but few will succeed in this game. Further an investment manager has to forecast the market correctly and 75% of the time he is only able to break even after taking into account the cost of errors and cost of transactions. According to Fisher Black, the market is just as well as on an average when the investor is out of the market as it does when he is in. So, he loses money relative to a single buy and sale strategy by being out of the market part of the time.

(b) Sector Rotation: Sector or group rotation may apply to both stock and bond component of the portfolio. It is used more compulsorily with respect to strategy. The components of the portfolio are used when it involves shifting. The weighting for various industry sectors is based on their asset outlook. If one thinks that steel and pharmaceutical would do well as compared to other sectors in the forthcoming period he may overweight the sector relative to their position in the market portfolio, with the result that his portfolio will be tilted more towards these sectors in comparison to the market portfolio.

With respect to bond portfolio sector rotation it implies a shift in the composition of the bond portfolio in terms of quality as reflected in credit rating, coupon rate, term of maturity etc. If one anticipates a rise in the interest rate one may shift from long term bonds to medium and short term. A long term bond is more sensitive to interest rate variation compared to a short term bond.

(c) Security Selection: Security selection involves a search for under-priced security. If one has to resort to active stock selection he may employ fundamental / technical analysis to identify stocks which seem to promise superior return and concentrate the stock components of portfolio on them. Such stock will be overweighted relative to their position in the market portfolio. Like wise stock which are perceived to be unattractive will be underweighted relative to their position in the market portfolio.

As far as bonds are concerned security selection calls for choosing bonds which offer the highest yields to maturity and at a given level of risk.

(d) **Use of Specialised Investment Concept:** To achieve superior return, one has to employ a specialised concept/philosophy particularly with respect to investment in stocks. The concept which have been exploited successfully are growth stock, neglected or out of favour stocks, asset stocks, technology stocks and cyclical stocks.

The advantage of cultivating a specialized investment concept is that it helps to:

- (i) Focus one's effort on a certain kind of investment that reflects one's ability and talent.
- (ii) Avoid the distraction of perusing other alternatives.
- (iii) Master an approach or style through sustained practice and continual self criticism.

The greatest disadvantage of focusing exclusively on a specialized concept is that it may become obsolete. The changes in the market risk may cast a shadow over the validity of the basic premise underlying the investor philosophy.

12.2 Passive Portfolio Strategy

Active strategy was based on the premise that the capital market is characterized by efficiency which can be exploited by resorting to market timing or sector rotation or security selection or use of special concept or some combination of these basis.

Passive strategy, on the other hand, rests on the tenet that the capital market is fairly efficient with respect to the available information. Hence they search for superior return. Basically, passive strategy involves adhering to two guidelines. They are:

- (a) Create a well-diversified portfolio at a predetermined level of risk.
- (b) Continue to hold the portfolio relatively unchanged over a period unless it becomes inadequately diversified or inconsistent with the investor risk return preference.

A fund which is *passively* managed is called index funds. An Index fund is a mutual fund scheme that invests in the securities of the target Index in the same proportion or weightage. Though it is designed to provide returns that closely track the benchmark Index, an Index Fund carries all the risks normally associated with the type of asset the fund holds. So, when the overall stock market rises/falls, you can expect the price of shares in the index fund to rise/fall, too. In short, an index fund does not mitigate market risks. Indexing merely ensures that your returns will not stray far from the returns on the Index that the fund mimics. In other words, an index fund is a fund whose daily returns are the same as the daily returns obtained from an index. Thus, it is passively managed in the sense that an index fund manager invests in a portfolio which is exactly the same as the portfolio which makes up an index. For instance, the NSE-50 index (Nifty) is a market index which is made up of 50 companies. A Nifty index fund has all its money invested in the Nifty fifty companies, held in the same weights of the companies which are held in the index.

12.3 Selection of Securities

There are certain criteria which must be kept in mind while selecting securities. The selection criteria for both bonds and equity shares are given as following:

12.3.1 Selection of Bonds

Bonds are fixed income avenues. The following factors have to be evaluated in selecting fixed income avenues:

- (a) *Yield to maturity*: The yield to maturity for a fixed income avenues represent the rate of return earned by the investor, if he invests in the fixed income avenues and holds it till its maturity.
- (b) *Risk of Default*: To assess such risk on a bond, one has to look at the credit rating of the bond. If no credit rating is available relevant financial ratios of the firm have to be examined such as debt equity, interest coverage, earning power etc and the general prospect of the industry to which the firm belongs have to be assessed.
- (c) *Tax Shield*: In the past, several fixed income avenues offers tax shields but at present only a few of them do so.
- (d) *Liquidity*: If the fixed income avenues can be converted wholly or substantially into cash at a fairly short notice it possesses a liquidity of a high order.

12.3.2 Selection of Stock (Equity Share)

Three approaches are applied for selection of equity shares- Technical analysis, Fundamental analysis and Random selection analysis.

- (a) Technical analysis looks at price behaviours and volume data to determine whether the share price will move up or down or remain trend less.
- (b) Fundamental analysis focuses on fundamental factors like earning level, growth prospects and risk exposure to establish intrinsic value of a share. The recommendation to buy hold or sell is based on comparison of intrinsic value and prevailing market price.
- (c) Random selection analysis is based on the premise that the market is efficient and security is properly priced.

Levels of Market Efficiency and Approach To Security Selection

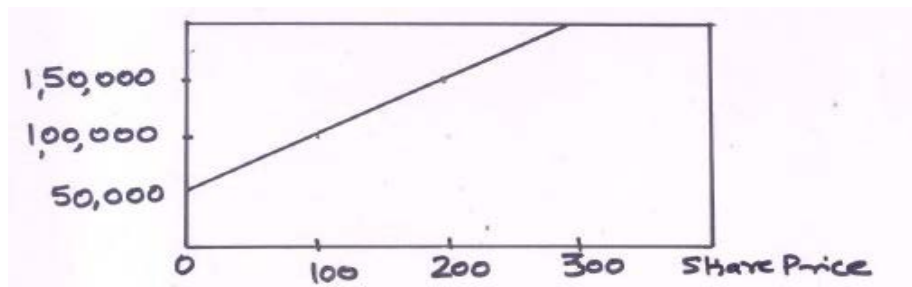
<i>Approach</i> <i>Levels of Efficiency</i>	<i>Technical Analysis</i>	<i>Fundamentals Analysis</i>	<i>Random Selection</i>
1) Inefficiency	Best	Poor	Poor
2) Weak form efficiency	Poor	Best	Poor
3) Semi-strong efficiency	Poor	Good	Fair
4) Strong Form efficiency	Poor	Fair	Best

13. PORTFOLIO REVISION AND REBALANCING

It means the value of portfolio as well as its composition. The relative proportion of bond and stocks may change as stock and bonds fluctuate in response to such changes. Portfolio rebalancing is necessary. There are three policies of portfolio rebalancing- Buy and hold policy, Constant mix policy, and Constant Proportion Portfolio Insurance (CPPI) policy. These policies have different pay off under varying market conditions. Under all these policies portfolio consists of investment in stock and bonds.

(a) Buy and Hold Policy: Sometime this policy is also called 'do nothing policy' as under this strategy no balancing is required and therefore investor maintain an exposure to stocks and therefore linearly related to the value of stock in general.

Under this strategy investors set a limit (floor) below which he does not wish the value of portfolio should go. Therefore, he invests an amount equal to floor value in non-fluctuating assets (Bonds). Since the value of portfolio is linearly related to value of stocks the pay-off diagram is a straight line. This can be better understood with the help of an example. Suppose a portfolio consisting of Debt/ Bonds for ₹ 50,000 and ₹ 50,000 in equity shares currently priced at ₹ 100 per share. If price of the share moves from ₹ 100 to ₹ 200 the value of portfolio shall become ₹ 1,50,000. The pay-off diagram is shown in figure below i.e. a straight line:



This policy is suitable for the investor whose risk tolerance is positively related to portfolio and stock market return but drops to zero of below floor value.

Concluding, it can be said that following are main features of this policy:

- The value of portfolio is positively related and linearly dependent on the value of the stock.
- The value of portfolio cannot fall below the floor value i.e. investment in Bonds.
- This policy performs better if initial percentage is higher in stock and stock outperform the bond. Reverse will happen if stock under perform in comparison of bond or their prices goes down.

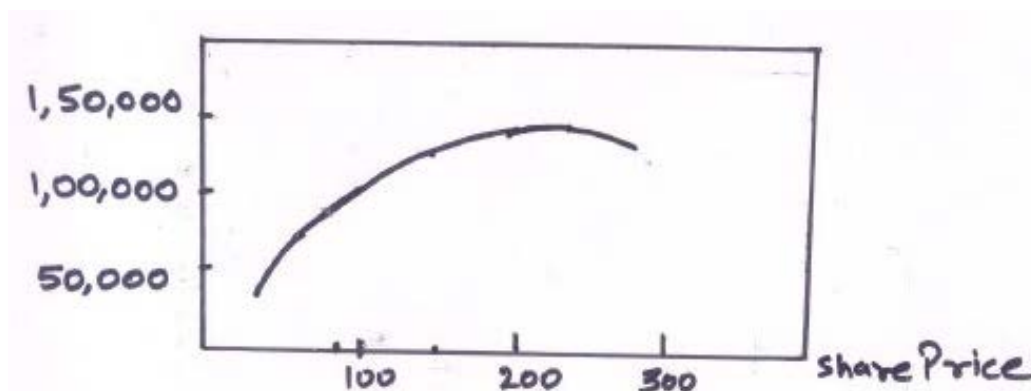
(b) Constant Mix Policy: Contrary to above policy this policy is a 'Do Something Policy'. Under this policy investor maintains an exposure to stock at a constant percentage of total portfolio. This strategy involves periodic rebalancing to required (desired) proportion by purchasing and selling

stocks as and when their prices goes down and up respectively. In other words this plan specifies that value of aggressive portfolio to the value of conservative portfolio will be held constant at a pre-determined ratio. However, it is important to this action is taken only there is change in the prices of share at a predetermined percentage.

For example if an investor decided his portfolio shall consist of 60% in equity shares and balance 40% in bonds on upward or downward of 10% in share prices he will strike a balance.

In such situation if the price of share goes down by 10% or more, he will sell the bonds and invest money in equities so that the proportion among the portfolio i.e. 60:40 remains the same. According if the prices of share goes up by 10% or more he will sell equity shares and shall in bonds so that the ratio remains the same i.e. 60:40. This strategy is suitable for the investor whose tolerance varies proportionally with the level of wealth and such investor holds equity at all levels.

The pay-off diagram of this policy shall be as follows:



Accordingly, it gives a concave pay off, tends to do well in flat but fluctuating market.

Continuing above example let us how investor shall rebalance his portfolio (50 : 50) under different scenarios as follows:

(a) If price decreases

Share Price		Value of Shares	Value of Bonds	Total	Stock to Bond Switching	Bond to Stock Switching
100	Starting Level	50,000	50,000	1,00,000	-	-
80	Before Rebalancing	40,000	50,000	90,000	-	-
	After Rebalancing	45,000	45,000	90,000	-	5,000
60	Before Rebalancing	33,750	45,000	78,750	-	-
	After Rebalancing	39,360	39,390	78,750	-	5,610

(b) If price increases

Share Price		Value of Shares	Value of Bonds	Total	Stock to Bond Switching	Bond to Stock Switching
100	Starting Level	50,000	50,000	1,00,000	-	-
150	Before Rebalancing	75,000	50,000	1,25,000	-	-
	After Rebalancing	62,400	62,600	1,25,000	12,600	-
200	Before Rebalancing	83,200	62,600	1,45,800	-	-
	After Rebalancing	72,800	73,000	1,45,800	10,400	-

(c) **Constant Proportion Insurance Policy** : Under this strategy investor sets a limit below which he does not wish his asset to fall called 'Floor Value', which is invested in some non-fluctuating assets such as Treasury Bills, Bonds etc. The value of portfolio under this strategy shall not fall below this specified floor under normal market conditions. This strategy performs well especially in bull market as the value of shares purchased as cushion increases. In contrast in bearish market losses are avoided by sale of shares. It should however be noted that this strategy performs very poorly in the market hurt by sharp reversals. The following equation is used to determine equity allocation:

Target Investment in Shares = Multiplier (Portfolio Value – Floor Value)

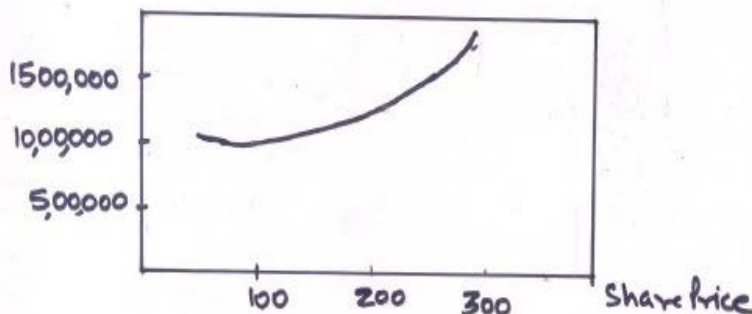
Multiplier is a fixed constant whose value shall be more than 1.

The pay-off under this strategy can be understood better with the help of an example. Suppose wealth of Mr. A is ₹ 10,00,000, a floor value of ₹ 7,50,000 and a multiplier of 2. Since the initial cushion (difference between Portfolio Value and Floor) is ₹ 2,50,000, the initial investment in the share shall be ₹ 5,00,000 (double of the initial cushion). Accordingly, initial portfolio mix shall consist of ₹ 5,00,000 in shares and balance ₹ 5,00,000 in Bonds.

Situation 1: Suppose stock market rises from 100 to 150. The value of shares of Mr. A's holding shall rise from ₹ 5,00,000 to ₹ 7,50,000 and value of portfolio shall jump to ₹ 12,50,000 and value of cushion to ₹ 7,50,000. Since the CPPI Policy requires the component of shares should go up to ₹ 10,00,000. This will necessitate the selling of bonds amounting ₹ 2,50,000 and re-investing proceeds in shares.

Situation 2: If stock market falls from 100 to 80, the value of shares of portfolio falls from ₹ 5,00,000 to ₹ 4,00,000 resulting in reduction of value of portfolio to ₹ 9,00,000 and cushion to ₹ 1,50,000. Since as per CPPI the share component should be ₹ 3,00,000 (₹ 1,50,000 x 2), hence shares of ₹ 1,00,000 should be sold and invest in Bonds.

Thus from above it is clear that as per CPPI sell the shares as their prices fall and buy them as their prices rise. This policy is contrary to the Constant Mix Policy and hence pay-off of CPPI shall be convex as shown below:



(d) Comparative Evaluation

Basis	Buy & Hold Policy	Constant Mix Policy	Constant Proportion Portfolio Insurance
Pay-off Line	Straight	Concave	Convex
Protection in Down/Up Markets	Definitely poor in Down market	Not much in Down market but relatively poor in Up market	Good in Down market and performs well in Up market
Performance in flat market	Performs between Constant and CPPI	Tend to do well in flat market.	Performs poorly.

 14. ASSET ALLOCATION STRATEGIES

Many portfolios containing equities also contain other asset categories, so the management factors are not limited to equities. There are four asset allocation strategies:

(a) Integrated Asset Allocation: Under this strategy, capital market conditions and investor objectives and constraints are examined and the allocation that best serves the investor's needs while incorporating the capital market forecast is determined.

(b) Strategic Asset Allocation: Under this strategy, optimal portfolio mixes based on returns, risk and co-variances is generated using historical information and adjusted periodically to restore target allocation within the context of the investor's objectives and constraints.

(c) Tactical Asset Allocation: Under this strategy, investor's risk tolerance is assumed constant and the asset allocation is changed based on expectations about capital market conditions.

(d) **Insured Asset Allocation:** Under this strategy, risk exposure for changing portfolio values (wealth) is adjusted; more value means more ability to take risk.



15. FIXED INCOME PORTFOLIO

Fixed Income Portfolio is same as equity portfolio with difference that it consist of fixed income securities such as bonds, debentures, money market instruments etc. Since, it mainly consists of bonds, it is also called Bond Portfolio.

15.1 Fixed Income Portfolio Process

Just like other portfolios, following five steps are involved in fixed income portfolio.

1. Setting up objective
2. Drafting guideline for investment policy
3. Selection of Portfolio Strategy - Active and Passive
4. Selection of securities and other assets
5. Evaluation of performance with benchmark

15.2 Calculation of Return on Fixed Income Portfolio

First and foremost step in evaluation of performance of a portfolio is calculation of return. Although there can be many types of measuring returns as per requirements but some of the commonly used measures are :

- (i) Arithmetic Average Rate of Return
- (ii) Time Weighted Rate of Return
- (iii) Rupee Weighted Rate of Return
- (iv) Annualized Return

15.3 Fixed Income Portfolio Management Strategies

There are two strategies

- (i) Passive Strategy
- (ii) Active Strategy

15.3.1 Passive Strategy

As mentioned earlier Passive Strategy is based on the premise that securities are fairly priced commensurate with the level of risk. Though investor does not try to outperform the market but it does not imply they remain totally inactive. Common strategies applied by passive investors of fixed income portfolios are as follows:

(i) *Buy and Hold Strategy*: This technique is do nothing technique and investor continues with initial selection and do not attempt to churn bond portfolio to increase return or reduce the level of risk.

However, sometime to control the interest rate risk, the investor may set the duration of fixed income portfolio equal to benchmarked index.

(ii) *Indexation Strategy*: This strategy involves replication of a predetermined benchmark well known bond index as closely as possible.

(iii) *Immunization*: This strategy cannot exactly be termed as purely passive strategy but a hybrid strategy. This strategy is more popular among pension funds. Since pension funds promised to pay fixed amount to retiring people in the form of annuities any inverse movement in interest may threaten fund's ability to meet their liability timely. By building an immunized portfolio the interest rate risk can be avoided.

(iv) *Matching Cash Flows*: Another stable approach to immunize the portfolio is Cash Flow Matching. This approach involves buying of Zero Coupon Bonds to meet the promised payment out of the proceeds realized.

15.3.2 Active Strategy

As mentioned earlier Active Strategy is usually adopted to outperform the market. Following are some of active strategies:

(1) *Forecasting Returns and Interest Rates*: This strategy involves the estimation of return on basis of change in interest rates. Since interest rate and bond values are inversely related if portfolio manager is expecting a fall in interest rate of bonds he/she should buy with longer maturity period. On the contrary, if he/she expected a fall in interest then he/she should sell bonds with longer period.

Based on short term yield movement following three strategies can be adopted:

- (a) *Bullet Strategy*: This strategy involves concentration of investment in one particular bond. This type of strategy is suitable for meeting the fund after a point of time such as meeting education expenses of children etc. For example, if 100% of fund meant for investing in bonds is invested in 5-years Bond.
- (b) *Barbell Strategy*: As the name suggests this strategy involves investing equal amount in short term and long term bonds. For example, half of fund meant for investment in bonds is invested in 1-year Bond and balance half in 10-year Bonds.
- (c) *Ladder Strategy*: This strategy involves investment of equal amount in bonds with different maturity periods. For example if 20% of fund meant for investment in bonds is invested in Bonds of periods ranging from 1 year to 5 years.

Further estimation of interest ratio is a daunting task, and quite difficult to ascertain. There are several models available to forecast the expected interest rates which are based on:

- (i) Inflation
- (ii) Past Trends
- (iii) Multi Factor Analysis

It should be noted that these models can be used as estimates only, as it is difficult to calculate the accurate changes.

There is one another technique of estimating expected change in interest rate called 'Horizon Analysis'. This technique requires that analyst should select a particular holding period and then predict yield curve at the end of that period as with a given period of maturity, a bond yield curve of a selected period can be estimated and its end price can also be calculated.

(2) *Bond Swaps*: This strategy involves regularly monitoring bond process to identify mispricing and try to exploit this situation. Some of the popular swap techniques are as follows:

- (a) *Pure Yield Pickup Swap* - This strategy involves switch from a lower yield bond to a higher yield bonds of almost identical quantity and maturity. This strategy is suitable for portfolio manager who is willing to assume interest rate risk as in switching from short term bond to long term bonds to earn higher rate of interest, he may suffer a capital loss.
- (b) *Substitution Swap* - This swapping involves swapping with similar type of bonds in terms of coupon rate, maturity period, credit rating, liquidity and call provision but with different prices. This type of differences exits due to temporary imbalance in the market. The risk a portfolio manager carries if some features of swapped bonds may not be truly identical to the swapped one.
- (c) *International Spread Swap* – In this swap portfolio manager is of the belief that yield spreads between two sectors is temporarily out of line and he tries to take benefit of this mismatch. Since the spread depends on many factor and a portfolio manager can anticipate appropriate strategy and can profit from these expected differentials.
- (d) *Tax Swap* – This is based on taking tax advantage by selling existing bond whose price decreased at capital loss and set it off against capital gain in other securities and buying another security which has features like that of disposed one.

(3) *Interest Rate Swap*: Interest Rate Swap is another technique that is used by Portfolio Manager. This technique has been discussed in details in the chapter on Interest Rate Risk Management.



16. ALTERNATIVE INVESTMENT AVENUES

Plainly speaking, Alternative Investments (AIs) are Investments other than traditional investments (stock, bond and cash).

Features of Alternative Investments

Though here may be many features of Alternative Investment but following are some common features.

- (i) *High Fees* – Being a specific nature product the transaction fees are quite on higher side.
- (ii) *Limited Historical Rate* – The data for historic return and risk is very limited where data for equity market for more than 100 years is available.
- (iii) *Illiquidity* – The liquidity of Alternative Investment is not good as next buyer may not be easily available due to limited market.
- (iv) *Less Transparency* – The level of transparency is not adequate due to limited public information available.
- (v) *Extensive Research Required* – Due to limited availability of market information extensive analysis is required by the Portfolio Managers.
- (vi) *Leveraged Buying* – Generally investment in alternative investments is highly leveraged.

Over the time various types of AIs have been evolved but some of the important AIs are as follows:

1. Real Estates
2. Gold
3. Private Equity
4. REITs
5. Hedge Funds
6. Exchange Traded Funds
7. Mutual Funds
8. Commodities
9. Distressed Securities

Since, some of the above terms have been covered under the respective chapter in this study, we shall cover other terms hereunder.

16.1 Real Estates

As opposed to financial claims in the form of paper or a dematerialized mode, real estate is a tangible form of assets which can be seen or touched. Real Assets consists of land, buildings, offices, warehouses, shops etc.

Although real investment is like any other investment but it has some special features as every country has their own laws and paper works which makes investment in foreign properties less attractive. However, in recent time due to globalization investment in foreign real estate has been increased.

16.1.1 Valuation Approaches

Comparing to financial instrument the valuation of Real Estate is quite complex as number of transactions or dealings comparing to financial instruments are very small.

Following are some characteristics that make valuation of Real Estate quite complex:

- (i) Inefficient market: Information may not be freely available as in case of financial securities.
- (ii) Illiquidity: Real Estates are not as liquid as financial instruments.
- (iii) Comparison: Real estates are only approximately comparable to other properties.
- (iv) High Transaction cost: In comparison to financial instruments, the transaction and management cost of Real Estate is quite high.
- (v) No Organized market: There is no such organized exchange or market as for equity shares and bonds.

16.1.2 Valuation of Real Estates

Generally, following four approaches are used in valuation of Real estates:

- (1) Sales Comparison Approach – It is like Price Earning Multiplier as in case of equity shares. Benchmark value of similar type of property can be used to value Real Estate.
- (2) Income Approach – This approach is like value of Perpetual Debenture or Irredeemable Preference Shares. In this approach the perpetual cash flow of potential net income (after deducting expense) is discounted at market required rate of return.
- (3) Cost Approach – In this approach, the cost is estimated to replace the building in its present form plus estimated value of land. However, adjustment of other factors such as good location, neighbourhood is also made in it.
- (4) Discounted After Tax Cash Flow Approach – In comparison to NPV technique, PV of expected inflows at required rate of return is reduced by amount of investment.

16.2 Gold

Being a real asset Gold is an attractive alternative form of investment by various categories of investors. Gold has been a very popular source of investment since a long time especially among Indians. The most common avenue of making investment in the gold has been buying the jewellery by most of the households. However, this form of investment in gold suffers from a serious limitation of making charges because jeweller charge them both at the time of selling and buying back.

Hence with the passage of time other forms have been evolved some of which are as follows:

(a) Gold Bars: An alternative to investment in jewellery, investors can buy gold coins/ bar of different denominations. However, similar to jewellery this form of investment suffers from the limitation of cost of physical storage.

(b) Sovereign Gold Bonds (SGBs): The SGB offers a superior alternative to holding gold in physical form. SGBs are government securities denominated in grams of gold. They are substitutes for holding physical gold. Investors have to pay the issue price in cash and the bonds will be redeemed in cash on maturity. The Bond is issued by Reserve Bank on behalf of Government of India. The quantity of gold for which the investor pays is protected, since he receives the ongoing

market price at the time of redemption/ premature redemption. The risks and costs of storage are eliminated. Investors are assured of the market value of gold at the time of maturity and periodical interest. SGB is free from issues like making charges and purity in the case of gold in jewellery form. The bonds are held in the books of the RBI or in demat form eliminating risk of loss of scrip etc.

(c) Gold Exchange Traded Funds (ETFs): Gold ETFs can be considered as an investment avenue which is a hybrid of flexibility of stock investment and the simplicity of gold investments. Like any other company stock, they can be bought and sold continuously at market prices on Stock Exchanges.

Prices of Gold ETFs are based on gold prices and investment of fund amount is made in gold bullion. Further because of its direct gold pricing, there is a complete transparency on the holdings of an ETF. Compared to physical gold investments due to its unique structure and creation mechanism, the ETFs have much lower expenses.

(d) E-gold: Started in 2010 in India, E-gold is offered by the National Spot Exchange Ltd (NSE). It can be bought by setting up a trading account with an authorized participant with NSE. Each unit of e-gold is equivalent to one gram of physical gold and is held in the Demat account (different from holding and transacting in equities). Like Gold ETFs, e-gold units are fully backed by an equivalent quantity of gold kept with the custodian and have less storage cost compared to physical gold. These units can be traded on the exchange.

16.3 Distressed securities

It is purchasing the securities of companies that are in or near bankruptcy. Since these securities are available at very low price, the main purpose of buying such securities is to make efforts to revive the sick company. Further, these securities are suitable for those investors who cannot participate in the market and those who want to avoid due diligence.

Now, question arises how profit can be earned from distressed securities. It can be by taking Long Position in Debt and Short Position in Equity. Now let us see how investor can earn arbitrage profit.

- (i) In case company's condition improves because of priority, the investor will get his interest payment which shall be more than the dividend on his short position in equity shares.
- (ii) If company's condition further deteriorates the value of both share and debenture goes down. He will make good profit from his short position.

Risks Analysis of Investment in Distressed Securities : On the face, investment in distressed securities appears to be a good proposition but following types of risks are needed to be analyzed.

- (i) Liquidity Risk – These securities may be saleable in the market.
- (ii) Event Risk – Any event that particularly effect the company not economy as a whole
- (iii) Market Risk – This is another type of risk though it is not important.
- (iv) Human Risk – The judge's decision on the company in distress also play a big role.

TEST YOUR KNOWLEDGE

Theoretical Questions

1. Write short note on factors affecting decision of investment in fixed income securities.
2. Briefly explain the objectives of "Portfolio Management".
3. Discuss the Capital Asset Pricing Model (CAPM) and its relevant assumptions.

Practical Questions

1. A stock costing ₹ 120 pays no dividends. The possible prices that the stock might sell for at the end of the year with the respective probabilities are:

Price	Probability
115	0.1
120	0.1
125	0.2
130	0.3
135	0.2
140	0.1

Required:

- (i) Calculate the expected return.
 - (ii) Calculate the Standard deviation of returns.
2. Following information is available in respect of expected dividend, market price and market condition after one year.

Market condition	Probability	Market Price	Dividend per share
		₹	₹
Good	0.25	115	9
Normal	0.50	107	5
Bad	0.25	97	3

The existing market price of equity share is ₹ 106 (F.V. ₹ 1), which is cum 10% bonus debenture of ₹ 6 each, per share. M/s. X Finance Company Ltd. had offered the buy-back of debentures at face value.

Find out the expected return and variability of returns of the equity shares if buyback offer is accepted by the investor.

And also advise-Whether to accept buy-back offer?

3. Mr. A is interested to invest ₹ 1,00,000 in the securities market. He selected two securities B and D for this purpose. The risk return profile of these securities are as follows :

Security	Risk (σ)	Expected Return (ER)
B	10%	12%
D	18%	20%

Co-efficient of correlation between B and D is 0.15.

You are required to calculate the portfolio return of the following portfolios of B and D to be considered by A for his investment.

- (i) 100 percent investment in B only;
- (ii) 50 percent of the fund in B and the rest 50 percent in D;
- (iii) 75 percent of the fund in B and the rest 25 percent in D; and
- (iv) 100 percent investment in D only.

Also indicate that which portfolio is best for him from risk as well as return point of view?

4. Consider the following information on two stocks, A and B :

Year	Return on A (%)	Return on B (%)
2006	10	12
2007	16	18

You are required to determine:

- (i) The expected return on a portfolio containing A and B in the proportion of 40% and 60% respectively.
 - (ii) The Standard Deviation of return from each of the two stocks.
 - (iii) The covariance of returns from the two stocks.
 - (iv) Correlation coefficient between the returns of the two stocks.
 - (v) The risk of a portfolio containing A and B in the proportion of 40% and 60%.
5. Following is the data regarding six securities:

	A	B	C	D	E	F
Return (%)	8	8	12	4	9	8
Risk (Standard deviation)	4	5	12	4	5	6

- (i) Assuming three will have to be selected, state which ones will be picked.

- (ii) Assuming perfect correlation, show whether it is preferable to invest 75% in A and 25% in C or to invest 100% in E
6. The historical rates of return of two securities over the past ten years are given. Calculate the Covariance and the Correlation coefficient of the two securities:

Years:	1	2	3	4	5	6	7	8	9	10
Security 1: (Return per cent)	12	8	7	14	16	15	18	20	16	22
Security 2: (Return per cent)	20	22	24	18	15	20	24	25	22	20

7. An investor has decided to invest ₹ 1,00,000 in the shares of two companies, namely, ABC and XYZ. The projections of returns from the shares of the two companies along with their probabilities are as follows:

Probability	ABC(%)	XYZ(%)
.20	12	16
.25	14	10
.25	-7	28
.30	28	-2

You are required to

- (i) Comment on return and risk of investment in individual shares.
- (ii) Compare the risk and return of these two shares with a Portfolio of these shares in equal proportions.
- (iii) Find out the proportion of each of the above shares to formulate a minimum risk portfolio.
8. The following information are available with respect of Krishna Ltd.

Year	Krishna Ltd. Average share price	Dividend per Share	Average Market Index	Dividend Yield	Return on Govt. bonds
	₹	₹			
2012	245	20	2013	4%	7%
2013	253	22	2130	5%	6%
2014	310	25	2350	6%	6%
2015	330	30	2580	7%	6%

Compute Beta Value of the Krishna Ltd. at the end of 2015 and state your observation.

9. The distribution of return of security 'F' and the market portfolio 'P' is given below:

Probability	Return %	
	F	P
0.30	30	-10
0.40	20	20
0.30	0	30

You are required to calculate the expected return of security 'F' and the market portfolio 'P', the covariance between the market portfolio and security and beta for the security.

10. Given below is information of market rates of Returns and Data from two Companies A and B:

	Year 2007	Year 2008	Year 2009
Market (%)	12.0	11.0	9.0
Company A (%)	13.0	11.5	9.8
Company B (%)	11.0	10.5	9.5

You are required to determine the beta coefficients of the Shares of Company A and Company B.

11. The returns on stock A and market portfolio for a period of 6 years are as follows:

Year	Return on A (%)	Return on market portfolio (%)
1	12	8
2	15	12
3	11	11
4	2	-4
5	10	9.5
6	-12	-2

You are required to determine:

- (i) Characteristic line for stock A
 - (ii) The systematic and unsystematic risk of stock A.
12. The rates of return on the security of Company X and market portfolio for 10 periods are given below:

Period	Return of Security X (%)	Return on Market Portfolio (%)
1	20	22
2	22	20
3	25	18

4	21	16
5	18	20
6	-5	8
7	17	-6
8	19	5
9	-7	6
10	20	11

- (i) What is the beta of Security X?
(ii) What is the characteristic line for Security X?

13. Expected returns on two stocks for particular market returns are given in the following table:

Market Return	Aggressive	Defensive
7%	4%	9%
25%	40%	18%

You are required to calculate:

- (a) The Betas of the two stocks.
(b) Expected return of each stock, if the market return is equally likely to be 7% or 25%.
(c) The Security Market Line (SML), if the risk free rate is 7.5% and market return is equally likely to be 7% or 25%.
(d) The Alphas of the two stocks.
14. A study by a Mutual fund has revealed the following data in respect of three securities:

Security	σ (%)	Correlation with Index, P_m
A	20	0.60
B	18	0.95
C	12	0.75

The standard deviation of market portfolio (BSE Sensex) is observed to be 15%.

- (i) What is the sensitivity of returns of each stock with respect to the market?
(ii) What are the covariances among the various stocks?
(iii) What would be the risk of portfolio consisting of all the three stocks equally?
(iv) What is the beta of the portfolio consisting of equal investment in each stock?
(v) What is the total, systematic and unsystematic risk of the portfolio in (iv)?
15. Mr. X owns a portfolio with the following characteristics:

	Security A	Security B	Risk Free security
Factor 1 sensitivity	0.80	1.50	0
Factor 2 sensitivity	0.60	1.20	0
Expected Return	15%	20%	10%

It is assumed that security returns are generated by a two factor model.

- (i) If Mr. X has ₹ 1,00,000 to invest and sells short ₹ 50,000 of security B and purchases ₹ 1,50,000 of security A what is the sensitivity of Mr. X's portfolio to the two factors?
- (ii) If Mr. X borrows ₹ 1,00,000 at the risk free rate and invests the amount he borrows along with the original amount of ₹ 1,00,000 in security A and B in the same proportion as described in part (i), what is the sensitivity of the portfolio to the two factors?
- (iii) What is the expected return premium of factor 2?

16. Mr. Tempest has the following portfolio of four shares:

Name	Beta	Investment ₹ Lac.
Oxy Rin Ltd.	0.45	0.80
Boxed Ltd.	0.35	1.50
Square Ltd.	1.15	2.25
Ellipse Ltd.	1.85	4.50

The risk-free rate of return is 7% and the market rate of return is 14%.

Required.

- (i) Determine the portfolio return. (ii) Calculate the portfolio Beta.

17. Mr. Abhishek is interested in investing ₹ 2,00,000 for which he is considering following three alternatives:

- (i) Invest ₹ 2,00,000 in Mutual Fund X (MFX)
- (ii) Invest ₹ 2,00,000 in Mutual Fund Y (MFY)
- (iii) Invest ₹ 1,20,000 in Mutual Fund X (MFX) and ₹ 80,000 in Mutual Fund Y (MFY)

Average annual return earned by MFX and MFY is 15% and 14% respectively. Risk free rate of return is 10% and market rate of return is 12%.

Covariance of returns of MFX, MFY and market portfolio Mix are as follow:

	MFX	MFY	Mix
MFX	4.800	4.300	3.370
MFY	4.300	4.250	2.800
Mix	3.370	2.800	3.100

You are required to calculate:

- (i) variance of return from MFX, MFY and market return,
- (ii) portfolio return, beta, portfolio variance and portfolio standard deviation,
- (iii) expected return, systematic risk and unsystematic risk; and
- (iv) Sharpe ratio, Treynor ratio and Alpha of MFX, MFY and Portfolio Mix

18. Amal Ltd. has been maintaining a growth rate of 12% in dividends. The company has paid dividend @ ₹ 3 per share. The rate of return on market portfolio is 15% and the risk-free rate of return in the market has been observed as 10%. The beta co-efficient of the company's share is 1.2.

You are required to calculate the expected rate of return on the company's shares as per CAPM model and the equilibrium price per share by dividend growth model.

19. The following information is available in respect of Security X

Equilibrium Return	15%
Market Return	15%
7% Treasury Bond Trading at	\$140
Covariance of Market Return and Security Return	225%
Coefficient of Correlation	0.75

You are required to determine the Standard Deviation of Market Return and Security Return.

20. Assuming that shares of ABC Ltd. and XYZ Ltd. are correctly priced according to Capital Asset Pricing Model. The expected return from and Beta of these shares are as follows:

Share	Beta	Expected return
ABC	1.2	19.8%
XYZ	0.9	17.1%

You are required to derive Security Market Line.

21. A Ltd. has an expected return of 22% and Standard deviation of 40%. B Ltd. has an expected return of 24% and Standard deviation of 38%. A Ltd. has a beta of 0.86 and B Ltd. has a beta of 1.24. The correlation coefficient between the return of A Ltd. and B Ltd. is 0.72. The Standard deviation of the market return is 20%. Suggest:

- (i) Is investing in B Ltd. better than investing in A Ltd.?
- (ii) If you invest 30% in B Ltd. and 70% in A Ltd., what is your expected rate of return and portfolio Standard deviation?
- (iii) What is the market portfolios expected rate of return and how much is the risk-free rate?
- (iv) What is the beta of Portfolio if A Ltd.'s weight is 70% and B Ltd.'s weight is 30%?

22. XYZ Ltd. has substantial cash flow and until the surplus funds are utilised to meet the future capital expenditure, likely to happen after several months, are invested in a portfolio of short-term equity investments, details for which are given below:

Investment	No. of shares	Beta	Market price per share ₹	Expected dividend yield
I	60,000	1.16	4.29	19.50%
II	80,000	2.28	2.92	24.00%
III	1,00,000	0.90	2.17	17.50%
IV	1,25,000	1.50	3.14	26.00%

The current market return is 19% and the risk free rate is 11%.

Required to:

- (i) Calculate the risk of XYZ's short-term investment portfolio relative to that of the market;
 - (ii) Whether XYZ should change the composition of its portfolio.
23. A company has a choice of investments between several different equity oriented mutual funds. The company has an amount of ₹1 crore to invest. The details of the mutual funds are as follows:

Mutual Fund	Beta
A	1.6
B	1.0
C	0.9
D	2.0
E	0.6

Required:

- (i) If the company invests 20% of its investment in each of the first two mutual funds and an equal amount in the mutual funds C, D and E, what is the beta of the portfolio?
 - (ii) If the company invests 15% of its investment in C, 15% in A, 10% in E and the balance in equal amount in the other two mutual funds, what is the beta of the portfolio?
 - (iii) If the expected return of market portfolio is 12% at a beta factor of 1.0, what will be the portfolios expected return in both the situations given above?
24. Suppose that economy A is growing rapidly and you are managing a global equity fund and so far you have invested only in developed-country stocks only. Now you have decided to add stocks of economy A to your portfolio. The table below shows the expected rates of

return, standard deviations, and correlation coefficients (all estimates are for aggregate stock market of developed countries and stock market of Economy A).

	Developed Country Stocks	Stocks of Economy A
Expected rate of return (annualized percentage)	10	15
Risk [Annualized Standard Deviation (%)]	16	30
Correlation Coefficient (ρ)	0.30	

Assuming the risk-free interest rate to be 3%, you are required to determine:

- What percentage of your portfolio should you allocate to stocks of Economy A if you want to increase the expected rate of return on your portfolio by 0.5%?
 - What will be the standard deviation of your portfolio assuming that stocks of Economy A are included in the portfolio as calculated above?
 - Also show how well the Fund will be compensated for the risk undertaken due to inclusion of stocks of Economy A in the portfolio?
25. Mr. FedUp wants to invest an amount of ₹ 520 lakhs and had approached his Portfolio Manager. The Portfolio Manager had advised Mr. FedUp to invest in the following manner:

Security	Moderate	Better	Good	Very Good	Best
Amount (in ₹ Lakhs)	60	80	100	120	160
Beta	0.5	1.00	0.80	1.20	1.50

You are required to advise Mr. FedUp in regard to the following, using Capital Asset Pricing Methodology:

- Expected return on the portfolio, if the Government Securities are at 8% and the NIFTY is yielding 10%.
 - Advisability of replacing Security 'Better' with NIFTY.
26. Your client is holding the following securities:

Particulars of Securities	Cost	Dividends/Interest	Market price	Beta
	₹	₹	₹	
Equity Shares:				
Gold Ltd.	10,000	1,725	9,800	0.6
Silver Ltd.	15,000	1,000	16,200	0.8
Bronze Ltd.	14,000	700	20,000	0.6
GOI Bonds	36,000	3,600	34,500	0.01

Average return of the portfolio is 15.7%, calculate:

- (i) Expected rate of return in each, using the Capital Asset Pricing Model (CAPM).
- (ii) Risk free rate of return.

27. A holds the following portfolio:

Share/Bond	Beta	Initial Price	Dividends	Market Price at end of year
		₹	₹	₹
Epsilon Ltd.	0.8	25	2	50
Sigma Ltd.	0.7	35	2	60
Omega Ltd.	0.5	45	2	135
GOI Bonds	0.01	1,000	140	1,005

Calculate:

- (i) The expected rate of return of each security using Capital Asset Pricing Method (CAPM)
- (ii) The average return of his portfolio.

Risk-free return is 14%.

28. Your client is holding the following securities:

Particulars of Securities	Cost ₹	Dividends ₹	Market Price ₹	BETA
Equity Shares:				
Co. X	8,000	800	8,200	0.8
Co. Y	10,000	800	10,500	0.7
Co. Z	16,000	800	22,000	0.5
PSU Bonds	34,000	3,400	32,300	0.2

Assuming a Risk-free rate of 15%, calculate:

- Expected rate of return in each, using the Capital Asset Pricing Model (CAPM).
- Simple Average return of the portfolio.

29. An investor is holding 1,000 shares of Fatlass Company. Presently the rate of dividend being paid by the company is ₹ 2 per share and the share is being sold at ₹ 25 per share in the market. However, several factors are likely to be changed during the course of the year as indicated below:

	Existing	Revised
Risk free rate	12%	10%
Market risk premium	6%	4%
Beta value	1.4	1.25
Expected growth rate	5%	9%

In view of the above factors whether the investor should buy, hold or sell the shares? And why?

30. An investor is holding 5,000 shares of X Ltd. Current year dividend rate is ₹ 3/ share. Market price of the share is ₹ 40 each. The investor is concerned about several factors which are likely to change during the next financial year as indicated below:

	Current Year	Next Year
Dividend paid /anticipated per share (₹)	3	2.5
Risk free rate	12%	10%
Market Risk Premium	5%	4%
Beta Value	1.3	1.4
Expected growth	9%	7%

In view of the above, advise whether the investor should buy, hold or sell the shares.

31. An investor has two portfolios known to be on minimum variance set for a population of three securities A, B and C having below mentioned weights:

	WA	WB	WC
Portfolio X	0.30	0.40	0.30
Portfolio Y	0.20	0.50	0.30

It is supposed that there are no restrictions on short sales.

- (i) What would be the weight for each stock for a portfolio constructed by investing ₹ 5,000 in portfolio X and ₹ 3,000 in portfolio Y?
- (ii) Suppose the investor invests ₹ 4,000 out of ₹ 8,000 in security A. How he will allocate the balance between security B and C to ensure that his portfolio is on minimum variance set?
32. X Co., Ltd., invested on 1.4.2009 in certain equity shares as below:

Name of Co.	No. of shares	Cost (₹)
M Ltd.	1,000 (₹ 100 each)	2,00,000
N Ltd.	500 (₹ 10 each)	1,50,000

In September, 2009, 10% dividend was paid out by M Ltd. and in October, 2009, 30% dividend paid out by N Ltd. On 31.3.2010 market quotations showed a value of ₹ 220 and ₹ 290 per share for M Ltd. and N Ltd. respectively.

On 1.4.2010, investment advisors indicate (a) that the dividends from M Ltd. and N Ltd. for the year ending 31.3.2011 are likely to be 20% and 35%, respectively and (b) that the probabilities of market quotations on 31.3.2011 are as below:

Probability factor	Price/share of M Ltd.	Price/share of N Ltd.
0.2	220	290
0.5	250	310
0.3	280	330

You are required to:

- (i) Calculate the average return from the portfolio for the year ended 31.3.2010;
 - (ii) Calculate the expected average return from the portfolio for the year 2010-11; and
 - (iii) Advise X Co. Ltd., of the comparative risk in the two investments by calculating the standard deviation in each case.
33. An investor holds two stocks A and B. An analyst prepared ex-ante probability distribution for the possible economic scenarios and the conditional returns for two stocks and the market index as shown below:

Economic scenario	Probability	Conditional Returns %		
		A	B	Market
Growth	0.40	25	20	18
Stagnation	0.30	10	15	13
Recession	0.30	-5	-8	-3

The risk free rate during the next year is expected to be around 11%. Determine whether the investor should liquidate his holdings in stocks A and B or on the contrary make fresh investments in them. CAPM assumptions are holding true.

34. Following are the details of a portfolio consisting of three shares:

Share	Portfolio weight	Beta	Expected return in %	Total variance
A	0.20	0.40	14	0.015
B	0.50	0.50	15	0.025
C	0.30	1.10	21	0.100

Standard Deviation of Market Portfolio Returns = 10%

You are given the following additional data:

Covariance (A, B) = 0.030

Covariance (A, C) = 0.020

Covariance (B, C) = 0.040

Calculate the following:

- (i) The Portfolio Beta
 - (ii) Residual variance of each of the three shares
 - (iii) Portfolio variance using Sharpe Index Model
 - (iv) Portfolio variance (on the basis of modern portfolio theory given by Markowitz)
35. Ramesh wants to invest in stock market. He has got the following information about individual securities:

Security	Expected Return	Beta	σ^2_{ci}
A	15	1.5	40
B	12	2	20
C	10	2.5	30
D	09	1	10
E	08	1.2	20
F	14	1.5	30

Market index variance is 10 percent and the risk free rate of return is 7%. What should be the optimum portfolio assuming no short sales?

36. A Portfolio Manager (PM) has the following four stocks in his portfolio:

Security	No. of Shares	Market Price per share (₹)	β
VSL	10,000	50	0.9
CSL	5,000	20	1.0
SML	8,000	25	1.5
APL	2,000	200	1.2

Compute the following:

- (i) Portfolio beta.
- (ii) If the PM seeks to reduce the beta to 0.8, how much risk free investment should he bring in?

- (iii) If the PM seeks to increase the beta to 1.2, how much risk free investment should he bring in?

37. A has portfolio having following features:

Security	β	Random Error σ_{e_i}	Weight
L	1.60	7	0.25
M	1.15	11	0.30
N	1.40	3	0.25
K	1.00	9	0.20

You are required to find out the risk of the portfolio if the standard deviation of the market index (σ_m) is 18%.

38. Mr. Tamarind intends to invest in equity shares of a company the value of which depends upon various parameters as mentioned below:

Factor	Beta	Expected value in %	Actual value in %
GNP	1.20	7.70	7.70
Inflation	1.75	5.50	7.00
Interest rate	1.30	7.75	9.00
Stock market index	1.70	10.00	12.00
Industrial production	1.00	7.00	7.50

If the risk free rate of interest be 9.25%, how much is the return of the share under Arbitrage Pricing Theory?

39. The total market value of the equity share of O.R.E. Company is ₹ 60,00,000 and the total value of the debt is ₹ 40,00,000. The treasurer estimate that the beta of the stock is currently 1.5 and that the expected risk premium on the market is 10 per cent. The treasury bill rate is 8 per cent.

Required:

- (i) What is the beta of the Company's existing portfolio of assets?
- (ii) Estimate the Company's Cost of capital and the discount rate for an expansion of the company's present business.

40. Mr. Nirmal Kumar has categorized all the available stock in the market into the following types:

- (i) Small cap growth stocks
- (ii) Small cap value stocks

- (iii) Large cap growth stocks
- (iv) Large cap value stocks

Mr. Nirmal Kumar also estimated the weights of the above categories of stocks in the market index. Further, the sensitivity of returns on these categories of stocks to the three important factor are estimated to be:

Category of Stocks	Weight in the Market Index	Factor I (Beta)	Factor II (Book Price)	Factor III (Inflation)
Small cap growth	25%	0.80	1.39	1.35
Small cap value	10%	0.90	0.75	1.25
Large cap growth	50%	1.165	2.75	8.65
Large cap value	15%	0.85	2.05	6.75
Risk Premium		6.85%	-3.5%	0.65%

The rate of return on treasury bonds is 4.5%

Required:

- (a) Using Arbitrage Pricing Theory, determine the expected return on the market index.
 - (b) Using Capital Asset Pricing Model (CAPM), determine the expected return on the market index.
 - (c) Mr. Nirmal Kumar wants to construct a portfolio constituting only the 'small cap value' and 'large cap growth' stocks. If the target beta for the desired portfolio is 1, determine the composition of his portfolio.
41. The following are the data on five mutual funds:

Fund	Return	Standard Deviation	Beta
A	15	7	1.25
B	18	10	0.75
C	14	5	1.40
D	12	6	0.98
E	16	9	1.50

You are required to compute Reward to Volatility Ratio and rank these portfolio using:

- ◆ Sharpe method and
- ◆ Treynor's method

assuming the risk free rate is 6%.

42. Five portfolios experienced the following results during a 7- year period:

Portfolio	Average Annual Return (R _p) (%)	Standard Deviation (S _p)	Correlation with the market returns (r)
A	19.0	2.5	0.840
B	15.0	2.0	0.540
C	15.0	0.8	0.975
D	17.5	2.0	0.750
E	17.1	1.8	0.600
Market Risk (σ _m)		1.2	
Market rate of Return (R _m)	14.0		
Risk-free Rate (R _f)	9.0		

Rank the portfolios using (a) Sharpe's method, (b) Treynor's method and (c) Jensen's Alpha

ANSWERS/ SOLUTIONS

Answers to Theoretical Questions

1. Please refer paragraph 12.3.
2. Please refer paragraph 1.2.
3. Please refer paragraph 8.

Answers to the Practical Questions

1. (i) Here, the probable returns have to be calculated using the formula

$$R = \frac{D}{P_0} + \frac{P_1 - P_0}{P_0}$$

Calculation of Probable Returns

Possible prices (P ₁) ₹	P ₁ -P ₀ ₹	[(P ₁ -P ₀)/ P ₀] x 100 Return (per cent)
115	-5	-4.17
120	0	0.00
125	5	4.17
130	10	8.33
135	15	12.50
140	20	16.67

Alternatively, it can be calculated as follows:

Calculation of Expected Returns

Possible return X_i	Probability $p(X_i)$	Product $X_i \cdot p(X_i)$
-4.17	0.1	-0.417
0.00	0.1	0.000
4.17	0.2	0.834
8.33	0.3	2.499
12.50	0.2	2.500
16.67	0.1	1.667
		$X = 7.083$

Expected return $X = 7.083$ per

Alternatively, it can also be calculated as follows:

Expected Price = $115 \times 0.1 + 120 \times 0.1 + 125 \times 0.2 + 130 \times 0.3 + 135 \times 0.2 + 140 \times 0.1 = 128.50$

$$\text{Return} = \frac{128.50 - 120}{120} \times 100 = 7.0833\%$$

(ii)

Calculation of Standard Deviation of Returns

Probable return X_i	Probability $p(X_i)$	Deviation $(X_i - X)$	Deviation squared $(X_i - X)^2$	Product $(X_i - X)^2 p(X_i)$
-4.17	0.1	-11.253	126.63	12.66
0.00	0.1	-7.083	50.17	5.017
4.17	0.2	-2.913	8.49	1.698
8.33	0.3	1.247	1.56	0.467
12.50	0.2	5.417	29.34	5.869
16.67	0.1	9.587	91.91	9.191
				$\sigma^2 = 34.902$

Variance, $\sigma^2 = 34.902$ per cent

Standard deviation, $\sigma = \sqrt{34.902} = 5.908$ per cent

2. The Expected Return of the equity share may be found as follows:

Market Condition	Probability	Total Return	Cost (*)	Net Return
Good	0.25	₹ 124	₹ 100	₹ 24
Normal	0.50	₹ 112	₹ 100	₹ 12
Bad	0.25	₹ 100	₹ 100	₹ 0

$$\text{Expected Return} = (24 \times 0.25) + (12 \times 0.50) + (0 \times 0.25) = 12 = \left(\frac{12}{100} \right) \times 100 = 12\%$$

The variability of return can be calculated in terms of standard deviation.

$$\begin{aligned} V \text{ SD} &= 0.25 (24 - 12)^2 + 0.50 (12 - 12)^2 + 0.25 (0 - 12)^2 \\ &= 0.25 (12)^2 + 0.50 (0)^2 + 0.25 (-12)^2 \\ &= 36 + 0 + 36 \end{aligned}$$

$$\text{SD} = \sqrt{72}$$

$$\text{SD} = 8.485 \text{ or say } 8.49$$

(*) The present market price of the share is ₹ 106 cum bonus 10% debenture of ₹ 6 each; hence the net cost is ₹ 100.

M/s X Finance company has offered the buyback of debenture at face value. There is reasonable 10% rate of interest compared to expected return 12% from the market. Considering the dividend rate and market price the creditworthiness of the company seems to be very good. The decision regarding buy-back should be taken considering the maturity period and opportunity in the market. Normally, if the maturity period is low say up to 1 year better to wait otherwise to opt buy back option.

3. We have $E_p = W_1E_1 + W_2E_2 + \dots + W_nE_n$

$$\text{and for standard deviation } \sigma_p^2 = \sum_{i=1}^n \sum_{j=1}^n w_i w_j \sigma_{ij}$$

$$\sigma_p^2 = \sum_{i=1}^n \sum_{j=1}^n w_i w_j \rho_{ij} \sigma_i \sigma_j$$

Two asset portfolio

$$\sigma_p^2 = w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \sigma_1 \sigma_2 \rho_{12}$$

Substituting the respective values we get,

- (i) All funds invested in B

$$E_p = 12\%$$

$$\sigma_p = 10\%$$

- (ii) 50% of funds in each of B & D

$$E_p = 0.50 \times 12\% + 0.50 \times 20\% = 16\%$$

$$\sigma_p^2 = (0.50)^2(10\%)^2 + (0.50)^2(18\%)^2 + 2(0.50)(0.50)(0.15)(10\%)(18\%)$$

$$\sigma_p^2 = 25 + 81 + 13.5 = 119.50$$

$$\sigma_p = 10.93\%$$

- (iii) 75% in B and 25% in D

$$E_p = 0.75\% \times 12\% + 0.25\% \times 20 = 14\%$$

$$\sigma_p^2 = (0.75)^2(10\%)^2 + (0.25)^2(18\%)^2 + 2(0.75)(0.25)(0.15)(10\%)(18\%)$$

$$\sigma_p^2 = 56.25 + 20.25 + 10.125 = 86.625$$

$$\sigma_p = 9.31\%$$

- (iv) All funds in D

$$E_p = 20\%$$

$$\sigma_p = 18.0\%$$

Portfolio	(i)	(ii)	(iii)	(iv)
Return	12	16	14	20
σ	10	10.93	9.31	18

In the terms of return, we see that portfolio (iv) is the best portfolio. In terms of risk we see that portfolio (iii) is the best portfolio.

4. (i) Expected return of the portfolio A and B

$$E(A) = (10 + 16) / 2 = 13\%$$

$$E(B) = (12 + 18) / 2 = 15\%$$

$$R_p = \sum_{i=1}^N X_i R_i = 0.4(13) + 0.6(15) = 14.2\%$$

- (ii) Stock A:

$$\text{Variance} = 0.5 (10 - 13)^2 + 0.5 (16 - 13)^2 = 9$$

Standard deviation = $\sqrt{9} = 3\%$

Stock B:

Variance = $0.5 (12 - 15)^2 + 0.5 (18 - 15)^2 = 9$

Standard deviation = 3%

(iii) Covariance of stocks A and B

$\text{COV}_{AB} = 0.5 (10 - 13) (12 - 15) + 0.5 (16 - 13) (18 - 15) = 9$

(iv) Correlation of coefficient

$$r_{AB} = \frac{\text{Cov}_{AB}}{\sigma_A \sigma_B} = \frac{9}{3 \times 3} = 1$$

(v) Portfolio Risk

$$\begin{aligned} \sigma_P &= \sqrt{X_A^2 \sigma_A^2 + X_B^2 \sigma_B^2 + 2X_A X_B (\sigma_A \sigma_B \sigma_{AB})} \\ &= \sqrt{(0.4)^2 (3)^2 + (0.6)^2 (3)^2 + 2(0.4)(0.6)(3)(3)(1)} \\ &= \sqrt{1.44 + 3.24 + 4.32} = 3\% \end{aligned}$$

5. (i) Security A has a return of 8% for a risk of 4, whereas B and F have a higher risk for the same return. Hence, among them A dominates.

For the same degree of risk 4, security D has only a return of 4%. Hence, D is also dominated by A.

Securities C and E remain in reckoning as they have a higher return though with higher degree of risk.

Hence, the ones to be selected are A, C & E.

(ii) The average values for A and C for a proportion of 3 : 1 will be :

$$\text{Risk} = \frac{(3 \times 4) + (1 \times 12)}{4} = 6\%$$

$$\text{Return} = \frac{(3 \times 8) + (1 \times 12)}{4} = 9\%$$

Therefore:	75% A	E
	25% C	-

Risk	6	5
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Return	9%	9%
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For the same 9% return the risk is lower in E. Hence, E will be preferable.

6. Calculation of Covariance

Year	R_1	Deviation $(R_1 - \bar{R}_1)$	Deviation $(R_1 - \bar{R}_1)^2$	R_2	Deviation $(R_2 - \bar{R}_2)$	Deviation $(R_2 - \bar{R}_2)^2$	Product of deviation s
1	12	-2.8	7.84	20	-1	1	2.8
2	8	-6.8	46.24	22	1	1	-6.8
3	7	-7.8	60.84	24	3	9	-23.4
4	14	-0.8	0.64	18	-3	9	2.4
5	16	1.2	1.44	15	-6	36	-7.2
6	15	0.2	0.04	20	-1	1	-0.2
7	18	3.2	10.24	24	3	9	9.6
8	20	5.2	27.04	25	4	16	20.8
9	16	1.2	1.44	22	1	1	1.2
10	22	7.2	51.84	20	-1	1	-7.2
$\bar{R}_1 = \frac{148}{10} = 14.8$			$\Sigma = 207.60$	$\bar{R}_2 = \frac{210}{10} = 21$		$\Sigma = 84.00$	

$$\text{Covariance} = \frac{\sum_{i=1}^N [R_1 - \bar{R}_1][R_2 - \bar{R}_2]}{N} = -8/10 = -0.8$$

Standard Deviation of Security 1

$$\sigma_1 = \sqrt{\frac{(R_1 - \bar{R}_1)^2}{N}}$$

$$\sigma_1 = \sqrt{\frac{207.60}{10}} = \sqrt{20.76}$$

$$\sigma_1 = 4.56$$

Standard Deviation of Security 2

$$\sigma_2 = \sqrt{\frac{(R_2 - \bar{R}_2)^2}{N}}$$

$$\sigma_2 = \sqrt{\frac{84}{10}} = \sqrt{8.40}$$

$$\sigma_2 = 2.90$$

Alternatively, Standard Deviation of securities can also be calculated as follows:

Calculation of Standard Deviation

Year	R ₁	R ₁ ²	R ₂	R ₂ ²
1	12	144	20	400
2	8	64	22	484
3	7	49	24	576
4	14	196	18	324
5	16	256	15	225
6	15	225	20	400
7	18	324	24	576
8	20	400	25	625
9	16	256	22	484
10	22	484	20	400
	148	2398	210	4494

Standard deviation of security 1:

$$\begin{aligned}\sigma_1 &= \sqrt{\frac{N \sum R_1^2 - (\sum R_1)^2}{N^2}} \\ &= \sqrt{\frac{(10 \times 2398) - (148)^2}{10 \times 10}} = \sqrt{\frac{23980 - 21904}{100}} \\ &= \sqrt{20.76} = 4.56\end{aligned}$$

Standard deviation of security 2:

$$\begin{aligned}\sigma_2 &= \sqrt{\frac{N \sum R_2^2 - (\sum R_2)^2}{N^2}} \\ &= \sqrt{\frac{(10 \times 4494) - (210)^2}{10 \times 10}} = \sqrt{\frac{44940 - 44100}{100}} \\ &= \sqrt{\frac{840}{100}} = \sqrt{8.4} = 2.90\end{aligned}$$

Correlation Coefficient

$$r_{12} = \frac{\text{Cov}}{\sigma_1 \sigma_2} = \frac{-0.8}{4.56 \times 2.90} = \frac{-0.8}{13.22} = -0.0605$$

7. (i)

Probability	ABC (%)	XYZ (%)	1X2 (%)	1X3 (%)
(1)	(2)	(3)	(4)	(5)
0.20	12	16	2.40	3.2
0.25	14	10	3.50	2.5
0.25	-7	28	-1.75	7.0
0.30	28	-2	<u>8.40</u>	<u>-0.6</u>
Average return			<u>12.55</u>	<u>12.1</u>

Hence the expected return from ABC = 12.55% and XYZ is 12.1%

Probability	(ABC- \bar{ABC})	(ABC- \bar{ABC}) ²	1X3	(XYZ- \bar{XYZ})	(XYZ- \bar{XYZ}) ²	(1)X(6)
(1)	(2)	(3)	(4)	(5)	(6)	
0.20	-0.55	0.3025	0.06	3.9	15.21	3.04
0.25	1.45	2.1025	0.53	-2.1	4.41	1.10
0.25	-19.55	382.2025	95.55	15.9	252.81	63.20
0.30	15.45	238.7025	<u>71.61</u>	-14.1	198.81	<u>59.64</u>
			<u>167.75</u>			<u>126.98</u>

$$\sigma^2_{ABC} = 167.75(\%)^2; \sigma_{ABC} = 12.95\%$$

$$\sigma^2_{XYZ} = 126.98(\%)^2; \sigma_{XYZ} = 11.27\%$$

(ii) In order to find risk of portfolio of two shares, the covariance between the two is necessary here.

Probability	(ABC- \bar{ABC})	(XYZ- \bar{XYZ})	2X3	1X4
(1)	(2)	(3)	(4)	(5)
0.20	-0.55	3.9	-2.145	-0.429
0.25	1.45	-2.1	-3.045	-0.761
0.25	-19.55	15.9	-310.845	-77.71
0.30	15.45	-14.1	-217.845	<u>-65.35</u>
				<u>-144.25</u>

$$\sigma^2_P = (0.5^2 \times 167.75) + (0.5^2 \times 126.98) + 2 \times (-144.25) \times 0.5 \times 0.5$$

$$\sigma^2_P = 41.9375 + 31.745 - 72.125$$

$$\sigma^2_P = 1.5575 \text{ or } 1.56(\%)$$

$$\sigma_P = \sqrt{1.56} = 1.25\%$$

$$E(R_p) = (0.5 \times 12.55) + (0.5 \times 12.1) = 12.325\%$$

Hence, the return is 12.325% with the risk of 1.25% for the portfolio. Thus, the portfolio results in the reduction of risk by the combination of two shares.

(iii) For constructing the minimum risk portfolio the condition to be satisfied is

$$X_{ABC} = \frac{\sigma_X^2 - r_{AX}\sigma_A\sigma_X}{\sigma_A^2 + \sigma_X^2 - 2r_{AX}\sigma_A\sigma_X} \text{ or } = \frac{\sigma_X^2 - \text{Cov.}_{AX}}{\sigma_A^2 + \sigma_X^2 - 2\text{Cov.}_{AX}}$$

σ_X = Std. Deviation of XYZ

σ_A = Std. Deviation of ABC

r_{AX} = Coefficient of Correlation between XYZ and ABC

Cov._{AX} = Covariance between XYZ and ABC.

Therefore,

$$\% \text{ ABC} = \frac{126.98 - (-144.25)}{126.98 + 167.75 - [2 \times (-144.25)]} = \frac{271.23}{583.23} = 0.46 \text{ or } 46\%$$

$$\% \text{ ABC} = 46\%, \text{ XYZ} = 54\%$$

$$(1 - 0.46) = 0.54$$

8. (i) Computation of Beta Value

Calculation of Returns

$$\text{Returns} = \frac{D_1 + (P_1 - P_0)}{P_0} \times 100$$

Year	Returns
2012 – 13	$\frac{22 + (253 - 245)}{245} \times 100 = 12.24\%$
2013 – 14	$\frac{25 + (310 - 253)}{253} \times 100 = 32.41\%$

$$2014 - 15 \quad \frac{30 + (330 - 310)}{310} \times 100 = 16.13\%$$

Calculation of Returns from market Index

Year	% of Index Appreciation	Dividend Yield %	Total Return %
2012-13	$\frac{(2130 - 2013)}{2013} \times 100 = 5.81\%$	5%	10.81%
2013-14	$\frac{(2350 - 2130)}{2130} \times 100 = 10.33\%$	6%	16.33%
2014-15	$\frac{(2580 - 2350)}{2350} \times 100 = 9.79\%$	7%	16.79%

Computation of Beta

Year	Krishna Ltd. (X)	Market Index (Y)	XY	Y ²
2012-13	12.24%	10.81%	132.31	116.86
2013-14	32.41%	16.33%	529.25	266.67
2014-15	16.13%	16.79%	270.82	281.90
Total	60.78%	43.93%	932.38	665.43

$$\text{Average Return of Krishna Ltd.} = \frac{60.78}{3} = 20.26\%$$

$$\text{Average Market Return} = \frac{43.93}{3} = 14.64\%$$

$$\text{Beta } (\beta) = \frac{\sum XY - n\bar{X}\bar{Y}}{\sum Y^2 - n(\bar{Y})^2} = \frac{932.38 - 3 \times 20.26 \times 14.64}{665.43 - 3(14.64)^2} = 1.897$$

(ii) Observation

	Expected Return (%)	Actual Return (%)	Action
2012 - 13	$6\% + 1.897(10.81\% - 6\%) = 15.12\%$	12.24%	Sell
2013 - 14	$6\% + 1.897(16.33\% - 6\%) = 25.60\%$	32.41%	Buy
2014 - 15	$6\% + 1.897(16.79\% - 6\%) = 26.47\%$	16.13%	Sell

9. Security F

Prob(P)	R _f	PxR _f	Deviations of F (R _f - ER _f)	(Deviation) ² of F	(Deviations) ² P _x
0.3	30	9	13	169	50.7
0.4	20	8	3	9	3.6
0.3	0	0	-17	289	86.7
		ER _f =17			<u>Var_f=141</u>

STDEV $\sigma_f = \sqrt{141} = 11.87$

Market Portfolio, P

R _M %	P _M	Exp. Return R _M x P _M	Dev. of P (R _M -ER _M)	(Dev. of P) ²	(DeV.) ² P _M	(Deviation of F) x (Deviation of P)	Dev. of F x Dev. of P) x P
-10	0.3	-3	-24	576	172.8	-312	-93.6
20	0.4	8	6	36	14.4	18	7.2
30	0.3	9	16	256	76.8	-272	-81.6
		ER _M =14			Var _M =264 σ _M =16.25		=Co Var P _M =- 168

Beta = $\frac{\text{Co Var P}_M}{\sigma_M^2} = \frac{-168}{264} = -.636$

10. Company A:

Year	Return % (R _a)	Market return % (R _m)	Deviation R(a)	Deviation R _m	D R _a x DR _m	R _m ²
1	13.0	12.0	1.57	1.33	2.09	1.77
2	11.5	11.0	0.07	0.33	0.02	0.11
3	<u>9.8</u>	<u>9.0</u>	-1.63	-1.67	<u>2.72</u>	<u>2.79</u>
	<u>34.3</u>	<u>32.0</u>			<u>4.83</u>	<u>4.67</u>

Average R_a = 11.43

Average R_m = 10.67

Covariance = $\frac{\sum (R_m - \bar{R}_m)(R_a - \bar{R}_a)}{N}$

$$\text{Covariance} = \frac{4.83}{3} = 1.61$$

$$\text{Variance } (\sigma_m^2) = \frac{\sum (R_m - \bar{R}_m)^2}{N}$$

$$= \frac{4.67}{3} = 1.557$$

$$\beta = \frac{1.61}{1.557} = 1.03$$

Company B:

Year	Return % (R _b)	Market return % (R _m)	Deviation R(b)	Deviation R _m	D R _b × D R _m	R _m ²
1	11.0	12.0	0.67	1.33	0.89	1.77
2	10.5	11.0	0.17	0.33	0.06	0.11
3	<u>9.5</u>	<u>9.0</u>	-0.83	-1.67	<u>1.39</u>	<u>2.79</u>
	<u>31.0</u>	<u>32.0</u>			<u>2.34</u>	<u>4.67</u>

Average R_b = 10.33

Average R_m = 10.67

$$\text{Covariance} = \frac{\sum (R_m - \bar{R}_m)(R_b - \bar{R}_b)}{N}$$

$$\text{Covariance} = \frac{2.34}{3} = 0.78$$

$$\text{Variance } (\sigma_m^2) = \frac{\sum (R_m - \bar{R}_m)^2}{N}$$

$$= \frac{4.67}{3} = 1.557$$

$$\beta = \frac{0.78}{1.557} = 0.50$$

11. Characteristic line is given by

$$\alpha + \beta R_m$$

$$\beta_i = \frac{\sum xy - n \bar{x} \bar{y}}{\sum x^2 - n(\bar{x})^2}$$

$$\alpha_i = \bar{y} - \beta \bar{x}$$

Return on A (Y)	Return on market (X)	xy	x ²	(x - \bar{x})	(x - \bar{x}) ²	(y - \bar{y})	(y - \bar{y}) ²
12	8	96	64	2.25	5.06	5.67	32.15
15	12	180	144	6.25	39.06	8.67	75.17
11	11	121	121	5.25	27.56	4.67	21.81
2	-4	-8	16	-9.75	95.06	-4.33	18.75
10	9.5	95	90.25	3.75	14.06	3.67	13.47
<u>-12</u>	<u>-2</u>	<u>24</u>	<u>4</u>	<u>-7.75</u>	<u>60.06</u>	<u>-18.33</u>	<u>335.99</u>
38	34.5	508	439.25		240.86		497.34

$$\bar{y} = \frac{38}{6} = 6.33$$

$$\bar{x} = \frac{34.5}{6} = 5.75$$

$$\beta = \frac{\sum xy - n \bar{x} \bar{y}}{\sum x^2 - n(\bar{x})^2} = \frac{508 - 6(5.75)(6.33)}{439.25 - 6(5.75)^2} = \frac{508 - 218.385}{439.25 - 198.375}$$

$$= \frac{289.615}{240.875} = 1.202$$

$$\alpha = \bar{y} - \beta \bar{x} = 6.33 - 1.202(5.75) = -0.58$$

Hence the characteristic line is $-0.58 + 1.202(R_m)$

$$\text{Total Risk of Market} = \sigma_{m^2} = \frac{\sum(x - \bar{x})^2}{n} = \frac{240.86}{6} = 40.14(\%)$$

$$\text{Total Risk of Stock} = \frac{497.34}{6} = 82.89(\%)$$

$$\text{Systematic Risk} = \beta^2 \sigma_2 = (1.202)^2 \times 40.14 = 57.99(\%)$$

$$\text{Unsystematic Risk is} = \text{Total Risk} - \text{Systematic Risk}$$

$$= 82.89 - 57.99 = 24.90(\%)$$

12. (i)

Period	R_x	R_M	$R_x - \bar{R}_x$	$R_M - \bar{R}_M$	$(R_x - \bar{R}_x)(R_M - \bar{R}_M)$	$(R_M - \bar{R}_M)^2$
1	20	22	5	10	50	100
2	22	20	7	8	56	64
3	25	18	10	6	60	36
4	21	16	6	4	24	16
5	18	20	3	8	24	64
6	-5	8	-20	-4	80	16
7	17	-6	2	-18	-36	324
8	19	5	4	-7	-28	49
9	-7	6	-22	-6	132	36
10	<u>20</u>	<u>11</u>	5	-1	<u>-5</u>	<u>1</u>
	<u>150</u>	<u>120</u>			<u>357</u>	<u>706</u>
	ΣR_x	ΣR_M			$\Sigma (R_x - \bar{R}_x)(R_M - \bar{R}_M)$	$\Sigma (R_M - \bar{R}_M)^2$

$$\bar{R}_x = 15 \quad \bar{R}_M = 12$$

$$\sigma^2_M = \frac{\sum (R_M - \bar{R}_M)^2}{n} = \frac{706}{10} = 70.60$$

$$\text{Cov}_{xM} = \frac{\sum (R_x - \bar{R}_x)(R_M - \bar{R}_M)}{n} = \frac{357}{10} = 35.70$$

$$\text{Beta}_x = \frac{\text{Cov}_{xM}}{\sigma^2_M} = \frac{35.70}{70.60} = 0.505$$

Alternative Solution

Period	X	Y	Y ²	XY
1	20	22	484	440
2	22	20	400	440
3	25	18	324	450
4	21	16	256	336
5	18	20	400	360

6	-5	8	64	-40
7	17	-6	36	-102
8	19	5	25	95
9	-7	6	36	-42
10	<u>20</u>	<u>11</u>	<u>121</u>	<u>220</u>
	<u>150</u>	<u>120</u>	<u>2146</u>	<u>2157</u>
	$\bar{X} = 15$	$\bar{Y} = 12$		

$$= \frac{\sum XY - n\bar{X}\bar{Y}}{\sum X^2 - n(\bar{X})^2}$$

$$= \frac{2157 - 10 \times 15 \times 12}{2146 - 10 \times 12 \times 12} = \frac{357}{706} = 0.506$$

(ii) $\bar{R}_X = 15$ $\bar{R}_M = 12$

$$y = \alpha + \beta x$$

$$15 = \alpha + 0.505 \times 12$$

$$\text{Alpha } (\alpha) = 15 - (0.505 \times 12) = 8.94\%$$

$$\text{Characteristic line for security X} = \alpha + \beta \times R_M$$

Where, R_M = Expected return on Market Index

$$\therefore \text{Characteristic line for security X} = 8.94 + 0.505 R_M$$

13. (a) The Betas of two stocks:

Aggressive stock - $(40\% - 4\%)/(25\% - 7\%) = 2$

Defensive stock - $(18\% - 9\%)/(25\% - 7\%) = 0.50$

Alternatively, it can also be solved by using the Characteristic Line Relationship as follows:

$$R_s = \alpha + \beta R_m$$

Where

$$\alpha = \text{Alpha}$$

$$\beta = \text{Beta}$$

$$R_m = \text{Market Return}$$

For Aggressive Stock

$$4\% = \alpha + \beta(7\%)$$

$$40\% = \alpha + \beta(25\%)$$

$$36\% = \beta(18\%)$$

$$\beta = 2$$

For Defensive Stock

$$9\% = \alpha + \beta(7\%)$$

$$18\% = \alpha + \beta(25\%)$$

$$9\% = \beta(18\%)$$

$$\beta = 0.50$$

(b) Expected returns of the two stocks:-

$$\text{Aggressive stock} \quad - \quad 0.5 \times 4\% + 0.5 \times 40\% = 22\%$$

$$\text{Defensive stock} \quad - \quad 0.5 \times 9\% + 0.5 \times 18\% = 13.5\%$$

(c) Expected return of market portfolio = $0.5 \times 7\% + 0.5 \times 25\% = 16\%$

$$\therefore \text{Market risk prem.} = 16\% - 7.5\% = 8.5\%$$

$$\therefore \text{SML is, required return} = 7.5\% + \beta_i 8.5\%$$

(d) $R_s = \alpha + \beta R_m$

For Aggressive Stock

$$22\% = \alpha_A + 2(16\%)$$

$$\alpha_A = -10\%$$

For Defensive Stock

$$13.5\% = \alpha_D + 0.50(16\%)$$

$$\alpha_D = 5.5\%$$

14. (i) Sensitivity of each stock with market is given by its beta.

Standard deviation of market Index = 15%

Variance of market Index = 0.0225

Beta of stocks = σ_i / σ_m

$$A = 20 \times 0.60 / 15 = 0.80$$

$$B = 18 \times 0.95 / 15 = 1.14$$

$$C = 12 \times 0.75 / 15 = 0.60$$

(ii) Covariance between any 2 stocks = $\beta_1\beta_2\sigma_m^2$

Covariance matrix

Stock/Beta	0.80	1.14	0.60
A	400.000	205.200	108.000
B	205.200	324.000	153.900
C	108.000	153.900	144.000

(iii) Total risk of the equally weighted portfolio (Variance) = $400(1/3)^2 + 324(1/3)^2 + 144(1/3)^2 + 2(205.20)(1/3)^2 + 2(108.0)(1/3)^2 + 2(153.900)(1/3)^2 = 200.244$

(iv) β of equally weighted portfolio = $\beta_p = \sum \beta_i/N = \frac{0.80+1.14+0.60}{3}$
 = 0.8467

(v) Systematic Risk $\beta_p^2\sigma_m^2 = (0.8467)^2(15)^2 = 161.302$

Unsystematic Risk = Total Risk – Systematic Risk
 = $200.244 - 161.302 = 38.942$

15. (i) Mr. X's position in the two securities are +1.50 in security A and -0.5 in security B. Hence the portfolio sensitivities to the two factors:-

b prop. 1 = $1.50 \times 0.80 + (-0.50 \times 1.50) = 0.45$

b prop. 2 = $1.50 \times 0.60 + (-0.50 \times 1.20) = 0.30$

(ii) Mr. X's current position:-

Security A ₹ 3,00,000 / ₹ 1,00,000 = 3

Security B -₹ 1,00,000 / ₹ 1,00,000 = -1

Risk free asset -₹ 100000 / ₹ 100000 = -1

b prop. 1 = $3.0 \times 0.80 + (-1 \times 1.50) + (-1 \times 0) = 0.90$

b prop. 2 = $3.0 \times 0.60 + (-1 \times 1.20) + (-1 \times 0) = 0.60$

(iii) Expected Return = Risk Free Rate of Return + Risk Premium

Let λ_1 and λ_2 are the Value Factor 1 and Factor 2 respectively.

Accordingly

$15 = 10 + 0.80 \lambda_1 + 0.60 \lambda_2$

$20 = 10 + 1.50 \lambda_1 + 1.20 \lambda_2$

On solving equation, the value of $\lambda_1 = 0$, and risk premium of factor 2 for Securities A & B shall be as follows:

Using Security A's Return

$$\text{Total Return} = 15\% = 10\% + 0.60 \lambda_2$$

$$\text{Risk Premium } (\lambda_2) = 5\% / 0.60 = 8.33\%$$

Alternatively using Security B's Return

$$\text{Total Return} = 20\% = 10 + 1.20 \lambda_2$$

$$\text{Risk Premium} = 10\% / 1.20 = 8.33\%$$

16. Market Risk Premium (A) = $14\% - 7\% = 7\%$

Share	Beta	Risk Premium (Beta x A) %	Risk Free Return %	Return %	Return ₹
Oxy Rin Ltd.	0.45	3.15	7	10.15	8,120
Boxed Ltd.	0.35	2.45	7	9.45	14,175
Square Ltd.	1.15	8.05	7	15.05	33,863
Ellipse Ltd.	1.85	12.95	7	19.95	89,775
Total Return					<u>1,45,933</u>

Total Investment ₹ 9,05,000

$$(i) \quad \text{Portfolio Return} = \frac{\text{₹ } 1,45,933}{\text{₹ } 9,05,000} \times 100 = 16.13\%$$

$$(ii) \quad \text{Portfolio Beta}$$

$$\text{Portfolio Return} = \text{Risk Free Rate} + \text{Risk Premium} \times \beta = 16.13\%$$

$$7\% + 7\beta = 16.13\%$$

$$\beta = 1.30$$

Alternative Approach

First we shall compute Portfolio Beta using the weighted average method as follows:

$$\text{Beta}_P = 0.45 \times \frac{0.80}{9.05} + 0.35 \times \frac{1.50}{9.05} + 1.15 \times \frac{2.25}{9.05} + 1.85 \times \frac{4.50}{9.05}$$

$$= 0.45 \times 0.0884 + 0.35 \times 0.1657 + 1.15 \times 0.2486 + 1.85 \times 0.4972$$

$$= 0.0398 + 0.058 + 0.2859 + 0.9198 = 1.3035$$

Accordingly,

- (i) Portfolio Return using CAPM formula will be as follows:

$$\begin{aligned} R_P &= R_F + \beta_P(R_M - R_F) \\ &= 7\% + 1.3035(14\% - 7\%) = 7\% + 1.3035(7\%) \\ &= 7\% + 9.1245\% = 16.1245\% \end{aligned}$$

- (ii) Portfolio Beta

As calculated above 1.3035

17. (i) Variance of Returns

$$\text{Cor}_{ij} = \frac{\text{Cov}(i, j)}{\sigma_i \sigma_j}$$

Accordingly, for MFX

$$1 = \frac{\text{Cov}(X, X)}{\sigma_X \sigma_X}$$

$$\sigma_X^2 = 4.800$$

Accordingly, for MFY

$$1 = \frac{\text{Cov}(Y, Y)}{\sigma_Y \sigma_Y}$$

$$\sigma_Y^2 = 4.250$$

Accordingly, for Market Return

$$1 = \frac{\text{Cov}(M, M)}{\sigma_M \sigma_M}$$

$$\sigma_M^2 = 3.100$$

Alternatively, by referring diagonally the given Table these values can identified as follows:

$$\text{Variance}_X = 4.800$$

$$\text{Variance}_Y = 4.250$$

$$\text{Variance}_M = 3.100$$

- (ii) Portfolio return, beta, variance and standard deviation

$$\text{Weight of MFX in portfolio} = \frac{1,20,000}{2,00,000} = 0.60$$

$$\text{Weight of MFY in portfolio} = \frac{80,000}{2,00,000} = 0.40$$

Accordingly Portfolio Return

$$0.60 \times 15\% + 0.40 \times 14\% = 14.60\%$$

Beta of each Fund

$$\beta = \frac{\text{Cov}(\text{Fund, Market})}{\text{Variance of Market}}$$

$$\beta_X = \frac{3.370}{3.100} = 1.087$$

$$\beta_Y = \frac{2.800}{3.100} = 0.903$$

Portfolio Beta

$$0.60 \times 1.087 + 0.40 \times 0.903 = 1.013$$

Portfolio Variance

$$\begin{aligned} \sigma_{XY}^2 &= w_X^2 \sigma_X^2 + w_Y^2 \sigma_Y^2 + 2 w_X w_Y \text{Cov}_{X,Y} \\ &= (0.60)^2 (4.800) + (0.40)^2 (4.250) + 2(0.60)(0.40)(4.300) \\ &= 4.472 \end{aligned}$$

Or Portfolio Standard Deviation

$$\sigma_{XY} = \sqrt{4.472} = 2.115$$

- (iii) Expected Return, Systematic and Unsystematic Risk of Portfolio

$$\text{Portfolio Return} = 10\% + 1.0134(12\% - 10\%) = 12.03\%$$

$$\text{MF X Return} = 10\% + 1.087(12\% - 10\%) = 12.17\%$$

$$\text{MF Y Return} = 10\% + 0.903(12\% - 10\%) = 11.81\%$$

$$\text{Systematic Risk} = \beta^2 \sigma^2$$

Accordingly,

$$\text{Systematic Risk of MFX} = (1.087)^2 \times 3.10 = 3.663$$

$$\text{Systematic Risk of MFY} = (0.903)^2 \times 3.10 = 2.528$$

$$\text{Systematic Risk of Portfolio} = (1.013)^2 \times 3.10 = 3.181$$

$$\text{Unsystematic Risk} = \text{Total Risk} - \text{Systematic Risk}$$

Accordingly,

$$\text{Unsystematic Risk of MFX} = 4.80 - 3.663 = 1.137$$

$$\text{Unsystematic Risk of MFY} = 4.250 - 2.528 = 1.722$$

$$\text{Unsystematic Risk of Portfolio} = 4.472 - 3.181 = 1.291$$

(iv) Sharpe and Treynor Ratios and Alpha

Sharpe Ratio

$$\text{MFX} = \frac{15\% - 10\%}{\sqrt{4.800}} = 2.282$$

$$\text{MFY} = \frac{14\% - 10\%}{\sqrt{4.250}} = 1.94$$

$$\text{Portfolio} = \frac{14.6\% - 10\%}{2.115} = 2.175$$

Treynor Ratio

$$\text{MFX} = \frac{15\% - 10\%}{1.087} = 4.60$$

$$\text{MFY} = \frac{14\% - 10\%}{0.903} = 4.43$$

$$\text{Portfolio} = \frac{14.6\% - 10\%}{1.0134} = 4.54$$

Alpha

$$\text{MFX} = 15\% - 12.17\% = 2.83\%$$

$$\text{MFY} = 14\% - 11.81\% = 2.19\%$$

$$\text{Portfolio} = 14.6\% - 12.03\% = 2.57\%$$

18. Capital Asset Pricing Model (CAPM) formula for calculation of expected rate of return is

$$E_R = R_f + \beta (R_m - R_f)$$

E_R = Expected Return

β = Beta of Security

R_m = Market Return

R_f = Risk free Rate

$$= 10 + [1.2 (15 - 10)]$$

$$= 10 + 1.2 (5)$$

$$= 10 + 6 = 16\% \text{ or } 0.16$$

Applying dividend growth mode for the calculation of per share equilibrium price:-

$$E_R = \frac{D_1}{P_0} + g$$

$$\text{or } 0.16 = \frac{3(1.12)}{P_0} + 0.12 \quad \text{or} \quad 0.16 - 0.12 = \frac{3.36}{P_0}$$

$$\text{or } 0.04 P_0 = 3.36 \quad \text{or} \quad P_0 = \frac{3.36}{0.04} = ₹ 84$$

Therefore, equilibrium price per share will be ₹ 84.

19. First we shall compute the β of Security X.

$$\text{Risk Free Rate} = \frac{\text{Coupon Payment}}{\text{Current Market Price}} = \frac{7}{140} = 5\%$$

Assuming equilibrium return to be equal to CAPM return then:

$$15\% = R_f + \beta_X(R_m - R_f)$$

$$15\% = 5\% + \beta_X(15\% - 5\%)$$

$$\beta_X = 1$$

or it can also be computed as follows:

$$\frac{R_m}{R_s} = \frac{15\%}{15\%} = 1$$

- (i) Standard Deviation of Market Return

$$\beta_m = \frac{\text{Cov}_{X,m}}{\sigma_m^2} = \frac{225\%}{\sigma_m^2} = 1$$

$$\sigma_m^2 = 225$$

$$\sigma_m = \sqrt{225} = 15\%$$

- (ii) Standard Deviation of Security Return

$$\beta_X = \frac{\sigma_X}{\sigma_m} \times \rho_{Xm} = \frac{\sigma_X}{15} \times 0.75 = 1$$

$$\sigma_X = \frac{15}{0.75} = 20\%$$

20. CAPM = $R_f + \beta (R_m - R_f)$

Accordingly

$$R_{ABC} = R_f + 1.2 (R_m - R_f) = 19.8$$

$$R_{XYZ} = R_f + 0.9 (R_m - R_f) = 17.1$$

$$19.8 = R_f + 1.2 (R_m - R_f) \quad \text{-----(1)}$$

$$17.1 = R_f + 0.9 (R_m - R_f) \quad \text{-----(2)}$$

Deduct (2) from (1)

$$2.7 = 0.3 (R_m - R_f)$$

$$R_m - R_f = 9$$

$$R_f = R_m - 9$$

Substituting in equation (1)

$$19.8 = (R_m - 9) + 1.2 (R_m - R_m + 9)$$

$$19.8 = R_m - 9 + 10.8$$

$$19.8 = R_m + 1.8$$

Then $R_m = 18\%$ and $R_f = 9\%$

Security Market Line

$$= R_f + \beta (\text{Market Risk Premium})$$

$$= 9\% + \beta \times 9\%$$

21. (i) A Ltd. has lower return and higher risk than B Ltd. Hence, investing in B Ltd. is better than in A Ltd. because the return is higher and the risk is lower. However, investing in both will yield diversification advantage.

(ii) $r_{AB} = 0.22 \times 0.7 + 0.24 \times 0.3 = 0.226$ i.e. 22.6%

$$\sigma_{AB}^2 = 0.40^2 \times 0.7^2 + 0.38^2 \times 0.3^2 + 2 \times 0.7 \times 0.3 \times 0.72 \times 0.40 \times 0.38 = 0.1374$$

$$\sigma_{AB} = \sqrt{\sigma_{AB}^2} = \sqrt{0.1374} = 0.37 = 37\%$$

* Answer = 37.06% is also correct and variation may occur due to approximation.

- (iii) This risk-free rate will be the same for A and B Ltd. Their rates of return are given as follows:

$$r_A = 22 = r_f + (r_m - r_f) 0.86$$

$$r_B = 24 = r_f + (r_m - r_f) 1.24$$

$$r_A - r_B = -2 = (r_m - r_f) (-0.38)$$

$$r_m - r_f = -2 / -0.38 = 5.26\%$$

$$r_A = 22 = r_f + (5.26) 0.86$$

$$r_f = 17.48\%$$

Or

$$r_B = 24 = r_f + (5.26) 1.24$$

$$r_f = 17.48\%$$

$$r_m - 17.48 = 5.26$$

$$r_m = 22.74\%$$

- (iv) $\beta_{AB} = \beta_A \times W_A + \beta_B \times W_B$
 $= 0.86 \times 0.7 + 1.24 \times 0.3 = 0.974$

22. (i) Computation of Beta of Portfolio

Investment	No. of shares	Market Price	Market Value	Dividend Yield	Dividend	Composition	β	Weighted β
I	60,000	4.29	2,57,400	19.50%	50,193	0.2339	1.16	0.27
II	80,000	2.92	2,33,600	24.00%	56,064	0.2123	2.28	0.48
III	1,00,000	2.17	2,17,000	17.50%	37,975	0.1972	0.90	0.18
IV	1,25,000	3.14	3,92,500	26.00%	1,02,050	0.3566	1.50	0.53
			11,00,500		2,46,282	1.0000		1.46

$$\text{Return of the Portfolio} = \frac{2,46,282}{11,00,500} = 0.2238$$

$$\text{Beta of Port Folio} = 1.46$$

Market Risk implicit

$$0.2238 = 0.11 + \beta \times (0.19 - 0.11)$$

Or, $0.08 \beta + 0.11 = 0.2238$

$$\beta = \frac{0.2238 - 0.11}{0.08} = 1.42$$

Market β implicit is 1.42 while the port folio β is 1.46. Thus the portfolio is marginally risky compared to the market.

- (ii) The decision regarding change of composition may be taken by comparing the dividend yield (given) and the expected return as per CAPM as follows:

Expected return	R _s as per CAPM is:
R _s	= I _{RF} + (R _M - I _{RF}) β
For investment I R _s	= I _{RF} + (R _M - I _{RF}) β
	= .11 + (.19 - .11) 1.16
	= 20.28%
For investment II, R _s	= .11 + (.19 - .11) 2.28 = 29.24%
For investment III, R _s	= .11 + (.19 - .11) .90
	= 18.20%
For investment IV, R _s	= .11 + (.19 - .11) 1.50
	= 23%

Comparison of dividend yield with the expected return R_s shows that the dividend yields of investment I, II and III are less than the corresponding R_s. So, these investments are over-priced and should be sold by the investor. However, in case of investment IV, the dividend yield is more than the corresponding R_s, so, XYZ Ltd. should increase its proportion.

23. With 20% investment in each MF Portfolio Beta is the weighted average of the Betas of various securities calculated as below:

- (i)

<i>Investment</i>	<i>Beta (β)</i>	<i>Investment (₹ Lacs)</i>	<i>Weighted Investment</i>
A	1.6	20	32
B	1.0	20	20
C	0.9	20	18
D	2.0	20	40
E	0.6	<u>20</u>	<u>12</u>
		<u>100</u>	<u>122</u>
Weighted Beta (β) = 1.22			

- (ii) With varied percentages of investments portfolio beta is calculated as follows:

Investment	Beta (β)	Investment (₹ Lacs)	Weighted Investment
A	1.6	15	24
B	1.0	30	30
C	0.9	15	13.5
D	2.0	30	60
E	0.6	<u>10</u>	<u>6</u>
		<u>100</u>	<u>133.5</u>
Weighted Beta (β) = 1.335			

- (iii) Expected return of the portfolio with pattern of investment as in case (i)

$$= 12\% \times 1.22 \text{ i.e. } 14.64\%$$

Expected Return with pattern of investment as in case (ii) = $12\% \times 1.335$ i.e., 16.02%.

24. (a) Let the weight of stocks of Economy A be expressed as w , then

$$(1-w) \times 10.0 + w \times 15.0 = 10.5$$

i.e. $w = 0.1$ or 10%.

- (b) Variance of portfolio shall be:

$$(0.9)^2 (0.16)^2 + (0.1)^2 (0.30)^2 + 2(0.9)(0.1)(0.16)(0.30) = 0.02423$$

Standard deviation is $(0.02423)^{1/2} = 0.15565$ or 15.6%.

- (c) The Sharpe ratio will improve by approximately 0.04, as shown below:

$$\text{Sharpe Ratio} = \frac{\text{Expected Return} - \text{Risk Free Rate of Return}}{\text{Standard Deviation}}$$

$$\text{Investment only in developed countries: } \frac{10-3}{16} = 0.437$$

$$\text{With inclusion of stocks of Economy A: } \frac{10.5-3}{15.6} = 0.481$$

25. (i) Computation of Expected Return from Portfolio

Security	Beta (β)	Expected Return (r) as per CAPM	Amount (₹ Lakhs)	Weights (w)	wr
Moderate	0.50	$8\% + 0.50(10\% - 8\%) = 9\%$	60	0.115	1.035
Better	1.00	$8\% + 1.00(10\% - 8\%) = 10\%$	80	0.154	1.540

Good	0.80	$8\% + 0.80(10\% - 8\%) = 9.60\%$	100	0.192	1.843
Very Good	1.20	$8\% + 1.20(10\% - 8\%) = 10.40\%$	120	0.231	2.402
Best	1.50	$8\% + 1.50(10\% - 8\%) = 11\%$	<u>160</u>	<u>0.308</u>	<u>3.388</u>
Total			<u>520</u>	<u>1</u>	<u>10.208</u>

Thus Expected Return from Portfolio 10.208% say 10.21%.

Alternatively, it can be computed as follows:

$$\text{Average } \beta = 0.50 \times \frac{60}{520} + 1.00 \times \frac{80}{520} + 0.80 \times \frac{100}{520} + 1.20 \times \frac{120}{520} + 1.50 \times \frac{160}{520} = 1.104$$

As per CAPM

$$= 0.08 + 1.104(0.10 - 0.08) = 0.10208 \text{ i.e. } 10.208\%$$

- (ii) As computed above the expected return from Better is 10% same as return from Nifty, hence there will be no difference even if the replacement of security is made. The main logic behind this neutrality is that the beta of security 'Better' is 1 which clearly indicates that this security shall yield same return as market return.

26.

Particulars of Securities	Cost ₹	Dividend	Capital gain
Gold Ltd.	10,000	1,725	-200
Silver Ltd.	15,000	1,000	1,200
Bronz Ltd.	14,000	700	6,000
GOI Bonds	<u>36,000</u>	<u>3,600</u>	<u>-1,500</u>
Total	<u>75,000</u>	<u>7,025</u>	<u>5,500</u>

Expected rate of return on market portfolio

$$\frac{\text{Dividend Earned} + \text{Capital appreciation}}{\text{Initial investment}} \times 100$$

$$= \frac{\text{₹ } 7,025 + \text{₹ } 5,500}{\text{₹ } 75,000} \times 100 = 16.7\%$$

Risk free return

$$\text{Average of Betas} = \frac{0.6 + 0.8 + 0.6 + 0.01}{4} = \text{Average of Betas}^* = 0.50$$

Average return = Risk free return + Average Betas (Expected return – Risk free return)

$$15.7 = \text{Risk free return} + 0.50 (16.7 - \text{Risk free return})$$

$$\text{Risk free return} = 14.7\%$$

* Alternatively, it can also be calculated through Weighted Average Beta.

Expected Rate of Return for each security is

$$\text{Rate of Return} = R_f + B (R_m - R_f)$$

$$\text{Gold Ltd.} = 14.7 + 0.6 (16.7 - 14.7) = 15.90\%$$

$$\text{Silver Ltd.} = 14.7 + 0.8 (16.7 - 14.7) = 16.30\%$$

$$\text{Bronz Ltd.} = 14.7 + 0.6 (16.7 - 14.7) = 15.90\%$$

$$\text{GOI Bonds} = 14.7 + 0.01 (16.7 - 14.7) = 14.72\%$$

* Alternatively, it can also be computed by using Weighted Average Method.

27. (i) Expected rate of return

	Total Investments	Dividends	Capital Gains
Epsilon Ltd.	25	2	25
Sigma Ltd.	35	2	25
Omega Ltd.	45	2	90
GOI Bonds	<u>1,000</u>	<u>140</u>	<u>5</u>
	<u>1,105</u>	<u>146</u>	<u>145</u>

$$\text{Expected Return on market portfolio} = \frac{146 + 145}{1105} = 26.33\%$$

$$\text{CAPM } E(R_p) = R_f + \beta [E(R_M) - R_f]$$

Epsilon Ltd	$14 + 0.8 [26.33 - 14] =$	$14 + 9.86$	$= 23.86\%$
Sigma Ltd.	$14 + 0.7 [26.33 - 14] =$	$14 + 8.63$	$= 22.63\%$
Omega Ltd.	$14 + 0.5 [26.33 - 14] =$	$14 + 6.17$	$= 20.17\%$
GOI Bonds	$14 + 0.01 [26.33 - 14] =$	$14 + 0.12$	$= 14.12\%$

(ii) Average Return of Portfolio

$$\frac{23.86 + 22.63 + 20.17 + 14.12}{4} = \frac{80.78}{4} = 20.20\%$$

$$\text{Alternatively, } \frac{0.8+0.7+0.5+0.01}{4} = \frac{2.01}{4} = 0.5025$$

$$14 + 0.5025 (26.33 - 14) = 14 + 6.20 = 20.20\%$$

28. Calculation of expected return on market portfolio (R_m)

Investment	Cost (₹)	Dividends (₹)	Capital Gains (₹)
Shares X	8,000	800	200
Shares Y	10,000	800	500
Shares Z	16,000	800	6,000
PSU Bonds	<u>34,000</u>	<u>3,400</u>	<u>-1,700</u>
	<u>68,000</u>	<u>5,800</u>	<u>5,000</u>

$$R_m = \frac{5,800 + 5,000}{68,000} \times 100 = 15.88\%$$

Calculation of expected rate of return on individual security:

Security

Shares X	$15 + 0.8 (15.88 - 15.0)$	= 15.70%
Shares Y	$15 + 0.7 (15.88 - 15.0)$	= 15.62%
Shares Z	$15 + 0.5 (15.88 - 15.0)$	= 15.44%
PSU Bonds	$15 + 0.2 (15.88 - 15.0)$	= 15.18%

Calculation of the Average Return of the Portfolio:

$$= \frac{15.70 + 15.62 + 15.44 + 15.18}{4} = 15.49\%$$

29. On the basis of existing and revised factors, rate of return and price of share is to be calculated.

Existing rate of return

$$= R_f + \text{Beta} (R_m - R_f) = 12\% + 1.4 (6\%) = 20.4\%$$

Revised rate of return

$$= 10\% + 1.25 (4\%) = 15\%$$

Price of share (original)

$$P_0 = \frac{D(1+g)}{K_e - g} = \frac{2(1.05)}{0.204 - 0.05} = \frac{2.10}{0.154} = ₹ 13.63$$

Price of share (Revised)

$$P_0 = \frac{2(1.09)}{0.15 - 0.09} = \frac{2.18}{0.06} = ₹ 36.33$$

In case of existing market price of ₹ 25 per share, rate of return (20.4%) and possible equilibrium price of share at ₹ 13.63, this share needs to be sold because the share is overpriced (₹ 25 – 13.63) by ₹ 11.37. However, under the changed scenario where growth of dividend has been revised at 9% and the return though decreased at 15% but the possible price of share is to be at ₹ 36.33 and therefore, in order to expect price appreciation to ₹ 36.33 the investor should hold the shares, if other things remain the same

30. On the basis of existing and revised factors, rate of return and price of share is to be calculated.

Existing rate of return

$$\begin{aligned} &= R_f + \text{Beta} (R_m - R_f) \\ &= 12\% + 1.3 (5\%) = 18.5\% \end{aligned}$$

Revised rate of return

$$= 10\% + 1.4 (4\%) = 15.60\%$$

Price of share (original)

$$P_0 = \frac{D(1+g)}{K_e - g} = \frac{3(1.09)}{0.185 - 0.09} = \frac{3.27}{0.095} = ₹ 34.42$$

Price of share (Revised)

$$P_0 = \frac{2.50(1.07)}{0.156 - 0.07} = \frac{2.675}{0.086} = ₹ 31.10$$

Market price of share of ₹ 40 is higher in comparison to current equilibrium price of ₹ 34.42 and revised equity price of ₹ 31.10. Under this situation investor should sell the share.

31. (i) Investment committed to each security would be:-

	<u>A</u> (₹)	<u>B</u> (₹)	<u>C</u> (₹)	<u>Total</u> (₹)
Portfolio X	1,500	2,000	1,500	5,000
Portfolio Y	<u>600</u>	<u>1,500</u>	<u>900</u>	<u>3,000</u>
Combined Portfolio	<u>2,100</u>	<u>3,500</u>	<u>2,400</u>	<u>8,000</u>
∴ Stock weights	0.26	0.44	0.30	

(ii) The equation of critical line takes the following form:-

$$WB = a + bWA$$

Substituting the values of WA & WB from portfolio X and Y in above equation, we get

$$0.40 = a + 0.30b, \text{ and}$$

$$0.50 = a + 0.20b$$

Solving above equation we obtain the slope and intercept, $a = 0.70$ and $b = -1$ and thus, the critical line is

$$WB = 0.70 - WA$$

If half of the funds is invested in security A then,

$$WB = 0.70 - 0.50 = 0.20$$

$$\text{Since } WA + WB + WC = 1$$

$$WC = 1 - 0.50 - 0.20 = 0.30$$

$$\therefore \text{ Allocation of funds to security B} = 0.20 \times 8,000 = ₹ 1,600, \text{ and}$$

$$\text{Security C} = 0.30 \times 8,000 = ₹ 2,400$$

32. Workings:

Calculation of return on portfolio for 2009-10	(Calculation in ₹ / share)		
	M	N	
Dividend received during the year	10	3	
Capital gain/loss by 31.03.10			
Market value by 31.03.10	220	290	
Cost of investment	200	300	
Gain/loss	20	(-)10	
Yield	30	(-)7	
Cost	200	300	
% return	15%	(-)2.33%	
Weight in the portfolio	57	43	
Weighted average return			7.55%
Calculation of estimated return for 2010-11			

Expected dividend	20	3.5
Capital gain by 31.03.11 (220x0.2)+ (250x0.5)+(280x0.3) – 220=(253-220)	33	-
(290x0.2)+(310x0.5)+(330x0.3) – 290= (312 – 290)	-	22
Yield	53	25.5
*Market Value 01.04.10	220	290
% return	24.09%	8.79%
*Weight in portfolio (1,000x220): (500x290)	60.3	39.7
Weighted average (Expected) return		18.02%
(*The market value on 31.03.10 is used as the base for calculating yield for 10-11)		

- (i) Average Return from Portfolio for the year ended 31.03.2010 is 7.55%.
(ii) Expected Average Return from portfolio for the year 2010-11 is 18.02%

(iii) **Calculation of Standard Deviation**
M Ltd.

Exp. market value	Exp. gain	Exp. div.	Exp Yield (1)	Prob. Factor (2)	(1) X(2)	Dev. $(P_M - \overline{P_M})$	Square of dev. (3)	(2) X (3)
220	0	20	20	0.2	4	-33	1089	217.80
250	30	20	50	0.5	25	-3	9	4.50
280	60	20	80	0.3	24	27	729	218.70
					53			$\sigma^2_M = 441.00$

Standard Deviation (σ_M)

21

N Ltd.

Exp. market value	Exp. gain	Exp. div.	Exp Yield (1)	Prob. Factor (2)	(1) X(2)	Dev. $(P_N - \overline{P_N})$	Square of dev. (3)	(2) X (3)
290	0	3.5	3.5	0.2	0.7	-22	484	96.80
310	20	3.5	23.5	0.5	11.75	-2	4	2.00
330	40	3.5	43.5	0.3	13.05	18	324	97.20
					25.5			$\sigma^2_N = 196.00$

Standard Deviation (σ_N)

14

Alternatively based on return in percentage terms Standard Deviation can also be computed as follows:

M Ltd.

Exp. market value	Exp. gain	Exp. div.	Exp Return (1)	Prob. Factor (2)	(1) X(2)	Dev. $(\frac{P_M - \bar{P}_M}{P_M})$	Square of dev. (3)	(2) X (3)
220	0	20	9.09	0.2	1.82	-15.01	225.30	45.06
250	30	20	22.73	0.5	11.37	-1.37	1.88	0.94
280	60	20	36.36	0.3	10.91	12.26	150.31	45.09
					24.10			$\sigma^2_M = 91.09$

Standard Deviation (σ_M)

9.54%

N Ltd.

Exp. market value	Exp. gain	Exp. div.	Exp Return (1)	Prob. Factor (2)	(1) X(2)	Dev. $(\frac{P_N - \bar{P}_N}{P_N})$	Square of dev. (3)	(2) X (3)
290	0	3.5	1.21	0.2	0.24	-7.58	57.46	11.49
310	20	3.5	8.10	0.5	4.05	-0.69	0.48	0.24
330	40	3.5	15.00	0.3	4.50	6.21	38.56	11.57
					8.79			$\sigma^2_N = 23.30$

Standard Deviation (σ_N)

4.83%

Share of company M Ltd. is more risky as the S.D. is more than company N Ltd.

33. Expected Return on stock A = $E(A) = \sum_{i=G,S,R} P_i A_i$

(G,S & R, denotes Growth, Stagnation and Recession)

$(0.40)(25) + 0.30(10) + 0.30(-5) = 11.5\%$

Expected Return on 'B'

$(0.40 \times 20) + (0.30 \times 15) + 0.30 \times (-8) = 10.1\%$

Expected Return on Market index

$(0.40 \times 18) + (0.30 \times 13) + 0.30 \times (-3) = 10.2\%$

Variance of Market index

$$(18 - 10.2)^2 (0.40) + (13 - 10.2)^2 (0.30) + (-3 - 10.2)^2 (0.30) \\ = 24.34 + 2.35 + 52.27 = 78.96\%$$

Covariance of stock A and Market Index M

$$\text{Cov. (AM)} = \sum_{i=G,S,R} ([A_i - E(A)][M_i - E(M)]P$$

$$(25 - 11.5) (18 - 10.2)(0.40) + (10 - 11.5) (13 - 10.2) (0.30) + (-5 - 11.5) (-3 - 10.2)(0.30) \\ = 42.12 + (-1.26) + 65.34 = 106.20$$

Covariance of stock B and Market index M

$$(20 - 10.1) (18 - 10.2)(0.40) + (15 - 10.1)(13 - 10.2)(0.30) + (-8 - 10.1)(-3 - 10.2)(0.30) = 30.89 + 4.12 \\ + 71.67 = 106.68$$

$$\text{Beta for stock A} = \frac{\text{CoV(AM)}}{\text{VAR(M)}} = \frac{106.20}{78.96} = 1.345$$

$$\text{Beta for Stock B} = \frac{\text{CoV(BM)}}{\text{VarM}} = \frac{106.68}{78.96} = 1.351$$

Required Return for A

$$R(A) = R_f + \beta (M - R_f)$$

$$11\% + 1.345(10.2 - 11) \% = 9.924\%$$

Required Return for B

$$11\% + 1.351 (10.2 - 11) \% = 9.92\%$$

Alpha for Stock A

$$E(A) - R(A) \text{ i.e. } 11.5\% - 9.924\% = 1.576\%$$

Alpha for Stock B

$$E(B) - R(B) \text{ i.e. } 10.1\% - 9.92\% = 0.18\%$$

Since stock A and B both have positive Alpha, therefore, they are underpriced. The investor should make fresh investment in them.

34. (i) Portfolio Beta

$$0.20 \times 0.40 + 0.50 \times 0.50 + 0.30 \times 1.10 = 0.66$$

(ii) Residual Variance

To determine Residual Variance first of all we shall compute the Systematic Risk as follows:

$$\beta_A^2 \times \sigma_M^2 = (0.40)^2(0.01) = 0.0016$$

$$\beta_B^2 \times \sigma_M^2 = (0.50)^2(0.01) = 0.0025$$

$$\beta_C^2 \times \sigma_M^2 = (1.10)^2(0.01) = 0.0121$$

Residual Variance

A $0.015 - 0.0016 = 0.0134$

B $0.025 - 0.0025 = 0.0225$

C $0.100 - 0.0121 = 0.0879$

(iii) Portfolio variance using Sharpe Index Model

Systematic Variance of Portfolio = $(0.10)^2 \times (0.66)^2 = 0.004356$

Unsystematic Variance of Portfolio = $0.0134 \times (0.20)^2 + 0.0225 \times (0.50)^2 + 0.0879 \times (0.30)^2 = 0.014072$

Total Variance = $0.004356 + 0.014072 = 0.018428$

(iv) Portfolio variance on the basis of Markowitz Theory

$$= (w_A \times w_A \times \sigma_A^2) + (w_A \times w_B \times \text{COV}_{AB}) + (w_A \times w_C \times \text{COV}_{AC}) + (w_B \times w_A \times \text{COV}_{AB}) + (w_B \times w_B \times \sigma_B^2) + (w_B \times w_C \times \text{COV}_{BC}) + (w_C \times w_A \times \text{COV}_{CA}) + (w_C \times w_B \times \text{COV}_{CB}) + (w_C \times w_C \times \sigma_C^2)$$

$$= (0.20 \times 0.20 \times 0.015) + (0.20 \times 0.50 \times 0.030) + (0.20 \times 0.30 \times 0.020) + (0.20 \times 0.50 \times 0.030) + (0.50 \times 0.50 \times 0.025) + (0.50 \times 0.30 \times 0.040) + (0.30 \times 0.20 \times 0.020) + (0.30 \times 0.50 \times 0.040) + (0.30 \times 0.30 \times 0.10)$$

$$= 0.0006 + 0.0030 + 0.0012 + 0.0030 + 0.00625 + 0.0060 + 0.0012 + 0.0060 + 0.0090$$

$$= 0.0363$$

35. Securities need to be ranked on the basis of excess return to beta ratio from highest to the lowest.

Security	R_i	β_i	$R_i - R_f$	$\frac{R_i - R_f}{\beta_i}$
A	15	1.5	8	5.33
B	12	2	5	2.5
C	10	2.5	3	1.2
D	9	1	2	2
E	8	1.2	1	0.83
F	14	1.5	7	4.67

Ranked Table:

Security	$R_i - R_f$	β_i	σ^2_{ei}	$\frac{(R_i - R_f) \times \beta_i}{\sigma^2_{ei}}$	$\sum_{e=i}^N \frac{(R_i - R_f) \times \beta_i}{\sigma^2_{ei}}$	$\frac{\beta_i^2}{\sigma^2_{ei}}$	$\sum_{e=i}^N \frac{\beta_i^2}{\sigma^2_{ei}}$	C_i
A	8	1.5	40	0.30	0.30	0.056	0.056	1.923
F	7	1.5	30	0.35	0.65	0.075	0.131	2.814
B	5	2	20	0.50	1.15	0.20	0.331	2.668
D	2	1	10	0.20	1.35	0.10	0.431	2.542
C	3	2.5	30	0.25	1.60	0.208	0.639	2.165
E	1	1.2	20	0.06	1.66	0.072	0.711	2.047

$$CA = 10 \times 0.30 / [1 + (10 \times 0.056)] = 1.923$$

$$CF = 10 \times 0.65 / [1 + (10 \times 0.131)] = 2.814$$

$$CB = 10 \times 1.15 / [1 + (10 \times 0.331)] = 2.668$$

$$CD = 10 \times 1.35 / [1 + (10 \times 0.431)] = 2.542$$

$$CC = 10 \times 1.60 / [1 + (10 \times 0.639)] = 2.165$$

$$CE = 10 \times 1.66 / [1 + (10 \times 0.711)] = 2.047$$

Cut off point is 2.814

$$Z_i = \frac{\beta_i}{\sigma^2_{ei}} \left[\left(\left[\frac{(R_i - R_f)}{\beta_i} - C \right] \right) \right]$$

$$Z_A = \frac{1.5}{40} (5.33 - 2.814) = 0.09435$$

$$Z_F = \frac{1.5}{30} (4.67 - 2.814) = 0.0928$$

$$X_A = \frac{0.09435}{[0.09435 + 0.0928]} = 50.41\%$$

$$X_F = \frac{0.0928}{[0.09435 + 0.0928]} = 49.59\%$$

Funds to be invested in security A & F are 50.41% and 49.59% respectively.

36. (i)

Security	No. of shares (1)	Market Price of Per Share (2)	(1) × (2)	% to total (w)	β (x)	wx
VSL	10000	50	500000	0.4167	0.9	0.375
CSL	5000	20	100000	0.0833	1	0.083
SML	8000	25	200000	0.1667	1.5	0.250
APL	2000	200	400000	0.3333	1.2	0.400
			<u>1200000</u>	1		<u>1.108</u>

Portfolio beta 1.108

(ii) Required Beta 0.8

It should become (0.8 / 1.108) 72.2 % of present portfolio

If ₹ 12,00,000 is 72.20%, the total portfolio should be

₹ 12,00,000 × 100/72.20 or ₹ 16,62,050

Additional investment in zero risk should be (₹ 16,62,050 – ₹ 12,00,000) = ₹ 4,62,050

Revised Portfolio will be

Security	No. of shares (1)	Market Price of Per Share (2)	(1) × (2)	% to total (w)	β (x)	wx
VSL	10000	50	500000	0.3008	0.9	0.271
CSL	5000	20	100000	0.0602	1	0.060
SML	8000	25	200000	0.1203	1.5	0.180
APL	2000	200	400000	0.2407	1.2	0.289
Risk free asset	46205	10	462050	0.2780	0	0
			<u>1662050</u>	1		<u>0.800</u>

(iii) To increase Beta to 1.2

Required beta 1.2

It should become 1.2 / 1.108 108.30% of present beta

If 1200000 is 108.30%, the total portfolio should be

1200000 × 100/108.30 or 1108033 say 1108030

Additional investment should be (-) 91967 i.e. Divest ₹ 91970 of Risk Free Asset

Revised Portfolio will be

Security	No. of shares (1)	Market Price of Per Share (2)	(1) × (2)	% to total (w)	β (x)	wx
VSL	10000	50	500000	0.4513	0.9	0.406
CSL	5000	20	100000	0.0903	1	0.090
SML	8000	25	200000	0.1805	1.5	0.271
APL	2000	200	400000	0.3610	1.2	0.433
Risk free asset	-9197	10	-91970	-0.0830	0	0
			1108030	1		1.20

Portfolio beta

1.20

Alternative Approach

(ii) Let x be the amount of Risk-Free Asset to be acquired, then

Security	(1) × (2)	β (x)	wx
VSL	500000	0.9	450000
CSL	100000	1	100000
SML	200000	1.5	300000
APL	400000	1.2	480000
Risk free asset	x	0	0
	1200000 + x		1330000

Accordingly,

$$\frac{13,30,000}{12,00,000 + x} = 0.8$$

x = 462500 i.e. value of Risk Free Asset to be purchased to decrease beta of portfolio to 0.8.

(iii) Similarly let y the amount of Risk Free Assets to be divest, then

$$\frac{13,30,000}{12,00,000 + y} = 1.20$$

y = -91,667 i.e. value of Risk Free Asset to be divested to increase beta of portfolio to 1.20.

$$37. \beta_p = \sum_{i=1}^4 x_i \beta_i$$

$$= 1.60 \times 0.25 + 1.15 \times 0.30 + 1.40 \times 0.25 + 1.00 \times 0.20$$

$$= 0.4 + 0.345 + 0.35 + 0.20 = 1.295$$

The Standard Deviation (Risk) of the portfolio is

$$= [(1.295)^2(18)^2 + (0.25)^2(7)^2 + (0.30)^2(11)^2 + (0.25)^2(3)^2 + (0.20)^2(9)^2]^{1/2}$$

$$= [543.36 + 3.0625 + 10.89 + 0.5625 + 3.24]^{1/2} = [561.115]^{1/2} = 23.69\%$$

Alternative Answer

The variance of Security's Return

$$\sigma^2 = \beta_i^2 \sigma_m^2 + \sigma_{ei}^2$$

Accordingly, variance of various securities

	σ^2	Weight(w)	$\sigma^2 X_w$
L	$(1.60)^2 (18)^2 + 7^2 = 878.44$	0.25	219.61
M	$(1.15)^2 (18)^2 + 11^2 = 549.49$	0.30	164.85
N	$(1.40)^2 (18)^2 + 3^2 = 644.04$	0.25	161.01
K	$(1.00)^2 (18)^2 + 9^2 = 405.00$	0.20	81
Variance			626.47

$$SD = \sqrt{626.47} = 25.03$$

38. Return of the stock under APT

Factor	Actual value in %	Expected value in %	Difference	Beta	Diff. x Beta
GNP	7.70	7.70	0.00	1.20	0.00
Inflation	7.00	5.50	1.50	1.75	2.63
Interest rate	9.00	7.75	1.25	1.30	1.63
Stock index	12.00	10.00	2.00	1.70	3.40
Ind. Production	7.50	7.00	0.50	1.00	0.50
					8.16
Risk free rate in %					9.25
Return under APT					17.41

$$39. \quad (i) \quad \beta_{\text{asset}} = \beta_{\text{equity}} \times \frac{V_E}{V_0} + \beta_{\text{debt}} \times \frac{V_D}{V_0}$$

Note: Since β_{debt} is not given it is assumed that company debt capital is virtually riskless.

If company's debt capital is riskless than above relationship become:

$$\text{Here } \beta_{\text{equity}} = 1.5; \beta_{\text{asset}} = \beta_{\text{equity}} \frac{V_E}{V_0}$$

$$\text{As } \beta_{\text{debt}} = 0$$

$$V_E = ₹ 60 \text{ lakhs.}$$

$$V_D = ₹ 40 \text{ lakhs.}$$

$$V_0 = ₹ 100 \text{ lakhs.}$$

$$\begin{aligned} \beta_{\text{asset}} &= 1.5 \times \frac{60 \text{ lakhs}}{100 \text{ lakhs}} \\ &= 0.9 \end{aligned}$$

- (ii) (a) If only equity is used to finance the expansion, the Cost of Capital for discounting company's expansion of existing business shall be computed as follows:

$$\text{Company's cost of equity} = R_f + \beta_A \times \text{Market Risk premium}$$

Where R_f = Risk free rate of return

β_A = Beta of company assets

Therefore, company's cost of equity = $8\% + 0.9 \times 10 = 17\%$ and overall cost of capital shall be 17%.

- (b) Alternatively, if funds expansion are raised for in same proportion as exiting capital structure, then cost of capital shall be computed as follows:

$$\text{Cost of Equity} = 8\% + 1.5 \times 10 = 23\%$$

$$\text{Cost of Debt} = 8\%$$

$$\text{WACC (Cost of Capital)} = 23\% \times \frac{3}{5} + 8\% \times \frac{2}{5} = 17\%$$

40. (a) **Method I**

Stock's return

$$\text{Small cap growth} = 4.5 + 0.80 \times 6.85 + 1.39 \times (-3.5) + 1.35 \times 0.65 = 5.9925\%$$

$$\text{Small cap value} = 4.5 + 0.90 \times 6.85 + 0.75 \times (-3.5) + 1.25 \times 0.65 = 8.8525\%$$

$$\text{Large cap growth} = 4.5 + 1.165 \times 6.85 + 2.75 \times (-3.5) + 8.65 \times 0.65 = 8.478\%$$

$$\text{Large cap value} = 4.5 + 0.85 \times 6.85 + 2.05 \times (-3.5) + 6.75 \times 0.65 = 7.535\%$$

Expected return on market index

$$0.25 \times 5.9925 + 0.10 \times 8.8525 + 0.50 \times 8.478 + 0.15 \times 7.535 = 7.7526\%$$

Method II

Expected return on the market index

$$= 4.5\% + [0.1 \times 0.9 + 0.25 \times 0.8 + 0.15 \times 0.85 + 0.50 \times 1.165] \times 6.85 + [(0.75 \times 0.10 + 1.39 \times 0.25 + 2.05 \times 0.15 + 2.75 \times 0.5)] \times (-3.5) + [(1.25 \times 0.10 + 1.35 \times 0.25 + 6.75 \times 0.15 + 8.65 \times 0.50)] \times 0.65$$

$$= 4.5 + 6.85 + (-7.3675) + 3.77 = 7.7525\%.$$

(b) Using CAPM,

$$\text{Small cap growth} = 4.5 + 6.85 \times 0.80 = 9.98\%$$

$$\text{Small cap value} = 4.5 + 6.85 \times 0.90 = 10.665\%$$

$$\text{Large cap growth} = 4.5 + 6.85 \times 1.165 = 12.48\%$$

$$\text{Large cap value} = 4.5 + 6.85 \times 0.85 = 10.3225\%$$

Expected return on market index

$$= 0.25 \times 9.98 + 0.10 \times 10.665 + 0.50 \times 12.45 + 0.15 \times 10.3225 = 11.33\%$$

(c) Let us assume that Mr. Nirmal will invest $X_1\%$ in small cap value stock and $X_2\%$ in large cap growth stock

$$X_1 + X_2 = 1$$

$$0.90 X_1 + 1.165 X_2 = 1$$

$$0.90 X_1 + 1.165(1 - X_1) = 1$$

$$0.90 X_1 + 1.165 - 1.165 X_1 = 1$$

$$0.165 = 0.265 X_1$$

$$\frac{0.165}{0.265} = X_1$$

$$0.623 = X_1, X_2 = 0.377$$

62.3% in small cap value

37.7% in large cap growth.

41. Sharpe Ratio $S = (R_p - R_f)/\sigma_p$

Treynor Ratio $T = (R_p - R_f)/\beta_p$

Where,

R_p = Return on Fund

R_f = Risk-free rate

σ_p = Standard deviation of Fund

β_p = Beta of Fund

Reward to Variability (Sharpe Ratio)

Mutual Fund	R_p	R_f	$R_p - R_f$	σ_p	Reward to Variability	Ranking
A	15	6	9	7	1.285	2
B	18	6	12	10	1.20	3
C	14	6	8	5	1.60	1
D	12	6	6	6	1.00	5
E	16	6	10	9	1.11	4

Reward to Volatility (Treynor Ratio)

Mutual Fund	R_p	R_f	$R_p - R_f$	β_p	Reward to Volatility	Ranking
A	15	6	9	1.25	7.2	2
B	18	6	12	0.75	16	1
C	14	6	8	1.40	5.71	5
D	12	6	6	0.98	6.12	4
E	16	6	10	1.50	6.67	3

42. Let portfolio standard deviation be σ_p

Market Standard Deviation = σ_m

Coefficient of correlation = r

$$\text{Portfolio beta } (\beta_p) = \frac{\sigma_p r}{\sigma_m}$$

$$\text{Required portfolio return } (R_p) = R_f + \beta_p (R_m - R_f)$$

Portfolio	Beta	Return from the portfolio (R_p) (%)
A	1.75	17.75
B	0.90	13.50
C	0.65	12.25
D	1.25	15.25
E	0.90	13.50

Portfolio	Sharpe Method		Treynor Method		Jensen's Alpha	
	Ratio	Rank	Ratio	Rank	Ratio	Rank
A	4.00	IV	5.71	V	1.25	V
B	3.00	V	6.67	IV	1.50	IV
C	7.50	I	9.23	I	2.75	II
D	4.25	III	6.80	III	2.25	III
E	4.50	II	9.00	II	3.60	I

SECURITIZATION



LEARNING OUTCOMES

After going through the chapter student shall be able to understand

- Introduction
- Concept and Definition
- Benefits of Securitization
- Participants in Securitization
- Mechanism of Securitization
- Problems in Securitization
- Securitization Instruments
- Pricing of Securitization Instruments
- Risks in Securitization
- Tokenization
- Securitization in India

1. INTRODUCTION

Some companies or firms who are involved in making credit sale must have a huge balance of receivables in their Balance Sheet. Though they have a huge amount of receivables but still they may face liquidity crunch to run their business. One way to address this problem may be to adopt

the borrowing route, but this results in changing the debt equity ratio of the company which may not only be unacceptable to some stakeholders but may also put companies to financial risk which affects the future borrowing capacity of the company. To overcome this problem the term 'securitization' was coined.

2. Concept and Definition

The process of securitization typically involves the creation of pool of assets from the illiquid financial assets, such as receivables or loans which are marketable. In other words, it is the process of repackaging or rebundling of illiquid assets into marketable securities. These assets can be automobile loans, credit card receivables, residential mortgages or any other form of future receivables.

The reserve Bank of India defines Securitization as transactions where credit risks in assets are redistributed by repackaging them into tradable securities.

Features of Securitization

The securitization has the following features:

- (i) Creation of Financial Instruments – The process of securities can be viewed as process of creation of additional financial product of securities in market backed by collaterals.
- (ii) Bundling and Unbundling – When all the assets are combined in one pool it is bundling and when these are broken into instruments of fixed denomination it is unbundling.
- (iii) Tool of Risk Management – In case assets are securitized on non-recourse basis, then securitization process acts as a risk management tool as the risk of default is shifted from originator (of securities) to investor (in securities).
- (iv) Structured Finance – In the process of securitization, financial instruments are tailor structured to meet the risk return trade off profile of the investor, and hence, these securitized instruments are considered as best examples of structured finance.
- (v) Trenching – Portfolio of different receivable or loan or asset are split into several parts based on risk and return they carry called 'Tranche'. Each Trench carries a different level of risk and return.
- (vi) Homogeneity – Under each tranche the securities issued are of homogenous nature and even meant for small investors who can afford to invest in small amounts.

3. BENEFITS OF SECURITIZATION

The benefits of securitization can be viewed from the angle of various parties involved as follows:

3.1 From the angle of originator

Originator (entity which sells assets collectively to Special Purpose Vehicle) achieves the following benefits from securitization.

- (i) Off – Balance Sheet Financing: When loan/receivables are securitized it releases a portion of capital tied up in these assets resulting in off Balance Sheet financing leading to improved liquidity position which helps in expanding the business of the company.
- (ii) More specialization in main business: By transferring the assets the entity could concentrate more on core business as servicing of loan is transferred to SPV. Further, in case of non-recourse arrangement even the burden of default is shifted.
- (iii) Helps to improve financial ratios: Especially in case of Financial Institutions and Banks, it helps to manage Capital –To-Weighted Asset Ratio effectively.
- (iv) Reduced borrowing Cost: Since securitized papers are rated due to credit enhancement and hence, they can be issued at reduced interest rate due to which the originator earns a spread, resulting in reduced cost of borrowings.

3.2 From the angle of investor

Following benefits accrues to the investors of securitized securities.

1. Diversification of Risk: Purchase of securities backed by different types of assets provides the diversification of portfolio resulting in reduction of risk.
2. Regulatory requirement: Acquisition of asset backed belonging to a particular industry say micro industry helps banks to meet regulatory requirement of investment in specific assets e.g., Priority Sector Lending (PSL) regulations of Reserve Bank of India (RBI).
3. Protection against default: In case of recourse arrangement, if there is any default by any third party then originator shall make good the loss amount. Moreover, there can be insurance arrangement for compensation for any such default.

4. PARTICIPANTS IN SECURITIZATION

Broadly, the participants in the process of securitization can be divided into two categories; one is Primary Participant and the other is Secondary Participant.

4.1 Primary Participants

Primary Participants are main parties to this process. The primary participants in the process of securitization are as follows:

(a) Originator: It is the initiator of deal or can be termed as securitizer. It is an entity which sells the assets lying in its books and receives the funds generated through the sale of such assets. The

originator transfers both legal as well as beneficial interest to the Special Purpose Vehicle (discussed later).

(b) Special Purpose Vehicle: Also, called SPV is created for the purpose of executing the deal. Since issuer originator transfers all rights in assets to SPV, it holds the legal title of these assets. It is created especially for the purpose of securitization only and normally could be in form of a company, a firm, a society or a trust.

The main objective of creating SPV is to remove and ring fence the asset from the Balance Sheet of Originator. Since, SPV makes an upfront payment to the originator, it holds the key position in the overall process of securitization. Further, it also issues the securities [called Asset Based Securities (ABS) or Mortgage Based Securities (MBS)] to the investors.

(c) The Investors: Investors are the buyers of securitized papers which may be an individual, an institutional investor such as mutual funds, provident funds, insurance companies, mutual funds, Financial Institutions etc.

Since, they are participating as investors in the pool of assets/receivable, they receive their money back in the form of interest and principal as per the terms agreed.

4.2 Secondary Participants

Besides the primary participants other parties involved into the securitization process are as follows:

(a) Obligors: They are the main root of the whole securitization process. They are the parties who owe money to the firm and are assets in the Balance Sheet of Originator. The amount due from the obligor is transferred to SPV and hence they form the basis of securitization process and their credit standing is of paramount importance in the whole process.

(b) Rating Agency: Since the securitization is based on the pools of assets rather than the originators, the assets have to be assessed in terms of its credit quality and credit support available. Rating agency assesses the following:

- Strength of the Cash Flow.
- Mechanism to ensure timely payment of interest and principle repayment.
- Credit quality of obligors.
- Liquidity support.
- Strength of legal framework.

Although rating agency is secondary to the process of securitization but it plays a vital role.

(c) Receiving and Paying agent (RPA): Also, called Servicer or Administrator, it collects the payment due from obligor(s) and passes it to SPV. It also follows up with defaulting obligor and if required initiate appropriate legal action against them. Generally, an originator or its affiliates acts as servicer.

(d) **Agent or Trustee:** Trustees are appointed to oversee that all parties to the deal perform in the true spirit of terms of agreement. Normally, it takes care of interest of investors who acquire the securities.

(e) **Credit Enhancer:** Since investors in securitized instruments are directly exposed to performance of the underlying securities and sometime may have limited or no recourse to the originator, they seek additional comfort in the form of credit enhancement. In other words, they require credit rating of issued securities which also empowers marketability of the securities.

Originator itself or a third party say a bank may provide this additional context called Credit Enhancer. While originator provides comfort in the form of over collateralization or cash collateral, the third party provides it in form of letter of credit or surety bonds.

(f) **Structurer:** It brings together the originator, investors, credit enhancers and other parties to the deal of securitization. Normally, these are investment bankers also called arranger of the deal. It ensures that deal meets all legal, regulatory, accounting and tax laws requirements.

5. MECHANISM OF SECURITIZATION

Let us discuss briefly the steps in securitization mechanism:

5.1 Creation of Pool of Assets

The process of securitization begins with creation of pool of assets by segregation of assets backed by similar type of mortgages (in the case of MBS) in terms of interest rate, risk, maturity and concentration units.

5.2 Transfer to SPV

Once assets have been pooled, they are transferred to Special Purpose Vehicle (SPV) especially created for this purpose.

5.3 Sale of Securitized Papers

SPV designs the instruments based on nature of interest, risk, tenure, pool of assets etc. These instruments can be Pass Through Security or Pay Through Certificates (PTC), (discussed later).

5.4 Administration of assets

The administration of assets is sub-contracted back to originator which collects principal and interest from underlying assets and transfer it to SPV, which works as a servicer/ conduit typically for an agreed fee.

5.5 Recourse to Originator

Performance of securitized papers depends on the performance of underlying assets and unless specified otherwise in case of default by debtors, receivables go back to originator from SPV.

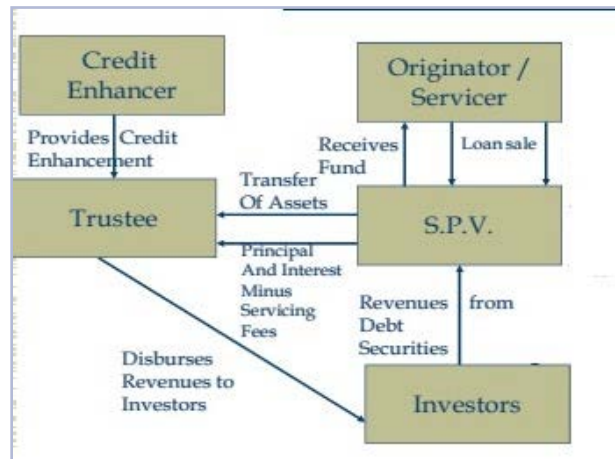
5.6 Repayment of funds

SPV will repay the funds to the investor in form of interest and principal that arises from the assets pooled.

5.7 Credit Rating to Instruments

Sometime before the sale of securitized instruments credit rating can be done to assess the risk of the issuer.

The mechanism of Securitization has been shown below in form of a diagram.



6. PROBLEMS IN SECURITIZATION

Following are main problems faced in growth of Securitization of instruments especially in Indian context:

6.1 Stamp Duty

Stamp Duty is one of the obstacle in India. Under Transfer of Property Act, 1882, a mortgage debt stamp duty which even goes upto 12% in some states of India and hence impedes the growth of securitization in India. It should be noted that since pass through certificate does not evidence any debt only able to receivable, they are exempted from stamp duty.

Moreover, in India, recognizing the special nature of securitized instruments in some states has reduced the stamp duty on them.

6.2 Taxation

Taxation is another area of concern in India. In the absence of any specific provision relating to securitized instruments in Income Tax Act, experts' opinion differ a lot. Some are of the opinion that SPV as a trustee is liable to be taxed in a representative capacity whereas others are of view that instead of SPV, investors will be taxed on their share of income. Clarity is also required on the issues of capital gain implications on passing payments to the investors.

6.3 Accounting

Accounting and reporting of securitized assets in the books of originator is another area of concern. Although securitization is slated to be an off-balance sheet instrument but in true sense receivables are removed from originator's balance sheet. Problem arises especially when assets are transferred without recourse.

6.4 Lack of standardization

Every originator follows his own format for documentation and administration and hence lack of standardization is another obstacle in the growth of securitization.

6.5 Inadequate Debt Market

Lack of existence of a well-developed debt market in India is another obstacle that hinders the growth of secondary market of securitized or asset backed securities.

6.6 Ineffective Foreclosure laws

For many years efforts are on for effective foreclosure but still foreclosure laws are not supportive to lending institutions and this makes securitized instruments especially mortgaged backed securities less attractive as lenders face difficulty in transfer of property in event of default by the borrower.

7. SECURITIZATION INSTRUMENTS

On the basis of different maturity characteristics, the securitized instruments can be divided into following three categories:

7.1 Pass Through Certificates (PTCs)

As the title suggests, originator (seller of the assets) transfers the entire receipt of cash in the form of interest or principal repayment from the assets sold. Thus, these securities represent direct claim of the investors on all the assets that has been securitized through SPV.

Since all cash flows are transferred, the investors carry proportional beneficial interest in the asset held in the trust by SPV.

It should be noted that since it is a direct route any prepayment of principal is also proportionately distributed among the securities holders. Further, due to these characteristics on completion of securitization by the final payment of assets, all the securities are terminated simultaneously.

Skewness of cash flows occurs in early stage if principals are repaid before the scheduled time.

7.2 Pay Through Security (PTS)

As mentioned earlier, since, in PTCs all cash flows are passed to the performance of the securitized assets. To overcome this limitation and limitation of single maturity there is another structure i.e. PTS.

In contrast to PTC in PTS, SPV debt securities are backed by the assets and hence it can restructure different tranches from varying maturities of receivables.

In other words, this structure permits desynchronization of servicing of securities issued from cash flow generating from the asset. Further, this structure also permits the SPV to reinvest surplus funds for short term as per their requirement.

While in Pass Through, all cash flows are passed on immediate basis, in PTS in case of early retirement of receivables the surplus cash can be used for short term yield. This structure also provides the freedom to issue several debt tranches with varying maturities.

7.3 Stripped Securities

Stripped Securities are created by dividing the cash flows associated with underlying securities into two or more new securities. Those two securities are as follows:

- (i) Interest Only (IO) Securities
- (ii) Principle Only (PO) Securities

As each investor receives a combination of principal and interest, it can be stripped into two portion of Interest and Principle.

Accordingly, the holder of IO securities receives only interest while PO security holder receives only principal. Being highly volatile in nature these securities are less preferred by investors.

In case yield to maturity in market rises, PO price tends to fall as borrower prefers to postpone the payment on cheaper loans. Whereas if interest rate in market falls, the borrower tends to repay the loans as they prefer to borrow fresh at lower rate of interest.

In contrast, value of IO's securities increases when interest rate goes up in the market as more interest is calculated on borrowings.

However, when interest rate due to prepayments of principals, IO's tends to fall.

Thus, from the above, it is clear that it is mainly perception of investors that determines the prices of IOs and POs

8. PRICING OF THE SECURITIZED INSTRUMENTS

Pricing of securitized instruments is an important aspect of securitization. While pricing the instruments, it is important that it should be acceptable to both originators as well as to the investors. On the same basis pricing of securities can be divided into following two categories:

8.1 From Originator's Angle

From originator's point of view, the instruments can be priced at a rate at which originator has to incur an outflow and if that outflow can be amortized over a period of time by investing the amount raised through securitization.

8.2 From Investor's Angle

From an investor's angle security price can be determined by discounting best estimate of expected future cash flows using rate of yield to maturity of a security of comparable security with respect to credit quality and average life of the securities. This yield can also be estimated by referring the yield curve available for marketable securities, though some adjustments is needed on account of spread points, because of credit quality of the securitized instruments.

9. RISKS IN SECURITIZATION

In a securitization transaction, investors are exposed to several risks at each stage of the transaction. The various types of risks in any securitization transaction are as follows:

9.1 Credit risk or Counterparty risk

It is the prime risk wherein investors are prone to the risk of bankruptcy and non-performance of the servicer.

9.2 Legal risks

Since in the Indian context it is a recently developed concept there is an absence of conclusive judicial precedent or explicit statutory provisions on securitization transactions. As a result, any dispute over the legal ownership of the assets is likely to result in uncertainty regarding investor pay-outs from the pool cash flow.

9.3 Market risks

Market risks represent risks external to the transaction and include market-related factors that impact the performance of the transaction. Some of these risks are as follows:

(a) Macroeconomic risks: The performance of the underlying loan contracts depends on macroeconomic factors, such as industry downturns or adverse price movements of the underlying

assets. For example, in the transportation industry a continuous decline in industrial production may lead to a downtrend in the use of services of the Commercial Vehicles (CVs) adversely impacting the cash flow of CVs operators. This in turn, may impact repayments on CV loans. Similarly, a fall in the prices of the CVs may increase chances of default as the borrower may wilfully default the loan and let the finance company repossess and sell the underlying vehicle instead of retaining it and continuing to pay instalments on time.

(b) Prepayment risks: A change in the market interest rate represents a difficult situation for investors because it is a combination of prepayment risk and volatile interest rates. With a reduction in interest rates generally prepayment of retail loans increases, resulting in reinvestment risk for investors because investors may receive their monies ahead of schedule and may not be able to reinvest the amount at the same yield.

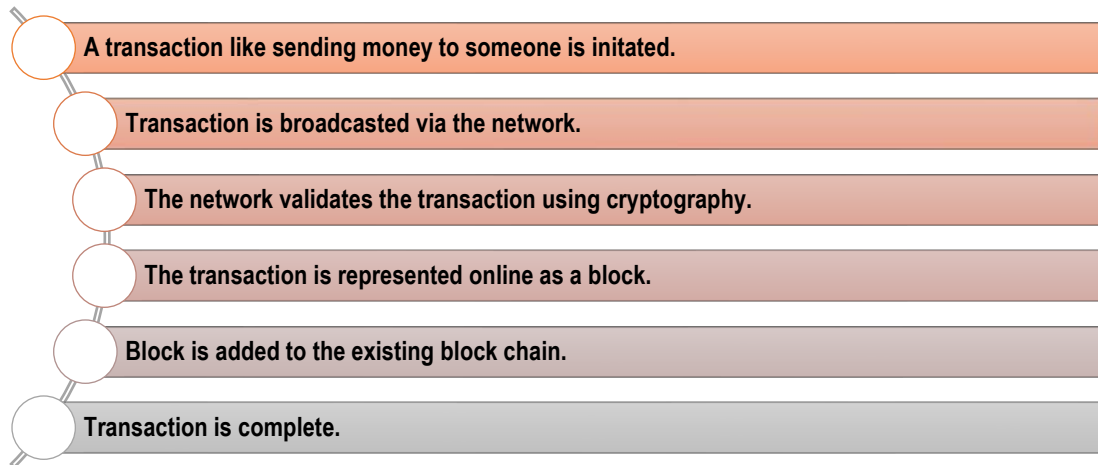
(c) Interest rate risks: This risk is prominent where the loans in the pool are based on a floating rate and investor pay-outs are based on a fixed rate or vice versa. It results in an interest rate mismatch and can lead to a situation where the pool cash inflow, even at 100% collection efficiency, is not sufficient to meet investor pay-outs. Interest rate swaps can be used to hedge this type of risk to some extent.

10. TOKENIZATION

Before we discuss the concept of Tokenization it is necessary to understand the concept of Blockchain.

Blockchain, sometimes referred to as Distributed Ledger Technology (DLT) is a shared, peer-to-peer, and decentralized open ledger of transactions system with no trusted third parties in between. This ledger database has every entry as permanent as it is an append-only database which cannot be changed or altered. All transactions are fully irreversible with any change in the transaction being recorded as a new transaction. The decentralised network refers to the network which is not controlled by any bank, corporation, or government. A block chain generally uses a chain of blocks, with each block representing the digital information stored in public database (“the chain”).

A simple analogy for understanding blockchain technology is a Google Doc. When we create a document and share it with a group of people, the document is distributed instead of copied or transferred. This creates a decentralized distribution chain that gives everyone access to the document at the same time. No one is locked out awaiting changes from another party, while all modifications to the document are being recorded in real-time, making changes completely transparent. Following figure represents the working of any Blockchain transaction.



10.1 Applications of Blockchain

Some initiatives that are already existing in various fields like financial services, healthcare, government, travel industry, economic forecasts etc. are discussed below:

(a) Financial Services: Blockchain can be used to provide an automated trade lifecycle in terms of the transaction log of any transaction of asset or property - whether physical or digital such as laptops, smartphones, automobiles, real estate, etc. from one person to another.

(b) Healthcare: Blockchain provides secure sharing of data in healthcare industry by increasing the privacy, security, and interoperability of the data by eliminating the interference of third party and avoiding the overhead costs.

(c) Government: At the government front, there are instances where the technical decentralization is necessary but politically should be governed by governments like land registration, vehicle registration and management, e-voting etc. Blockchain improves the transparency and provides a better way to monitor and audit the transactions in these systems.

(d) Travel Industry: Blockchain can be applied in money transactions and in storing important documents like passports/other identification cards, reservations and managing travel insurance, loyalty, and rewards thus, changing the working of travel and hospitality industry.

(e) Economic Forecasts: Blockchain makes possible the financial and economic forecasts based on decentralized prediction markets, decentralized voting, and stock trading, thus enabling the organizations to plan and shape their businesses.

10.2 Risks associated with Blockchain

Some of the risk associated with the use blockchain technology are as follows:

(i) With the use of blockchain, organizations need to consider risks with a wider perspective as different members of a particular blockchain may have different risk appetite/risk tolerances that may further lead to conflict when monitoring controls are designed for a blockchain. There may be questions about who is responsible for managing risks if no one party is in-charge, and how proper accountability is to be achieved in a blockchain.

(ii) The reliability of financial transactions is dependent on the underlying technology and if this underlying consensus mechanism has been tampered with, it could render the financial information stored in the ledger to be inaccurate and unreliable.

(iii) In the absence of any central authority to administer and enforce protocol amendments, there could be a challenge in the development and maintenance of process control activities and in such case, users of public blockchains find difficult to obtain an understanding of the general IT controls implemented and the effectiveness of these controls.

(iv) As blockchain involves humongous data getting updated frequently, risk related to information overload could potentially challenge the level of monitoring required. Furthermore, to find competent people to design and perform effective monitoring controls may again prove to be difficult.

10.3 Meaning of Tokenization

Tokenization is a process of converting tangible and intangible assets into blockchain tokens. Digitally representing anything has recently acquired a lot of traction. It can be effective in conventional industries like real estate, artwork etc.

10.4 Tokenization and Securitization

Since tokenization of illiquid assets attempts to convert illiquid assets into a product that is liquid and tradable and hence to some extent it resembles the process of Securitization. Hence, following are some similarities between Tokenization and Securitization:

(i) **Liquidity:** - First and foremost both Securitization and Tokenization inject liquidity in the market for the assets which are otherwise illiquid assets.

(ii) **Diversification:** - Both help investors to diversify their portfolio thus managing risk and optimizing returns.

(iii) **Trading:** - Both are tradable hence helps to generate wealth.

(iv) **New Opportunities:** - Both provide opportunities for financial institutions and related agencies to earn income through collection of fees.

11. SECURITIZATION IN INDIA

It is the Citi Bank who pioneered the concept of securitization in India by bundling of auto loans into securitized instruments.

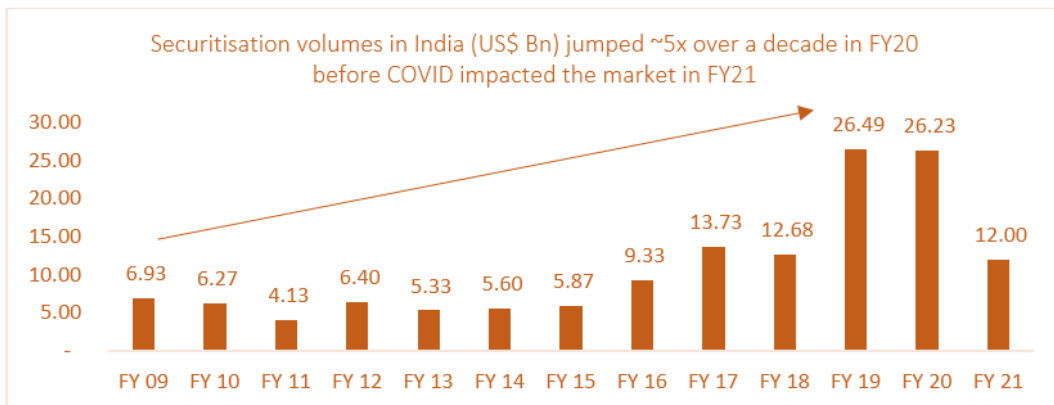
Thereafter many organizations securitized their receivables. Although it started with securitization of auto loans it moved to other types of receivables such as sales tax deferrals, aircraft receivable etc.

In order to encourage securitization, the Government has come out with Securitization and Reconstruction of Financial Assets and Enforcement of Security Interest (SARFAESI) Act, 2002, to tackle the menace of Non-Performing Assets (NPAs) without approaching the Court.

With growing sophistication of financial products in Indian Capital Market, securitization has occupied an important place.

As mentioned above, though, initially started with auto loan receivables, it has become an important source of funding for micro finance companies and NBFCs and even now a days commercial mortgage backed securities are also emerging.

The important highlight of the scenario of securitization in Indian Market is that it is dominated by a few players e.g. ICICI Bank, HDFC Bank, NHB etc.



CRISIL estimates that securitisation market volumes may reach near pre-pandemic highs of ₹ 1.9 trillion (touched in FY19 & FY20) once the macro-situation and interest rates stabilise. Securitisation may also become a key funding source for non-banks who are looking to grow their loan book and simultaneously it can also be an attractive investment avenue for banks looking to grow their retail assets.

In order to further enhance the investor base in securitized debts, SEBI has allowed FPIs to invest in securitized debt of unlisted companies upto a certain limit.

TEST YOUR KNOWLEDGE

Theoretical Questions

1. Differentiate between PTS and PTC.
2. What are the main problems faced in securitisation especially in Indian context?

ANSWERS/ SOLUTIONS

Answers to Theoretical Questions

1. Please refer paragraph 7.
2. Please refer paragraph 6.

MUTUAL FUNDS



LEARNING OUTCOMES

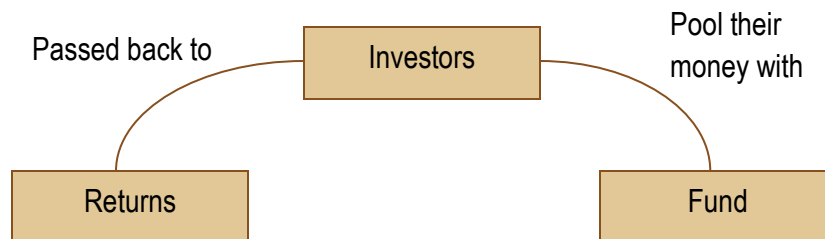
After going through the chapter student shall be able to understand:

- Basics of Mutual Funds
- Classification of Mutual Funds
- Types of Schemes
- Advantages and Disadvantages of Mutual Fund
- Terms associated with Mutual Funds
- Evaluation of Mutual Funds
- Role of Fund Manager in Mutual Funds
- Role of FIIs in Mutual Funds

1. INTRODUCTION

Mutual Fund is a trust that pools together the resources of investors to make a foray into investments in the capital market thereby making the investor to be a part owner of the assets of the mutual fund. The fund is managed by professional money managers who invest money collected from various investors in stocks, bonds and/or other securities according to stated investment objectives of the Scheme. If the value of the securities where the Scheme has invested into goes up, the return on the investment also goes up and vice versa. The net income earned on the funds, along with capital appreciation of the investment, is shared amongst the unit holders in proportion to the units owned by them. Mutual Fund is therefore a vehicle for the investors to invest in the capital markets. The

Fund House charges fees based on the value of the assets for managing and administering the investment portfolio.



How does a mutual fund work?

1.1 Mutual Benefits

Investing in the Capital market via mutual funds is an expert's job in the present market scenario. A regular and systematic investment into Mutual Fund can deliver good returns in the long run. That is why over 2 crore investors have faith & invest in mutual funds.

1.2 What is a Mutual Fund?

A mutual fund is a trust that pools the savings of numerous investors who share a common financial goal. A mutual fund is the most suitable investment vehicle for the investors as it offers an opportunity to invest in a basket of diversified securities managed by professionally qualified managers at a relatively low cost. So, we can say that Mutual Funds are trusts which pool resources from large number of investors through issue of units for investments in capital market instruments such as shares, debentures and bonds and money-market instruments like Commercial Papers, Certificate of Deposits and Treasury Bills.

1.3 Who can invest in Mutual Funds?

Anybody with an investible surplus of as little as a few thousand rupees can invest in mutual funds by buying units of a particular mutual fund scheme that has a defined investment objective and strategy.

1.4 How Mutual Funds work for you?

The money collected from the investors is invested by the fund managers in different types of securities. These could range from shares and debentures to money market instruments depending upon the scheme's stated investment objectives.

The income earned through these investments and capital appreciation realized by the scheme is shared amongst its unit holders in proportion to the units owned by them. (please refer the diagram above)

1.5 Should we invest in Stocks or Mutual Funds?

As soon as you have set your goals and decided to invest in equity, the question arises should you invest in stocks or mutual funds? Well, you need to decide what kind of an investor you are.

First, consider if you have the kind of disposable income to invest in 15-20 stocks. This means that in how many stocks you will have to invest in if you want to create a well-diversified portfolio. Remember the familiar adage: Do not put all your eggs in one basket. If you have only ₹ 5,000 to invest, it would be impractical to invest it across many stocks at your own.

Many beginners tend to focus on stocks that have a market price of less than ₹ 100 or ₹ 50; that should never be a criterion for choosing a stock. Also, brokerage could eat into your returns if you purchase small quantities of a stock.

On the other hand, you would be able to gain access to a wide basket of stocks for ₹ 5,000 if you invest through a mutual fund. Investing in funds would also be an easy way to build your equity portfolio over time.

Let's say you can afford to invest only ₹ 1,000 a month in the Stock market. You can simply invest in a fund every month through a Systematic Investment Plan (SIP) as a matter of financial discipline. You can save yourself the trouble of scouting for a stock every month.

That brings us to the next point. Do you have the time to pick stocks? You need to invest a considerable amount of time reading newspapers, magazines, annual reports, quarterly updates, industry reports and talking to people who are familiar with industry practices. Else, you certainly won't catch a trend or pick a stock ahead of the market. How many great investors have you heard of, who have not made investing their full-time job?

Plus, you may have the time, but not the inclination. You have to be an active investor, which means continuously monitoring the stocks you pick and make changes – buy more, cut exposure – depending upon the unfolding of events. These actions have costs as well. As you churn your portfolio, you bear expenses such as capital gains tax. Mutual Funds do not pay capital gains tax when they sell a stock.

All this assumes that you know what you are doing and have the skill to pick the right stocks. You are likely to be better at investing in an industry you understand. Only too bad, if that industry becomes out of favour in the market.

If you love the thrill of the ups and downs in the stock market; if you find yourself turning to business channels and business newspapers hoping that you can pick the next multi bagger stock like Infosys; if you have an instinct for spotting stocks and, importantly, the discipline to act on it; if you have the emotional maturity to cut your losses when the stock prices are nosediving, then you can trust yourself to invest in stocks.

Otherwise, hand over your money to the professional money managers. Mutual funds could be the best avenue for the risk-averse Investors.



2. CLASSIFICATION OF MUTUAL FUNDS

There are three different types of classification of mutual funds - (1) Functional (2) Portfolio and (3) Ownership.

2.1 Functional Classification

Funds are divided into:

- (1) Open-Ended funds
- (2) Close-Ended funds and
- (3) Interval Funds

In an Open-Ended scheme, the investor can enter and exit any time. Also, the capital of the fund is unlimited, and the redemption period is indefinite.

On the contrary, in a Close-Ended scheme, the investor can invest into the scheme during New Fund Offer or from the stock market after the units have been listed. The scheme has a limited life at the end of which the corpus is liquidated. The investor can make his exit from the scheme by selling in the stock market, or at the expiry of the scheme or during repurchase period, if any, at his option.

Interval schemes are a combination of an Open-Ended and a Close-Ended structure. These schemes are open for both purchase and redemption during pre-specified intervals (viz. monthly, quarterly, annually etc.) at prevailing NAV based prices. Interval funds are very similar to Close-Ended funds, but differ on the following points:

- They are not required to be listed on the stock exchanges, as they have an in-built redemption window.
- They can make fresh issue of units during the specified interval period, at the prevailing NAV based prices.
- Maturity period is not defined.

2.2 Portfolio Classification

Funds are classified into Equity Funds, Debt Funds and Special Funds.

Equity funds invest primarily in stocks. A share or stock represents a unit of ownership in a company. If a company is successful, shareholders can profit in two ways:

- the stock price may increase in value, or
- the company can pass its profits to shareholders in the form of dividends & bonus.

If a company fails, a shareholder can lose the entire value of his or her shares; however, a shareholder is not liable for the debts of the company.

2.2.1 Equity Funds

Equity Funds are of the following types viz.

- (a) **Growth Funds:** They seek to provide long term capital appreciation to the investor and are best suited to long term investors.
- (b) **Aggressive Funds:** They look for super normal returns for which investment is made in start-ups, IPOs and speculative shares. They are suited best to investors willing to take risks.
- (c) **Income Funds:** They seek to maximize present income of investors by investing in safe stocks which pay high dividends and in high yield money market instruments. They are best suited to investors seeking current income.

2.2.2 Debt Funds

Debt Funds are of two types viz.

- (a) **Bond Funds:** They invest in fixed income securities e.g. government bonds, corporate debentures, convertible debentures, money market instruments etc. Investors seeking tax free income go in for tax-free bonds while those looking for safe, steady income buy government bonds or high grade corporate bonds. Although there have been past exceptions, bond funds tend to be less volatile than equity mutual funds and often produce regular income. For these reasons, investors often use bond funds to diversify, provide a stream of income, or invest for intermediate-term goals. However, like equity mutual funds, bond funds also have following risks.
 - ❖ *Interest Rate Risk:* This risk relates to fluctuation in market value of Bond consequent upon the change in interest rate (YTM) as discussed in the chapter on Security Valuation. There is inverse relationship between market value of bond and interest rate. As interest rate goes up market value of Bond falls and vice versa.
 - ❖ *Credit Risk:* This risk is similar to risk of default in repayment of loans or payment of interest or both by the borrowers of the funds. Thus, this risk takes place when a Mutual Fund invested money in the Bonds of a company which defaults in the payment of Interest or Principal.

This risk is higher in case of companies with lower Credit Rating.
 - ❖ *Prepayment Risk:* This risk is related to early refund of money by the issuer of Bonds before the date of maturity. This generally happens in case of falling interest rates when a company who already issued Bond at higher interest rate issues fresh Bonds at lower rate of interest exercising its right of early redemption of Callable Bonds and refunding the money raised out of fresh issue.
 - ❖ *Reinvestment Risk:* In a falling interest rate scenario, on maturity of the Bonds on its due date, the maturity proceeds get invested at a lower rate of interest. This brings down the overall yield of the Portfolio. This is known as a Reinvestment Risk. This turns out to be favourable in a rising interest rate scenario.

- (b) **Gilt Funds:** These Funds invest into Treasury Bills & dated securities issued by the State & Central Govts.

2.2.3 Special Funds

Special Funds are of four types viz.

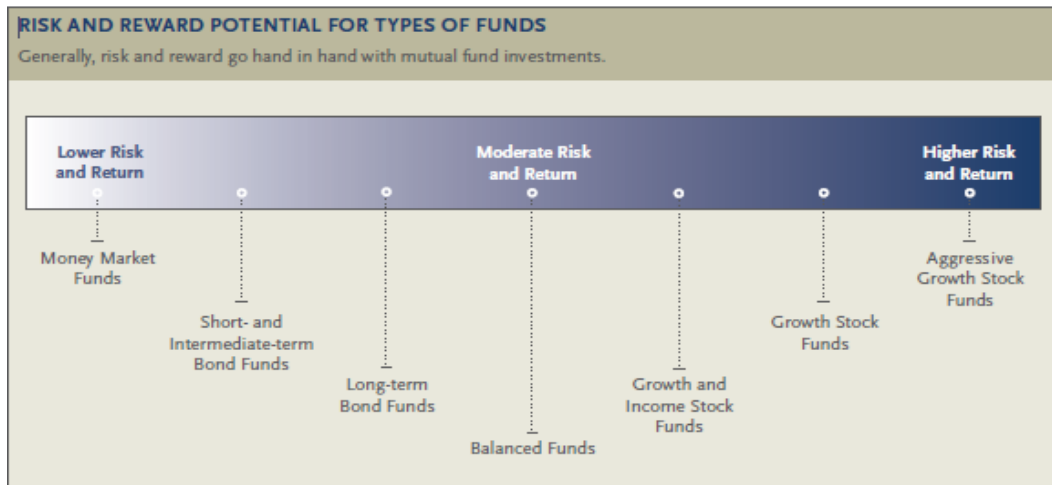
- (a) **Index Funds:** Every stock market has an Index or a basket of shares which represent the economy of the country at large. Index is a barometer which highlights the upward and downward sentiments of the stock market. In Index, every share has a specific weightage and on an aggregate basis, it will become 100. The funds get invested in these stocks exactly in the same weightage which it bears in the Index. Generally, Index Funds are low-cost funds as they are passively managed Funds. The Fund Manager is not managing it actively, but it can influence the stock market. Index Funds deliver the same return what the market delivers e.g., NIFTY 50 Index Fund will invest into 50 stocks of NIFTY in the same proportion it bears and will deliver approx. the same return what Index delivers.
- (b) **International Funds:** A mutual fund which raises money in India but invests globally.
- (c) **Offshore Funds:** A mutual fund located outside India which raises money globally for investing in India.
- (d) **Sector Funds:** They invest their entire fund in a particular sector e.g., Infrastructure, Information & Technology, Pharmaceuticals etc.
- (e) **Money Market Funds:** These are debt-oriented mutual fund schemes, whose main objective is preservation of capital, easy liquidity and moderate income generation. To achieve these objectives, money market funds like liquid funds invest predominantly in safer short-term instruments like Commercial Papers, Certificate of Deposits, Treasury Bills, G-Secs etc.

These schemes are used mainly by institutions and individuals to park their surplus funds for short periods of time. These funds are less vulnerable from changes in the interest rate in the economy and endeavour to capture the current yields prevailing in the market. These Funds offer lower volatility as compared to long dated Bond Funds.

- (f) **Fund of Funds:** Fund of Funds (FoF), as the name suggests are schemes which invest in other mutual fund schemes. The concept is popular in markets where there are number of mutual fund offerings and choosing a suitable scheme according to one's objective is tough. Just as a mutual fund scheme invests in a portfolio of securities such as equity, debt etc, the underlying investments for a FoF is the units of other mutual fund schemes, either from the same fund family or from other fund houses. Some of the popular Fund of Funds are Indian Mutual Funds investing into the Schemes of International Mutual Funds.
- (g) **Capital Protection Oriented Fund:** The term 'capital protection oriented scheme' means a mutual fund scheme which is designed and which endeavours to protect the capital invested therein through suitable orientation of its portfolio structure. The orientation towards

protection of capital originates from the portfolio structure of the scheme and not from any bank guarantee, insurance cover etc. SEBI stipulations require these types of schemes to be close-ended in nature, listed on the stock exchange and the intended portfolio structure would have to be mandatorily rated by a credit rating agency. A typical portfolio structure could be to set aside major portion of the assets for capital safety and could be invested in highly rated debt instruments. The remaining portion would be invested in equity or equity related instruments to provide capital appreciation. Capital Protection Oriented schemes are a recent entrant in the Indian capital markets and should not be confused with 'capital guaranteed' schemes.

- (h) **Gold Funds:** The objective of these funds is to track the performance of Gold. The units represent the value of gold or gold related instruments held in the scheme. Gold Funds which are generally in the form of an Exchange Traded Fund (ETF) are listed on the stock exchange and offer investors an opportunity to participate in the bullion market without having to take physical delivery of gold.



- (i) **Quant Funds:** Quant Fund works on a data-driven approach for stock selection and investment decisions based on pre-determined rules or parameters using statistics or mathematics-based models.

While an active fund manager selects the quantity, price of share and timing of investments (entry or exit) based on his/ her analysis and judgement, in case of Quant Fund a complete reliance is placed on an automated programme that helps in taking decision for quantum of investment as well as its timings and action and the concerned manager has to act accordingly.

However, it is to be noted it does not mean that in this type of Fund there is no human intervention at all, because the Fund Manager usually focuses on the robustness of the Models in use and also monitors its performance on continuous basis and if required some modification is done in the same.

Sometime the term 'Quant Fund Manager' is confused with the term 'Index Fund Manager' but it should be noted that both terms are different because while the Index Fund Manager entirely hands off the investment decision purely based on the concerned Index, the Quant Fund Manager designs and monitors models and makes decisions based on the outcomes.

The prime advantage of Quant Fund is that it eliminates the human biasness and subjectivity and by using model-based approach also ensures consistency in strategy across the market conditions.

In addition to that, since the Quant Fund normally follows passive strategy their expense ratio generally tends to be lower than the actively managed Mutual Fund Schemes.

On the con side, since Quant Funds are tested based on historical data and past trends though cannot altogether be ignored but also cannot be used blindly as good indicators.

Thus, overall, it can be said that whether it is human or a machine it is not easy to beat the market.

2.3 Ownership Classification

Funds are classified into Public Sector Mutual Funds, Private Sector Mutual Funds and Foreign Mutual Funds. Public Sector Mutual Fund is sponsored by a company/Bank of the public sector. Private Sector Mutual Fund is sponsored by a company of the private sector. Foreign Mutual Fund is sponsored by a foreign company operating from India, for raising funds in India, and investing those funds in India.

2.4 Direct Plans in Mutual Funds

Investors were permitted to make direct investments in mutual fund schemes even before 2011, but there were no separate plans for these investments. These investments were made in a regular plan and were tracked with single NAV - one of the regular plans. Therefore, an investor was forced to buy mutual funds based on the NAV of the regular plans. However, things changed with introduction of direct plans by SEBI on January 1, 2013.

Mutual fund direct plans are those plans where Asset Management Companies do not charge distribution expenses, trail fees and transaction charges. NAV of the direct plan is generally higher in comparison to a regular plan. Studies have shown that the 'Direct Plans' have performed better than the 'Regular Plans' for almost all the mutual fund schemes to the extent of lower fees charged by the Mutual Fund Company.

3. TYPES OF SCHEMES

3.1 Balanced Funds

Balanced funds make strategic allocation to both debt as well as equities. It mainly works on the premise that while the debt portfolio of the scheme provides stability, the equity portfolio provides growth. It can be an ideal option for those who do not wish to take total exposure to equity, but only

a limited exposure. Such funds provide moderate returns to the investors as the investors are neither taking too high risk nor too low a risk.

3.2 Diversified Equity Funds

A Diversified Equity Fund is a fund that contains a wide array of stocks. The fund manager of a Diversified Equity Fund ensures a high level of diversification in its holdings, thereby reducing the amount of concentration risk in the fund.

a. Flexicap Fund: These are by definition, diversified funds. Under this category, the Fund Manager is allowed to invest any proportion across market cap without any restrictions. In case of other categories, the offer document spells out minimum & maximum amount that can/needs to be invested in different market cap stocks. This category offers true diversification to the investors & a lot of flexibility to the Fund Managers.

b. Multicap Fund: Under this category, the Fund Manager is mandated to invest at least 25% each into Large, Mid & Small cap stocks and remaining 25% can be invested at the discretion of the Fund Manager. This category offers diversification with a lot of discipline as a minimum percentage of the assets has to be invested across all market cap stocks.

b. Contra fund: A contra fund invests in those out-of-favour companies that are unrecognized/under valued. It is ideally suited for those investors who want to invest in a fund that has the potential to perform in all types of market environments as it blends together both growth with value opportunities. Investors who invest in contra funds should have an aggressive risk appetite.

c. Index fund: An index fund seeks to track the performance of a benchmark market index like the BSE Sensex or S&P CNX Nifty. Simply put, the fund maintains the portfolio of all the securities in the same proportion as stated in the benchmark index and earns the same return as earned by the market.

d. Dividend Yield fund: A dividend yield fund invests in shares of companies having high dividend yields. Dividend yield is defined as dividend per share divided by the share's market price. Most of these funds invest in stocks of companies having a dividend yield higher than the dividend yield of a particular index, i.e., Sensex or Nifty. The prices of dividend yielding stocks are generally less volatile than growth stocks. Besides, they also offer the potential to appreciate.

Among diversified equity funds, dividend yield funds are considered to be a medium-risk proposition. However, it is important to note that dividend yield funds have not always proved resilient in short-term corrective phases.

There are two options for earning Income from Mutual Fund Schemes which are enumerated as under:

1. **Growth/Appreciation or Cumulative Option:** Under this option, the investor doesn't get any intermittent income. The investor gets income only at the time of withdrawal of investment.

Till the time of withdrawal, the return gets accumulated & is paid back to the investor at the time of withdrawal in the form of capital gain.

2. **Dividend Option:** At a regular frequency may be monthly/quarterly/half yearly or Annual, the Scheme declares dividend to the unitholders of the Scheme. Dividend option is further divided in two sub-options as under:

- *Dividend Payout Option:* Dividends are paid out to the unit holders under this option. However, the NAV of the units falls to the extent of the dividend paid out and applicable statutory levies.
- *Dividend Re-investment Option:* The dividend that accrues on units under option is re-invested back into the scheme at ex-dividend NAV. Hence, investors receive additional units on their investments in lieu of dividends.

3.3 Equity Linked Savings Scheme (ELSS)

ELSS is one of the options for investors to save taxes under Section 80 C of the Income Tax Act. ELSS also offers the perfect way to participate in the growth of the capital market, having a lock-in-period of three years. Besides, ELSS has the potential to give better returns than any traditional tax savings instrument.

Moreover, by investing in an ELSS through a Systematic Investment Plan (SIP), one can not only avoid the problem of investing a lump sum towards the end of the year but also take advantage of “averaging”.

3.4 Sector Funds

These funds are highly focused on a particular sector or industry. The basic objective is to enable investors to take advantage of industry cycles. Since sector funds ride on market cycles, they have the potential to offer good returns if the timing is perfect. However, they are more vulnerable to downside risk protection as compared to diversified equity funds.

Sector funds should constitute only a limited portion of one's portfolio, as they are much riskier than the diversified equity funds. Besides, sector funds are not suitable for first time investors into Mutual Funds.

For example, Real Estate Mutual Funds invest in real estate properties and earn income in the form of rentals and capital appreciation from the developed properties. Also, some part of the fund corpus is invested in equity shares or debentures of companies engaged in real estate business or developing real estate development projects. REMFs are required to be close-ended in nature and listed on the stock exchange.

3.5 Thematic Funds

A Thematic fund focuses on trends that are likely to result in the ‘out-performance’ by certain themes, sectors or companies. The theme could vary from multi-sector, international exposure, commodity exposure etc. Unlike a sector fund, thematic funds have a broader outlook.

However, the downside is that the market may take a longer time to recognize views of the fund house with regards to a particular theme, which forms the basis of launching a fund.

3.6 Arbitrage Funds

Typically, these funds promise safety of deposits, but better returns, tax benefits and greater liquidity.

The open-ended equity scheme aims to generate low volatility returns by investing in a mix of cash equities, equity derivatives and debt markets. The fund seeks to provide better returns than typical debt instruments and lower volatility in comparison to equity.

Arbitrage fund seeks to capitalize on the price differentials between the spot and the futures market.

3.7 Hedge Fund

A Hedge Fund is a lightly regulated investment fund that escapes most regulations by being a sort of private investment vehicle being offered to selected clients.

The big difference between a hedge fund and a mutual fund is that the former does not reveal anything about its operations publicly and charges a performance fee. Typically, if it outperforms a benchmark, it takes a cut off the profits. Of course, this is a one-way street; any losses are borne by the investors themselves. Hedge funds are aggressively managed portfolio of investments which use advanced investment strategies such as leveraged, long, short and derivative positions in both domestic and international markets with the goal of generating high returns (either in an absolute sense or over a specified market benchmark). It is important to note that hedging is actually the practice of attempting to reduce risk, but the goal of most hedge funds is to maximize return on investment.

3.8 Cash Fund

Cash Fund is an open-ended liquid scheme that aims to generate returns with lower volatility and higher liquidity through a portfolio of very short dated debt and money market instrument.

Cash Funds offer growth and dividend options.

3.9 Exchange Traded Funds

Exchange Traded Funds (ETFs) are hybrids product that combine the features of listed stocks and index fund. These funds are listed on the stock exchanges and their prices are linked to the underlying index. The authorized participants act as market makers for ETFs.

ETFs can be bought and sold like any other stock on an exchange. In other words, ETFs can be bought or sold any time during the market hours at prices that are expected to be closer to the NAV at the end of the day. Therefore, one can invest at real time prices as against the end of the day prices as is the case with open-ended schemes.

There is no paper work involved for investing in an ETF. These can be bought like any other stock by just placing an order with a broker. ETFs may be attractive as investments because of their low costs, tax efficiency, and stock-like features. An ETF combines the valuation feature of a mutual fund or unit investment trust, which can be bought or sold at the end of each trading day for its net asset value, with the tradability feature of a closed-end fund, which trades throughout the trading day at prices that may be more or less than its net asset value. Following types of ETF products are available in the market:

- Index ETFs - Most ETFs are index funds that hold securities and attempt to replicate the performance of a stock market index.
- Commodity ETFs - Commodity ETFs invest in commodities, such as precious metals and futures.
- Bond ETFs - Exchange-traded funds that invest in bonds are known as bond ETFs. They thrive during economic recessions because investors pull their money out of the stock market and invest into bonds (for example, government treasury bonds or those issues by companies regarded as financially stable). Because of this cause-and-effect relationship, the performance of bond ETFs may be indicative of broader economic conditions.
- Currency ETFs - The funds are total return products where the investor gets access to the FX spot change, local institutional interest rates and a collateral yield.

3.10 Fixed Maturity Plans

Fixed Maturity Plans (FMPs) are closely ended mutual funds in which an investor can invest during a New Fund Offer (NFO). FMPs usually invest in Certificates of Deposits (CDs), Commercial Papers (CPs), Money Market Instruments and Non-Convertible Debentures over fixed investment period. Sometimes, they also invest in Bank Fixed Deposits.

In New Fund Offers, during the course of which FMPs are issued, are later traded on the stock exchange where they are listed. But, the trading in FMPs is very less. So, basically FMPs are not liquid instruments.

The main advantage of Fixed Maturity Plans is that they are free from any interest rate risk because FMPs invest in debt instruments that have the same maturity as that of the fund. However, they carry credit risk, as there is a possibility of default by the debt issuing company. So, if the credit rating of an instrument is downgraded, the returns of FMP can come down.

Presently, most of the FMPs are launched with tenure of three years to take the benefit of indexation. But, because of the longer maturity period they find it difficult to provide good returns in the form of interest to the investors in highest rated instruments. They, therefore assign some portions of the invested funds in AA and below rated debt instruments to earn higher interest. The reason is that lower rated instruments carry higher coupon rates than higher rated instruments.

4. ADVANTAGES OF MUTUAL FUND

- (a) **Professional Management:** The funds are managed by skilled and professionally experienced managers backed by a team of Research Analysts.
- (b) **Diversification:** Mutual Funds invest into many securities and offer diversification which reduces the concentration risk.
- (c) **Convenient Administration:** There are no administrative risks of share transfer, as many of the Mutual Funds offer services in a demat form which saves investor's time and prevents delay.
- (d) **Higher Returns:** Over a medium to long-term investment horizon, investors get higher returns in Mutual Funds as compared to other avenues of investment. However, investors are cautioned that such very high returns during the exceptional bull phase of the market like IT boom or Infrastructure boom should not be considered as regular returns and therefore one should look at the average returns provided by the Mutual Funds particularly in the equity schemes over a long period of time.
- (e) **Low Cost of Management:** SEBI has prescribed maximum limit of charging 2.50% for Equity Mutual Funds. No Mutual Fund can increase the cost beyond prescribed limits of 2.5% maximum and any extra cost of management is to be borne by the AMC.
- (f) **Liquidity:** In all the open ended funds, liquidity is provided by direct sales / repurchase by the Mutual Fund and in case of close ended funds, the liquidity is provided by listing the units on the Stock Exchange.
- (g) **Transparency:** The SEBI Regulations now compel all the Mutual Funds to disclose their portfolios on a half-yearly basis. However, many Mutual Funds disclose their Scheme Portfolio on a quarterly or monthly basis to their investors. The NAVs are calculated on a daily basis in case of open ended funds and are published through AMFI in the newspapers.
- (h) **Other Benefits:** Mutual Funds provide systematic withdrawal and systematic investment plans according to the need of the investors. The investors can also switch from one scheme to another without any restrictions except in case of Tax Savings Fund which restricts switch out for first 3 years of its investments.
- (i) **Highly Regulated:** Mutual Funds all over the world are highly regulated and in India all Mutual Funds are registered with SEBI and are strictly regulated as per the Mutual Fund Regulations which provide high level of investor protection.
- (j) **Economies of scale:** The way mutual funds are structured gives it a natural advantage. The "pooled" money from numerous investors ensures that mutual funds enjoy economies of scale; it is cheaper compared to investing directly in the capital markets which involves higher charges. This also allows retail investors access to participation in the Capital Market which otherwise is difficult for them go directly.

- (k) **Flexibility:** One of the biggest advantages of a Mutual Fund Scheme is its flexibility. An investor can opt for Systematic Investment Plan (SIP), Systematic Withdrawal Plan etc. to plan his cash flow requirements as per his convenience. The wide range of schemes being launched in India by different mutual funds also provides an added flexibility to the investor to plan his portfolio accordingly.
- (l) **Convenience:** It is very convenient & easy to invest & disinvest from Mutual Fund Schemes specially through digital transaction portals.



5. DRAWBACKS OF MUTUAL FUND

- (a) **No guarantee of Return** – There are three issues involved:
 - (i) All Mutual Funds cannot be winners. There may be some Schemes who may underperform against the benchmark index. However, the Fund Manager will endeavour to give better return than the underlying benchmark Index in the long run.
 - (ii) A mutual fund may perform better than the stock market but this does not necessarily lead to a similar gain for every investor. This is because of the different entry & exit points for each investor.
 - (iii) In case of a massive fall in the value of the stocks held in the Portfolio, the investor may lose principal in the short-term e.g., during Global Financial Crisis in 2008 or during outbreak of Covid 19 pandemic in 2020 etc. But if the investment is held for a longer term, the chances of losing principal are very remote & negligible.
- (b) **Diversification** – A mutual fund helps to create a diversified portfolio. Though diversification minimizes risk, it does not ensure maximizing returns. The returns that mutual funds offer is at times lesser than what an investor can earn from a single stock. For example, if a single security held by a mutual fund double in value, the mutual fund itself would not double in value because that security is only one small part of the fund's holdings. By holding a large number of different investments, mutual funds tend to do neither exceptionally well nor exceptionally poor.
- (c) **Selection of Proper Fund** – It may be easy for someone to select the right share rather than the right mutual fund scheme. For stocks, one can rely his selection on the parameters of economic, industry and company analysis. In case of mutual funds, past performance is the one of the most important criteria to fall back upon but the past performance cannot predict the future.
- (d) **Cost Factor** – Every Mutual Fund Scheme charges some fund management fees as a part of Annual Recurring Expenses. Although there are no charges/load on entry, but at times an exit may get charged if withdrawn before a stipulated period, known as “Exit Load”. Amount withdrawn after the stipulated period of holding, if withdrawn, doesn't attract any Exit Load. The fees paid to the Asset Management Company is in no way related to performance.



6. TERMS ASSOCIATED WITH MUTUAL FUNDS

6.1 Net Asset Value (NAV)

It is the value of per unit of Portfolio holding. It is the value that a unit holder would receive per unit if the mutual fund gets redeemed. An investor in mutual fund is a part owner of all its assets and liabilities. Returns to the investor are determined by the interplay of two elements, Net Asset Value and Costs of Mutual Fund. Net Asset Value is the mutual fund's calling card. It is the basis for assessing the return that an investor has earned. There are three aspects which need to be highlighted:

- (i) It is the net value of all assets less liabilities. NAV represents the market value of total assets of the Fund less total liabilities attributable to those assets on a per unit basis.
- (ii) NAV changes daily. The value of assets and liabilities changes daily. NAV today will not be NAV tomorrow or day later. NAV fluctuates depending upon the change in the value of the assets & liability on a daily basis.
- (iii) NAV is computed on per unit basis i.e., dividing the Net Asset Value by number of Outstanding Units.

How Net Asset Value is calculated?

It is value of net assets of the funds. The investor's subscription is treated as the unit capital in the balance sheet of the fund and the investments on their behalf are treated as assets. The fund's net assets are defined as the assets less liabilities.

$$\text{NAV} = \frac{\text{Net asset of the scheme}}{\text{Number of units outstanding}}$$

Net Assets of the Scheme = Market value of investments + Receivables + Other accrued income + other assets - Accrued Expenses - Other Payables - Other Liabilities

6.2 Entry and Exit Load in Mutual Funds

Some Asset Management Companies (AMCs) have sales charges, or loads, on their funds (entry load and/or exit load) to compensate for distribution costs. Funds that can be purchased without a sales charge are called no-load funds.

Entry load is charged at the time an investor purchases the units of a scheme. The entry load percentage is added to the prevailing NAV at the time of allotment of units. Hence, to that extent, the investor is allotted lesser no. of units. As of now, none of the Mutual Fund Scheme has any Entry Load/Charge.

Exit load is charged at the time of redeeming (or transferring an investment between schemes). The exit load percentage is deducted from the NAV at the time of redemption (or transfer between schemes). This amount goes into the pool of funds of the scheme and not with the Asset

Management Company. Most of the Mutual Fund Schemes don't have Exit Load, if units are held for a stipulated period of time. Hence, in theory, therefore, Entry and Exit Load in Mutual Fund are the charges one pays while buying and selling the fund respectively. But practically these charges have been done away with in the recent times.

Example

Mr. X earns 10% on his investments in equity shares. He is considering a recently floated scheme of a Mutual Fund where the initial expenses are 6% and annual recurring expenses are expected to be 2%. How much the Mutual Fund scheme should earn to provide a return of 10% to Mr. X?

Answer

$$r_2 = \frac{1}{1 - \text{initial exp}} \times r_1 + \text{recurring exp.}$$

The rate of return the mutual fund should earn; = $\frac{1}{1 - 0.06} \times 0.1 + 0.02 = 0.1264$ or 12.64%

6.3 Trail Commission

It is the amount that a mutual fund investor pays to his advisor each year. The purpose of charging this commission from the investor is to provide incentive to the advisor to review their customer's holdings and to give advice from time to time.

Distributors usually charge a trail commission of 0.30-0.75% on the value of the investment for each year that the investor's money remains invested with the fund company.

This is calculated as a percentage of the daily average assets under management of the distributor and is paid monthly. This is separate from upfront commission, if any, paid by the fund company to the distributor out of its own pocket.

6.4 Expense Ratio

It is the percentage of the assets that were spent to run a mutual fund. It includes things like management and advisory fees, travel costs, audit fees, custodian fees, registrar fees, consultancy fees etc. The expense ratio does not include brokerage costs for trading the portfolio. It is also referred to as the Management Expense Ratio (MER) or Total Expense Ratio (TER)

Paying close attention to the expense ratio is necessary. The reason is it can sometimes be as high as 2-3% which can seriously undermine the performance of a mutual fund scheme.

6.5 Side Pocketing

In simple words, a Side Pocketing in Mutual Funds leads to separation of risky or doubtful assets from other investments and cash holdings. The purpose is to make sure that money invested in a mutual fund, which is linked to stressed assets, gets locked, until the fund recovers the money from the company or could avoid distress selling of illiquid securities.

The modus operandi is simple. Whenever, the rating of a mutual fund decreases, the fund shifts the illiquid assets into a side pocket so that current shareholders can be benefitted from the liquid assets. Consequently, the Net Asset Value (NAV) of the fund will then reflect the actual value of the liquid assets.

Side Pocketing is beneficial for those investors who wish to hold on to the units of the main funds for long term. Therefore, the process of Side Pocketing ensures that liquidity is not the problem even in the circumstances of frequent allotments and redemptions.

Side Pocketing is quite common internationally. However, Side Pocketing has also been resorted to bereft the investors of genuine returns.

In India recent fiasco in the Infrastructure Leasing and Financial Services (IL&FS) has led to many discussions on the concept of side pocketing as IL&FS and its subsidiaries have failed to fulfill their repayments obligations due to severe liquidity crisis.

The Mutual Funds have given low to negative returns because they have completely written off their exposure to IL&FS instruments.

6.6 Tracking Error

Tracking error can be defined as the divergence or deviation of a fund's return from the benchmarks return it is following.

The passive fund managers closely follow or track the benchmark index. Although they design their investment strategy on the same index but often it may not exactly replicate the index return. In such situation, there is possibility of deviation between the returns.

The tracking error can be calculated on the basis of corresponding benchmark return vis a vis quarterly or monthly average NAVs.

Higher the tracking error higher is the risk profile of the fund. Whether the funds outperform or underperform their benchmark indices; it clearly indicates that of fund managers are not following the benchmark indices properly. In addition to the same, other reasons for tracking error are as follows:

- Transaction cost
- Fees charged by AMCs
- Fund expenses
- Cash holdings
- Sampling biasness

Thus, from above it can be said that to replicate the return of any benchmark index the tracking error should be near to zero.

The Tracking Error is calculated as follows:

$$TE = \sqrt{\frac{\sum (d - \bar{d})^2}{n-1}}$$

d = Differential return

\bar{d} = Average differential return

n = No. of observation

7. EVALUATION OF MUTUAL FUNDS

Not only selection and making investment in any scheme of Mutual Fund is important, the evaluation of performance of the same fund is also equally important. The purpose of evaluation of performance is to ensure that fund should continue to generate maximum profits with minimum underlying risk. If performance is not upto the market then you have to decide to hold it or replace it. Another strong reason to evaluate the performance of a Mutual Fund is that the past performance cannot guarantee the future performance.

Now question arises how often you should evaluate the performance of Mutual Funds. The answer is that since market is subject to fluctuations, evaluation of performance on daily basis is not advisable. Further, at least a time of 3 to 5 year should be given to equity fund to assess its return. However, ideally the performance should be evaluated at least every six/twelve month.

Next big question comes how to evaluate the performance of a Mutual Fund. Generally, both Quantitative and Qualitative Parameters can be used to evaluate the performance of any Mutual Fund.

7.1 Quantitative Parameters

These parameters consist of quantitative data and numbers. Following are some quantitative parameters for the evaluation of Mutual Funds.

(1) Risk Adjusted Returns: - Basically it is the return of a Mutual Fund relative to the risk it assumed as benchmarked against the market and industry risk.

Suppose if we are given a choice to select a Mutual Fund out of the two Mutual Funds giving same return, then we shall opt for the fund that has lower risk.

(2) Benchmark Returns: - Benchmark can be defined as the quality or set of standards against which performance of Mutual Fund can be measured. A good Mutual Fund performs over and above its benchmark during all phases of market, this excess return is known as 'Alpha'. For example, generally Equity funds are benchmarked to the Sensex or Nifty 50. Suppose if during a particular period of time Index has provided a return of 11% whereas a Mutual Fund has provided a return of

13% then the same fund has outperformed the benchmark i.e., Index. Similarly, if same Fund has provided a return of 8% then it has underperformed.

(3) Comparison to Peers: - Similar to evaluating performance of Mutual Fund against Benchmark, the comparison of relative performance of fund with its peers (of same category) is another quantitative method because evaluation of performance in isolation does not have any meaning. Further there is a logic behind comparison with peers that it is fair to compare apples with apples not with oranges. A good mutual fund is supposed to consistently beat its peers in performance only then it is worthwhile to hold it.

(4) Comparison of Returns across different economic and market cycles: - At the time of evaluating performance of any Mutual Fund it is not just looking across different time frames such as 6 months, 12 months etc. but performance during different economic and market cycles also needs to be evaluated because, due to some special economic or market condition a Mutual Fund might have outperformed/underperformed for a short time. It may not be necessary that such conditions shall be continued in future period for ever.

(5) Financial Measures: - There are some financial measures that help in evaluation of performance of any Mutual Fund which are as follows:

- (a) *Expense Ratio:* - Discussed in earlier section, it ultimately impacts the return of a Mutual Fund Scheme.
- (b) *Sharpe Ratio:* - As discussed in the chapter on Portfolio Management, this ratio measures the Mutual Fund's performance measured against the total risk (both systematic and unsystematic) taken.
- (c) *Treynor Ratio:* - As discussed in the chapter on Portfolio Management, beta measures the volatility of return of a security vis-à-vis to the market, in mutual funds the Beta of a mutual fund measures volatility of a fund's return to return from its Benchmark. Treynor Ratio measures performance of a mutual fund against the systematic risk it has taken.
- (d) *Sortino Ratio:* - A variation of Sharpe Ratio that considers and uses downside deviation instead of total standard deviation in denominator.

7.2 Qualitative Parameters

Some of the Qualitative factors that need to be taken into account in addition to Quantitative Factors are as follows: -

(1) Quality of Portfolio: - Quality of stocks and securities in the portfolio of the Mutual Funds is an important qualitative parameter. The reason is that the quality of the portfolio plays a big role in achieving superior returns. The qualitative characteristic of portfolio of Equity Mutual Fund involves allocation of funds in top Blue-chip companies, large companies and how diversified is the portfolio. The style followed can be growth, value or blend of the same. In Debt Funds, the quality of portfolio

is measured on the basis of credit quality, average maturity and modified duration of the fixed asset securities.

Not only that it is necessary that Mutual Fund should hold good quality stocks or securities, but it is also necessary the investment should be as per the objective of the Fund. Under normal circumstances, the fund having lower Portfolio Turnover ratio is considered to be better.

(2) Track record and competence of Fund Manager: - Since Fund Manager decides about the selection of securities and takes investment decisions, his/her competence and conviction plays a very big role. The competence of a Fund Manager is assessed from his/her knowledge and ability to manage in addition to past performance.

(3) Credibility of Fund House Team: - Team of Fund House also plays a big role towards the investors' interest. In addition to investment decisions, there are some other administrative tasks also such as redemption of units, crediting of dividend, providing adequate information etc. which play a crucial role in qualitative assessment of any mutual fund house.

8. ROLE OF FUND MANAGERS IN MUTUAL FUNDS

Like Portfolio Manager (who manages individual's fund) a Fund manager is a gatekeeper of funds of any Mutual Fund. While his main responsibility is to ensure good performance of the fund he/she is managing, but there are other roles as well. The nature of Fund manager's role also depends on the fact that whether Fund is an Actively Managed Fund or a Passively Managed Fund.

8.1 Actively Managed Funds

Fund Manager's role in these funds is more crucial as through use of his extensive research, judgement and due diligence, he/she has to outperform the market and generate positive alpha. Right stock picking can help him to outperform.

8.2 Passively Managed Funds

Contrary to Actively Managed Funds, in these types of Funds, mainly Fund Manager's role is to match the return of the underlying index with the minimum Tracking Error.

In addition to the abovementioned primary role of a Fund Manager, following are other key roles of a Fund Manager

(a) Compliances: - Nowadays there are a plethora of Regulations in the Capital Market. As a result, the number of Regulatory Compliances has increased multifold. Fund Manager must ensure that:

- ❖ Compliance of various Guidelines as laid down by SEBI, AMFI etc.
- ❖ Ensuring various reporting such as Expenses Ratio, redemption of funds etc.
- ❖ Ensuring that investors are aware of various required details and rules.
- ❖ Ensuring that all required documents are furnished on time.

(b) Constant Monitoring the Performance of the Fund: - The role of a Fund Manager does not end with selection of securities or avenues for investments, but he/ she also has to evaluate them on a continuous basis. It is the Mutual Fund Manager's decision to enter or exit market that maximises the wealth of unit holders. The performance of a Fund Manager is not only judged on the basis of return but also on growth achieved above inflation and interest rate.

(c) Creation of Wealth and Protection: - This role can be considered as a fundamental role of a Fund Manager. Though wealth creation for investors is very important but reckless assumption to risk should be avoided. The investments should be made after a thorough research using Fundamental Analysis and Technical Analysis techniques.

(d) Control over the works outsourced to third parties: - In many cases some of the works of the Funds are required to be outsourced to any third party. In such cases, it is the duty of the Fund Manager to exercise proper control over functioning of the third party to ensure error free operations.

9. ROLE OF FIIs IN MUTUAL FUNDS

We often come across the term FIIs which represent the Foreign Institutional Investors. FIIs are large foreign groups with substantial investible funds. FIIs are registered abroad with a view to investing in other nations to invest in equity market, hedge funds, pension funds and mutual funds. FIIs have strong research team which guides them to invest in a country with a possibility of strong return in equity market. These funds park their funds to fuel a bullish market.

FIIs are an important source of capital in any economy especially in developing economies. However as mentioned above, Normally, FIIs fuel a bullish market for a short period of time and hence the nation experiences a strong inflow of foreign currency in its financial system at that time.

Foreign Institutional Investors can buy units of domestic mutual funds either directly from the issuer of such securities or through a registered stock broker on a recognized stock exchange in India. These investments are subject to limits notified by SEBI. Foreign institutional investors play a very important role in any economy. The FIIs plays an important role for Indian Economy through their investment in Mutual Funds because of following reasons:

(a) Enhanced Corporate Governance: - Generally FIIs before making investment in any Mutual Fund carries out thorough due diligence of Corporate Governance. Hence, Corporate Governance is improved to a great extent.

(b) Improved Competition in Market: - With the investment of FIIs in Mutual Funds improvement takes place in the capital market.

(c) Improved Inflow of Capital in the economy: - With the investment of funds in Mutual Funds in the economy not only employment is generated but the position of Foreign Exchange also improves.

TEST YOUR KNOWLEDGE

Theoretical Questions

1. Explain how to establish a Mutual Fund.
2. What are the advantages of investing in Mutual Funds?

Practical Questions

1. Mr. A can earn a return of 16 per cent by investing in equity shares on his own. Now he is considering a recently announced equity based mutual fund scheme in which initial expenses are 5.5 per cent and annual recurring expenses are 1.5 per cent. How much should the mutual fund earn to provide Mr. A return of 16 per cent?
2. The unit price of Equity Linked Savings Scheme (ELSS) of a mutual fund is ₹ 10/-. The public offer price (POP) of the unit is ₹ 10.204 and the redemption price is ₹ 9.80.

Calculate:

- (i) Front-end Load
 - (ii) Back end Load
3. A mutual fund that had a net asset value of ₹ 20 at the beginning of month - made income and capital gain distribution of ₹ 0.0375 and ₹ 0.03 per share respectively during the month, and then ended the month with a net asset value of ₹ 20.06. Calculate monthly return.
 4. An investor purchased 300 units of a Mutual Fund at ₹ 12.25 per unit on 31st December, 2009. As on 31st December, 2010 he has received ₹ 1.25 as dividend and ₹ 1.00 as capital gains distribution per unit.

Required:

- (i) The return on the investment if the NAV as on 31st December, 2010 is ₹ 13.00.
 - (ii) The return on the investment as on 31st December, 2010 if all dividends and capital gains distributions are reinvested into additional units of the fund at ₹ 12.50 per unit.
5. SBI mutual fund has a NAV of ₹ 8.50 at the beginning of the year. At the end of the year NAV increases to ₹ 9.10. Meanwhile fund distributes ₹ 0.90 as dividend and ₹ 0.75 as capital gains.
 - (i) What is the fund's return during the year?
 - (ii) Had these distributions been re-invested at an average NAV of ₹ 8.75 assuming 200 units were purchased originally. What is the return?
 6. The following information is extracted from Steady Mutual Fund's Scheme:

- Asset Value at the beginning of the month	- ₹ 65.78
---	-----------

- Annualised return -15 %
- Distributions made in the nature of Income & Capital gain (per unit respectively). - ₹ 0.50 and ₹ 0.32

You are required to:

- (i) Calculate the month end net asset value of the mutual fund scheme (limit your answers to two decimals).
 - (ii) Provide a brief comment on the month end NAV.
7. Cinderella Mutual Fund has the following assets in Scheme Rudolf at the close of business on 31st March, 2014.

Company	No. of Shares	Market Price Per Share
Nairobi Ltd.	25000	₹ 20
Dakar Ltd.	35000	₹ 300
Senegal Ltd.	29000	₹ 380
Cairo Ltd.	40000	₹ 500

The total number of units of Scheme Rudolf are 10 lacs. The Scheme Rudolf has accrued expenses of ₹ 2,50,000 and other liabilities of ₹ 2,00,000. Calculate the NAV per unit of the Scheme Rudolf.

8. A Mutual Fund Co. has the following assets under it on the close of business as on:

Company	No. of Shares	1 st February 2012	2 nd February 2012
		Market price per share ₹	Market price per share ₹
L Ltd	20,000	20.00	20.50
M Ltd	30,000	312.40	360.00
N Ltd	20,000	361.20	383.10
P Ltd	60,000	505.10	503.90

Total No. of Units 6,00,000

- (i) Calculate Net Assets Value (NAV) of the Fund.
- (ii) Following information is given:

Assuming one Mr. A, submits a cheque of ₹ 30,00,000 to the Mutual Fund and the Fund manager of this company purchases 8,000 shares of M Ltd; and the balance amount is held in Bank. In such a case, what would be the position of the Fund?

(iii) Find new NAV of the Fund as on 2nd February 2012.

9. On 1st April 2009 Fair Return Mutual Fund has the following assets and prices at 4.00 p.m.

Shares	No. of Shares	Market Price Per Share (₹)
A Ltd.	10000	19.70
B Ltd.	50000	482.60
C Ltd.	10000	264.40
D Ltd.	100000	674.90
E Ltd.	30000	25.90
No. of units of funds		8,00,000

Please calculate:

- (a) NAV of the Fund on 1st April 2009.
- (b) Assuming that on 1st April 2009, Mr. X, a HNI, send a cheque of ₹ 50,00,000 to the Fund and Fund Manager immediately purchases 18000 shares of C Ltd. and balance is held in bank. Then what will be position of fund.
- (c) Now suppose on 2 April 2009 at 4.00 p.m. the market price of shares is as follows:

Shares	₹
A Ltd.	20.30
B Ltd.	513.70
C Ltd.	290.80
D Ltd.	671.90
E Ltd.	44.20

Then what will be new NAV.

10. A has invested in three Mutual Fund Schemes as per details below:

Particulars	MF A	MF B	MF C
Date of investment	01.12.2009	01.01.2010	01.03.2010
Amount of investment	₹ 50,000	₹ 1,00,000	₹ 50,000

Net Asset Value (NAV) at entry date	₹ 10.50	₹ 10	₹ 10
Dividend received upto 31.03.2010	₹ 950	₹ 1,500	Nil
NAV as at 31.03.2010	₹ 10.40	₹ 10.10	₹ 9.80

Required:

What is the effective yield on per annum basis in respect of each of the three schemes to Mr. A upto 31.03.2010?

11. Mr. Sinha has invested in three Mutual fund schemes as per details below:

	Scheme X	Scheme Y	Scheme Z
Date of Investment	01.12.2008	01.01.2009	01.03.2009
Amount of Investment	₹ 5,00,000	₹ 1,00,000	₹ 50,000
Net Asset Value at entry date	₹ 10.50	₹ 10.00	₹ 10.00
Dividend received upto 31.03.2009	₹ 9,500	₹ 1,500	Nil
NAV as at 31.3.2009	₹ 10.40	₹ 10.10	₹ 9.80

You are required to calculate the effective yield on per annum basis in respect of each of the three schemes to Mr. Sinha upto 31.03.2009.

12. Mr. Y has invested in the three mutual funds (MF) as per the following details:

Particulars	MF 'X'	MF 'Y'	MF 'Z'
Amount of Investment (₹)	2,00,000	4,00,000	2,00,000
Net Assets Value (NAV) at the time of purchase (₹)	10.30	10.10	10
Dividend Received up to 31.03.2018 (₹)	6,000	0	5,000
NAV as on 31.03.2018 (₹)	10.25	10	10.20
Effective Yield per annum as on 31.03.2018 (percent)	9.66	-11.66	24.15

Assume 1 Year =365 days

Mr. Y has misplaced the documents of his investment. Help him in finding the date of his original investment after ascertaining the following:

- Number of units in each scheme;
- Total NAV;
- Total Yield; and
- Number of days investment held.

13. Mr. X on 1.7.2007, during the initial offer of some Mutual Fund invested in 10,000 units having face value of ₹ 10 for each unit. On 31.3.2008, the dividend paid by the M.F. was 10% and Mr. X found that his annualized yield was 153.33%. On 31.3.2009, 20% dividend was given. On 31.3.2010, Mr. X redeemed all his balance of 11,296.11 units when his annualized yield was 73.52%. What are the NAVs as on 31.3.2008, 31.3.2009 and 31.3.2010?
14. Mr. X on 1.7.2012, during the initial public offer of a Mutual Fund (MF) invested ₹ 1,00,000 at Face Value of ₹ 10. On 31.3.2013, the MF declared a dividend of 10% when Mr. X calculated that his holding period return was 115%. On 31.3.2014, MF again declared a dividend of 20%. On 31.3.2015, Mr. X redeemed all his investment which had accumulated to 11,296.11 units when his holding period return was 202.17%.

Calculate the NAVs as on 31.03.2013, 31.03.2014 and 31.03.2015.

15. A Mutual Fund having 300 units has shown its NAV of ₹ 8.75 and ₹ 9.45 at the beginning and at the end of the year respectively. The Mutual Fund has given two options:
- Pay ₹ 0.75 per unit as dividend and ₹ 0.60 per unit as a capital gain, or
 - These distributions are to be reinvested at an average NAV of ₹ 8.65 per unit.

What difference would it make in terms of return available and which option is preferable?

16. On 1-4-2012 ABC Mutual Fund issued 20 lakh units at ₹ 10 per unit. Relevant initial expenses involved were ₹ 12 lakhs. It invested the funds so raised in capital market instruments to build a portfolio of ₹ 185 lakhs. During the month of April 2012 it disposed off some of the instruments costing ₹ 60 lakhs for ₹ 63 lakhs and used the proceeds in purchasing securities for ₹ 56 lakhs. Fund management expenses for the month of April 2012 was ₹ 8 lakhs of which 10% was in arrears. In April 2012 the fund earned dividends amounting to ₹ 2 lakhs and it distributed 80% of the realized earnings. On 30-4-2012 the market value of the portfolio was ₹ 198 lakhs.

Mr. Akash, an investor, subscribed to 100 units on 1-4-2012 and disposed off the same at closing NAV on 30-4-2012. What was his annual rate of earning?

17. Sun Moon Mutual Fund (Approved Mutual Fund) sponsored open-ended equity-oriented scheme "Chanakya Opportunity Fund". There were three plans viz. 'A' – Dividend Re-investment Plan, 'B' – Bonus Plan & 'C' – Growth Plan.

At the time of Initial Public Offer on 1.4.1999, Mr. Anand, Mr. Bacchan & Mrs. Charu, three investors invested ₹ 1,00,000 each & chose 'B', 'C' & 'A' Plan respectively.

The History of the Fund is as follows:

Date	Dividend %	Bonus Ratio	Net Asset Value per Unit (F.V. ₹ 10)		
			Plan A	Plan B	Plan C
28.07.2003	20		30.70	31.40	33.42
31.03.2004	70	5 : 4	58.42	31.05	70.05
31.10.2007	40		42.18	25.02	56.15
15.03.2008	25		46.45	29.10	64.28
31.03.2008		1 : 3	42.18	20.05	60.12
24.03.2009	40	1 : 4	48.10	19.95	72.40
31.07.2009			53.75	22.98	82.07

On 31st July all three investors redeemed all the balance units.

Calculate annual rate of return to each of the investors.

Consider:

1. Long-term Capital Gain is exempt from Income tax.
 2. Short-term Capital Gain is subject to 10% Income tax.
 3. Security Transaction Tax 0.2 per cent only on sale/redemption of units.
 4. Ignore Education Cess.
18. A mutual fund company introduces two schemes i.e. Dividend plan (Plan-D) and Bonus plan (Plan-B). The face value of the unit is ₹ 10. On 1-4-2005 Mr. K invested ₹ 2,00,000 each in Plan-D and Plan-B when the NAV was ₹ 38.20 and ₹ 35.60 respectively. Both the plans matured on 31-3-2010.

Particulars of dividend and bonus declared over the period are as follows:

Date	Dividend %	Bonus Ratio	Net Asset Value (₹)	
			Plan D	Plan B
30-09-2005	10	---	39.10	35.60
30-06-2006	---	1:5	41.15	36.25
31-03-2007	15	---	44.20	33.10
15-09-2008	13	---	45.05	37.25
30-10-2008	---	1:8	42.70	38.30

27-03-2009	16	---	44.80	39.10
11-04-2009	---	1:10	40.25	38.90
31-03-2010	---	---	40.40	39.70

What is the effective yield per annum in respect of the above two plans?

19. A mutual fund made an issue of 10,00,000 units of ₹ 10 each on January 01, 2008. No entry load was charged. It made the following investments:

Particulars	₹
50,000 Equity shares of ₹ 100 each @ ₹ 160	80,00,000
7% Government Securities	8,00,000
9% Debentures (Unlisted)	5,00,000
10% Debentures (Listed)	<u>5,00,000</u>
	<u>98,00,000</u>

During the year, dividends of ₹ 12,00,000 were received on equity shares. Interest on all types of debt securities was received as and when due. At the end of the year equity shares and 10% debentures are quoted at 175% and 90% respectively of face value. Other investments are valued at par.

Find out the Net Asset Value (NAV) per unit given that operating expenses paid during the year amounted to ₹ 5,00,000. Also find out the NAV, if the Mutual fund had distributed a dividend of ₹ 0.80 per unit during the year to the unit holders.

20. Based on the following information, determine the NAV of a regular income scheme on per unit basis:

Particulars	₹ Crores
Listed shares at Cost (ex-dividend)	20
Cash in hand	1.23
Bonds and debentures at cost	4.3
Of these, bonds not listed and quoted	1
Other fixed interest securities at cost	4.5
Dividend accrued	0.8
Amount payable on shares	6.32
Expenditure accrued	0.75

Number of units (₹ 10 face value)	20 lacs
Current realizable value of fixed income securities of face value of ₹ 100	106.50
The listed shares were purchased when Index was	1,000
Present index is	2,300
Value of listed bonds and debentures at NAV date	8

There has been a diminution of 20% in unlisted bonds and debentures. Other fixed interest securities are at cost.

21. On 1st April, an open ended scheme of mutual fund had 300 lakh units outstanding with Net Assets Value (NAV) of ₹ 18.75. At the end of April, it issued 6 lakh units at opening NAV plus 2% load, adjusted for dividend equalization. At the end of May, 3 Lakh units were repurchased at opening NAV less 2% exit load adjusted for dividend equalization. At the end of June, 70% of its available income was distributed.

In respect of April-June quarter, the following additional information are available:

	₹ in lakh
Portfolio value appreciation	425.47
Income of April	22.950
Income for May	34.425
Income for June	45.450

You are required to calculate

- (i) Income available for distribution;
 - (ii) Issue price at the end of April;
 - (iii) repurchase price at the end of May; and
 - (iv) net asset value (NAV) as on 30th June.
22. There are two Mutual Funds viz. D Mutual Fund Ltd. and K Mutual Fund Ltd. Each having close ended equity schemes.
- NAV as on 31-12-2014 of equity schemes of D Mutual Fund Ltd. is ₹ 70.71 (consisting 99% equity and remaining cash balance) and that of K Mutual Fund Ltd. is ₹ 62.50 (consisting 96% equity and balance in cash).

Following is the other information:

Particular	Equity Schemes	
	D Mutual Fund Ltd.	K Mutual Fund Ltd.
Sharpe Ratio	2	3.3
Treynor Ratio	15	15
Standard deviation	11.25	5

There is no change in portfolios during the next month and annual average cost is ₹ 3 per unit for the schemes of both the Mutual Funds.

If Share Market goes down by 5% within a month, calculate expected NAV after a month for the schemes of both the Mutual Funds.

For calculation, consider 12 months in a year and ignore number of days for particular month.

23. ANP Plan, a hedge fund currently has assets of ₹ 20 crore. CA. X, the manager of fund charges fee of 0.10% of portfolio asset. In addition to it he charges incentive fee of 2%. The incentive will be linked to gross return each year in excess of the portfolio maximum value since the inception of fund. The maximum value the fund achieved so far since inception of fund about one and half year ago was ₹ 21 crores.

You are required to compute the fee payable to CA. X, if return on the fund this year turns out to be

- (a) 29%, (b) 4.5%, (c) -1.8%

24. Ms. Sunidhi is working with an MNC at Mumbai. She is well versant with the portfolio management techniques and wants to test one of the techniques on an equity fund she has constructed and compare the gains and losses from the technique with those from a passive buy and hold strategy. The fund consists of equities only and the ending NAVs of the fund he constructed for the last 10 months are given below:

Month Ending	NAV (₹/unit)	Month Ending	NAV (₹/unit)
December 2008	40.00	May 2009	37.00
January 2009	25.00	June 2009	42.00
February 2009	36.00	July 2009	43.00
March 2009	32.00	August 2009	50.00
April 2009	38.00	September 2009	52.00

Assume Sunidhi had invested a notional amount of ₹ 2 lakhs equally in the equity fund and a conservative portfolio (of bonds) in the beginning of December 2008 and the total portfolio was being rebalanced each time the NAV of the fund increased or decreased by 15%.

You are required to determine the value of the portfolio for each level of NAV following the Constant Ratio Plan.

Answers to Theoretical Questions

1. Establishment of a Mutual Fund: A mutual fund is required to be registered with the Securities and Exchange Board of India (SEBI) before it can collect funds from the public. All mutual funds are governed by the same set of regulations and are subject to monitoring and inspections by the SEBI. The Mutual Fund has to be established through the medium of a sponsor. A sponsor means any body corporate which, acting alone or in combination with another body corporate, establishes a mutual fund after completing the formalities prescribed in the SEBI's Mutual Fund Regulations.

The role of sponsor is akin to that of a promoter of a company, who provides the initial capital and appoints the trustees. The sponsor should be a body corporate in the business of financial services for a period not less than 5 years, be financially sound and be a fit party to act as sponsor in the eyes of SEBI.

The Mutual Fund has to be established as either a trustee company or a Trust, under the Indian Trust Act and the instrument of trust shall be in the form of a deed. The deed shall be executed by the sponsor in favour of the trustees named in the instrument of trust. The trust deed shall be duly registered under the provisions of the Indian Registration Act, 1908. The trust deed shall contain clauses specified in the Third Schedule of the Regulations.

An Asset Management Company, who holds an approval from SEBI, is to be appointed to manage the affairs of the Mutual Fund and it should operate the schemes of such fund. The Asset Management Company is set up as a limited liability company, with a minimum net worth of 100 crores.

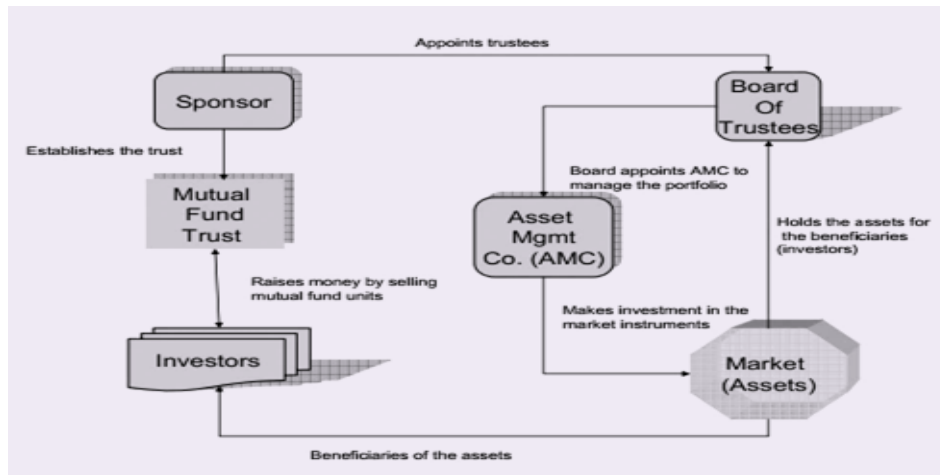
The sponsor should contribute at least 40% to the net worth of the Asset Management Company. The Trustee should hold the property of the Mutual Fund in trust for the benefit of the unit holders.

SEBI regulations require that at least two-thirds of the directors of the Trustee Company or board of trustees must be independent, that is, they should not be associated with the sponsors. Also, 50 per cent of the directors of AMC must be independent. The appointment of the AMC can be terminated by majority of the trustees or by 75% of the unit holders of the concerned scheme.

The AMC may charge the mutual fund with Investment Management and Advisory fees subject to prescribed ceiling. Additionally, the AMC may get the expenses on operation of the mutual fund reimbursed from the concerned scheme.

The Mutual fund also appoints a custodian, holding valid certificate of registration issued by SEBI, to have custody of securities held by the mutual fund under different schemes. In case of dematerialized securities, this is done by Depository Participant. The custodian must be

independent of the sponsor and the AMC.



2. Please refer paragraph 4.

Answers to the Practical Questions

1. Personal earnings of Mr. A = $R_1 = 16\%$

Mutual Fund earnings = R_2

$$\begin{aligned} R_2 &= \frac{1}{1 - \text{Initial expenses (\%)}} R_1 + \text{Recurring expenses (\%)} \\ &= \frac{1}{1 - 0.055} \times 16\% + 1.5\% \\ &= 18.43\% \end{aligned}$$

Mutual Fund earnings = 18.43%

2. Public Offer Price = $\text{NAV} / (1 - \text{Front end Load})$

Public Offer Price: ₹ 10.204 and NAV: ₹ 10

Accordingly,

$$10.204 = 10 / (1 - F)$$

$$F = 0.0199 \text{ say } 2\%$$

Redemption Price = $\text{NAV} / (1 + \text{Back End Load})$

$$₹ 9.80 = 10 / (1 + \text{Back End Load})$$

$$B = 0.0204 \text{ i.e. } 2.04\%$$

Alternative

$$(i) \quad \text{Front End Load} = \frac{10.204 - 10.00}{10.00} = 0.0204 \text{ or } 2.04\%$$

$$(ii) \quad \text{Exit Load} = \frac{10.00 - 9.80}{10.00} = 0.020 \text{ or } 2.00\%$$

3. Calculation of Monthly Return on the Mutual Funds

$$r = \left[\frac{(\text{NAV}_t - \text{NAV}_{t-1}) + I_t + G_t}{\text{NAV}_{t-1}} \right]$$

Where,

r = Return on the mutual fund

NAV_t = Net assets value at time period t

NAV_{t-1} = Net assets value at time period $t - 1$

I_t = Income at time period t

G_t = Capital gain distribution at time period t

$$= \left[\frac{(\text{₹ } 20.06 - \text{₹ } 20.00) + (\text{₹ } 0.0375 + \text{₹ } 0.03)}{20} \right]$$

$$= \frac{0.06 + 0.0675}{20}$$

$$= \frac{0.1275}{20} = 0.006375$$

Or, $r = 0.6375\%$ p.m.

Or $= 7.65\%$ p.a.

4. Return for the year (all changes on a per year basis)

Particulars	₹ /Unit
Change in price (₹ 13.00 – ₹ 12.25)	0.75
Dividend received	1.25
Capital gain distribution	<u>1.00</u>
Total Return	<u>3.00</u>

$$\text{Return on investment} = \frac{3.00}{12.25} \times 100 = 24.49\%$$

Alternatively, it can also be computed as follows:

$$\frac{(\text{NAV}_1 - \text{NAV}_0) + D_1 + \text{CG}_1}{\text{NAV}_0} \times 100$$

$$= \frac{(13 - 12.25) + 1.25 + 1.00}{12.25} \times 100$$

$$= 24.49\%$$

If all dividends and capital gain are reinvested into additional units at ₹ 12.50 per unit the position would be.

$$\text{Total amount reinvested} = ₹ 2.25 \times 300 = ₹ 675$$

$$\text{Additional units added} = \frac{₹ 675}{12.50} = 54 \text{ units}$$

$$\text{Value of 354 units as on 31-12-2010} = ₹ 4,602$$

$$\text{Price paid for 300 units on 31-12-2009} (300 \times ₹ 12.25) = ₹ 3,675$$

$$\text{Return} = \frac{₹ 4,602 - ₹ 3,675}{₹ 3,675} = \frac{₹ 927}{₹ 3,675} = 25.22\%$$

5. (i) **Normal Return for the year (all changes on a per year basis)**

Particulars	₹ /Unit
Change in price (₹ 9.10 – ₹ 8.50)	0.60
Dividend received	0.90
Capital gain distribution	<u>0.75</u>
Total Return	<u>2.25</u>

$$\text{Return on investment} = \frac{2.25}{8.50} \times 100 = 26.47\%$$

(ii) If all dividends and capital gain are reinvested into additional units at ₹ 8.75 per unit the position would be.

$$\text{Total amount reinvested} = ₹ 1.65 \times 200 = ₹ 330$$

$$\text{Additional units added} = \frac{\text{₹ } 330}{8.75} = 37.71 \text{ units}$$

Value of 237.71 units at end of year = ₹ 2,163.16

Price paid for 200 units in beginning of the year (200 × ₹ 8.50) = ₹ 1,700

$$\text{Return} = \frac{\text{₹ } 2,163.16 - \text{₹ } 1,700}{\text{₹ } 1,700} = \frac{\text{₹ } 463.16}{\text{₹ } 1,700} = 27.24\%$$

6. (i) Calculation of NAV at the end of month:

Given Annual Return = 15%

Hence Monthly Return = 1.25% (r)

$$r = \frac{(\text{NAV}_t - \text{NAV}_{t-1}) + I_t + G_t}{\text{NAV}_{t-1}}$$

$$0.0125 = \frac{(\text{NAV}_t - \text{₹ } 65.78) + \text{₹ } 0.50 + \text{₹ } 0.32}{\text{₹ } 65.78}$$

$$0.82 = \text{NAV}_t - \text{₹ } 64.96$$

$$\text{NAV}_t = \text{₹ } 65.78$$

- (ii) There is no change in NAV.

7.

Shares	No. of shares	Price	Amount (₹)
Nairobi Ltd.	25,000	20.00	5,00,000
Dakar Ltd.	35,000	300.00	1,05,00,000
Senegal Ltd.	29,000	380.00	1,10,20,000
Cairo Ltd.	40,000	500.00	2,00,00,000
			4,20,20,000
Less: Accrued Expenses			2,50,000
Other Liabilities			2,00,000
Total Value			4,15,70,000
No. of Units			10,00,000
NAV per Unit (4,15,70,000/10,00,000)			41.57

8. (i) NAV of the Fund

$$= \frac{\text{₹ } 4,00,000 + \text{₹ } 93,72,000 + \text{₹ } 72,24,000 + \text{₹ } 3,03,06,000}{6,00,000}$$

$$= \frac{\text{₹ } 4,73,02,000}{6,00,000} = \text{₹ } 78.8366 \text{ rounded to ₹ } 78.84$$

(ii) The revised position of fund shall be as follows:

Shares	No. of shares	Price	Amount (₹)
L Ltd.	20,000	20.00	4,00,000
M Ltd.	38,000	312.40	1,18,71,200
N Ltd.	20,000	361.20	72,24,000
P Ltd.	60,000	505.10	3,03,06,000
Cash			<u>5,00,800</u>
			<u>5,03,02,000</u>

$$\text{No. of units of fund} = 6,00,000 + \frac{30,00,000}{78.8366} = 6,38,053$$

(iii) On 2nd February 2012, the NAV of fund will be as follows:

Shares	No. of shares	Price	Amount (₹)
L Ltd.	20,000	20.50	4,10,000
M Ltd.	38,000	360.00	1,36,80,000
N Ltd.	20,000	383.10	76,62,000
P Ltd.	60,000	503.90	3,02,34,000
Cash			<u>5,00,800</u>
			<u>5,24,86,800</u>

$$\text{NAV as on 2nd February 2012} = \frac{\text{₹ } 5,24,86,800}{6,38,053} = \text{₹ } 82.26 \text{ per unit}$$

9. (a) NAV of the Fund.

$$= \frac{\text{₹ } 1,97,000 + \text{₹ } 2,41,30,000 + \text{₹ } 26,44,000 + \text{₹ } 6,74,90,000 + \text{₹ } 7,77,000}{800000}$$

$$= \frac{₹ 9,52,38,000}{800000} = ₹ 119.0475 \text{ rounded to ₹ 119.05}$$

(b) The revised position of fund shall be as follows:

Shares	No. of shares	Price	Amount (₹)
A Ltd.	10000	19.70	1,97,000
B Ltd.	50000	482.60	2,41,30,000
C Ltd.	28000	264.40	74,03,200
D Ltd.	100000	674.90	674,90,000
E Ltd.	30000	25.90	7,77,000
Cash			<u>2,40,800</u>
			<u>10,02,38,000</u>

$$\text{No. of units of fund} = 800000 + \frac{5000000}{119.0475} = 842000$$

(c) On 2nd April 2009, the NAV of fund will be as follows:

Shares	No. of shares	Price	Amount (₹)
A Ltd.	10000	20.30	2,03,000
B Ltd.	50000	513.70	2,56,85,000
C Ltd.	28000	290.80	81,42,400
D Ltd.	100000	671.90	6,71,90,000
E Ltd.	30000	44.20	13,26,000
Cash			<u>2,40,800</u>
			<u>10,27,87,200</u>

$$\text{NAV as on 2nd April 2009} = \frac{₹ 10,27,87,200}{842000} = ₹ 122.075 \text{ per unit}$$

10.

Scheme	Investment	Unit Nos. (Investment/NAV at entry date)	Unit NAV 31.3.2010	Total NAV 31.3.2010 (Unit Nos. X Unit NAV as on 31.3.2010)
	₹		₹	₹
MF A	50,000	4761.905	10.40	49,523.812
MF B	1,00,000	10,000	10.10	1,01,000
MF C	50,000	5,000	9.80	49,000

Scheme	NAV (+) / (-) (NAV as on 31.3.2010 - Investment)	Dividend Received	Total Yield Change in NAV + Dividend	Number of days	Effective Yield (% P.A.) (Total Yield/ Investment) X (365/No. of days) X 100
	₹	₹	₹		
MF A	(-)476.188	950	473.812	121	2.858%
MF B	(+)1,000	1,500	2,500	90	10.139%
MF C	(-)1,000	Nil	(-)1,000	31	(-)24%

11. Calculation of effective yield on per annum basis in respect of three mutual fund schemes to Mr. Sinha up to 31-03-2009:

Particulars	MF X	MF Y	MF Z
(a) Investments	₹ 5,00,000	₹ 1,00,000	₹ 50,000
(b) Opening NAV	₹10.50	₹10.00	₹10.00
(c) No. of units (a/b)	47,619.05	10,000	5,000
(d) Unit NAV ON 31-3-2009	₹ 10.40	₹ 10.10	₹ 9.80
(e) Total NAV on 31-3-2009 (c x d)	₹ 4,95,238.12	₹ 1,01,000	₹ 49,000
(f) Increase / Decrease of NAV (e - a)	(₹ 4,761.88)	₹ 1,000	(₹ 1,000)
(g) Dividend Received	₹ 9,500	₹ 1,500	Nil

(h)	Total yield (f + g)	₹ 4,738.12	₹ 2,500	(₹ 1,000)
(i)	Number of Days	121	90	31
(j)	Effective yield p.a. (h/a x 365/i x 100)	2.859%	10.139%	(-) 23.55%

12. (i) **Number of Units in each Scheme**

MF 'X'	$\frac{₹ 2,00,000}{₹ 10.30}$	= 19,417.48
MF 'Y'	$\frac{₹ 4,00,000}{₹ 10.10}$	= 39,603.96
MF 'Z'	$\frac{₹ 2,00,000}{₹ 10.00}$	= 20,000.00

(ii) **Total NAV on 31.03.2018**

MF 'X'	= 19,417.48 x ₹ 10.25	₹ 1,99,029.17
MF 'Y'	= 39,603.96 x ₹ 10.00	₹ 3,96,039.60
MF 'Z'	= 20,000.00 x ₹ 10.20	₹ 2,04,000.00
Total		₹ 7,99,068.77

(iii) **Total Yield**

	Capital Yield	Dividend Yield	Total
MF 'X'	₹ 1,99,029.17 - ₹ 2,00,000 = - ₹ 970.83	₹ 6,000	₹ 5,029.17
MF 'Y'	₹ 3,96,039.60 - ₹ 4,00,000 = - ₹ 3,960.40	Nil	- ₹ 3,960.40
MF 'Z'	₹ 2,04,000 - ₹ 2,00,000 = ₹ 4,000	₹ 5,000	₹ 9,000.00
Total			₹ 10,068.77

$$\text{Total Yield} = \frac{₹ 10,068.77}{₹ 8,00,000} \times 100 = 1.2586\%$$

(iv) No. of Days Investment Held

	MF 'X'	MF 'Y'	MF 'Z'
Initial Investment (₹)	2,00,000	4,00,000	2,00,000
Yield (₹)	5,029.17	-3,960.40	9,000.00
Yield (%)	2.5146	-0.9901	4.5
Period of Holding (Days)	$\frac{2.5146}{9.66} \times 365$ = 95 Days	$\frac{-0.9901}{-11.66} \times 365$ = 31 Days	$\frac{4.5}{24.15} \times 365$ = 68 Days

Date of Original Investment 27.12.17 01.03.18 23.01.18

Alternatively following dates can also be considered:

Date of Original Investment 26.12.17 28.02.18 22.01.18

13. Yield for 9 months = $(153.33 \times 9/12)$ = 115%
- Market value of Investments as on 31.03.2008 = $1,00,000/- + (1,00,000 \times 115\%)$
= ₹2,15,000/-
- Therefore, NAV as on 31.03.2008 = $(2,15,000 - 10,000)/10,000 = ₹20.50$
(NAV would stand reduced to the extent of dividend payout, being $(10,000 \times 10 \times 10\%) = ₹10,000$)
- Since dividend was reinvested by Mr. X, additional units acquired = $\frac{₹10,000}{₹20.50} = 487.80$ units
- Therefore, units as on 31.03.2008 = $10,000 + 487.80 = 10,487.80$
- Alternately, units as on 31.03.2008 = $(2,15,000/20.50) = 10,487.80$
- Dividend as on 31.03.2009 = $10,487.80 \times 10 \times 0.2 = ₹20,975.60$
- Let X be the NAV on 31.03.2009, then number of new units reinvested will be $₹20,975.60/X$.
Accordingly 11296.11 units shall consist of reinvested units and 10487.80 (as on 31.03.2008).
Thus, by way of equation it can be shown as follows:
- $$11296.11 = \frac{20975.60}{X} + 10487.80$$
- Therefore, NAV as on 31.03.2009 = $20,975.60/(11,296.11 - 10,487.80)$
= ₹25.95
- NAV as on 31.03.2010 = $₹1,00,000 (1 + 0.7352 \times 33/12)/11296.11$
= ₹26.75

14. Yield for 9 months = 115%
- Market value of Investments as on 31.03.2013 = 1,00,000 + (1,00,000 x 115%)
= ₹ 2,15,000/-
- Therefore, NAV as on 31.03.2013 = (2,15,000 - 10,000)/10,000 = ₹ 20.50
(NAV would stand reduced to the extent of dividend payout, being (₹100,000 x 10%)
= ₹ 10,000)

Since dividend was reinvested by Mr. X, additional units acquired

$$= \frac{₹ 10,000}{₹ 20.50} = 487.80 \text{ units}$$

Therefore, units as on 31.03.2013 = 10,000 + 487.80 = 10,487.80

[Alternately, units as on 31.03.2013 = (2,15,000/20.50) = 10,487.80]

Dividend as on 31.03.2014 = 10,487.80 x 10 x 0.2 = ₹ 20,975.60

Let X be the NAV on 31.03.2014, then number of new units reinvested will be ₹ 20,975.60/X. Accordingly 11296.11 units shall consist of reinvested units and 10487.80 (as on 31.03.2013). Thus, by way of equation it can be shown as follows:

$$11296.11 = \frac{20975.60}{X} + 10487.80$$

Therefore, NAV as on 31.03.2014 = 20,975.60/(11,296.11 - 10,487.80)
= ₹ 25.95

NAV as on 31.03.2015 = ₹ 1,00,000 (1+2.0217)/11296.11
= ₹ 26.75

15. (i) Returns for the year
(All changes on a Per -Unit Basis)

Change in Price: ₹ 9.45 – ₹8.75 = ₹ 0.70

Dividends received: ₹ 0.75

Capital gains distribution ₹ 0.60

Total reward ₹ 2.05

Holding period reward: $\frac{₹ 2.05}{₹ 8.75} \times 100 = 23.43\%$

- (ii) When all dividends and capital gains distributions are re-invested into additional units of the fund @ (₹ 8.65/unit)

$$= \text{Dividend} + \text{Capital Gains per unit}$$

$$= ₹ 0.75 + ₹ 0.60 = ₹ 1.35$$

$$\text{Total received from 300 units} = ₹ 1.35 \times 300 = ₹ 405/-$$

Additional Units Acquired

$$= ₹ 405 / ₹ 8.65 = 46.82 \text{ Units.}$$

$$\text{Total No. of Units} = 300 \text{ units} + 46.82 \text{ units} = 346.82 \text{ units.}$$

Value of 346.82 units held at the end of the year

$$= 346.82 \text{ units} \times ₹ 9.45 = ₹ 3277.45$$

Price Paid for 300 Units at the beginning of the year

$$= 300 \text{ units} \times ₹ 8.75 = ₹ 2,625.00$$

Holding Period Reward

$$₹ (3277.45 - 2625.00) = ₹ 652.45$$

$$\text{Holding Period Reward} = \frac{₹ 652.45}{₹ 2625.00} \times 100 = 24.85\%$$

Conclusion: Since the holding period reward is more in terms of percentage in option-two i.e., reinvestment of distributions at an average NAV of ₹8.65 per unit, this option is preferable.

16.

	Amount in ₹ lakhs	Amount in ₹ lakhs	Amount in ₹ lakhs
Opening Bank (200 - 185 -12)	3.00		
Add: Proceeds from sale of securities	63.00		
Add: Dividend received	<u>2.00</u>	68.00	
Deduct:			
Cost of securities purchased	56.00		
Fund management expenses paid (90% of 8)	7.20		
Capital gains distributed = 80% of (63 - 60)	2.40		
Dividend distributed =80% of 2.00	<u>1.60</u>	<u>67.20</u>	

Closing Bank		0.80
Closing market value of portfolio		<u>198.00</u>
		198.80
Less: Arrears of expenses		<u>0.80</u>
Closing Net Assets		<u>198.00</u>
Number of units (Lakhs)		20
Closing NAV per unit (198.00/20)		9.90

Rate of Earning (Per Unit)

	Amount
Income received (₹ 2.40 + ₹ 1.60)/20	₹ 0.20
Loss: Loss on disposal (₹ 200 - ₹ 198)/20	<u>₹ 0.10</u>
Net earning	<u>₹ 0.10</u>
Initial investment	₹ 10.00
Rate of earning (monthly)	1%
Rate of earning (Annual)	12%

17. Mrs. Charu Plan A Dividend Reinvestment

(Amount in ₹)

Date	Investment (₹)	Dividend payout (%)	Dividend Re- invested (Closing Units X Face value of '10 X Dividend Payout %)	NAV (₹)	Units	Closing Unit Balance Σ Units
01.04.1999	1,00,000.00			10.00	10,000.00	10,000.00
28.07.2003		20	20,000.00	30.70	651.47	10,651.47
31.03.2004		70	74,560.29	58.42	1,276.28	11,927.75
30.10.2007		40	47,711.00	42.18	1,131.13	13,058.88
15.03.2008		25	32,647.20	46.45	702.85	13,761.73
24.03.2009		40	55,046.92	48.10	1,144.43	14,906.16

Redemption value $14,906.16 \times 53.75$	8,01,206.10
Less: Security Transaction Tax (STT) is 0.2%	<u>1,602.41</u>
Net amount received	7,99,603.69
Less: Short term capital gain tax @ 10% on $1,144.43 (53.64^* - 48.10^{\approx}) = 6,340$	<u>634</u>
Net of tax	7,98,969.69
Less: Investment	<u>1,00,000.00</u>
	<u>6,98,969.69</u>

* $(53.75 - \text{STT @ } 0.2\%)$

\approx This value can also be taken as zero

$$\text{Annual average return (\%)} = \frac{6,98,969.69}{1,00,000} \times \frac{12}{124} \times 100 = 67.64 \%$$

Mr. Anand Plan B – Bonus

<i>(Amount in ₹)</i>				
<i>Date</i>	<i>Units</i>	<i>Bonus units</i>	<i>Total Balance</i>	<i>NAV per unit</i>
01.04.1999	10,000		10,000	10
31.03.2004		12,500	22,500	31.05
31.03.2008		7,500	30,000	20.05
24.03.2009		7,500	37,500	19.95

Redemption value $37,500 \times 22.98$	8,61,750.00
Less: Security Transaction Tax (STT) is 0.2%	<u>1,723.50</u>
Net amount received	8,60,026.50
Less: Short term capital gain tax @ 10%	
$7,500 \times (22.93^{\dagger} - 19.95^{\approx}) = 22,350$	<u>2,235.00</u>
Net of tax	8,57,791.50
Less: Investment	<u>1,00,000.00</u>
Net gain	<u>7,57,791.50</u>

$\dagger(22.98 - \text{STT @ } 0.2\%)$

\approx This value can also be taken as zero

$$\text{Annual average return (\%)} = \frac{7,57,791.50}{1,00,000} \times \frac{12}{124} \times 100 = 73.33 \%$$

Mr. Bacchan Plan C – Growth

Particulars	(Amount in ₹)
Redemption value 10,000 × 82.07	8,20,700.00
Less: Security Transaction Tax (S.T.T) is .2%	<u>1,641.40</u>
Net amount received	8,19,058.60
Less: Short term capital gain tax @ 10%	<u>0.00</u>
Net of tax	8,19,058.60
Less: Investment	<u>1,00,000.00</u>
Net gain	<u>7,19,058.60</u>

$$\text{Annual average return (\%)} = \frac{7,19,058}{1,00,000} \times \frac{12}{124} \times 100 = 69.59 \%$$

Note: Alternatively, figure of * and † can be taken as without net of Tax because, as per Proviso 5 of Section 48 of IT Act, no deduction of STT shall be allowed in computation of Capital Gain.

18. Plan – D

$$\text{Unit acquired} = \frac{2,00,000}{38.20} = 5235.60$$

Date	Units held	Dividend		Reinvestment Rate	New Units	Total Units
		%	Amount			
01.04.2005						5235.60
30.09.2005	5235.60	10	5235.60	39.10	133.90	5369.50
31.03.2007	5369.50	15	8054.25	44.20	182.22	5551.72
15.09.2008	5551.72	13	7217.24	45.05	160.20	5711.92
27.03.2009	5711.92	16	9139.07	44.80	204	5915.92
31.03.2010	Maturity Value		(₹ 40.40 X 5915.92)			₹ 2,39,003.17
	Less: Cost of Acquisition					<u>₹ 2,00,000.00</u>
	Total Gain					<u>₹ 39,003.17</u>

$$\therefore \text{Effective Yield} = \frac{\text{₹ } 39,003.17}{\text{₹ } 2,00,000} \times \frac{1}{5} \times 100 = 3.90\%$$

Alternatively, it can be computed by using the IRR method as follows:

$$\text{NPV at } 4\% = -\text{₹ } 2,00,000 + \text{₹ } 1,96,443 = -\text{₹ } 3,557$$

$$\text{NPV at } 2\% = -\text{₹ } 2,00,000 + \text{₹ } 2,16,473 = \text{₹ } 16,473$$

$$\text{IRR} = \text{LR} + \frac{\text{NPV at LR}}{\text{NPV at LR} - \text{NPV at HR}} (\text{HR} - \text{LR}) = 2\% + \frac{16473}{16473 - (-3557)} (4\% - 2\%) = 3.645\%$$

Plan – B

Date	Particulars	Calculation Working	No. of Units	NAV (₹)
1.4.05	Investment	₹2,00,000/35.60=	5617.98	35.60
30.6.06	Bonus	5617.98/5 =	<u>1123.60</u>	36.25
			6741.58	
30.10.08	"	6741.58/8 =	<u>842.70</u>	38.30
			7584.28	
11.4.09	"	7584.28/10 =	<u>758.43</u>	38.90
			8342.71	
31.3.10	Maturity Value	8342.71 x ₹ 39.70=		3,31,205.59
	Less: Investment			<u>2,00,000.00</u>
	Gain			<u>1,31,205.59</u>

$$\therefore \text{Effective Yield} = \frac{1,31,205.59}{2,00,000} \times \frac{1}{5} \times 100 = 13.12\%$$

Alternatively, it can be computed by using the IRR method as follows:

$$\text{NPV at } 13\% = -\text{₹ } 2,00,000 + \text{₹ } 1,79,765 = -\text{₹ } 20,235$$

$$\text{NPV at } 8\% = -\text{₹ } 2,00,000 + \text{₹ } 2,25,413 = \text{₹ } 25,413$$

$$\text{IRR} = \text{LR} + \frac{\text{NPV at LR}}{\text{NPV at LR} - \text{NPV at HR}} (\text{HR} - \text{LR}) = 8\% + \frac{25413}{25413 - (-20235)} (13\% - 8\%) = 10.78\%$$

19. In order to find out the NAV, the cash balance at the end of the year is calculated as follows-

Particulars	₹
Cash balance in the beginning (₹ 100 lakhs – ₹ 98 lakhs)	2,00,000
Dividend Received	12,00,000
Interest on 7% Govt. Securities	56,000
Interest on 9% Debentures	45,000
Interest on 10% Debentures	<u>50,000</u>
	15,51,000
(-) Operating expenses	<u>5,00,000</u>
Net cash balance at the end	<u>10,51,000</u>
<u>Calculation of NAV</u>	₹
Cash Balance	10,51,000
7% Govt. Securities (at par)	8,00,000
50,000 equity shares @ ₹ 175 each	87,50,000
9% Debentures (Unlisted) at cost	5,00,000
10% Debentures @90%	<u>4,50,000</u>
Total Assets	<u>1,15,51,000</u>
No. of Units	10,00,000
NAV per Unit	₹ 11.55

Calculation of NAV, if dividend of ₹ 0.80 is paid –

Net Assets (₹ 1,15,51,000 – ₹ 8,00,000)	₹ 1,07,51,000
No. of Units	10,00,000
NAV per unit	₹ 10.75

20.

Particulars	Adjusted Values ₹ crores
Equity Shares	46.00
Cash in hand	1.23
Bonds and debentures not listed	0.80
Bonds and debentures listed	8.00
Dividends accrued	0.80
Fixed income securities	4.50
Sub total assets (A)	61.33
Less: Liabilities	
Amount payable on shares	6.32
Expenditure accrued	0.75
Sub total liabilities (B)	7.07
Net Assets Value (A) – (B)	54.26
No. of units	20,00,000
Net Assets Value per unit (₹ 54.26 crore / 20,00,000)	₹ 271.30

21.

Calculation of Income available for Distribution

	Units (Lakh)	Per Unit (₹)	Total (₹ In lakh)
Income from April	300	0.0765	22.9500
Add: Dividend equalization collected on issue	6	0.0765	0.4590
	306	0.0765	23.4090
Add: Income from May		0.1125	34.4250
	306	0.1890	57.8340
Less: Dividend equalization paid on repurchase	3	0.1890	(0.5670)
	303	0.1890	57.2670
Add: Income from June		0.1500	45.4500

	303	0.3390	102.7170
Less: Dividend Paid		0.2373	(71.9019)
	303	0.1017	30.8151

Calculation of Issue Price at the end of April

	₹
Opening NAV	18.750
Add: Entry Load 2% of ₹ 18.750	0.375
	19.125
Add: Dividend Equalization paid on Issue Price	0.0765
	19.2015

Calculation of Repurchase Price at the end of May

	₹
Opening NAV	18.750
Less: Exit Load 2% of ₹ 18.750	(0.375)
	18.375
Add: Dividend Equalization paid on Issue Price	0.1890
	18.564

Closing NAV

		₹ (Lakh)
Opening Net Asset Value (₹ 18.75 × 300)		5625.0000
Portfolio Value Appreciation		425.4700
Issue of Fresh Units (6 × 19.2015)		115.2090
Income Received (22.950 + 34.425 + 45.450)		102.8250
		6268.504
Less: Units repurchased (3 × 18.564)	-55.692	
Income Distributed	-71.9019	(-127.5939)
Closing Net Asset Value		6140.9101
Closing Units (300 + 6 – 3) lakh		303 lakh
∴ Closing NAV as on 30 th June		₹ 20.2670

22. Working Notes:

(i) Decomposition of Funds in Equity and Cash Components

	D Mutual Fund Ltd.	K Mutual Fund Ltd.
NAV on 31.12.14	₹ 70.71	₹ 62.50
% of Equity	99%	96%
Equity element in NAV	₹ 70	₹ 60
Cash element in NAV	₹ 0.71	₹ 2.50

(ii) Calculation of Beta

(a) D Mutual Fund Ltd.

$$\text{Sharpe Ratio} = 2 = \frac{E(R) - R_f}{\sigma_D} = \frac{E(R) - R_f}{11.25}$$

$$E(R) - R_f = 22.50$$

$$\text{Treynor Ratio} = 15 = \frac{E(R) - R_f}{\beta_D} = \frac{22.50}{\beta_D}$$

$$\beta_D = 22.50/15 = 1.50$$

(b) K Mutual Fund Ltd.

$$\text{Sharpe Ratio} = 3.3 = \frac{E(R) - R_f}{\sigma_K} = \frac{E(R) - R_f}{5}$$

$$E(R) - R_f = 16.50$$

$$\text{Treynor Ratio} = 15 = \frac{E(R) - R_f}{\beta_K} = \frac{16.50}{\beta_K}$$

$$\beta_K = 16.50/15 = 1.10$$

(iii) Decrease in the Value of Equity

	D Mutual Fund Ltd.	K Mutual Fund Ltd.
Market goes down by	5.00%	5.00%
Beta	1.50	1.10
Equity component goes down	7.50%	5.50%

(iv) Balance of Cash after 1 month

	D Mutual Fund Ltd.	K Mutual Fund Ltd.
Cash in Hand on 31.12.14	₹ 0.71	₹ 2.50
Less: Exp. Per month	₹ 0.25	₹ 0.25
Balance after 1 month	₹ 0.46	₹ 2.25

NAV after 1 month

	D Mutual Fund Ltd.	K Mutual Fund Ltd.
Value of Equity after 1 month		
70 x (1 - 0.075)	₹ 64.75	-
60 x (1 - 0.055)	-	₹ 56.70
Cash Balance	0.46	2.25
	65.21	58.95

23. (a) If return is 29%

	₹
Fixed fee (A) 0.10% of ₹ 20 crore	2,00,000
New Fund Value (1.29 x ₹ 20 crore)	25.80 crore
Excess Value of best achieved (25.8 crore – 21.0 crore)	4.80 crore
Incentive Fee (2% of 4.80 crores) (B)	9,60,000
Total Fee (A)+(B)	11,60,000

(b) If return is 4.5%

	₹
Fixed (A) 0.10% of ₹ 20 crore	2,00,000
New Fund Value (1.045 x ₹ 20 crore)	20.90 crore
Excess Value of best achieved (20.90 crore – 21.00 crore)	(₹ 0.10 crore)
Incentive Fee (as does not exceed best achieved) (B)	Nil
Total Fee (A)+(B)	2,00,000

(c) If return is (-1.8%)

No incentive only fixed fee of ₹ 2,00,000 will be paid

24. **Constant Ratio Plan:**

Stock Portfolio NAV (₹)	Value of Conservative Portfolio (₹)	Value of aggressive Portfolio (₹)	Total value of Constant Ratio Plan (₹)	Revaluation Action	Total No. of units in aggressive portfolio
40.00	1,00,000	1,00,000	2,00,000	-	2500
25.00	1,00,000	62,500	1,62,500	-	2500
	81,250	81,250	1,62,500	Buy 750 units	3250
36.00	81,250	1,17,000	1,98,250	-	3250
	99,125	99,125	1,98,250	Sell 496.53 units	2753.47
32.00	99,125	88,111.04	1,87,236.04	-	2753.47
38.00	99,125	1,04,631.86	2,03,756.86	-	2753.47
	1,01,878.43	1,01,878.43	2,03,756.86	Sell 72.46 units	2681.01
37.00	1,01,878.50	99,197.37	2,01,075.87	-	2681.01
42.00	1,01,878.50	1,12,602.42	2,14,480.92	-	2681.01
43.00	1,01,878.50	1,15,283.43	2,17,161.93	-	2681.01
50.00	1,01,878.50	1,34,050.50	2,35,929	-	2681.01
	1,17,964.50	1,17,964.50	2,35,929	Sell 321.72 units	2359.29
52.00	1,17,964.50	1,22,683.08	2,40,647.58	-	2359.29

Hence, the ending value of the mechanical strategy is ₹ 2,40,647.58 and buy & hold strategy is ₹ 2,60,000.

DERIVATIVES ANALYSIS AND VALUATION



LEARNING OUTCOMES

After going through the chapter student shall be able to understand

- Introduction to Forwards, Futures and Options
- Futures Market
- Pricing of Forwards and Futures
- Hedging using Futures
- Options
- Credit Derivatives
- Real Options
- Derivative Mishaps and Lessons
- Swaps
- Commodity Derivatives
- Weather Derivatives
- Electricity Derivatives



1. INTRODUCTION

Derivative is a product whose value is to be derived from the value of one or more basic variables called bases (underlying assets, index or reference rate). The underlying assets can be Equity, Forex, and Commodity.

The underlying has a marketable value which is subject to market risks. The importance of underlying in derivative instruments is as follows:

- ❖ All derivative instruments are dependent on an underlying to have value.
- ❖ The change in value in a forward contract is broadly equal to the change in value in the underlying.
- ❖ In the absence of a valuable underlying asset the derivative instrument will have no value.
- ❖ On maturity, the position of profit/loss is determined by the price of underlying instruments. If the price of the underlying is higher than the contract price the buyer makes a profit. If the price is lower, the buyer suffers a loss.

Main users of Derivatives are as follows:

	Users	Purpose
(a)	Corporation	To hedge currency risk and inventory risk.
(b)	Individual Investors	For speculation, hedging and yield enhancement.
(c)	Institutional Investor	For hedging asset allocation, yield enhancement and to avail arbitrage opportunities.
(d)	Dealers	For hedging position taking, exploiting inefficiencies and earning dealer spreads.

The basic differences between Cash and the Derivative market are enumerated below:-

- (a) In cash market, tangible assets are traded whereas in derivative market contracts based on tangible or intangibles assets like index or rates are traded.
- (b) In cash market, we can purchase even one share whereas in Futures and Options minimum lots are fixed.
- (c) Cash market is riskier than Futures and Options segment because in "Futures and Options" risk is limited upto 20%.
- (d) Cash assets may be meant for consumption or investment. Derivative contracts are for hedging, arbitrage or speculation.
- (e) The value of derivative contract is always based on and linked to the underlying security. However, this linkage may not be on point-to-point basis.

- (f) In the cash market, a customer must open securities trading account with a securities depository whereas to trade futures a customer must open a future trading account with a derivative broker.
- (g) Buying securities in cash market involves putting up all the money upfront whereas buying futures simply involves putting up the margin money.
- (h) With the purchase of shares of the company in cash market, the holder becomes part owner of the company. While in future it does not happen.

The most important derivatives are forward, futures and options.

2. FORWARD CONTRACT

Consider a Punjab farmer who grows wheat and has to sell it at a profit. The simplest and the traditional way for him is to harvest the crop in March or April and sell in the spot market then. However, in this way the farmer is exposing himself to risk of a downward movement in the price of wheat which may occur by the time the crop is ready for sale.

In order to avoid this risk, one way could be that the farmer may sell his crop at an agreed-upon rate now with a promise to deliver the asset, i.e., crop at a pre-determined date in future. This will at least ensure to the farmer the input cost and a reasonable profit.

Thus, the farmer would sell wheat forward to secure himself against a possible loss in future. It is true that by this way he is also foreclosing upon him the possibility of a bumper profit in the event of wheat prices going up steeply but then more important is that the farmer has played safe and insured himself against any eventuality of closing down his source of livelihood altogether. The transaction which the farmer has entered into is called a **forward transaction** and the contract which covers such a transaction is called a **forward contract**.

A forward contract is an agreement between a buyer and a seller obligating the seller to deliver a specified asset of specified quality and quantity to the buyer on a specified date at a specified place and the buyer, in turn, is obligated to pay to the seller a pre-negotiated price in exchange of the delivery.

This means that in a forward contract, the contracting parties negotiate on, not only the price at which the commodity is to be delivered on a future date but also on what quality and quantity to be delivered and at what place. No part of the contract is standardised and the two parties sit across each other and work out each and every detail of the contract before signing it.

For example, in case a gold bullion forward contract is being negotiated between two parties, they would negotiate each of the following features of the contract:

- ❖ the weight of the gold bullion to be delivered,
- ❖ the fineness of the metal to be delivered,

- ❖ the place at which the delivery is to be made,
- ❖ the period after which the delivery is to be made, and
- ❖ the price which the buyer would pay.

Suppose a buyer L and a seller S agrees to do a trade in 100 tolas of gold on 31 Dec 2013 at ₹ 30,000/tola. Here, ₹ 30,000/tola is the 'forward price of 31 Dec 2013 Gold'. The buyer L is said to be in long position and the seller S is said to be in short position. Once the contract has been entered into, L is obligated to pay S ₹ 30 lakhs on 31 Dec 2013, and take delivery of 100 tolas of gold. Similarly, S is obligated to be ready to accept ₹ 30 lakhs on 31 Dec 2013, and give 100 tolas of gold in exchange.

3. FUTURE CONTRACT

A Future Contract is an agreement between two parties that commits one party to buy an underlying financial instrument (bond, stock or currency) or commodity (gold, soyabean or natural gas) and one party to sell a financial instrument or commodity at a specific price at a future date. The agreement is completed at a specified expiration date by physical delivery or cash settlement or offset prior to the expiration date. In order to initiate a trade in futures contracts, the buyer and seller must put up "good faith money" in a margin account. Regulators, commodity exchanges and brokers doing business on commodity exchanges determine margin levels.

Suppose A buyer "B" and a Seller "S" enter into a 5,000 kgs Corn Futures contract at ₹ 5 per kg. Assuming that on the second day of trading the settlement price is ₹ 5.20 per kg. Settlement price is generally the representative price at which the contracts trade during the closing minutes of the trading period and this price is designated by a stock exchange as the settlement price. In case the price movement during the day is such that the price during the closing minutes is not the representative price, the stock exchange may select a price which it feels is close to being the representative price, e.g., average of the high and low prices which have occurred during a trading day. This price movement has led to a loss of ₹ 1,000 to S while B has gained the corresponding amount.

Thus, the initial margin account of S gets reduced by ₹ 1,000 and that of B is increased by the same amount. While the margin accounts, also called the equity of the buyer and the seller, get adjusted at the end of the day in keeping with the price movement, the futures contract gets replaced with a new one at a price which has been used to make adjustments to the buyer and seller's equity accounts. In this case, the settle price is ₹ 5.20, which is the new price at which next day's trading would start for this particular futures contract. Thus, each future contract is rolled over to the next day at a new price. This is called marking-to-market.

Difference between forward and future contract is as follows:

S. No.	Features	Forward	Futures
1.	Trading	Forward contracts are traded on personal basis or on telephone or otherwise.	Futures Contracts are traded in a competitive arena.
2.	Size of Contract	Forward contracts are individually tailored and have no standardized size	Futures contracts are standardized in terms of quantity or amount as the case may be
3.	Organized exchanges	Forward contracts are traded in an over-the-counter market.	Futures contracts are traded on organized exchanges with a designated physical location.
4.	Settlement	Forward contracts settlement takes place on the date agreed upon between the parties.	Futures contracts settlements are made daily via. Exchange's clearing house.
5.	Delivery date	Forward contracts may be delivered on the dates agreed upon and in terms of actual delivery.	Futures contracts delivery dates are fixed on cyclical basis and hardly takes place. However, it does not mean that there is no actual delivery.
6.	Transaction costs	Cost of forward contracts is based on bid – ask spread.	Futures contracts entail brokerage fees for buy and sell order.
7.	Marking to market	Forward contracts are not subject to marking to market	Futures contracts are subject to marking to market in which the loss or profit is debited or credited in the margin account on daily basis due to change in price.
8.	Margins	Margins are not required in forward contract.	In futures contracts every participants is subject to maintain margin as decided by the exchange authorities
9.	Credit risk	In forward contract, credit risk is born by each party and, therefore, every party has to bother for the creditworthiness.	In futures contract since the transaction is a two way transaction, the parties need not be bothered about the credit risk.



4. PRICING/ VALUATION OF FORWARD/ FUTURE CONTRACTS

The difference between the prevailing spot price of an asset and the futures price is known as the Basis, i.e.,

Basis = Spot price – Futures price

In a normal market, the spot price is less than the futures price (which includes the full cost-of-carry) and accordingly the basis would be negative. Such a market, in which the basis is decided solely by the cost-of-carry is known as a contango market.

Basis can become positive, i.e., the spot price can exceed the futures price only if there are factors other than the cost of carry to influence the futures price. In case this happens, then basis becomes positive and the market under such circumstances is termed as a backwardation market or inverted market.

Basis will approach zero towards the expiry of the contract, i.e., the spot and futures prices converge as the date of expiry of the contract approaches. The process of the basis approaching zero is called convergence.

The relationship between futures prices and cash prices is determined by the cost-of-carry. However, there might be factors other than cost-of-carry, especially in stock futures in which there may be various other returns like dividends, in addition to carrying costs, which may influence this relationship.

The cost-of-carry model in for futures/ forward, is as under:-

Future price = Spot price + Carrying cost – Returns (dividends, etc.)

This is also called as Theoretical minimum price or arbitrage free price as calculated above.

Let us take an example to understand this relationship.

Example

The price of ACC stock on 31 December 2010 was ₹ 220 and the futures price on the same stock on the same date, i.e., 31 December 2010 for March 2011 was ₹ 230. Other features of the contract and related information are as follows:

Time to expiration	-	3 months (0.25 year)
Borrowing rate	-	15% p.a.
Annual Dividend on the stock	-	25% payable before 31.03. 2011
Face Value of the Stock	-	₹ 10

Based on the above information, the futures price for ACC stock on 31 December 2010 should be:

$$= 220 + (220 \times 0.15 \times 0.25) - (0.25 \times 10) = 225.75$$

Thus, as per the 'cost of carry' criteria, the futures price is ₹ 225.75, which is less than the actual price of ₹ 230 on 31 March 2011. This would give rise to arbitrage opportunities and consequently the two prices will tend to converge.

How Will the Arbitrager Act?

He will buy the ACC stock at ₹ 220 by borrowing the amount @ 15 % for a period of 3 months and at the same time sell the March 2011 futures on ACC stock. By 31st March 2011, he will receive the dividend of ₹ 2.50 per share. On the expiry date of 31st March, he will deliver the ACC stock against the March futures contract sales.

The arbitrager's inflows/outflows are as follows:

Sale proceeds of March 2011 futures	₹ 230.00
Dividend	₹ 2.50
Total (A)	₹ 232.50
Pays back the Bank	₹ 220.00
Cost of borrowing	₹ 8.25
Total (B)	₹ 228.25
Balance (A) – (B)	₹ 4.25

Thus, the arbitrager earns ₹ 4.25 per share without involving any risk.

In financial forward contracts, the cost of carry is primarily the interest cost.

Let us take a very simple example of a fixed deposit in the bank. ₹ 100 deposited in the bank at a rate of interest of 10% would become ₹ 110 after one year. Based on annual compounding, the amount will become ₹ 121 after two years. Thus, we can say that the forward price of the fixed deposit of ₹ 100 is ₹ 110 after one year and ₹ 121 after two years.

As against the usual annual, semi-annual and quarterly compounding, which the reader is normally used to, continuous compounding are used in derivative securities. In terms of the annual compounding, the forward price can be computed through the following formula:

$$A = P (1+r/100)^t$$

Where, A is the terminal value of an amount P invested at a rate of interest of r % p.a. for t years.

However, in case there are multiple compounding in a year, say n times per annum, then the above formula will read as follows:

$$A = P (1+r/n)^{nt}$$

And in case the compounding becomes continuous, i.e., more than daily compounding, the above formula can be simplified mathematically and rewritten as follows:

$$A = Pe^{rt}$$

Where

e = Called epsilon, is a mathematical constant and has a value of - 2.718.

r = Risk-free Rate of Interest

t = Time Period

This function is available in all mathematical calculators and is easy to handle.

The above formula gives the future value of an amount invested in a particular security now. In this formula, we have assumed no interim income flow like dividends etc.

Example

Consider a 3-month maturity forward contract on a non-dividend paying stock. The stock is available for ₹ 200. With compounded continuously risk-free rate of interest (CCRRI) of 10 % per annum, the price of the forward contract would be:

$$A = 200 \times e^{(0.25)(0.10)} = ₹ 205.06$$

In case there is cash income accruing to the security like dividends, the above formula will read as follows:

$$A = (P-I)e^{rt}$$

Where I is the present value of the income flow during the tenure of the contract.

Example

Consider a 4-month forward contract on 500 shares with each share priced at ₹ 75. Dividend @ ₹ 2.50 per share is expected to accrue to the shares in a period of 3 months. The CCRRI is 10% p.a. The value of the forward contract is as follows:

$$\begin{aligned} \text{Dividend proceeds} &= 500 \times 2.50 = 1250 \\ &= 1250e^{-(3/12)(0.10)} = 1219.13 \\ \text{Value of forward contract} &= (500 \times 75 - 1219.13) e^{(4/12)(0.10)} \\ &= 36280.87 \times e^{0.033} \\ &= ₹ 37498.11 \end{aligned}$$

However, in case the income accretion to the securities is in the form of percentage yield, y , as in the case of stock indices arising on account of dividend accruals to individual stocks constituting the index, the above formula will read as follows:

$$A = Pe^{n(r-y)}$$

Correlation between Forward and Futures Prices

For contracts of the same maturity, the forward and futures contracts tend to have the same value subject to the interest rates remaining fixed. In case the interest rates are fluid, the value of a futures contract would differ from that of a forward contract because the cash flows generated from marking to the market in the case of the former would be available for reinvestment at variable rates on a

day-to-day basis. However, market imperfections like transaction costs, taxes and asset indivisibilities bring futures prices close enough to the forward prices and hence it is safe to assume that the two prices to be practically the same.

5. TYPES OF FUTURES CONTRACTS

5.1 Single Stock Futures

A single stock futures contract is an agreement to buy or sell shares or stock such as Microsoft, Intel, ITC, or Tata Steel at a point in the future. The buyer has an obligation to purchase shares or stock and the seller has an obligation to sell shares or stock at a specific price at a specific date in the future. Thus, a stock futures contract is a standardized contract to buy or sell a specific stock at a future date at an agreed price. Single-stock futures contracts are completed via offset or the delivery of actual shares at expiration. Margin on a single-stock futures contract is expected normally to be 20% of notional value.

Each Stock Future contract is standardized and includes basic specifications.

The terms of the contract call for delivery of the stock by the seller at some time specified in the future. However, most contracts are not held to expiration. The contracts are standardized, making them highly liquid. To get out of an open long (buying) position, the investor simply takes an offsetting short position (sells). Conversely, if an investor has sold (short) a contract and wishes to close it out, he or she buys (goes long) the offsetting contract.

5.2 Index Futures

A contract for stock index futures is based on the level of a particular stock index such as the S&P 500 or the Dow Jones Industrial Average or NIFTY or BSE Sensex. The agreement calls for the contract to be bought or sold at a designated time in the future based on the level of stock indexes. Just as hedgers and speculators buy and sell futures contracts based on future prices of individual stocks they may for the same reasons can buy and sell such contracts based on stock indexes.

Stock index futures may be used to either speculate on the equity market's general performance or to hedge a stock portfolio against a decline in value. Unlike commodity futures or individual stocks, stock index futures are not based on tangible goods, thus all settlements are in cash. Because settlements are in cash, investors usually have to meet liquidity or income requirements to show that they have money to cover their potential losses.

Stock index futures are traded in terms of number of contracts. Each contract is to buy or sell a fixed value of the index. The value of the index is defined as the value of the index multiplied by the specified monetary amount. In Nifty 50 futures contract traded at the National Stock Exchange, the contract specification states:

1 Contract = 50 units of Nifty 50 * Value of Nifty 50

If we assume that Nifty 50 is quoting at 8000 , the value of one contract will be equal to ₹ 4,00,000 (50*8000). The contract size of 50 units of Nifty 50 in this case is fixed by National Stock Exchange where the contract is traded.

Example

Consider the following:

Current value of index	-	₹ 1400
Dividend yield	-	6% p.a.
CCRR	-	10% p.a.

To find the value of a 3 month forward contract.

$$A = Pe^{t(r-y)}$$

$$= ₹ 1400 \times e^{(3/12)(0.10 - .06)} = ₹ 1400 \times 1.01005 = ₹ 1,414.07$$

5.2.1 Trading Mechanism in Stock Futures

While trading in futures contracts (both stock as well as futures) both buyers and sellers of the contract have to deposit an initial margin with their brokers based on the value of contract entered. The rules for calculation of margins to be deposited with the brokers are framed by the stock exchanges.

Another major feature regarding the margin requirements for stock as well index futures is that the margin requirement is continuous. Every business day, the broker will calculate the margin requirement for each position. The investor will be required to post additional margin funds if the account does not meet the minimum margin requirement.

The investor can square off his position in the futures contract before expiry or wait till expiry date when the contracts will automatically stand as squared off at the closing price on the expiry date. In Indian stock market the expiry date is the last Thursday of the relevant month to which the future contract belongs.

Example–Margin Requirements

In a stock future contract on ITC stock at ₹ 120, both the buyer and seller have a margin requirement of 20% or ₹ 24. If ITC stock goes up to ₹ 122, the account of the long contract is credited with ₹ 200 (₹ 122-₹ 120 = ₹ 2 X 100 = ₹ 200) and the account of the seller (seller) is debited by the same ₹ 200. This indicates that investors in futures must be very vigilant - they must keep close track of market movements.

5.2.2 Purpose of Trading in Futures

Trading in futures is for two purposes namely:

- (a) Speculation and
- (b) Hedging

(a) **Speculation** – For simplicity we will assume that one contract= 100 units and the margin requirement is 20% of the value of contract entered. Brokerage and transaction costs are not taken into account.

Example- Going Long on a Single Stock Futures Contract

Suppose an investor is bullish on McDonald's (MCD) and goes long on one September stock future contract on MCD at ₹ 80. At some point in the near future, MCD is trading at ₹ 96. At that point, the investor sells the contract at ₹ 96 to offset the open long position and makes a ₹ 1600 gross profit on the position.

This example seems simple, but let's examine the trades closely. The investor's initial margin requirement was only ₹ 1600 ($₹ 80 \times 100 = ₹ 8,000 \times 20\% = ₹ 1600$). This investor had a 100% return on the margin deposit. This dramatically illustrates the leverage power of trading futures. Of course, had the market moved in the opposite direction, the investor easily could have experienced losses in excess of the margin deposit.

The pay off table for the above transaction can be depicted as follows:-

Particulars	Details	Inflow/(outflow){In ₹}
Initial Payoff - Margin (Refundable at maturity)	₹ 8000 x 20% = ₹ 1600	(₹ 1600)
Pay off upon squaring off the contract	Profit (₹ 96 - ₹ 80) x 100 = ₹ 1600 Initial Margin = ₹ 1600	₹ 3200
Net Payoff		₹ 1600

Example- Going Short on a Single Stock Futures Contract

An investor is bearish in Kochi Refinery (KR) stock for the near future and goes short an August stock future contract on KR at ₹ 160. KR stock performs as the investor had guessed and drops to ₹ 140 in July. The investor offsets the short position by buying an August stock future at ₹ 140. This represents a gross profit of ₹ 20 per share, or a total of ₹ 2,000.

Again, let's examine the return the investor had on the initial deposit. The initial margin requirement was ₹ 3,200 ($₹ 160 \times 100 = ₹ 16,000 \times 20\% = ₹ 3,200$) and the gross profit was ₹ 2,000. The return on the investor's deposit was more than 60% - a terrific return on a short-term investment.

Particulars	Details	Inflow/(outflow){In ₹}
Initial Payoff - Margin (Refundable at maturity)	₹ 160 x 100 x 20% = ₹ 3200	(₹ 3200)
Pay off upon squaring off the contract	Profit (₹ 160 - ₹ 140) x 100 = ₹ 2000 Initial Margin = ₹ 3200	₹ 5200
Net Payoff		₹ 2000

Example- Going Long on an Index Futures Contract

Suppose an investor has a bullish outlook for Indian market for the month of October 2014. He will go for a long position in October 2014 Nifty Index Future Contract. Assuming that he enters into long positions when Nifty is trading at 8000 and one month later, he squares off his position when the value of Nifty rises to 8500 his payoff will be as under. (Assuming that one contract= 50 units of Nifty and margin requirement is 20% of the value of the contract)

Particulars	Details	Inflow/(outflow){In ₹}
Initial Payoff - Margin (Refundable at maturity)	$(8000 \times 50 \times 20\%) = ₹ 80,000$	(₹ 80,000)
Pay off upon squaring off the contract	Profit $(8500 - 8000) \times 50 = ₹ 25,000$ Initial Margin = ₹ 80,000	₹ 1,05,000
Net Payoff		₹ 25,000

Example- Going Short on an Index Futures Contract

Suppose an investor has a bearish outlook for Indian banking sector for the month of October 2014. He will go for a short position for one October 2014 Bank Nifty Future Contract. Assuming that he enters into short positions when Bank Nifty is trading at 25000 and one month later he squares off his position when the value of Bank Nifty declines to 24000 his payoff will be as under. (Assuming that one contract = 10 units of Bank Nifty and margin requirement is 20% of the value of the contract)

Particulars	Details	Inflow/(outflow){In ₹}
Initial Payoff - Margin (Refundable at maturity)	$(25000 \times 10 \times 20\%) = ₹ 50,000$	(₹ 50,000)
Pay off upon squaring off the contract	Profit $(25000 - 24000) \times 10 = ₹ 10,000$ Initial Margin = ₹ 50,000	₹ 60,000
Net Payoff		₹ 10,000

(b) Hedging – Hedging is the practice of taking a position in one market to offset and balance against the risk adopted by assuming a position in a contrary or opposing market or investment. In simple language, hedging is used to reduce any substantial losses/gains suffered by an individual or an organization. To hedge, the investor takes a stock future position exactly opposite to the stock position. That way, any losses on the stock position will be offset by gains on the future position.

Example- Using single stock future as a Hedge

Consider an investor who has bought 100 shares of Tata Steel (TS) at ₹ 300. In July, the stock is trading at ₹ 350. The investor is happy with the unrealized gain of ₹ 50 per share but is concerned that in a stock as volatile as TS, the gain could be wiped out in one bad day. The investor wishes to keep the stock at least until September, however, because of an upcoming dividend payment.

To hedge, the investor sells a ₹ 350 September stock future contract - whether the stock rises or declines, the investor has locked in the ₹ 50-per-share gain. In September on maturity date of the

futures contract (last Thursday of September) , the investor sells the stock at the market price and buys back the future contract.

The pay-off at various price levels of Tata Steel is as under:-

Particulars	September Closing price of Tata Steel= ₹ 300	September Closing price of Tata Steel= ₹ 350	September Closing price of Tata Steel= ₹ 400
<i>Initial Payoff</i>			
Cost of scrip in cash market	₹ 300 x 100 = ₹ 30000	₹ 300 x 100 = ₹ 30000	₹ 300 x 100 = ₹ 30000
Margin Payment on futures contract	₹ 350 x 100 x 20% = ₹ 7000	₹ 350 x 100 x 20% = ₹ 7000	₹ 350 x 100 x 20% = ₹ 7000
Total Initial Payoff (outflow)	₹ 37000	₹ 37000	₹ 37000
<i>Pay-off at maturity (September end)</i>			
	Sale proceeds of TS in cash market= ₹ 300 x 100 = ₹ 30000	Sale proceeds of TS in cash market= ₹ 350 x 100 = ₹ 35000	Sale proceeds of TS in cash market= ₹ 400 x 100 = ₹ 40000
	Margin refund on futures contract = ₹ 7000	Margin refund on futures contract = ₹ 7000	Margin refund on futures contract = ₹ 7000
	Gain on futures contract (inflow) = (₹ 350 - ₹ 300) x 100 = ₹ 5000	No profit /loss on futures contract = (₹ 350 - ₹ 350) x 100 = ₹ 0	Loss on futures contract (outflow) = (₹ 350 - ₹ 400) x 100 = - ₹ 5000
Total Pay-off at maturity (Inflow)	₹ 42000	₹ 42000	₹ 42000
Net Payoff	₹ 5000	₹ 5000	₹ 5000

Hence, it can be observed in the above table that in any case the investor has locked in a profit of ₹ 5000 via hedging.

In a similar manner as illustrated above index futures can also be used as a hedge. The difference would be that instead of single stock futures the investor would enter into a position into an Index Futures Contract according to the risk potential of the investor. Index Futures are also used to hedge a Portfolio of shares and number of contracts depends upon the β of the portfolio.

5.2.3 Marking to Market

It implies the process of recording the investments in traded securities (shares, debt-instruments, etc.) at a value, which reflects the market value of securities on the reporting date. In the context of derivatives trading, the futures contracts are marked to market on periodic (or daily) basis. Marking

to market essentially means that at the end of a trading session, all outstanding contracts are repriced at the settlement price of that session. Unlike the forward contracts, the future contracts are repriced every day. Any loss or profit resulting from repricing would be debited or credited to the margin account of the broker. It, therefore, provides an opportunity to calculate the extent of liability on the basis of repricing. Thus, the futures contracts provide better risk management measure as compared to forward contracts.

Suppose on 1st day we take a long position, say at a price of ₹ 100 to be matured on 7th day. Now on 2nd day if the price goes up to ₹ 105, the contract will be repriced at ₹ 105 at the end of the trading session and profit of ₹ 5 will be credited to the account of the buyer. This profit of ₹ 5 may be drawn and thus cash flow also increases. This marking to market will result in three things – one, you will get a cash profit of ₹ 5; second, the existing contract at a price of ₹ 100 would stand cancelled; and third you will receive a new futures contract at ₹ 105. In essence, the marking to market feature implies that the value of the futures contract is set to zero at the end of each trading day.

5.2.4 Advantages of Stock Index Futures Trading Vs. Stock Futures Trading

Stock index futures is most popular financial derivatives over stock futures due to following reasons:

1. It adds flexibility to one's investment portfolio. Institutional investors and other large equity holders prefer this instrument the most in terms of portfolio hedging purpose. The stock systems do not provide this flexibility and hedging.
2. It creates the possibility of speculative gains using leverage. Because a relatively small amount of margin money controls a large amount of capital represented in a stock index contract, a small change in the index level might produce a profitable return on one's investment if one is right about the direction of the market. Speculative gains in stock futures are limited but liabilities are greater.
3. Stock index futures are the most cost-efficient hedging device whereas hedging through individual stock futures is costlier.
4. Stock index futures cannot be easily manipulated whereas individual stock price can be exploited more easily.
5. Since, stock index futures consists of many securities, so being an average stock, is much less volatile than individual stock price. Further, it implies much lower capital adequacy and margin requirements in comparison of individual stock futures. Risk diversification is possible under stock index future than in stock futures.
6. One can sell contracts as readily as one buys them and the amount of margin required is the same.
7. In case of individual stocks the outstanding positions are settled normally against physical delivery of shares. In case of stock index futures they are settled in cash all over the world on the premise that index value is safely accepted as the settlement price.

8. It is also seen that regulatory complexity is much less in the case of stock index futures in comparison to stock futures.
9. It provides hedging or insurance protection for a stock portfolio in a falling market.

5.2.5 Uses/Advantages of Stock Index Futures

Investors can use stock index futures to perform myriad tasks. Some common uses are:

- (1) Investors commonly use stock index futures to change the weightings or risk exposures of their investment portfolios. A good example of this is investors who hold equities from two or more countries. Suppose these investors have portfolios invested in 60 percent U.S. equities and 40 percent Japanese equities and want to increase their systematic risk to the U.S. market and reduce these risks to the Japanese market. They can do this by buying U.S. stock index futures contracts in the indexes underlying their holdings and selling Japanese contracts (in the Nikkei Index).
- (2) Stock index futures also allow investors to separate market timing from market selection decisions. For instance, investors may want to take advantage of perceived immediate increases in an equity market but are not certain which securities to buy; they can do this by purchasing stock index futures. If the futures contracts are bought and the present value of the money used to buy them is invested in risk-free securities, investors will have a risk exposure equal to that of the market. Similarly, investors can adjust their portfolio holdings at a more leisurely pace. For example, assume the investors see that they have several undesirable stocks but do not know what holdings to buy to replace them. They can sell the unwanted stocks and, at the same time, buy stock index futures to keep their exposure to the market. They can later sell the futures contracts when they have decided which specific stocks they want to purchase.
- (3) Investors can also make money from stock index futures through index arbitrage, also referred to as program trading as it is carried out through use of computers. Basically, arbitrage is the purchase of a security or commodity in one market and the simultaneous sale of an equal product in another market to profit from pricing differences. Investors taking part in stock index arbitrage seek to gain profits whenever a futures contract is trading out of line with the fair price of the securities underlying it. Thus, if a stock index futures contract is trading above its fair value, investors could buy a basket of stocks composing the index in the correct proportion—such as a mutual fund comprised of stocks represented in the index—and then sell the expensively priced futures contract. Once the contract expires, the equities could then be sold and a net profit would result. While the investors can keep their arbitrage position until the futures contract expires, they are not required to. If the futures contract seems to be returning to fair market value before the expiration date, it may be prudent for the investors to sell early.
- (4) Investors often use stock index futures to hedge the value of their portfolios. Provide hedging or insurance protection for a stock portfolio in a falling market. To implement a hedge, the instruments in the cash and futures markets should have similar price movements. Also, the

amount of money invested in the cash and futures markets should be the same. To illustrate, while investors owning well-diversified investment portfolios are generally shielded from unsystematic risk (risk specific to particular firms), they are fully exposed to systematic risk (risk relating to overall market fluctuations). A cost-effective way for investors to reduce the exposure to systematic risk is to hedge with stock index futures, similar to the way that people hedge commodity holdings using commodity futures. Investors often use short hedges when they are in a long position in a stock portfolio and believe that there will be a temporary downturn in the overall stock market. Hedging transfers the price risk of owning the stock from a person unwilling to accept systematic risks to someone willing to take the risk.

To carry out a short hedge, the hedger sells a futures contract; thus, the short hedge is also called a "sell-hedge."

Example

Consider investors who own portfolios of securities valued at \$1.2 million with a dividend of 1 percent. The investors have been very successful with their stock picks. Therefore, while their portfolios' returns move up and down with the market, they consistently outperform the market by 6 percent. Thus, the portfolio would have a beta of 1.00 and an alpha of 6 percent. Say that the investors believe that the market is going to have a 15 percent decline, which would be offset by the 1 percent received from dividends. The net broad market return would be -14 percent but, since they consistently outperform the market by 6 percent, their estimated return would be -8 percent. In this instance, the investors would like to cut their beta in half without necessarily cutting their alpha in half. They can achieve this by selling stock index futures. In this scenario, the S&P 500 index is at 240. The contract multiplier is \$500, and therefore each contract represents a value of \$120,000. Since the investors want to simulate the sale of half of their \$1.2 million portfolios, they must sell five contracts ($5 \times \$120,000 = \$600,000$). Thus, their portfolios would be affected by only half of the market fluctuation. While the investors could protect their portfolios equally well by selling half of their shares of stock and buying them again at short time later, using a short hedge on stock index futures is much cheaper than paying the capital gains tax plus the broker commissions associated with buying and selling huge blocks of stock.

At the extreme, stock index futures can theoretically eliminate the effects of the broad market on a portfolio. Perfect hedges are very unusual because of the existence of basis risk. The basis is the difference between the existing price in the futures market and the cash price of the underlying securities. Basis risk occurs when changes in the economy and the financial situation have different impacts on the cash and futures markets.

- (5) Stock index futures add flexibility to his or her portfolio as a hedging and trading instrument.
- (6) Create the possibility of speculative gains using leverage. Because a relatively small amount of margin money controls a large amount of capital represented in a stock index contract, a small change in the index level might produce a profitable return on one's investment if he or she is right about the market's direction.

- (7) Maintain one's stock portfolio during stock market corrections. One may not need "insurance" for all the time, but there are certain times when one would like less exposure to stocks. Yet, one doesn't want to sell off part of a stock portfolio that has taken him or her a long time to put together and looks like a sound, long-term investment program.
- (8) One of the major advantages of futures markets, in general, is that one can sell contracts as readily as he or she can buy them and the amount of margin required is the same. Mutual funds do not specialize in bear market approaches by short selling stocks but, and also it is not possible for individuals to short sell stocks in a falling market to make money.
- (9) Transfer risk quickly and efficiently. Whether one is speculating, looking for insurance protection (hedging), or temporarily substituting futures for a later cash transaction, most stock index futures trades can be accomplished quickly and efficiently. Many mutual funds require investors to wait until the end of the day to see at what price they were able to purchase or sell shares. With today's volatility, once-a-day pricing may not give one the maneuverability to take positions at exactly the time he or she wants. Stock index futures give individual the opportunity to get into or out of a position whenever he or she wants.



6. OPTIONS

An Option may be understood as a privilege, sold by one party to another, that gives the buyer the right, but not the obligation, to buy (call) or sell (put) any underlying say stock, foreign exchange, commodity, index, interest rate etc. at an agreed-upon price within a certain period or on a specific date regardless of changes in underlying's market price during that period.

The various kinds of stock options include put and call options, which may be purchased in anticipation of changes in stock prices, as a means of speculation or hedging. A put gives its holder an option to sell, shares to another party at a fixed price even if the market price declines. A call gives the holder an option to buy, or call for, shares at a fixed price even if the market price rises.

6.1 Stock Options

Stock options involve no commitments on the part of the buyers of the option contracts to purchase or sell the stock. The option is usually exercised only if the price of the stock has risen above (in case of call option) or fallen below (in case of put option) the price specified at the time the option was given. One important difference between stocks and options is that stocks give you a small piece of ownership in the company, while options are just contracts that give you the right to buy or sell the stock at a specific price by a specific date. Investing in options provide limited risk, high potential reward and smaller amount of capital required to control the same number of shares which can be done via investing through cash market.

6.2 Stock Index Option

It is a call or put option on a financial index. Investors trading index options are essentially betting on the overall movement of the stock market as represented by a basket of stocks.

Index options can be used by the portfolio managers to limit their downside risk. Suppose the value of the index is S . Consider a manager in charge of a well diversified portfolio which has a β of 1.0 so that its value mirrors the value of the index. If for each 100 S rupees in the portfolio, the manager buys one put option contract with exercise price X , the value of the portfolio is protected against the possibility of the index falling below X . For instance, suppose that the manager's portfolio is worth ₹ 10,00,000 and the value of the index is 10000. The portfolio is worth 100 times the index. The manager can obtain insurance against the value of the portfolio dropping below ₹ 900,000 in the next two months by buying 1 put option contracts with a strike price of ₹ 9000. To illustrate how this would work, consider the situation where the index drops to 8500. The portfolio will be worth ₹ 850000 (100 x 8500). However, the payoff from the options will be $1 \times (\text{₹ } 9000 - \text{₹ } 8500) \times 100 = \text{₹ } 50000$, bringing the total value of the portfolio up to the insured value of ₹ 9,00,000.

6.3 Parties to the Options

There are always two types of entities for an option transaction viz buyer and a seller (also known as writer of the option). So, for every call or put option purchased, there is always someone else selling/buying it. When individuals sell options, they effectively create a security that didn't exist before. This is known as writing an option and explains one of the main sources of options, since neither the associated company nor the options exchange issues options. When you write a call, you may be obligated to sell shares at the strike price any time before the expiration date. When you write a put, you may be obligated to buy shares at the strike price any time before expiration. The price of an option is called its premium. The buyer of an option cannot lose more than the initial premium paid for the contract, no matter what happens to the underlying security. So, the risk to the buyer is never more than the amount paid for the option. The profit potential, on the other hand, is theoretically unlimited

6.4 Premium for Options

In return for the premium received from the buyer, the seller of an option assumes the risk of having to deliver (if a call option) or taking delivery (if a put option) of the shares of the stock. Unless that option is covered by another option or a position in the underlying stock (opposite to the position taken via selling the option contracts), the seller's loss can be unlimited, meaning the seller can lose much more than the original premium received.

6.5 Types of Options

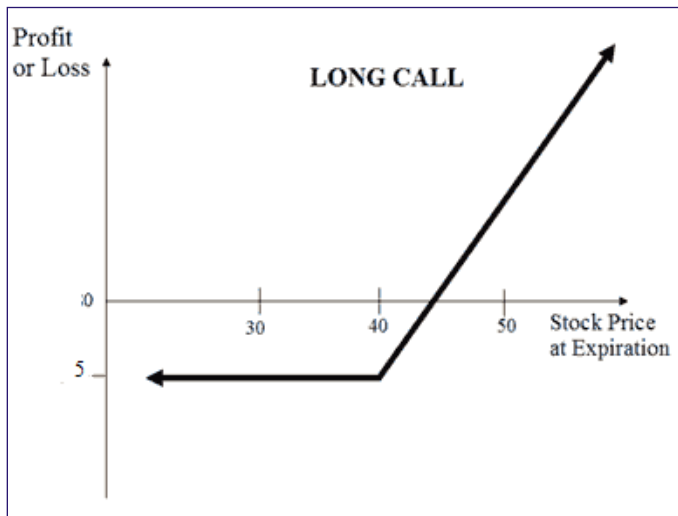
You should be aware that there are two basic styles of options: American and European. An American, or American-style, option can be exercised at any time between the date of purchase and the expiration date. Most exchange-traded options are American style and all stock options are American style. A European, or European-style, option can only be exercised on the expiration date. In Indian Market most of the options are European style options.

6.6 Pay-off scenarios

The possible pay-off under various scenarios are as follows:

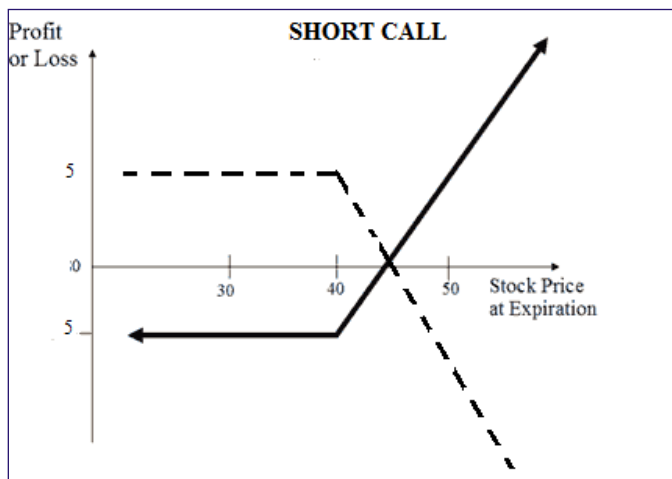
6.6.1 Pay-off for a Call Buyer

Also, called Long Call. For example, Mr. X buys a call option at strike price of ₹ 40 in exchange of a premium of ₹ 5. In case if actual price of the stock at the time of exercise is less than ₹ 40, Mr. X would not exercise his option and his loss would be ₹ 5. Mr. X would exercise his option at any price above ₹ 40. In such a situation his loss would start reducing and at the price of ₹ 45 there will be Break Even.



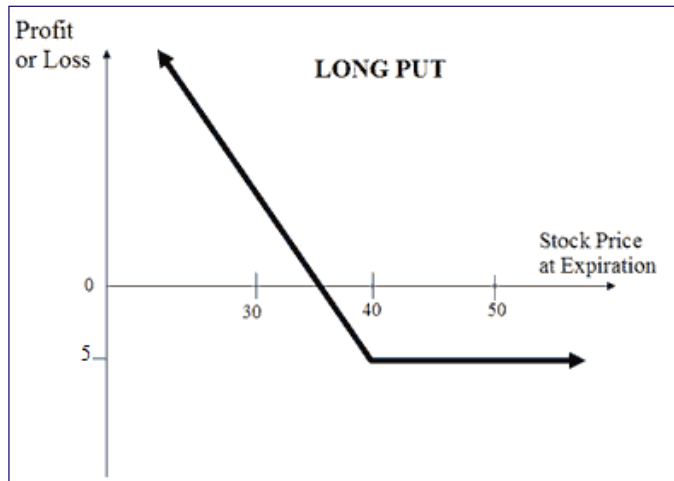
6.6.2 Pay-off for a Call Seller

Also, called Short Call. The pay-off profile of Call Seller shall be the mirror image of the Long Call as shown below in dotted line.



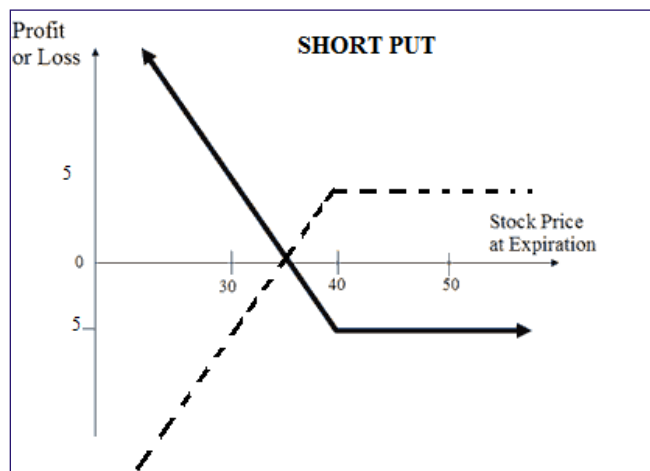
6.6.3 Pay-off for a Put Buyer

Also, called Long Put. For example, Mr. X buys a put option at strike price of ₹ 40 in exchange of a premium of ₹ 5. In case if actual price of the stock at the time of exercise is less than ₹ 40, Mr. X would exercise his option and his gain would be (Spot Price – Exercise Price – Premium). Mr. X would exercise his option at any price below ₹ 40. The break-even price will be ₹ 35 and Mr. X would not exercise his option for any price above ₹ 40.



6.6.4 Pay-off for a Put Seller

Also, called Short Put. The pay-off profile of Put Seller shall be the mirror image of the Long Put as shown below in dotted line.



6.7 Comparison with Single Stock Futures

Investing in stock futures differs from investing in equity options contracts in several ways:

- *Nature:* In options, the buyer of the options has the right but not the obligation to purchase or

sell the stock. However while going in for a long futures position, the investor is obligated to square off his position at or before the expiry date of the futures contract.

- *Movement of the Market:* Options traders use a mathematical factor, the delta that measures the relationship between the options premium and the price of the underlying stock. At times, an option contract's value may fluctuate independently of the stock price. In contrast, the future contract will much more closely follow the movement of the underlying stock.
- *The Price of Investing:* When an options investor takes a long position, he or she pays a premium for the contract. The premium is often called a sunk cost. At expiration, unless the options contract is in the money, the contract is worthless and the investor has lost the entire premium. Stock future contracts require an initial margin deposit and a specific maintenance level of cash for mark to market margin

7. OPTION VALUATION TECHNIQUES

We have already been introduced to characteristics of both European and American Options. Assuming a European Call Option on a non-dividend paying stock, it is easy to see that its value at expiration date shall either be zero or the difference between the market price and the exercise price, whichever is higher. It may be noted that the value of an Option cannot be negative. An investor is required to pay a premium for acquiring such an Option. In case this premium is less than the value of the Option, the investor shall make profits, however, in case the premium paid is more than the value, the investor shall end up losing money. Note that, while measuring these gains or losses, Time Value of Money and Transaction Costs have been ignored. The opposite picture emerges for the Writer.

The Value of an Option with one period to expire: Simply speaking, the theoretical value of an Option should be the difference between the current stock price and the exercise price. In case the stock price is less than the exercise price the theoretical value shall be zero. However, as long as there is time to expiration it is possible for a zero theoretical value Option to have some actual positive Market value. This is because there may be a possibility of the stock price rising at which point of time the Option may be exercised advantageously.

7.1 Binomial Model

The binomial model breaks down the time to expiration into potentially a very large number of time intervals, or steps. This requires the use of probability and future discrete projections through which a tree of stock prices is initially produced working forward from the present to expiration.

To facilitate understanding we shall restrict ourselves to a European Option having a one year time branching process where at the end of the year there are only two possible values for the common stock. One is higher and the other lower than the current value. Assume that the probability of the two values to materialize is known. In such a situation, a hedged position can be established by buying the stock and by writing Options. This shall help offset price movements. At each step, it is

assumed that the stock price will either move up or down. The pricing of the Options should be such that the return equals the risk-free rate.

The above mentioned is an example of Binomial Distribution. When the number of high and low value projections for the concerned stock are numerous, the tree shall represent all possible paths that the stock price could take during the life of the option.

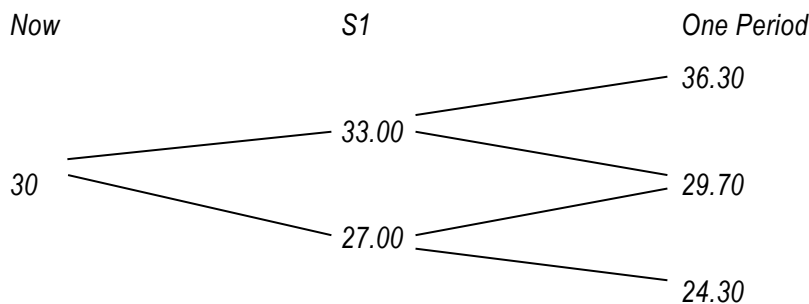
At the end of the tree - i.e. at expiration of the option - all the terminal option prices for each of the final possible stock prices are known as they simply equal their intrinsic values.

The big advantage the binomial model has over the Black-Scholes model is that it can be used to accurately price American options. This is because with the binomial model it's possible to check at every point in an option's life (i.e. at every step of the binomial tree) for the possibility of early exercise (e.g. a put option being deeply in the money and due to dividend declaration its price at that point is less than its intrinsic value).

Where an early exercise point is found it is assumed that the option holder would elect to exercise, and the option price can be adjusted to equal the intrinsic value at that point. This then flows into the calculations higher up the tree and so on.

Illustration 1

Following is a two sub-periods tree of 6-months each for the share of CAB Ltd.:



Using the binomial model, calculate the current fair value of a regular call option on CAB Stock with the following characteristics: $X = ₹ 28$, Risk Free Rate = 5 percent p.a. You should also indicate the composition of the implied riskless hedge portfolio at the valuation date.

Solution

$$u = 33.00/30.00 = 36.30/33.00 = 1.10 \quad d = 27.00/30.00 = 24.30/27.00 = 0.90$$

$$r = (1 + .05)^{1/2} = 1.0247$$

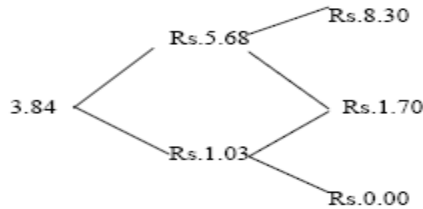
$$p = \frac{r - d}{u - d} = \frac{1.0247 - 0.90}{1.10 - 0.90} = 0.1247/0.20 = 0.6235 \text{ (Prob. of increase in Price of Share)}$$

$$\text{Prob. of decrease in Price of Share} = 1 - 0.6235 = 0.3765$$

$$C_{uu} = \text{Max} [0, 36.30 - 28] = 8.30$$

$$C_{ud} = \text{Max} [0, 29.70 - 28] = 1.70$$

$$C_{dd} = \text{Max} [0, 24.30 - 28] = 0$$



$$C_u = \frac{(0.6235)(8.30) + (0.3765)(1.70)}{1.025} = \frac{5.175 + 0.640}{1.025} = 5.815/1.025 = ₹ 5.673$$

$$C_d = \frac{(0.6235)(1.70) + (0.3765)(0.00)}{1.025} = \frac{1.05995}{1.025} = ₹ 1.0341$$

$$C_o = \frac{(0.6235)(5.673) + (0.3765)(1.0341)}{1.025} = \frac{3.537 + 0.3893}{1.025} = ₹ 3.83$$

The composition of the implied risk-less hedge portfolio at valuation date is called Delta (Δ) and it is calculated as follows:

$$\frac{C_u - C_d}{S_u - S_d}$$

Where,

C_u = Pay-off from Call Option if price of Stock goes up

C_d = Pay-off from Call Option if price of Stock goes down

S_u = Upward price of the Stock

S_d = Downward price of the Stock

Accordingly, the Risk-less Portfolio shall require Δ Share shall be required for writing off one Call Option. The Δ shall be computed as follows:

$$\Delta = \frac{5 - 0}{33 - 27} = \frac{5}{6}$$

Thus, $\frac{5}{6}$ shares shall be held or purchased for writing one Call Option.

7.2 Risk Neutral Method

The “risk-neutral” technique can also be used to value derivative securities. It was developed by John Cox and Stephen Ross in 1976. The basic argument in the risk neutral approach is that since the valuation of options is based on arbitrage and is therefore independent of risk preferences; one should be able to value options assuming any set of risk preferences and get the same answer as by using Binomial Model. This model is a simple model.

Using this model, we can derive the risk neutral probabilities and apply the same probabilities in the binomial model.

Example

Suppose the price of the share of Company X is ₹ 50. In one year, it is expected either to go up to ₹ 60 or go down to ₹ 40. The risk-free rate of interest is 5%.

Let p be the probability that the price will increase then $(1-p)$ will be probability of price decrease. The value of the stock today must be equal to the present value of the expected price after one year discounted at risk-free rate as follows:

$$50 = \frac{60p + 40(1-p)}{1.05}$$

On solving we shall get the value of $p = 0.625$. With this value we can find out the present value of the expected payout as follows:

$$\frac{10(0.625) + 0(1 - 0.625)}{1.05} = 5.95$$

It may however be noted that the discounting can also be made on daily basis as shown in following illustration.

Illustration 2

The current market price of an equity share of Penchant Ltd is ₹ 420. Within a period of 3 months, the maximum and minimum price of it is expected to be ₹ 500 and ₹ 400 respectively. If the risk free rate of interest be 8% p.a., what should be the value of a 3 months Call option under the “Risk Neutral” method at the strike rate of ₹ 450 ? Given $e^{0.02} = 1.0202$

Solution

Let the probability of attaining the maximum price be p

$$(500 - 420) \times p + (400 - 420) \times (1-p) = 420 \times (e^{0.02} - 1)$$

$$\text{or, } 80p - 20(1 - p) = 420 \times 0.0202$$

$$\text{or, } 80p - 20 + 20p = 8.48$$

$$\text{or, } 100p = 28.48$$

$$p = 0.2848$$

The value of Call Option in ₹ = $\frac{0.2848 \times (500 - 450)}{1.0202} = \frac{0.2848 \times 50}{1.0202} = 13.96$

7.3 Black-Scholes Model

The Black-Scholes model is used to calculate a theoretical price of an Option. The Black-Scholes price is nothing more than the amount an option writer would require as compensation for writing a call and completely hedging the risk of buying stock. The important point is that the hedger's view about future stock prices is irrelevant. Thus, while any two investors may strongly disagree on the rate of return they expect on a stock they will, given agreement to the assumptions of volatility and the risk-free rate, always agree on the fair value of the option on that underlying asset. This key concept underlying the valuation of all derivatives -- that fact that the price of an option is independent of the risk preferences of investors -- is called risk-neutral valuation. It means that all derivatives can be valued by assuming that the return from their underlying assets is the risk-free rate.

The model is based on a normal distribution of underlying asset returns.

The following assumptions accompany the model:

1. European Options are considered,
2. No transaction costs,
3. Short term interest rates are known and are constant,
4. Stocks do not pay dividend,
5. Stock price movement is similar to a random walk,
6. Stock returns are normally distributed over a period of time, and
7. The variance of the return is constant over the life of an Option.

The original formula for calculating the theoretical option price (OP) is as follows:

$$OP = SN(d_1) - Xe^{-rt}N(d_2)$$

Where:

$$d_1 = \frac{\ln\left(\frac{S}{X}\right) + \left(r + \frac{v^2}{2}\right)t}{v\sqrt{t}}$$

$$d_2 = d_1 - v\sqrt{t}$$

The variables are:

- S = current stock price
X = strike price of the option

- t = time remaining until expiration, expressed as a percent of a year
- r = current continuously compounded risk-free interest rate
- v = annual volatility of stock price (the standard deviation of the short-term returns over one year).
- ln = natural logarithm
- $N(x)$ = standard normal cumulative distribution function (Area under Normal Curve)
- e = the exponential function

Understanding the formula

$N(d_1)$ represents the hedge ratio of shares of stock to Options necessary to maintain a fully hedged position.

Consider the Option holder as an investor who has borrowed an equivalent amount of the exercise price at interest rate r. $Xe^{-rt}N(d_2)$ represents this borrowing which is equivalent to the present value of the exercise price times an adjustment factor of $N(d_2)$

$N(d_2)$ in the above formulae represents the probability that price in spot market on expiration would be higher than the exercise price of the call option.

The main advantage of the Black-Scholes model is speed -- it lets you calculate a very large number of option prices in a very short time.

The Black-Scholes model has one major limitation that it cannot be used to accurately price options with an American-style exercise as it only calculates the option price at one point of time -- at expiration. It does not consider the steps along the way where there could be the possibility of early exercise of an American option.

Illustration 3

- (i) The shares of TIC Ltd. are currently priced at ₹ 415 and call option exercisable in three months' time has an exercise rate of ₹ 400. Risk free interest rate is 5% p.a. and standard deviation (volatility) of share price is 22%. Based on the assumption that TIC Ltd. is not going to declare any dividend over the next three months, is the option worth buying for ₹ 25?
- (ii) Calculate value of aforesaid call option based on Black Scholes valuation model if the current price is considered as ₹ 380.
- (iii) What would be the worth of put option if current price is considered ₹ 380.
- (iv) If TIC Ltd. share price at present is taken as ₹ 408 and a dividend of ₹ 10 is expected to be paid in the two months time, then, calculate value of the call option.

Given

$$\ln(1.0375) = 0.03681$$

$$\ln(0.95) = -0.05129$$

$$\ln(0.9952) = -0.00481$$

$$e^{0.0125} = 1.012578$$

$$e^{0.008333} = 1.0084$$

Solution

(i) Given: TIC Ltd. Current Price = ₹ 415

Exercise rate = 400

Risk free interest rate is = 5% p.a.

SD (Volatility) = 22%

Based on the above bit is calculated value of an option based on Black Scholes Model:

$$d_1 = \frac{\ln\left(\frac{415}{400}\right) + \left[.05 + \frac{1}{2} (22)^2\right] .25}{.22 \sqrt{.25}}$$

$$= \frac{.03681 + .01855}{.11} = .5032727$$

$$d_2 = \frac{\ln\left(\frac{415}{400}\right) + \left[.05 - \frac{1}{2} (22)^2\right] .25}{.22 \sqrt{.25}}$$

$$= \frac{.03681 + .00645}{.11} = 0.3932727$$

$$N(d_1) = N(.50327) = 1 - 0.3072 = 0.6928$$

$$N(d_2) = N(.39327) = 1 - 0.3471 = 0.6529$$

$$\text{Value of Option} = 415 (.6928) - \frac{400}{e^{(.05)(.25)}} (.6529)$$

$$= 287.512 - \frac{400}{1.012578} (.6529) = 287.512 - 257.916 = ₹ 29.60$$

NB : $N(0.39327)$ can also be find as under :

Step 1: From table of area under normal curve find the area of variable 0.39 i.e. 0.6517.

Step 2: From table of area under normal curve find the area of variable 0.40.

Step 3: Find out the difference between above two variables and areas under normal curve.

Step 4 : Using interpolation method find out the value of 0.00327. Which is as follows:

$$\frac{0.0037}{0.01} \times 0.00327 = 0.0012$$

Step 5: Add this value, computed above to the N(0.39). Thus N (0.39327)
= 0.6517 + 0.0012 = 0.6529

Since market price of ₹ 25 is less than ₹ 29.60 (as per Black Scholes Valuation model) indicate that option is underpriced, hence worth buying.

(ii) If the current price is taken as ₹ 380 the computations are as follows:

$$d_1 = \frac{\ln\left(\frac{380}{400}\right) + \left[.05 + \frac{1}{2} (.22)^2\right] .25}{.22 \sqrt{.25}} = \frac{-0.05129 + .01855}{.11} = -0.297636$$

$$d_2 = \frac{\ln\left(\frac{380}{400}\right) + \left[.05 - \frac{1}{2} (.22)^2\right] .25}{.22 \sqrt{.25}} = \frac{-0.05129 + .00645}{.11} = -0.407636$$

$$V_o = V_s N(d_1) - \frac{E}{e^{rt}} N(d_2)$$

$$N(d_1) = N(-0.297636) = 0.3830$$

$$N(d_2) = N(-0.407636) = 0.3418$$

$$380 (.3830) - \frac{400}{e^{(.05)(.25)}} \times (.3418)$$

$$145.54 - \frac{400}{1.012578} (.3418) = 145.54 - 135.02 = ₹ 10.52$$

(iii) Value of call option = ₹ 10.52

Current Market Value = ₹ 415

$$\text{Present Value of Exercise Price} = \frac{400}{1.0125} = 395.06 \text{ or } \frac{400}{1.012578} = 395.03$$

Value of Put Option can be find by using Put Call Parity relationship as follows:

$$V_p = -V_s + V_c + PV (E)$$

$$V_p = -380 + 10.52 + 395.06 = 25.58$$

= ₹ 25.58 Ans

$$\text{or } -380 + 10.52 + 395.03 = 25.55$$

= ₹ 25.55

- (iv) Since dividend is expected to be paid in two months time we have to adjust the share price and then use Black Scholes model to value the option:

Present Value of Dividend (using continuous discounting) = Dividend $\times e^{-rt}$

$$= ₹ 10 \times e^{-.05 \times .16666}$$

$$= ₹ 10 \times e^{-.008333}$$

$$= ₹ 9.917 \text{ (Please refer Exponential Table)}$$

Adjusted price of shares is ₹ 408 – 9.917 = ₹ 398.083

This can be used in Black Scholes model

$$d_1 = \frac{\ln\left(\frac{398.083}{400}\right) + \left[.05 + \frac{1}{2} (.22)^2\right] .25}{.22 \sqrt{.25}} = \frac{-.00481 + .01855}{.11} = 0.125$$

$$d_2 = \frac{\ln\left(\frac{398.083}{400}\right) + \left[.05 - \frac{1}{2} (.22)^2\right] .25}{.22 \sqrt{.25}} = \frac{-.00481 + .00645}{.11} = 0.015$$

$$N(d_1) = N(0.125) = .5498$$

$$N(d_2) = N(0.015) = .5060$$

$$\text{Value of Option} = 398.083 (.5498) - \frac{400}{e^{(.05)(.25)}} (.5060)$$

$$218.866 - \frac{400}{e^{.0125}} (.5060)$$

$$218.866 - \frac{400}{1.012578} (.5060) = 218.866 - 199.8858 = ₹ 18.98$$

7.4 Greeks

The Greeks are a collection of statistical values (expressed as percentages) that give the investor a better overall view of how a stock has been performing. These statistical values can be helpful in deciding what options strategies are best to use. The investor should remember that statistics show trends based on past performance. It is not guaranteed that the future performance of the stock will behave according to the historical numbers. These trends can change drastically based on new stock performance.

Before we discuss these statistical measures let us discuss the factors that affects the value of option as these statistical measures are related to changes in the in these factors.

7.4.1 Factors Affecting Value of an Option

There are a number of different mathematical formulae, or models, that are designed to compute the fair value of an option. You simply input all the variables (stock price, time, interest rates, dividends and future volatility), and you get an answer that tells you what an option should be worth. Here are the general effects the variables have on an option's price:

(a) Price Movement of the Underlying: The value of calls and puts are affected by changes in the underlying stock price in a relatively straightforward manner. When the stock price goes up, calls should gain in value and puts should decrease. Put options should increase in value and calls should drop as the stock price falls.

(b) Time till expiry: The option's future expiry, at which time it may become worthless, is an important and key factor of every option strategy. Ultimately, time can determine whether your option trading decisions are profitable. To make money in options over the long term, you need to understand the impact of time on stock and option positions.

With stocks, time is a trader's ally as the stocks of quality companies tend to rise over long periods of time. But time is the enemy of the options buyer. If days pass without any significant change in the stock price, there is a decline in the value of the option. Also, the value of an option declines more rapidly as the option approaches the expiration day. That is good news for the option seller, who tries to benefit from time decay, especially during that final month when it occurs most rapidly.

(c) Volatility in Stock Prices: Volatility can be understood via a measure called Statistical (sometimes called historical) Volatility, or SV for short. SV is a statistical measure of the past price movements of the stock; it tells you how volatile the stock has actually been over a given period of time.

But to give you an accurate fair value for an option, option pricing models require you to put in what the future volatility of the stock will be during the life of the option. Naturally, option traders don't know what that will be, so they have to try to guess. To do this, they work the options pricing model "backwards" (to put it in simple terms). After all, you already know the price at which the option is trading; you can also find the other variables (stock price, interest rates, dividends, and the time left in the option) with just a bit of research. So, the only missing number is future volatility, which you can calculate from the equation.

(d) Interest Rate- Another feature which affects the value of an Option is the time value of money. The greater the interest rates, the present value of the future exercise price are less.

Now let us discuss these measures.

7.4.2 Delta

A by-product of the Black-Scholes model is the calculation of the delta. It is the degree to which an option price will move given a small change in the underlying stock price. For example, option price (with a delta of 0.5) will move half a rupee for every full rupee movement in the underlying stock.

A deeply out-of-the-money call will have a delta very close to zero; a deeply in-the-money call will have a delta very close to 1.

The formula for a delta of a European call on a non-dividend paying stock is:

Delta = $N(d_1)$ (see Black-Scholes formula above for d_1)

Call Deltas are positive; Put Deltas are negative, reflecting the fact that the Put option price and the underlying stock price are inversely related. The Put Delta is equal to (Call Delta – 1).

As discussed earlier the delta is often called the Hedge Ratio. If you have a portfolio consisting short 'n' options (e.g., you have written n calls) and holding number of shares (units of the underlying i.e., n multiplied by the delta). This gives you a riskless position - i.e., a portfolio which would be worth the same whether the stock price rose by a very small amount or fell by a very small amount. In such a "delta neutral" portfolio any gain in the value of the shares held due to a rise in the share price would be exactly offset by a loss on the value of the calls written, and vice versa.

Note that as the Delta changes with the stock price and time to expiration the number of shares would need to be continually adjusted to maintain the hedge. How quickly the delta changes with the stock price are given by 'Gamma'.

In addition to Delta there are some other "Greeks" which some find useful when constructing option strategies.

7.4.3 Gamma

It measures how fast the Delta changes for small changes in the underlying stock price i.e. the Delta of the Delta. If you are hedging a portfolio using the Delta-hedge technique then you will want to keep gamma as small as possible, the smaller it is the less often you will have to adjust the hedge to maintain a delta neutral position. If gamma is too large, a small change in stock price could wreck your hedge. Adjusting gamma, however, can be tricky and is generally done using options i.e. it cannot be done by selling or buying underlying asset rather by selling or buying options.

7.4.4 Theta

It is change in the option price upon one day decrease in time to expiration. Basically, it is a measure of time decay. Unless you and your portfolio are travelling at close to the speed of light the passage of time is constant and inexorable. Thus, hedging a portfolio against time decay, the effects of which are completely predictable, would be pointless.

7.4.5 Rho

The change in option price given a one percentage point change in the risk-free interest rate. It is sensitivity of option value to change in interest rate. Rho indicates the absolute change in option value for a one percent change in the interest rate. For example, a Rho of 0.06 indicates the option's theoretical value will increase by 0.06 if the interest rate is decreased by 1.0.

7.4.6 Vega

Sensitivity of option value to change in volatility. Vega indicates an absolute change in option value for a one percent change in volatility. For example, a Vega of 0.09 indicates an absolute change in the option's theoretical value will increase by 0.09 if the volatility percentage is increased by 1.0 or decreased by 0.09 if the volatility percentage is decreased by 1.0. Results may not be exact due to rounding. It can also be stated as the change in option price given a one percentage point change in volatility. Like delta and gamma, Vega is also used for hedging.

7.5 Exotic Options

Exotic options are the classes of option contracts with structure and features different from plain vanilla options i.e. American and European style options. Not only that Exotic options are different from these vanilla options in their expiration dates also. As mentioned earlier an American option allows the option buyer to exercise its right at any time on or before expiration date. On the other hand European option can be exercised only at the expiry of maturity period. Exotic option is some type of hybrid of American and European options and hence falls somewhere in between these options.

7.5.1 Exotic Vs. Traditional Option

- a. An exotic option can vary in terms of pay off and time of exercise.
- b. These options are more complex than vanilla options.
- c. Mostly Exotic options are traded in OTC market.

7.5.2 Types of Exotic Options

The most common types of Exotic options are as follows:

- (a) **Chooser Options:** This option provides a right to the buyer of option after a specified period of time to decide whether purchased option is a call option or put option. It is to be noted that the decision can be made within a specified period prior to the expiration of contracts.
- (b) **Compound Options:** Also called split fee option or 'option on option'. As the name suggests this option provides a right or choice not an obligation to buy another option at specific price on the expiry of first maturity date. Thus, it can be said in this option the underlying is an option. Further the payoff depends on the strike price of second option.
- (c) **Barrier options:** Though it is similar to plain vanilla call and put options, but unique feature of this option is that contract will become activated only if the price of the underlying reaches a certain price during a predetermined period.
- (d) **Binary Options:** Also known as 'Digital Option', this option contract guarantees the pay-off based on the happening of a specific event. If the event has occurred, the pay-off shall be pre-decided amount and if event it has not occurred then there will be no pay-off.

- (e) **Asian Options:** These are the option contracts whose pay off are determined by the average of the prices of the underlying over a predetermined period during the lifetime of the option.
- (f) **Bermuda Option:** It is somewhat a compromise between a European and American options. Contrary to American option where it can be exercised at any point of time, the exercise of this option is restricted to certain dates or on expiration like European option.
- (g) **Basket Options:** In this type of contracts the value of option instead of one underlying depends on the value of a portfolio i.e., a basket. Generally, this value is computed based on the weighted average of underlying constituting the basket.
- (h) **Spread Options:** As the name suggests the payoff of these type of options depend on difference between prices of two underlying.
- (i) **Look back options:** Unlike other type of options whose exercise prices are pre-decided, in this option on maturity date the holder of the option is given a choice to choose a most favourable strike price depending on the minimum and maximum price of an underlying achieved during the life time of option.

8. CREDIT DERIVATIVES

Credit Derivatives is summation of two terms, Credit + Derivatives. As we know that derivative implies value deriving from an underlying, and this underlying can be anything we discussed earlier i.e. stock, share, currency, interest etc.

Initially started in 1996, due to the need of the banking institutions to hedge their exposure of lending portfolios today it is one of the popular structured financial products.

Plainly speaking the financial products are subject to following two types of risks:

- (a) **Market Risk:** Due to adverse movement of the stock market, interest rates and foreign exchange rates.
- (b) **Credit Risk:** Also called counter party or default risk, this risk involves non-fulfilment of obligation by the counter party.

While, financial derivatives can be used to hedge the market risk, credit derivatives emerged out to mitigate the credit risk. Accordingly, the credit derivative is a mechanism whereby the risk is transferred from the risk averse investor to those who wish to assume the risk.

Although there are number of credit derivative products but in this chapter, we shall discuss two types of credit Derivatives 'Collateralised Debt Obligation' and 'Credit Default Swap'.

8.1 Collateralized Debt Obligations (CDOs)

While in securitization the securities issued by SPV are backed by the loans and receivables the CDOs are backed by pool of bonds, asset backed securities, REITs, and other CDOs. Accordingly, it covers both Collateralized Bond Obligations (CBOs) and Collateralized Loan Obligations (CLOs).

8.1.1 Types of CDOs

The various types of CDOs are as follows:

(a) Cash Flow Collateralized Debt Obligations (Cash CDOs): Cash CDO is CDO which is backed by cash market debt or securities which normally have low risk weight. This structure mainly relies on the collateral's risk weight and collateral's ability to generate sufficient cash to pay off the securities issued by SPV.

(b) Synthetic Collateralized Debt Obligations: It is similar to Cash Flow CDOs but with the difference that instead of transferring ownerships of collateral to SPV (a separate legal entity), synthetic CDOs are structured in such a manner that credit risk is transferred by the originator without actual transfer of assets.

Normally the structure resembles the hedge funds where in the value of portfolio of CDO is dependent upon the value of collateralized instruments and market value of CDOs depends on the portfolio manager's ability to generate adequate cash and meeting the cash flow obligations (principal and interest) in timely manner.

While in cash CDO the collateral assets are moved away from Balance Sheet, in synthetic CDO there is no actual transfer of assets instead economic effect is transferred.

This effect of transfer economic risk is achieved by creating provision for Credit Default Swap (CDS) or by issue of Credit Linked Notes (CLN), a form of liability.

Accordingly, this structure is mainly used to hedge the risk rather than balance sheet funding. Further, for banks, this structure also allows the customer's relations to be unaffected. This was started mainly by banks who want to hedge the credit risk but not interested in taking administrative burden of sale of assets through securitization.

Technically, speaking synthetic CDO obtain regulatory capital relief benefits vis-à-vis cash CDOs. Further, they are more popular in European market due to the reason of less legal documentation requirements. Synthetic CDOs can also be categorized as follows:

- (i) Unfunded: - It will be comprised only CDs.
- (ii) Fully Funded: - It will be through issue of Credit Linked Notes (CLN).
- (iii) Partially Funded: - It will be partially through issue of CLN and partially through CDs.

(c) **Arbitrage CDOs:** Basically, in Arbitrage CDOs, the issuer captures the spread between the return realized collateral underlying the CDO and cost of borrowing to purchase these collaterals. In addition to this issuer also collects the fee for the management of CDOs. This arbitrage arises due to acquisition of relatively high yielding securities with large spread from open market.

8.1.2 Risks involved in CDOs

CDOs are structured products and just like other financial products are also subject to various types of Risk.

The main types of risk associated with investment in CDOs are as follows:

(a) **Default Risk:** - Also called 'credit risk', it emanates from the default of underlying party to the instruments. The prime sufferers of these types of risks are equity or junior tranche in the waterfall.

(b) **Interest Rate Risk:** - Also called Basis risk and mainly arises due to different basis of interest rates. For example, asset may be based on floating interest rate but the liability may be based on fixed interest rates. Though this type of risk is quite difficult to manage fully but commonly used techniques such as swaps, caps, floors, collars etc. can be used to mitigate the interest rate risk.

(c) **Liquidity Risk:** - Another major type of risk by which CDOs are affected is liquidity risks as there may be mismatch in coupon receipts and payments.

(d) **Prepayment Risk:** - This risk results from unscheduled or unexpected repayment of principal amount underlying the security. Generally, this risk arises in case assets are subject to fixed rate of interest and the debtors have a call option. Since, in case of falling interest rates they may pay back the money.

(e) **Reinvestment Risk:** - This risk is generic in nature as the CDO manager may not find adequate opportunity to reinvest the proceeds when allowed for substitutions.

(f) **Foreign Exchange Risk:** - Sometimes CDOs are comprised of debts and loans from countries other than the country of issue. In such a case, in addition to above mentioned risks, CDOs are also subject to the foreign exchange rate risk.

8.2 Credit Default Swaps (CDSs)

It is a combination of following 3 words:

Credit : Loan given

Default : Non payment

Swap : Exchange of Liability or Risk

Accordingly, CDS can be defined as an insurance (not in stricter sense) against the risk of default on a debt which may be debentures, bonds etc.

Under this arrangement, one party (called buyer) needing protection against the default pays a periodic premium to another party (called seller), who in turn assumes the default risk. Hence, in case default takes place then there will be settlement and in case no default takes place no cash flow will accrue to the buyer alike option contract and agreement is terminated. Although it resembles the options but since element of choice is not there it more resembles the swap arrangements.

Amount of premium mainly depends on the price of underlying and especially when the credit risk is more.

8.2.1 Main Features of CDS

The main features of CDS are as follows:

- (a) CDS is a non-standardized private contract between the buyer and seller. Therefore, it is covered in the category of Forward Contracts.
- (b) They are normally not traded on any exchange and hence remains free from the regulations of Governing Body.
- (c) The International Swap and Derivative Association (ISAD) publishes the guidelines and general rules used normally to carry out CDS contracts.
- (d) CDS can be purchased from third party to protect itself from default of borrowers.
- (e) Similarly, an individual investor who is buying bonds from a company can purchase CDS to protect his investment from insolvency of that company. Thus, this increases the level of confidence of investor in Bonds purchased.
- (f) The cost or premium of CDS has a positive relationship with risk attached with loans. Therefore, higher the risk attached to Bonds or loans, higher will be premium or cost of CDS.
- (g) If an investor buys a CDS without being exposed to credit risk of the underlying bond issuer, it is called "naked CDS".

8.2.2 Uses of Credit Default Swap

Following are the main purposes for which CDS can be used:

- (a) **Hedging-** Main purpose of using CDS is to neutralize or reduce a risk to which CDS is exposed to. Thus, by buying CDS, risk can be passed on to CDS seller or writer.
- (b) **Arbitrage-** It involves buying a CDS and entering into an asset swap. For example, a fixed coupon payment of a bond is swapped against a floating interest stream.
- (c) **Speculation-** CDS can also be used to make profit by exploiting price changes. For example, a CDS writer assumed risk of default, will gain from contract if credit risk does not materialize during the tenure of contract or if compensation received exceeds potential payout.

8.2.3 Parties to CDS

In a CDS at least three parties are involved which are as follows:

- i. **The initial borrowers-** It is also called a 'reference entity', which are owing a loan or bond obligation.
- ii. **Buyer-** It is also called 'investor' i.e. the buyer of protection. The buyer will make regular payment to the seller for the protection from default or credit event of reference entity.
- iii. **Seller-** It is also called 'writer' of the CDS and makes payment to buyer in the event of credit event of reference entity. It receives a regular pay off from the buyer of CDS.

Example

Suppose BB Corp. buys CDS from SS Bank for the Bonds amounting \$ 10 million of Danger Corp. In such case, the BB Corp. will become the buyer, SS Bank becomes seller and Danger Corp. becomes the reference entity. BB Corp. will make regular payment to SS Bank of the premium and if Danger Corp. defaults on its debts, the BB Corp. will receive one time payment and CDS contract is terminated.

8.2.4 Settlement of CDS

Broadly, following are main ways of settlement of CDS.

- (i) **Physical Settlement** – This is the traditional method of settlement. It involves the delivery of Bonds or debts of the reference entity by the buyer to the seller and seller pays the buyer the par value.

For example, as mentioned above suppose Danger Corp. defaults then SS Bank will pay \$ 10 Million to BB Corp. and BB Corp will deliver \$10 Million face value of Bonds to SS Bank.

- (ii) **Cash Settlement-** Under this arrangement seller pays the buyer the difference between par value and the market price of a debt (whatever may be the market value) of the reference entity. Continuing the above example suppose, the market value of Bonds is 30%, as market is of belief that bond holder will receive 30% of the money owed in case company goes into liquidation. Thus, the SS Bank shall pay BB Corp. \$ 10 Million - \$3 million (100% - 30%) = \$ 7 Million.

To make Cash settlement even more transparent, the credit event auction was developed. Credit event auction set a price for all market participants that choose to cash settlement.

9. REAL OPTIONS

Real Options methodology is an approach to capital budgeting that relies on Option Pricing theory to evaluate projects. Insights from option-based analysis can improve estimates of project value and, therefore, has potential, in many instances to significantly enhance project management. However, Real options approach is intended to supplement, and not replace, capital budgeting analyses based

on standard Discounted Cash Flow (DCF) methodologies that has been discussed at Intermediate Level.

9.1 How Real Option is different from Financial Option

Before we further discuss the various aspects of Real Option it is important to first understand How Real Option is different from Financial Option which is as follows:

Basis	Financial Options	Real Options
Underlying	Have underlying assets that are normally traded in the market i.e. shares, stocks, bonds, commodity etc.	Have underlying the projects that are not traded in the market.
Pay-off	In most of the cases it is specified in the contracts and hence is fixed.	It is estimated from the project cash flows and hence can be varied.
Exercise Period	Mostly the period of these options is short and can go maximum upto 1 year.	The period of these options mostly starts from the end of 1st year and higher than the Financial Options.
Approach	Since these options are normally traded in the market they are "Priced".	Since these options are used to make decisions, they are "Valued".

The following is a list of options that may exist in a capital budgeting project.

Long call:

- Right to invest at some future date, at a certain price.
- Generally, any flexibility to invest, to enter a business, to expand a business.

Long put:

- Right to sell at some future date at a certain price.
- Right to abandon at some future date at zero or certain price.
- Generally, any flexibility to disinvest, to exit from a business.

Short call:

- Promise to sell if the counterparty wants to buy.
- Generally, any commitment to disinvest upon the action of another party.

Short put:

- Promise to buy if the counterparty wants to sell.
- Generally, any commitment to invest upon the action of another party.

9.2 Valuation of Real Options

The methods employed to valuation of real options are same as used in valuation of Financial Options. However, sometimes it becomes difficult to identify the value of certain inputs. The various type of cash flows associated with Real Option can be analysed with cash flows involved in financial options and methods used in financial options can be employed easily.

Broadly, following methods are employed for Valuation of Financial Options.

- (a) Binomial Model
- (b) Risk Neutral Method
- (c) Black-Scholes Model

Note: Above 3 methods have been discussed in detail in earlier section.

9.3 Type of Real Options

Following are broad type of Real Options:

9.3.1 Growth Options

Sometimes it may be possible that some projects have a negative or insignificant NPV even then managers may be interested in accepting the project as it may enable companies to find considerable profitability and add values in future. This case of real option is like *European Call Option*.

Some of the examples of such options are as follows:

- Investment in R&D activities
- Heavy expenditure on advertisement
- Initial investment in foreign market to expand business in future
- Acquiring making rights
- Acquisition of vacant plot with an intention to develop it in future.

The purposes of making such investments are as follows:

- Defining the competitive position of firm hence it is called strategic investments.
- Gaining knowledge about project's from profitability.
- Providing the manufacturing and making flexibility to the firm.

Illustration 4

ABC Ltd. is a pharmaceutical company possessing a patent of a drug called 'Aidrex', a medicine for aids patient. Being an approach drug ABC Ltd. holds the right of production of drugs and its marketing. The period of patent is 15 years after which any other pharmaceutical company produce the drug with same formula. It is estimated that company shall require to incur \$ 12.5 million for

development and market of the drug. As per a survey conducted the expected present value of cashflows from the sale of drug during the period of 15 years shall be \$ 16.7 million. Cash flow from the previous similar type of drug have exhibited a variance of 26.8% of the present value of cashflows. The current yield on Treasury Bonds of similar duration (15 years) is 7.8%.

Determine the value of the patent.

Given

$$\ln(1.336) = 0.2897$$

$$e^{1.0005} = 0.3677 \text{ and } e^{-1.17} = 0.3104$$

Solution

The given solution is like valuation of stock option wherein delay in introduction of drug 'Aidrex' shall cause the loss of cashflow which is like payment of dividend.

To value the patent, we shall use Black Scholes Model for option pricing as follows:

Inputs

S (Spot Price) = The Present Value of Cashflows = \$16.7 million

E (Exercise Price) = Cost of Development Formula = \$ 12.5 million

σ^2 (Variance of Cash flow) = 26.8% i.e. 0.27

R (Risk Free Rate of Return) = 7.8%

D (Expected cost of Delays) = $\frac{1}{15} = 0.0667$ i.e. 6.67%

Value call option

$$C = Se^{-df} - Ee^{-rt} N(d_2)$$

$$d_1 = \frac{\ln(S/E) + [R - D + (\frac{1}{2})\sigma^2] t}{\sigma\sqrt{t}}$$

$$d_2 = d_1 - \sigma\sqrt{t}$$

Accordingly,

$$d_1 = \frac{\ln(16.7/12.5) + [0.078 - 0.0667 + (\frac{1}{2})(0.268)] 15}{\sqrt{0.268} \sqrt{15}}$$

$$D_1 = \frac{0.2897 + (0.1453)15}{0.5177 \times 3.8730}$$

$$D_1 = \frac{0.2897 + 2.1795}{2.005}$$

$$D_1 = \frac{2.4692}{2.005} = 1.2315$$

$$d_2 = 1.2315 - 2.005$$

$$d_2 = -0.7735$$

$$N(d_1) = 0.8910$$

$$N(d_2) = 0.2196$$

Value of Patent

$$= 16.7 \times e^{-0.0667 \times 15} \times 0.8910 - 12.5 \times e^{-0.078 \times 15} \times 0.2196$$

$$= 16.7 \times 0.3677 \times 0.8910 - 12.5 \times 0.3104 \times 0.2196$$

$$= 5.471 - 0.852 = 4.619$$

Thus, the value of patents is \$ 4.619 million

9.3.2 Abandonment Option

As we have already studied in the topic of Capital Budgeting that once funds have been committed in any Capital Budgeting project it cannot be reverted without incurring a heavy loss. However, in some cases due to change in economic conditions the firm may like to opt for abandoning the project without incurring further huge losses.

The option to abandon the project is similar to an *American Put Option* where option to abandon the project shall be exercised if value derived from project's assets is more than PV of continuing the project for one or more period.

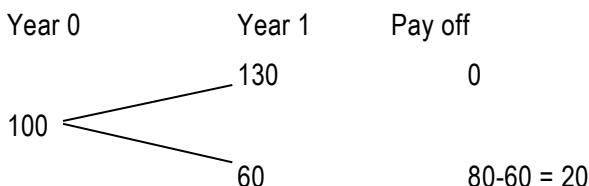
Illustration 5

IPL already in production of Fertilizer is considering a proposal of building a new plant to produce pesticides. Suppose the PV of proposal is ₹ 100 crore without the abandonment option. However, if market conditions for pesticide turns out to be favourable the PV of proposal shall increase by 30%. On the other hand, market conditions remain sluggish the PV of the proposal shall be reduced by 40%. In case company is not interested in continuation of the project it can be disposed of for ₹ 80 crore.

If the risk-free rate of interest is 8% then what will be value of abandonment option.

Solution

Decision Tree showing pay off



First of all we shall calculate probability of high demand (P) using risk neutral method as follows:

$$8\% = p \times 30\% + (1-p) \times (-40\%)$$

$$0.08 = 0.30 p - 0.40 + 0.40p$$

$$p = \frac{0.48}{0.70} = 0.686$$

The value of abandonment option will be as follows:

Expected Payoff at Year 1

$$= p \times 0 + [(1-p) \times 20]$$

$$= 0.686 \times 0 + [0.314 \times 20]$$

$$= ₹ 6.28 \text{ crore}$$

Since expected pay off at year 1 is ₹ 6.28 crore. Present value of expected pay off will be:

$$\frac{6.28}{1.08} = ₹ 5.81 \text{ crore.}$$

This is the value of abandonment option (Put Option).

9.3.3 Timing Option

In traditional capital budgeting the project can either be accepted or rejected, implying that this will be undertaken or forever not. However, in real life situation sometimes a third choice also arises i.e., delay the decision until later, i.e., option when to invest. Possible reasons for this delay may be availability of better information or ideas later. This case of real option is like *American Call Option*.

Illustration 6

Suppose MIS Ltd. is considering installation of solar electricity generating plant for light the staff quarters. The plant shall cost ₹ 2.50 crore and shall lead to saving in electricity expenses at the current tariff by ₹ 21 lakh per year forever.

However, with change in Government in state, the rate of electricity is subject to change. Accordingly, the saving in electricity can be of ₹ 12 lakh or ₹ 35 lakh per year and forever.

Assuming WACC of MIS Ltd. is 10% and risk-free rate of rate of return is 8%.

Decide whether MIS Ltd. should accept the project or wait and see.

Solution

Here we shall evaluate NPV in two possible situations:

(1) As on Today

At cost of Capital of 10%, the value of saving forever = $\frac{\text{₹ 21 lakhs}}{0.10} = \text{₹ 2.1 crore}$

NPV = ₹ 2.1 crore - ₹ 2.5 crore = - ₹ 0.4 crore

Since NPV is negative, it does not worth to accept the project.

(2) After one Year

After one year these are two possible situations, either rate of electricity decreases or increase.

(a) If price of electricity increases

At cost of Capital of 10%, the value of saving forever = $\frac{\text{₹35 lakh}}{0.10} = \text{₹ 3.50 crore}$

The position of the NPV will be as follows:

= ₹ 3.50 crore - ₹ 2.50 crore = ₹ 1 crore

And Rate of Return will be $(3.5/2.5) - 1 = 0.40$ is 40%

(b) If the price of electricity decreases, then value of saving forever will be

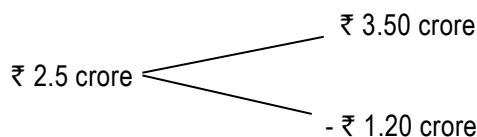
At cost of Capital of 10%, the value of saving forever = $\frac{12 \text{ lakh}}{0.10} = \text{₹ 1.20 crore}$

The position of the NPV will be as follows:

= ₹ 1.20 crore - ₹ 2.5 crore = - ₹ 1.3 crore

and Rate of Return will be $(1.2/2.5) - 1 = -0.52$ i.e. - 52.00%

Diagrammatically it can be shown below



Let prob. of price increase be p . Then using Risk Neutral Method, the risk-free rate of return will be equal to expected saving as follows:

$$p \times 0.40 + (1-p) (-0.52) = 0.08$$

$$0.40p - 0.52 + 0.52p = 0.08$$

$$0.92p = 0.60$$

$$p = 0.652$$

Hence, expected pay off = $0.652 \times ₹ 1 \text{ crore} + 0.348 \times (- ₹ 1.30 \text{ crore}) = ₹ 19.96 \text{ lakh}$.

PV of Pay off after one year = $₹ 19.96 \text{ lakh} / 1.08 = ₹ 18.48 \text{ lakh}$.

Thus, it shall be advisable to wait and see as NPV may turn out to be positive after one year.

10. COMMODITY DERIVATIVES

Trading in commodity derivatives first started to protect farmers from the risk of the value of their crop going below the cost price of their produce. Derivative contracts were offered on various agricultural products like cotton, rice, coffee, wheat, pepper etc.

The first organized exchange, the Chicago Board of Trade (CBOT) -- with standardized contracts on various commodities -- was established in 1848. In 1874, the Chicago Produce Exchange - which is now known as Chicago Mercantile Exchange (CME) was formed.

CBOT and CME are two of the largest commodity derivatives exchanges in the world.

10.1 Necessary Conditions to Introduce Commodity Derivatives

The commodity characteristic approach defines feasible commodities for derivatives trading based on an extensive list of required commodity attributes. It focuses on the technical aspects of the underlying commodity. The following attributes are considered crucial for qualifying for the derivatives trade:

- 1) a commodity should be durable and it should be possible to store it;
- 2) units must be homogeneous;
- 3) the commodity must be subject to frequent price fluctuations with wide amplitude; supply and demand must be large;
- 4) supply must flow naturally to market and there must be breakdowns in an existing pattern of forward contracting.

The first attribute, durability and storability, has received considerable attention in commodity finance, since one of the economic functions often attributed to commodity derivatives markets is the temporal allocation of stocks. The commodity derivatives market is an integral part of this storage scenario because it provides a hedge against price risk for the carrier of stocks.

Since commodity derivatives contracts are standardized contracts, this approach requires the underlying product to be homogeneous, the second attribute, so that the underlying commodity as defined in the commodity derivatives contract corresponds with the commodity traded in the cash market. This allows for actual delivery in the commodity derivatives market.

The third attribute, a fluctuating price, is of great importance, since firms will feel little incentive to insure themselves against price risk if price changes are small. A broad cash market is important because a large supply of the commodity will make it difficult to establish dominance in the market

place and a broad cash market will tend to provide for a continuous and orderly meeting of supply and demand forces.

The last crucial attribute, breakdowns in an existing pattern of forward trading, indicates that cash market risk will have to be present for a commodity derivatives market to come into existence. Should all parties decide to eliminate each and every price fluctuation by using cash forward contracts for example, a commodity derivatives market would be of little interest.

A commodity derivative must reflect the commercial movement of a commodity both loosely and broadly enough, so that price distortions will not be a result of specifications in the contract. To warrant hedging, the contract must be as close a substitute for the cash commodity as possible. Hedging effectiveness is an important determinant in explaining the success of commodity derivatives and as a result considerable attention has been paid to the hedging effectiveness of commodity derivatives.

The total set of customer needs concerning commodity derivatives is differentiated into instrumental needs and convenience needs (see Figure 1). Customers will choose that “service-product” (futures, options, cash forwards, etc.) which best satisfy their needs, both instrumental and convenience, at an acceptable price.

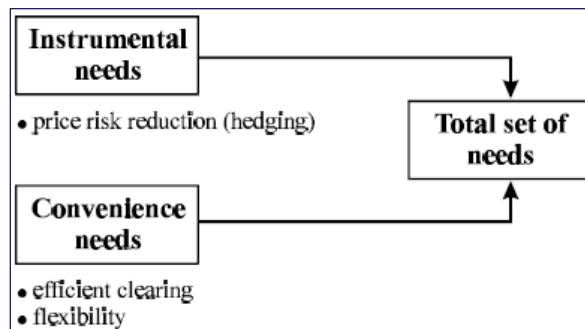


FIGURE 1

Instrumental needs are the hedgers' needs for price risk reduction. Hedgers wish to reduce, or, if possible, eliminate portfolio risks at low cost. The instrumental needs are related to the core service of the commodity derivatives market, which consists of reducing price variability to the customer. Not only do hedgers wish to reduce price risk, they also desire flexibility in doing business, easy access to the market, and an efficient clearing system. These needs are called convenience needs. They deal with the customer's need to be able to use the core service provided by the exchange with relative ease. The extent to which the commodity derivatives exchange is able to satisfy convenience needs determines the process quality. The service offering is not restricted to the core service, but has to be complemented by so-called peripheral services.

10.2 Investing in Commodity Derivatives

Commodity derivatives, which were traditionally developed for risk management purposes, are now growing in popularity as an investment tool. Most of the trading in the commodity derivatives market is being done by people who have no need for the commodity itself.

They just speculate on the direction of the price of these commodities, hoping to make money if the price moves in their favour.

The commodity derivatives market is a direct way to invest in commodities rather than investing in the companies that trade in those commodities.

For example, an investor can invest directly in a steel derivative rather than investing in the shares of Tata Steel. It is easier to forecast the price of commodities based on their demand and supply forecasts as compared to forecasting the price of the shares of a company which depend on many other factors than just the demand and supply of the products they manufacture and sell or trade in.

Also, derivatives are much cheaper to trade in as only a small sum of money is required to buy a derivative contract.

Let us assume that an investor buys a tonne of soybean for ₹ 8,700 in anticipation that the prices will rise to ₹ 9,000 by June 30, 2013. He will be able to make a profit of ₹ 300 on his investment, which is 3.4%. Compare this to the scenario if the investor had decided to buy soybean futures instead.

Before we look into how investment in a derivative contract works, we must familiarize ourselves with the buyer and the seller of a derivative contract. A buyer of a derivative contract is a person who pays an initial margin to buy the right to buy or sell a commodity at a certain price and a certain date in the future.

On the other hand, the seller accepts the margin and agrees to fulfill the agreed terms of the contract by buying or selling the commodity at the agreed price on the maturity date of the contract.

Now let us say the investor buys soybean futures contract to buy one tonne of soybean for ₹ 8,700 (exercise price) on November 30, 2013. The contract is available by paying an initial margin of 10%, i.e. ₹ 870. Note that the investor needs to invest only ₹ 870 here.

On November 30, 2013, the price of soybean in the market is, say, ₹ 9,000 (known as Spot Price -- Spot Price is the current market price of the commodity at any point in time).

The investor can take the delivery of one tonne of soybean at ₹ 8,700 and immediately sell it in the market for ₹ 9,000, making a profit of ₹ 300. So the return on the investment of ₹ 870 is 34.5%. On the contrary, if the price of soybean drops to ₹ 8,400 the investor will end up making a loss of 34.5%.

If the investor wants, instead of taking the delivery of the commodity upon maturity of the contract, an option to settle the contract in cash also exists. Cash settlement comprises exchange of the difference in the spot price of the commodity and the exercise price as per the futures contract.

At present, the option of cash settlement lies only with the seller of the contract. If the seller decides to make or take delivery upon maturity, the buyer of the contract has to fulfill his obligation by either taking or making delivery of the commodity, depending on the specifications of the contract.

In the above example, if the seller decides to go for cash settlement, the contract can be settled by the seller by paying ₹ 300 to the buyer, which is the difference in the spot price of the commodity and the exercise price. Once again, the return on the investment of ₹ 870 is 34.5%.

The above example shows that with very little investment, the commodity futures market offers scope to make big bucks. However, trading in derivatives is highly risky because just as there are high returns to be earned if prices move in favour of the investors, an unfavourable move results in huge losses.

The most critical function in a commodity derivatives exchange is the settlement and clearing of trades. Commodity derivatives can involve the exchange of funds and goods. The exchanges have a separate body to handle all the settlements, known as the clearing house.

For example, the holder of a futures contract to buy soybean might choose to take delivery of soya bean rather than closing his position before maturity. The function of the clearing house or clearing organization, in such a case, is to take care of possible problems of default by the other party involved by standardizing and simplifying transaction processing between participants and the organization.

Certain special characteristics/benefits of Commodity derivatives trading are:

- ❖ To complement investment in companies that use commodities;
- ❖ To invest in a country's consumption and production;
- ❖ No dividends, only returns from price increases.

In spite of the surge in the turnover of the commodity exchanges in recent years, a lot of work in terms of policy liberalization, setting up the right legal system, creating the necessary infrastructure, large-scale training programs, etc. still needs to be done in order to catch up with the developed commodity derivative markets.

10.3 Commodity Market

Commodity markets in early time are believed to have originated in Sumer where small baked clay tokens in the shape of sheep or goats were used in trade. Sealed in clay vessels with a certain number of such tokens, with that number written on the outside, they represented a promise to deliver that number.

In modern times, commodity markets represent markets where raw or primary products are exchanged. These raw commodities are traded on regulated, commodity exchanges in which they are bought and sold in standardized contracts.

Some of the advantages of commodity markets are:

- ❖ Most money managers prefer derivatives to tangible commodities;

- ❖ Less hassle (delivery, etc);
- ❖ Allows indirect investment in real assets that could provide an additional hedge against inflation risk.

10.4 Commodity Futures

Almost all the commodities were allowed to be traded in the futures market from April 2003. To make trading in commodity futures more transparent and successful, multi-commodity exchanges at national level were also conceived and these next generation exchanges were allowed to start futures trading in commodities on-line.

The process of trading commodities is also known as Futures Trading. Unlike other kinds of investments, such as stocks and bonds, when you trade futures, you do not actually buy anything or own anything. You are speculating on the future direction of the price in the commodity you are trading. This is like a bet on future price direction. The terms "buy" and "sell" merely indicate the direction you expect future prices will take.

If, for instance, you were speculating in corn, you would buy a futures contract if you thought the price would be going up in the future. You would sell a futures contract if you thought the price would go down. For every trade, there is always a buyer and a seller. Neither person has to own any corn to participate. He must only deposit sufficient capital with a brokerage firm to ensure that he will be able to pay the losses if his trades lose money.

On one side of a transaction may be a producer like a farmer. He has a field full of corn growing on his farm. It won't be ready for harvest for another three months. If he is worried about the price going down during that time, he can sell futures contracts equivalent to the size of his crop and deliver his corn to fulfill his obligation under the contract. Regardless of how the price of corn changes in the three months until his crop will be ready for delivery, he is guaranteed to be paid the current price.

On the other side of the transaction might be a producer such as a cereal manufacturer who needs to buy lots of corn. The manufacturer, such as Kellogg, may be concerned that in the next three months the price of corn will go up, and it will have to pay more than the current price. To protect against this, Kellogg can buy futures contracts at the current price. In three months, Kellogg can fulfill its obligation under the contracts by taking delivery of the corn. This guarantees that regardless of how the price moves in the next three months, Kellogg will pay no more than the current price for its commodity.

In addition to agricultural commodities, there are futures for financial instruments and intangibles such as currencies, bonds and stock market indexes. Each futures market has producers and consumers who need to hedge their risk from future price changes. The speculators, who do not actually deal in the physical commodities, are there to provide liquidity. This maintains an orderly market where price changes from one trade to the next are small.

Rather than taking delivery or making delivery, the speculator merely offsets his position at some time before the date set for future delivery. If price has moved in the right direction, he will earn profit, if not, he will lose.

Advantages of Commodity Futures

Some of the advantages of commodity futures are:

- Easiest and cheapest way to invest in commodities
- 3 Major Categories like Agricultural products (soft commodities) –fibers, grains, food, livestock; Energy – crude oil, heating oil, natural gas; and Metals – copper, aluminium, gold, silver, platinum

10.5 Commodity Swaps

Producers need to manage their exposure to fluctuations in the prices for their commodities. They are primarily concerned with fixing prices on contracts to sell their produce. A gold producer wants to hedge his losses attributable to a fall in the price of gold for his current gold inventory. A cattle farmer wants to hedge his exposure to changes in the price of his livestock.

End-users need to hedge the prices at which they can purchase these commodities. A university might want to lock in the price at which it purchases electricity to supply its air conditioning units for the upcoming summer months. An airline wants to lock in the price of the jet fuel it needs to purchase in order to satisfy the peak in seasonal demand for travel.

Speculators are funds or individual investors who can either buy or sell commodities by participating in the global commodities market. While many may argue that their involvement is fundamentally destabilizing, it is the liquidity they provide in normal markets that facilitates the business of the producer and of the end-user.

Why would speculators look at the commodities markets? Traditionally, they may have wanted a hedge against inflation. If the general price level is going up, it is probably attributable to increases in input prices. Or, speculators may see tremendous opportunity in commodity markets. Some analysts argue that commodity markets are more technically-driven or more likely to show a persistent trend.

10.5.1 Types of Commodity Swaps

There are two types of commodity swaps: fixed-floating or commodity-for-interest.

(a) Fixed-Floating Swaps: They are just like the fixed-floating swaps in the interest rate swap market with the exception that both indices are commodity based indices.

General market indices in the international commodities market with which many people would be familiar include the S&P Goldman Sachs Commodities Index (S&PGSCI) and the Commodities Research Board Index (CRB). These two indices place different weights on the various commodities so they will be used according to the swap agent's requirements.

(b) **Commodity-for-Interest Swaps:** They are similar to the equity swap in which a total return on the commodity in question is exchanged for some money market rate (plus or minus a spread).

10.5.2 Valuing Commodity Swaps

In pricing commodity swaps, we can think of the swap as a strip of forwards, each priced at inception with zero market value (in a present value sense). Thinking of a swap as a strip of at-the-money forwards is also a useful and intuitive way of interpreting interest rate swaps or equity swaps.

Commodity swaps are characterized by some peculiarities. These include the following factors for which we must account:

- (i) The cost of hedging;
- (ii) The institutional structure of the particular commodity market in question;
- (iii) The liquidity of the underlying commodity market;
- (iv) Seasonality and its effects on the underlying commodity market;
- (v) The variability of the futures bid/offer spread;
- (vi) Brokerage fees; and
- (vii) Credit risk, capital costs and administrative costs.

Some of these factors must be extended to the pricing and hedging of interest rate swaps, currency swaps and equity swaps as well. The idiosyncratic nature of the commodity markets refers to the limited number of participants in these markets (naturally begging questions of liquidity and market information), the unique factors driving these markets, the inter-relations with cognate markets and the individual participants in these markets.

10.6 Hedging with Commodity Derivatives

Many times, when using commodity derivatives to hedge an exposure to a financial price, there is not one exact contract that can be used to hedge the exposure. If you are trying to hedge the value of a particular type of refined chemical derived from crude oil, you may not find a listed contract for that individual product. You will find an over-the-counter price if you are lucky.

They look at the correlation (or the degree to which prices in the individual chemical trade with respect to some other more liquid object, such as crude oil) for clues as to how to price the OTC product that they offer you. They make assumptions about the stability of the correlation and its volatility and they use that to "shade" the price that they show you.

Correlation is an un-hedgable risk for the OTC market maker, though. There is very little that he can do if the correlation breaks down.

For example, if all of a sudden, the price for your individual chemical starts dropping faster than the correlation of the chemical's price with crude oil suggests it should, the OTC dealer has to start dumping more crude oil in order to compensate.

It is a very risky business. The OTC market maker's best hope is to see enough "two-way" business involving end-users and producers so that his exposure is "naturally" hedged by people seeking to benefit from price movement in either direction.

Commodity swaps and commodity derivatives are a useful and important tool employed by most leading energy, chemical and agricultural corporations in today's world.

Note: Please note other forms of Swaps such as Currency Swap and Interest Rate Swap have been discussed in the respective chapters.

11. WEATHER DERIVATIVES

While there are some companies whose performance are completely unaffected by weather but there are many companies whose performance is liable to be adversely affected by the weather. For example, airline companies, juice manufacturing companies etc. Especially farmers are highly exposed to weather. To hedge this risk, instruments are required like instruments are used to hedge foreign exchange and other financial risks. This led to rise of a new class of financial instruments - Weather Derivatives- has been introduced to enable businesses to manage their volumetric risk resulting from unfavourable weather patterns. Just as traditional contingent claims, whose payoffs depend upon the price of some fundamental, a weather derivative has its underlying "asset", a weather measure. "Weather", of course, has several dimensions: rainfall, temperature, humidity, wind speed, etc. There is a fundamental difference between weather and traditional derivative contracts concerning the hedge objective. The underlying of weather derivatives is represented by a weather measure, which influences the trading volume of goods. This, in turn, means that the primary objective of weather derivatives is to hedge volume risk, rather than price risk, that results from a change in the demand for goods due to a change in weather.

The first weather transaction was executed in 1997 in the Over the Counter (OTC) market by Aquila Energy Company. The market was jump started during the warm Midwest/Northeast El Nino winter of 1997-1998, when the unusual higher temperatures induced companies to protect themselves from significant earnings decline. Since then, the market has rapidly expanded.

Weather derivatives represent an alternative tool to the usual insurance contract by which firms and individuals can protect themselves against losing out because of unforeseen weather events. Many factors differentiate weather derivatives from insurance contracts. The main difference is due to the type of coverage provided by the two instruments. Insurance provides protection to extreme, low probability weather events, such as earthquakes, hurricanes and floods, etc. Instead, derivatives can also be used to protect the holder from all types of risks, including uncertainty in normal conditions that are much more likely to occur. This is very important for industries closely related to weather conditions for which less dramatic events can also generate huge losses.

Like other derivatives a Weather derivative is a contract between a buyer and a seller wherein the seller of a weather derivative receives a premium from a buyer with the understanding that the seller

will provide a monetary amount in case the buyer suffers any financial loss due to adverse weather conditions. In case no adverse weather condition occurs, then the seller makes a profit through the premium received.

Pricing a weather derivative is quite challenging as it cannot be stored and following issues are involved: -

- ❖ Data: - The reliability of data is a big challenge as the availability of data quite differs from one country to another and even agency to agency within a country.
- ❖ Forecasting of weather: - Though various models can be used to make short term and long-term predictions about evolving weather conditions but it is difficult to predict the future weather behaviour as it is governed by various dynamic factors. Generally, forecasts address seasonal levels but not the daily levels of temperature.
- ❖ Temperature Modelling: - Temperature is one of the important underlying for weather derivatives. The temperature normally remains quite constant across different months in a year. Hence, there is no such Model that can claim perfection and universality.

12. ELECTRICITY DERIVATIVES

The purchase and sale of power in India takes place through state-owned distribution companies which enter into Power Purchase Agreements (PPAs) with power generators. Such long-term contracts (usually around 20-25 years) are needed given the high capital and operational expenditure requirements of these projects.

Since electricity spot prices in India, are generally volatile, due to smaller market size and other various dynamic factors such as change in fuel supply positions, weather conditions, transmission congestion, variation in RE generation, and other physical attributes of production and distribution there is a need for hedging instruments that reduces price risk exposures for market participants i.e., generators, buyers and load serving entities.

As discussed earlier the derivative instruments can be used to hedge the risk of price volatility derivative contracts linked with spot electricity prices as underlying can help market participants to hedge from price risk variations. This will help the buyer to pay a fixed price irrespective of variation in spot electricity prices as variations are absorbed by derivative instruments.

Like other derivatives the vanilla forms of electricity derivatives are:

- (i) forwards,
- (ii) futures, and
- (iii) swaps.

Not only that being traded either on the exchanges or over the counters, these power contracts play the primary roles in offering future price discovery and price certainty to generators, distributing companies and other buyers.

12.1 Electricity Forwards

Electricity Forward contracts represent the obligation to buy or sell a fixed amount of electricity at a pre-specified contract price, known as the forward price, at a certain time in the future (called maturity or expiration time). Like financial and commodity forward contracts, electricity forwards are custom-tailored supply contracts between a buyer and a seller, where the buyer is obligated to take power and the seller is obligated to supply. The payoff of a forward contract promising to deliver one unit of electricity at price F at a future time T is: Payoff of a Forward Contract = $(ST - F)$; where ST is the electricity spot price at time T .

Although the payoff function appears to be similar as pay-off in case of any financial forwards, electricity forwards differ from other financial and commodity forward contracts in the sense that the underlying electricity is a different commodity at different times. The settlement price ST is usually calculated based on the average price of electricity over the delivery period at the maturity day "T".

12.2 Electricity Futures

Electricity Futures are contracts for the delivery of a certain quantity of electricity at a specified price and a specified time in the future, sellers can sell a proportion of their production in the future market, while consumers can buy a specific amount of the power they need.

Like other financial futures contracts, Electricity futures contracts are standardized contracts in terms of trading locations, transaction requirements and settlement procedures. The apparent difference between the specifications of electricity futures and those of forwards is the quantity of power to be delivered. The delivery quantity specified in electricity futures contracts is often significantly smaller than that in forward contracts.

Like difference between Financial Futures and Forwards discussed earlier the electricity futures are exclusively traded on the organized exchanges and electricity forwards are usually traded over the counter. As a result, the electricity futures prices more transparent than forward prices being reflective of higher market consensus. Similar to financial futures most electricity futures contracts are settled by financial payments rather than physical delivery resulting in lowering of the transaction costs. In addition, credit risks and monitoring costs in trading futures are much lower than those in trading forwards since exchanges implement strict margin requirements to ensure the financial performance of all trading parties. The fact that the gains and losses of Electricity Futures are paid out daily, as opposed to forward contract being cumulated and paid out in a lump sum at maturity time thus reduces the credit risks. Overall, as compared to Electricity Forwards, the advantages of Electricity Futures lie in market consensus, price transparency, trading liquidity, and reduced transaction and monitoring costs though there are limitations of various basis risks associated with the rigidity in futures specification and the limited transaction quantities specified in the contracts.

12.3 Electricity Swap

Electricity Swaps are financial contracts that enable their holders to pay a fixed price for underlying electricity, regardless of the floating electricity price, or vice versa, over the contracted time. They

are typically established for a fixed quantity of power referenced to a variable spot price at either a generator's or a consumer's location. Electricity Swaps are widely used in providing short-to-medium term price certainty for up to a couple of years. Similar to financial swaps, Electricity Swap can be considered as a strip of electricity forwards with multiple settlement dates and identical forward prices for each settlement.

Another variant of Electricity Swap is Electricity Locational Basis Swaps wherein a holder of an electricity swap agrees to either pay or receive the difference between a specified futures contract price and another locational spot price of interest for a fixed constant cash flow at the time of the transaction. These swaps are used to lock-in a fixed price at a geographic location that is different from the delivery point of a futures contract and hence are effective financial instruments for hedging the risk-based on the price difference between power prices at two different physical locations.



13. DERIVATIVE MISHAPS AND LESSONS

From the above discussion it can be seen that while Derivatives can be used for hedging purpose, simultaneously they can also be used for speculation purpose also. Due to this attribute of Financial Derivatives, legendary investor Warren Buffet believes that the derivatives are financial weapons of mass destruction. Though there may be many example/cases where derivatives have proven very fatal for various organizations and even brought them to their knees, but we shall keep our discussion limited to some of infamous cases which are as follows:

13.1 Orange County's Case

This case is based on Robert Citron, the treasurer of Orange County a California municipality losing about \$ 2 billion in 1994 having a fund of about 7.5 billion. In this case Treasurer Robert Citron despite the fact having no background in trading of Financial Instrument he used derivative to speculate in Interest rates using yield curve play strategy by arbitraging the difference between long term and short-term rates that by leveraging the position of the Fund which gone very well in the years 1992 and 1993 resulting in major contributor in Income of the Orange County. Due to this reason Citron was selected even though his opponent said the strategy followed was too risky. Not only that to increase his bet on the structure of interest rate yield curve, Citron also used around \$ 2.8 billion of Inverse Floaters (a Structured Note)

Since due to type of strategy followed by Citron in 1992 and 1993 Orange County fund had been earning 300 to 400 basis points i.e. 3-4% above the returns earned by similar funds operated in the State i.e. California, Orange County Fund accepted funds from other municipalities as well. At one time Orange County's Fund stood at almost \$ 7.5 billion. Now Citron also leveraged his position in the Repo market. This practice he followed many times ultimately resulting in County's leveraged position threefold i.e. about \$ 20 billion with \$ 7.50 billion fund. Some of the municipalities realizing this over leveraged position withdrew their funds.

However, this strategy turned sour with a shift in policy of Federal Reserve in 1994, when it made first of six consecutive interest rates rise in the beginning of 1994. As a result, between February

1994 to May 1994 the County had to produce \$ 515 million in cash as Margin to cover its position. When further interest rate rise caused the fund to have a series of huge margin calls from their broker, the reserve of the County started dipping. When it could not meet margin, the lenders started selling the collateral amounting to \$ 10 Billion sending a shock wave in Bond market and prices tumbled. Not only that other bodies who invested their money with County started looking at ways to exit and started withdrawing their money lacking credible assurance. As a result of all this Citron admitted that the County had lost a fund of about \$ 1.5 Billion i.e., 20% of its value and he resigned on 3rd December 1994. Further Board of County declared County as bankrupt on 6th December 1994, to prevent move to investors to withdraw their money.

In 1996, Citron held guilty and sentence a year jail and fined \$ 1,00,000.

13.2 Barings Bank's Case

This is another infamous case of Derivative mishap. Perhaps after this mishap the term 'Operational Risk' gained importance in the world and especially in context of banking business. Further to some extent it can be said that to some extent due to this case the Basel Committee on Banking Supervision (BCBS) introduced concept of Operational risk Capital requirements in Basel II Guidelines.

This case can be considered as one of the best examples of risk that a firm could face if arbitrageur switched to speculation.

Nick Leeson, a Star trader of Barings Banks was carrying out low-risk arbitrage between the Singapore stock Exchange and Osaka Market on Nikkei 225 Futures. This arbitrage involves long position at one exchange where price of Future is bit lower and shortening position in same Futures on another exchange where prices are quite higher.

Since in some of the trade Nick Leeson incurred huge losses and to cover up these losses which can cost him his job, he started taking speculative long position on Nikkei 225 Futures on both Exchange in anticipation of price rise of same. Such action of Leeson exposed the Bank to two major risks 'Market Risk' and 'Event Risk' which can result from unexpected major events though may not be directly related to market.

Leeson in addition to being Floor's manager was also in charge of back office i.e., settlement operations, which allowed him to influence the staff of back office to hide losses due to trading positions taken by him. To hide these losses, he used an old error account '8888'. Not only that by hiding these losses, but he was also able to show a substantial profit in 1994 for which he was rewarded with a bonus of \$ 7,20,000.

To some extent it can also be termed as an oversight by management when in 1994, Leeson asked for \$ 354 million for margin call which he received without any question, as management was of view that Leeson is using a risk-free strategy.

In January 1995 guessing that both Singapore and Tokyo stock exchanges would remain stable as neither going down or up Leeson built-up Future positions on both exchanges with a total notional

value of \$ 7 Billion on Nikkei 225. In addition to that he also started selling Futures on Long-Term and Short-Term Japanese Government Bond. The main reason for this strategy was that interest rate moves in opposite direction of the price of debt. This position would be profit if there is a rise in interest rates on these Bonds. Unfortunately, due to a big earthquake in Japan on 17 January 1995 both Japanese Stock Market and Interest Rate plunged resulting in huge losses of \$ 827 million (\$ 1.4 Billion) in both positions taken by Nick Leeson.

On 23rd February 1995, Nick left Singapore and on next day the management of Barings Bank were informed about the situation. To meet the requirement of funds for liquidation position on both exchanges the 233 years old bank became bankrupt and in March 1995, ING a Dutch Bank purchased this Bank for £1 only.

13.3 Protector & Gamble (P&G) and Gibson Greetings' Case

This is a dramatic example of activities of Banker Trust (BT) a banking organization who in 1994 intentionally developed complex derivative structures product and sold them to various clients including P&G and Gibson Greetings leading to huge losses for these two companies. Further it also misled both companies into thinking that the products have been structured to meet their individual needs. The products sold to these two companies were inappropriate because BT was aware of the risk appetite of these companies and other clients. As a result, both the companies sued BT and it was forced to pay a huge amount to them for settlement made out of court.

In 1999 this banking organization was taken over by Deutsche Bank.

This case supports the thumb rule that if a product is so complex and complicated that it cannot be understood by the client it should not be offered or sold to the same.

In this case BT sold Leveraged Swap products to the P&G. A Leveraged Swap (also known Ratio Swap or Power Swap) is just like plain vanilla swap with the difference that the receipt/payments are adjusted by a multiplying factor or leverage factor. The result is that magnifying effect because of compounding with interest rate movement.

The structure of the deal was such that P&G could make a profit if there is no change in rates of returns on the two Bonds or if the rates of return did not increase to the point where the spread has a positive value. Though the profit to P&G was limited to 0.75% per 6 months, the potential loss was unlimited or without ceiling because of the rise in rate of return on the Bonds.

In similar manner the Banker's Trust sold two swap products 'Ratio Swap' and 'Basis Swap' to Gibson Greetings (an American manufacturer of cards and wrapping papers) in 1992. Under this agreement Gibson in exchange of receiving 5.5% from BT agreed to pay floating rate squared and then divided by 6. Though this swap was a good bet in a declining interest environment. However, if interest LIBOR rises beyond a certain point, then it will give a loss and it would increase exponentially. As a result of this swap agreement the Gibson Greetings suffered a loss of \$ 3 Million in February 1994, as interest rates are increased because FRR tightened the monetary policy.

Further in April 1994, it suffered a loss of \$ 16.7 Million at the same time P&G suffered a loss of \$ 106 million from the swap agreement.

Both P&G and Gibson Greetings filed suit against BT and reached an out of court settlement with both.

13.4 Lessons from Derivative Mishaps

Following are some of the important lessons can be learnt from the above-mentioned case studies of Derivative Mishaps.

13.4.1 Don't buy any derivative product that you don't understand

This is an important lesson for non-financial corporation not to undertake a trade or derivative product that they do not understand. As apparent in above mentioned case of Orange County, treasurer Robert Citron speculated on derivative instruments even though he has no financial background. Similar things happened in BT's case where both P&G and Gibson Greetings were misguided.

The best way to avoid such loss is to value the instrument in house because outside persons can misguide the corporation about the potential dangers.

13.4.2 Due diligence before making Treasury Department as a Profit Centre

Though the main objective of establishing a Treasury Department is to reduce financing costs and manage risk optimally. But it has been seen that though initially Treasury Department made limited profits from treasury activities later started taking more risks in anticipation of higher profit. As mentioned in case study of Orange County the treasurer Citron with initial profit from yield curve play strategy leveraged its position and led to bankruptcy. The best way to avoid this situation is to avoid linking the treasurer's salary with the profit he made for the organization.

13.4.3 Specify the Risk Limits

Proper monitoring is prerequisite for the trader to ensure that he/she should switch from arbitrageur to speculator. Above mentioned Baring Bank's case is a leading example for the bankruptcy of same bank as his positions remained unmonitored and unquestionable by the management.

The best way to avoid the situation of overtrading is to limit the sizes positions that can be taken by a trader, and it should be accurately reported from risk perspective. The management should ensure that the limits specified should be strictly obeyed and even daily reports of various positions taken by each trader (though a star performer) should be obtained and scrutinized before the things goes out of control.

13.4.4 Separation of Front, Middle and Back Offices

The three offices though are interlinked but they discharge separate functions. Accordingly, there should be a firewall in the functioning of these offices i.e. person of one office should not have the access to the functioning of other office. Barings bank's case is a classic example where Nick Leeson

carried out manipulations in back office (which was under his control also) and hid the losses in error account.

To ensure that these three offices work independently it is essential that role and functions of each office should be clearly defined and followed.

13.4.5 Ensure that a hedger should not become a speculator

In most of the cases discussed above hedgers/arbitrageur have become speculators and leveraged their position.

To avoid this situation, it is essential that clear cut risk limits should be defined. Further before entering into any trading strategy proper risk analysis should be carried out and if proposed strategy is crossing the limits of Risk Appetite of the company it should be avoided.

13.4.6 Carry out Stress Test, Scenario Analysis etc.

As mentioned in above case of BT where Gibson Greetings was of belief that the interest rates shall remain lower and to some extent ignored the possibility of increasing of interest rates by 1%. But it happened and ultimately Gibson Greetings faced a huge loss.

To counter this type of unpredictable situation it is necessary that VAR analysis should always be followed by Scenario Analysis because as tendency a human being normally can anticipate two to three scenarios. It will be better to refer the data of at least 10 to 20 years to anticipate a Black Swan event.

Further even Simulation Test can be applied to analyze the results in various possible situations.

TEST YOUR KNOWLEDGE

Theoretical Questions

1. What are the reasons for stock index futures becoming more popular financial derivatives over stock futures segment in India?
2. Write short note on Marking to market.
3. State any four assumptions of Black Scholes Model.
4. Define the term Greeks with respect to options.

Practical Questions

1. The 6-months forward price of a security is ₹ 208.18. The borrowing rate is 8% per annum payable with monthly rests. What should be the spot price?
2. The following data relate to Anand Ltd.'s share price:

Current price per share	₹ 1,800
6 months future's price/share	₹ 1,950

Assuming it is possible to borrow money in the market for transactions in securities at 12% per annum, you are required:

- (i) to calculate the theoretical minimum price of a 6-months forward purchase; and
 - (ii) to explain arbitrage opportunity.
3. On 31-8-2011, the value of stock index was ₹ 2,200. The risk-free rate of return has been 8% per annum. The dividend yield on this Stock Index is as under:

Month	Dividend Paid p.a.
January	3%
February	4%
March	3%
April	3%
May	4%
June	3%
July	3%
August	4%
September	3%
October	3%
November	4%
December	3%

Assuming that interest is continuously compounded daily, find out the future price of contract deliverable on 31-12-2011. Given: $e^{0.01583} = 1.01593$

4. Calculate the price of 3 months PQR futures, if PQR (FV ₹10) quotes ₹220 on NSE and the three months future price quotes at ₹230 and the one month borrowing rate is given as 15 percent per annum and the expected annual dividend is 25 percent, payable before expiry. Also examine arbitrage opportunities.
- 5.

BSE	5000
Value of portfolio	₹ 10,10,000
Risk free interest rate	9% p.a.
Dividend yield on Index	6% p.a.
Beta of portfolio	1.5

We assume that a future contract on the BSE index with four months maturity is used to hedge the value of portfolio over next three months. One future contract is for delivery of 50 times the index.

Based on the above information calculate:

- (i) Price of future contract.
 - (ii) The gain on short futures position if index turns out to be 4,500 in three months.
6. The share of X Ltd. is currently selling for ₹ 300. Risk free interest rate is 0.8% per month. A three-month futures contract is selling for ₹ 312. Develop an arbitrage strategy and show what your riskless profit will be 3 months hence assuming that X Ltd. will not pay any dividend in the next three months.

7. A Mutual Fund is holding the following assets in ₹ Crores :

Investments in diversified equity shares	90.00
Cash and Bank Balances	<u>10.00</u>
	100.00

The Beta of the equity shares portfolio is 1.1. The index future is selling at 4300 level. The Fund Manager apprehends that the index will fall at the most by 10%. How many index futures he should short for perfect hedging? One index future consists of 50 units.

Substantiate your answer assuming the Fund Manager's apprehension will materialize.

8. A trader is having in its portfolio shares worth ₹ 85 lakhs at current price and cash ₹ 15 lakhs. The beta of share portfolio is 1.6. After 3 months the price of shares dropped by 3.2%.

Determine:

- (i) Current portfolio beta
 - (ii) Portfolio beta after 3 months if the trader on current date goes for long position on ₹ 100 lakhs Nifty futures.
9. Which position on the index future gives a speculator, a complete hedge against the following transactions:
- (i) The share of Right Limited is going to rise. He has a long position on the cash market of ₹ 50 lakhs on the Right Limited. The beta of the Right Limited is 1.25.
 - (ii) The share of Wrong Limited is going to depreciate. He has a short position on the cash market of ₹ 25 lakhs on the Wrong Limited. The beta of the Wrong Limited is 0.90.
 - (iii) The share of Fair Limited is going to stagnant. He has a short position on the cash market of ₹ 20 lakhs of the Fair Limited. The beta of the Fair Limited is 0.75.
10. Ram buys 10,000 shares of X Ltd. at a price of ₹ 22 per share whose beta value is 1.5 and sells 5,000 shares of A Ltd. at a price of ₹ 40 per share having a beta value of 2. He obtains a complete hedge by Nifty futures at ₹ 1,000 each. He closes out his position at the closing price of the next day when the share of X Ltd. dropped by 2%, share of A Ltd. appreciated by 3% and Nifty futures dropped by 1.5%.

What is the overall profit/loss to Ram?

11. On January 1, 2013 an investor has a portfolio of 5 shares as given below:

Security	Price	No. of Shares	Beta
A	349.30	5,000	1.15
B	480.50	7,000	0.40
C	593.52	8,000	0.90
D	734.70	10,000	0.95
E	824.85	2,000	0.85

The cost of capital to the investor is 10.5% per annum.

You are required to calculate:

- The beta of his portfolio.
- The theoretical value of the NIFTY futures for February 2013.
- The number of contracts of NIFTY the investor needs to sell to get a full hedge until February for his portfolio if the current value of NIFTY is 5900 and NIFTY futures have a minimum trade lot requirement of 200 units. Assume that the futures are trading at their fair value.
- The number of future contracts the investor should trade if he desires to reduce the beta of his portfolios to 0.6.

No. of days in a year be treated as 365.

Given: $\ln(1.105) = 0.0998$ and $e^{(0.015858)} = 1.01598$

12. Details about portfolio of shares of an investor is as below:

Shares	No. of shares (lakh)	Price per share	Beta
A Ltd.	3.00	₹ 500	1.40
B Ltd.	4.00	₹ 750	1.20
C Ltd.	2.00	₹ 250	1.60

The investor thinks that the risk of portfolio is very high and wants to reduce the portfolio beta to 0.91. He is considering two below mentioned alternative strategies:

- Dispose off a part of his existing portfolio to acquire risk free securities, or
- Take appropriate position on Nifty Futures which are currently traded at 8125 and each Nifty points is worth ₹ 200.

You are required to determine:

- (1) portfolio beta,
- (2) the value of risk free securities to be acquired,
- (3) the number of shares of each company to be disposed off,
- (4) the number of Nifty contracts to be bought/sold; and
- (5) the value of portfolio beta for 2% rise in Nifty.

13. On April 1, 2015, an investor has a portfolio consisting of eight securities as shown below:

Security	Market Price	No. of Shares	Value
A	29.40	400	0.59
B	318.70	800	1.32
C	660.20	150	0.87
D	5.20	300	0.35
E	281.90	400	1.16
F	275.40	750	1.24
G	514.60	300	1.05
H	170.50	900	0.76

The cost of capital for the investor is 20% p.a. continuously compounded. The investor fears a fall in the prices of the shares in the near future. Accordingly, he approaches you for the advice to protect the interest of his portfolio.

You can make use of the following information:

- (1) The current NIFTY value is 8500.
- (2) NIFTY futures can be traded in units of 25 only.
- (3) Futures for May are currently quoted at 8700 and Futures for June are being quoted at 8850.

You are required to calculate:

- (i) the beta of his portfolio.
- (ii) the theoretical value of the futures contract for contracts expiring in May and June.

Given ($e^{0.03} = 1.03045$, $e^{0.04} = 1.04081$, $e^{0.05} = 1.05127$)

- (iii) the number of NIFTY contracts that he would have to sell if he desires to hedge until June in each of the following cases:
- (A) His total portfolio
 - (B) 50% of his portfolio
 - (C) 120% of his portfolio
14. Sensex futures are traded at a multiple of 50. Consider the following quotations of Sensex futures in the 10 trading days during February, 2009:

<u>Day</u>	<u>High</u>	<u>Low</u>	<u>Closing</u>
4-2-09	3306.4	3290.00	3296.50
5-2-09	3298.00	3262.50	3294.40
6-2-09	3256.20	3227.00	3230.40
7-2-09	3233.00	3201.50	3212.30
10-2-09	3281.50	3256.00	3267.50
11-2-09	3283.50	3260.00	3263.80
12-2-09	3315.00	3286.30	3292.00
14-2-09	3315.00	3257.10	3309.30
17-2-09	3278.00	3249.50	3257.80
18-2-09	3118.00	3091.40	3102.60

Abshishek bought one sensex futures contract on February, 04. The average daily absolute change in the value of contract is ₹ 10,000 and standard deviation of these changes is ₹ 2,000. The maintenance margin is 75% of initial margin.

You are required to determine the daily balances in the margin account and payment on margin calls, if any.

15. Mr. A purchased a 3 month call option for 100 shares in XYZ Ltd. at a premium of ₹ 30 per share, with an exercise price of ₹ 550. He also purchased a 3 month put option for 100 shares of the same company at a premium of ₹ 5 per share with an exercise price of ₹ 450. The market price of the share on the date of Mr. A's purchase of options, is ₹ 500. Calculate the profit or loss that Mr. A would make assuming that the market price falls to ₹ 350 at the end of 3 months.
16. The market received rumour about ABC corporation's tie-up with a multinational company. This has induced the market price to move up. If the rumour is false, the ABC corporation stock price will probably fall dramatically. To protect from this an investor has bought the call and put options.

He purchased one 3 months call with a striking price of ₹ 42 for ₹ 2 premium, and paid Re.1 per share premium for a 3 months put with a striking price of ₹ 40.

- (i) Determine the Investor's position if the tie up offer bids the price of ABC Corporation's stock up to ₹ 43 in 3 months.
- (ii) Determine the Investor's ending position, if the tie up programme fails and the price of the stocks falls to ₹ 36 in 3 months.

17. Equity share of PQR Ltd. is presently quoted at ₹ 320. The Market Price of the share after 6 months has the following probability distribution:

Market Price	₹ 180	260	280	320	400
Probability	0.1	0.2	0.5	0.1	0.1

A put option with a strike price of ₹ 300 can be written.

You are required to find out expected value of option at maturity (i.e. 6 months)

18. You as an investor had purchased a 4 month call option on the equity shares of X Ltd. of ₹ 10, of which the current market price is ₹ 132 and the exercise price ₹ 150. You expect the price to range between ₹ 120 to ₹ 190. The expected share price of X Ltd. and related probability is given below:

Expected Price (₹)	120	140	160	180	190
Probability	0.05	0.20	0.50	0.10	0.15

Compute the following:

- (i) Expected Share price at the end of 4 months.
 - (ii) Value of Call Option at the end of 4 months, if the exercise price prevails.
 - (iii) In case the option is held to its maturity, what will be the expected value of the call option?
19. Mr. X established the following strategy on the Delta Corporation's stock :
- (1) Purchased one 3-month call option with a premium of ₹ 30 and an exercise price of ₹ 550.
 - (2) Purchased one 3-month put option with a premium of ₹ 5 and an exercise price of ₹ 450.

Delta Corporation's stock is currently selling at ₹ 500. Determine profit or loss, if the price of Delta Corporation's stock:

- (i) remains at ₹ 500 after 3 months.
- (ii) falls at ₹ 350 after 3 months.

(iii) rises to ₹ 600.

Assume the option size is 100 shares of Delta Corporation.

20. The equity share of VCC Ltd. is quoted at ₹ 210. A 3-month call option is available at a premium of ₹ 6 per share and a 3-month put option is available at a premium of ₹ 5 per share. Ascertain the net payoffs to the option holder of a call option and a put option separately.

(i) the strike price in both cases in ₹ 220; and

(ii) the share price on the exercise day is ₹ 200,210,220,230,240.

Also indicate the price range at which the call and the put options may be gainfully exercised.

21. Sumana wanted to buy shares of EIL which has a range of ₹ 411 to ₹ 592 a month later. The present price per share is ₹ 421. Her broker informs her that the price of this share can sore up to ₹ 522 within a month or so, so that she should buy a one-month CALL of EIL. In order to be prudent in buying the call, the share price should be more than or at least ₹ 522 the assurance of which could not be given by her broker.

Though she understands the uncertainty of the market, she wants to know the probability of attaining the share price ₹ 592 so that buying of a one-month CALL of EIL at the execution price of ₹ 522 is justified. Advice her. Take the risk-free interest to be 3.60% for one month and $e^{0.036} = 1.037$.

22. Mr. Dayal is interested in purchasing equity shares of ABC Ltd. which are currently selling at ₹ 600 each. He expects that price of share may go upto ₹ 780 or may go down to ₹ 480 in three months. The chances of occurring such variations are 60% and 40% respectively. A call option on the shares of ABC Ltd. can be exercised at the end of three months with a strike price of ₹ 630.

(i) What combination of share and option should Mr. Dayal select if he wants a perfect hedge?

(ii) What should be the value of option today (the risk free rate is 10% p.a.)?

(iii) What is the expected rate of return on the option?

23. Consider a two-year call option with a strike price of ₹ 50 on a stock the current price of which is also ₹ 50. Assume that there are two-time periods of one year and in each year the stock price can move up or down by equal percentage of 20%. The risk-free interest rate is 6%. Using binominal option model, calculate the probability of price moving up and down. Also draw a two-step binomial tree showing prices and payoffs at each node.

24. The current market price of an equity share of Penchant Ltd is ₹ 420. Within a period of 3 months, the maximum and minimum price of it is expected to be ₹ 500 and ₹ 400 respectively. If the risk free rate of interest be 8% p.a., what should be the value of a 3 months Call option under the "Risk Neutral" method at the strike rate of ₹ 450?

Given $e^{0.02} = 1.0202$

25. From the following data for certain stock, find the value of a call option:

Price of stock now	= ₹ 80
Exercise price	= ₹ 75
Standard deviation of continuously compounded annual return	= 0.40
Maturity period	= 6 months
Annual interest rate	= 12%

Given

Number of S.D. from Mean, (z)	Area of the left or right (one tail)
0.25	0.4013
0.30	0.3821
0.55	0.2912
0.60	0.2743

$$e^{0.12 \times 0.5} = 1.062$$

$$\ln 1.0667 = 0.0646$$

ANSWERS/ SOLUTIONS

Answers to Theoretical Questions

1. Please refer paragraph 5.2.4.
2. Please refer paragraph 5.2.3.
3. Please refer paragraph 7.3.
4. Please refer paragraph 7.4.

Answers to the Practical Questions

1. Calculation of spot price

The formula for calculating forward price is:

$$A = P \left(1 + \frac{r}{n}\right)^{nt}$$

Where

- A = Forward price
- P = Spot Price
- r = rate of interest
- n = no. of compounding
- t = time

Using the above formula,

$$208.18 = P (1 + 0.08/12)^6$$

$$\text{Or } 208.18 = P \times 1.0409$$

$$P = 208.18/1.0409 = 200$$

Hence, the spot price should be ₹ 200.

2. Anand Ltd

(i) Calculation of theoretical minimum price of a 6 months forward contract-

$$\text{Theoretical minimum price} = ₹ 1,800 + (₹ 1,800 \times 12/100 \times 6/12) = ₹ 1,908$$

(ii) Arbitrage Opportunity-

The arbitrageur can borrow money @ 12 % for 6 months and buy the shares at ₹ 1,800. At the same time he can sell the shares in the futures market at ₹ 1,950. On the expiry date 6 months later, he could deliver the share and collect ₹ 1,950 pay off ₹ 1,908 and record a profit of ₹ 42 (₹ 1,950 – ₹ 1,908)

3. The duration of future contract is 4 months. The average yield during this period will be:

$$\frac{3\% + 3\% + 4\% + 3\%}{4} = 3.25\%$$

As per Cost to Carry model the future price will be

$$F = S e^{(r_f - D)t}$$

Where S = Spot Price

r_f = Risk Free interest

D = Dividend Yield

t = Time Period

Accordingly, future price will be

$$\begin{aligned} &= ₹ 2,200 e^{(0.08 - 0.0325) \times 4/12} = ₹ 2,200 e^{0.01583} \\ &= ₹ 2,200 \times 1.01593 = ₹ 2235.05 \end{aligned}$$

4. Future's Price = Spot + cost of carry – Dividend

$$F = 220 + 220 \times (0.15 \times 0.25)^\dagger - 0.25^{**} \times 10 = 225.75$$

** Entire 25% dividend is payable before expiry, which is ₹2.50.

† Alternatively monthly compounding can also be used.

Thus, we see that futures price by calculation is ₹225.75 which is quoted at ₹230 in the exchange.

(i) Analysis:

Fair value of Futures less than Actual futures Price:

Futures Overvalued Hence it is advised to sell. Also do Arbitraging by buying stock in the cash market.

Step I

He will buy PQR Stock at ₹220 by borrowing at 15% for 3 months. Therefore, his outflows are:

Cost of Stock	220.00
Add: Interest @ 15 % for 3 months i.e. 0.25 years $(220 \times 0.15 \times 0.25)$	<u>8.25</u>
Total Outflows (A)	<u>228.25</u>

Step II

He will sell March 2000 futures at ₹230. Meanwhile he would receive dividend for his stock.

Hence his inflows are	230.00
Sale proceeds of March 2000 futures	<u>2.50</u>
Total inflows (B)	<u>232.50</u>

Inflow – Outflow = Profit earned by Arbitrageur

$$= 232.50 - 228.25 = 4.25$$

5. (i) Current future price of the index = $5000 + 5000 (0.09 - 0.06) \frac{4}{12} = 5000 + 50 = 5,050$

$$\therefore \text{Price of the future contract} = ₹ 50 \times 5,050 = ₹ 2,52,500$$

(ii) Hedge ratio = $\frac{1010000}{252500} \times 1.5 = 6$ contracts

Index after three months turns out to be 4500

$$\text{Future price will be} = 4500 + 4500 (0.09 - 0.06) \times \frac{1}{12} = 4,511.25$$

$$\begin{aligned} \text{Therefore, Gain from the short futures position is} &= 6 \times (5050 - 4511.25) \times 50 \\ &= ₹1,61,625 \end{aligned}$$

Note: Alternatively we can also use daily compounding (exponential) formula.

6. The appropriate value of the 3 months futures contract is –

$$F_0 = ₹ 300 (1.008)^3 = ₹ 307.26$$

Since the futures price exceeds its appropriate value it pays to do the following:-

Action	Initial Cash flow	Cash flow at time T (3 months)
Borrow ₹ 300 now and repay with interest after 3 months	+ ₹ 300	- ₹ 300 (1.008) ³ = - ₹ 307.26
Buy a share	- ₹ 300	ST
Sell a futures contract (Fo = 312/-)	0	₹ 312 - ST
Total	₹ 0	₹ 4.74

Such an action would produce a risk less profit of ₹ 4.74.

7. Number of index future to be sold by the Fund Manager is:

$$\frac{1.1 \times 90,00,00,000}{4,300 \times 50} = 4,605$$

Justification of the answer:

$$\text{Loss in the value of the portfolio if the index falls by 10\% is } ₹ \frac{11}{100} \times 90 \text{ Crore} = ₹ 9.90$$

Crore.

$$\text{Gain by short covering of index future is: } \frac{0.1 \times 4,300 \times 50 \times 4,605}{1,00,00,000} = 9.90 \text{ Crore}$$

This justifies the answer. Further, cash is not a part of the portfolio.

8. (i) **Current Portfolio Beta**

$$\text{Current Beta for share portfolio} = 1.6$$

$$\text{Beta for cash} = 0$$

$$\text{Current portfolio beta} = 0.85 \times 1.6 + 0 \times 0.15 = 1.36$$

- (ii) **Portfolio beta after 3 months:**

$$\text{Beta for portfolio of shares} = \frac{\text{Change in value of portfolio of share}}{\text{Change in value of market portfolio (Index)}}$$

$$1.6 = \frac{0.032}{\text{Change in value of market portfolio (Index)}}$$

$$\text{Change in value of market portfolio (Index)} = (0.032 / 1.6) \times 100 = 2\%$$

Position taken on 100 lakh Nifty futures : Long

$$\begin{aligned} \text{Value of index after 3 months} &= ₹ 100 \text{ lakh} \times (1.00 - 0.02) \\ &= ₹ 98 \text{ lakh} \end{aligned}$$

$$\text{Mark-to-market paid} = ₹ 2 \text{ lakh}$$

Cash balance after payment of mark-to-market = ₹ 13 lakh

$$\begin{aligned} \text{Value of portfolio after 3 months} &= ₹85 \text{ lakh} \times (1 - 0.032) + ₹13 \text{ lakh} \\ &= ₹95.28 \text{ lakh} \end{aligned}$$

$$\text{Change in value of portfolio} = \frac{₹100 \text{ lakh} - ₹95.28 \text{ lakh}}{₹100 \text{ lakh}} = 4.72\%$$

$$\text{Portfolio beta} = 0.0472/0.02 = 2.36$$

9.

Sl. No. (1)	Company Name (2)	Trend (3)	Amount (₹) (4)	Beta (5)	(₹) (6) [(4) x (5)]	Position (7)
(i)	Right Ltd.	Rise	50 lakh	1.25	62,50,000	Short
(ii)	Wrong Ltd.	Depreciate	25 lakh	0.90	22,50,000	Long
(iii)	Fair Ltd.	Stagnant	20 lakh	0.75	15,00,000	Long
					<u>25,00,000</u>	Short

10. No. of the Future Contract to be obtained to get a complete hedge

$$\begin{aligned} &= \frac{10000 \times ₹22 \times 1.5 - 5000 \times ₹40 \times 2}{₹1000} \\ &= \frac{₹3,30,000 - ₹4,00,000}{₹1000} = 70 \text{ contracts} \end{aligned}$$

Thus, by purchasing 70 Nifty future contracts to be long to obtain a complete hedge.

Cash Outlay

$$\begin{aligned} &= 10000 \times ₹ 22 - 5000 \times ₹ 40 + 70 \times ₹ 1,000 \\ &= ₹ 2,20,000 - ₹ 2,00,000 + ₹ 70,000 = ₹ 90,000 \end{aligned}$$

Cash Inflow at Close Out

$$\begin{aligned} &= 10000 \times ₹ 22 \times 0.98 - 5000 \times ₹ 40 \times 1.03 + 70 \times ₹ 1,000 \times 0.985 \\ &= ₹ 2,15,600 - ₹ 2,06,000 + ₹ 68,950 = ₹ 78,550 \end{aligned}$$

Gain/ Loss

$$= ₹ 78,550 - ₹ 90,000 = - ₹ 11,450 \text{ (Loss)}$$

11. (i) **Calculation of Portfolio Beta**

Security	Price of the Stock	No. of shares	Value	Weightage w_i	Beta B_i	Weighted Beta
A	349.30	5,000	17,46,500	0.093	1.15	0.107
B	480.50	7,000	33,63,500	0.178	0.40	0.071
C	593.52	8,000	47,48,160	0.252	0.90	0.227
D	734.70	10,000	73,47,000	0.390	0.95	0.370
E	824.85	2,000	16,49,700	0.087	0.85	0.074
			1,88,54,860			0.849

Portfolio Beta = 0.849

(ii) **Calculation of Theoretical Value of Future Contract**

Cost of Capital = 10.5% p.a. Accordingly, the Continuously Compounded Rate of Interest $\ln(1.105) = 0.0998$

For February 2013 contract, $t = 58/365 = 0.1589$

Further $F = Se^{rt}$

$$F = ₹ 5,900e^{(0.0998)(0.1589)}$$

$$F = ₹ 5,900e^{0.015858}$$

$$F = ₹ 5,900 \times 1.01598 = ₹ 5,994.28$$

Alternatively, it can also be taken as follows:

$$= ₹ 5900 e^{0.105 \times 58/365}$$

$$= ₹ 5900 e^{0.01668}$$

$$= ₹ 5900 \times 1.01682 = ₹ 5,999.24$$

(iii) When total portfolio is to be hedged:

$$= \frac{\text{Value of Spot Position requiring hedging}}{\text{Value of Future Contract}} \times \text{Portfolio Beta}$$

$$= \frac{1,88,54,860}{5994.28 \times 200} \times 0.849 = 13.35 \text{ contracts say 13 or 14 contracts}$$

(iv) When total portfolio beta is to be reduced to 0.6:

$$\begin{aligned} \text{Number of Contracts to be sold} &= \frac{P(\beta_P - \beta'_P)}{F} \\ &= \frac{1,88,54,860(0.849 - 0.600)}{5994.28 \times 200} = 3.92 \text{ contracts say 4 contracts} \end{aligned}$$

12.

Shares	No. of shares (lakhs) (1)	Market Price of Per Share (2)	× (2) (₹ lakhs)	% to total (w)	β (x)	wx
A Ltd.	3.00	500.00	1500.00	0.30	1.40	0.42
B Ltd.	4.00	750.00	3000.00	0.60	1.20	0.72
C Ltd.	2.00	250.00	<u>500.00</u>	<u>0.10</u>	1.60	<u>0.16</u>
			<u>5000.00</u>	1.00		<u>1.30</u>

(1) Portfolio beta 1.30

(2) Required Beta 0.91

Let the proportion of risk free securities for target beta $0.91 = p$

$$0.91 = 0 \times p + 1.30 (1 - p)$$

$$p = 0.30 \text{ i.e. } 30\%$$

Shares to be disposed off to reduce beta ($5000 \times 30\%$) ₹ 1,500 lakh and Risk Free securities to be acquired.

(3) Number of shares of each company to be disposed off

Shares	% to total (w)	Proportionate Amount (₹ lakhs)	Market Price Per Share	No. of Shares (Lakh)
A Ltd.	0.30	450.00	500.00	0.90
B Ltd.	0.60	900.00	750.00	1.20
C Ltd.	0.10	150.00	250.00	0.60

(4) Number of Nifty Contract to be sold

$$\frac{(1.30 - 0.91) \times 5000 \text{ lakh}}{8,125 \times 200} = 120 \text{ contracts}$$

- (5) 2% rises in Nifty is accompanied by $2\% \times 1.30$ i.e. 2.6% rise for portfolio of shares

	₹ Lakh
Current Value of Portfolio of Shares	5000
Value of Portfolio after rise	5130
Mark-to-Market Margin paid ($8125 \times 0.020 \times ₹ 200 \times 120$)	39
Value of the portfolio after rise of Nifty	5091
% change in value of portfolio $(5091 - 5000) / 5000$	1.82%
% rise in the value of Nifty	2%
Beta	0.91

13. (i) **Beta of the Portfolio**

Security	Market Price	No. of Shares	Value	β	Value $\times \beta$
A	29.40	400	11760	0.59	6938.40
B	318.70	800	254960	1.32	336547.20
C	660.20	150	99030	0.87	86156.10
D	5.20	300	1560	0.35	546.00
E	281.90	400	112760	1.16	130801.60
F	275.40	750	206550	1.24	256122.00
G	514.60	300	154380	1.05	162099.00
H	170.50	900	153450	0.76	116622.00
			994450		1095832.30

$$\text{Portfolio Beta} = \frac{10,95,832.30}{9,94,450} = 1.102$$

(ii) **Theoretical Value of Future Contract Expiring in May and June**

$$F = Se^{rt}$$

$$F_{\text{May}} = 8500 \times e^{0.20 \times (2/12)} = 8500 \times e^{0.0333}$$

$e^{0.0333}$ shall be computed using Interpolation Formula as follows:

$e^{0.03}$	= 1.03045
$e^{0.04}$	= 1.04081
$e^{0.01}$	= 0.01036

$e^{0.0033}$	= 0.00342
$e^{0.0067}$	= 0.00694

$$e^{0.0333} = 1.03045 + 0.00342 = 1.03387 \text{ or } 1.04081 - 0.00694 = 1.03387$$

According the price of the May Contract

$$8500 \times 1.03387 = ₹ 8788$$

Price of the June Contract

$$F_{\text{May}} = 8500 \times e^{0.20 \times (3/12)} = 8500 \times e^{0.05} = 8500 \times 1.05127 = 8935.80$$

(iii) **No. of NIFTY Contracts required to sell to hedge until June**

$$= \frac{\text{Value of Position to be hedged}}{\text{Value of Future Contract}} \times \beta$$

(A) Total portfolio

$$\frac{994450}{8850 \times 25} \times 1.102 = 4.953 \text{ say 5 contracts}$$

(B) 50% of Portfolio

$$\frac{994450 \times 0.50}{8850 \times 25} \times 1.102 = 2.47 \text{ say 3 contracts}$$

(C) 120% of Portfolio

$$\frac{994450 \times 1.20}{8850 \times 25} \times 1.102 = 5.94 \text{ say 6 contracts}$$

14. Initial Margin = $\mu + 3\sigma$

Where μ = Daily Absolute Change

σ = Standard Deviation

Accordingly

$$\text{Initial Margin} = ₹ 10,000 + ₹ 6,000 = ₹ 16,000$$

$$\text{Maintenance margin} = ₹ 16,000 \times 0.75 = ₹ 12,000$$

Day	Changes in future Values (₹)	Margin A/c (₹)	Call Money (₹)
4/2/09	-	16000	-
5/2/09	$50 \times (3294.40 - 3296.50) = -105$	15895	-
6/2/09	$50 \times (3230.40 - 3294.40) = -3200$	12695	-
7/2/09	$50 \times (3212.30 - 3230.40) = -905$	16000	4210

10/2/09	$50 \times (3267.50 - 3212.30) = 2760$	18760	-
11/2/09	$50 \times (3263.80 - 3267.50) = -185$	18575	-
12/2/09	$50 \times (3292 - 3263.80) = 1410$	19985	-
14/2/09	$50 \times (3309.30 - 3292) = 865$	20850	-
17/2/09	$50 \times (3257.80 - 3309.30) = -2575$	18275	-
18/2/09	$50 \times (3102.60 - 3257.80) = -7760$	16000	5485

15. Since the market price at the end of 3 months falls to ₹ 350 which is below the exercise price under the call option, the call option will not be exercised. Only put option becomes viable.

	₹
The gain will be:	
Gain per share (₹450 – ₹ 350)	<u>100</u>
Total gain per 100 shares	10,000
Cost or premium paid (₹ 30 x 100) + (₹ 5 x 100)	<u>3,500</u>
Net gain	<u>6,500</u>

16. Cost of Call and Put Options

$$= (\text{₹ } 2 \text{ per share}) \times (100 \text{ share call}) + (\text{₹ } 1 \text{ per share}) \times (100 \text{ share put})$$

$$= \text{₹ } 2 \times 100 + 1 \times 100$$

$$= \text{₹ } 300$$

- (i) Price increases to ₹43. Since the market price is higher than the strike price of the call, the investor will exercise it.

$$\begin{aligned} \text{Ending position} &= (- \text{₹ } 300 \text{ cost of 2 option}) + (\text{₹ } 1 \text{ per share gain on call}) \times 100 \\ &= - \text{₹ } 300 + 100 \end{aligned}$$

$$\text{Net Loss} = - \text{₹ } 200$$

- (ii) The price of the stock falls to ₹36. Since the market price is lower than the strike price, the investor may not exercise the call option.

$$\begin{aligned} \text{Ending Position} &= (- \text{₹}300 \text{ cost of 2 options}) + (\text{₹}4 \text{ per stock gain on put}) \times 100 \\ &= - \text{₹}300 + 400 \end{aligned}$$

$$\text{Gain} = \text{₹}100$$

17. Expected Value of Option

$$(300 - 180) \times 0.1 \quad 12$$

$$(300 - 260) \times 0.2 \quad 8$$

$(300 - 280) \times 0.5$	10
$(300 - 320) \times 0.1$	Not Exercised*
$(300 - 400) \times 0.1$	<u>Not Exercised*</u>
	<u>30</u>

* If the strike price goes beyond ₹ 300, option is not exercised at all.

In case of Put option, since Share price is greater than strike price Option Value would be zero.

18. (i) **Expected Share Price**

$$= ₹120 \times 0.05 + ₹140 \times 0.20 + ₹160 \times 0.50 + ₹180 \times 0.10 + ₹190 \times 0.15$$

$$= ₹6 + ₹28 + ₹80 + ₹18 + ₹28.50 = ₹160.50$$

(ii) **Value of Call Option**

$$= ₹150 - ₹150 = \text{Nil}$$

(iii) **If the option is held till maturity the expected Value of Call Option**

Expected price (X)	Value of call (C)	Probability (P)	CP
₹ 120	0	0.05	0
₹ 140	0	0.20	0
₹ 160	₹ 10	0.50	₹ 5
₹ 180	₹ 30	0.10	₹ 3
₹ 190	₹ 40	0.15	<u>₹ 6</u>
Total			<u>₹ 14</u>

Alternatively, it can also be calculated as follows:

Expected Value of Option

$(120 - 150) \times 0.1$	Not Exercised*
$(140 - 150) \times 0.2$	Not Exercised*
$(160 - 150) \times 0.5$	5
$(180 - 150) \times 0.1$	3
$(190 - 150) \times 0.15$	<u>6</u>
	<u>14</u>

* If the stock price goes below ₹ 150, option is not exercised at all.

19. (i) Total premium paid on purchasing a call and put option
 $= (\text{₹}30 \text{ per share} \times 100) + (\text{₹}5 \text{ per share} \times 100)$
 $= 3,000 + 500 = \text{₹}3,500$

In this case, X exercises neither the call option nor the put option as both will result in a loss for him.

Ending value = - ₹3,500 + zero gain = - ₹3,500

i.e Net loss = ₹3,500

- (ii) Since the price of the stock is below the exercise price of the call, the call will not be exercised. Only put is valuable and is exercised.

Total premium paid = ₹3,500

Ending value = - ₹3,500 + ₹[(450 - 350) × 100] = - ₹3,500 + ₹10,000 = ₹6,500

∴ Net gain = ₹6,500

- (iii) In this situation, the put is worthless, since the price of the stock exceeds the put's exercise price. Only call option is valuable and is exercised.

Total premium paid = ₹3,500

Ending value = -3,500 + [(600 - 550) × 100]

Net Gain = -3,500 + 5,000 = ₹1,500

20. **Net payoff for the holder of the call option**

	(₹)				
Share price on exercise day	200	210	220	230	240
Option exercise	No	No	No	Yes	Yes
Outflow (Strike price)	Nil	Nil	Nil	220	220
Out flow (premium)	6	6	6	6	6
Total Outflow	6	6	6	226	226
Less inflow (Sales proceeds)	-	-	-	230	240
Net payoff	-6	-6	-6	4	14

Net payoff for the holder of the put option

	(₹)				
Share price on exercise day	200	210	220	230	240
Option exercise	Yes	Yes	No	No	No
Inflow (strike price)	220	220	Nil	Nil	Nil

Less outflow (purchase price)	200	210	-	-	-
Less outflow (premium)	5	5	5	5	5
Net Payoff	15	5	-5	-5	-5

The call option can be exercised gainfully for any price above ₹226 (₹220 + ₹6) and put option for any price below ₹215 (₹220 - ₹5).

$$21. \quad p = \frac{e^{rt} - d}{u - d}$$

$$e^{rt} = e^{0.036}$$

$$d = 411/421 = 0.976$$

$$u = 592/421 = 1.406$$

$$p = \frac{e^{0.036} - 0.976}{1.406 - 0.976} = \frac{1.037 - 0.976}{0.43} = \frac{0.061}{0.43} = 0.1418$$

Thus probability of rise in price 0.1418

22. (i) To compute perfect hedge we shall compute Hedge Ratio (Δ) as follows:

$$\Delta = \frac{C_1 - C_2}{S_1 - S_2} = \frac{150 - 0}{780 - 480} = \frac{150}{300} = 0.50$$

Mr. Dayal should purchase 0.50 share for every 1 call option.

- (ii) Value of Option today

If price of share comes out to be ₹780 then value of purchased share will be:

Sale Proceeds of Investment (0.50 x ₹ 780)	₹ 390
Loss on account of Short Position (₹ 780 - ₹ 630)	₹ 150
	₹ 240

If price of share comes out to be ₹ 480 then value of purchased share will be:

Sale Proceeds of Investment (0.50 x ₹ 480)	₹ 240
--	-------

Accordingly, Premium say P shall be computed as follows:

$$(\text{₹ } 300 - P) 1.025 = \text{₹ } 240$$

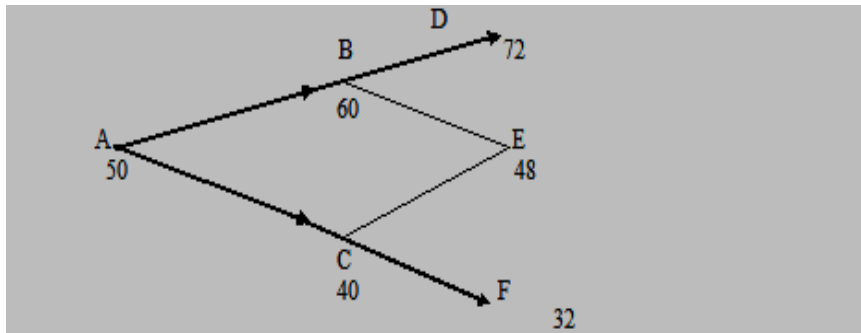
$$P = \text{₹}65.85$$

(iii) Expected Return on the Option

$$\text{Expected Option Value} = (\text{₹ } 780 - \text{₹ } 630) \times 0.60 + \text{₹ } 0 \times 0.40 = \text{₹ } 90$$

$$\text{Expected Rate of Return} = \frac{90 - 65.85}{65.85} \times 100 = 36.67\%$$

23. Stock prices in the two step Binominal tree

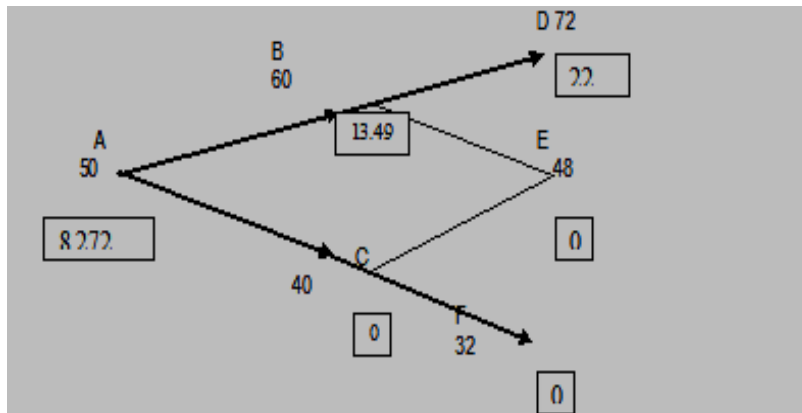


Using the single period model, the probability of price increase is

$$P = \frac{R - d}{u - d} = \frac{1.06 - 0.80}{1.20 - 0.80} = \frac{0.26}{0.40} = 0.65$$

therefore the p of price decrease = 1 - 0.65 = 0.35

The two step Binominal tree showing price and pay off



The value of an American call option at nodes D, E and F will be equal to the value of European option at these nodes and accordingly the call values at nodes D, E and F will be 22, 0 and 0 using the single period binomial model the value of call option at node B is

$$C = \frac{C_u p + C_d (1-p)}{R} = \frac{22 \times 0.65 + 0 \times 0.35}{1.06} = 13.49$$

The value of option at node 'A' is

$$\frac{13.49 \times 0.65 + 0 \times 0.35}{1.06} = 8.272$$

24. Let the probability of attaining the maximum price be p

$$(500 - 420) \times p + (400 - 420) \times (1-p) = 420 \times (e^{0.02} - 1)$$

$$\text{or, } 80p - 20(1 - p) = 420 \times 0.0202$$

$$\text{or, } 80p - 20 + 20p = 8.48$$

$$\text{or, } 100p = 28.48$$

$$p = 0.2848$$

$$\text{The value of Call Option in ₹} = \frac{0.2848 \times (500 - 450)}{1.0202} = \frac{0.2848 \times 50 + 0.7152 \times 0}{1.0202} = 13.96$$

25. Applying the Black Scholes Formula,

Value of the Call option now:

$$\text{The Formula } C = SN(d_1) - Ke^{(-rt)} N(d_2)$$

$$d_1 = \frac{\ln(S/K) + (r + \sigma^2 / 2)t}{\sigma\sqrt{t}}$$

$$d_2 = d_1 - \sigma\sqrt{t}$$

Where,

C = Theoretical call premium

S = Current stock price

t = time until option expiration

K = option striking price

r = risk-free interest rate

N = Cumulative standard normal distribution

e = exponential term

σ = Standard deviation of continuously compounded annual return.

ln = natural logarithm

$$d_1 = \frac{\ln(1.0667) + (12\% + 0.08)0.5}{0.40\sqrt{0.5}}$$

$$= \frac{0.0646 + (0.2)0.5}{0.40 \times 0.7071}$$

$$= \frac{0.1646}{0.2828}$$

$$= 0.5820$$

$$d_2 = 0.5820 - 0.2828 = 0.2992$$

$$N(d_1) = N(0.5820)$$

$$N(d_2) = N(0.2992)$$

$$\text{Price} = SN(d_1) - Ke^{(-rt)} N(d_2)$$

$$= 80 \times N(d_1) - (75/1.062) \times N(d_2)$$

Value of option

$$= 80 N(d_1) - \frac{75}{1.062} \times N(d_2)$$

$$N(d_1) = N(0.5820) = 0.7197$$

$$N(d_2) = N(0.2992) = 0.6176$$

$$\text{Price} = 80 \times 0.7197 - \frac{75}{1.062} \times 0.6176$$

$$= 57.57 - 70.62 \times 0.6176$$

$$= 57.57 - 43.61$$

$$= ₹13.96$$

Teaching Notes:

Students may please note following important point:

Values of $N(d_1)$ and $N(d_2)$ have been computed by interpolating the values of areas under respective numbers of SD from Mean (Z) given in the question.

It may also be possible that in question paper areas under Z may be mentioned otherwise e.g. Cumulative Area or Area under Two tails. In such situation the areas of the respective Zs given in the question will be as follows:

Cumulative Area

Number of S.D. from Mean, (z)	Cumulative Area
0.25	0.5987
0.30	0.6179
0.55	0.7088
0.60	0.7257

Two tail area

<i>Number of S.D. from Mean, (z)</i>	<i>Area of the left and right (two tail)</i>
0.25	0.8026
0.30	0.7642
0.55	0.5823
0.60	0.5485

FOREIGN EXCHANGE EXPOSURE AND RISK MANAGEMENT



LEARNING OUTCOMES

After going through the chapter student shall be able to understand

- Factors affecting foreign exchange rate
- Role of SWIFT in Foreign Exchange
- National and International Payment Gateways
- Exchange rate determination
- Foreign currency market
- Management of Foreign Exchange Risk

1. INTRODUCTION

Coupled with globalization of business, the raising of capital from the international capital markets has assumed significant proportion during the recent years. The volume of finance raised from international capital market is steadily increasing over a period of years, across the national boundaries. Every day new institutions are emerging on the international financial scenario and introducing new derivative financial instruments (products) to cater to the requirements of multinational organizations and the foreign investors.

To accommodate the underlying demands of investors and capital raisers, financial institutions and instruments have also changed dramatically. Financial deregulation, first in the United States and then in Europe and Asia, has prompted increased integration of world financial markets. As a result of the rapidly changing scenario, the finance manager today has to be global in his approach.

In consonance with these remarkable changes, the Government of India has also opened Indian economy to foreign investments and has taken a number of bold and drastic measures to globalize the Indian economy. Various fiscal, trade and industrial policy decisions have been taken and new avenues provided to foreign investors like Foreign Institutional Investors (FII's) and NRI's etc., for investment especially in infrastructural sectors like power and telecommunication etc.

The basic principles of financial management i.e., efficient allocation of resources and raising of funds on most favourable terms and conditions etc. are the same, both for domestic and international enterprises. However, the difference lies in the environment in which these multi-national organizations function. The environment relates to political risks, Government's tax and investment policies, foreign exchange risks and sources of finance etc. These are some of the crucial issues which need to be considered in the effective management of international financial transactions and investment decisions.

Under the changing circumstances as outlined above, a finance manager, naturally cannot just be a silent spectator and wait and watch the developments. He has to search for "best price" in a global market place (environment) through various tools and techniques. Sometimes he uses currency and other hedges to optimize the utilization of financial resources at his command.

However, the problems to be faced by him in the perspective of financial management of the multinational organizations are slightly more complex than those of domestic organizations. While the concepts developed earlier in the previous chapters are also applicable here, the environment in which decisions are made in respect of international financial management is different and it forms the subject matter of this chapter for discussion. In this chapter we shall describe how a finance manager can protect his organization from the vagaries of international financial transactions.

An exchange rate is, simply, the price of one nation's currency in terms of another currency, often termed the reference currency. For example, the rupee/dollar exchange rate is just the number of rupees that one dollar will buy. If a dollar will buy 100 rupees, the exchange rate would be expressed as ₹ 100/\$ and the rupee would be the reference currency.

Equivalently, the dollar/ rupee exchange rate is the number of dollars one rupee will buy. Continuing the previous example, the exchange rate would be \$0.01/₹ (1/100) and the dollar would now be the reference currency. Exchange rates can be for spot or forward delivery.

The foreign exchange market includes both the spot and forward exchange rates. The spot rate is the rate paid for delivery within two business days after the day the transaction takes place. If the rate is quoted for delivery of foreign currency at some future date, it is called the forward rate. In the forward rate, the exchange rate is established at the time of the contract, though payment and delivery are not required until maturity. Forward rates are usually quoted for fixed periods of 30, 60, 90 or 180 days from the day of the contract.

(a) The Spot Market: The most common way of stating a foreign exchange quotation is in terms of the number of units of foreign currency needed to buy one unit of home currency. Thus, India quotes

its exchange rates in terms of the amount of rupees that can be exchanged for one unit of foreign currency.

Illustration 1

If the Indian rupee is the home currency and the foreign currency is the US Dollar then what is the exchange rate between the rupee and the US dollar?

Solution

- ❖ One can buy 0.0217 US dollars for one Indian rupee.
- ❖ ₹ 46.08 Indian rupees are needed to buy one US dollar.

(b) The Forward Market: A forward exchange contract occurs when buyers and sellers of currencies agree to deliver the currency at some future date. They agree to transact a specific amount of currency at a specific rate at a specified future date. The forward exchange rate is set and agreed by the parties and remains fixed for the contract period regardless of the fluctuations in the spot exchange rates in future. The forward exchange transactions can be understood by an example.

A US exporter of computer peripherals might sell computer peripherals to a German importer with immediate delivery but not require payment for 60 days. The German importer has an obligation to pay the required dollars in 60 days, so he may enter into a contract with a trader (typically a local banker) to deliver Euros for dollars in 60 days at a forward rate – the rate today for future delivery.

So, a forward exchange contract implies a forward delivery at specified future date of one currency for a specified amount of another currency. The exchange rate is agreed today, though the actual transactions of buying and selling will take place on the specified date only. The forward rate is not the same as the spot exchange rate that will prevail in future. The actual spot rate that may prevail on the specified date is not known today and only the forward rate for that day is known. The actual spot rate on that day will depend upon the supply and demand forces on that day. The actual spot rate on that day may be lower or higher than the forward rate agreed today.

An Indian exporter of goods to London could enter into a forward contract with his banker to sell pound sterling 90 days from now. This contract can also be described as a contract to purchase Indian Rupees in exchange for delivery of pound sterling. In other words, foreign exchange markets are the only markets where barter happens – i.e., money is delivered in exchange for money.

2. ROLE OF SWIFT IN FOREIGN EXCHANGE

Foreign Exchange Dealers/Traders use a network of communication to carry out their business transactions called SWIFT (Society for Worldwide Interbank Financial Telecommunication) which is purely a messaging system. It was founded in 1973 and headquartered at La Hulpe, Belgium, near Brussels. It is a non-profit organization. It has offices around the world. It employs a dedicated computer network system for communicating fund transfers. Since each country has their own symbol to communicate their currency, to avoid miscommunication SWIFT has

assigned codes to currencies of each country. These codes are 3 lettered codes and are used internationally in cross border communications. Some of the common codes used in communication are as follows:

Country/ Region	Currency	Code
USA	US Dollar	USD
UK	Pound	GBP
China	Chinese Renminbi/Yuan	CNY
Canada	Canadian Dollar	CAD
Australia	Australian Dollar	AUD
Hong Kong	Hong Kong Dollar	HKD
India	Indian Rupee	INR
Japan	Japanese Yen	JPY
New Zealand	New Zealand Dollar	NZD
Singapore	Singapore Dollar	SGD
Sweden	Swedish Krona	SEK
Switzerland	Swiss Franc	CHF
Europe	Euro	EUR

SWIFT uses common language for financial transactions and uses a centralized data processing system. It is important to note that SWIFT is only a standardized communication system and not a transaction settlement system.

The SWIFT connects various financial institutions in more than 200 countries. The SWIFT plays an important role in Foreign Exchange dealings because of the following reasons:

- * In addition to validation statements and documentation it is a form of quick settlement as messaging takes place within seconds.
- * Because of security and reliability helps to reduce Operational Risk.
- * Since it enables its customers to standardise transaction it brings operational efficiencies and reduced costs.
- * It also ensures full backup and recovery system.
- * Acts as a catalyst that brings financial agencies to work together in a collaborative manner for mutual interest.

3. NATIONAL AND INTERNATIONAL PAYMENT GATEWAYS

A Payment Gateway is a virtual mode equivalent to physical mode of transfer of cash that authenticates and routes payment details in an extremely secure environment. The services ranges from collecting and sending payments to banks or to e-commerce sites for carrying out commercial transactions.

The Payment Gateway functions in essence as an “encrypted” channel, which securely passes transaction details from the buyer’s Personal Computer (PC)/ Mobile Phone or Tablet to banks for authorization and approval. It involves the transfer of data in an encrypted manner from entry point to the Point of Sale (POS)/ and after approval from banker of Debit/ Credit Cards it completes the transaction/ order along with verification vide a reference number

A Payment Gateway provides multiple benefits such as:

- 24x7x365 convenience.
- Real time authorisation of credit/debit cards.
- Rapid, efficient transaction processing.
- Multiple payment options.
- Minimising risk by encrypting transactions and verifying other information.
- Flexible, powerful real-time reports generation.
- Facility for customer refund.
- Merchants can get rid of operating complex software and maintaining huge data.
- CA (Certifying Authority) authenticated secure servers.
- Collection of bulk data in a cost-efficient manner, with the additional benefit of being checked for card validity.
- Provision for multiple host interfaces.
- Comprehensive, simple administrative control.
- Gaining customers’ support and merchants’ trust.

Despite so many benefits there are some challenges that are hampering the growth of payment gateways such as:

- (a) Payments may not happen at all simply because the customer may not have an account with the banks supporting the payment gateway.
- (b) Some payment gateways have only limited number of banks.

- (c) There are problems of reliability, delivery, and limited payment avenues and general lack of trust among customers, and doubts about the service provider.

Similar to domestic payment gateways there are International Payment Gateways that offers global/multi-currency payments, as well as an interface with multiple languages. Chances of customer conversion increases when a prospective customer sees the price of a product or service in their currency. International Payment Gateways let merchants offer their international customers the ability to pay in the currency they know best – their own. These Payment gateways not only accelerate but also make international payments and transactions easy. Customers can easily benchmark prices if it is quoted in their own currency. If anybody travels to the US or China or the UK or any other country, any expenditure is preceded by a conversion to the Indian rupee.

4. NOSTRO, VOSTRO AND LORO ACCOUNTS

In interbank transactions, foreign exchange is transferred from one account to another account and from one centre to another centre. Therefore, the banks maintain three types of current accounts in order to facilitate quick transfer of funds in different currencies. These accounts are Nostro, Vostro and Loro accounts meaning “our”, “your” and “their”. A bank’s foreign currency account maintained by the bank in a foreign country and in the home currency of that country is known as Nostro Account or “our account with you”. For example, An Indian bank’s Swiss franc account with a bank in Switzerland.

Vostro account is the account which is held by a foreign bank with a local bank, so if Citibank maintains an account with State bank of India it will be a Vostro account for State bank of India. The account which is Nostro for one bank is Vostro for another.

When domestic banks use the account of third party banks which holds a Nostro account to settle foreign exchange transactions these type of transactions are included under the Loro Account e.g. HDFC Bank has an account with Citi Bank but IDBI Bank doesn’t have any Nostro account with Citi Bank. IDBI Bank has to pay the bill of imported machinery from the USA on behalf of its customers IDBI Bank approaches to HDFC Bank and ask to settle the invoice on its own behalf. HDFC bank worked as an intermediary between Citi Bank and IDBI Bank.

4.1 Exchange Position

It is referred to as total of purchase and sale commitments of a bank to purchase or sale foreign exchange whether actual delivery has taken place or not. In other words, all transactions for which bank has agreed with counter party are entered into exchange position on the date of the contract.

4.2 Cash Position

It is outstanding balance (debit or credit) in bank’s Nostro account. Since all foreign exchange dealings of bank are routed through Nostro account it is credited for all purchases and debited for sales by the bank.

It should however be noted that all dealings whether delivery has taken place or not effects the Exchange Position but Cash Position is effected only when actual delivery has taken place.

Therefore, all transactions affecting Cash position will affect Exchange Position not vice versa.

Illustration 2

Suppose you are a dealer of ABC Bank and on 20.10.2014 you found that balance in your Nostro account with XYZ Bank in London is £65,000 and you had overbought £35,000. During the day following transaction have taken place:

	£
DD purchased	12,500
Purchased a Bill on London	40,000
Sold forward TT	30,000
Forward purchase contract cancelled	15,000
Remitted by TT	37,500
Draft on London cancelled	15,000

What steps would you take, if you are required to maintain a credit Balance of £7,500 in the Nostro A/c and keep as overbought position on £7,500?

Solution

Exchange Position:

Particulars	Purchase £	Sale £
Opening Balance Overbought	35,000	—
DD Purchased	12,500	—
Purchased a Bill on London	40,000	—
Sold forward TT	—	30,000
Forward purchase contract cancelled	—	15,000
TT Remittance	—	37,500
Draft on London cancelled	15,000	—
	1,02,500	82,500
Closing Balance Overbought	—	20,000
	1,02,500	1,02,500

Cash Position (Nostro A/c)

	Credit £	Debit £
Opening balance credit	65,000	—
TT Remittance	—	<u>37,500</u>
	65,000	37,500
Closing balance (credit)	—	<u>27,500</u>
	<u>65,000</u>	<u>65,000</u>

To maintain Cash Balance in Nostro Account at £7,500 you have to sell £20,000 in Spot which will bring Overbought exchange position to Nil. Since bank require Overbought position of £7,500 it has to buy the same in forward market.

5. EXCHANGE RATE QUOTATION

5.1 American Term and European Term

Quotes in *American terms* are the rates quoted in amounts of U.S. dollar per unit of foreign currency. While rates quoted in amounts of foreign currency per U.S. dollar are known as quotes in *European terms*.

For example, U.S. dollar 0.2 per unit of Indian rupee is an American quote while INR 44.92 per unit of U.S. dollar is a European quote.

Most foreign currencies in the world are quoted in terms of the number of units of foreign currency needed to buy one U.S. dollar i.e. the European term.

5.2 Direct and Indirect Quote

As indicated earlier, a currency quotation is the price of a currency in terms of another currency. For example, \$1 = ₹ 48.00, means that one dollar can be exchanged for ₹ 48.00. Alternatively, we may pay ₹ 48.00 to buy one dollar. A foreign exchange quotation can be either a direct quotation and or an indirect quotation, depending upon the home currency of the person concerned.

A direct quote is the home currency price of one-unit foreign currency. Thus, in the aforesaid example, the quote \$1 = ₹ 48.00 is a direct-quote for an Indian.

An indirect quote is the foreign currency price of one unit of the home currency. The quote Re.1 = \$0.0208 is an indirect quote for an Indian. ($\$1/\text{₹ } 48.00 = \0.0208 approximately)

Direct and indirect quotes are reciprocals of each other, which can be mathematically expressed as follows.

Direct quote = 1/indirect quote and vice versa

The following table is an extract from the Bloomberg website showing the Foreign Exchange Cross rates prevailing on 14/09/2012.

	USD	CNY	JPY	HKD	INR	KRW	SGD	EUR
USD		0.1583	0.0128	0.129	0.0184	0.0009	0.8197	1.3089
CNY	6.3162		0.0809	0.8147	0.1161	0.0057	5.177	8.2667
JPY	78.08	12.362		10.072	1.435	0.0701	64	102.17
HKD	7.7526	1.2274	0.0993		0.143	0.0069	6.3546	10.148
INR	54.405	8.613	0.6955	7.005		0.0488	44.505	71.067
KRW	1,114.65	176.5476	14.2965	143.9908	20.4965		914.8582	1,459.05
SGD	1.2202	0.1932	0.0156	0.1574	0.0224	0.0011		1.5961
EUR	0.7642	0.121	0.0098	0.0986	0.014	0.0007	0.6263	

Source : <http://www.bloomberg.com/markets/currencies/cross-rates/>

Students will notice that the rates given in the rows are direct quotes for each of the currencies listed in the first column and the rates given in the columns are the indirect quotes for the currencies listed in the first row. Students can also verify that in every case above.

5.3 Bid, Offer and Spread

A foreign exchange quotes are two-way quotes, expressed as a 'bid' (sell) and an offer' (or ask/Buy) price. Bid is the price at which the dealer is willing to buy another currency. The offer is the rate at which he is willing to sell another currency. Thus, a bid in one currency is simultaneously an offer in another currency. For example, a dealer may quote Indian rupees as ₹48.80 - 48.90 vis-a-vis dollar. That means that he is willing to buy dollars at ₹48.80/\$ (sell rupees and buy dollars), while he will sell dollar at ₹ 48.90/\$ (buy rupees and sell dollars). The difference between the bid and the offer is called the spread. The offer is always higher than the bid as inter-bank dealers make money by buying at the bid and selling at the offer.

$$\% \text{ Spread} = \frac{\text{Bid} - \text{Offer}}{\text{Bid}} \times 100$$

It must be clearly understood that while a dealer buys a currency, he at the same time is selling another currency. When a dealer wants to buy a currency, he/she will ask the other dealer a quote for say a million dollars. The second dealer does not know whether the first dealer is interested in buying or selling one million dollars. The second dealer would then give a two-way quote (a bid/offer quote). When the first dealer is happy with the 'ask' price given by the second dealer, he/she would convey "ONE MINE", which means "I am buying one million dollars from you". If the first dealer had actually wanted to sell one million dollars and had asked a quote and he is happy with the 'bid' price given by the second dealer, he/she would convey "ONE YOURS", which means "I am selling one million dollars to you".

5.4 Cross Rates

It is the exchange rate which is expressed by a pair of currency in which none of the currencies is the official currency of the country in which it is quoted. For example, if the currency exchange rate between a Canadian dollar and a British pound is quoted in Indian newspapers, then this would be called a cross rate since none of the currencies of this pair is of Indian rupee.

5.5 Pips

This is another technical term used in the market. PIP is the Price Interest Point. It is the smallest unit by which a currency quotation can change. e.g., USD/INR quoted to a customer is INR 61.75. The minimum value this rate can change is either INR 61.74 or INR 61.76. In other words, for USD/INR quote, the pip value is 0.01. Pip in foreign currency quotation is similar to the tick size in share quotations. However, in Indian interbank market, USD-INR rate is quoted upto 4 decimal points. Hence, minimum value change will be to the tune of 0.0001. Spot EUR/USD is quoted at a bid price of 1.0213 and an ask price of 1.0219. The difference is USD 0.0006 i.e. equal to 6 “pips”.

5.6 Forward exchange rate quotation

Forward outright contracts are contracts where two parties agree to deliver a certain amount of currency at a fix rate at some time in future. Ideally, the way in which exchange rate for a forward date [forward exchange rate] is quoted should be the same as that for spot date e.g., if the spot rate is 61.53/54, then the [say six months] forward rate quoting should look like say 61.93/98. However, the market convention is different. Forward rate is not quoted like this but always quoted with spot rate and the forward margin separately. In other words, forward quote is not a foreign exchange rate quotation but is quoted as a difference between spot & forward rates.

The reader or user has to calculate the forward rate applicable by loading the forward margin into the spot rate. Thus e.g., in the above case, the foreign exchange dealer will quote the six month forward rate as 40/44. He will even presume that the ongoing spot rate is known to the counterparty and may not even mention it. Even if he were to mention, he will only mention 53/54, because the ‘big figure’ [in this case, “61”] is supposed to be known to the counterparty without ambiguity. Since the rate fluctuation is very high, the dealer has no time to quote rates in very detailed English sentences and these conventions have come into practice! The numbers 40 & 44 are arrived at as the differential between 61.93 – 61.53 and 61.98 – 62.54 respectively. These numbers 40 & 44 are called forward margins representing the factor by which the forward rate is different from the spot rate i.e. the margin to be ‘loaded’ onto the spot rate. Though looks silly, it is worth reiterating that this margin is not the profit margin of the trader!

If the price on a future date is higher, then the currency is said to be at forward premium and then the number represents the forward premium for that forward period. If the price on a future date is lower, then the currency is said to be at forward discount and then the number represents the forward discount for that forward period. In the above example, US dollar is at a premium and the forward premium of USD for six months is 40/44 paise for buying and selling rate respectively in the interbank

market. Generally, the margin is quoted in annualized percentage terms. e.g., in this case, extrapolating the premium of six months to twelve months, it can be said that US dollar is likely to have a premium of 80 paise per year [40 paise per six months X 2] which means on a base rate of 61.53, the annualized premium $[=0.8 \times 2 \times 100 / 61.53]$ is 2.60% p.a. In market parlance, forward premium is quoted in percentage terms and this is the basis of calculation. Actually, the forward market in foreign exchange is an interest rate market and is not a foreign exchange market. Because it compares interest rate of one currency with that of another over a period of time. In fact, some banks include FX forward traders under their interest rate segment rather than FX segment.

5.7 Forward point determination

The number of 'basis points' from the spot rate to arrive at the forward rate in the above discussions is also referred to as forward points. The points are added to the spot rate when the [foreign] currency is at a premium and deducted from the spot rate when the [foreign] currency is at a discount, to arrive at the forward rate. This is when the rates are quoted in direct method. In case of indirect rate quotations, the process will be exactly the opposite. The forward point may be positive or negative and marked accordingly or specifically mentioned so. The forward points represent the interest rate differential between the two currencies e.g., if the spot exchange rate is GBP 1 = 1.6000 - 1.6010 USD and if the outright forward points are 5-8, then the outright forward exchange rate quote is GBP 1 = \$ 1.6005 - 1.6018. The number of forward points between the spot and forward is influenced by the present and forward interest rates, the 'length' of the forward and other market factors. Forward point is not a rate but a difference in the rate between two currencies, the currency which carries lower interest rate is always at a premium versus the other currency. This is the same as stating that if a currency has a relatively higher 'yield', then it will cost less in the forward market and a currency having lower yield will cost more in the forward market. If there is an aberration to this, arbitrage opportunity arises, which itself will push the prices to equilibrium. If the forward points are mentioned simply as 5/8, then a doubt arises as to whether it is at premium, and hence has to be added or at discount and hence to be deducted. The spot market always has the lowest bid-ask spread and the spread will steadily widen as the duration lengthens.

This is because the uncertainty and the liquidity concerns increase as we go forward in time. If we add 5/8 to the left and right side, the spread will widen and hence fits into the argument.

Hence, a quote such as 5/8 or 43/45 with increasing numbers from left to right means the foreign currency is at premium. This looks like a workaround to calculate but the reader can visualize the logic.

Forward points are equivalent to pips in the spot market which we discussed earlier. They are quoted to an accuracy of 1/100th of one point e.g., if EUR/USD rates for spot and forward are 1.1323 & 1.1328, then the forward point is 5 because one pip or point is worth 0.0001 in EUR/USD.

5.8 Broken period forward rate

Interbank exchange rates are wholesale rates which are applicable to transaction among banks and in the interbank market. They are for large standard amounts with standardized due dates i.e., end of January, end of February and so on. However, in customer transactions, the amounts are not only smaller & for odd amounts, but the due date could be also a non-standardized one. There could be an export bill for euro 12,345.67 getting realized on 10th January or 23rd February and so on. Thus, the forward rate that is available in the interbank market [in the form of forward points for February, for March and so on] cannot be applied as such for customer transactions. The broken period concept becomes relevant in such situations.

On 1st January, if the spot rate for US Dollar is ₹ 62 and if the forward margin for two months i.e., at the end of February is 10 paise [premium], then the forward rate can be calculated as ₹ 62.10 per USD and any customer transaction exchange rate can be calculated using this as the base rate. Thus, if the bank wishes to keep a margin of say 3 paise, it will quote a rate of ₹ 62.13 for an importer and quote a rate of ₹ 62.07 for an exporter. However, this logic is valid only for a bill to be realized [for an exporter] or a bill to be paid [for an importer] on 28th February because the underlying forward rate was for two months on 1st January i.e., the date of 28th February. However, in customer transactions, the event [of converting FC into INR or vice versa] does not always happen on the exact standard dates. Thus, if the bill is getting paid or is to be retired on 23rd February, then the forward points are to be calculated for such odd number of days starting from 1st January. It will be presumed [though there is no logical answer, in practice, it turns out to be adequately accurate], that the forward points 'grow' uniformly throughout and arithmetically proportionate manner for the applicable date is arrived at e.g. in the above instance, on 1st January, the premium for a customer transaction expected to happen on 23rd February is calculated as $=10 \times 53/59 = 8.98$ paise [53 & 59 are broken & full periods] and hence the exchange rate will be 62.0898. As market convention, this will be rounded off to 62.09. The merchant forward rate for a customer transaction expected to happen on 23rd February will be this margin loaded onto spot rate. Thus, if the margin is 3 paise, the rate for an exporter will be 62.06 & for an importer, the rate will be 62.12. This logic will be applied even while calculating exchange rate for a third currency though the calculation will be a bit lengthier.

5.9 Merchant Rates

It is always interesting to know who 'fixes' the exchange rates as quoted to customers and to realize that nobody fixes but the market decides the exchange rate based on demand and supply and other relevant factors. RBI often clarifies that it does not fix the exchange rates, though in the same breath, RBI also clarifies that it monitors the 'volatility' of Indian rupee exchange rate. In other words, RBI does not control the exchange rates, but it controls the volatile movement of INR exchange rate by intervention i.e. by deliberately altering the demand and supply of the foreign currency say USD. It does it by either buying USD from the interbank market or pumping in USD into the market. This wholesale interbank market rate is the basis for banks' exchange rates quoted to customers.

In foreign exchange market, banks consider customers as 'merchants' for historical reasons. It may look ridiculous to call an NRI who has remitted dollars to India as a merchant but exchange rates applied to all types of customers including that for converting inward remittance in USD to INR are called merchant rates as against the rates quoted to each other by banks in the interbank market, which are called interbank rates. This term is important because there are guidelines issued by FEDAI [Foreign Exchange Dealers Association of India] to banks on these merchant rates as there is customer service element involved in these.

Till 1998, FEDAI prescribed what 'margins' are to be loaded by banks onto the ongoing interbank exchange rate for quoting to customers i.e., to arrive at the merchant rates. This was because, most customer affecting costs like interest rates were then controlled by regulators.

As a part of liberalization, banks got the freedom to quote their own rates. Since then, banks decide themselves what should be the margin depending on the bank's 'position'. The only rule that is still existing in the FEDAI rule book is rule 5A.8 which states that "Settlement of all merchant transactions shall be effected on the principle of rounding off the Rupee amounts to the nearest whole Rupee i.e., without paise". This means if an exporter or an individual has received USD 1234 and if the applicable exchange rate is 61.32, then the amount to be credited to customer's account is ₹ 75669 and not ₹ 75668.88, less charges if any. This rule will be similarly applicable for import or outward remittance transactions also. This rule is more a matter of common sense and does not have any meaningful impact on customer transactions. In fact, in some of the banking software, amount is always rounded off.

After the discontinuation of gold standard in 1971 by USA, the foreign exchange market was in turmoil. Initially, RBI had kept sterling as the intervention currency pegging the rupee exchange rate for historical reasons and due to political legacy. Effective 1975, rupee was delinked from sterling and was linked to a basket of currencies. It should be noted that the concept of RBI/FEDAI advising the fixed exchange rate was discontinued long ago. The sterling schedule was abolished from the beginning of 1984. FEDAI issued detailed guidelines to banks on how to calculate exchange rates under the new freedom, the minimum & maximum profit margin and the maximum spread between the buying and selling rates. All these are now redundant now. There were arguments for and against giving freedom to banks for loading margins by banks themselves on the ongoing interbank rate. However, the liberalization wave overruled the skeptics.

The International Division of any bank calculates the merchant rates for a variety of transactions like import bill, export bill, inward & outward remittance etc. and advises the same in the morning with standard spread loaded to all branches. It is called card rate. For a walk-in customer, for transactions of small value [what is small varies with the bank], this is applied.

However, for regular customers and for transactions of high value, always a better rate is sought from the dealing room. Card rates advised in the margin are generally not changed unless there is too much volatility.

6. EXCHANGE RATE FORECASTING

The foreign exchange market has changed dramatically over the past few years. The amounts traded each day in the foreign exchange market are now huge. In this increasingly challenging and competitive market, investors and traders need tools to select and analyze the right data from the vast amounts of data available to them to help them make good decisions. Corporates need to do the exchange rate forecasting for taking decisions regarding hedging, short-term financing, short-term investment, capital budgeting, earnings assessments and long-term financing.

Techniques of Exchange Rate Forecasting: There are numerous methods available for forecasting exchange rates. They can be categorized into four general groups- technical, fundamental, market-based and mixed.

(a) **Technical Forecasting:** It involves the use of historical data to predict future values. For example, time series models. Speculators may find the models useful for predicting day-to-day movements. However, since the models typically focus on the near future and rarely provide point or range estimates, they are of limited use to MNCs.

(b) **Fundamental Forecasting:** It is based on the fundamental relationships between economic variables and exchange rates. For example, subjective assessments, quantitative measurements based on regression models and sensitivity analyses.

In general, fundamental forecasting is limited by:

- ❖ the uncertain timing of the impact of the factors,
- ❖ the need to forecast factors that have an immediate impact on exchange rates,
- ❖ the omission of factors that are not easily quantifiable and
- ❖ changes in the sensitivity of currency movements to each factor over time.

(c) **Market-Based Forecasting:** It uses market indicators to develop forecasts. The current spot/forward rates are often used, since speculators will ensure that the current rates reflect the market expectation of the future exchange rate.

(d) **Mixed Forecasting:** It refers to the use of a combination of forecasting techniques. The actual forecast is a weighted average of the various forecasts developed.

7. EXCHANGE RATE DETERMINATION

The major factors that affect the foreign exchange of any country are inflation rate and interest rate. The impact of these factors has been discussed in forthcoming paragraphs under the headings Purchasing Power Parity (PPP) and Interest Rate Parity (IRP) respectively. The other factors that affect foreign exchange rate are as follows:

(a) **Deficit/Surplus on Capital/Current Account:** - A country's Deficit/Surplus on both Capital and Current Account plays a big role in determination of its exchange rate. While deficit in Current Account leads to depreciation of currency, the surplus results in appreciation of home currency.

In case of Capital Account if net inflow is positive then home currency is appreciated and if it is negative then home currency depreciates because of oversupply.

(b) **Trade Barriers:** - Generally with the increase in trade barriers or quota restrictions for import of goods from any country the value of own currency appreciates in the long run. For example, if India puts some restriction on import from China for any goods, then demand for Indian goods will be increased and will be sold for higher price.

(c) **Intervention by Central Bank:** - Sometimes to regulate the prices of foreign exchange the Central Bank or Monetary Authorities of country intervenes by selling or buying foreign exchange in/from the Market.

(d) **Government Controls:** - Government Controls such as restrictions on FDI, FPI or repatriation of Foreign Exchange also affects the foreign exchange rates.

(e) **Expectations (Band Wagon Effect):** - Sometimes speculations by the speculators on any currency can have a substantial impact on exchange rate. When a dominant speculator in Foreign Exchange market expects a fall in value of any currency and he starts taking short position in the same currency, other speculators may also follow the same path. This will ultimately result in fall in the value of same currency.

8. EXCHANGE RATE THEORIES

There are three theories of exchange rate determination- Interest rate parity, Purchasing power parity and International Fisher effect.

8.1 Interest Rate Parity (IRP)

Interest Rate Parity is a theory which states that 'the size of the forward premium (or discount) should be equal to the interest rate differential between the two countries of concern'. When interest rate parity exists, covered interest arbitrage (means foreign exchange risk is covered) is not feasible because any interest rate advantage in the foreign country will be offset by the discount on the forward rate. Thus, the act of covered interest arbitrage would generate a return that is not higher than what would be generated by a domestic investment.

The Covered Interest Rate Parity equation is given by:

$$(1 + r_D) = \frac{F}{S}(1 + r_F)$$

Where,

$(1 + r_D)$ = Amount that an investor would get after a unit period by investing a rupee in the domestic market at r_D rate of interest and $\frac{F}{S}(1+r_F)$ is the amount that an investor by investing in the foreign market at r_F that the investment of one rupee yield same return in the domestic as well as in the foreign market.

The Uncovered Interest Rate Parity equation is given by:

$$r + r_D = \frac{S_1}{S}(1 + r_F)$$

Where,

S_1 = Expected future spot rate when the receipts denominated in foreign currency is converted into domestic currency.

Thus, it can be said that Covered Interest Arbitrage has an advantage as there is an incentive to invest in the higher-interest currency to the point where the discount of that currency in the forward market is less than the interest differentials. If the discount on the forward market of the currency with the higher interest rate becomes larger than the interest differential, then it pays to invest in the lower-interest currency and take advantage of the excessive forward premium on this currency.

8.2 Purchasing Power Parity (PPP)

Why is a dollar worth ₹ 48.80, JPY 122.18, etc. at some point of time? One possible answer is that these exchange rates reflect the relative purchasing powers of the currencies, i.e., the basket of goods that can be purchased with a dollar in the US will cost ₹ 48.80 in India and ¥ 122.18 in Japan.

Purchasing Power Parity theory focuses on the 'inflation – exchange rate' relationship. There are two forms of PPP theory: -

The ABSOLUTE FORM, also called the 'Law of One Price' suggests that "prices of similar products of two different countries should be equal when measured in a common currency". If a discrepancy in prices as measured by a common currency exists, the demand should shift so that these prices should converge.

An alternative version of the absolute form that accounts for the possibility of market imperfections such as transportation costs, tariffs, and quotas embed the sectoral constant. It suggests that 'because of these market imperfections, prices of similar products of different countries will not necessarily be the same when measured in a common currency.' However, it states that the rate of change in the prices of products should be somewhat similar when measured in a common currency, as long as the transportation costs and trade barriers are unchanged.

In Equilibrium Form:

$$S = \alpha \frac{P_D}{P_F}$$

Where,

$S(\text{₹}/\$)$ = spot rate

P_D = is the price level in India, the domestic market.

P_F = is the price level in the foreign market, the US in this case.

α = Sectoral price and sectoral shares constant.

For example, A cricket bat sells for ₹ 1000 in India. The transportation cost of one bat from Ludhiana to New York costs ₹ 100 and the import duty levied by the US on cricket bats is ₹ 200 per bat. Then the sectoral constant for adjustment would be $1000/1300 = 0.7692$.

It becomes extremely messy if one were to deal with millions of products and millions of constants. One way to overcome this is to use a weighted basket of goods in the two countries represented by an index such as Consumer Price Index. However, even this could break down because the basket of goods consumed in a country like Finland would vary with the consumption pattern in a country such as Malaysia making the aggregation an extremely complicated exercise.

The RELATIVE FORM of the Purchasing Power Parity tries to overcome the problems of market imperfections and consumption patterns between different countries. A simple explanation of the Relative Purchase Power Parity is given below:

Assume the current exchange rate between INR and USD is ₹ 50 / \$1. The inflation rates are 12% in India and 4% in the US. Therefore, a basket of goods in India, let us say costing now ₹ 50 will cost one year hence ₹ $50 \times 1.12 = ₹ 56.00$. A similar basket of goods in the US will cost USD 1.04 one year from now. If PPP holds, the exchange rate between USD and INR, one year hence, would be ₹ $56.00 = \$1.04$. This means, the exchange rate would be ₹ $53.8462 / \$1$, one year from now. This can also be worked backwards to say what should have been the exchange rate one year before, taking into account the inflation rates during last year and the current spot rate.

Expected spot rate = Current Spot Rate x expected difference in inflation rates

$$E(S_1) = S_0 \times \frac{(1 + I_d)}{(1 + I_f)}$$

Where,

$E(S_1)$ is the expected Spot rate in time period 1

S_0 is the current spot rate (Direct Quote)

I_d is the inflation in the domestic country (home country)

I_f is the inflation in the foreign country

According to Relative PPP, any differential exchange rate to the one propounded by the theory is the 'real appreciation' or 'real depreciation' of one currency over the other. For example, if the exchange rate between INR and USD one year ago was ₹ 45.00. If the rates of inflation in India and

USA during the last one year were 10% and 2% respectively, the spot exchange rate between the two currencies today should be

$$S_0 = 45.00 \times (1+10\%)/(1+2\%) = ₹ 48.53$$

However, if the actual exchange rate today is ₹ 50.00, then the real appreciation of the USD against INR is ₹ 1.47, which is $1.47/45.00 = 3.27\%$ and this appreciation of the USD against INR is explained by factors other than inflation.

PPP is more closely approximated in the long run than in the short run, and when disturbances are purely monetary in character.

8.3 International Fisher Effect (IFE)

International Fisher Effect theory uses interest rate rather than inflation rate differentials to explain why exchange rates change over time but it is closely related to the Purchasing Power Parity (PPP) theory because interest rates are often highly correlated with inflation rates.

According to the International Fisher Effect, 'nominal risk-free interest rates contain a real rate of return and anticipated inflation'. This means that if investors of all countries require the same real return, interest rate differentials between countries may be the result of differential in expected inflation.

The IFE theory suggests that foreign currencies with relatively high interest rates will depreciate because the high nominal interest rates reflect expected inflation. The nominal interest rate would also incorporate the default risk of an investment.

The IFE equation can be given by:

$$r_D - P_D = r_F - \Delta P_F$$

or

$$P_D - P_F = \Delta S = r_D - r_F$$

The above equation states that if there are no barriers to capital flows the investment will flow in such a manner that the real rate of return on investment will equalize. In fact, the equation represents the interaction between real sector, monetary sector and foreign exchange market.

If the IFE holds, then a strategy of borrowing in one country and investing the funds in another country should not provide a positive return on average. The reason is that exchange rates should adjust to offset interest rate differentials on the average. As we know that purchasing power has not held over certain periods and since the International Fisher Effect is based on Purchasing Power Parity (PPP). It does not consistently hold either because there are factors other than inflation that affect exchange rates, the exchange rates do not adjust in accordance with the inflation differential.

8.4 Comparison of PPP, IRP and IFE Theories

All the above theories relate to the determination of exchange rates. Yet, they differ in their implications.

The theory of IRP focuses on why the forward rate differs from the spot rate and on the degree of difference that should exist. This relates to a specific point of time.

Conversely, PPP theory and IFE theory focuses on how a currency's spot rate will change over time. While PPP theory suggests that the spot rate will change in accordance with inflation differentials, IFE theory suggests that it will change in accordance with interest rate differentials. PPP is nevertheless related to IFE because inflation differentials influence the nominal interest rate differentials between two countries.

<i>Theory</i>	<i>Key Variables</i>	<i>Basis</i>	<i>Summary</i>
Interest Rate Parity (IRP)	Forward rate premium (or discount)	Interest rate differential	The forward rate of one currency will contain a premium (or discount) that is determined by the differential in interest rates between the two countries. As a result, covered interest arbitrage will provide a return that is no higher than a domestic return.
Purchasing Power Parity (PPP)	Percentage change in spot exchange rate.	Inflation rate differential.	The spot rate of one currency w.r.t. another will change in reaction to the differential in inflation rates between two countries. Consequently, the purchasing power for consumers when purchasing goods in their own country will be similar to their purchasing power when importing goods from foreign country.
International Fisher Effect (IFE)	Percentage change in spot exchange rate	Interest rate differential	The spot rate of one currency w.r.t. another will change in accordance with the differential in interest rates between the two countries. Consequently, the return on uncovered foreign money market securities will on average be no higher than the return on domestic money market securities from the perspective of investors in the home country.



9. FOREIGN EXCHANGE MARKET

The Foreign Exchange market is the market in which individuals, firms and banks buy and sell foreign currencies or foreign exchange. The purpose of the foreign exchange market is to permit transfers of purchasing power denominated in one currency to another i.e., to trade one currency for another. For example, a Japanese exporter sells automobiles to a US dealer for dollars, and a US manufacturer sells machine tools to Japanese company for yen. Ultimately, however, the US company will be interested in receiving dollars, whereas the Japanese exporter will want yen because it would be inconvenient for the individual buyers and sellers of foreign exchange to seek out one another, a foreign exchange market has developed to act as an intermediary.

Transfer of purchasing power is necessary because international trade and capital transactions usually involve parties living in countries with different national currencies. Each party wants to trade and deal in his own currency but since the trade can be invoiced only in a single currency, the parties mutually agree on a currency beforehand. The currency agreed could also be any convenient third country currency such as the US dollar. For, if an Indian exporter sells machinery to a UK importer, the exporter could invoice in pound, rupees or any other convenient currency like the US dollar.

But why do individuals, firms and banks want to exchange one national currency for another? The demand for foreign currencies arises when tourists visit another country and need to exchange their national currency for the currency of the country they are visiting or when a domestic firm wants to import from other nations or when an individual wants to invest abroad and so on. On the other hand, a nation's supply of foreign currencies arises from foreign tourist expenditures in the nation, from export earnings, from receiving foreign investments, and so on. For example, suppose a US firm exporting to the UK is paid in pounds sterling (the UK currency). The US exporter will exchange the pounds for dollars at a commercial bank. The commercial bank will then sell these pounds for dollars to a US resident who is going to visit the UK or to a United States firm that wants to import from the UK and pay in pounds, or to a US investor who wants to invest in the UK and needs the pounds to make the investment.

Thus, a nation's commercial banks operate as clearing houses for the foreign exchange demanded and supplied in the course of foreign transactions by the nation's residents. Hence, four levels of transactor or participants can be identified in foreign exchange markets. At the first level, are tourists, importers, exporters, investors, etc. These are the immediate users and suppliers of foreign currencies. At the next or second level are the commercial banks which act as clearing houses between users and earners of foreign exchange. At the third level are foreign exchange brokers through whom the nation's commercial banks even out their foreign exchange inflows and outflows among themselves. Finally, at the fourth and highest level is the nation's central bank which acts as the lender or buyer of last resort when the nation's total foreign exchange earnings and expenditures are unequal. The central bank then either draws down its foreign exchange reserves or adds to them.

Market Participants

The participants in the foreign exchange market can be categorized as follows:

- (i) **Non-bank Entities:** Many multinational companies exchange currencies to meet their import or export commitments or hedge their transactions against fluctuations in exchange rate. Even at the individual level, there is an exchange of currency as per the needs of the individual.
- (ii) **Banks:** Banks also exchange currencies as per the requirements of their clients.
- (iii) **Speculators:** This category includes commercial and investment banks, multinational companies and hedge funds that buy and sell currencies with a view to earn profit due to fluctuations in the exchange rates.
- (iv) **Arbitrageurs:** This category includes those investors who make profit from price differential existing in two markets by simultaneously operating in two different markets.
- (v) **Governments:** The governments participate in the foreign exchange market through the central banks. They constantly monitor the market and help in stabilizing the exchange rates.



10. FOREIGN EXCHANGE EXPOSURE

“An Exposure can be defined as a Contracted, Projected or Contingent Cash Flow whose magnitude is not certain at the moment. The magnitude depends on the value of variables such as Foreign Exchange rates and Interest rates.”

Accordingly Foreign Exchange exposure refers to those parts of a company's business that would be affected if exchange rate changes. Foreign exchange exposures arise from many different activities.

For example, travellers going to visit another country have the risk that if that country's currency appreciates against their own their trip will be more expensive.

An exporter who sells his product in foreign currency has the risk that if the value of that foreign currency falls then the revenues in the exporter's home currency will be lower.

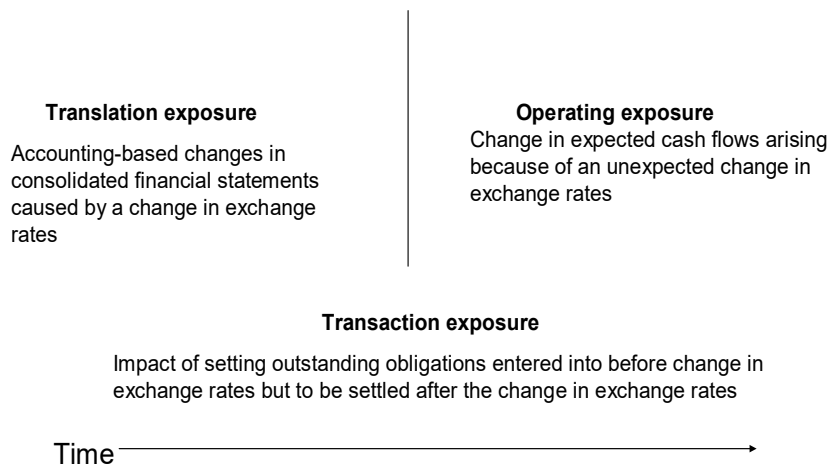
An importer who buys goods priced in foreign currency has the risk that the foreign currency will appreciate thereby making the local currency cost greater than expected.

Fund Managers and companies who own foreign assets are exposed to fall in the currencies where they own the assets. This is because if they were to sell those assets their exchange rate would have a negative effect on the home currency value.

Other foreign exchange exposures are less obvious and relate to the exporting and importing in ones local currency but where exchange rate movements are affecting the negotiated price.

The foreign exchange exposure may be classified under three broad categories:

Moment in time when exchange rate changes



10.1 Transaction Exposure

It measures the effect of an exchange rate change on outstanding obligations that existed before exchange rates changed but were settled after the exchange rate changes. Thus, it deals with cash flows that result from existing contractual obligations.

Example: If an Indian exporter has a receivable of \$100,000 due in six months hence and if the dollar depreciates relative to the rupee a cash loss occurs. Conversely, if the dollar appreciates relative to the rupee, a cash gain occurs.

The above example illustrates that whenever a firm has foreign currency denominated receivables or payables, it is subject to transaction exposure and their settlements will affect the firm's cash flow position.

It measures the changes in the value of outstanding financial obligation incurred prior to a change in exchange rates but not due to be settled until after the exchange rates change.

Thus, it deals with the changes in the cashflow which arise from existing contractual obligation.

In fact, the transaction exposures are the most common ones amongst all the exposures. Let's take an example of a company which exports to US and the export receivables are also denominated in USD. While doing budgeting the company had assumed rate of ₹ 62 per USD. By the time the exchange inward remittance arrives USD/INR could move down to ₹ 57 leading to wiping off of commercial profit for exporter. Such transaction exposures arise whenever a business has foreign currency denominated receipts or payments. The risk is an adverse movement of the exchange rate from the time the transaction is budgeted till the time the exposure is extinguished by sale or purchase of the foreign currency against the domestic currency.

10.2 Translation Exposure

It refers to gains or losses caused by the translation of foreign currency assets and liabilities into the currency of the parent company for consolidation purposes.

Translation exposure, also called as accounting exposure, is the potential for accounting derived changes in owner's equity to occur because of the need to "translate" foreign currency financial statements of foreign subsidiaries into a single reporting currency to prepare worldwide consolidated financial statements.

Translation exposures arise due to the need to "translate" foreign currency assets and liabilities into the home currency for the purpose of finalizing the accounts for any given period. A typical example of translation exposure is the treatment of foreign currency loans.

Consider that a company has taken a medium term loan to finance the import of capital goods worth dollars 1 million. When the import materialized, the exchange rate was, say, USD/INRR-55. The imported fixed asset was, therefore, capitalized in the books of the company at ₹ 550 lacs through the following accounting entry:

Debit fixed assets	₹ 550 lacs
Credit dollar loan	₹ 550 lacs

In the ordinary course assuming no change in the exchange rate, the company would have provided depreciation on the asset valued at ₹ 550 lacs, for finalizing its account for the year in which the asset was purchased.

However, what happens if at the time of finalization of the accounts the exchange rate has moved to say USD/INR-58. Now the dollar loan will have to be "translated" at ₹ 58, involving a "translation loss" of a ₹ 30 lacs. It shall have to be capitalized by increasing the book value of the asset, thus making the figure ₹ 580 lacs and consequently higher depreciation will have to be provided, thus reducing the net profit.

It will be readily seen that both transaction and translation exposures affect the bottom line of a company. The effect could be positive as well if the movement is favourable – i.e., in the cited examples, in case the USD would have appreciated and the USD would have depreciated against the rupee.

An important observation is that the translation exposure, of course, becomes a transaction exposure at some stage: the dollar loan has to be repaid by undertaking the transaction of purchasing dollars.

10.3 Economic Exposure

It refers to the extent to which the economic value of a company can decline due to changes in exchange rate. It is the overall impact of exchange rate changes on the value of the firm. The

essence of economic exposure is that exchange rate changes significantly alter the cost of a firm's inputs and the prices of its outputs and thereby influence its competitive position substantially.

Effects of Local Currency Fluctuations on Company's Economic Exposure (Cash inflow)

<i>Variables influencing the inflow of cash in Local currency</i>	<i>Revaluation impact</i>	<i>Devaluation impact</i>
Local sale, relative to foreign competition in local currency	Decrease	Increase
Company's export in local currency	Decrease	Increase
Company's export in foreign currency	Decrease	Increase
Interest payments from foreign investments	Decrease	Increase

Effects of Local Currency Fluctuations on Company's Economic Exposure (Cash outflow)

<i>Variables influencing the outflow of cash in local currency</i>	<i>Revaluation impact</i>	<i>Devaluation impact</i>
Company's import of material the same denoted in local currency	Remain the same	Remain the same
Company's import of material denoted in foreign currency	Decrease	Increase
Interest on foreign debt	Decrease	Increase

Foreign exchange risk management is a critical component of any business that deals with international transactions. It involves the identification, assessment, and mitigation of risks associated with fluctuations in foreign currency exchange rates. The importance of foreign exchange risk management cannot be overstated, and here are some reasons why:

- (i) *Protection against volatility:* Exchange rates are highly volatile and can change rapidly, which can result in significant losses for a business. Foreign exchange risk management helps to protect against this volatility by allowing businesses to lock in exchange rates in advance, providing greater stability and certainty in financial planning.
- (ii) *Cost reduction:* Effective foreign exchange risk management can help businesses reduce costs associated with foreign transactions. By minimizing currency exchange rate losses and reducing the need for hedging, businesses can save significant amounts of money in the long run.
- (iii) *Competitive advantage:* Companies that effectively manage their foreign exchange risks can gain a competitive advantage over their competitors. They can offer more competitive prices and more attractive payment terms, which can help to attract and retain customers.
- (iv) *Improved cash flow:* Foreign exchange risk management can also help businesses to improve their cash flow by providing greater visibility and predictability in their international

transactions. This can help businesses to better manage their cash flow and ensure that they have sufficient funds to meet their obligations.

- (v) *Compliance with regulations:* Many countries have regulations in place that require businesses to manage their foreign exchange risks. Failure to comply with these regulations can result in significant fines and penalties. Effective foreign exchange risk management can help businesses to stay in compliance with these regulations and avoid potential legal issues.

In summary, foreign exchange risk management is critical for businesses that engage in international transactions. It helps to protect against volatility, reduce costs, gain a competitive advantage, improve cash flow, and ensure compliance with regulations. By managing foreign exchange risks effectively, businesses can achieve greater financial stability and success in the global marketplace.

11. HEDGING CURRENCY RISK

Though there are a range of hedging instruments that can be used to reduce risk but often Exporters use Natural Hedging Strategy to mitigate transaction exposure risk by availing different Short Term Foreign currency loans i.e. Pre-Shipment Credit in Foreign Currency (PCFC)/ Foreign Currency Non-Resident Account (FCNR B) Loans because of following two major benefits:

1. PCFC is available to exporters for exporting their goods in Foreign Currencies. This product is available at cheaper rate compared to other Domestic Currency rates.
2. Secondly by availing PCFC, one can hedge foreign currency transaction risk against exports receivables by settling exports collection against PCFC loans outstanding.

Broadly other techniques can be divided into:

(A) *Internal Techniques:* These techniques explicitly do not involve transaction costs and can be used to completely or partially offset the exposure. These techniques can be further classified as follows:

(i) **Invoicing in Domestic Currency:** Companies engaged in exporting and importing, whether of goods or services, are concerned with decisions relating to the currency in which goods and services are invoiced. Trading in a foreign currency gives rise to transaction exposure. Although trading purely in a company's home currency has the advantage of simplicity, it fails to take account of the fact that the currency in which goods are invoiced has become an essential aspect of the overall marketing package given to the customer. Sellers will usually wish to sell in their own currency or the currency in which they incur cost. This avoids foreign exchange exposure but buyers' preferences may be for other currencies. Many markets, such as oil or aluminum, in effect require that sales be made in the same currency as that quoted by major competitors, which may not be the seller's own currency. In a buyer's market, sellers tend increasingly to invoice in the buyer's ideal currency. The closer the seller can approximate the buyer's aims, the greater chance he or she has to make the sale.

Should the seller elect to invoice in foreign currency, perhaps because the prospective customer prefers it that way or because sellers tend to follow market leader, then the seller should choose only a major currency in which there is an active forward market for maturities at least as long as the payment period. Currencies, which are of limited convertibility, chronically weak, or with only a limited forward market, should not be considered.

The seller's ideal currency is either his own, or one which is stable relative to it but often the seller is forced to choose the market leader's currency. Whatever the chosen currency, it should certainly be one with a deep forward market. For the buyer, the ideal currency is usually its own or one that is stable relative to it, or it may be a currency of which the purchaser has reserves.

(ii) Leading and Lagging: Leading and Lagging refer to adjustments at the time of payments in foreign currencies. Leading is the payment before due date while lagging is delaying payment post the due date. These techniques are aimed at taking advantage of expected devaluation and/or revaluation of relevant currencies. Lead and lag payments are of special importance in the event that forward contracts remain inconclusive. For example, Subsidiary b in B country owes money to subsidiary a in country A with payment due in three months' time and with the debt denominated in US dollar. On the other side, country B's currency is expected to devalue within three months against US dollar, vis-à-vis country A's currency. Under these circumstances, if company b leads -pays early - it will have to part with less of country B's currency to buy US dollars to make payment to company A. Therefore, lead is attractive for the company. When we take reverse the example-revaluation expectation- it could be attractive for lagging.

(iii) Netting: Netting involves associated companies, which trade with each other. The technique is simple. Group companies merely settle inter affiliate indebtedness for the net amount owing. Gross intra-group trade, receivables and payables are netted out. The simplest scheme is known as bilateral netting and involves pairs of companies. Each pair of associates nets out their own individual positions with each other and cash flows are reduced by the lower of each company's purchases from or sales to its netting partner. Bilateral netting involves no attempt to bring in the net positions of other group companies.

Netting basically reduces the number of inter-company payments and receipts which pass over the foreign exchanges. Fairly straightforward to operate, the main practical problem in bilateral netting is usually the decision about which currency to use for settlement.

Netting reduces banking costs and increases central control of inter-company settlements. The reduced number and amount of payments yield savings in terms of buy/sell spreads in the spot and forward markets and reduced bank charges.

(iv) Matching: Although netting and matching are terms which are frequently used interchangeably, there are distinctions. Netting is a term applied to potential flows within a group of companies whereas matching can be applied to both intra-group and to third-party balancing.

Matching is a mechanism whereby a company matches its foreign currency inflows with its foreign currency outflows in respect of amount and approximate timing. Receipts in a particular currency

are used to make payments in that currency thereby reducing the need for a group of companies to go through the foreign exchange markets to the unmatched portion of foreign currency cash flows.

The prerequisite for a matching operation is a two-way cash flow in the same foreign currency within a group of companies; this gives rise to a potential for natural matching. This should be distinguished from parallel matching, in which the matching is achieved with receipt and payment in different currencies but these currencies are expected to move closely together, near enough in parallel.

Both Netting and Matching presuppose that there are enabling Exchange Control regulations. For example, an MNC subsidiary in India cannot net its receivable(s) and payable(s) from/to its associated entities. Receivables have to be received separately and payables have to be paid separately.

(v) Price Variation: Price variation involves increasing selling prices to counter the adverse effects of exchange rate change. This tactic raises the question as to why the company has not already raised prices if it is able to do so. In some countries, price increases are the only legally available tactic of exposure management.

Let us now concentrate on price variation in inter-company trade. Transfer pricing is the term used to refer to the pricing of goods and services, which changes hands within a group of companies. As an exposure management technique, transfer price variation refers to the arbitrary pricing of inter-company sales of goods and services at a higher or lower price than the fair price, arm's length price. This fair price will be the market price if there is an existing market or, if there is not, the price which would be charged to a third-party customer. Taxation authorities, customs and excise departments and exchange control regulations in most countries require that the arm's length pricing should be used.

(vi) Asset and Liability Management: This technique can be used to manage balance sheet, income statement or cash flow exposures. Concentration on cash flow exposure makes economic sense but emphasis on pure translation exposure is misplaced. Hence, our focus here is on asset liability management as a cash flow exposure management technique.

In essence, asset and liability management can involve aggressive or defensive postures. In the aggressive attitude, the firm simply increases exposed cash inflows denominated in currencies expected to be strong or increases exposed cash outflows denominated in weak currencies. In contrast, the defensive approach involves matching cash inflows and outflows according to their currency of denomination, irrespective of whether they are in strong or weak currencies.

(B) External Techniques: Under this category range of various financial products are used which can be categorized as follows:

(i) Money Market Hedging: At its simplest, a money market hedge is an agreement to exchange a certain amount of one currency for a fixed amount of another currency, at a particular date. For example, suppose a business owner in India expects to receive 1 Million USD in six months. This Owner could create an agreement now (today) to exchange 1 Million USD for INR at roughly the

current exchange rate. Thus, if the USD dropped in value by the time the business owner got the payment, he would still be able to exchange the payment for the original quantity of U.S. dollars specified.

Advantages and Disadvantages of Money Market Hedge: Following are the advantages and disadvantages of this technique of hedging.

Advantages

- (a) Fixes the future rate, thus eliminating downside risk exposure.
- (b) Flexibility with regard to the amount to be covered.
- (c) Money market hedges may be feasible as a way of hedging for currencies where forward contracts are not available.

Disadvantages include:

- (a) More complicated to organize than a forward contract.
- (b) Fixes the future rate - no opportunity to benefit from favourable movements in exchange rates.
- (ii) **Derivative Instruments:** A derivatives transaction is a bilateral contract or payment exchange agreement whose value depends on - derives from - the value of an underlying asset, reference rate or index. Today, derivatives transactions cover a broad range of underlying - interest rates, exchange rates, commodities, equities and other indices.

In addition to privately negotiated, global transactions, derivatives also include standardized futures and options on futures that are actively traded on organized exchanges and securities such as call warrants.

The term derivative is also used to refer to a wide variety of other instruments. These have payoff characteristics, which reflect the fact that they include derivatives products as part of their make-up.

Transaction risk can also be hedged using a range of financial derivatives products which include: Forwards, futures, options, swaps, etc. These instruments are discussed in detailed manner in following pages.

12. FORWARD CONTRACT

The simplest form of derivatives is the forward contract. It obliges one party to buy, and the other to sell, a specified quantity of a nominated underlying financial instrument at a specific price, on a specified date in the future. There are markets for a multitude of underlying. Among these are the traditional agricultural or physical commodities, currencies (foreign exchange forwards) and interest rates (forward rate agreements - FRAs). The volume of trade in forward contracts is massive.

Companies importing goods are also exposed to foreign currency risk. To mitigate this, they can use forward contracts for all their liabilities. When foreign Currency is depreciating, one can book a long-term forward contract which will be used in future when foreign currency is appreciating.

12.1 Forward Rate – Premium and Discount

The change in value in a forward contract is broadly equal to the change in value in the underlying. Forwards differ from options in that options carry a different payoff profile. Forward contracts are unique to every trade. They are customized to meet the specific requirements of each end-user. The characteristics of each transaction include the particular business, financial or risk-management targets of the counterparties. Forwards are not standardized. The terms in relation to contract size, delivery grade, location, delivery date and credit period are always negotiated.

In a forward contract, the buyer of the contract draws its value at maturity from its delivery terms or a cash settlement. On maturity, if the price of the underlying is higher than the contract price the buyer makes a profit. If the price is lower, the buyer suffers a loss. The gain to the buyer is loss to the seller.

- ❖ *Forwards Rates:* The forward rate is different from the spot rate. Depending upon whether the forward rate is greater than the spot rate, given the currency in consideration, the forward may either be at a 'discount' or at a 'premium'. Forward premiums and discounts are usually expressed as an annual percentage of the difference between the spot and the forward rates.
- ❖ *Premium:* When a currency is costlier in forward or say, for a future value date, it is said to be at a premium. In the case of direct method of quotation, the premium is added to both the selling and buying rates.
- ❖ *Discount:* If the currency is cheaper in forward or for a future value date, it is said to be at a discount. In case of direct quotation, the discount is deducted from both the selling and buying rate. The following example explains how to calculate Premium / Discount both under Indirect/Direct quotes.

To calculate the Premium or Discount of a currency vis-à-vis another, we need to find out how much each unit of the first currency can buy units of the second currency. For instance, if the Spot rate between INR and USD is ₹ 55 to a dollar and the six months forward rate is ₹ 60 to a dollar, it is clear the USD is strengthening against the Rupee and hence is at a premium which also means that Rupee is at discount.

The premium of USD against INR is ₹ 5 for six months in absolute terms. However, forward premium is always expressed as an annual percentage. Therefore, this premium is calculated as

$$\begin{aligned} & [(\text{Forward Rate} - \text{Spot rate}) / (\text{Spot rate})] \times (12/6) \\ & = (60 - 55) / (55) \times 12/6 = 18.18\% \end{aligned}$$

Rupee is at discount and to calculate the discount, we need to find out how many dollars each Rupee can buy today and six months from now. Therefore, the Spot rate of USD in terms of INR today is

USD 1/55 = \$ 0.01818 and six months from now is USD 1/60 = \$ 0.01667. The discount is calculated as:

$$\begin{aligned} & [(\text{Forward Rate} - \text{Spot rate}) / (\text{Spot rate})] \times (12/6) \\ & = (0.01667 - 0.01818) / 0.01818 \times 12/6 \\ & = - 0.00151 / 0.01818 \times 12/6 = - 16.61\% \end{aligned}$$

The minus sign implies that the Rupee is at discount.

Another important point to be noted in the above example, is that the forward premiums do not equal forward discount always. In the aforesaid example, for instance, the rupee is trading at a discount of 16.67% while the dollar is trading at a premium of 18.18%.

12.2 Fate of Forward Contracts

Whenever any forward contract is entered, normally it meets any of the following three fates.

- (A) *Delivery under the Contract*
- (B) *Cancellation of the Contract*
- (C) *Extension of the Contract*

Further above of fates of forward contract can further classified into following sub-categories.

- (A) Delivery under the Contract
 - (i) Delivery on Due Date
 - (ii) Early Delivery
 - (iii) Late Delivery
- (B) Cancellation of the Contract
 - (i) Cancellation on Due Date
 - (ii) Early Cancellation
 - (iii) Late Cancellation
- (C) Extension of the Contract
 - (i) Extension on Due Date
 - (ii) Early Extension
 - (iii) Late Extension

Let us discuss each of above executions one by one.

Delivery on Due Date

This situation does not pose any problem as rate applied for the transaction would be rate originally agreed upon. Exchange shall take place at this rate irrespective of the spot rate prevailing.

Illustration 3

On 1st June 2015 the bank enters into a forward contract for 2 months for selling US\$ 1,00,000 at ₹ 65.5000. On 31st July 2015 the spot rate was ₹ 65.7500/65.2500. Calculate the amount to be debited in the customer's account.

Solution

The bank will apply rate originally agreed upon i.e., ₹ 65.5000 and will debit the account of the customer with ₹ 65,50,000.

Early Delivery

The bank may accept the request of customer of delivery before due date of forward contract provided the customer is ready to bear the loss if any that may accrue to the bank as a result of this. In addition to some prescribed fixed charges bank may also charge additional charges comprising of:

- (a) *Swap Difference*: This difference can be loss/ gain to the bank. This arises on account of offsetting its position earlier created by early delivery as bank normally covers itself against the position taken in the original forward contract.
- (b) *Interest on Outlay of Funds*: It might be possible early delivery request of a customer may result in outlay of funds. In such bank shall charge from the customer at a rate not less than prime lending rate for the period of early delivery to the original due date. However, if there is an inflow of funds the bank at its discretion may pass on interest to the customer at the rate applicable to term deposits for the same period.

Illustration 4

On 1 October 2015 Mr. X an exporter enters into a forward contract with a BNP Bank to sell US\$ 1,00,000 on 31 December 2015 at ₹ 65.40/\$. However, due to the request of the importer, Mr. X received amount on 28 November 2015. Mr. X requested the bank the take delivery of the remittance on 30 November 2015 i.e., before due date. The inter-banking rates on 28 November 2015 was as follows:

Spot	₹ 65.22/65.27
One Month Premium	10/15

If bank agrees to take early delivery then what will be net inflow to Mr. X assuming that the prevailing prime lending rate is 18%.

Solution

Bank will buy from customer at the agreed rate of ₹ 65.40. In addition to the same if bank will charge/ pay swap difference and interest on outlay funds.

- (a) Swap Difference

Bank Sells at Spot Rate on 28 November 2015	₹ 65.22
Bank Buys at Forward Rate of 31 December 2015 (65.27 + 0.15)	<u>₹ 65.42</u>
Swap Loss per US\$	<u>₹ 00.20</u>
Swap loss for US\$ 1,00,000	₹ 20,000
(b) Interest on Outlay Funds	
On 28 th November Bank sells at	₹ 65.22
It buys from customer at	<u>₹ 65.40</u>
Outlay of Funds per US\$	<u>₹ 00.18</u>
Interest on Outlay fund for US\$ 1,00,000 for 31 days	₹ 275.00
(US\$100000 x 00.18 x 31/365 x 18%)	
(c) Charges for early delivery	
Swap loss	₹ 20,000.00
Interest on Outlay fund for US\$ 1,00,000 for 31 days	<u>₹ 275.00</u>
	<u>₹ 20,275.00</u>
(d) Net Inflow to Mr. X	
Amount received on sale (₹ 65.40 x 1,00,000)	₹ 65,40,000
Less: Charges for early delivery payable to bank	<u>(₹ 20,275)</u>
	<u>₹ 65,19,725</u>

Late Delivery

In case of late delivery, current rate prevailing on such date of delivery shall be applied. However, before this delivery (execution) takes place the provisions of Automatic Cancellation (discussed later on) shall be applied.

Cancellation on Due Date

In case of cancellation on due date in addition to flat charges (if any) the difference between contracted rate and the cancellation rate (reverse action of original contract) is charged from/ paid to the customer.

Illustration 5

On 15th January 2015 you as a banker booked a forward contract for US\$ 250000 for your import customer deliverable on 15th March 2015 at ₹ 65.3450. On due date customer request you to cancel the contract. On this date quotation for US\$ in the inter-bank market is as follows:

Spot	₹ 65.2900/2975 per US\$
Spot/ April	3000/ 3100
Spot/ May	6000/ 6100

Assuming that the flat charges for the cancellation is ₹ 100 and exchange margin is 0.10%, then determine the cancellation charges payable by the customer.

Solution

Bank will sell to customer at the agreed rate of ₹ 65.3450.

Since this is sale contract by the bank the contract shall be cancelled at ready buying rate on the date of cancellation as follows:

Spot Buying Rate on 15 March 2015	₹ 65.2900
Less: Exchange Margin	<u>₹ 0.0653</u>
	<u>₹ 65.2247</u>
Rounded to ₹ 65.2250	
Dollars sold to customer at	₹ 65.3450
Dollars bought from customer	<u>₹ 65.2250</u>
Net amount payable by the customer per US\$	<u>₹ 0.1200</u>
Amount payable by the customer	
Flat Charges	₹ 100.00
Cancellation Charges (₹ 0.12 x 250000)	₹ <u>30,000.00</u>
	₹ <u>30,100.00</u>

Early Cancellation

If a forward is required to be cancelled earlier than the due date of forward contract same shall be cancelled at opposite rate of original contract of the date that synchronizes with the date of original forward contract.

Illustration 6

You as a banker has entered into a 3 month's forward contract with your customer to purchase AUD 1,00,000 at the rate of ₹ 47.2500. However, after 2 months your customer comes to you and requests cancellation of the contract. On this date quotation for AUD in the market is as follows:

Spot	₹ 47.3000/3500 per AUD
1 month forward	₹ 47.4500/5200 per AUD

Determine the cancellation charges payable by the customer.

Solution

The contract shall be cancelled at the 1 month forward sale rate of ₹ 47.5200 as follows:

AUD bought from customer under original forward contract at	₹ 47.2500
On cancellation it is sold to him at	<u>₹ 47.5200</u>
Net amount payable by customer per AUD	<u>₹ 00.2700</u>

Thus, total cancellation charges payable by the customer ₹ 27,000

Late Cancellation

In case of late cancellation of Forward Contract, the provisions of Automatic Cancellation (discussed later on) shall be applied.

Extension on Due Date

It might also be possible that an exporter is not able to export goods on the due date. Similarly, it might also be possible that an importer is not able to pay on due date. In both of these situations an extension of contract for selling and buying contract is warranted. Accordingly, if earlier contract is extended first, it shall be cancelled and rebooked for the new delivery period. In case extension is on due date it shall be cancelled at spot rate as like cancellation on due date (discussed earlier) and new contract shall be rebooked at the forward rate for the new delivery period.

Illustration 7

Suppose you are a banker and one of your export customers has booked a US\$ 1,00,000 forward sale contract for 2 months with you at the rate of ₹ 62.5200 and simultaneously you covered yourself in the interbank market at ₹ 62.5900. However, on due date, after 2 months your customer comes to you and requests for cancellation of the contract and also requests for extension of the contract by one month. On this date quotation for US\$ in the market was as follows:

Spot	₹ 62.7200/62.6800
1 month forward	₹ 62.6400/62.7400

Determine the extension charges payable by the customer assuming exchange margin of 0.10% on buying as well as selling.

Solution*Cancellation*

First the original contract shall be cancelled at Spot Selling Rate as follows:

US\$/₹ Spot Selling Rate	₹ 62.7200
Add: Margin @ 0.10%	<u>₹ 0.06272</u>
	<u>₹ 62.78272</u>

Rounded off	₹ 62.7825
Bank buys US\$ under original contract at	₹ 62.5200
Bank Sells at Spot Rate	<u>₹ 62.7825</u>
	<u>₹ 0.2625</u>

Thus, total cancellation charges payable by the customer for US\$ 1,00,000 is ₹ 26,250.

Rebooking

Forward US\$/₹ Buying Rate	₹ 62.6400
Less: Margin @ 0.10%	<u>₹ 0.06264</u>
Net amount payable by customer per US\$	<u>₹ 62.57736</u>
Rounded off	₹ 62.5775

Extension before Due Date

In case any request to extend the contract is received before due date of maturity of forward contract, first the original contract would be cancelled at the relevant forward rate as in case of cancellation of contract before due date and shall be rebooked at the current forward rate of the forward period.

Illustration 8

Suppose you as a banker entered into a forward purchase contract for US\$ 50,000 on 5th March with an export customer for 3 months at the rate of ₹ 59.6000. On the same day you also covered yourself in the market at ₹ 60.6025. However, on 5th May your customer comes to you and requests extension of the contract to 5th July. On this date (5th May) quotation for US\$ in the market is as follows:

Spot	₹ 59.1300/1400 per US\$
Spot/ 5 th June	₹ 59.2300/2425 per US\$
Spot/ 5 th July	₹ 59.6300/6425 per US\$

Assuming a margin 0.10% on buying and selling, determine the extension charges payable by the customer and the new rate quoted to the customer.

Note: Rates to be rounded off to 4 decimals in multiples of 0.0025.

Solution

(a) Cancellation of Original Contract

The forward purchase contract shall be cancelled at the for the forward sale rate for delivery June.

Interbank forward selling rate	₹ 59.2425
Add: Exchange Margin	<u>₹ 0.0592</u>
Net amount payable by customer per US\$	<u>₹ 59.3017</u>

Rounded off, the rate applicable is ₹ 59.3025

Buying US\$ under original contract at original rate	₹ 59.6000
Selling rate to cancel the contract	<u>₹ 59.3025</u>
Difference per US\$	<u>₹ 00.2975</u>

Exchange difference for US\$ 50,000 payable to the customer is ₹ 14,875.

(b) Rate for booking new contract

The forward contract shall be rebooked with the delivery 15th July as follows:

Forward buying rate (5 th July)	₹ 59.6300
Less: Exchange Margin	<u>₹ 0.0596</u>
	<u>₹ 59.5704</u>

Rounded off to ₹ 59.5700

Late Extension

In case of late extension current rate prevailing on such date of delivery shall be applied. However, before this delivery the provisions of Automatic Cancellation (discussed later on) shall be applied.

Automatic Cancellation

As per FEDAI Rule 6, a forward contract which remains overdue without any instructions from the customers on or before due date shall stand automatically cancelled within 3 working days after the maturity date. Though customer is liable to pay the exchange difference arising there from but not entitled for the profit resulting from this cancellation.

For late delivery and extension after due date as mentioned above the contract shall be treated as fresh contract and appropriate rates prevailing on such date shall be applicable as mentioned below:

1. Late Delivery: In this case the relevant spot rate prevailing on the such date shall be applicable.
2. Extension after Due Date: In this case relevant forward rate for the period desired shall be applicable.

As mentioned earlier in both of above case cancellation charges shall be payable consisting of following:

- (i) *Exchange Difference*: The difference between Spot Rate of offsetting position (cancellation rate) on the date of cancellation of contract after due date or 3 working days (whichever is earlier) and original rate contracted for.

- (ii) *Swap Loss (Difference)*: The loss arises on account of offsetting its position at the spot rate on the date of cancellation and taking opposite position of offsetting position at earliest forward rate.
- (iii) *Interest on Outlay of Funds*: Interest on the difference between the rate entered by the bank in the interbank market and actual spot rate on the due date of contract of the opposite position multiplied by the amount of foreign currency amount involved. This interest shall be calculated for the period from the due date of maturity of the contract and the actual date of cancellation of the contract or 3 working days whichever is later.

Please note in above in any case there is profit by the bank on any course of action same shall not be passed on the customer as normally passed cancellation and extension on or before due dates.

Illustration 9

An importer booked a forward contract with his bank on 10th April for USD 2,00,000 due on 10th June @ ₹ 64.4000. The bank covered its position in the market at ₹ 64.2800.

The exchange rates for dollar in the interbank market on 10th June and 13th June were:

	10th June	13th June
Spot USD 1=	₹ 63.8000/8200	₹ 63.6800/7200
Spot/June	₹ 63.9200/9500	₹ 63.8000/8500
July	₹ 64.0500/0900	₹ 63.9300/9900
August	₹ 64.3000/3500	₹ 64.1800/2500
September	₹ 64.6000/6600	₹ 64.4800/5600

Exchange Margin 0.10% and interest on outlay of funds @ 12%. The importer requested on 14th June for extension of contract with due date on 10th August.

Rates to be rounded off to 4 decimals in multiples of 0.0025.

On 10th June, Bank Swaps by selling spot and buying one month forward.

Calculate:

- (i) Cancellation rate
- (ii) Amount payable on \$ 2,00,000
- (iii) Swap loss
- (iv) Interest on outlay of funds, if any
- (v) New contract rate
- (vi) Total Cost

Solution**(i) Cancellation Rate:**

The forward sale contract shall be cancelled at Spot TT Purchase for \$ prevailing on the date of cancellation as follows:

\$/ ₹ Market Buying Rate	₹ 63.6800
Less: Exchange Margin @ 0.10%	₹ 0.0636
	₹ 63.6163

Rounded off to ₹ 63.6175

(ii) Amount payable on \$ 2,00,000

Bank sells \$2,00,000 @ ₹ 64.4000	₹ 1,28,80,000
Bank buys \$2,00,000 @ ₹ 63.6175	₹ 1,27,23,500
Amount payable by customer	₹ 1,56,500

(iii) Swap Loss

On 10th June the bank does a swap sale of \$ at market buying rate of ₹ 63.8000 and forward purchase for June at market selling rate of ₹ 63.9500.

Bank buys at	₹ 63.9500
Bank sells at	₹ 63.8000
Amount payable by customer	₹ 0.1500

Swap Loss for \$ 2,00,000 is ₹ = ₹ 30,000

(iv) Interest on Outlay of Funds

On 10th June, the bank receives delivery under cover contract at ₹ 64.2800 and sell spot at ₹ 63.8000.

Bank buys at	₹ 64.2800
Bank sells at	₹ 63.8000
Amount payable by customer	₹ 0.4800

Outlay for \$ 2,00,000 is ₹ 96,000

Interest on ₹ 96,000 @ 12% for 3 days ₹ 96

(v) New Contract Rate

The contract will be extended at current rate

\$/ ₹ Market forward selling Rate for August	₹ 64.2500
Add: Exchange Margin @ 0.10%	₹ 0.0643
	₹ 64.3143

Rounded off to ₹ 64.3150

(vi) **Total Cost**

Cancellation Charges	₹ 1,56,500.00
Swap Loss	₹ 30,000.00
Interest	₹ 96.00
	₹ 1,86,596.00

12.3 Non-deliverable Forward Contract

A cash-settled, short-term forward contract on a thinly traded or non-convertible foreign currency, where the profit or loss at the time at the settlement date is calculated by taking the difference between the agreed upon exchange rate and the spot rate at the time of settlement, for an agreed upon notional amount of funds.

All NDFs have a fixing date and a settlement date. The fixing date is the date at which the difference between the prevailing market exchange rate and the agreed upon exchange rate is calculated. The settlement date is the date by which the payment of the difference is due to the party receiving payment.

NDFs are commonly quoted for time periods of one month up to one year, and are normally quoted and settled in U.S. dollars. They have become a popular instrument for corporations seeking to hedge exposure to foreign currencies that are not internationally traded.

12.4 Rollover of Deliverable Forward Contract

Rollover of Deliverable Forward Contract is a Contract wherein, as an Exporter, you have no Foreign Currency to Deliver at maturity and as an Importer you have no Local Currency to deliver at maturity. As an Exporter or Importer you would like to rollover the contract which effectively means spot cancellation and booking of new contract for later date.

The rationale behind the rollover is:

- ❖ Non receipt of Foreign Currency from client (export perspective),
- ❖ Shortage of local currencies (Import perspective) ,
- ❖ Non-agreement of payment with clients,
- ❖ Non availability of longer period forward contracts as normally forward contracts are available maximum for one year and to hedge the exposure for the period more than one roll over contract shall be used.

13. FUTURES CONTRACTS

A basic futures contract is very similar to the forward contract in its obligation and payoff profile.

There are some important distinctions between futures and forwards.

- ❖ The contract terms of futures are standardized. These encompass:
 - Quantity and quality of the underlying;
 - Time and place of delivery;
 - Method of payment.
- ❖ Being standardized in nature credit risk is greatly reduced by marking the contract to market on a daily basis with daily checking of position.
- ❖ Futures are smaller in contract size than forwards and swaps, which means that they are available to a wider business market.

A financial futures contract is purchased or sold through a broker. It is a commitment to make or take delivery of a specified financial instrument, or perform a particular service, at predetermined date in the future. The price of the contract is established at the outset.

Distinction between Futures and Forward Contracts

There are major differences between the traditional forward contract and a futures contract. These are tabulated below:

Feature	Forward Contract	Futures Contract
Amount	Flexible	Standard amount
Maturity	Any valid business date agreed to by the two parties	Standard date. Usually, one delivery date such as the second Tuesday of every month
Furthest maturity date	Open	12 months forward
Currencies traded	All currencies	Majors
Cross rates	Available in one contract; Multiple contracts avoided	Usually requires two contracts
Market-place	Global network	Regular markets – futures market and exchanges
Price fluctuations	No daily limit in many currencies	Daily price limit set by exchange
Risk	Depends on counter party	Minimal due to margin requirements

Honouring of contract	By taking and giving delivery	Mostly by a reverse transaction
Cash flow	None until maturity date	Initial margin plus ongoing variation margin because of market to market rate and final payment on maturity date
Trading hours	24 hours a day	4 – 8 hours trading sessions

14. OPTION CONTRACTS

An option is a contract which has one or the other of two key attributes:

- to buy (**call option**);
- or to sell (**put option**).

The purchaser is called the buyer or holder; the seller is called the writer or grantor. The premium may be expressed as a percentage of the price per unit of the underlying.

The holder of an **American option** has the right to exercise the contract at any stage during the period of the option, whereas the holder of a **European option** can exercise his right only at the end of the period.

During or at the end of the contract period (depending on the type of the option) the holder can do as he pleases. He can buy or sell (as the case may be) the underlying, let the contract expire or sell the option contract itself in the market.

Call Option: It is a contract that gives the buyer the right, but not the obligation, to buy a specified number of units of commodity or a foreign currency from the seller of option at a fixed price on or up to a specific date.

Put Option: It is a contract that gives the buyer the right, but not the obligation, to sell a specified number of units of commodity or a foreign currency to a seller of option at a fixed price on or up to a specific date.

Distinction between Options and Futures

There are certain fundamental differences between a futures and an option contract. Let us look at the main comparative features given below:

	Options	Futures
(a)	Only the seller (writer) is obliged to perform	Both the parties are obligated to perform.
(b)	Premium is paid by the buyer to the seller at the inception of the contract	No premium is paid by any party.

(c)	Loss is restricted while there is unlimited gain potential for the option buyer.	There is potential/risk for unlimited gain/loss for the futures buyer.
(d)	An American option contract can be exercised any time during its period by the buyer.	A futures contract has to be honoured by both the parties only on the date specified.

Options Vs Futures: Gain and Losses in Different Circumstances

Price Movement	Type of Position Held					
	Call buyer	Long Futures Position	Call Seller	Put Buyer	Short Futures Position	Put Seller
Price rises	Unlimited gain	Unlimited gain	Unlimited loss	Limited loss	Unlimited loss	Limited gain
Price falls	Limited loss	Unlimited loss*	Limited gain	Unlimited gain*	Unlimited gain*	Unlimited loss*
Price unchanged	Limited loss	No gain or loss	Limited gain	Limited loss	No Gain or loss	Limited gain

Note: Transaction Costs are ignored.

*Since the price of any commodity or share cannot go below zero, there is technically a 'limit' to the gain/loss when the price falls. For practical purposes, this is largely irrelevant.

15. SWAP CONTRACTS

Swaps are infinitely flexible. In technical terms they are a method of exchanging the underlying economic basis of a debt or asset without affecting the underlying principal obligation on the debt or asset.

A swap transaction commits the participants to exchange cash flows at specified intervals, which are called payment or settlement dates. Cash flows are either fixed or calculated for specific dates by multiplying the quantity of the underlying by specified reference rates or prices.

The vast majority of swaps are classified into the following groups:

- ❖ Interest rate;
- ❖ Currency;
- ❖ Commodity;
- ❖ Equity.

The notional principal (i.e. the face value of a security) on above swap, except currency swaps, is used to calculate the payment streams but are not actually exchanged. Interim payments are usually netted - the difference is paid by one party to the other.

Like forwards, the main users of swaps are large multinational banks or corporations. Swaps create credit exposures and are individually designed to meet the risk-management objectives of the participants.

15.1 Interest Rate Swaps

Interest Rate Swap has been covered in detail in the Chapter 12 of this Study Material. Please refer the same from there.

15.2 Currency Swaps

It involves an exchange of liabilities between currencies. A currency swap can consist of three stages:

- ❖ A spot exchange of principal - this forms part of the swap agreement as a similar effect can be obtained by using the spot foreign exchange market.
- ❖ Continuing exchange of interest payments during the term of the swap - this represents a series of forward foreign exchange contracts during the term of the swap contract. The contract is typically fixed at the same exchange rate as the spot rate used at the outset of the swap.
- ❖ Re-exchange of principal on maturity.

A currency swap has the following benefits:

- ❖ Treasurers can hedge currency risk.
- ❖ It can provide considerable cost savings. A strong borrower in the Japanese Yen market may be interested in borrowing in the American USD markets where his credit rating may not be as good as it is in Tokyo. Such a borrower could get a better US dollar rate by raising funds first in the Tokyo market and then swapping Yen for US dollars.
- ❖ The swap market permits funds to be accessed in currencies, which may otherwise command a high premium.
- ❖ It offers diversification of borrowings.

A more complex version of a currency swap is a currency coupon swap, which swaps a fixed-or-floating rate interest payment in one currency for a floating rate payment in another. These are also known as *Circus Swaps*.

In a currency swap the principal sum is usually exchanged:

- ❖ At the start;

- ❖ At the end;
- ❖ At a combination of both; or
- ❖ Neither.

Many swaps are linked to the issue of a Eurobond. An issuer offers a bond in a currency and instrument where it has the greatest competitive advantage. It then asks the underwriter of the bond to provide it with a swap to convert funds into the required type.

15.3 Commodity Swaps

It is a kind of series of Future Contracts involving settlement on the basis of notional amount over multiple dates at predetermined specified reference prices or related commodities indices. Although this swap strategy can be used for any type of commodity but is primarily used in hedging oil price risks.

15.4 Equity Swaps

An equity swap is an arrangement in which total return on equity or equity index in the form of dividend and capital is exchanged with either a fixed or floating rate of interest.

16. POPULAR DERIVATIVE PRODUCTS

Some of the popularly used derivative products are as follows:

16.1 Forward Importer

This Product consists of an FX Transaction where the Counterparty will buy the Notional Amount of USD against INR at the forward rate under predefined conditions.

Benefits / Risks:

- If the USD/INR rate on the settlement date of an FX Transaction is greater than Forward Rate, Counterparty (Importer) will buy at a rate better than the market rate. If this occurs, the structure will protect the Counterparty against appreciation in USD against INR.
- If the USD/INR rate on an FX Transaction is less than Forward Rate, Counterparty will buy at a rate worse than the market rate. If this occurs, the Counterparty will incur a loss, which could be potentially unlimited.

Example

Notional Amount: USD 500,000.00 – Strike Rate – ₹ 80.00/USD

₹/USD rate on Settlement Date	Settlement Conditions for FX	Profit and Loss (in ₹)
75.00	Counterparty buys USD Notional Amount against INR @ 80.00	25,00,000.00 (Loss)

78.50	Counterparty buys USD Notional Amount against INR @ 80.00	7,50,000.00 (Loss)
82.50	Counterparty buys USD Notional Amount against INR @ 80.00	12,50,000.00 (Gain)

16.2 Forward Exporter

This Product consists of an FX Transaction where the Counterparty will sell the Notional Amount of USD against INR at the forward rate under predefined conditions.

Benefits / Risks:

- If the USD/INR rate on the settlement date of an FX Transaction is less than forward rate, Counterparty will sell at a rate better than the market rate. If this occurs, the structure will protect the Counterparty against depreciation in USD against INR.
- If the USD/INR rate on an FX Transaction is greater than Forward Rate, Counterparty will sell at a rate worse than the market rate. If this occurs, the Counterparty will incur a loss, which could be potentially unlimited.

Example

Notional Amount : USD 500,000.00 – Strike Rate – ₹ 80.00/USD

₹/USD rate on Settlement Date	Settlement Conditions for FX	Profit and Loss (in ₹)
75.00	Counterparty sells USD Notional Amount against INR @ 80.00	25,00,000.00 (Gain)
78.50	Counterparty sells USD Notional Amount against INR @ 80.00	7,50,000.00 (Gain)
82.50	Counterparty sells USD Notional Amount against INR @ 80.00	12,50,000.00 (Loss)

16.3 FX Call Option

This Product consists of an FX Transaction where the Counterparty (generally Importer) has a right to buy the Notional Amount of USD against INR at the relevant Strike Rate(s) under predefined conditions. The Counterparty will pay the premium to bank.

Benefits / Risks:

- If the Expiry Reference Rate is greater than or equal to the Strike Rate, the Counterparty has the right to buy Notional Amount at the Strike Rate.

- If the Expiry Reference Rate is less than the Strike Rate, there is neither right nor obligation on the Counterparty to buy the Notional Amount. The Counterparty will be able to buy at the prevailing market rate, thus retaining participation in any INR appreciation without any limitation.

Example

Notional Amount: USD 500,000.00 – Strike Rate – ₹ 78.00/USD

Expiry Reference Rate	Settlement Conditions for FX	Profit and Loss (in ₹)
64.0080	No Settlement	-
71.1200	No Settlement	-
78.2320	Counterparty Buys USD Notional Amount against INR @ 78.00	1,16,000.00 (Gain)

16.4 FX Put Option

This Product consists of an FX Transaction where the Counterparty (generally exporter) has a right to sell the Notional Amount of USD against INR at the relevant Strike Rate(s) under predefined conditions. The Counterparty will pay the Premium to bank.

Benefits / Risks:

- If the Expiry Reference Rate is less than or equal to the Strike Rate, the Counterparty has the right to sell Notional Amount at the Strike Rate.
- If the Expiry Reference Rate is greater than the Strike Rate, there is neither right nor obligation on the Counterparty to sell the Notional Amount. The Counterparty will be able to sell at the prevailing market rate, thus retaining participation in any USD appreciation without any limitation.

Example

Notional Amount: USD 500,000.00 – Strike Rate – ₹ 78.00/USD

Reference Rate	Settlement Conditions for FX	Profit and Loss (in ₹)
75.00	Counterparty Sells USD Notional Amount against INR @ 78.00	15,00,000.00 (Gain)
79.00	No Settlement	-

16.5 IRS USD Floating to Fixed

In this swap transaction one party pays periodic amounts in respect of each calculation period in a currency based on a fixed rate, and the other party pays periodic amounts in the same currency based on a floating rate that is reset periodically. Such periodic amounts calculations are based on predetermined notional amount(s) in that same currency. Notional amount(s) may be constant throughout the term of the transaction, or amortizing, accreting, or otherwise variable over the term.

- The Counterparty receives floating USD cashflows from bank and pays fixed USD cashflows, thereby, transforming its floating USD exposure into a fixed rate USD exposure via this swap structure.
- If the floating USD cashflows of the Counterparty is lower than fixed USD cashflows on sustained basis, then Counterparty would end up having net negative cashflows.
- If the floating USD cashflows of the Counterparty is higher than fixed USD cashflows on sustained basis, then Counterparty would end up having net positive cashflows.

Example

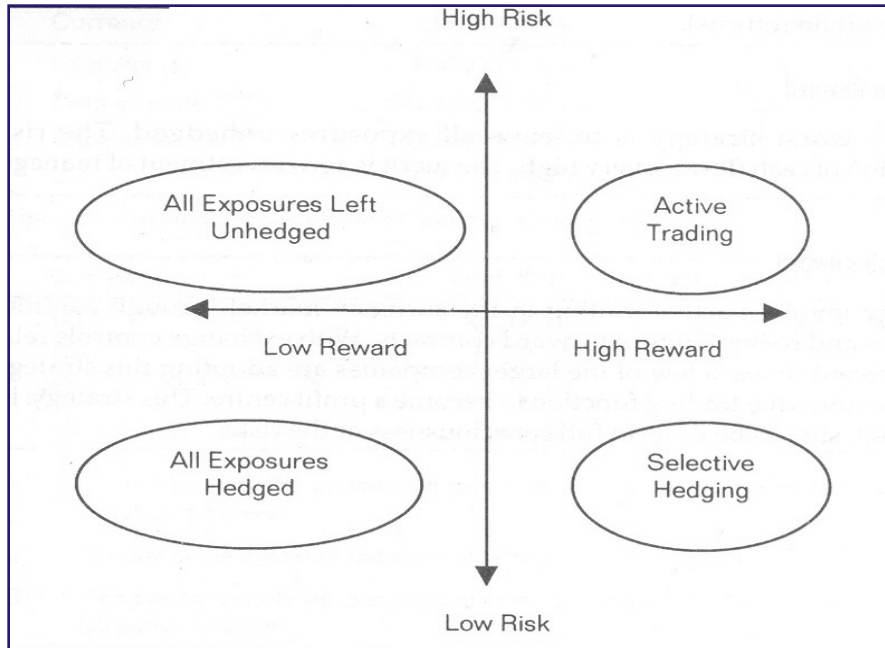
Fixed Rate: USD 1.50% per annum, payable semi-annually

Notional Amount: USD 10,00,000.00

Floating Rate Fixing	Counterparty Receives (USD)	Counterparty Pays (USD)	Gain/ (Loss) in USD
0.0000%	-	7,500.00	(7,500.00)
0.1500%	750.00	7,500.00	(6,750.00)
2.0000%	10,000.00	7,500.00	2,500.00

17. STRATEGIES FOR EXPOSURE MANAGEMENT

A company's attitude towards risk, financial strength, nature of business, vulnerability to adverse movements, etc. shapes its exposure management strategies. There can be no single strategy which is appropriate to all businesses. Four separate strategy options are feasible for exposure management.



Exposure Management Strategies

17.1 Low Risk: Low Reward

This option involves automatic hedging of exposures in the forward market as soon as they arise, irrespective of the attractiveness or otherwise of the forward rate. The merits of this approach are that yields and costs of the transaction are known and there is little risk of cash flow destabilization. Again, this option doesn't require any investment of managerial time or effort. The negative side is that automatic hedging at whatever rates are available is hardly likely to result into optimum costs. At least some management seems to prefer this strategy on the grounds that an active management of exposures is not really their business. In the floating rate era, currencies outside their home countries, in terms of their exchange rate, have assumed the characteristics of commodities. And business whose costs depend significantly on commodity prices can hardly afford not to take views on the price of the commodity. Hence this does not seem to be an optimum strategy.

17.2 Low Risk: Reasonable Reward

This strategy requires selective hedging of exposures whenever forward rates are attractive but keeping exposures open whenever they are not. Successful pursuit of this strategy requires quantification of expectations about the future and the rewards would depend upon the accuracy of the prediction. This option is similar to an investment strategy of a combination of bonds and equities with the proportion of the two components depending on the attractiveness of prices. In foreign exchange exposure terms, hedged positions are similar to bonds (known costs or yields) and unhedged ones to equities (uncertain returns).

17.3 High Risk: Low Reward

Perhaps the worst strategy is to leave all exposures unhedged. The risk of destabilization of cash flows is very high. The merit is zero investment of managerial time or effort.

17.4 High Risk: High Reward

This strategy involves active trading in the currency market through continuous cancellations and re-bookings of forward contracts. With exchange controls relaxed in India in recent times, a few of the larger companies are adopting this strategy. In effect, this requires the trading function to become a profit centre. This strategy, if it has to be adopted, should be done in full consciousness of the risks.

18. CONCLUSION

Thus, on account of increased globalization of financial markets, risk management has gained more importance. The benefits of the increased flow of capital between nations include a better international allocation of capital and greater opportunities to diversify risk. However, globalization of investment has meant new risks from exchange rates, political actions and increased interdependence on financial conditions of different countries.

All these factors- increase in exchange rate risk, growth in international trade, globalization of financial markets, increase in the volatility of exchange rates and growth of multinational and transnational corporations- combine to make it imperative for today's financial managers to study the factors behind the risks of international trade and investment, and the methods of reducing these risks.

TEST YOUR KNOWLEDGE

Theoretical Questions

1. "Operations in foreign exchange are exposed to a number of risks." Discuss.
2. What do you mean by Nostro, Vostro and Loro Accounts?

Practical Questions

1. The price of a bond just before a year of maturity is \$ 5,000. Its redemption value is \$ 5,250 at the end of the said period. Interest is \$ 350 p.a. The Dollar appreciates by 2% during the said period. Calculate the rate of return.
2. ABN-Amro Bank, Amsterdam, wants to purchase ₹ 15 million against US\$ for funding their Nostro account with Canara Bank, New Delhi. Assuming the inter-bank, rates of US\$ is ₹ 51.3625/3700, what would be the rate Canara Bank would quote to ABN-Amro Bank? Further, if the deal is struck, what would be the equivalent US\$ amount.

3. XYZ LTD Bank, Amsterdam, wants to purchase ₹ 25 million against £ for funding their Nostro account and they have credited LORO account with Bank of London, London.

Calculate the amount of £'s credited. Ongoing inter-bank rates are per \$, ₹ 61.3625/3700 & per £, \$ 1.5260/70.

4. ABC Ltd. of UK has exported goods worth Can \$ 5,00,000 receivable in 6 months. The exporter wants to hedge the receipt in the forward market. The following information is available:

Spot Exchange Rate	Can \$ 2.5/£
Interest Rate in UK	12%
Interest Rate In Canada	15%

The forward rates truly reflect the interest rates differential. Find out the gain/loss to UK exporter if Can \$ spot rates (i) declines 2%, (ii) gains 4% or (iii) remains unchanged over next 6 months.

5. On April 3, 2016, a Bank quotes the following:

Spot exchange Rate (US \$ 1)	INR 66.2525	INR 67.5945
2 months' swap points	70	90
3 months' swap points	160	186

In a spot transaction, delivery is made after two days.

Assume spot date as April 5, 2016.

Assume 1 swap point = 0.0001,

You are required to:

- ascertain swap points for 2 months and 15 days. (For June 20, 2016),
 - determine foreign exchange rate for June 20, 2016, and
 - compute the annual rate of premium/discount of US\$ on INR, on an average rate.
6. JKL Ltd., an Indian company has an export exposure of JPY 10,000,000 receivable August 31, 2014. Japanese Yen (JPY) is not directly quoted against Indian Rupee.

The current spot rates are:

INR/US \$	=	₹ 62.22
JPY/US\$	=	JPY 102.34

It is estimated that Japanese Yen will depreciate to 124 level and Indian Rupee to depreciate against US \$ to ₹ 65.

Forward rates for August 2014 are

INR/US \$ = ₹ 66.50

JPY/US\$ = JPY 110.35

Required:

(i) Calculate the expected loss, if the hedging is not done. How the position will change, if the firm takes forward cover?

(ii) If the spot rates on August 31, 2014 are:

INR/US \$= ₹ 66.25

JPY/US\$ = JPY 110.85

Is the decision to take forward cover justified?

7. You sold Hong Kong Dollar 1,00,00,000 value spot to your customer at ₹ 5.70 & covered yourself in London market on the same day, when the exchange rates were

US\$ 1 = H.K.\$ 7.5880 7.5920

Local inter bank market rates for US\$ were

Spot US\$ 1 = ₹ 42.70 42.85

Calculate cover rate and ascertain the profit or loss in the transaction. Ignore brokerage.

8. You, a foreign exchange dealer of your bank, are informed that your bank has sold a T.T. on Copenhagen for Danish Kroner 10,00,000 at the rate of Danish Kroner 1 = ₹ 6.5150. You are required to cover the transaction either in London or New York market. The rates on that date are as under:

Mumbai-London	₹ 74.3000	₹ 74.3200
Mumbai-New York	₹ 49.2500	₹ 49.2625
London-Copenhagen	DKK 11.4200	DKK 11.4350
New York-Copenhagen	DKK 07.5670	DKK 07.5840

In which market will you cover the transaction, London or New York, and what will be the exchange profit or loss on the transaction? Ignore brokerages.

9. On January 28, 2013 an importer customer requested a Bank to remit Singapore Dollar (SGD) 2,500,000 under an irrevocable Letter of Credit (LC). However, due to unavoidable factors, the Bank could effect the remittances only on February 4, 2013. The inter-bank market rates were as follows:

	January 28, 2013	February 4, 2013
US\$ 1=	₹ 45.85/45.90	₹ 45.91/45.97
GBP £ 1 =	US\$ 1.7840/1.7850	US\$ 1.7765/1.7775
GBP £ 1 =	SGD 3.1575/3.1590	SGD 3.1380/3.1390

The Bank wishes to retain an exchange margin of 0.125%

Required:

How much does the customer stand to gain or lose due to the delay?

(Note: Calculate the rate in multiples of 0.0001)

10. Following are the details of cash inflows and outflows in foreign currency denominations of MNP Co. an Indian export firm, which have no foreign subsidiaries:

Currency	Inflow	Outflow	Spot rate	Forward rate
US \$	4,00,00,000	2,00,00,000	48.01	48.82
French Franc (FFr)	2,00,00,000	80,00,000	7.45	8.12
U.K. £	3,00,00,000	2,00,00,000	75.57	75.98
Japanese Yen	1,50,00,000	2,50,00,000	3.20	2.40

- (i) Determine the net exposure of each foreign currency in terms of Rupees.
- (ii) Are any of the exposure positions offsetting to some extent?
11. The following 2-way quotes appear in the foreign exchange market:
- | | Spot | 2-months forward |
|----------|---------------|------------------|
| RS/US \$ | ₹46.00/₹46.25 | ₹47.00/₹47.50 |
- Required:
- (i) How many US dollars should a firm sell to get ₹ 25 lakhs after 2 months?
- (ii) How many Rupees is the firm required to pay to obtain US \$ 2,00,000 in the spot market?
- (iii) Assume the firm has US \$ 69,000 in current account earning no interest. ROI on Rupee investment is 10% p.a. Should the firm encash the US \$ now or 2 months later?
12. Z Ltd. importing goods worth USD 2 million, requires 90 days to make the payment. The overseas supplier has offered a 60 days interest free credit period and for additional credit for 30 days an interest of 8% per annum.

The bankers of Z Ltd offer a 30 days loan at 10% per annum and their quote for foreign exchange is as follows:

	₹
Spot 1 USD	56.50
60 days forward for 1 USD	57.10
90 days forward for 1 USD	57.50

You are required to evaluate the following options:

- (i) Pay the supplier in 60 days, or
 - (ii) Avail the supplier's offer of 90 days credit.
13. Followings are the spot exchange rates quoted at three different forex markets:
- USD/INR 48.30 in Mumbai
 GBP/INR 77.52 in London
 GBP/USD 1.6231 in New York
- The arbitrageur has USD1,00,00,000. Assuming that there are no transaction costs, explain whether there is any arbitrage gain possible from the quoted spot exchange rates.
14. The US dollar is selling in India at ₹ 55.50. If the interest rate for 6 months borrowing in India is 10% per annum and the corresponding rate in USA is 4%.
- (i) Do you expect that US dollar will be at a premium or at discount in the Indian Forex Market?
 - (ii) What will be the expected 6-months forward rate for US dollar in India? and
 - (iii) What will be the rate of forward premium or discount?
15. In March, 2009, the Multinational Industries make the following assessment of dollar rates per British pound to prevail as on 1.9.2009:

\$/Pound	Probability
1.60	0.15
1.70	0.20
1.80	0.25
1.90	0.20
2.00	0.20

- (i) What is the expected spot rate for 1.9.2009?
- (ii) If, as of March, 2009, the 6-month forward rate is \$ 1.80, should the firm sell forward its pound receivables due in September, 2009?

20. In International Monetary Market an international forward bid for December, 15 on pound sterling is \$ 1.2816 at the same time that the price of IMM sterling future for delivery on December, 15 is \$ 1.2806. The contract size of pound sterling is £ 62,500. How could the dealer use arbitrage in profit from this situation and how much profit is earned?
21. An Indian importer has to settle an import bill for \$ 1,30,000. The exporter has given the Indian exporter two options:
- Pay immediately without any interest charges.
 - Pay after three months with interest at 5 percent per annum.

The importer's bank charges 15 percent per annum on overdrafts. The exchange rates in the market are as follows:

Spot rate (₹/\$) : 48.35 /48.36

3-Months forward rate (₹/\$) : 48.81 /48.83

The importer seeks your advice. Give your advice.

22. DEF Ltd. has imported goods to the extent of US\$ 1 crore. The payment terms are 60 days interest-free credit. For additional credit of 30 days, interest at the rate of 7.75% p.a. will be charged.

The banker of DEF Ltd. has offered a 30 days loan at the rate of 9.5% p.a. Their quote for the foreign exchange is as follows:

Spot rate INR/US\$	62.50
60 days forward rate INR/US\$	63.15
90 days forward rate INR/US\$	63.45

Which one of the following options would be better?

- Pay the supplier on 60th day and avail bank loan for 30 days.
 - Avail the supplier's offer of 90 days credit.
23. A company is considering hedging its foreign exchange risk. It has made a purchase on 1st July, 2016 for which it has to make a payment of US\$ 60,000 on December 31, 2016. The present exchange rate is 1 US \$ = ₹ 65. It can purchase forward 1 \$ at ₹ 64. The company will have to make an upfront premium @ 2% of the forward amount purchased. The cost of funds to the company is 12% per annum.

In the following situations, compute the profit/loss the company will make if it hedges its foreign exchange risk with the exchange rate on 31st December, 2016 as:

- ₹ 68 per US \$.
- ₹ 62 per US \$.

- (iii) ₹ 70 per US \$.
 (iv) ₹ 65 per US \$.

24. Following information relates to AKC Ltd. which manufactures some parts of an electronics device which are exported to USA, Japan and Europe on 90 days credit terms.

Cost and Sales information:

	Japan	USA	Europe
Variable cost per unit	₹225	₹395	₹510
Export sale price per unit	Yen 650	US\$10.23	Euro 11.99
Receipts from sale due in 90 days	Yen 78,00,000	US\$1,02,300	Euro 95,920

Foreign exchange rate information:

	Yen/₹	US\$/₹	Euro/₹
Spot market	2.417-2.437	0.0214-0.0217	0.0177-0.0180
3 months forward	2.397-2.427	0.0213-0.0216	0.0176-0.0178
3 months spot	2.423-2.459	0.02144-0.02156	0.0177-0.0179

Advise AKC Ltd. by calculating average contribution to sales ratio whether it should hedge its foreign currency risk or not.

25. EFD Ltd. is an export business house. The company prepares invoice in customers' currency. Its debtors of US\$. 10,000,000 is due on April 1, 2015.

Market information as at January 1, 2015 is:

Exchange rates US\$/INR		Currency Futures US\$/INR	
Spot	0.016667	Contract size: ₹ 24,816,975	
1-month forward	0.016529	1-month	0.016519
3-months forward	0.016129	3-month	0.016118
	Initial Margin	Interest rates in India	
1-Month	₹ 17,500	6.5%	
3-Months	₹ 22,500	7%	

On April 1, 2015 the spot rate US\$/INR is 0.016136 and currency future rate is 0.016134.

Which of the following methods would be most advantageous to EFD Ltd?

- (i) Using forward contract
 (ii) Using currency futures
 (iii) Not hedging the currency risk

26. Spot rate 1 US \$ = ₹ 48.0123
 180 days Forward rate for 1 US \$ = ₹ 48.8190
 Annualised interest rate for 6 months – Rupee = 12%
 Annualised interest rate for 6 months – US \$ = 8%
 Is there any arbitrage possibility? If yes how an arbitrageur can take advantage of the situation, if he is willing to borrow ₹ 40,00,000 or US \$83,312.

27. Given the following information:

Exchange rate – Canadian dollar 0.665 per DM (spot)

Canadian dollar 0.670 per DM (3 months)

Interest rates – DM 7% p.a.

Canadian Dollar – 9% p.a.

What operations would be carried out to take the possible arbitrage gains?

28. An Indian exporting firm, Rohit and Bros., would be covering itself against a likely depreciation of pound sterling. The following data is given:

Receivables of Rohit and Bros : £500,000

Spot rate : ₹ 56.00/£

Payment date : 3-months

3 months interest rate : India : 12 per cent per annum

: UK : 5 per cent per annum

What should the exporter do?

29. An exporter is a UK based company. Invoice amount is \$3,50,000. Credit period is three months. Exchange rates in London are :

Spot Rate (\$/£) 1.5865 – 1.5905

3-month Forward Rate (\$/£) 1.6100 – 1.6140

Rates of interest in Money Market :

	Deposit	Loan
\$	7%	9%
£	5%	8%

Compute and show how a money market hedge can be put in place. Compare and contrast the outcome with a forward contract.

30. The rate of inflation in India is 8% per annum and in the U.S.A. it is 4%. The current spot rate for USD in India is ₹ 46. What will be the expected rate after 1 year and after 4 years applying the Purchasing Power Parity Theory.
31. On April 1, 3 months interest rate in the UK £ and US \$ are 7.5% and 3.5% per annum respectively. The UK £/US \$ spot rate is 0.7570. What would be the forward rate for US \$ for delivery on 30th June?
32. An importer requests his bank to extend the forward contract for US\$ 20,000 which is due for maturity on 30th October, 2010, for a further period of 3 months. He agrees to pay the required margin money for such extension of the contract.

Contracted Rate – US\$ 1 = ₹ 42.32

The US Dollar quoted on 30-10-2010:-

Spot – 41.5000/41.5200

3 months' Premium -0.87% /0.93%

Margin money for buying and selling rate is 0.075% and 0.20% respectively.

Compute:

- (i) The cost to the importer in respect of the extension of the forward contract, and
- (ii) The rate of new forward contract.
33. XYZ LTD, an Indian firm, will need to pay JAPANESE YEN (JY) 5,00,000 on 30th June. In order to hedge the risk involved in foreign currency transaction, the firm is considering two alternative methods i.e. forward market cover and currency option contract.

On 1st April, following quotations (JY/INR) are made available:

Spot	3 months forward
1.9516/1.9711.	1.9726./1.9923

The prices for forex currency option on purchase are as follows:

Strike Price	JY 2.125
Call option (June)	JY 0.047
Put option (June)	JY 0.098

For excess or balance of JY covered, the firm would use forward rate as future spot rate.

You are required to recommend cheaper hedging alternative for XYZ LTD.

34. ABC Technologic is expecting to receive a sum of US\$ 4,00,000 after 3 months. The company decided to go for future contract to hedge against the risk. The standard size of future contract available in the market is \$1000. As on date spot and futures \$ contract are quoting at ₹ 44.00 & ₹ 45.00 respectively. Suppose after 3 months the company closes out its position futures

are quoting at ₹ 44.50 and spot rate is also quoting at ₹ 44.50. You are required to calculate effective realization for the company while selling the receivable. Also calculate how company has been benefitted by using the future option.

35. Gibraltar Limited has imported 5000 bottles of shampoo at landed cost in Mumbai, of US \$ 20 each. The company has the choice for paying for the goods immediately or in 3 months' time. It has a clean overdraft limited where 14% p.a. rate of interest is charged.

Calculate which of the following method would be cheaper to Gibraltar Limited.

- (i) Pay in 3 months' time with interest @ 10% p.a. and cover risk forward for 3 months.
 (ii) Settle now at a current spot rate and pay interest of the over draft for 3 months.

The rates are as follows:

Mumbai ₹ /\$ spot	:	60.25-60.55
3 months swap points	:	35/25

36. An American firm is under obligation to pay interests of Can\$ 1010000 and Can\$ 705000 on 31st July and 30th September respectively. The Firm is risk averse and its policy is to hedge the risks involved in all foreign currency transactions. The Finance Manager of the firm is thinking of hedging the risk considering two methods i.e. fixed forward or option contracts.

It is now June 30. Following quotations regarding rates of exchange, US\$ per Can\$, from the firm's bank were obtained:

Spot	1 Month Forward	3 Months Forward
0.9284-0.9288	0.9501	0.9556

Price for a Can\$ option on a U.S. stock exchange (cents per Can\$, payable on purchase of the option, contract size Can\$ 50000) are as follows:

Strike Price (US\$/Can\$)	Calls		Puts	
	July	Sept.	July	Sept.
0.93	1.56	2.56	0.88	1.75
0.94	1.02	NA	NA	NA
0.95	0.65	1.64	1.92	2.34

According to the suggestion of finance manager if options are to be used, one month option should be bought at a strike price of 94 cents and three month option at a strike price of 95 cents and for the remainder uncovered by the options the firm would bear the risk itself. For this, it would use forward rate as the best estimate of spot. Transaction costs are ignored.

Recommend, which of the above two methods would be appropriate for the American firm to hedge its foreign exchange risk on the two interest payments.

37. Zaz plc, a UK Company is in the process of negotiating an order amounting €2.8 million with a large German retailer on 6 month's credit. If successful, this will be first time for Zaz has exported goods into the highly competitive German Market. The Zaz is considering following 3 alternatives for managing the transaction risk before the order is finalized.
- Mr. Peter the Marketing head has suggested that in order to remove transaction risk completely Zaz should invoice the German firm in Sterling using the current €/£ average spot rate to calculate the invoice amount.
 - Mr. Wilson, CE is doubtful about Mr. Peter's proposal and suggested an alternative of invoicing the German firm in € and using a forward exchange contract to hedge the transaction risk.
 - Ms. Karen, CFO is agreed with the proposal of Mr. Wilson to invoice the German first in €, but she is of opinion that Zaz should use sufficient 6-month Sterling Future contracts (to the nearest whole number) to hedge the transaction risk.

Following data is available

Spot Rate	€ 1.1960 - €1.1970/£
6-months forward points	0.60 – 0.55 Euro Cents.
6-month Future contract is currently trading at	€ 1.1943/£
6-month Future contract size is	£62,500
After 6-month Spot rate and future rate	€ 1.1873/£

You are required to

- Calculate (to the nearest £) the £ receipt for Zaz plc, under each of 3 above proposals.
 - In your opinion which alternative you consider to be most appropriate.
38. Columbus Surgicals Inc. is based in US, has recently imported surgical raw materials from the UK and has been invoiced for £ 480,000, payable in 3 months. It has also exported surgical goods to India and France.

The Indian customer has been invoiced for £ 138,000, payable in 3 months, and the French customer has been invoiced for € 590,000, payable in 4 months.

Current spot and forward rates are as follows:

£ / US\$

Spot:	0.9830 – 0.9850
Three months forward:	0.9520 – 0.9545

US\$ / €

Spot: 1.8890 – 1.8920

Four months forward: 1.9510 – 1.9540

Current money market rates are as follows:

UK: 10.0% – 12.0% p.a.

France: 14.0% – 16.0% p.a.

USA: 11.5% – 13.0% p.a.

You as Treasury Manager are required to show how the company can hedge its foreign exchange exposure using Forward markets and Money markets hedge and suggest which the best hedging technique is.

39. XYZ Ltd. a US firm will need £ 3,00,000 in 180 days. In this connection, the following information is available:

Spot rate 1 £ = \$ 2.00

180 days forward rate of £ as of today = \$1.96

Interest rates are as follows:

	U.K.	US
180 days deposit rate	4.5%	5%
180 days borrowing rate	5%	5.5%

A call option on £ that expires in 180 days has an exercise price of \$ 1.97 and a premium of \$ 0.04.

XYZ Ltd. has forecasted the spot rates 180 days hence as below:

Future rate	Probability
\$ 1.91	25%
\$ 1.95	60%
\$ 2.05	15%

Which of the following strategies would be most preferable to XYZ Ltd.?

- (a) A forward contract;
- (b) A money market hedge;
- (c) An option contract;
- (d) No hedging.

Show calculations in each case

40. A Ltd. of U.K. has imported some chemical worth of USD 3,64,897 from one of the U.S. suppliers. The amount is payable in six months time. The relevant spot and forward rates are:

Spot rate	USD 1.5617-1.5673
6 months' forward rate	USD 1.5455 –1.5609

The borrowing rates in U.K. and U.S. are 7% and 6% respectively and the deposit rates are 5.5% and 4.5% respectively.

Currency options are available under which one option contract is for GBP 12,500. The option premium for GBP at a strike price of USD 1.70/GBP is USD 0.037 (call option) and USD 0.096 (put option) for 6 months period.

The company has 3 choices:

- (i) Forward cover
- (ii) Money market cover, and
- (iii) Currency option

Which of the alternatives is preferable by the company?

41. Nitrogen Ltd, a UK company is in the process of negotiating an order amounting to €4 million with a large German retailer on 6 months credit. If successful, this will be the first time that Nitrogen Ltd has exported goods into the highly competitive German market. The following three alternatives are being considered for managing the transaction risk before the order is finalized.

- (i) Invoice the German firm in Sterling using the current exchange rate to calculate the invoice amount.
- (ii) Alternative of invoicing the German firm in € and using a forward foreign exchange contract to hedge the transaction risk.
- (iii) Invoice the German first in € and use sufficient 6 months sterling future contracts (to the nearly whole number) to hedge the transaction risk.

Following data is available:

Spot Rate	€ 1.1750 - €1.1770/£
6 months forward premium	0.55-0.60 Euro Cents
6 months future contract is currently trading at	€1.1760/£
6 months future contract size is	£62500
Spot rate and 6 months future rate	€1.1785/£

45. A bank enters into a forward purchase TT covering an export bill for Swiss Francs 1,00,000 at ₹ 32.4000 due 25th April and covered itself for same delivery in the local interbank market at ₹ 32.4200. However, on 25th March, exporter sought for cancellation of the contract as the tenor of the bill is changed.

In Singapore market, Swiss Francs were quoted against dollars as under:

Spot	USD 1 = Sw. Fcs.	1.5076/1.5120
One month forward		1.5150/ 1.5160
Two months forward		1.5250 / 1.5270
Three months forward		1.5415/ 1.5445

and in the interbank market US dollars were quoted as under:

Spot	USD 1 = ₹	49.4302/4455
Spot / April		4100/4200
Spot/May		4300/4400
Spot/June		4500/4600

Calculate the cancellation charges, payable by the customer if exchange margin required by the bank is 0.10% on buying and selling.

46. Your forex dealer had entered into a cross currency deal and had sold US \$ 10,00,000 against EURO at US \$ 1 = EURO 1.4400 for spot delivery.

However, later during the day, the market became volatile and the dealer in compliance with his management's guidelines had to square – up the position when the quotations were:

Spot US \$ 1	INR 31.4300/4500
1 month margin	25/20
2 months margin	45/35
Spot US \$ 1	EURO 1.4400/4450
1 month forward	1.4425/4490
2 months forward	1.4460/4530

What will be the gain or loss in the transaction?

47. You have following quotes from Bank A and Bank B:

	Bank A	Bank B
SPOT	USD/CHF 1.4650/55	USD/CHF 1.4653/60
3 months	5/10	

6 months	10/15	
SPOT	GBP/USD 1.7645/60	GBP/USD 1.7640/50
3 months	25/20	
6 months	35/25	

Calculate :

- (i) How much minimum CHF amount you have to pay for 1 Million GBP spot?
 - (ii) Considering the quotes from Bank A only, for GBP/CHF what are the Implied Swap points for Spot over 3 months?
48. M/s Omega Electronics Ltd. exports air conditioners to Germany by importing all the components from Singapore. The company is exporting 2,400 units at a price of Euro 500 per unit. The cost of imported components is S\$ 800 per unit. The fixed cost and other variables cost per unit are ₹ 1,000 and ₹ 1,500 respectively. The cash flows in Foreign currencies are due in six months. The current exchange rates are as follows:

₹/Euro	51.50/55
₹/S\$	27.20/25

After six months the exchange rates turn out as follows:

₹/Euro	52.00/05
₹/S\$	27.70/75

- (A) You are required to calculate loss/gain due to transaction exposure.
 - (B) Based on the following additional information calculate the loss/gain due to transaction and operating exposure if the contracted price of air conditioners is ₹ 25,000 :
 - (i) the current exchange rate changes to

₹/Euro	51.75/80
₹/S\$	27.10/15
 - (ii) Price elasticity of demand is estimated to be 1.5
 - (iii) Payments and receipts are to be settled at the end of six months.
49. Your bank's London office has surplus funds to the extent of USD 5,00,000/- for a period of 3 months. The cost of the funds to the bank is 4% p.a. It proposes to invest these funds in London, New York or Frankfurt and obtain the best yield, without any exchange risk to the bank. The following rates of interest are available at the three centres for investment of domestic funds there at for a period of 3 months.
- | | |
|----------|----------|
| London | 5 % p.a. |
| New York | 8% p.a. |

Frankfurt 3% p.a.

The market rates in London for US dollars and Euro are as under:

London on New York

Spot	1.5350/90
1 month	15/18
2 months	30/35
3 months	80/85

London on Frankfurt

Spot	1.8260/90
1 month	60/55
2 months	95/90
3 months	145/140

At which centre, will be investment be made & what will be the net gain (to the nearest pound) to the bank on the invested funds?

50. Drilldip Inc. a US based company has a won a contract in India for drilling oil field. The project will require an initial investment of ₹ 500 crore. The oil field along with equipments will be sold to Indian Government for ₹ 740 crore in one year time. Since the Indian Government will pay for the amount in Indian Rupee (₹) the company is worried about exposure due exchange rate volatility.

You are required to:

- (a) Construct a swap that will help the Drilldip to reduce the exchange rate risk.
- (b) Assuming that Indian Government offers a swap at spot rate which is 1US\$ = ₹ 50 in one year, then should the company should opt for this option or should it just do nothing. The spot rate after one year is expected to be 1US\$ = ₹ 54. Further you may also assume that the Drilldip can also take a US\$ loan at 8% p.a.
51. You as a dealer in foreign exchange have the following position in Swiss Francs on 31st October, 2009:

	Swiss Francs
Balance in the Nostro A/c Credit	1,00,000
Opening Position Overbought	50,000
Purchased a bill on Zurich	80,000
Sold forward TT	60,000

Forward purchase contract cancelled	30,000
Remitted by TT	75,000
Draft on Zurich cancelled	30,000

What steps would you take, if you are required to maintain a credit Balance of Swiss Francs 30,000 in the Nostro A/c and keep as overbought position on Swiss Francs 10,000?

ANSWERS/ SOLUTIONS

Answers to Theoretical Questions

1. Please refer paragraph 10.
2. Please refer paragraph 4.

Answers to the Practical Questions

1. Here we can assume two cases (i) If investor is US investor then there will be no impact of appreciation in \$. (ii) If investor is from any other nation other than US say Indian then there will be impact of \$ appreciation on his returns.

First we shall compute return on bond which will be common for both investors.

$$\text{Return} = \frac{(\text{Price at end} - \text{Price at beginning}) + \text{Interest}}{\text{Price at beginning}}$$

$$= \frac{(5250 - 5000) + 350}{5000}$$

$$= \frac{250 + 350}{5000} = 0.12 \text{ say } 12\%$$

- (i) For US investor the return shall be 12% and there will be no impact of appreciation in \$.
- (ii) If \$ appreciate by 2% then return for non-US investor shall be:

$$(1 + 0.12)(1 + 0.02) - 1 = 1.12 \times 1.02 - 1 = 0.1424 \text{ i.e. } 14.24\%$$

2. Here Canara Bank shall buy US\$ and credit ₹ to Vostro account of ABN-Amro Bank. Canara Bank's buying rate will be based on the Inter-bank Buying Rate (as this is the rate at which Canara Bank can sell US\$ in the Interbank market)

Accordingly, the Interbank Buying Rate of US\$ will be ₹ 51.3625 (lower of two) i.e. $(1/51.3625) = \$ 0.01947/\text{₹}$

Equivalent of US\$ for ₹ 15 million at this rate will be

$$= \frac{15,000,000}{51.3625} = \text{US\$ } 2,92,041.86$$

or $= 15,000,000 \times \$ 0.01947 = \text{US\$ } 2,92,050$

3. To purchase Rupee, XYZ LTD Bank shall first sell £ and purchase \$ and then sell \$ to purchase Rupee. Accordingly, rate $(\text{£}/\text{₹})_{\text{ask}}$ shall be used.

The available rates are as follows:

$$(\text{\$/£})_{\text{bid}} = \$1.5260$$

$$(\text{\$/£})_{\text{ask}} = \$1.5270$$

$$(\text{₹}/\text{\$})_{\text{bid}} = ₹ 61.3625$$

$$(\text{₹}/\text{\$})_{\text{ask}} = ₹ 61.3700$$

From above available rates we can compute required rate as follows:

$$\begin{aligned} (\text{£}/\text{₹})_{\text{ask}} &= (\text{£}/\text{\$})_{\text{ask}} \times (\text{\$/₹})_{\text{ask}} \\ &= (1/1.5260) \times (1/61.3625) \\ &= \text{£ } 0.01068 \text{ or } \text{£ } 0.0107 \end{aligned}$$

Thus, amount of £ to be credited

$$\begin{aligned} &= ₹ 25,000,000 \times \text{£ } 0.0107 \\ &= \text{£ } 267,500 \end{aligned}$$

4. Forward Rate = $\frac{2.50 (1 + 0.075)}{(1 + 0.060)} = \text{Can\$ } 2.535/\text{£}$

- (i) If spot rate decline by 2%

$$\text{Spot Rate} = \text{Can\$ } 2.50 \times 1.02 = \text{Can\$ } 2.55/\text{£}$$

	£
£ receipt as per Forward Rate (Can \$ 5,00,000/ Can\$ 2.535)	1,97,239
£ receipt as per Spot Rate (Can \$ 5,00,000/ Can\$ 2.55)	1,96,078
Gain due to forward contract	1,161

- (ii) If spot rate gains by 4%

$$\text{Spot Rate} = \text{Can\$ } 2.50 \times 0.96 = \text{Can\$ } 2.40/\text{£}$$

	£
£ receipt as per Forward Rate (Can \$ 5,00,000/ Can\$ 2.535)	1,97,239
£ receipt as per Spot Rate (Can \$ 5,00,000/ Can\$ 2.40)	2,08,333
Loss due to forward contract	11,094

(iii) If spot rate remains unchanged

	£
£ receipt as per Forward Rate (Can \$ 5,00,000/ Can\$ 2.535)	1,97,239
£ receipt as per Spot Rate (Can \$ 5,00,000/ Can\$ 2.50)	2,00,000
Loss due to forward contract	2,761

5. (i) Swap Points for 2 months and 15 days

	Bid	Ask
Swap Points for 2 months (a)	70	90
Swap Points for 3 months (b)	160	186
Swap Points for 30 days (c) = (b) – (a)	90	96
Swap Points for 15 days (d) = (c)/2	45	48
Swap Points for 2 months & 15 days (e) = (a) + (d)	115	138

(ii) Foreign Exchange Rates for 20th June 2016

	Bid	Ask
Spot Rate (a)	66.2525	67.5945
Swap Points for 2 months & 15 days (b)	0.0115	0.0138
	66.2640	67.6083

(iii) Annual Rate of Premium

	Bid	Ask
Spot Rate (a)	66.2525	67.5945
Foreign Exchange Rates for 20 th June 2016 (b)	66.2640	67.6083
Premium (c)	0.0115	0.0138
Total (d) = (a) + (b)	132.5165	135.2028
Average (d) / 2	66.2583	67.6014

Premium	$\frac{0.0115}{66.2583} \times \frac{12}{2.5} \times 100$ = 0.0833%	$\frac{0.0138}{67.6014} \times \frac{12}{2.5} \times 100$ = 0.0980%
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6. Since the direct quote for ¥ and ₹ is not available it will be calculated by cross exchange rate as follows:

$$\text{₹/\$} \times \text{\$/¥} = \text{₹/¥}$$

$$62.22/102.34 = 0.6080$$

Spot rate on date of export 1¥ = ₹ 0.6080

Expected Rate of ¥ for August 2014 = ₹ 0.5242 (₹ 65/¥124)

Forward Rate of ¥ for August 2014 = ₹ 0.6026 (₹ 66.50/¥110.35)

(i) **Calculation of expected loss without hedging**

Value of export at the time of export (₹ 0.6080 x ¥10,000,000)	₹ 60,80,000
Estimated payment to be received on Aug. 2014 (₹ 0.5242 x ¥10,000,000)	₹ 52,42,000
Loss	₹ 8,38,000

Hedging of loss under Forward Cover

₹ Value of export at the time of export (₹ 0.6080 x ¥10,000,000)	₹ 60,80,000
Payment to be received under Forward Cover (₹ 0.6026 x ¥10,000,000)	₹ 60,26,000
Loss	₹ 54,000

By taking forward cover loss is reduced to ₹ 54,000.

(ii) **Actual Rate of ¥ on August 2014 = ₹ 0.5977 (₹ 66.25/¥110.85)**

Value of export at the time of export (₹ 0.6080 x ¥10,000,000)	₹ 60,80,000
Estimated payment to be received on Aug. 2014 (₹ 0.5977 x ¥10,000,000)	₹ 59,77,000
Loss	₹ 1,03,000

The decision to take forward cover is still justified.

7. The bank (Dealer) covers itself by buying from the market at market selling rate.

Rupee – Dollar selling rate	= ₹ 42.85
Dollar – Hong Kong Dollar	= HK \$ 7.5880
Rupee – Hong Kong cross rate	= ₹ 42.85 / 7.5880
	= ₹ 5.6471

Profit / Loss to the Bank

Amount received from customer (1 crore × 5.70)	₹ 5,70,00,000
Amount paid on cover deal (1 crore × 5.6471)	<u>₹ 5,64,71,000</u>
Profit to Bank	<u>₹ 5,29,000</u>

8. Amount realized on selling Danish Kroner 10,00,000 at ₹ 6.5150 per Kroner = ₹ 65,15,000.

Cover at London:

Bank buys Danish Kroner at London at the market selling rate.

Pound sterling required for the purchase (DKK 10,00,000 ÷ DKK 11.4200) = GBP 87,565.67

Bank buys locally GBP 87,565.67 for the above purchase at the market selling rate of ₹ 74.3200.

The rupee cost will be = ₹ 65,07,88

Profit (₹ 65,15,000 - ₹ 65,07,881) = ₹ 7,119

Cover at New York:

Bank buys Kroners at New York at the market selling rate.

Dollars required for the purchase of Danish Kroner (DKK10,00,000 ÷ 7.5670) = USD 1,32,152.77

Bank buys locally USD 1,32,152.77 for the above purchase at the market selling rate of ₹ 49.2625.

The rupee cost will be = ₹ 65,10,176.

Profit (₹ 65,15,000 - ₹ 65,10,176) = ₹ 4,824

The transaction would be covered through London which gets the maximum profit of ₹ 7,119 or lower cover cost at London Market by (₹ 65,10,176 - ₹ 65,07,881) = ₹ 2,295

9. On January 28, 2013 the importer customer requested to remit SGD 25 lakhs.

To consider sell rate for the bank:

US \$	=	₹45.90
Pound 1	=	US\$ 1.7850

Pound 1	=	SGD 3.1575
Therefore, SGD 1	=	$\frac{\text{₹ } 45.90 * 1.7850}{\text{SGD } 3.1575}$
SGD 1	=	₹25.9482
Add: Exchange margin (0.125%)		<u>₹ 0.0324</u>
		<u>₹ 25.9806</u>

On February 4, 2013 the rates are

US \$	=	₹ 45.97
Pound 1	=	US\$ 1.7775
Pound 1	=	SGD 3.1380
Therefore, SGD 1	=	$\frac{\text{₹ } 45.97 * 1.7775}{\text{SGD } 3.1380}$
SGD 1	=	₹ 26.0394
Add: Exchange margin (0.125%)		<u>₹ 0.0325</u>
		<u>₹ 26.0719</u>

Hence, loss to the importer

$$= \text{SGD } 25,00,000 (\text{₹}26.0719 - \text{₹}25.9806) = \text{₹}2,28,250$$

10. (i) Net exposure of each foreign currency in Rupees

	Inflow (Millions)	Outflow (Millions)	Net Inflow (Millions)	Spread	Net Exposure (Millions)
US\$	40	20	20	0.81	16.20
FFr	20	8	12	0.67	8.04
UK£	30	20	10	0.41	4.10
Japan Yen	15	25	-10	-0.80	8.00

- (ii) In Japanese Yen, the net exposure is payable, and the forward rate is quoted at a discount, effectively offsetting the position. Likewise, in the remaining currencies, the net exposures are in receivables, and the related currencies are at a premium, offsetting the positions in their respective currencies.

11. (i) US \$ required to get ₹ 25 lakhs after 2 months at the Rate of ₹ 47/\$

$$\therefore \frac{\text{₹ } 25,00,000}{\text{₹ } 47} = \text{US } \$ 53191.489$$

(ii) ₹ required to get US\$ 2,00,000 now at the rate of ₹ 46.25/\$

$$\therefore \text{US \$ } 200,000 \times \text{₹ } 46.25 = \text{₹ } 92,50,000$$

(iii) Encashing US \$ 69000 Now Vs 2 month later

Proceed if we can encash in open mkt \$ 69000 × ₹46 = ₹ 31,74,000

Opportunity gain

$$= 31,74,000 \times \frac{10}{100} \times \frac{2}{12} \quad \text{₹ } \underline{52,900}$$

Likely sum at end of 2 months 32,26,900

Proceeds if we can encash by forward rate :

\$ 69000 × ₹47.00 32,43,000

It is better to encash the proceeds after 2 months and get opportunity gain.

12. (i) **Pay the supplier in 60 days**

If the payment is made to supplier in 60 days the applicable forward rate for 1 USD	₹ 57.10
Payment Due	USD 2,000,000
Outflow in Rupees (USD 2000000 × ₹ 57.10)	₹ 114,200,000
Add: Interest on loan for 30 days@10% p.a.	₹ 9,51,667
Total Outflow in ₹	₹ 11,51,51,667

(ii) **Availing supplier's offer of 90 days credit**

Amount Payable	USD 2,000,000
Add: Interest on credit period for 30 days@8% p.a.	USD 13,333
Total Outflow in USD	USD 2,013,333
Applicable forward rate for 1 USD	₹ 57.50
Total Outflow in ₹ (USD 2,013,333 × ₹ 57.50)	₹ 115,766,648

Alternative 1 is better as it entails lower cash outflow.

13. The arbitrageur can proceed as stated below to realize arbitrage gains.

(i) Buy ₹ from USD 10,000,000 At Mumbai $48.30 \times 10,000,000$ ₹483,000,000

(ii) Convert these ₹ to GBP at London $\left(\frac{\text{₹ } 483,000,000}{\text{₹ } 77.52} \right)$ GBP 6,230,650.155

(iii) Convert GBP to USD at New York GBP 6,230,650.155 × 1.6231 USD 10,112,968.26
There is net gain of USD 10,112,968.26 less USD 10,000,000 i.e. USD 112,968.26

14. (i) Under the given circumstances, the USD is expected to quote at a premium in India as the interest rate is higher in India.

(ii) Calculation of the forward rate:

$$\frac{1+R_h}{1+R_f} = \frac{F_1}{E_0}$$

Where: R_h is home currency interest rate, R_f is foreign currency interest rate, F_1 is end of the period forward rate, and E_0 is the spot rate.

$$\text{Therefore } \frac{1 + (0.10/2)}{1 + (0.04/2)} = \frac{F_1}{55.50}$$

$$\frac{1 + 0.05}{1 + 0.02} = \frac{F_1}{55.50}$$

$$\text{or } \frac{1.05}{1.02} \times 55.50 = F_1$$

$$\text{or } \frac{58.275}{1.02} = F_1$$

$$\text{or } F_1 = ₹57.13$$

(iii) Rate of premium:

$$\frac{57.13 - 55.50}{55.50} \times \frac{12}{6} \times 100 = 5.87\%$$

15. (i) Calculation of expected spot rate for September, 2009:

\$ for £ (1)	Probability (2)	Expected \$/£ (1) × (2) = (3)
1.60	0.15	0.24
1.70	0.20	0.34
1.80	0.25	0.45
1.90	0.20	0.38
2.00	<u>0.20</u>	<u>0.40</u>
	<u>1.00</u>	EV = <u>1.81</u>

Therefore, the expected spot value of \$ for £ for September, 2009 would be \$ 1.81.

- (ii) If the six-month forward rate is \$ 1.80, the expected profits of the firm can be maximised by retaining its pounds receivable.

16.

USD/ ₹ on 3 rd September	49.3800
Swap Point for October	0.1300
	49.5100
USD/ SGD on 3 rd September	1.7058
Swap Point for 2 nd month Forward	0.0096
	1.7154
SGD/ ₹ (49.5100/ 1.7154)	28.8621
Add: Exchange Margin	0.0500
	28.9121

Thus, Cross Rate for SGD/ ₹ of 30th October shall be ₹ 28.9121.

17. Spot rate of ₹ 1 against yen = 108 lakhs yen/₹ 30 lakhs = 3.6 yen

3 months forward rate of Re. 1 against yen = 3.3 yen

Anticipated decline in Exchange rate = 10%.

Expected spot rate after 3 months = 3.6 yen – 10% of 3.6 = 3.6 yen – 0.36 yen = 3.24 yen per rupee

	₹ (in lakhs)
Present cost of 108 lakhs yen	30.00
Cost after 3 months: 108 lakhs yen/ 3.24 yen	<u>33.33</u>
Expected exchange loss	<u>3.33</u>
If the expected exchange rate risk is hedged by a Forward contract:	
Present cost	30.00
Cost after 3 months if forward contract is taken 108 lakhs yen/ 3.3 yen	<u>32.73</u>
Expected loss	<u>2.73</u>

Suggestion: If the exchange rate risk is not covered with forward contract, the expected exchange loss is ₹ 3.33 lakhs. This could be reduced to ₹ 2.73 lakhs if it is covered with Forward contract. Hence, taking forward contract is suggested.

18. Firstly, the interest is calculated at 3% p.a. for 6 months. That is:

$$\text{USD } 20,00,000 \times 3/100 \times 6/12 = \text{USD } 30,000$$

From the forward points quoted, it is seen that the second figure is less than the first, this means that the currency is quoted at a discount.

(i) The value of the total commitment in Indian rupees is calculated as below:

Principal Amount of loan	USD 20,00,000
Add: Interest	<u>USD 30,000</u>
Amount due	<u>USD 20,30,000</u>
Spot rate	₹ 48.5275
Forward Points (6 months)	(-) 0.0700
Forward Rate	₹ 48.4575
Value of Commitment	₹ 9,83,68,725

(ii) It is seen from the forward rates that the market expectation is that the dollar will depreciate. If the firm's own expectation is that the dollar will depreciate more than what the bank has quoted, it may be worthwhile not to cover forward and keep the exposure open.

If the firm has no specific view regarding future dollar price movements, it would be better to cover the exposure. This would freeze the total commitment and insulate the firm from undue market fluctuations. In other words, it will be advisable to cut the losses at this point of time.

Given the interest rate differentials and inflation rates between India and USA, it would be unwise to expect continuous depreciation of the dollar. The US Dollar is a stronger currency than the Indian Rupee based on past trends and it would be advisable to cover the exposure.

19. (i) Rate of discount quoted by the bank

$$= \frac{(45.20 - 45.60) \times 365 \times 100}{45.60 \times 60} = 5.33\%$$

(ii) Probable loss of operating profit:

$$(45.20 - 45.50) \times 1,00,000 = ₹ 30,000$$

20. Buy £ 62500 × 1.2806 = \$ 80037.50

Sell £ 62500 × 1.2816 = \$ 80100.00

Profit \$ 62.50

Alternatively, if the market comes back together before December 15, the dealer could unwind his position (by simultaneously buying £ 62,500 forward and selling a futures contract. Both for delivery on December 15) and earn the same profit of \$ 62.5.

21. If importer pays now, he will have to buy US\$ in Spot Market by availing overdraft facility. Accordingly, the outflow under this option will be

	₹
Amount required to purchase \$130000[\$130000 X ₹48.36]	6286800
Add: Overdraft Interest for 3 months @15% p.a.	235755
	6522555

If importer makes payment after 3 months then, he will have to pay interest for 3 months @ 5% p.a. for 3 month along with the sum of import bill. Accordingly, he will have to buy \$ in forward market. The outflow under this option will be as follows:

	\$
Amount of Bill	130000
Add: Interest for 3 months @5% p.a.	1625
	131625

Amount to be paid in Indian Rupee after 3 month under the forward purchase contract

₹ 6427249 (US\$ 131625 X ₹ 48.83)

Since outflow of cash is least in (ii) option, it should be opted for.

22. (i) **Pay the supplier in 60 days**

If the payment is made to supplier in 60 days the applicable forward rate for 1 USD	₹ 63.15
Payment Due	USD 1 crore
Outflow in Rupees (USD 1 crore × ₹ 63.15)	₹ 63.15 crore
Add: Interest on loan for 30 days@9.5% p.a.	₹ 0.50 crore
Total Outflow in ₹	₹ 63.65 crore

- (ii) **Availing supplier's offer of 90 days credit**

Amount Payable	USD 1.00000 crore
Add: Interest on credit period for 30 days@7.75% p.a.	USD 0.00646 crore
Total Outflow in USD	USD 1.00646 crore
Applicable forward rate for 1 USD	₹ 63.45
Total Outflow in ₹ (USD 1.00646 crore × ₹ 63.45)	₹ 63.86 crore

Alternative 1 is better as it entails lower cash outflow.

23.

	(₹)
Present Exchange Rate ₹65 = 1 US\$	
If company purchases US\$ 60,000 forward premium is $60000 \times 64 \times 2\%$	76,800
Interest on ₹76,800 for 6 months at 12%	<u>4,608</u>
Total hedging cost	<u>81,408</u>
If exchange rate is ₹68	
Then gain (₹68 – ₹64) for US\$ 60,000	2,40,000
Less: Hedging cost	<u>81,408</u>
Net gain	<u>1,58,592</u>
If US\$ = ₹62	
Then loss (₹64 – ₹62) for US\$ 60,000	1,20,000
Add: Hedging Cost	<u>81,408</u>
Total Loss	<u>2,01,408</u>
If US\$ = ₹70	
Then Gain (₹70 – ₹64) for US\$ 60,000	3,60,000
Less: Hedging Cost	<u>81,408</u>
Total Gain	<u>2,78,592</u>
If US\$ = ₹65	
Then Gain (₹ 65 – ₹ 64) for US\$ 60,000	60,000
Less: Hedging Cost	<u>81,408</u>
Net Loss	<u>21,408</u>

24. If foreign exchange risk is hedged

				Total (₹)
Sum due	Yen 78,00,000	US\$1,02,300	Euro 95,920	
Unit input price	Yen 650	US\$10.23	Euro 11.99	
Unit sold	12000	10000	8000	
Variable cost per unit	₹ 225/-	₹ 395/-	₹ 510/-	
Variable cost	₹ 27,00,000	₹ 39,50,000	₹ 40,80,000	₹ 1,07,30,000

Three months forward rate for selling	2.427	0.0216	0.0178	
Rupee value of receipts	₹32,13,844	₹ 47,36,111	₹ 53,88,764	₹ 1,33,38,719
Contribution	₹5,13,844	₹ 7,86,111	₹ 13,08,764	₹ 26,08,719
Average contribution to sale ratio				19.56%
If risk is not hedged				
Rupee value of receipt	₹31,72,021	₹ 47,44,898	₹ 53,58,659	₹ 1,32,75,578
Total contribution				₹ 25,45,578
Average contribution to sale ratio				19.17%

AKC Ltd. Is advised to hedge its foreign currency exchange risk.

25. Receipts using a forward contract = $\$10,000,000/0.016129 = ₹ 620,001,240$

Receipts using currency futures

The number of contracts needed is $(\$10,000,000/0.016118)/24,816,975 = 25$

Initial margin payable is 25 contracts x ₹ 22,500 = ₹ 5,62,500

On April 1, 2015 Close at 0.016134

Receipts = $US\$10,000,000/0.016136 = ₹ 619,732,276$

Variation Margin =

$[(0.016134 - 0.016118) \times 25 \times 24,816,975]/0.016136$

OR $(0.000016 \times 25 \times 24,816,975)/0.016136 = 9926.79/0.016136 = ₹ 615,195$

Less: Interest Cost – ₹ 5,62,500 x 0.07 x 3/12 = ₹ 9,844

Net Receipts ₹ 620,337,627

Receipts under different methods of hedging

Forward contract ₹ 620,001,240

Futures ₹ 620,337,627

No hedge (US\$ 10,000,000/0.016136) ₹ 619,732,276

The most advantageous option would have been to hedge with futures.

26.

$$\text{Spot Rate} = ₹40,00,000 / \text{US\$}83,312 = 48.0123$$

$$\begin{aligned} \text{Forward Premium on US\$} &= [(48.8190 - 48.0123) / 48.0123] \times 12/6 \times 100 \\ &= 3.36\% \end{aligned}$$

$$\text{Interest rate differential} = 12\% - 8\% = 4\%$$

Since the negative Interest rate differential is greater than forward premium there is a possibility of arbitrage inflow into India.

The advantage of this situation can be taken in the following manner:

1. Borrow US\$ 83,312 for 6 months

Amount to be repaid after 6 months

$$= \text{US \$ } 83,312 (1 + 0.08 \times 6/12) = \text{US\$}86,644.48$$

2. Convert US\$ 83,312 into Rupee and get the principal i.e. ₹40,00,000

Interest on Investments for 6 months – ₹40,00,000/- x 0.06 = ₹2,40,000/-

Total amount at the end of 6 months = ₹(40,00,000 + 2,40,000) = ₹42,40,000/-

Converting the same at the forward rate

$$= ₹42,40,000 / ₹48.8190 = \text{US\$ } 86,851.43$$

Hence the gain is US \$ (86,851.43 – 86,644.48) = US\$ 206.95 OR

₹10,103 i.e., (\$206.95 x ₹48.8190)

27. In this case, DM is at a premium against the Can\$.

$$\text{Premium} = [(0.67 - 0.665) / 0.665] \times (12/3) \times 100 = 3.01 \text{ per cent}$$

$$\text{Interest rate differential} = 9\% - 7\% = 2 \text{ per cent.}$$

Since the interest rate differential is smaller than the premium, it will be profitable to place money in Deutschmarks the currency whose 3-months interest is lower.

The following operations are carried out:

- (i) Borrow Can\$ 1000 at 9 per cent for 3- months;
- (ii) Change this sum into DM at the spot rate to obtain DM

$$= (1000 / 0.665) = 1503.76$$

- (iii) Place DM 1503.76 in the money market for 3 months to obtain a sum of DM

Principal:	1503.76
Add: Interest @ 7% for 3 months =	<u>26.32</u>
Total	1530.08

- (iv) Sell DM at 3-months forward to obtain Can\$ = $(1530.08 \times 0.67) = 1025.15$

- (v) Refund the debt taken in Can\$ with the interest due on it, i.e.,

	Can\$
Principal	1000.00
Add: Interest @9% for 3 months	<u>22.50</u>
Total	<u>1022.50</u>

$$\text{Net arbitrage gain} = 1025.15 - 1022.50 = \text{Can\$ } 2.65$$

28. The only thing lefts Rohit and Bros to cover the risk in the money market. The following steps are required to be taken:

- (i) Borrow pound sterling for 3- months. The borrowing has to be such that at the end of three months, the amount becomes £ 500,000. Say, the amount borrowed is £ x. Therefore

$$x \left[1 + 0.05 \times \frac{3}{12} \right] = 500,000 \text{ or } x = \text{£}493,827$$

- (ii) Convert the borrowed sum into rupees at the spot rate. This gives: $\text{£}493,827 \times \text{₹ } 56 = \text{₹ } 27,654,312$

- (iii) The sum thus obtained is placed in the money market at 12 per cent to obtain at the end of 3- months:

$$S = \text{₹ } 27,654,312 \times \left[1 + 0.12 \times \frac{3}{12} \right] = \text{₹ } 28,483,941$$

- (iv) The sum of £500,000 received from the client at the end of 3- months is used to refund the loan taken earlier.

From the calculations. It is clear that the money market operation has resulted into a net gain of ₹ 483,941 ($\text{₹ } 28,483,941 - \text{₹ } 500,000 \times 56$).

If pound sterling has depreciated in the meantime. The gain would be even bigger.

29. **Identify:** Foreign currency is an asset. Amount \$ 3,50,000.

Create: \$ Liability.

Borrow: In \$. The borrowing rate is 9% per annum or 2.25% per quarter.

Amount to be borrowed: $3,50,000 / 1.0225 = \$ 3,42,298.29$

Convert: Sell \$ and buy £. The relevant rate is the Ask rate, namely, 1.5905 per £,

(**Note:** This is an indirect quote). Amount of £s received on conversion is 2,15,214.27 ($3,42,298.29/1.5905$).

Invest: £ 2,15,214.27 will be invested at 5% for 3 months and get £ 2,17,904.45

Settle: The liability of \$3,42,298.29 at interest of 2.25 per cent quarter matures to \$3,50,000 receivable from customer.

Using forward rate, amount receivable is = $3,50,000 / 1.6140 = £2,16,852.54$

Amount received through money market hedge = £2,17,904.45

Gain = $2,17,904.45 - 2,16,852.54 = £1,051.91$

So, money market hedge is beneficial for the exporter

30.

End of Year	₹	₹/USD
1	$₹46.00 \times \frac{(1+0.08)}{(1+0.04)}$	47.77
2	$₹47.77 \times \frac{(1+0.08)}{(1+0.04)}$	49.61
3	$₹49.61 \times \frac{(1+0.08)}{(1+0.04)}$	51.52
4	$₹51.52 \times \frac{(1+0.08)}{(1+0.04)}$	53.50

31. As per interest rate parity

$$S_1 = S_0 \left[\frac{1 + \text{in A}}{1 + \text{in B}} \right]$$

$$\begin{aligned}
 S_1 &= \text{£}0.7570 \left[\frac{1 + (0.075) \times \frac{3}{12}}{1 + (0.035) \times \frac{3}{12}} \right] \\
 &= \text{£}0.7570 \left[\frac{1.01875}{1.00875} \right] \\
 &= \text{£}0.7570 \times 1.0099 = \text{£}0.7645 \\
 &= \text{UK £}0.7645 / \text{US\$}
 \end{aligned}$$

32. (i) The contract is to be cancelled on 30-10-2010 at the spot buying rate of US\$ 1
= ₹ 41.5000

Less: Margin Money 0.075% = ₹ 0.0311

= ₹ 41.4689 or ₹ 41.47

US\$ 20,000 @ ₹ 41.47 = ₹ 8,29,400

US\$ 20,000 @ ₹ 42.32 = ₹ 8,46,400

The difference in favour of the Bank/Cost to the importer ₹ 17,000

- (ii) The Rate of New Forward Contract

Spot Selling Rate US\$ 1 = ₹ 41.5200

Add: Premium @ 0.93% = ₹ 0.3861

= ₹ 41.9061

Add: Margin Money 0.20% = ₹ 0.0838

= ₹ 41.9899 or ₹ 41.99

33. (i) **Forward Cover**

$$3\text{-month Forward Rate} = \frac{1}{1.9726} = ₹ 0.5070/\text{JY}$$

Accordingly, INR required for JY 5,00,000 (5,00,000 X ₹ 0.5070) ₹ 2,53,500

- (ii) **Option Cover**

To purchase JY 5,00,000, XYZ LTD shall enter into a Put Option @ JY 2.125/INR

$$\text{Accordingly, outflow in INR} \left(\frac{\text{JY } 5,00,000}{2.125} \right) \quad ₹ 2,35,294$$

$$\text{Premium} \left(\frac{\text{INR } 2,35,294 \times 0.098}{1.9516} \right) \quad \text{₹ } 11,815$$

 ₹ 2,47,109

Since outflow of cash is least in case of Option same should be opted for. Further if price of INR goes above JY 2.125/INR the outflow shall further be reduced.

34. The company can hedge position by selling future contracts as it will receive amount from outside.

$$\text{Number of Contracts} = \frac{\$4,00,000}{\$1,000} = 400 \text{ contracts}$$

$$\text{Gain by trading in futures} = (\text{₹ } 45 - \text{₹ } 44.50) 4,00,000 = \text{₹ } 2,00,000$$

$$\text{Net Inflow after after 3 months} = \text{₹ } 44.50 \times \text{₹ } 4,00,000 + 2,00,000 = \text{₹ } 1,80,00,000$$

$$\text{Effective Price realization} = \frac{\text{₹ } 1,80,00,000}{\$4,00,000} = \text{₹ } 45 \text{ Per US\$}$$

35. **Option - I**

$$\$20 \times 5000 = \$1,00,000$$

$$\text{Repayment in 3 months time} = \$1,00,000 \times (1 + 0.10/4) = \$1,02,500$$

$$\text{3-months outright forward rate} = \text{₹ } 59.90 / \text{₹ } 60.30$$

$$\text{Repayment obligation in ₹} (\$1,02,500 \times \text{₹ } 60.30) = \text{₹ } 61,80,750$$

Option - II

$$\text{Overdraft} (\$1,00,000 \times \text{₹ } 60.55) \quad \text{₹ } 60,55,000$$

$$\text{Interest on Overdraft} (\text{₹ } 60,55,000 \times 0.14/4) \quad \text{₹ } 2,11,925$$

 ₹ 62,66,925

Option I should be preferred as it has lower outflow.

36. *Forward Market Cover*

Hedge the risk by buying Can\$ in 1 and 3 months time will be:

July	-	1010000 X 0.9501 = US \$ 959601
Sept.	-	705000 X 0.9556 = US \$ 673698

Option Contracts

$$\text{July Payment} = 1010000 / 50,000 = 20.20$$

$$\text{September Payment} = 705000 / 50,000 = 14.10$$

Company would like to take out 20 contracts for July and 14 contracts for September respectively. Therefore costs, if the options were exercised, will be:

	July		Sept.	
	Can \$	US \$	Can \$	US \$
Covered by Contracts	1000000	940000	700000	665000
Balance bought at spot rate	10000	9501	5000	4778
<u>Option Costs:</u>				
Can \$ 50000 x 20 x 0.0102		10200	---	
Can \$ 50000 x 14 x 0.0164	---			11480
Total cost in US \$ of using Option Contract		959701		681258

Decision: As the firm is stated as risk averse and the money due to be paid is certain, a fixed forward contract, being the cheapest alternative in the both the cases, would be recommended.

37. (i) **Receipt under three proposals**

(a) Proposal of Mr. Peter

$$\text{Invoicing in } \pounds \text{ will produce} = \frac{\text{€ 2.8 million}}{1.1965} = \pounds 2.340 \text{ million}$$

(b) Proposal of Mr. Wilson

$$\text{Forward Rate} = \text{€ } 1.1970 - 0.0055 = 1.1915$$

$$\text{Using Forward Market hedge Sterling receipt would be } \frac{\text{€ 2.8 million}}{1.1915} = \pounds 2.35 \text{ million}$$

(c) Proposal of Ms. Karen

The equivalent sterling of the order placed based on future price (€1.1943)

$$= \frac{\text{€ 2.8 million}}{1.1943} = \pounds 2,344,470 \text{ (rounded off)}$$

$$\text{Number of Contracts} = \frac{\pounds 2,344,470}{62,500} = 37 \text{ Contracts (to the nearest whole number)}$$

Thus, € amount hedged by future contract will be = $37 \times \pounds 62,500 = \pounds 23,12,500$

Buy Future at	€ 1.1943
Sell Future at	€ <u>1.1873</u>
	€ <u>0.0070</u>

Total loss on Future Contracts = $37 \times \text{€ } 62,500 \times \text{€ } 0.0070 = \text{€ } 16,188$

After 6 months

Amount Received	€ 28,00,000
Less: Loss on Future Contracts	€ <u>16,188</u>
	€ <u>27,83,812</u>

Sterling Receipts

On sale of € at spot = $\frac{\text{€ } 27,83,812}{1.1873} = \text{€ } 2.3446 \text{ million}$

- (ii) Proposal of option (b) is preferable because the option (a) & (c) produces least receipts. Further, in case of proposal (a) there must be a doubt as to whether this would be acceptable to German firm as it is described as a competitive market and Zaz is moving into it first time.

38. £ Exposure

Since Columbus has a £ receipt (£ 138,000) and payment of (£ 480,000) maturing at the same time i.e. 3 months, it can match them against each other leaving a net liability of £ 342,000 to be hedged.

- (i) Forward market hedge

Buy 3 months' forward contract accordingly, amount payable after 3 months will be
 $\text{£ } 342,000 / 0.9520 = \text{US\$ } 359,244$

- (ii) Money market hedge

To pay £ after 3 months' Columbus shall requires to borrow in US\$ and translate to £ and then deposit in £.

For payment of £ 342,000 in 3 months (@2.5% interest) amount required to be deposited now ($\text{£ } 342,000 \div 1.025$) = £ 333,658

With spot rate of 0.9830 the US\$ loan needed will be = US\$ 339,429

Loan repayable after 3 months (@3.25% interest) will be = US\$ 350,460

In this case the money market hedge is a cheaper option.

€ Receipt

Amount to be hedged = € 590,000

(i) Forward market hedge

Sell 4 months' forward contract accordingly, amount receivable after 4 months will be (€ 590,000 x 1.9510) = US\$ 1,151,090

(ii) Money market hedge

For money market hedge Columbus shall borrow in € and then translate to US\$ and deposit in US\$

For receipt of € 590,000 in 4 months (@ 5.33% interest) amount required to be borrowed now (€590,000 ÷ 1.0533) = € 560,144

With spot rate of 1.8890 the US\$ deposit will be = US\$ 1,058,113

Deposit amount will increase over 4 months (@3.83% interest) will be = US\$ 1,098,639

In this case, more will be received in US\$ under the forward hedge.

39. (a) Forward contract: Dollar needed in 180 days = £3,00,000 x \$ 1.96 = \$5,88,000/-

(b) Money market hedge: Borrow \$, convert to £, invest £, repay \$ loan in 180 days

Amount in £ to be invested = 3,00,000/1.045 = £ 2,87,081

Amount of \$ needed to convert into £ = 2,87,081 x 2 = \$ 5,74,162

Interest and principal on \$ loan after 180 days = \$5,74,162 x 1.055 = \$ 6,05,741

(c) Call option:

Expected Spot rate in 180 days	Prem./ unit	Exercise Option	Total price per unit	Total price for £3,00,000xi	Prob. Pi	pixi
1.91	0.04	No	1.95	5,85,000	0.25	1,46,250
1.95	0.04	No	1.99	5,97,000	0.60	3,58,200
2.05	0.04	Yes	2.01*	6,03,000	0.15	90,450
						5,94,900
Add: Interest on Premium @ 5.5% (12,000 x 5.5%)						660
						5,95,560

* (\$1.97 + \$0.04)

(d) No hedge option:

<i>Expected Future spot rate</i>	<i>Dollar needed Xi</i>	<i>Prob. Pi</i>	<i>Pi xi</i>
1.91	5,73,000	0.25	1,43,250
1.95	5,85,000	0.60	3,51,000
2.05	6,15,000	0.15	92,250
			5,86,500

The probability distribution of outcomes for no hedge strategy appears to be most preferable because least number of \$ are needed under this option to arrange £3,00,000.

40. In the given case, the exchange rates are indirect. These can be converted into direct rates as follows:

Spot rate

$$\text{GBP} = \frac{1}{\text{USD}1.5617} \quad \text{to} \quad \frac{1}{\text{USD}1.5673}$$

$$\text{USD} = \text{GBP } 0.64033 \quad - \quad \text{GBP } 0.63804$$

6 months' forward rate

$$\text{GBP} = \frac{1}{\text{USD}1.5455} \quad \text{to} \quad \frac{1}{\text{USD}1.5609}$$

$$\text{USD} = \text{GBP } 0.64704 \quad - \quad \text{GBP } 0.64066$$

Payoff in 3 alternatives

i. **Forward Cover**

Amount payable USD 3,64,897

Forward rate GBP 0.64704

Payable in GBP GBP 2,36,103

ii. **Money market Cover**

Amount payable USD 3,64,897

PV @ 4.5% for 6 months i.e. $\frac{1}{1.0225} = 0.9779951$ USD 3,56,867

Spot rate purchase GBP 0.64033

Borrow GBP 3,56,867 x 0.64033	GBP 2,28,512
Interest for 6 months @ 7 %	7,998
	-
Payable after 6 months	<u>GBP 2,36,510</u>

iii. Currency options

Amount payable	USD 3,64,897
Unit in Options contract	GBP 12,500
Value in USD at strike rate of 1.70 (GBP 12,500 x 1.70)	USD 21,250
Number of contracts USD 3,64,897/ USD 21,250	17.17
Exposure covered USD 21,250 x 17	USD 3,61,250
Exposure to be covered by Forward (USD 3,64,897 – USD 3,61,250)	USD 3,647
Options premium 17 x GBP 12,500 x 0.096	USD 20,400
Premium in GBP (USD 20,400 x 0.64033)	GBP 13,063
Total payment in currency option	
Payment under option (17 x 12,500)	GBP 2,12,500
Premium payable	GBP 13,063
Payment for forward cover (USD 3,647 x 0.64704)	<u>GBP 2,360</u>
	GBP <u>2,27,923</u>

Thus total payment in:

(i) Forward Cover	2,36,103 GBP
(ii) Money Market	2,36,510 GBP
(iii) Currency Option	2,27,923 GBP

The company should take currency option for hedging the risk.

Note: Even interest on Option Premium can also be considered in the above solution.

41. (i) Receipt under three proposals

(a) Invoicing in Sterling

$$\text{Invoicing in } \text{£} \text{ will produce} = \frac{\text{€ 4 million}}{1.1770} = \text{£}3398471$$

(b) Use of Forward Contract

$$\text{Forward Rate} = \text{€}1.1770 + 0.0060 = 1.1830$$

$$\text{Using Forward Market hedge Sterling receipt would be } \frac{\text{€ 4 million}}{1.1830}$$

$$= \text{£} 3381234$$

(c) Use of Future Contract

The equivalent sterling of the order placed based on future price (€1.1760)

$$= \frac{\text{€}4.00\text{million}}{1.1760} = \text{£} 3401360$$

$$\text{Number of Contracts} = \frac{\text{£}3401360}{62,500} = 54 \text{ Contracts (to the nearest whole number)}$$

$$\text{Thus, € amount hedged by future contract will be} = 54 \times \text{£}62,500 = \text{£}3375000$$

$$\text{Buy Future at } \text{€}1.1760$$

$$\text{Sell Future at } \text{€}1.1785$$

$$\text{€}0.0025$$

$$\text{Total profit on Future Contracts} = 54 \times \text{£}62,500 \times \text{€}0.0025 = \text{€}8438$$

After 6 months

$$\text{Amount Received} \quad \text{€} 4000000$$

$$\text{Add: Profit on Future Contracts} \quad \text{€} \quad \underline{8438}$$

$$\text{€} \underline{\underline{4008438}}$$

Sterling Receipts

$$\text{On sale of € at spot} = \frac{\text{€}4008438}{1.1785} = \text{€}3401305$$

(ii) Proposal of option (c) is preferable because the option (a) & (b) produces least receipts.

42. Option I (To finance the purchases by availing loan at 18% per annum):

Cost of equipment	₹ in lakhs
3400 lakh yen at ₹100 = 340 yen	1,000.00
Add: Interest at 4.5% I Quarter	45.00
Add: Interest at 4.5% II Quarter (on ₹1045 lakhs)	<u>47.03</u>
Total outflow in Rupees	<u>1,092.03</u>
Alternatively, interest may also be calculated on compounded basis, i.e., ₹1000 × [1.045] ²	₹1092.03

Option II (To accept the offer from foreign branch):

Cost of letter of credit	
At 1 % on 3400 lakhs yen at ₹100 = 340 yen	₹ 10.00 lakhs
Add: Interest for 2 Quarters	₹ 0.90 lakhs
(A)	₹ 10.90 lakhs
Payment at the end of 180 days:	
Cost	3400.00 lakhs yen
Interest at 2% p.a. [3400 × 2/100 × 180/365]	33.53 lakhs yen
	3433.53 lakhs yen
Conversion at ₹100 = 345 yen [3433.53 / 345 × 100] (B)	₹ 995.23 lakhs
Total Cost: (A) + (B)	₹ 1006.13 lakhs

Advise: Option 2 is cheaper by (1092.03 – 1006.13) lakh or ₹ 85.90 lakh. Hence, the offer may be accepted.

43. (A) To cover payable and receivable in forward Market

Amount payable after 3 months	\$7,00,000
Forward Rate	₹ 48.45
Thus Payable Amount (₹) (A)	₹ 3,39,15,000
Amount receivable after 2 months	\$ 4,50,000
Forward Rate	₹ 48.90
Thus Receivable Amount (₹) (B)	₹ 2,20,05,000
Interest @ 12% p.a. for 1 month (C)	₹ 2,20,050
Net Amount Payable in (₹) (A) – (B) – (C)	<u>₹ 1,16,89,950</u>

- (B) Assuming that since the forward contract for receivable was already booked it shall be cancelled if we lag the receivables. Accordingly, any profit/ loss on cancellation of contract shall also be calculated and shall be adjusted as follows:

Amount Payable (\$)	\$7,00,000
Amount receivable after 3 months	\$ 4,50,000
Net Amount payable	\$2,50,000
Applicable Rate	₹ 48.45
Amount payable in (₹) (A)	₹ 1,21,12,500
Profit on cancellation of Forward cost (48.90 – 48.30) × 4,50,000 (B)	₹ 2,70,000
Thus, net amount payable in (₹) (A) + (B)	₹ 1,18,42,500

Since net payable amount is least in case of first option, hence the company should cover payable and receivables in forward market.

Note: In the question it has not been clearly mentioned that whether quotes given for 2 and 3 months (in points terms) are premium points or direct quotes. Although above solution is based on the assumption that these are direct quotes, but students can also consider them as premium points and solve the question accordingly.

44. The contract would be cancelled at the one-month forward sale rate of ₹ 27.52.

	₹
Francs bought from customer under original forward contract at:	27.25
It is sold to him on cancellation at:	<u>27.52</u>
Net amount payable by customer per Franc	<u>0.27</u>

At ₹ 0.27 per Franc, exchange difference for CHF 10,000 is ₹ 2,700.

Loss to the Customer:

Exchange difference (Loss) ₹ 2,700

Note: The exchange commission and other service charges are ignored.

45. First the contract will be cancelled at TT Selling Rate

USD/ Rupee Spot Selling Rate	₹ 49.4455
Add: Premium for April	₹ 0.4200
	₹ 49.8655

Add: Exchange Margin @ 0.10%	₹ 0.04987	
	<u>₹ 49.91537</u>	Or 49.9154
USD/ Sw. Fcs One Month Buying Rate	Sw. Fcs. 1.5150	
Sw. Fcs. Spot Selling Rate (₹49.91537/1.5150)	₹ 32.9474	
Rounded Off	₹ 32.9475	
Bank buys Sw. Fcs. Under original contract	₹ 32.4000	
Bank Sells under Cancellation	₹ 32.9475	
Difference payable by customer	<u>₹ 00.5475</u>	
Exchange difference of Sw. Fcs. 1,00,000 payable by customer		₹ 54,750
(Sw. Fcs. 1,00,000 x ₹ 0.5475)		

46. The amount of EURO bought by selling US\$

$$\text{US\$ } 10,00,000 * \text{EURO } 1.4400 = \text{EURO } 14,40,000$$

$$\text{The amount of EURO sold for buying USD } 10,00,000 * 1.4450 = \underline{\text{EURO } 14,45,000}$$

$$\text{Net Loss in the Transaction} = \underline{\text{EURO } 5,000}$$

To acquire EURO 5,000 from the market @

(a) USD 1 = EURO 1.4400 &

(b) USD1 = INR 31.4500

Cross Currency buying rate of EUR/INR is ₹ 31.4500 / 1.440 i.e. ₹ 21.8403

$$\text{Loss in the Transaction } ₹ 21.8403 * 5000 = ₹ 1,09,201.50$$

Alternatively, if delivery to be affected then computation of loss shall be as follows:

$$\text{EURO to be surrendered to acquire } \$ 10,00,000 = \text{EURO } 14,45,000$$

$$\text{EURO to be received after selling } \$ 10,00,000 = \underline{\text{EURO } 14,40,000}$$

$$\text{Loss} = \underline{\text{EURO } 5,000}$$

To acquire EURO 5,000 from market @

$$\text{US } \$ 1 = \text{EURO } 1.4400$$

$$\text{US } \$ 1 = \text{INR } 31.45$$

$$\text{Cross Currency} = \frac{31.45}{1.440} = ₹ 21.8403$$

$$\text{Loss in Transaction (21.8403 x EURO 5,000)} = ₹ 1,09,201.50$$

47. (i) To Buy 1 Million GBP Spot against CHF
1. First to Buy USD against CHF at the cheaper rate i.e. from Bank A.
1 USD = CHF 1.4655
 2. Then to Buy GBP against USD at a cheaper rate i.e. from Bank B 1 GBP = USD 1.7650

By applying chain rule Buying rate would be

$$1 \text{ GBP} = 1.7650 * 1.4655 \text{ CHF}$$

$$1 \text{ GBP} = \text{CHF } 2.5866$$

Amount payable CHF 2.5866 Million or CHF 25,86,600

- (ii) Spot rate Bid rate GBP 1 = CHF 1.4650 * 1.7645 = CHF 2.5850
 Offer rate GBP 1 = CHF 1.4655 * 1.7660 = CHF 2.5881
 GBP / USD 3 months swap points are at discount
 Outright 3 Months forward rate GBP 1 = USD 1.7620 / 1.7640
 USD / CHF 3 months swap points are at premium
 Outright 3 Months forward rate USD 1 = CHF 1.4655 / 1.4665
 Hence
 Outright 3 Months forward rate GBP 1 = CHF 2.5822 / 2.5869
 Spot rate GBP 1 = CHF 2.5850 / 2.5881

Therefore 3-month swap points are at discount of 28/12.

48. (i) **Profit at current exchange rates**

$$2400 [€ 500 \times ₹ 51.50 - (\text{S\$ } 800 \times ₹ 27.25 + ₹ 1,000 + ₹ 1,500)]$$

$$2400 [₹ 25,750 - ₹ 24,300] = ₹ 34,80,000$$

Profit after change in exchange rates

$$2400 [€ 500 \times ₹ 52 - (\text{S\$ } 800 \times ₹ 27.75 + ₹ 1000 + ₹ 1500)]$$

$$2400 [₹ 26,000 - ₹ 24,700] = ₹ 31,20,000$$

LOSS DUE TO TRANSACTION EXPOSURE

$$₹ 34,80,000 - ₹ 31,20,000 = ₹ 3,60,000$$

- (ii) **Profit based on new exchange rates**

$$2400 [₹ 25,000 - (800 \times ₹ 27.15 + ₹ 1,000 + ₹ 1,500)]$$

$$2400[\text{₹ } 25,000 - \text{₹ } 24,220] = \text{₹ } 18,72,000$$

Profit after change in exchange rates at the end of six months

$$2400 [\text{₹ } 25,000 - (800 \times \text{₹ } 27.75 + \text{₹ } 1,000 + \text{₹ } 1,500)]$$

$$2400 [\text{₹ } 25,000 - \text{₹ } 24,700] = \text{₹ } 7,20,000$$

Decline in profit due to transaction exposure

$$\text{₹ } 18,72,000 - \text{₹ } 7,20,000 = \text{₹ } 11,52,000$$

$$\text{Current price of each unit in €} = \frac{\text{₹ } 25,000}{\text{₹ } 51.50} = \text{€ } 485.44$$

$$\text{Price after change in Exch. Rate} = \frac{\text{₹ } 25,000}{\text{₹ } 51.75} = \text{€ } 483.09$$

Change in Price due to change in Exch. Rate

$$\text{€ } 485.44 - \text{€ } 483.09 = \text{€ } 2.35 \quad \text{or } (-) 0.48\%$$

Price elasticity of demand = 1.5

$$\text{Increase in demand due to fall in price} \quad 0.48 \times 1.5 = 0.72\%$$

$$\text{Size of increased order} = 2400 \times 1.0072 = 2417 \text{ units}$$

$$\begin{aligned} \text{Profit} &= 2417 [\text{₹ } 25,000 - (800 \times \text{₹ } 27.75 + \text{₹ } 1,000 + \text{₹ } 1,500)] \\ &= 2417 [\text{₹ } 25,000 - \text{₹ } 24,700] = \text{₹ } 7,25,100 \end{aligned}$$

Therefore, decrease in profit due to operating exposure

$$\text{₹ } 18,72,000 - \text{₹ } 7,25,100 = \text{₹ } 11,46,900$$

Alternatively, if it is assumed that Fixed Cost shall not be changed with change in units then answer will be as follows:

$$\text{Fixed Cost} = 2400[\text{₹ } 1,000] = \text{₹ } 24,00,000$$

$$\begin{aligned} \text{Profit} &= 2417 [\text{₹ } 25,000 - (800 \times \text{₹ } 27.75 + \text{₹ } 1,500)] - \text{₹ } 24,00,000 \\ &= 2417 (\text{₹ } 1,300) - \text{₹ } 24,00,000 = \text{₹ } 7,42,100 \end{aligned}$$

$$\begin{aligned} \text{Therefore, decrease in profit due to operating exposure} & \text{₹ } 18,72,000 - \text{₹ } 7,42,100 \\ & = \text{₹ } 11,29,900 \end{aligned}$$

49. (i) If investment is made at London

$$\text{Convert US\$ } 5,00,000 \text{ at Spot Rate } (5,00,000/1.5390) = \text{£ } 3,24,886$$

$$\text{Add: £ Interest for 3 months on £ } 324,886 \text{ @ } 5\% = \underline{\text{£ } 4,061}$$

= £ 3,28,947

Less: Amount Invested	\$ 5,00,000
Interest accrued thereon	<u>\$ 5,000</u>
	= <u>\$ 5,05,000</u>

Equivalent amount of £ required to pay the above sum (\$ 5,05,000/1.5430*)	= <u>£ 3,27,285</u>
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Arbitrage Profit	= <u>£ 1,662</u>
------------------	------------------

(ii) If investment is made at New York

Gain \$ 5,00,000 (8% - 4%) x 3/12	= \$ 5,000
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Equivalent amount in £ 3 months (\$ 5,000/ 1.5475)	£ 3,231
--	---------

(iii) If investment is made at Frankfurt

Convert US\$ 500,000 at Spot Rate (Cross Rate) 1.8260/1.5390= € 1.1865	
--	--

Euro equivalent US\$ 500,000	= € 5,93,250
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Add: Interest for 3 months @ 3%	= <u>€ 4,449</u>
---------------------------------	------------------

= € 5,97,699

3 month Forward Rate of selling € (1/1.8150)	= £ 0.5510
--	------------

Sell € in Forward Market € 5,97,699 x £ 0.5510	= £ 3,29,332
--	--------------

Less: Amounted invested and interest thereon	= <u>£ 3,27,285</u>
--	---------------------

Arbitrage Profit	= <u>£ 2,047</u>
------------------	------------------

Since out of three options the maximum profit is in case investment is made in New York. Hence it should be opted.

* Due to conservative outlook.

50. (a) The following swap arrangement can be entered by Drilldip.

(i) Swap a US\$ loan today at an agreed rate with any party to obtain Indian Rupees (₹) to make initial investment.

(ii) After one year swap back the Indian Rupees with US\$ at the agreed rate. In such case the company is exposed only on the profit earned from the project.

(b) With the swap

	Year 0 (Million US\$)	Year 1 (Million US\$)
Buy ₹ 500 crore at spot rate of 1US\$ = ₹ 50	(100.00)	----
Swap ₹ 500 crore back at agreed rate of ₹ 50	----	100.00
Sell ₹ 240 crore at 1US\$ = ₹ 54	----	44.44
Interest on US\$ loan @8% for one year	----	(8.00)
	(100.00)	136.44

Net result is a net receipt of US\$ 36.44 million.

Without the swap

	Year 0 (Million US\$)	Year 1 (Million US\$)
Buy ₹ 500 crore at spot rate of 1US\$ = ₹ 50	(100.00)	----
Sell ₹ 740 crore at 1US\$ = ₹ 54	----	137.04
Interest on US\$ loan @8% for one year	----	(8.00)
	(100.00)	129.04

Net result is a net receipt of US\$ 29.04 million.

Decision: Since the net receipt is higher in swap option the company should opt for the same.

51. Exchange Position:

Particulars	Purchase Sw. Fcs.	Sale Sw. Fcs.
Opening Balance Overbought	50,000	
Bill on Zurich	80,000	
Forward Sales – TT		60,000
Cancellation of Forward Contract		30,000
TT Sales		75,000
Draft on Zurich cancelled	30,000	—
	1,60,000	1,65,000
Closing Balance Oversold	5,000	—
	1,65,000	1,65,000

Cash Position (Nostro A/c)

	Credit	Debit
Opening balance credit	1,00,000	—
TT sales	<u>—</u>	<u>75,000</u>
	1,00,000	75,000
Closing balance (credit)	<u>—</u>	<u>25,000</u>
	<u>1,00,000</u>	<u>1,00,000</u>

The Bank has to buy spot TT Sw. Fcs. 5,000 to increase the balance in Nostro account to Sw. Fcs. 30,000.

This would bring down the oversold position on Sw. Fcs. as Nil.

Since the bank requires an overbought position of Sw. Fcs. 10,000, it has to buy forward Sw. Fcs. 10,000.

INTERNATIONAL FINANCIAL MANAGEMENT



LEARNING OUTCOMES

After going through the chapter student shall be able to understand

- International Capital Budgeting
- Raising funds from International Sources
- Sovereign Funds
- International Financial Centre (GIFT City)
- International Working Capital Management
 - (a) International Working Capital Management
 - (b) Multinational Cash Management
 - (c) Multinational Inventory Management
 - (b) Multinational Receivable Management



1. INTERNATIONAL CAPITAL BUDGETING

1.1 Complexities Involved

Multinational Capital Budgeting has to take into consideration the different factors and variables which affect a foreign project and are complex in nature than domestic projects. The factors crucial in such a situation are:

- (a) Cash flows from foreign projects have to be converted into the currency of the parent organization.

- (b) Parent cash flows are quite different from project cash flows.
- (c) Profits remitted to the parent firm are subject to tax in the home country as well as the host country.
- (d) Effect of foreign exchange risk on the parent firm's cash flow.
- (e) Changes in rates of inflation causing a shift in the competitive environment and thereby affecting cash flows over a specific time period.
- (f) Restrictions imposed on cash flow distribution generated from foreign projects by the host country.
- (g) Initial investment in the host country to benefit from the release of blocked funds.
- (h) Political risk in the form of changed political events reduce the possibility of expected cash flows.
- (i) Concessions/benefits provided by the host country ensures the upsurge in the profitability position of the foreign project.
- (j) Estimation of the terminal value in multinational capital budgeting is difficult since the buyers in the parent company have divergent views on acquisition of the project.

1.2 Problems Affecting Foreign Investment Analysis

The various types of problems faced in International Capital Budgeting analysis are as follows:

- (1) Multinational companies investing elsewhere are subjected to foreign exchange risk in the sense that currency appreciates/ depreciates over a span of time. To include foreign exchange risk in the cash flow estimates of any project, it is necessary to forecast the inflation rate in the host country during the lifetime of the project. Adjustments for inflation are made in the cash flows depicted in local currency. The cash flows are converted in parent country's currency at the spot exchange rate multiplied by the expected depreciation rate obtained from purchasing power parity.
- (2) Due to restrictions imposed on transfer of profits, depreciation charges and technical specifications differences exist between project cash flows and cash flows obtained by the parent organization. Such restriction can be diluted by the application of techniques viz internal transfer prices, overhead payments. Adjustment for blocked funds depends on its opportunity cost, a vital issue in capital budgeting process.
- (3) In Multinational Capital Budgeting, after tax cash flows need to be considered for project evaluation. The presence of two tax regimes along with other factors such as remittances to the parent firm in the form of royalties, dividends, management fees etc., withholding tax provisions with held in the host country, presence of tax treaties, tax discrimination pursued by the host country between transfer of realized profits vis-à-vis local re-investment of such profits cause serious impediments to multinational capital budgeting process. MNCs are in a position to reduce overall tax burden through the system of transfer pricing.

For computation of actual after tax cash flows accruing to the parent firm, higher of home/ host country tax rate is used. If the project becomes feasible then it is acceptable under a more favourable tax regime. If not feasible, then, other tax saving aspects need to be incorporated in order to find out whether the project crosses the hurdle rate.

1.3 Project vis-a-vis Parent Cash Flows

There exists a big difference between the project and parent cash flows due to tax rules, exchange controls etc. Management and royalty payments are returns to the parent firm. The basis on which a project shall be evaluated depends on one's own cash flows, cash flows accruing to the parent firm or both.

Evaluation of a project on the basis of own cash flows entails that the project should compete favourably with domestic firms and earn a return higher than the local competitors. If not, the shareholders and management of the parent company shall invest in the equity/government bonds of domestic firms. A comparison cannot be made since foreign projects replace imports and are not competitors with existing local firms. Project evaluation based on local cash flows avoid currency conversion and eliminates problems associated with fluctuating exchange rate changes.

For evaluation of foreign project from the parent firm's angle, both operating and financial cash flows actually remitted to it form the yardstick for the firm's performance and the basis for distribution of dividends to the shareholders and repayment of debt/interest to lenders. An investment has to be evaluated on basis of net after tax operating cash flows generated by the project. As both types of cash flows (operating and financial) are clubbed together, it is essential to see that financial cash flows are not mixed up with operating cash flows.

1.4 Discount Rate and Adjusting Cash Flows

An important aspect in multinational capital budgeting is to adjust cash flows or the discount rate for the additional risk arising from foreign location of the project. Earlier MNCs adjusted the discount rate upwards for riskier projects as they considered uncertainties in political environment and foreign exchange fluctuations. The MNCs considered adjusting the discount rate to be popular as the rate of return of a project should be in conformity with the degree of risk. It is not proper to combine all risks into a single discount rate. Political risk/uncertainties attached to a project relate to possible adverse effects which might occur in future but cannot be foreseen at present. So adjusting discount rates for political risk penalises early cash flows more than distant cash flows. Also adjusting discount rate to offset exchange risk only when adverse exchange rate movements are expected is not proper since a MNC can gain from favourable currency movements during the life of the project on many occasions. Instead of adjusting discount rate while considering risk it is worthwhile to adjust cash flows. The annual cash flows are discounted at a rate applicable to the project either at that of the host country or parent country. Probability with certainty equivalent method along with decision tree analysis are used for economic and financial forecasting. Cash flows generated by the project and remitted to the parent during each period are adjusted for political risk, exchange rate and other uncertainties by converting them into certainty equivalents.

1.5 Adjusted Present Value (APV)

APV is used in evaluating foreign projects. The APV model is a value additive approach to capital budgeting process i.e. each cash flow is considered individually and discounted at a rate consistent with risk involved in the cash flow.

Different components of the project's cash flow have to be discounted separately.

The APV method uses different discount rates for different segments of the total cash flows depending on the degree of certainty attached with each cash flow. The financial analyst tests the basic viability of the foreign project before accounting for all complexities. If the project is feasible no further evaluation based on accounting for other cash flows is done. If not feasible, an additional evaluation is done taking into consideration the other complexities.

The APV model is represented as follows.

$$-I_0 + \sum_{t=1}^n \frac{X_t}{(1+k^*)^t} + \sum_{t=1}^n \frac{T_t}{(1+i_d)^t} + \sum_{t=1}^n \frac{S_t}{(1+i_d)^t}$$

Where $I_0 \rightarrow$ Present Value of Investment Outlay

$\frac{X_t}{(1+k^*)^t} \rightarrow$ Present Value of Operating Cash Flow

$\frac{T_t}{(1+i_d)^t} \rightarrow$ Present Value of Interest Tax Shields

$\frac{S_t}{(1+i_d)^t} \rightarrow$ Present Value of Interest Subsidies

$k^* \rightarrow$ Unlevered Cost of Capital

$T_t \rightarrow$ Tax Saving in year t due to financial mix adopted

$S_t \rightarrow$ Before tax value of interests subsidies in year t due to project specific financing

$i_d \rightarrow$ Before tax cost of debt

The initial investment will be net of any 'Blocked Funds' that can be made use of by the parent company for investment in the project. 'Blocked Funds' are balances held in foreign countries that cannot be remitted to the parent due to Exchange Control regulations. These are 'Direct Blocked Funds'. Apart from this, it is quite possible that significant costs in the form of local taxes or withholding taxes arise at the time of remittance of the funds to the parent country. Such 'Blocked Funds' are indirect. If a parent company can release such 'Blocked Funds' in one country for the

investment in a overseas project, then such amounts will go to reduce the 'Cost of Investment Outlay'.

The last two terms are discounted at the before tax cost of debt to reflect the relative cash flows due to tax and interest savings.

1.6 Scenarios

Following three illustrations are based on three different scenarios:

1.6.1 A foreign company is investing in India

Illustration 1

Perfect Inc., a U.S. based Pharmaceutical Company has received an offer from Aidscore Ltd., a company engaged in manufacturing of drugs to cure Dengue, to set up a manufacturing unit in Baddi (H.P.), India in a joint venture.

As per the Joint Venture agreement, Perfect Inc. will receive 55% share of revenues plus a royalty @ US \$0.01 per bottle. The initial investment will be ₹ 200 crores for machinery and factory. The scrap value of machinery and factory is estimated at the end of five (5) year to be ₹ 5 crores. The machinery is depreciable @ 20% on the value net of salvage value using Straight Line Method. An initial working capital to the tune of ₹ 50 crores shall be required and thereafter ₹ 5 crores each year.

As per GOI directions, it is estimated that the price per bottle will be ₹ 7.50 and production will be 24 crores bottles per year. The price in addition to inflation of respective years shall be increased by ₹ 1 each year. The production cost shall be 40% of the revenues.

The applicable tax rate in India is 30% and 35% in US and there is Double Taxation Avoidance Agreement between India and US. According to the agreement tax credit shall be given in US for the tax paid in India. In both the countries, taxes shall be paid in the following year in which profit have arisen/ remittance received.

The Spot rate of \$ is ₹ 57. The inflation in India is 6% (expected to decrease by 0.50% every year) and 5% in US.

As per the policy of GOI, only 50% of the share can be remitted in the year in which they are realised and remaining in the following year.

Though WACC of Perfect Inc. is 13% but due to risky nature of the project it expects a return of 15%.

Determine whether Perfect Inc. should invest in the project or not (from subsidiary point of view).

Solution

Working Notes:

1. Estimated Exchange Rates (Using PPP Theory)

Year	0	1	2	3	4	5	6
Exchange rate *	57	57.54	57.82	57.82	57.54	56.99	56.18

2. Share in sales

Year	1	2	3	4	5
Annual Units in crores	24	24	24	24	24
Price per bottle (₹)	7.50	8.50	9.50	10.50	11.50
Price fluctuating Inflation Rate	6.00%	5.50%	5.00%	4.50%	4.00%
Inflated Price (₹)	7.95	8.97	9.98	10.97	11.96
Inflated Sales Revenue (₹ Crore)	190.80	215.28	239.52	263.28	287.04
Sales share @55%	104.94	118.40	131.74	144.80	157.87

3. Royalty Payment

Year	1	2	3	4	5
Annual Units in crores	24	24	24	24	24
Royalty in \$	0.01	0.01	0.01	0.01	0.01
Total Royalty (\$ Crore)	0.24	0.24	0.24	0.24	0.24
Exchange Rate	57.54	57.82	57.82	57.54	56.99
Total Royalty (₹ Crore)	13.81	13.88	13.88	13.81	13.68

4. Tax Liability

(₹ Crore)

Year	1	2	3	4	5
Sales Share	104.94	118.40	131.74	144.80	157.87
Total Royalty	13.81	13.88	13.88	13.81	13.68
Total Income	118.75	132.28	145.61	158.61	171.55
Less: Expenses					
Production Cost (Sales share x 40%)	41.98	47.36	52.69	57.92	63.15
Depreciation (195 x 20%)	39.00	39.00	39.00	39.00	39.00
PBT	37.77	45.92	53.92	61.69	69.40
Tax on Profit @30%	11.33	13.78	16.18	18.51	20.82
Net Profit	26.44	32.14	37.74	43.18	48.58

5. Free Cash Flow

(₹ Crore)

Year	0	1	2	3	4	5	6
Sales Share	0.00	104.94	118.40	131.74	144.80	157.87	0.00
Total Royalty	0.00	13.81	13.88	13.88	13.81	13.68	0.00
Production Cost	0.00	-41.98	-47.36	-52.69	-57.92	-63.15	0.00
Initial Outlay	-200.00	0.00	0.00	0.00	0.00	0.00	0.00
Working Capital	-50.00	-5.00	-5.00	-5.00	-5.00	70.00	0.00
Scrap Value	0.00	0.00	0.00	0.00	0.00	5.00	0.00
Tax on Profit	0.00	0.00	-11.33	-13.78	-16.18	-18.51	-20.82
Free Cash Flow	-250.00	71.77	68.59	74.15	79.51	164.89	-20.82

6. Remittance of Cash Flows

(₹ Crore)

Year	0	1	2	3	4	5	6
Free Cash Flow	-250.00	71.77	68.59	74.15	79.51	164.89	-20.82
50% of Current Year Cash Flow	0.00	35.89	34.29	37.07	39.76	82.45	0.00
Previous year remaining cash flow	0.00	0.00	35.88	34.30	37.08	39.75	82.44
Total Remittance	-250.00	35.88	70.17	71.37	76.84	122.20	61.62

NPV of Project under Appraisal

Year	0	1	2	3	4	5	6	7
Total Remittance (₹ Crore)	-250.00	35.88	70.17	71.37	76.84	122.20	61.62	-
Exchange Rate	57.00	57.54	57.82	57.82	57.54	56.99	56.18	-
Remittance (\$ mn)	-43.86	6.24	12.14	12.34	13.35	21.44	10.97	-
US Tax @35% (\$ mn)	0.00	0.00	2.18	4.25	4.32	4.67	7.50	3.84
Indian Tax (\$ mn)	0.00	0.00	1.96	2.38	2.82	3.25	3.71	-
Net Tax (\$ mn)	0.00	0.00	0.22	1.87	1.51	1.42	3.79	3.84
Net Cash Flow (\$ mn)	-43.86	6.24	11.92	10.47	11.84	20.02	7.18	-3.84
PVF @ 15%	1.000	0.870	0.756	0.658	0.572	0.497	0.432	0.376
Present Value (\$ mn)	-43.86	5.43	9.01	6.89	6.77	9.95	3.10	-1.44
Net Present Value (\$ mn)								= -4.15

Decision: Since NPV of the project is negative, Perfect inc. should not invest in the project.

* Estimated exchange rates have been calculated by using the following formula:

Expected spot rate = Current Spot Rate x expected difference in inflation rates

$$E(S_1) = S_0 \times \frac{(1 + I_d)}{(1 + I_f)}$$

Where

$E(S_1)$ is the expected Spot rate in time period 1

S_0 is the current spot rate (Direct Quote)

I_d is the inflation in the domestic country (home country)

I_f is the inflation in the foreign country

1.6.2 An Indian Company is investing in foreign country by raising fund in the same country

Illustration 2

Its Entertainment Ltd., an Indian Amusement Company is happy with the success of its Water Park in India. The company wants to repeat its success in Nepal also where it is planning to establish a Grand Water Park with world class amenities. The company is also encouraged by a marketing research report on which it has just spent ₹ 20,00,000.

The estimated cost of construction would be Nepali Rupee (NPR) 450 crores and it would be completed in one years time. Half of the construction cost will be paid in the beginning and rest at the end of year. In addition, working capital requirement would be NPR 65 crores from the year end one. The after tax realizable value of fixed assets after four years of operation is expected to be NPR 250 crores. Under the Foreign Capital Encouragement Policy of Nepal, company is allowed to claim 20% depreciation allowance per year on reducing balance basis subject to maximum capital limit of NPR 200 crore. The company can raise loan for theme park in Nepal @ 9%.

The water park will have a maximum capacity of 20,000 visitors per day. On an average, it is expected to achieve 70% capacity for first operational four years. The entry ticket is expected to be NPR 220 per person. In addition to entry tickets revenue, the company could earn revenue from sale of food and beverages and fancy gift items. The average sales expected to be NPR 150 per visitor for food and beverages and NPR 50 per visitor for fancy gift items. The sales margin on food and beverages and fancy gift items is 20% and 50% respectively. The park would open for 360 days a year.

The annual staffing cost would be NPR 65 crores per annum. The annual insurance cost would be NPR 5 crores. The other running and maintenance costs are expected to be NPR 25 crores in the first year of operation which is expected to increase NPR 4 crores every year. The company would apportion existing overheads to the tune of NPR 5 crores to the park.

All costs and receipts (excluding construction costs, assets realizable value and other running and maintenance costs) mentioned above are at current prices (i.e. 0 point of time) which are expected to increase by 5% per year.

The current spot rate is NPR 1.60 per rupee. The tax rate in India is 30% and in Nepal it is 20%.

The average market return is 11% and interest rate on treasury bond is 8%. The company's current equity beta is 0.45. The company's funding ratio for the Water Park would be 55% equity and 45% debt.

Being a tourist Place, the amusement industry in Nepal is competitive and very different from its Indian counterpart. The company has gathered the relevant information about its nearest competitor in Nepal. The competitor's market value of the equity is NPR 1850 crores and the debt is NPR 510 crores and the equity beta is 1.35.

State whether Its Entertainment Ltd. should undertake Water Park project in Nepal or not.

Solution

Working Notes:

1. Calculation of Cost of Funds/ Discount Rate

Competing Company's Information	
Equity Market Value	1850.00
Debt Market Value	510.00
Equity Beta	1.35

Assuming debt to be risk free i.e. beta is zero, the beta of competitor is un-g geared as follows:

$$\text{Asset Beta} = \text{Equity Beta} \times \frac{E}{E + D(1-t)} = 1.35 \times \frac{1850}{1850 + 510(1-0.20)} = 1.106$$

Equity beta for Its Entertainment Ltd. in Nepal

Assets beta in Nepal	1.106
Ratio of funding in Nepal	
Equity	55.00%
Debt	45.00%

$$1.106 = \text{Equity Beta} \times \frac{55}{55 + 45(1 - 0.20)}$$

$$\text{Equity Beta} = 1.83$$

Cost of Equity as per CAPM

Market Return 11.00%

Risk free return 8.00%

Cost of Equity = Risk free return + β (Market Return - Risk free return)
 = 8.00% + 1.83(11.00% - 8.00%) = 13.49%

WACC = 13.49% x 0.55 + 9%(1 - 0.20) x 0.45 = 10.66%

2. Present Value Factors at the discount rate of 10.66%

Year	0	1	2	3	4	5
PVAF	1.000	0.904	0.817	0.738	0.667	0.603

3. Calculation of Capital Allowances

Year	1	2	3	4
Opening Balance (NPR Crore)	200.00	160.00	128.00	102.40
Less: Depreciation (NPR Crore)	40.00	32.00	25.60	20.48
Closing Balance (NPR Crore)	160.00	128.00	102.40	81.92

Calculation of Present of Free Cash Flow

Year	0	1	2	3	4	5
Expected Annual visitors			5040000	5040000	5040000	5040000
Entry ticket price per visitor (NPR)			242.55	254.68	267.41	280.78
Profit from sale of Food and Beverages per visitor (NPR)			33.08	34.73	36.47	38.29
Profit from sale of Fancy Gift Items per visitor (NPR)			27.56	28.94	30.39	31.91
Revenue per visitor (NPR)			303.19	318.35	334.27	350.98
Total Revenue (NPR crores)			152.81	160.45	168.47	176.89
Less:						
Annual Staffing Cost (NPR crores)			71.66	75.25	79.01	82.96
Annual Insurance Costs (NPR crores)			5.51	5.79	6.08	6.38
Other running and maintenance						

costs (NPR crores)			25.00	29.00	33.00	37.00
Depreciation Allowances (NPR crores)			40.00	32.00	25.60	20.48
Total Expenses (NPR crores)			142.17	142.04	143.69	146.82
PBT (NPR crores)			10.64	18.41	24.78	30.07
Tax on Profit (NPR crores)			2.13	3.68	4.96	6.01
Net Profit (NPR crores)			8.51	14.73	19.82	24.06
Add: Depreciation Allowances (NPR crores)			40	32	25.6	20.48
Park Construction Cost (NPR crores)	-225	-225				
After tax assets realisation value (NPR crores)						250
Working capital (NPR crores)		-65.00	-3.25	-3.41	-3.58	75.25
Net cash Flow (NPR crores)	-225.00	-290.00	45.26	43.32	41.84	369.79
PVF at discount rate	1.00	0.904	0.817	0.738	0.667	0.603
Present Values (NPR crores)	-225.00	-262.16	36.98	31.97	27.91	222.98

Net Present Value (NPR crores)

-167.32

Decision: Since NPV of the project is negative the Entertainment Ltd. should not undertake Water Park project in Nepal.

1.6.3 An Indian Company is investing in foreign country by raising fund in different country through the mode of Global Depository Receipts (GDRs)

Illustration 3

Opus Technologies Ltd., an Indian IT company is planning to make an investment through a wholly owned subsidiary in a software project in China with a shelf life of two years. The inflation in China is estimated as 8 percent. Operating cash flows are received at the year end.

For the project an initial investment of Chinese Yuan (CN¥) 30,00,000 will be in land. The land will be sold after the completion of project at estimated value of CN¥ 35,00,000. The project also requires

an office complex at cost of CN¥ 15,00,000 payable at the beginning of project. The complex will be depreciated on straight-line basis over two years to a zero salvage value. This complex is expected to fetch CN¥ 5,00,000 at the end of project.

The company is planning to raise the required funds through GDR issue in Mauritius. Each GDR will have 5 common equity shares of the company as underlying security which are currently trading at ₹ 200 per share (Face Value = ₹10) in the domestic market. The company has currently paid the dividend of 25% which is expected to grow at 10% p.a. The total issue cost is estimated to be 1 percent of issue size.

The annual sales is expected to be 10,000 units at the rate of CN¥ 500 per unit. The price of unit is expected to rise at the rate of inflation. Variable operating costs are 40 percent of sales. Fixed operating costs will be CN¥ 22,00,000 per year and expected to rise at the rate of inflation.

The tax rate applicable in China for income and capital gain is 25 percent and as per GOI Policy no further tax shall be payable in India. The current spot rate of CN¥ 1 is ₹ 9.50. The nominal interest rate in India and China is 12% and 10% respectively and the international parity conditions hold

You are required to

- (a) Identify expected future cash flows in China and determine NPV of the project in CN¥.
- (b) Determine whether Opus Technologies should go for the project or not assuming that there neither there is restriction on the transfer of funds from China to India nor any charges/taxes payable on the transfer of funds.

Solution

Working Notes:

1. Calculation of Cost of Capital (GDR)

Current Dividend (D_0)	2.50
Expected Dividend (D_1)	2.75
Net Proceeds (₹ 200 per share – 1%)	198.00
Growth Rate	10.00%

$$k_e = \frac{2.75}{198} + 0.10 = 0.1139 \text{ i.e. } 11.39\%$$

2. Calculation of Expected Exchange Rate as per Interest Rate Parity

YEAR	EXPECTED RATE
1	$= 9.50 \times \frac{(1 + 0.12)}{(1 + 0.10)} = 9.67$
2	$= 9.50 \times \frac{(1 + 0.12)^2}{(1 + 0.10)^2} = 9.85$

3. Realization on the disposal of Land net of Tax

	CN¥
Sale value at the end of project	3500000.00
Cost of Land	3000000.00
Capital Gain	500000.00
Tax paid	125000.00
Amount realized net of tax	3375000.00

4. Realization on the disposal of Office Complex

	(CN¥)
Sale value at the end of project	500000.00
WDV	0.00
Capital Gain	500000.00
Tax paid	125000.00
Amount realized net of tax (A)	375000.00

5. Computation of Annual Cash Inflows

Year	1	2
Annual Units	10000	10000
Price per bottle (CN¥)	540.00	583.20
Annual Revenue (CN¥)	5400000.00	5832000.00
Less: Expenses		
Variable operating cost (CN¥)	2160000.00	2332800.00
Depreciation (CN¥)	750000.00	750000.00
Fixed Cost per annum (CN¥)	2376000.00	2566080.00
PBT (CN¥)	114000.00	183120.00
Tax on Profit (CN¥)	28500.00	45780.00
Net Profit (CN¥)	85500.00	137340.00
Add: Depreciation (CN¥)	750000.00	750000.00
Cash Flow	835500.00	887340.00

- (a) Computation of NPV of the project in CN¥

(CN¥)

Year	0	1	2
Initial Investment	-4500000.00		
Annual Cash Inflows		835500.00	887340.00
Realization on the disposal of Land net of Tax			3375000.00
Realization on the disposal of Office Complex			375000.00
Total	-4500000.00	835500.00	4637340.00
PVF @11.39%	1.000	0.898	0.806
PV of Cash Flows	-4500000.00	750279.00	3737696.00
NPV			-12,025

- (b) Evaluation of Project from Opus Point of View

- (i) Assuming that inflow funds are transferred in the year in which same are generated i.e. first year and second year.

Year	0	1	2
Cash Flows (CN¥)	-4500000.00	835500.00	4637340.00
Exchange Rate (₹/ CN¥)	9.50	9.67	9.85
Cash Flows (₹)	-42750000.00	8079285.00	45677799.00
PVF @ 12%	1.00	0.893	0.797
	-42750000.00	7214802.00	36405206.00
NPV			870008.00

- (ii) Assuming that inflow funds are transferred at the end of the project i.e. second year.

Year	0	2
Cash Flows (CN¥)	-4500000.00	5472840.00
Exchange Rate (₹/ CN¥)	9.50	9.85
Cash Flows (₹)	-42750000.00	53907474.00
PVF	1.00	0.797
	-42750000.00	42964257.00
NPV		214257.00

Though in terms of CN¥ the NPV of the project is negative but in ₹ it has positive NPV due to weakening of ₹ in comparison of CN¥. Thus, Opus can accept the project.



2. INTERNATIONAL SOURCES OF FINANCE

Indian companies have been able to tap global markets to raise foreign currency funds by issuing various types of financial instruments which are discussed as follows:

2.1 Foreign Currency Convertible Bonds (FCCBs)

A type of convertible bond issued in a currency different than the issuer's domestic currency. In other words, the money being raised by the issuing company is in the form of a foreign currency. A convertible bond is a mix between a debt and equity instrument. It acts like a bond by making regular coupon and principal payments, but these bonds also give the bondholder the option to convert the bond into stock.

These types of bonds are attractive to both investors and issuers. The investors receive the safety of guaranteed payments on the bond and are also able to take advantage of any large price appreciation in the company's stock. (Bondholders take advantage of this appreciation by means of warrants attached to the bonds, which are activated when the price of the stock reaches a certain point.) Due to the equity side of the bond, which adds value, the coupon payments on the bond are lower for the company, thereby reducing its debt-financing costs.

Advantages of FCCBs

- (i) The convertible bond gives the investor the flexibility to convert the bond into equity at a price or redeem the bond at the end of a specified period, normally three years if the price of the share has not met his expectations.
- (ii) Companies prefer bonds as it leads to delayed dilution of equity and allows company to avoid any current dilution in earnings per share that a further issuance of equity would cause.
- (iii) FCCBs are easily marketable as investors enjoy the option of conversion into equity resulting into capital appreciation. Further investor is assured of a minimum fixed interest earnings.

Disadvantages of FCCBs

- (i) Exchange risk is more in FCCBs as interest on bonds would be payable in foreign currency. Thus, companies with low debt equity ratios, large forex earnings potential only opt for FCCBs.
- (ii) FCCBs mean creation of more debt and a forex outgo in terms of interest which is in foreign exchange.
- (iii) In the case of convertible bonds, the interest rate is low, say around 3–4% but there is exchange risk on the interest payment as well as re-payment if the bonds are not converted into equity shares. The only major advantage would be that where the company has a high rate of growth in earnings and the conversion takes place subsequently, the price at which shares can be issued can be higher than the current market price.

2.2 American Depository Receipts (ADRs)

Depository receipts issued by a company in the United States of America (USA) is known as American Depository Receipts (ADRs). Such receipts must be issued in accordance with the provisions stipulated by the Securities and Exchange Commission of USA (SEC) which are very stringent.

An ADR is generally created by the deposit of the securities of a non-United States company with a custodian bank in the country of incorporation of the issuing company. The custodian bank informs the depository in the United States that the ADRs can be issued. ADRs are United States dollar denominated and are traded in the same way as are the securities of United States companies. The ADR holder is entitled to the same rights and advantages as owners of the underlying securities in the home country. Several variations on ADRs have developed over time to meet more specialized demands in different markets. One such variation is the GDR which are identical in structure to an ADR, the only difference being that they can be traded in more than one currency and within as well as outside the United States.

2.3 Global Depository Receipts (GDRs)

A depository receipt is basically a negotiable certificate, denominated in a currency not native to the issuer, that represents the company's publicly - traded local currency equity shares. Most GDRs are denominated in USD, while a few are denominated in Euro and Pound Sterling. The Depository Receipts issued in the US are called American Depository Receipts (ADRs), which anyway are denominated in USD and outside of USA, these are called GDRs. In theory, though a depository receipt can also represent a debt instrument, in practice it rarely does. DRs (depository receipts) are created when the local currency shares of an Indian company are delivered to the depository's local custodian bank, against which the Depository bank (such as the Bank of New York) issues depository receipts in US dollar. These depository receipts may trade freely in the overseas markets like any other dollar-denominated security, either on a foreign stock exchange, or in the over-the-counter market, or among a restricted group such as Qualified Institutional Buyers (QIBs). Indian issues have taken the form of GDRs to reflect the fact that they are marketed globally, rather than in a specific country or market.

Through the issue of depository receipts, companies in India have been able to tap global equity market to raise foreign currency funds by way of equity. Quite apart from the specific needs that Indian companies may have for equity capital in preference to debt and the perceived advantages of raising equity over debt in general (no repayment of "principal" and generally lower servicing costs, etc.) the fact of the matter is quite simple, that no other form of term foreign exchange funding has been available. In addition, it has been perceived that a GDR issue has been able to fetch higher prices from international investors (even when Indian issues were being sold at a discount to the prevailing domestic share prices) than those that a domestic public issue would have been able to extract from Indian investors.

- **Impact of GDRs on Indian Capital Market**

Since the inception of GDRs a remarkable change in Indian capital market has been observed as follows:

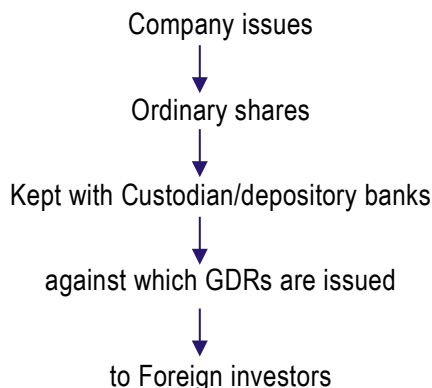
- (i) Indian stock market to some extent is shifting from Bombay to Luxemburg.
- (ii) There is arbitrage possibility in GDR issues.
- (iii) Indian stock market is no longer independent from the rest of the world. This puts additional strain on the investors as they now need to keep updated with world wide economic events.
- (iv) Indian retail investors are completely sidelined. GDRs/Foreign Institutional Investors' placements + free pricing implies that retail investors can no longer expect to make easy money on heavily discounted rights/public issues.

As a result of introduction of GDRs a considerable foreign investment has flown into India.

- **Markets of GDRs**

- (i) GDR's are sold primarily to institutional investors.
- (ii) Demand is likely to be dominated by emerging market funds.
- (iii) Switching by foreign institutional investors from ordinary shares into GDRs is likely.
- (iv) Major demand is also in UK, USA (Qualified Institutional Buyers), South East Asia (Hong Kong, Singapore), and to some extent continental Europe (principally France and Switzerland).

- **Mechanism of GDR:** The mechanics of a GDR issue may be described with the help of following diagram.

**Characteristics**

- (i) Holders of GDRs participate in the economic benefits of being ordinary shareholders, though

they do not have voting rights.

- (ii) GDRs are settled through CEDEL & Euro-clear international book entry systems.
- (iii) GDRs are listed on the Luxemburg stock exchange.
- (iv) Trading takes place between professional market makers on an OTC (over the counter) basis.
- (v) The instruments are freely traded.
- (vi) They are marketed globally without being confined to borders of any market or country as it can be traded in more than one currency.
- (vii) Investors earn fixed income by way of dividends which are paid in issuer currency converted into dollars by depository and paid to investors and hence exchange risk is with investor.
- (viii) As far as the case of liquidation of GDRs is concerned, an investor may get the GDR cancelled any time after a cooling period of 45 days. A non-resident holder of GDRs may ask the overseas bank (depository) to redeem (cancel) the GDRs. In that case overseas depository bank shall request the domestic custodians bank to cancel the GDR and to get the corresponding underlying shares released in favour of non-resident investor. The price of the ordinary shares of the issuing company prevailing in the Bombay Stock Exchange or the National Stock Exchange on the date of advice of redemption shall be taken as the cost of acquisition of the underlying ordinary share.

Illustration 4

X Ltd. is interested in expanding its operation and planning to install manufacturing plant at US. For the proposed project it requires a fund of \$ 10 million (net of issue expenses/ floatation cost). The estimated floatation cost is 2%. To finance this project it proposes to issue GDRs.

You as financial consultant is required to compute the number of GDRs to be issued and cost of the GDR with the help of following additional information.

- (i) Expected market price of share at the time of issue of GDR is ₹ 250 (Face Value ₹ 100)
- (ii) 2 Shares shall underly each GDR and shall be priced at 10% discount to market price.
- (iii) Expected exchange rate ₹ 60/\$.
- (iv) Dividend expected to be paid is 20% with growth rate 12%.

Solution

Net Issue Size = \$10 million

$$\text{Gross Issue} = \frac{\$10 \text{ million}}{0.98} = \$ 10.204 \text{ million}$$

Issue Price per GDR in ₹ (250 x 2 x 90%)	₹ 450
Issue Price per GDR in \$ (₹ 450/ ₹ 60)	\$ 7.50
Dividend Per GDR (D ₁) (₹ 20 x 2)	₹ 40
Net Proceeds Per GDR (₹ 450 x 0.98)	₹ 441.00

(a) Number of GDR to be issued $\frac{\$10.204 \text{ million}}{\$7.50} = 1.3605 \text{ million}$

(b) Cost of GDR to X Ltd. $k_e = \frac{40.00}{441.00} + 0.12 = 21.07\%$

2.4 Euro-Convertible Bonds (ECBs)

A convertible bond is a debt instrument which gives the holders of the bond an option to convert the bond into a predetermined number of equity shares of the company. Usually, the price of the equity shares at the time of conversion will have a premium element. The bonds carry a fixed rate of interest. If the issuer company desires, the issue of such bonds may carry two options viz.

(i) Call Options: (Issuer's option) - where the terms of issue of the bonds contain a provision for call option, the issuer company has the option of calling (buying) the bonds for redemption before the date of maturity of the bonds. Where the issuer's share price has appreciated substantially, i.e. far in excess of the redemption value of the bonds, the issuer company can exercise the option. This call option forces the investors to convert the bonds into equity. Usually, such a case arises when the share prices reach a stage near 130% to 150% of the conversion price.

(ii) Put options - A provision of put option gives the holder of the bonds a right to put (sell) his bonds back to the issuer company at a pre-determined price and date. In case of Euro-convertible bonds, the payment of interest on and the redemption of the bonds will be made by the issuer company in US dollars.

2.5 Other Sources

- **Euro-Convertible Zero Coupon Bonds:** These bonds are structured as a convertible bond. No interest is payable on the bonds. But conversion of bonds takes place on maturity at a pre-determined price. Usually there is a 5 years maturity period and they are treated as a deferred equity issue.
- **Euro-bonds with Equity Warrants:** These bonds carry a coupon rate determined by the market rates. The warrants are detachable. Pure bonds are traded at a discount. Fixed income funds may like to invest in these bonds for the purposes of regular income.
- **Syndicated bank loans:** It is one of the earlier ways of raising funds in the form of large loans from banks with good credit rating, can be arranged in reasonably short time and with few formalities. The maturity of the loan can be for a duration of 5 to 10 years. The interest rate is generally set with reference to an index, say, LIBOR plus a spread which depends

upon the credit rating of the borrower. Some covenants are laid down by the lending institution like maintenance of key financial ratios.

- **Euro-bonds:** These are basically debt instruments denominated in a currency issued outside the country of that currency for examples Yen bond floated in France. Primary attraction of these bonds is the refuge from tax and regulations and provide scope for arbitraging yields. These are usually bearer bonds and can take the form of
 - (i) Traditional Fixed Rate Bonds.
 - (ii) Floating Rate Notes (FRNs)
 - (iii) Convertible Bonds.
- **Foreign Bonds:** Foreign bonds are denominated in a currency which is foreign to the borrower and sold at the country of that currency. Such bonds are always subject to the restrictions and are placed by that country on the foreigners funds.
- **Euro Commercial Papers:** These are short term money market securities usually issued at a discount, for maturities less than one year.
- **Credit Instruments:** The foregoing discussion relating to foreign exchange risk management and international capital market shows that foreign exchange operations of banks consist primarily of purchase and sale of credit instruments. There are many types of credit instruments used in effecting foreign remittances. They differ in the speed, with which money can be received by the creditor at the other end after it has been paid in by the debtor at his end. The price or the rate of each instrument, therefore, varies with extent of the loss of interest and risk of loss involved. There are, therefore, different rates of exchange applicable to different types of credit instruments.



3. INTERNATIONAL FINANCIAL CENTRE (GIFT CITY)

International Financial Centre (IFC) is the financial center that caters to the needs of the customers outside their own jurisdiction. Broadly, speaking IFC is a hub that deals with flow of funds, financial products and financial services even though in own land but with different set of regulations and laws.

Thus, these centers provide flexibility in currency trading, insurance, banking and other financial services. This flexible regime attracts foreign investors which is of potential benefit not only to the stakeholders but as well as for the country hosting IFC itself.

3.1 Benefits of IFC

There are numberless direct and indirect benefits of setting up IFC but some major benefits emanating from establishing IFC are as follows:

- (i) Opportunity for qualified professionals working outside India come here and practice their profession.
- (ii) A platform for qualified and talented professionals to pursue global opportunities without leaving their homeland.

- (iii) Stops Brain Drain from India.
- (iv) Bringing back those financial services transactions presently carried out abroad by overseas financial institutions/entities or branches or subsidiaries of Indian Financial Market.
- (v) Trading of complicated financial derivative can be started from India.

3.2 Constituents of IFC

Although there are many constituents for IFC but some of the important constituents are as follows:

- (i) **Highly developed Infrastructure:** - A leading edge infrastructure is a prerequisite for creating a platform to offer internationally competitive financial services.
- (ii) **Stable Political Environment:** - Destabilized political environment brings country risk for investment by foreign nationals. Hence, to accelerate foreign participation in growth of financial center, stable political environment is a prerequisite.
- (iii) **Strategic Location:** - The geographical location of the finance center should be strategic such as near to airport, seaport and should have friendly weather.
- (iv) **Quality Life:** - The quality of life at the center should be good as center retains highly paid professionals from own country as well from outside.
- (v) **Rationale Regulatory Framework:** - Rationale legal regulatory framework is another prerequisite of international finance center as it should be fair and transparent.
- (vi) **Sustainable Economy:** - The economy should be sustainable and should possess capacity to absorb all the shocks as it will boost investors' confidence.

3.3 GIFT City - India's International Financial Services Centre

To compete with its rival financial services centres situated in Dubai, Hong Kong etc. the idea of setting up an International Financial Center in India was coined in 2007. The main motive of setting up IFC in India was to retain the financial services businesses in India which moves out of India.

Since foreign investors normally remain hesitant to get registered in India GIFT city provides them a separate jurisdiction where it is easy to do business because of relaxed tax and other laws.

Accordingly, Government of India operationalized International Financial Services Centre (IFSC) at GIFT Multi Services SEZ in April 2015. The Union Budget 2016 provided competitive tax regime for the IFSC at GIFT SEZ.

With the objective of achieving sustainable growth and achieving above cited objective India's honorable Prime Minister in inaugurated India's first International Exchange – India INX, a wholly owned subsidiary of Bombay Stock Exchange on 9/1/2017. The India INX has stated trading in Index, currency, commodity and equity derivatives.

On 5th June, 2017, National Stock Exchange (NSE) the competitor of Bombay Stock Exchange (BSE) also launched its trading at GIFT. Initially, it started trading in derivative products in equity, currency, interest rate futures and commodities.

GIFT IFSC provides very competitive cost of operations with very competitive tax regime, single window clearance; relax company law provisions, international arbitration centre with overall facilitation of doing business. GIFT IFSC is now moving toward unified regulatory mechanism.

GIFT City is a new Financial & Technology Gateway of India for the World. To be internationalized, exchange controls cannot apply. So, FEMA is not applicable at GIFT city.

Hence, with all these development more and more financial institutions are setting business units in GIFT as they will pay reduced taxes as valid for special economic zones and can easily offer foreign currency loans to Indian Companies abroad and foreign firm.

4. SOVEREIGN FUNDS

A Sovereign Wealth Fund (SWF) is a state-owned investment fund comprised of money generated by the government. This money generally derived by Government from country's own surplus reserves. SWFs provide a benefit for a country's economy and its citizens. Since it is created by the Government the legal basis on which these are created varies from Government to Government. The legal basis for a sovereign wealth fund can be Constitutive Law, Fiscal Law, Constitution, Company Law or any Other Laws and Regulations.

The popular sources for funding SWF are:

- ❖ Surplus reserves from state-owned natural resource revenues and trade surpluses,
- ❖ Bank reserves that may accumulate from budgeting excesses,
- ❖ Foreign currency operations,
- ❖ Money from privatizations, and
- ❖ Governmental transfer payments.

Generally, SWFs are created for a targeted purpose though some countries have created SWFs like venture capital for the private sector. Some of the common objectives of a sovereign wealth fund are as follows: -

- Protection & Stabilization of the budget and economy from excess volatility in revenues/exports
- Diversify from non-renewable commodity exports
- Earn better returns than returns on foreign exchange reserves
- Assist monetary authorities dissipate unwanted liquidity
- Increase savings for future generations

- Fund social and economic development
- Ensuring Sustainable long term capital growth for target countries
- Political strategy

Like any other type of investment funds, SWFs can have their own objectives, risk tolerances, terms, and liquidity concerns etc. While some funds prefer returns over liquidity and some may prefer vice-versa. Depending on the assets and objectives, sovereign wealth funds' risk management can range from very conservative to a high tolerance for risk. Traditional classifications of SWFs include:

- ✓ Stabilization funds
- ✓ Savings or future generation funds
- ✓ Public benefit pension reserve funds
- ✓ Reserve investment funds
- ✓ Strategic Development Sovereign Wealth Funds (SDSWF)

Various types of Sovereign Investment Vehicles are:

- Sovereign Wealth Funds (SWFs)
- Public Pension Funds
- State-Owned Enterprises
- Sovereign Wealth Enterprises (SWEs)

5. INTERNATIONAL WORKING CAPITAL MANAGEMENT

The management of working capital in an international firm is much more complex as compared to a domestic one. The reasons for such complexity are:

- (1) A multinational firm has a wider option for financing its current assets. A MNC has funds flowing in from different parts of international financial markets. Therefore, it may choose to avail financing either locally or from global financial markets. Such an opportunity does not exist for pure domestic firms.
- (2) Interest and tax rates may vary from one country to another. A Treasurer associated with a multinational firm has to consider the interest/ tax rate differentials while financing current assets. This is not the case for domestic firms.
- (3) A multinational firm is confronted with foreign exchange risk as the value of inflow/outflow of funds as well as the value of import/export are influenced by exchange rate variations.
- (4) Restrictions imposed by the home or host country government towards movement of cash and inventory on account of political considerations affect the growth of MNCs. Domestic firms limit their operations within the country and do not face such problems.

- (5) With limited knowledge of the politico-economic conditions prevailing in different host countries, a Manager of a multinational firm often finds it difficult to manage working capital of different units of the firm operating in these countries. The pace of development taking place in the communication system has to some extent eased this problem.
- (6) In countries which operate on full capital convertibility, a MNC can move its funds from one location to another and thus mobilize and 'position' the funds in the most efficient way possible. Such freedom may not be available for MNCs operating in countries that have not subscribed to full capital convertibility (like India).

A study of International Working Capital Management requires knowledge of Multinational Cash Management, International Inventory Management and International Receivables Management.

5.1 Multinational Cash Management

MNCs are very much concerned for effective cash management. International money managers follow the traditional objectives of cash management viz.

- (1) Effectively managing and controlling cash resources of the company as well as
- (2) Achieving optimum utilization and conservation of funds.

The former objective can be attained by improving cash collections and disbursements and by making an accurate and timely forecast of cash flow pattern. The latter objective can be reached by making money available as and when needed, minimising the cash balance level and increasing the risk adjusted return on funds that is to be invested.

International Cash Management requires Multinational firms to adhere to the extant rules and regulations in various countries that they operate in. Apart from these rules and regulations, they would be required to follow the relevant forex market practices and conventions which may not be practiced in their parent countries. A host of factors curtail the area of operations of an international money manager e.g. restrictions on FDI, repatriation of foreign sales proceeds to the home country within a specified time limit and the, problem of blocked funds. Such restrictions hinder the movement of funds across national borders and the manager has to plan beforehand the possibility of such situation arising on a country to country basis. Other complications in the form of multiple tax jurisdictions and currencies and absence of internationally integrated exchange facilities result in shifting of cash from one location to another to overcome these difficulties.

The main objectives of an effective system of international cash management are:

- (1) To minimise currency exposure risk.
- (2) To minimise overall cash requirements of the company as a whole without disturbing smooth operations of the subsidiary or its affiliate.
- (3) To minimise transaction costs.
- (4) To minimise country's political risk.

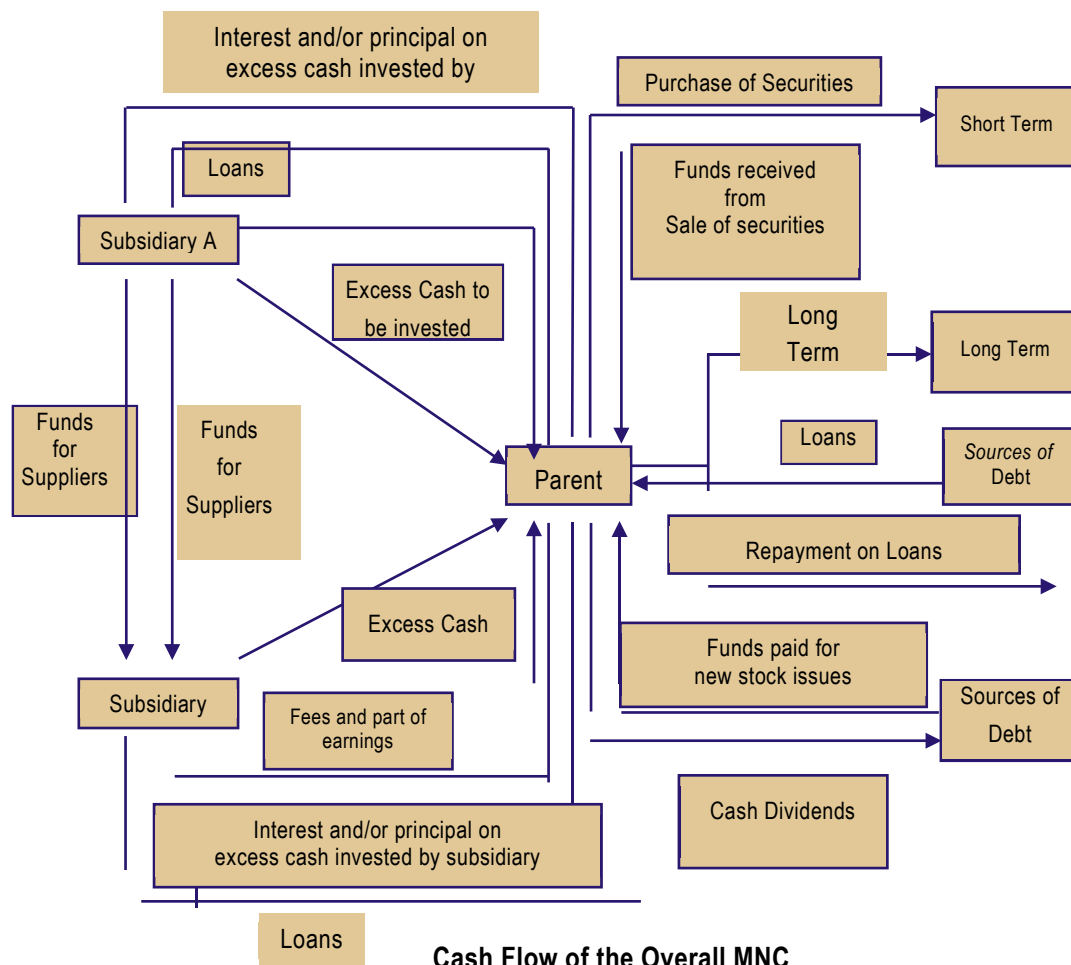
(5) To take advantage of economies of scale as well as reap benefits of superior knowledge.

A centralized cash management group is required to monitor and manage parent subsidiary and inter-subsidiary cash flows. Centralization needs centralization of information, reports and decision making processes relating to cash mobilisation, movement and investment. This system benefits individual subsidiaries which require funds or are exposed to exchange rate risk.

A centralised cash management system helps MNCs as follows:

- (a) To maintain minimum cash balance during the year.
- (b) To manage judiciously liquidity requirements of the centre.
- (c) To optimally use various hedging strategies so that MNC's foreign exchange exposure is minimised.
- (d) To aid the centre to generate maximum returns by investing all cash resources optimally.
- (e) To aid the centre to take advantage of multinational netting so that transaction costs and currency exposure are minimised.
- (f) To make maximum utilization of transfer pricing mechanism so that the firm enhances its profitability and growth.
- (g) To exploit currency movement correlations:
 - (i) Payables & receivables in different currencies having positive correlations.
 - (ii) Payables of different currencies having negative correlations.
 - (iii) Pooling of funds allows for reduced holding – the variance of the total cash flows for the entire group will be smaller than the sum of the individual variances.

Consider an MNC with two subsidiaries in different countries. The two subsidiaries periodically send fees and dividends to the parent as well as send excess cash – all of them represent incoming cash to the parent while the cash outflows to the subsidiaries include loans and return on cash invested by them. As subsidiaries purchase supplies from each other they have cash flows between themselves.



International Cash Management has two basic objectives:

1. Optimising Cash Flow movements.
2. Investing excess cash.

As no single strategy of international cash management can help in achieving both these objectives together, its task on such aspects becomes very challenging.

There are numerous ways of optimising cash inflows:

1. Accelerating Cash Inflows.
2. Managing Blocked Funds.
3. Leading and Lagging strategy.
4. Minimising tax on cash flow through International Transfer Pricing.

5. Using netting to reduce overall transaction costs by eliminating number of unnecessary conversions and transfer of currencies (Netting).
6. Investing Excess Cash

5.1.1 Accelerating Cash Inflows

Faster recovery of cash inflows helps the firm to use them whenever required or to invest them for better returns. Customers if using cheques for making payments, all over the world are instructed to send their payments to lockboxes set up at various locations, thereby reducing the time and transaction costs involved in collecting payments. Also, through pre-authorized payment, an organization may be allowed to charge the customer's bank account up to some limit.

5.1.2 Managing Blocked Funds

The host country may block funds of the subsidiary to be sent to the parent or make sure that earnings generated by the subsidiary be reinvested locally before being remitted to the parent so that jobs are created and unemployment reduced. The subsidiary may be instructed to obtain bank finance locally for the parent firm so that blocked funds may be utilised to pay off bank loans.

The parent company has to assess the potential of future funds blockage in a foreign country. MNCs have to be aware of political risks cropping up due to unexpected blockage of funds and devise ways to benefit their shareholders by using different methods for moving blocked funds through transfer pricing strategies, direct negotiations, leading and lagging and so on.

5.1.3 Leading and Lagging

This technique is used by subsidiaries for optimizing cash flow movements by adjusting the timing of payments to determine expectations about future currency movements. MNCs accelerate (lead) or delay (lag) the timing of foreign currency payments through adjustment of the credit terms extended by one unit to another. This technique helps to reduce foreign exchange exposure or to increase available working capital. Firms accelerate payments of hard currency payables and delay payments of soft currency payables in order to reduce foreign exchange exposure. Suppose an MNC in the USA has subsidiaries all over the world. The subsidiary in India purchases its supplies from another subsidiary in Japan. If the Indian subsidiary expects the rupee to fall against the yen, then it shall be the objective of that firm to accelerate the timing of its payment before the rupee depreciates. Such a strategy is called Leading. On the other hand, if the Indian subsidiary expects the rupee further to be stronger against the yen then it shall be the objective of that firm to delay the timing of its payment before the rupee appreciates. Such a strategy is called Lagging. MNCs should be aware of the government restrictions in such countries before availing such strategies.

5.1.4 Minimising Tax on Cash Flows through Transfer Pricing Mechanism

Large entities having many divisions require goods and services to be transferred frequently from one division to another. The profits of different divisions are determined by the price to be charged by the transferor division to the transferee division. The higher the transfer price, the larger will be

the gross profit of the transferor division with respect to the transferee division. The position gets complicated for MNCs due to exchange restrictions, inflation differentials, import duties, tax rate differentials between two nations, quotas imposed by host country, etc.

5.1.5 Netting

It is a technique of optimising cash flow movements with the combined efforts of the subsidiaries thereby reducing administrative and transaction costs resulting from currency conversion. There is a co-ordinated international interchange of materials, finished products and parts among the different units of MNC with many subsidiaries buying /selling from/to each other. Netting helps in minimising the total volume of inter-company fund flow.

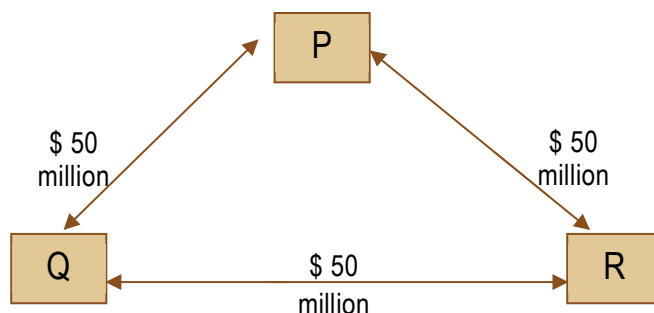
Advantages derived from netting system includes:

- 1) Reduces the number of cross-border transactions between subsidiaries thereby decreasing the overall administrative costs of such cash transfers
- 2) Reduces the need for foreign exchange conversion and hence decreases transaction costs associated with foreign exchange conversion.
- 3) Improves cash flow forecasting since net cash transfers are made at the end of each period
- 4) Gives an accurate report and settles accounts through co-ordinated efforts among all subsidiaries.

There are two types of Netting:

1. **Bilateral Netting System** – It involves transactions between the parent and a subsidiary or between two subsidiaries. If subsidiary X purchases \$ 20 million worth of goods from subsidiary Y and subsidiary Y in turn buy \$ 30 million worth of goods from subsidiary X, then the combined flows add up to \$ 50 million. But in bilateral netting system subsidiary Y would pay subsidiary X only \$10 million. Thus, bilateral netting reduces the number of foreign exchange transactions and also the costs associated with foreign exchange conversion. A more complex situation arises among the parent firm and several subsidiaries paving the way to multinational netting system.
2. **Multilateral Netting System** – Each affiliate nets all its inter affiliate receipts against all its disbursements. It transfers or receives the balance on the position of it being a net receiver or a payer thereby resulting in savings in transfer / exchange costs. For an effective multilateral netting system, these should be a centralised communication system along with disciplined subsidiaries. This type of system calls for the consolidation of information and net cash flow positions for each pair of subsidiaries.

Subsidiary P sells \$ 50 million worth of goods to Subsidiary Q, Subsidiary Q sells \$ 50 million worth of goods to Subsidiary R and Subsidiary R sells \$ 50 million worth of goods to Subsidiary P. Through multilateral netting inter affiliate fund transfers are completely eliminated.



The netting system uses a matrix of receivables and payables to determine the net receipt / net payment position of each affiliate at the date of clearing. A US parent company has subsidiaries in France, Germany, UK and Italy. The amounts due to and from the affiliates is converted into a common currency viz. US dollar and entered in the following matrix.

Inter Subsidiary Payments Matrix (US \$ Thousands)

		Paying affiliate				
		France	Germany	UK	Italy	Total
Receiving affiliate	France	---	40	60	100	200
	Germany	60	---	40	80	180
	UK	80	60	---	70	210
	Italy	100	30	60	---	190
	Total	240	130	160	250	780

Without netting, the total payments are \$ 780 Thousands. Through multinational netting these transfers will be reduced to \$ 100 Thousands, a net reduction of 87%. Also currency conversion costs are significantly reduced. The transformed matrix after consolidation and net payments in both directions convert all figures to US dollar equivalents to the below form:

Netting Schedule (US \$ Thousands)

	Receipt	Payment	Net Receipt	Net Payments
France	200	240	---	40
Germany	180	130	50	---
UK	210	160	50	---
Italy	190	250	---	60
			100	100

5.1.6 Investing Excess Cash

Euro Currency market accommodates excess cash in international money market. Euro Dollar

deposits offer MNCs higher yield than bank deposits in US. The MNCs use the Euro Currency market for temporary use of funds, purchase of foreign treasury bills / commercial paper. Through better telecommunication system and integration of various money markets in different countries, access to the securities in foreign markets has become easier.

Through a centralized cash management strategy, MNCs pool together excess funds from subsidiaries enabling them to earn higher returns due to the larger deposits lying with them. Sometimes a separate investment account is maintained for all subsidiaries so that short term financing needs of one can be met by the other subsidiary without incurring transaction costs charged by banks for exchanging currencies. Such an approach leads to excessive transaction costs. The centralized system helps to convert the excess funds pooled together into a single currency for investments thereby involving considerable transaction cost and a cost benefit analysis should be made to find out whether the benefits reaped are not offset by the transaction costs incurred. A question may arise as to how MNCs will utilise their excess funds once they have used them to meet short term financing needs. This is vital since some currencies may provide a higher interest rate or may appreciate considerably. So deposits made in such currencies will be attractive. Again MNCs may go in for foreign currency deposit which may give an effective yield higher than domestic deposit so as to overcome exchange rate risk. Forecasting of exchange rate fluctuations needs to be calculated in this respect so that a comparative study can be effectively made. Lastly an MNC can go for a diversification of its portfolio in different countries having different currencies because of the exchange rate fluctuations taking place and at the same time avoid the possibility of incurring substantial losses that may arise due to sudden currency depreciation.

5.2 International Inventory Management

An international firm possesses normally a bigger stock than EOQ and this process is known as stock piling. The different units of a firm get a large part of their inventory from sister units in different countries. This is possible in a vertical set up. Due to political disturbance there may be bottlenecks in import. If the currency of the importing country depreciates, imports will be costlier thereby giving rise to stock piling. To take a decision against stock piling the firm has to weigh the cumulative carrying cost vis-à-vis expected increase in the price of input due to changes in exchange rate. If the probability of interruption in supply is very high, the firm may opt for stock piling even if it is not justified on account of higher cost.

Also in case of global firms, lead time is larger on various units as they are located far off in different parts of the globe. Even if they reach the port in time, a lot of customs formalities have to be carried out. Due to these factors, re-order point for international firm lies much earlier. The final decision depends on the quantity of goods to be imported and how much of them are locally available. Relying on imports varies from unit to unit but it is very much large for a vertical set up.

5.3 International Receivables Management

Credit Sales lead to the emergence of account receivables. There are two types of such sales viz. Inter firm Sales and Intra firm Sales in the global aspect.

In case of Inter firm Sales, the currency in which the transaction should be denominated and the terms of payment need proper attention. With regard to currency denomination, the exporter is interested to denominate the transaction in a strong currency while the importer wants to get it denominated in weak currency. The exporter may be willing to invoice the transaction in the weak currency even for a long period if he/she has debt in that currency. This is due to sale proceeds being used to retire debts without loss on account of exchange rate changes. With regard to terms of payment, the exporter does not provide a longer period of credit and ventures to get the export proceeds quickly in order to invoice the transaction in a weak currency. If the credit term is liberal the exporter is able to borrow currency from the bank on the basis of bills receivables. Also, credit terms may be liberal in cases where competition in the market is keen on compelling the exporter to finance a part of the importer's inventory. Such an action from the exporter helps to expand sales in a big way.

In case of Intra firm sales, the focus is on global allocation of firm's resources. Different parts of the same product are produced in different units established in different countries and exported to the assembly units leading to a large size of receivables. The question of quick or delayed payment does not affect the firm as both the seller and the buyer are from the same firm though the one having cash surplus will make early payments while the other having cash crunch will make late payments. This is a case of intra firm allocation of resources where leads and lags explained earlier will be taken recourse to.

TEST YOUR KNOWLEDGE

Theoretical Questions

1. Write a short note on Instruments of International Finance.
2. What is the impact of GDRs on Indian Capital Market?

Practical Questions

1. ABC Ltd. is considering a project in US, which will involve an initial investment of US \$ 1,10,00,000. The project will have 5 years of life. Current spot exchange rate is ₹ 48 per US \$. The risk free rate in US is 8% and the same in India is 12%. Cash inflow from the project is as follows:

Year	Cash inflow
1	US \$ 20,00,000
2	US \$ 25,00,000
3	US \$ 30,00,000
4	US \$ 40,00,000
5	US \$ 50,00,000

Calculate the NPV of the project using foreign currency approach. Required rate of return on this project is 14%.

2. A USA based company is planning to set up a software development unit in India. Software developed at the Indian unit will be bought back by the US parent at a transfer price of US \$10 millions. The unit will remain in existence in India for one year; the software is expected to get developed within this time frame.

The US based company will be subject to corporate tax of 30 per cent and a withholding tax of 10 per cent in India and will not be eligible for tax credit in the US. The software developed will be sold in the US market for US \$ 12.0 millions. Other estimates are as follows:

Rent for fully furnished unit with necessary hardware in India	₹ 15,00,000
Man power cost (80 software professional will be working for 10 hours each day) ₹ 400 per man hour	
Administrative and other costs	₹ 12,00,000

Advise the US Company on the financial viability of the project. The rupee-dollar rate is ₹48/\$.

Note: Assume 365 days a year.

3. XY Limited is engaged in large retail business in India. It is contemplating for expansion into a country of Africa by acquiring a group of stores having the same line of operation as that of India.

The exchange rate for the currency of the proposed African country is extremely volatile. Rate of inflation is presently 40% a year. Inflation in India is currently 10% a year. Management of XY Limited expects these rates likely to continue for the foreseeable future.

Estimated projected cash flows, in real terms, in India as well as African country for the first three years of the project are as follows:

	Year – 0	Year – 1	Year – 2	Year - 3
Cashflows in Indian ₹ (000)	-50,000	-1,500	-2,000	-2,500
Cash flows in African Rands (000)	-2,00,000	+50,000	+70,000	+90,000

XY Ltd. assumes the year 3 nominal cash flows will continue to be earned each year indefinitely. It evaluates all investments using nominal cash flows and a nominal discounting rate. The present exchange rate is African Rand 6 to ₹ 1.

You are required to calculate the net present value of the proposed investment considering the following:

- (i) African Rand cash flows are converted into rupees and discounted at a risk adjusted rate.

- (ii) All cash flows for these projects will be discounted at a rate of 20% to reflect its high risk.
- (iii) Ignore taxation.

	Year - 1	Year - 2	Year - 3
PVIF @ 20%	.833	.694	.579

4. A multinational company is planning to set up a subsidiary company in India (where hitherto it was exporting) in view of growing demand for its product and competition from other MNCs. The initial project cost (consisting of Plant and Machinery including installation) is estimated to be US\$ 500 million. The net working capital requirements are estimated at US\$ 50 million. The company follows straight line method of depreciation. Presently, the company is exporting two million units every year at a unit price of US\$ 80, its variable cost per unit being US\$ 40.

The Chief Financial Officer has estimated the following operating cost and other data in respect of proposed project:

- (i) Variable operating cost will be US \$ 20 per unit of production;
- (ii) Additional cash fixed cost will be US \$ 30 million p.a. and project's share of allocated fixed cost will be US \$ 3 million p.a. based on principle of ability to share;
- (iii) Production capacity of the proposed project in India will be 5 million units;
- (iv) Expected useful life of the proposed plant is five years with no salvage value;
- (v) Existing working capital investment for production & sale of two million units through exports was US \$ 15 million;
- (vi) Export of the product in the coming year will decrease to 1.5 million units in case the company does not open subsidiary company in India, in view of the presence of competing MNCs that are in the process of setting up their subsidiaries in India;
- (vii) Applicable Corporate Income Tax rate is 35%, and
- (viii) Required rate of return for such project is 12%.

Assuming that there will be no variation in the exchange rate of two currencies and all profits will be repatriated, as there will be no withholding tax, estimate Net Present Value (NPV) of the proposed project in India.

Present Value Interest Factors (PVIF) @ 12% for five years are as below:

Year	1	2	3	4	5
PVIF	0.8929	0.7972	0.7118	0.6355	0.5674

5. XYZ Ltd., a company based in India, manufactures very high quality modern furniture and sells to a small number of retail outlets in India and Nepal. It is facing tough competition. Recent studies on marketability of products have clearly indicated that the customers are now more interested in variety and choice rather than exclusivity and exceptional quality. Since the cost of quality wood in India is very high, the company is reviewing the proposal for import of woods in bulk from Nepalese supplier.

The estimate of net Indian (₹) and Nepalese Currency (NC) cash flows in Nominal terms for this proposal is shown below:

Year	Net Cash Flow (in millions)			
	0	1	2	3
NC	-25.000	2.600	3.800	4.100
Indian (₹)	0	2.869	4.200	4.600

The following information is relevant:

- XYZ Ltd. evaluates all investments by using a discount rate of 9% p.a. All Nepalese customers are invoiced in NC. NC cash flows are converted to Indian (₹) at the forward rate and discounted at the Indian rate.
- Inflation rates in Nepal and India are expected to be 9% and 8% p.a. respectively. The current exchange rate is ₹ 1 = NC 1.6

Assuming that you are the finance manager of XYZ Ltd., calculate the net present value (NPV) and modified internal rate of return (MIRR) of the proposal.

You may use following values with respect to discount factor for ₹ 1 @9%.

	Present Value	Future Value
Year 1	0.917	1.188
Year 2	0.842	1.090
Year 3	0.772	1

ANSWERS/ SOLUTIONS

Answers to Theoretical Questions

- Please refer paragraph 2.
- Please refer paragraph 2.3.

Answers to the Practical Questions

- $(1 + 0.12) (1 + \text{Risk Premium}) = (1 + 0.14)$
 Or, $1 + \text{Risk Premium} = 1.14/1.12 = 1.0179$

Therefore, Risk adjusted dollar rate is = $1.0179 \times 1.08 = 1.099 - 1 = 0.099$

Calculation of NPV

Year	Cash flow (Million) US\$	PV Factor at 9.9%	P.V.
1	2.00	0.910	1.820
2	2.50	0.828	2.070
3	3.00	0.753	2.259
4	4.00	0.686	2.744
5	5.00	0.624	<u>3.120</u>
			12.013
		Less: Investment	<u>11.000</u>
		NPV	<u>1.013</u>

Therefore, Rupee NPV of the project is = ₹ (48 x 1.013) Million = ₹48.624 Million

2. Proforma profit and loss account of the Indian software development unit

	₹	₹
Revenue		48,00,00,000
Less: Costs:		
Rent	15,00,000	
Manpower (₹400 x 80 x 10 x 365)	11,68,00,000	
Administrative and other costs	12,00,000	11,95,00,000
<u>Earnings before tax</u>		36,05,00,000
Less: Tax		10,81,50,000
Earnings after tax		25,23,50,000
Less: Withholding tax(TDS)		2,52,35,000
Repatriation amount (in rupees)		22,71,15,000
Repatriation amount (in dollars)		\$ 4.7 million

Advise: The cost of development software in India for the US based company is \$5.268 million. As the USA based Company is expected to sell the software in the US at \$12.0 million, it is advised to develop the software in India.

Alternatively, if it is assumed that since foreign subsidiary has paid taxes it will not pay withholding taxes then solution will be as under:

	₹	₹
Revenue		48,00,00,000
Less: Costs:		
Rent	15,00,000	
Manpower (₹400 x 80 x 10 x 365)	11,68,00,000	
Administrative and other costs	12,00,000	11,95,00,000
Earnings before tax		36,05,00,000
Less: Tax		10,81,50,000
Earnings after tax		25,23,50,000
Repatriation amount (in rupees)		25,23,50,000
Repatriation amount (in dollars)		\$ 5,257,292

Advise: The cost of development software in India for the US based company is \$4.743 million. As the USA based Company is expected to sell the software in the US at \$12.0 million, it is advised to develop the software in India.

Alternatively, if it assumed that first the withholding tax @ 10% is being paid and then its credit is taken in the payment of corporate tax then solution will be as follows:

	₹	₹
Revenue		48,00,00,000
Less: Costs:		
Rent	15,00,000	
Manpower (₹400 x 80 x 10 x 365)	11,68,00,000	
Administrative and other costs	12,00,000	11,95,00,000
Earnings before tax		36,05,00,000
Less: Withholding Tax		3,60,50,000
Earnings after Withholding tax @ 10%		32,44,50,000
Less: Corporation Tax net of Withholding Tax		7,21,00,000
Repatriation amount (in rupees)		25,23,50,000
Repatriation amount (in dollars)		\$ 5,257,292

Advise: The cost of development software in India for the US based company is \$4.743 million. As the USA based Company is expected to sell the software in the US at \$12.0 million, it is advised to develop the software in India.

3. Calculation of NPV

Year	0	1	2	3
Inflation factor in India	1.00	1.10	1.21	1.331
Inflation factor in Africa	1.00	1.40	1.96	2.744
Exchange Rate (as per IRP)	6.00	7.6364	9.7190	12.3696
Cash Flows in ₹ '000				
Real	-50000	-1500	-2000	-2500
Nominal (1)	-50000	-1650	-2420	-3327.50
Cash Flows in African Rand '000				
Real	-200000	50000	70000	90000
Nominal	-200000	70000	137200	246960
In Indian ₹ '000 (2)	-33333	9167	14117	19965
Net Cash Flow in ₹ '000 (1)+(2)	-83333	7517	11697	16637
PVF@20%	1	0.833	0.694	0.579
PV	-83333	6262	8118	9633

NPV of 3 years = -59320 (₹ '000)

NPV of Terminal Value = $\frac{16637}{0.20} \times 0.579 = 48164$ (₹ '000)

Total NPV of the Project = -59320 (₹ '000) + 48164 (₹ '000) = -11156 (₹ '000)

4. Financial Analysis whether to set up the manufacturing units in India or not may be carried using NPV technique as follows:

I. Incremental Cash Outflows

	\$ Million
Cost of Plant and Machinery	500.00
Working Capital	50.00
Release of existing Working Capital	(15.00)
	535.00

II. Incremental Cash Inflow after Tax (CFAT)

(a) Generated by investment in India for 5 years

	\$ Million
Sales Revenue (5 Million x \$80)	400.00
Less: Costs	
Variable Cost (5 Million x \$20)	100.00

Fixed Cost	30.00
Depreciation (\$500Million/5)	100.00
EBIT	170.00
Taxes@35%	59.50
EAT	110.50
Add: Depreciation	100.00
CFAT (1-5 years)	210.50

- (b) Cash flow at the end of the 5 years (Release of Working Capital) 35.00
- (c) Cash generation by exports (Opportunity Cost)

	\$ Million
Sales Revenue (1.5 Million x \$80)	120.00
Less: Variable Cost (1.5 Million x \$40)	60.00
Contribution before tax	60.00
Tax@35%	21.00
CFAT (1-5 years)	39.00

- (d) Additional CFAT attributable to Foreign Investment

	\$ Million
Through setting up subsidiary in India	210.50
Through Exports in India	39.00
CFAT (1-5 years)	171.50

III. Determination of NPV

Year	CFAT (\$ Million)	PVF@12%	PV (\$ Million)
1-5	171.50	3.6048	618.2232
5	35	0.5674	19.8590
			638.0822
Less: Initial Outflow			535.0000
			103.0822

Since NPV is positive the proposal should be accepted.

5. Working Notes:

(i) Computation of Forward Rates

End of Year	NC	NC/₹
1	$NC1.60 \times \left(\frac{(1+0.09)}{(1+0.08)} \right)$	1.615
2	$NC1.615 \times \left(\frac{(1+0.09)}{(1+0.08)} \right)$	1.630
3	$NC1.630 \times \left(\frac{(1+0.09)}{(1+0.08)} \right)$	1.645

(ii) NC Cash Flows converted in Indian Rupees

Year	NC (Million)	Conversion Rate	₹ (Million)
0	-25.00	1.600	-15.625
1	2.60	1.615	1.61
2	3.80	1.630	2.33
3	4.10	1.645	2.49

Net Present Value

(₹ Million)

Year	Cash Flow in India	Cash Flow in Nepal	Total	PVF @ 9%	PV
0	---	-15.625	-15.625	1.000	-15.625
1	2.869	1.61	4.479	0.917	4.107
2	4.200	2.33	6.53	0.842	5.498
3	4.600	2.49	7.09	0.772	5.473
					-0.547

Modified Internal Rate of Return

	Year			
	0	1	2	3
Cash Flow (₹ Million)	-15.625	4.479	6.53	7.09

Year 1 Cash Inflow reinvested for 2 years (1.188 x 4.479)				5.32
Year 2 Cash Inflow reinvested for 1 years (1.090 x 6.53)				7.12
				19.53

$$\text{MIRR} = \sqrt[n]{\frac{\text{Terminal Cash Flow}}{\text{Initial Outlay}}} - 1 = \sqrt[3]{\frac{19.53}{15.625}} - 1 = 0.0772 \text{ say } 7.72\%$$

INTEREST RATE RISK MANAGEMENT



LEARNING OUTCOMES

After going through the chapter student shall be able to understand:

- Benchmark Rates
- Interest Rate Risk
- Hedging Interest Rate Risk
 - (a) Traditional Methods
 - (b) Modern Methods including Interest Rate Derivatives

1. INTRODUCTION

Companies with low profit margins and high capital expenses may be extremely sensitive to interest rate increases. Interest rate derivatives are valuable tools in managing risks. Derivatives are powerful tools that mitigate risk and build value. They help companies to develop a risk mitigation strategy.

Interest rate is the cost of borrowing money and the compensation for the service and risk of lending money. Interest rates are always changing, and different types of loans offer various interest rates. The lender of money takes a risk because the borrower may not pay back the loan. Thus, interest provides a certain compensation for bearing risk.

Coupled with the risk of default is the risk of inflation. When you lend money now, the prices of goods and services may go up by the time you are paid back, so your money's original purchasing power would decrease. Thus, interest protects against future rises in inflation. A lender such as a bank uses the interest to process account costs as well.

The factors affecting interest rates are largely macro-economic in nature:

- (a) Demand/supply of money- When economic growth is high, demand for money increases, pushing the interest rates up and vice-versa.
- (b) Inflation - The higher the inflation rate, the more interest rates are likely to rise.
- (c) Government- Government is the biggest borrower. The level of borrowing also determines the interest rates. Central Bank i.e. RBI either by printing more notes or through its Open Market Operations (OMO) changes the key rates (CRR, SLR and bank rates) depending on the state of the economy or to combat inflation.

2. BENCHMARK RATES

As the name implies the benchmark interest is an interest rate that forms the basis for determination of other interest rates. These rates are also known as 'Reference Rates'. These rates are very important in any economy and banking system and especially in financial transactions as they not only form the basis of financial contracts such as bank overdrafts, loans, mortgages but are also used in other complex financial transactions.

The benchmark rates are widely used in derivative transactions such as Forward, Future, Option Contract and especially Swap Contracts (discussed later in detail). The Benchmark rate also forms the basis for floating rate loans. Generally based on relative credit rating of the concerned entities basis points (BPs) are added over and above the benchmark rate for any financial transaction loan or issuance of Bonds etc.

Now question arises who decides these Benchmark rates, the answer is that the rates are decided by an independent body after considering various factors.

In financial transactions both domestic as well as international benchmark rates are used.

One of the most popular benchmark rates in international financial market was LIBOR (London Interbank Offered Rate). However, after coming of the news of manipulations by some banks in 2012, it was finally decided in 2017 that it would cease to exist. Accordingly, with the beginning of 1st January 2022, to enter into contracts companies are required to use Alternative Reference Rates (ARRs).

ARRs are different from LIBOR because of the following reasons :-

- (i) While ARR's are based on actual overnight transactions either secured or unsecured, LIBOR is unsecured without any collateral and mainly relies on the judgment of the panel banks to a great extent.
- (ii) ARR's are also considered to be near risk free rates with no term premium.

Now question arises which ARR shall be used for benchmarks rate i.e., what is the alternative to LIBOR. The answer lies in the fact that contrary to single LIBOR for different currencies, the ARR's

shall have different names, regulator, and nature. In addition to that, these will be referred on the basis of geographical referred locations of different currencies.

The different ARRs are as follows:

Region	Rate	Regulator	Nature
USA	Secured Overnight Financing Rate (SOFR)	Federal Reserve Bank of New York	Secured
UK	Sterling Overnight Index Average (SONIA)	Bank of England	Unsecured
Europe	Euro-Short-Term Rate (€STER)	European Central Bank	Unsecured
Japan	Tokyo Overnight Average Rate (TONAR)	Bank of Japan	Unsecured
Switzerland	Swiss Average Rate Overnight (SARON)	SIX (Swiss Stock Exchange)	Secured

In India though there are many benchmark interest rates such as Repo Rate, Prime Lending Rate, MCLR (Marginal Cost of Lending Rate) etc. but most of the common benchmark rates are MIBOR (Mumbai Interbank Offered Rate) and MIBID (Mumbai Interbank Bid Rate). While MIBOR is that interest rate at which bank will charge from borrower, the MIBID is that rate at which bank would like to borrow from other bank.

These two rates are used in majority of derivative deals such as Interest Rate Swaps, Forward rate Agreement, Floating Rate Debentures etc.

Further it is also important to note that not only benchmark rates are used in various types of financial transactions as discussed above but they also form the basis for valuation of various financial instruments especially the Bonds and Debentures.

3. INTEREST RATE RISK

Interest risk is the change in prices of bonds that could occur because of change in interest rates. It also considers the impact on interest income due to changes in the rate of interest. In other words, price as well as reinvestment risks require focus. So far as the terms for which interest rates were fixed on deposits banks incurs interest rate risk i.e., they stood to make gains or losses with every change in the level of interest rates.

3.1 Types of Interest Rate Risk

Various types of Interest rate risk faced by companies/ banks are as follows:

3.1.1 Gap Exposure

A gap or mismatch risk arises from holding assets and liabilities and off-balance sheet items with different principal amounts, maturity dates or re-pricing dates, thereby creating exposure to unexpected changes in the level of market interest rates. This exposure is more important in relation to banking business.

The positive Gap indicates that banks have more interest Rate Sensitive Assets (RSAs) than interest Rate Sensitive Liabilities (RSLs). A positive or asset sensitive Gap means that an increase in market interest rates could cause an increase in Net Interest Income (NII). Conversely, a negative or liability sensitive Gap implies that the banks' NII could increase as a result of decrease in market interest rates.

A negative gap indicates that banks have more RSLs than RSAs. The Gap is used as a measure of interest rate sensitivity.

Positive or Negative Gap is multiplied by the assumed interest rate changes to derive the Earnings at Risk (EaR). The EaR method facilitates to estimate how much the earnings might be impacted by an adverse movement in interest rates. The changes in interest rate could be estimated on the basis of past trends, forecasting of interest rates, etc. The banks should fix EaR which could be based on last/current year's income and a trigger point at which the line management should adopt on-or off-balance sheet hedging strategies may be clearly defined.

Gap calculations can be augmented by information on the average coupon on assets and liabilities in each time band and the same could be used to calculate estimates of the level of NII from positions maturing or due for repricing within a given time-band, which would then provide a scale to assess the changes in income implied by the gap analysis.

The periodic gap analysis indicates the interest rate risk exposure of banks over distinct maturities and suggests magnitude of portfolio changes necessary to alter the risk profile.

Although the Gap Report is very useful for analysis of Risk but it also suffers from following limitations:

- ❖ The Gap report quantifies only the time difference between re-pricing dates of assets and liabilities but fails to measure the impact of basis and embedded option risks.
- ❖ The Gap report also fails to measure the entire impact of a change in interest rate (Gap report assumes that all assets and liabilities are matured or re-priced simultaneously) within a given time-band and effect of changes in interest rates on the economic or market value of assets, liabilities and off-balance sheet position.
- ❖ It also does not take into account any differences in the timing of payments that might occur as a result of changes in interest rate environment.
- ❖ Further, the assumption of parallel shift in yield curves seldom happen in the financial market.

- ❖ The Gap report also fails to capture variability in non-interest revenue and expenses, a potentially important source of risk to current income.

3.1.2 Basis Risk

Market interest rates of various instruments seldom change by the same degree during a given period of time. The risk that the interest rate of different assets, liabilities and off-balance sheet items may change in different magnitude is termed as basis risk. For example, while assets may be benchmarked to Fixed Rate of Interest, liabilities may be benchmarked to floating rate of interest. The degree of basis risk is fairly high in respect of banks that create composite assets out of composite liabilities. The Loan book in India is funded out of a composite liability portfolio and is exposed to a considerable degree of basis risk. The basis risk is quite visible in volatile interest rate scenarios.

When the variation in market interest rate causes the NII to expand, the banks have experienced favourable basis shifts and if the interest rate movement causes the NII to contract, the basis has moved against the banks.

3.1.3 Embedded Option Risk

Significant changes in market interest rates create another source of risk to banks' profitability by encouraging prepayment of cash credit/demand loans/term loans and exercise of call/put options on bonds/debentures and/or premature withdrawal of term deposits before their stated maturities. The embedded option risk is becoming a reality in India and is experienced in volatile situations. The faster and higher the magnitude of changes in interest rate, the greater will be the embedded option risk to the banks' NII. Thus, banks should evolve scientific techniques to estimate the probable embedded options and adjust the Gap statements (Liquidity and Interest Rate Sensitivity) to realistically estimate the risk profiles in their balance sheet. Banks should also endeavour to stipulate appropriate penalties based on opportunity costs to stem the exercise of options, which is always to the disadvantage of banks.

3.1.4 Yield Curve Risk

The movements in yield curve are rather frequent when the economy moves through business cycles. Thus, banks should evaluate the movement in yield curves and its impact on the portfolio values and income.

3.1.5 Price Risk

Price risk occurs when assets are sold before their stated maturities. In the financial market, bond prices and yields are inversely related. The price risk is closely associated with the trading book, which is created for making profit out of short-term movements in interest rates.

Banks which have an active trading book should, therefore, formulate policies to limit the portfolio size, holding period, duration, defeasance period, stop loss limits, marking to market, etc.

3.1.6 Reinvestment Risk

Uncertainty with regard to interest rate at which the future cash flows could be reinvested is called reinvestment risk. Any mismatches in cash flows would expose the banks to variations in NII as the market interest rates move in different directions.

3.2 Measuring Interest Rate Risk

Before interest rate risk could be managed, they should be identified and quantified. Unless the quantum of IRR inherent in the balance sheet is identified, it is impossible to measure the degree of risks to which banks are exposed. It is also equally impossible to develop effective risk management strategies/hedging techniques without being able to understand the correct risk position of banks.

The IRR measurement system should address all material sources of interest rate risk including gap or mismatch, basis, embedded option, yield curve, price, reinvestment and net interest position risks exposures. The IRR measurement system should also take into account the specific characteristics of each individual interest rate sensitive position and should capture in detail the full range of potential movements in interest rates.

There are different techniques for measurement of interest rate risk, ranging from the traditional Maturity Gap Analysis (to measure the interest rate sensitivity of earnings), Duration (to measure interest rate sensitivity of capital), Simulation and Value at Risk.

While these methods highlight different facets of interest rate risk, many banks use them in combination, or use hybrid methods that combine features of all the techniques.



4. HEDGING INTEREST RATE RISK

Methods of Hedging of Interest Rate Risk can be broadly divided into following two categories:

- (A) Traditional Methods: These methods can further be classified in following categories:
 - i. Asset and Liability Management (ALM)
 - ii. Forward Rate Agreement (FRA)
- (B) Modern Methods: These methods can further be classified in following categories:
 - i. Interest Rate Futures (IRF)
 - ii. Interest Rate Options (IRO)
 - iii. Interest Rate Swaps

4.1 Traditional Methods

Now let us discuss some of the traditional methods of hedging interest rate risk.

4.1.1 Asset and Liability Management (ALM)

Asset-Liability Management (ALM) is one of the important tools of risk management in commercial banks of India. Indian banking industry is exposed to a number of risks prevailing in the market such as market risk, financial risk, interest rate risk etc. The net income of the banks is very sensitive to these factors or risks. For this purpose, Reserve bank of India (RBI), regulator of Indian banking industry evolved the tool known as ALM.

ALM is a comprehensive and dynamic framework for measuring, monitoring and managing the market risk of a bank. It is the management of structure of Balance Sheet (liabilities and assets) in such a way that the net earnings from interest are maximized within the overall risk preference (present and future) of the institutions. The ALM functions extend to liquidity risk management, management of market risk, trading risk management, funding & capital planning, profit planning and growth projection.

The concept of ALM is of recent origin in India. It has been introduced in Indian Banking industry w.e.f. 1st April, 1999. ALM is concerned with risk management and provides a comprehensive and dynamic framework for measuring, monitoring and managing liquidity, interest rate, foreign exchange and equity and commodity price risks of a bank that needs to be closely integrated with the bank's business strategy. Asset-liability management basically refers to the process by which an institution manages its balance sheet in order to allow for alternative interest rate and liquidity scenarios.

Banks and other financial institutions provide services which expose them to various kinds of risks like credit risk, interest risk, and liquidity risk. Asset liability management is an approach that provides institutions with protection that makes such risk acceptable. Asset-liability management models enable institutions to measure and monitor risk, and provide suitable strategies for their management.

It is therefore appropriate for institutions (banks, finance companies, leasing companies, insurance companies, and others) to focus on asset-liability management when they face financial risks of different types. Asset-liability management includes not only a formalization of this understanding, but also a way to quantify and manage these risks. Further, even in the absence of a formal asset-liability management program, the understanding of these concepts is of value to an institution as it provides a true picture of the risk/reward trade-off in which the institution is engaged.

Asset-liability management is a first step in the long-term strategic planning process.

Therefore, it can be considered as a planning function for an intermediate term. In a sense, the various aspects of balance sheet management deal with planning as well as direction and control of the levels, changes and mixes of assets, liabilities, and capital.

4.1.2 Forward Rate Agreements (FRAs)

A Forward Rate Agreement (FRA) is an agreement between two parties through which a borrower/lender protects itself from the unfavourable changes to the interest rate. Unlike futures FRAs are not traded on an exchange thus are called OTC product. Following are main features of FRA.

- Normally it is used by banks to fix interest costs on anticipated future deposits or interest revenues on variable-rate loans indexed to Benchmark Interest Rate e.g. LIBOR, MIBOR etc.
- It is an off-Balance Sheet instrument.
- It does not involve any transfer of principal. The principal amount of the agreement is termed "notional" because, while it determines the amount of the payment, actual exchange of the principal never takes place.
- It is settled at maturity in cash representing the profit or loss. A bank that sells an FRA agrees to pay the buyer the increased interest cost on some "notional" principal amount if Reference Rate of some specified maturity is above a stipulated "Forward Interest Rate" on the contract maturity or settlement date. Conversely, the buyer agrees to pay the seller any decrease in interest cost if Reference Rate fall below the forward rate.
- Final settlement of the amounts owed by the parties to an FRA is determined by the formula

$$= \frac{(N)(RR - FR)(dtm/DY)}{[1 + RR(dtm/DY)]} \times 100$$

Where,

N = the notional principal amount of the agreement;

RR = Reference Rate for the maturity specified by the contract prevailing on the contract settlement date; typically LIBOR or MIBOR

FR = Agreed-upon Forward Rate; and

dtm = maturity of the forward rate, specified in days (FRA Days)

DY = Day count basis applicable to money market transactions which could be 360 or 365 days.

If Reference Rate > FR then the seller owes the payment to the buyer, and if Reference Rate < FR then the buyer owes the seller the absolute value of the payment amount determined by the above formula.

- The differential amount is discounted at post change (actual) interest rate as it is settled in the beginning of the period not at the end.

Example

Suppose two banks enter into an agreement specifying:

- a forward rate of 5 percent on a Eurodollar deposit with a three-month maturity;
- a \$1 million notional principal; and settlement in one month.

Such an agreement is termed a 1x4 FRA because it fixes the interest rate for a deposit to be placed after one month and maturing four months after the date the contract is negotiated.

If the three-month LIBOR is 6 percent on the contract settlement date, the seller would owe the buyer the difference between 6 and 5 percent interest on \$1 million for a period of 90 days.

Every 1 basis point change in the interest rate payable on a principal of \$1 million for a 90-day maturity changes interest cost by \$25, so that the increase in the interest cost on a three-month Eurodollar deposit over the specified forward rate in this case is $\$25 \times 100 \text{ basis points} = \$2,500$.

The \$2,500 difference in interest costs calculated above is discounted back three months using the actual three-month LIBOR prevailing on the settlement date.

Thus, if 90-day LIBOR turns out to be 6 percent on the contract maturity date the buyer would receive $\$2,463.05 = \$2,500/[1 + 0.06(90/360)]$.

4.2 Modern Methods

Now let us discuss some of the modern methods of hedging interest rate risk.

4.2.1 Interest Rate Futures

As per Investopedia, an interest rate future is a futures contract with an underlying instrument that pays interest. An interest rate future is a contract between the buyer and seller agreeing to the future delivery of any interest-bearing asset. The interest rate future allows the buyer and seller to lock in the price of the interest-bearing asset for a future date.

Interest rate futures are used to hedge against the risk that interest rates will move in an adverse direction, causing a cost to the company.

For example, borrowers face the risk of interest rates rising. Futures use the inverse relationship between interest rates and bond prices to hedge against the risk of rising interest rates.

A borrower will enter to sell a future today. Then if interest rates rise in the future, the value of the future will fall (as it is linked to the underlying asset, bond prices), and hence a profit can be made when closing out the future (i.e. buying the future).

Currently, Interest Rate Futures segment of NSE offers two instruments i.e. Futures on 6 year, 10 year and 13 year Government of India Security and 91-day Government of India Treasury Bill (91DTB).

Bonds form the underlying instruments, not the interest rate. Further, IRF, settlement is done at two levels:

- Mark-to-Market settlement done on a daily basis and
- physical delivery which happens on any day in the expiry month.

Final settlement can happen only on the expiry date. Prices of IRF determined by demand and supply Interest rates are inversely related to prices of underlying bonds. In IRF following are two important terms:

(a) **Conversion factor:** All the deliverable bonds have different maturities and coupon rates. To make them comparable to each other, and also with the notional bond, RBI introduced Conversion Factor. Conversion factor for each deliverable bond and for each expiry at the time of introduction of the contract is being published by NSE.

(Conversion Factor) x (futures price) = actual delivery price for a given deliverable bond.

(b) **Cheapest to Deliver (CTD):** The CTD is the bond that minimizes difference between the quoted Spot Price of bond and the Futures Settlement Price (adjusted by the conversion factor). It is called CTD bond because it is the least expensive bond in the basket of deliverable bonds.

CTD bond is determined by the difference between cost of acquiring the bonds for delivery and the price received by delivering the acquired bond. This difference gives the profit / loss of the seller of the futures.

Profit of seller of futures = (Futures Settlement Price x Conversion factor) – Quoted Spot Price of Deliverable Bond

Loss of Seller of futures = Quoted Spot Price of deliverable bond – (Futures Settlement Price x Conversion factor)

That bond is chosen as CTD bond which either maximizes the profit or minimizes the loss.

4.2.2 Interest Rate Options

Also known as Interest Rate Guarantee (IRG) as option is a right not an obligation and acts as insurance by allowing businesses to protect themselves against adverse interest rate movements while allowing them to benefit from favourable movements.

It should be noted that the IRO is basically a series of FRAs which are exercisable at predetermined benchmarked interest rates on each period say 3 months, 6 months etc. Some of the important types of Interest Rate Options are as follows:

4.2.2.1 Cap Option

Also called Call Option, the buyer of an interest rate cap pays the seller a premium in return for the right to receive the difference in the interest cost on some notional principal amount any time a specified index or market interest rates rises above a stipulated "Cap Rate." The buyer bears no obligation or liability if interest rates fall below the cap rate. Thus, a cap resembles an option as it represents a right rather than an obligation to the buyer.

Caps evolved from interest rate guarantees that fixed a maximum level of interest payable on floating-rate loans. The advent of trading in over-the-counter interest rate caps dates back to 1985, when banks began to strip such guarantees from floating-rate notes to sell to the market. The leveraged buyout boom of the 1980s spurred the evolution of the market for interest rate caps. Firms engaged in leveraged buyouts typically took on large quantities of short-term debt, which made them vulnerable to financial distress in the event of a rise in interest rates. As a result, lenders began requiring such borrowers to buy interest-rate caps to reduce the risk of financial distress. More

recently, trading activity in interest rate caps has declined as the number of new leveraged buyouts has fallen. An interest rate cap is characterized by:

- ❖ a notional principal amount upon which interest payments are based;
- ❖ an interest rate benchmark say LIBOR, MIBOR, PLR etc. for typically some specified maturity period;
- ❖ a cap rate, which is equivalent to a strike or exercise price of an option; and
- ❖ the period of the agreement, including payment dates and interest rate reset dates.

Payment schedules for interest rate caps follow conventions in the interest rate swap market. Payment amounts are determined by the value of the benchmark rate on a series of interest rate reset dates. Intervals between interest rate reset dates and scheduled payment dates typically coincide with the term of the benchmark interest rate.

If the specified index or interest rate is above the cap rate, the seller pays the buyer the difference in interest cost on the next payment date. The amount of the payment is determined by the formula

$$(N) \max (0, r - r_c)(d_t/\text{No. of days a year}),$$

where

N is the notional principal amount of the agreement,

r is the actual spot rate on the reset date

r_c is the cap rate (expressed as a decimal), and

d_t is the number of days from the interest rate reset date to the payment date.

Example

Consider a one-year interest rate cap that specifies a notional principal amount of \$1 million and a six-month LIBOR cap rate of 5 percent. Assume the agreement covers a period starting January 15 through the following January 15 with the interest rate to be reset on July 15. The first period of a cap agreement typically is excluded from the agreement as it is known on the date of agreement. Hence, the cap buyer will be entitled to a payment only if the six-month LIBOR exceeds 5 percent on the July 15 interest rate reset date. Suppose that six-month LIBOR is 5.5 percent on July 15. Then, on the following January 15 (184 days after the July 15 reset date) the seller will owe the buyer.

$$\$2,555.56 = (\$1,000,000)(0.055 - 0.050)(184/360).$$

4.2.2.2 Floor Option

It is an OTC instrument that protects the buyer of the floor from losses arising from a decrease in interest rates. The seller of the floor compensates the buyer with a pay off when the interest rate falls below the strike rate of the floor.

If the benchmark rate is below the floor rate on the interest rate reset date the buyer receives a payment of, which is equivalent to the payoff from selling an FRA at a forward rate. On the other hand, if the index rate is above the floor rate the buyer receives no payment and loses the premium paid to the seller. Thus, a floor effectively gives the buyer the right, but not the obligation, to sell an FRA, which makes it equivalent to a European put option on an FRA. More generally, a multi-period floor can be viewed as a bundle of European-style put options on a sequence of FRAs maturing on a succession of future maturity dates.

The payment received by the buyer of an interest rate floor is determined by the formula

$$(N) \max(0, r_f - r)(d_t/\text{No. of days a year}),$$

Where,

N is the notional principal amount of the agreement,

r is the actual spot rate on the reset date

r_f is the floor rate or strike price, and

d_t is the number of days from the last interest rate reset date to the payment date.

4.2.2.3 Interest Rate Collars

It is a combination of a Cap and Floor. The purchaser of a Collar buys a Cap and simultaneously sells a Floor. A Collar has the effect of locking its purchases into a floating rate of interest that is bounded on both high side and the low side.

Although buying a collar limits a borrower's ability to benefit from a significant decline in market interest rates, it has the advantage of being less expensive than buying a cap alone because the borrower earns premium income from the sale of the floor that offsets the cost of the cap. A zero-cost collar results when the premium earned by selling a floor exactly offsets the cap premium.

The amount of the payment due to or owed by a buyer of an interest rate collar is determined by the expression

$$(N) [\max(0, r - r_c) - \max(0, r_f - r)](d_t/\text{No. of days a year}),$$

Where,

N is the notional principal amount of the agreement,

r is the actual spot rate on the reset date

r_c is the cap rate,

r_f is the floor rate, and

d_t is the term of the index in days.

4.2.3 Interest Rate Swaps

In an interest rate swap, the parties to the agreement, termed the swap counterparties, agree to exchange payments indexed to two different interest rates. Total payments are determined by the specified notional principal amount of the swap, which is never actually exchanged.

4.2.3.1 Swap Dealers

The intermediary collected a brokerage fee as compensation, but did not maintain a continuing role once the transaction was completed. The contract was between the two ultimate swap users, who exchanged payments directly.

4.2.3.2 A fixed/floating swap is characterized by

- ❖ a fixed interest rate;
- ❖ a variable or floating interest rate which is periodically reset;
- ❖ a notional principal amount upon which total interest payments are based; and
- ❖ the term of the agreement, including a schedule of interest rate reset dates (that is, dates when the value of the interest rate used to determine floating-rate payments is determined) and payment dates.

4.2.3.3 Timing of Payments

A swap is negotiated on its "trade date" and settlement takes effect two days later called "settlement date."

4.2.3.4 Price Quotation

The convention in the swap market is to quote the fixed interest rate as an All-In-Cost (AIC), which means that the fixed interest rate is quoted relative to a flat floating-rate index.

4.2.3.5 Types of Swap

(a) Plain Vanilla Swap: Also called Generic Swap or Coupon Swap and it involves the exchange of a fixed rate loan to a floating rate loan over a period of time and that too on notional principal. Floating rate basis can be LIBOR, MIBOR, Prime Lending Rate etc.

For example, Fixed interest payments on a generic swap are calculated assuming each month has 30 days and the quoted interest rate is based on a 360-day year. Given an All-In-Cost of the swap, the semi-annual fixed-rate payment would be:

$$(N)(AIC)(180/360),$$

Where,

N denotes the notional principal amount of the agreement.

AIC denotes the fixed rate

Then, the floating-rate receipt is determined by the formula:

$$(N)(R)(d_t/360)$$

Where,

d_t denotes the number of days since the last settlement date

R denotes the reference rate such as LIBOR, MIBOR etc.

(b) Basis Rate Swap: Also, called Non-Generic Swap. Similar to plain vanilla swap with the difference that payments are based on the difference between two different variable rates. For example one rate may be 1 month LIBOR and other may be 3-month LIBOR. In other words two legs of swap are floating but measured against different benchmarks.

(c) Asset Swap: Like plain vanilla swaps with the difference that it is the exchange fixed rate investments such as bonds which pay a guaranteed coupon rate with floating rate investments such as an index.

(d) Amortising Swap: An interest rate swap in which the notional principal for the interest payments declines during the life of the swap. They are particularly useful for borrowers who have issued redeemable bonds or debentures. It enables them to do interest rate risk hedging attached with redemption profile of bonds or debentures.

4.2.4 Swaptions

An interest rate swaption is simply an option on an interest rate swap. It gives the holder the right but not the obligation to enter into an interest rate swap at a specific date in the future, at a particular fixed rate and for a specified term.

There are two types of swaption contracts: -

- A **fixed rate payer swaption** (also called Call Swaption) gives the owner of the swaption the right but not the obligation to enter into a swap where they pay the fixed leg and receive the floating leg.
- A **fixed rate receiver swaption** (also called Put Swaption) gives the owner of the swaption the right but not the obligation to enter into a swap in which they will receive the fixed leg, and pay the floating leg.

4.2.4.1 Principal features of Swaptions

- A swaption is effectively an option on a forward-start IRS, where exact terms such as the fixed rate of interest, the floating reference interest rate and the tenure of the IRS are established upon conclusion of the swaption contract.
- A 3-month into 5-year swaption would therefore be seen as an option to enter into a 5-year IRS, 3 months from now.

- C. The 'option period' refers to the time which elapses between the transaction date and the expiry date.
- D. The swaption premium is expressed as basis points.
- E. Swaptions can be cash-settled; therefore, at expiry they are marked to market off the applicable forward curve at that time and the difference is settled in cash.

4.2.4.2 Pricing of Swaptions

The pricing methodology depends upon setting up a model of probability distribution of the forward zero-coupon curve which undoes a Market process.

2.2.4.3 Uses of Swaptions

- (a) Swaptions can be applied in a variety of ways for both active traders as well as for corporate treasurers.
- (b) Swap traders can use them for speculation purposes or to hedge a portion of their swap books.
- (c) Swaptions have become useful tools for hedging embedded optionality which is common to the natural course of many businesses.
- (d) Swaptions are useful to borrowers targeting an acceptable borrowing rate.
- (e) Swaptions are also useful to those businesses tendering for contracts.
- (f) Swaptions also provide protection on callable/puttable bond issues.

TEST YOUR KNOWLEDGE

Theoretical Questions

1. Write a short note on Forward Rate Agreements.
2. What do you know about swaptions and their uses?

Practical Questions

1. M/s. Parker & Co. is contemplating to borrow an amount of ₹60 crores for a Period of 3 months in the coming 6 month's time from now. The current rate of interest is 9% p.a., but it may go up in 6 month's time. The company wants to hedge itself against the likely increase in interest rate.

The Company's Bankers quoted an FRA (Forward Rate Agreement) at 9.30% p.a.

What will be the Final settlement amount, if the actual rate of interest after 6 months happens to be (i) 9.60% p.a. and (ii) 8.80% p.a.?

2. TM Fincorp has bought a 6 x 9 ₹ 100 crore Forward Rate Agreement (FRA) at 5.25%. On fixing date reference rate i.e. MIBOR turns out be as follows:

Period	Rate (%)
3 months	5.50
6 months	5.70
9 months	5.85

You are required to determine:

- Profit/Loss to TM Fincorp. in terms of basis points.
 - The settlement amount.
- (Assume 360 days in a year)
3. XYZ Limited borrows £ 15 Million of six months LIBOR + 10.00% for a period of 24 months. The company anticipates a rise in LIBOR, hence it proposes to buy a Cap Option from its Bankers at the strike rate of 8.00%. The lump sum premium is 1.00% for the entire reset periods and the fixed rate of interest is 7.00% per annum. The actual position of LIBOR during the forthcoming reset period is as under:

Reset Period	LIBOR
1	9.00%
2	9.50%
3	10.00%

You are required to show how far interest rate risk is hedged through Cap Option.

For calculation, work out figures at each stage up to three decimal points and amount nearest to £. It should be part of working notes.

4. Suppose a dealer quotes 'All-in-cost' for a generic swap at 8% against six month LIBOR flat. If the notional principal amount of swap is ₹ 5,00,000.
- Calculate semi-annual fixed payment.
 - Find the first floating rate payment for (i) above if the six month period from the effective date of swap to the settlement date comprises 181 days and that the corresponding LIBOR was 6% on the effective date of swap.
- In (ii) above, if the settlement is on 'Net' basis, how much the fixed rate payer would pay to the floating rate payer?

Generic swap is based on 30/360 days basis.

5. Derivative Bank entered into a plain vanilla swap through on OIS (Overnight Index Swap) on a principal of ₹ 10 crores and agreed to receive MIBOR overnight floating rate for a fixed

payment on the principal. The swap was entered into on Monday, 2nd August, 2010 and was to commence on 3rd August, 2010 and run for a period of 7 days.

Respective MIBOR rates for Tuesday to Monday were:

7.75%, 8.15%, 8.12%, 7.95%, 7.98%, 8.15%.

If Derivative Bank received ₹ 317 net on settlement, calculate Fixed rate and interest under both legs.

Notes:

- (i) Sunday is Holiday.
- (ii) Work in rounded rupees and avoid decimal working.

6. A Inc. and B Inc. intend to borrow \$200,000 and ₹200,000 in ₹ respectively for a time horizon of one year. The prevalent interest rates are as follows:

Company	₹ Loan	\$ Loan
A Inc	5%	9%
B Inc	8%	10%

The prevalent exchange rate is \$1 = ₹120.

They entered in a currency swap under which it is agreed that B Inc will pay A Inc @ 1% over the ₹ Loan interest rate which the later will have to pay as a result of the agreed currency swap whereas A Inc will reimburse interest to B Inc only to the extent of 9%. Keeping the exchange rate invariant, quantify the opportunity gain or loss component of the ultimate outcome, resulting from the designed currency swap.

7. A textile manufacturer has taken floating interest rate loan of ₹ 40,00,000 on 1st April, 2012. The rate of interest at the inception of loan is 8.5% p.a. interest is to be paid every year on 31st March. In the month of October 2012, the Central bank of the country releases following projections about the interest rates likely to prevail in future.

- (i) On 31st March, 2013, at 8.75%; on 31st March, 2014 at 10% on 31st March, 2015 at 10.5% and on 31st March, 2016 at 7.75%. Show how the borrower can hedge the risk using Option Cap arising out of expected rise in the rate of interest when he wants to peg his interest cost at 8.50% p.a.
- (ii) Assume that the premium negotiated by both the parties is 0.75% to be paid at once on 1st October, 2012 and the actual rate of interest on the respective due dates happens to be as: on 31st March, 2013 at 10.2%; on 31st March, 2014 at 11.5%; on 31st March, 2015 at 9.25%; on 31st March, 2016 at 8.25%. Show how the settlement will be executed on the perspective interest due dates.

ANSWERS/ SOLUTIONS

Answers to Theoretical Questions

1. Please refer paragraph 4.1.2.
2. Please refer paragraph 4.2.4.

Answers to the Practical Questions

1. Final settlement amount shall be computed by using formula:

$$= \frac{(N)(RR - FR)(dtm/DY)}{[1 + RR(dtm/DY)]}$$

Where,

N = the notional principal amount of the agreement;

RR = Reference Rate for the maturity specified by the contract prevailing on the contract settlement date;

FR = Agreed-upon Forward Rate; and

dtm = maturity of the forward rate, specified in days (FRA Days)

DY = Day count basis applicable to money market transactions which could be 360 or 365 days.

Accordingly,

If actual rate of interest after 6 months happens to be 9.60%

$$= \frac{(\text{₹ } 60 \text{ crore})(0.096 - 0.093)(3/12)}{[1 + 0.096(3/12)]}$$

$$= \frac{(\text{₹ } 60 \text{ crore})(0.00075)}{1.024} = \text{₹ } 4,39,453.13$$

Thus banker will pay Parker & Co. a sum of ₹ 4,39,453.13 or ₹ 4,39,453.

If actual rate of interest after 6 months happens to be 8.80%

$$= \frac{(\text{₹ } 60 \text{ crore})(0.088 - 0.093)(3/12)}{[1 + 0.088(3/12)]}$$

$$= \frac{(\text{₹ } 60 \text{ crore})(-0.00125)}{1.022} = - \text{₹ } 7,33,855.19$$

Thus Parker & Co. will pay banker a sum of ₹ 7,33,855.19 or ₹ 7,33,855.

Note: Alternatively, students may solve the question on basis of different days count conventions instead of months (as considered in above calculations) i.e. 90 days/360 days, 90 days/ 365 days, 91 days/360 days or 91 days/365 days.

2. (a) TM will make a profit of 25 basis points since a 6X9 FRA is a contract on 3-month interest rate in 6 months, which turns out to be 5.50% (higher than FRA price).
 (b) The settlement amount shall be calculated by using the following formula:

$$\frac{N(RR - FR)(dtm / 360)}{1 + RR(dt / 360)}$$

Where

N = Notional Principal Amount

RR = Reference Rate

FR = Agreed upon Forward Rate

Dtm = FRA period specified in days.

Accordingly:

$$\frac{100 \text{ crore } (5.50\% - 5.25\%)(92^*/360)}{1 + 0.055(92^*/360)} = ₹ 6,30,032$$

Hence there is profit of ₹ 6,30,032 to TM Fincorp.

* Alternatively, it can also be taken as 90 days.

3. First of all we shall calculate premium payable to bank as follows:

$$P = \frac{rp}{\left[(1+i) - \frac{1}{i \times (1+i)^t} \right]} \times A \text{ or } \frac{rp}{PVA(3.5\%,4)} \times A$$

Where

P = Premium

A = Principal Amount

rp = Rate of Premium

i = Fixed Rate of Interest

t = Time

$$= \frac{0.01}{\left[(1/0.035) - \frac{1}{0.035 \times 1.035^4} \right]} \times ₹15,000,000 \text{ or } \frac{0.01}{(0.966 + 0.933 + 0.901 + 0.871)}$$

× ₹15,000,000

$$= \frac{0.01}{\left[(28.571) - \frac{1}{0.0402} \right]} \times \text{£}15,000,000 = \text{£}40,595 \text{ or } \frac{\text{£}150,000}{3.671} = \text{£}40,861$$

Now we see the net payment received from bank

Reset Period	Additional interest due to rise in interest rate	Amount received from bank	Premium paid to bank*	Net Amt. received from bank
1	£ 75,000	£ 75,000	£ 40,861	£34,139
2	£ 112,500	£ 112,500	£ 40,861	£71,639
3	£ 150,000	£ 150,000	£ 40,861	£109,139
TOTAL	£ 337,500	£ 337,500	£122,583	£ 214,917

Thus, from above it can be seen that interest rate risk amount of £ 337,500 reduced by £ 214,917 by using of Cap option.

* Alternatively, if premium paid is considered as £ 40,595, then above figure of £ 214,917 shall be changed to £ 215,715.

4. (i) Semi-annual fixed payment

$$= (N) (AIC) (\text{Period})$$

Where N = Notional Principal amount = ₹5,00,000

$$AIC = \text{All-in-cost} = 8\% = 0.08$$

$$= 5,00,000 \times 0.08 \left(\frac{180}{360} \right)$$

$$= 5,00,000 \times 0.08 (0.5)$$

$$= 5,00,000 \times 0.04 = \text{₹}20,000/-$$

(ii) Floating Rate Payment

$$= N (\text{LIBOR}) \left(\frac{dt}{360} \right)$$

$$= 5,00,000 \times 0.06 \times \frac{181}{360}$$

$$= 5,00,000 \times 0.06 (0.503) \text{ or } 5,00,000 \times 0.06 (0.502777)$$

$$= 5,00,000 \times 0.03018 \text{ or } 5,00,000 \times 0.030166 = \text{₹}15,090 \text{ or } 15,083$$

(iii) **Net Amount**

= (i) – (ii)

= ₹20,000 – ₹15,090 = ₹4,910

or = ₹20,000 – ₹15,083 = ₹4,917

5.

Day	Principal (₹)	MIBOR (%)	Interest (₹)
Tuesday	10,00,00,000	7.75	21,233
Wednesday	10,00,21,233	8.15	22,334
Thursday	10,00,43,567	8.12	22,256
Friday	10,00,65,823	7.95	21,795
Saturday & Sunday (*)	10,00,87,618	7.98	43,764
Monday	10,01,31,382	8.15	<u>22,358</u>
Total Interest @ Floating			1,53,740
Less: Net Received			<u>317</u>
Expected Interest @ fixed			<u>1,53,423</u>
Thus Fixed Rate of Interest			0.07999914
Approx.			8%

(*) i.e. interest for two days.

Note: Alternatively, answer can also be calculated on the basis of 360 days in a year.

6.

Opportunity gain of A Inc under currency swap	Receipt	Payment	Net
Interest to be remitted to B. Inc in \$ 2,00,000 x 9% = \$18,000 Converted into (\$18,000 x ₹120)		₹21,60,000	
Interest to be received from B. Inc in \$ converted into ₹ (6% x \$2,00,000 x ₹120)	₹14,40,000	-	
Interest payable on ₹ loan	<u>-</u>	<u>₹12,00,000</u>	
	₹14,40,000	₹33,60,000	
Net Payment	<u>₹19,20,000</u>	<u>-</u>	
	<u>₹33,60,000</u>	<u>₹33,60,000</u>	
\$ equivalent paid ₹19,20,000 x (1/₹120)			\$16,000
Interest payable without swap in \$			<u>\$18,000</u>
Opportunity gain in \$			<u>\$ 2,000</u>

Opportunity gain of B inc under currency swap	Receipt	Payment	Net
Interest to be remitted to A. Inc in (\$ 2,00,000 x 6%)		\$12,000	
Interest to be received from A. Inc in ¥ converted into \$ = ¥21,60,000/¥120	\$18,000		
Interest payable on \$ loan@10%	-	\$20,000	
	\$18,000	\$32,000	
Net Payment	\$14,000\$3 2,000	- \$32,000	
¥ equivalent paid \$14,000 X ¥120			¥16,80,000
Interest payable without swap in ¥ (\$2,00,000 X ¥ 120 X 8%)			¥19,20,000
Opportunity gain in ¥			¥ 2,40,000

Alternative Solution

Cash Flows of A Inc

(i) At the time of exchange of principal amount

Transactions		Cash Flows
Borrowings	\$2,00,000 x ¥120	+ ¥240,00,000
Swap		- ¥240,00,000
Swap		+\$2,00,000
Net Amount		+\$2,00,000

(ii) At the time of exchange of interest amount

Transactions		Cash Flows
Interest to the lender	¥240,00,000X5%	¥12,00,000
Interest Receipt from B Inc.	¥2,00,000X120X6%	¥14,40,000
Net Saving (in \$)	¥2,40,000/¥120	\$2,000
Interest to B Inc.	\$2,00,000X9%	-\$18,000
Net Interest Cost		-\$16,000

A Inc. used \$2,00,000 at the net cost of borrowing of \$16,000 i.e. 8%. If it had not opted for swap agreement the borrowing cost would have been 9%. Thus there is saving of 1%.

Cash Flows of B Inc

(i) At the time of exchange of principal amount

Transactions		Cash Flows
Borrowings		+ \$2,00,000
Swap		- \$2,00,000
Swap	\$2,00,000X¥120	+¥240,00,000
Net Amount		+¥240,00,000

(ii) At the time of exchange of interest amount

Transactions		Cash Flows
Interest to the lender	\$2,00,000X10%	- \$20,000
Interest Receipt from A Inc.		+\$18,000
Net Saving (in ¥)	-\$2,000X¥120	- ¥2,40,000
Interest to A Inc.	\$2,00,000X6%X¥120	- ¥14,40,000
Net Interest Cost		- ¥16,80,000

B Inc. used ¥240,00,000 at the net cost of borrowing of ¥16,80,000 i.e. 7%. If it had not opted for swap agreement the borrowing cost would have been 8%. Thus there is saving of 1%.

7. As borrower does not want to pay more than 8.5% p.a., on this loan where the rate of interest is likely to rise beyond this, hence, he has hedge the risk by entering into an agreement to buy interest rate caps with the following parameters:

- Notional Principal: ₹ 40,00,000/-
- Strike rate: 8.5% p.a.
- Reference rate: the rate of interest applicable to this loan
- Calculation and settlement date: 31st March every year
- Duration of the caps: till 31st March 2016
- Premium for caps: negotiable between both the parties

To purchase the caps this borrower is required to pay the premium upfront at the time of buying caps. The payment of such premium will entitle him with right to receive the compensation from the seller of the caps as soon as the rate of interest on this loan rises above 8.5%. The compensation will be at the rate of the difference between the rate of none of the cases the cost of this loan will rise above 8.5% calculated on ₹ 40,00,000/-. This implies

that in none of the cases the cost of this loan will rise above 8.5%. This hedging benefit is received at the respective interest due dates at the cost of premium to be paid only once.

The premium to be paid on 1st October 2012 is **30,000/-** ($\text{₹ } 40,00,000 \times 0.75/100$). The payment of this premium will entitle the buyer of the caps to receive the compensation from the seller of the caps whereas the buyer will not have obligation. The compensation received by the buyer of caps will be as follows:

On 31st March 2013

The buyer of the caps will receive the compensation at the rate of 1.70% (10.20 - 8.50) to be calculated on ₹ 40,00,000, the amount of compensation will be ₹ 68000/- ($40,00,000 \times 1.70/100$).

On 31st March 2014

The buyer of the caps will receive the compensation at the rate of 3.00% (11.50 – 8.50) to be calculated on ₹ 40,00,000/-, the amount of compensation will be ₹ 120000/- ($40,00,000 \times 3.00/100$).

On 31st March 2015

The buyer of the caps will receive the compensation at the rate of 0.75% (9.25 – 8.50) to be calculated on ₹ 40,00,000/-, the amount of compensation will be ₹ 30,000 ($40,00,000 \times 0.75/100$).

On 31st March 2016

The buyer of the caps will not receive the compensation as the actual rate of interest is 8.25% whereas strike rate of caps is 8.5%. Hence, his interest liability shall not exceed 8.50%.

Thus, by paying once the premium upfront buyer of the caps gets the compensation on the respective interest due dates without any obligations.

BUSINESS VALUATION



LEARNING OUTCOMES

After going through the chapter student shall be able to understand

- Conceptual Framework of Valuation
- Approaches/ Methods of Valuation
- Measuring Cost of Equity
- Relative Valuation
- Other Approaches to Value Measurement
- Arriving at Fair Value
- Going concern and Non-Going concern valuation
- Valuation of Distressed Companies
- Valuation of Start ups
- Valuation of Digital Platforms
- Valuation of Professional/ Consultancy Firms
- Impact of ESG on valuation



1. CONCEPTUAL FRAMEWORK OF VALUATION

The syllabus of this paper requires you to have expert knowledge of various techniques of valuation of various securities (e.g. equity shares, preference shares and bonds etc.) as well as of business.

While we discussed earlier the topic of Valuation of Securities now we shall discuss the topic of 'Valuation of Business' that too in corporate context. Though Corporate Valuation can be carried out for various purpose but here we shall mainly use the same for the Mergers and Acquisitions decisions, the next topic for the discussion.

The basic purpose of any enterprise is to earn profits in order to sustain itself and promote growth. Managements across the world endeavor in this aspect – be it be a sole proprietorship concern or a multinational giant having its foothold across geographies.

Corporate valuation can be traced back to centuries ago when the United East India Company (referred to as 'Dutch East India Company' by the Britishers) was the first corporation to be valued and an IPO was launched. The East India Company too stands as a fine example of a corporatized way of doing world trade, and perhaps the earliest of institutions to focus on wealth maximization, albeit in unethical ways. Today, almost every enterprise that generates a positive cash flow and generates suitable employment opportunities feels the pressing need to 'value' itself – be it for going to the local bank for debt financing, or for assessing an initial public offering.

It is obvious that the more an enterprise grows, the more the number of stakeholders it adds in its progress to growth. Presentation of annual financial statements in the annual body meeting, publishing quarterly results for the street – all these become the staple diet for stakeholders who sow the seeds of capital in the enterprise and in turn, wait for the enterprise to multiply its progressive potencies. In a relative world, this persisting curiosity of the stakeholders to understand the 'true worth' of their enterprise becomes translated to the concept of 'valuation'. Add to it, the market analysts, financial intermediaries, and let's not forget the academicians, and what we have is a handful of valuation approaches that have been painstakingly and meticulously crafted for valuing the correct worth of the enterprise at hand. In a true sense, valuation imbibes both the science and the art of itself per se. As it stands today, valuation has become an inseparable part of strategic financial management.

To elaborate, the need of a proper assessment of an enterprise's value can be typically for:

- (a) Information for its internal stakeholders,
- (b) Comparison with similar enterprises for understanding management efficiency,
- (c) Future public listing of the enterprise,
- (d) Strategic planning, for e.g. finding out the value driver of the enterprise, or for a correct deployment of surplus cash,
- (e) Ball park price (i.e. an approximate price) for acquisition, etc.

2. IMPORTANT TERMS ASSOCIATED WITH VALUATION

It's imperative to understand the important terms that we would come across and will be used widely in any valuation model. Some of the terms have indeed evolved over a period of time and continued usage, and now stand on their own as precursor to application of the actual valuation model itself.

2.1 The Concept of PV (Present Value) of cash flows

Needless to state that all students must have referred and understood thoroughly the concept of 'Time Value of Money' at Intermediate Level in the paper of Financial Management. Accordingly, a receipt of ₹ 1,000 twelve months hence would not be the same as of today, because of the concept of Time Value of Money and the discounted value of ₹ 1,000 a year at the rate of 10% shall be ₹ 909 approximately.

2.2 The Concept of IRR (Internal Rate of Return)

Similar to above, this concept has also been discussed in the paper of Financial Management at Intermediate Level. IRR is the discount rate that will equate the present value (NPV) of all cash flows from a particular investment or project to zero. We can also visualize IRR as a discount rate that will get the PVs of cash inflows equal to the investment.

The Decision Rule – the higher the IRR of a project, the more likely it gets selected for further investments.

2.3 ROI (Return on investment)

Simply put, ROI is the return over the investment made in an entity from a stakeholder's point of view.

A simple example would be where the stakeholder has sold shares valued at 1400, invested initially at 1000; the ROI would be the return divided by the investment cost, which would be $(1400-1000)/1000 = 40\%$ in this case. You would have noted that the 40% is the return on cash investment for this standalone transaction, primarily signifying the absolute rate of return on liquidating his holdings. But if the stakeholder sells his shares that was held by him from the past several years, he would try to calculate the ROI by taking into account the time value of money. This would imply that the ROI gets 'adjusted' over the period of his holdings. So, if a stakeholder had worth 1000 of shares at the beginning of the year and he makes an additional investment of 200 during the year, and his investment is valued at 2000 at the end of the year, his ROI would be calculated as returns divided by the average investment held during the year. His returns would be $(2000-1200 = 800)$ and the average investment would be $[(1000+1200)/2] = 1100$ for the year. Accordingly, his ROI will be $800/1100 = 72\%$. The average cost of investments is arrived at to recognize the timing of the investment. In this case, the stakeholder may also calculate the actual days of the additional investment, to arrive at the exact ROI. However, stakeholders who hold multiple investments and portfolios will use the average cost of investments as illustrated above.

From an entity's point of view, the most significant use of ROI would be to calculate the returns generated by each individual / incremental investment on a project or different projects. Thus, a company that has initiated a couple of projects during the year towards new business lines can implement the ROI concept to calculate the returns on the investment and take further decisions based on the same. Note that ROI is a historical ratio, so naturally the decision can either only be a course corrective action, or channeling further investments into the more successful business line.

By now you will appreciate that essentially, we are viewing ROI as a performance measure ratio in the corporate scenario; which also brings us to an interesting question –how about measuring returns against the total investments, or simply put, the total 'assets' held by the enterprise? After all, it is imperative that all assets are put forth only for the purpose of wealth maximization and fullest returns, right? And that's precisely the concepts seen below.

2.4 Perpetual Growth Rate (Gordon Model)

As discussed in the topic of Cost of Capital at Intermediate Level the Gordon's model assumes a perpetual growth in dividend; thereby potential investor eyeing stable inflows will take the latest Dividend payout and factor it with his expected rate of return.

This model is not widely used by potential investors because of following reasons:

- (i) there are more parameters which need to be factored in, and
- (ii) dividends rarely grow perpetually at a steady rate.

However, this model is the darling of academicians as it can neatly fit into a 'constant rate' model for deliberation purposes.

2.5 The term 'TV' (Terminal Value)

'Terminal' refers to the 'end' of something – in the valuation world, to 'terminate' would be to exit out of a particular investment or line of business. So, when an investor decides to pull out and book profits, he would not only be expecting a fair value of the value created, but also would definitely look to the 'horizon' and evaluate the future cash flows, to incorporate them into his 'selling price'. Hence, Terminal Value (TV) is also referred to as the 'Horizon Value' that the investor forecasts for valuing his investment at the exit point. Mostly TV is estimated using a perpetual growth model as per the Gordon model. We will see the practical usage of TV in the various questions/ illustrations during the study of this Paper.



3. APPROACHES/ METHODS OF VALUATION

As mentioned earlier one of the purposes of the valuation is Mergers and Acquisitions as the carrying out valuation of target company becomes important to gauge out the price to be offered to it. The target company can be listed or unlisted. If the target company is unlisted then the price of acquisition shall be at the negotiated price acceptable by both companies. For listed companies stock market value or market capitalization can form the basis of valuation of target company. Though stock market price is a guide to the acquiring company but it does not give an estimate how much the target company is worth as stock price will also depend on Market Efficiency.

Further in some cases even small portion of total shares is quoted and hence market price represents a marginal portion of overall capital. This calls for further analysis of valuation of target company.

As mentioned earlier the valuation of securities especially valuation of equity shares has been covered in chapter on Security Valuation in this chapter we shall focus on methods of valuation other than discussed in the chapter on Security Valuation.

Broadly there are three approaches to value an enterprise:

- (a) Assets Based Valuation Model
- (b) Earning Based Models
- (c) Cash Flow Based Models

In addition to the above there are some other methods. First let's see above three methods in detail as below:

3.1 Asset Based Approach

Being a straight forward method, the value of shares of target company is computed in terms of net assets acquired. This method of valuation is not based on income generation rather than on income generating assets.

This method is least important in case of IT companies where 'hard' assets make little importance as these companies' assets are intellectual property rights and human resources.

This approach further can be classified into following three methods:

3.1.1 Net Asset Value

The most simplest method also called 'Book Value' Method computes the value of the shares of the company as follows:

Net Fixed Asset = Fixed Assets + Net Current Assets – Long Term Debt

Though this method has the advantage of being simplest as it uses historical costs which are easily available, but it has little relevance as Balance Sheet is not a valuation device. Therefore, this method offers a lower limit to value the shares of target company.

Further this method ignores the current asset valuation even for intangible assets such as Brand, Intellectual Property Rights etc.

3.1.2 Net Realizable Value

Also called Liquidation Value or Adjusted Book Value it can be defined as realizable value of all assets after deduction of liquidation expenses and paying off liabilities. Though in some case liquidation expenses can be ignored if business of target company is acquired as a going concern.

Despite appearing to be a simple method the calculation of net realizable value may not be so simple as being an off-market purchase it is likely that buyer may offer lowest prices.

This method is not so popular as it involves total break up of the target company. This method is generally useful where the acquirer is interested in selling one part of business and integrate remaining part of the business with the existing operations.

In the below example we see that the realizable values are different as compared to the book values:

		Book Values	Net Realizable Values
Long Term Debt			
(Term Loan from ZB Bank)		10,000	10,000
Current Liabilities		10,000	10,000
Total Liabilities (A)		20,000	20,000
Non-Current Assets (B)			
PPE	50,000		40,000
Licenses	10,000	60,000	30,000
			70,000
Current Assets (C)			
Sundry Debtors	50,000		45,000
			10,000
Cash	10,000	60,000	55,000
Net Assets (B) + (C) – (A)		1,00,000	1,05,000

Thus, total net realizable assets of the net book value of ₹ 1,00,000 in the above example would ₹ 105,000 and if there are 5000 equity shares then the value of per share will be ₹ 21.

3.1.3 Replaceable Value

This method involves valuation as per determination of the cost of group of assets and liabilities of equivalent company in the open market. This method has an advantage over Book Value as it takes into consideration proper valuation and generally it is slightly higher than Net Realizable Value as quick asset disposal is not encouraged. And due to this reason many author believes that it is the maximum price that an acquirer would pay for the equivalent business. However, this approach also suffers from limitation that hard assets are taken into consideration still loyalty of the staff cannot be taken into consideration.

Conclusions: The asset-based approach can depict the enterprise's net worth fairly correctly using the fundamental principle of 'going concern'. However, it suffers from a major drawback – It fails to consider the ability of the enterprise to generate future revenues and how the market dynamics will affect the future operations and cash flow.

3.2 Income based Approach

This approach looks to overcome the drawbacks of using the asset-backed valuation approach by referring to the earning potential. This method is more suitable when acquiring company is intending to continue business of target company for foreseen future without selling or liquidating assets of the same. Accordingly, if any additional earning is there due to acquisition the same should also be considered in valuation. Basically, PE Ratio also called Earning Yield is used in this approach. Though there is another version of the same called Capitalization Rate.

Now let us discuss valuation by these two versions one by one.

3.2.1 PE Ratio or Earning Yield Multiplier

This method is generally used for valuing listed companies whose PE Ratios are available. This approach has one benefit that it takes into account the expected growth rate of the company as well as market expectations.

The price or value of equity share can be calculated using the following equation:

$$\text{Price Per Share} = \text{EPS} \times \text{PE Ratio}$$

Though mainly this method is followed for listed companies but PE Ratio of equivalent companies or the industry can be used to value the shares of the unlisted companies. This method serves as minimum acceptable price to the shareholders of the target company. It involves following steps:

- (i) Choosing PE Ratio of equivalent quoted company.
- (ii) Making adjustment downward for additional risk due to non listing of shares.
- (iii) Determination of future maintainable EPS.
- (iv) Multiply same EPS with adjusted PE Ratio.

3.2.2 Capitalisation of Earning

In this method the value of business is calculated by capitalization of company's expected annual maintainable profit using appropriate required rate of return or yield or discounting rate.

Annual expected maintainable profit can be calculated using weighted average of previous years' profits after adjusting synergy benefits or economy of scales in the same profit.

The capitalization rate depends on many factors. The capitalization rate can be approximated as follows:

$$\text{Required Earning Yield} = \frac{\text{EPS}}{\text{Share Price}}$$

Or

$$\text{Reciprocal of PE Ratio} = \frac{1}{\text{PE Ratio}}$$

Using this method valuation of the company can be computed as follows:

$$\text{Capitalized Earning Value} = \frac{\text{Expected Annual Maintainable Profit}}{\text{Capitalization Rate or Required Earning Yield}}$$

Though the main advantage of using this method is that it is forward looking approach however the disadvantages are estimation of expected future profit and difference in treatment of extra ordinary and exceptional items.

3.3 Cash flow based approach

As opposed to the asset based and income based approaches, the cash flow approach takes into account the quantum of free cash that is available in future periods, and discounting the same appropriately to match to the flow's risk. Variant of this approach in context of equity has been discussed earlier in the chapter of Security Valuation.

Simply speaking, if the present value arrived post application of the discount rate is more than the current cost of investment, the valuation of the enterprise is attractive to both stakeholders as well as externally interested parties (like stock analysts). It attempts to overcome the problem of over-reliance on historical data as seen in both the previous methods. There are essentially five steps in performing DCF based valuation:

- (a) Arriving at the 'Free Cash Flows'
- (b) Forecasting of future cash flows (also called projected future cash flows)
- (c) Determining the discount rate based on the cost of capital
- (d) Finding out the Terminal Value (TV) of the enterprise

- (e) Finding out the present values of both the free cash flows and the TV, and interpretation of the results.

Let's take an example, with assumed figures, to understand how the DCF method works:

Step a:

	INR ('000s)	
Computation of free cash flows	2016-17	Remarks
EAT (Earning After Taxes)	600	
Less: One time incomes	(200)	One time events to be eliminated
Add: One time expenses	100	One time events to be eliminated
Add: Depreciation	100	Depreciation is a book entry
Free Cash Flow	600	

Step b:

Assumptions to arrive at Adjusted Free Cash Flow as below:

Free Cash Flow estimated to grow @ 5% p.a.

Suitable assumptions to be made for changes in WC and investments in FA

	Projected (in INR '000s)		
	2017-18	2018-19	2019-20
Free Cash Flow (5 % increment Y-o-Y)	600.00	630.00	661.50
Less: Changes in Working Capital Cycle	(50.00)	(30.00)	10.00
Less: Investment in Fixed assets	(50.00)	(50.00)	(20.00)
Adjusted Free Cash Flow	500.00	550.00	651.50

Step c:

	Discounted Cash Flows (in INR '000s)		
	2017-18	2018-19	2019-20
WACC (assumed)	8%	8%	8%
PVF	0.926	0.857	0.794
Present Value of Cash flow	463.00	471.35	517.29

Step d:

Terminal Value: The perpetual growth that will be achieved after year 3 onwards is assumed @ 3%

Therefore, TV = (CF at Year 3 * growth rate) / (WACC - growth rate) = (517.29*1.03)/(0.08 - 0.03) = **10656.17**

Step e:

Total DCF of enterprise = 12,107.81 thousands (PV of cash flows arrived in above table plus the TV arrived)

In other words, the value of the enterprise for a potential acquisition is approximately 12108 thousands.

The DCF is indeed a revolutionary model for valuation as FCFs truly represent the intrinsic value of an entity. However, the whole calculation gravitates heavily on the WACC and the TV. In fact in many cases the TV is found to be a significant portion in final value arrived by DCF. This means that the growth rate and underlying assumptions need to be thoroughly validated to deny any room for margin of error of judgment.



4. MEASURING COST OF EQUITY

4.1 Capital Assets Pricing Model (CAPM)

An alternative way to look at value of an investment or a portfolio is to view returns as a direct benefit of assuming risks. As discussed earlier the CAPM model is represented by the below formula:

$$R = r_f + \beta (r_m - r_f)$$

Where R = expected rate of return

r_f = risk free rate of return

β = Beta value of the stock

R_m = market rate of return

4.2 Arbitrage Pricing Model

It is obvious that the CAPM has gained massive popularity due to its 'intuitive based approach' of classifying risks into 2 buckets – 'a risk free part' and 'the risk part that is relative to the market index'. However, this is also its greatest inherent weakness - the oversimplification of risks.

In the 1970's Mr. Stephen Alan Ross, professor and economist, introduced the concept of 'multiple factors' that can influence the risk component – motley of 'macro-economic factors'. So, the basic idea is to breakdown risks into individual identifiable elements that influence the overall risk in a proportion (called 'factor'), and each factor gets assigned its own beta; and the sum total of all the assets' 'sensitivities' to 'n' factors will give the 'expected rate of return for the asset'.

In a simplistic way, if a particular asset, say a stock, has its major influencers as the 'interest rate fluctuations' and the 'sectoral growth rate', then the stocks' return would be calculated by using the Arbitrage Pricing Theory (APT) in the following manner:

- (a) Calculate the risk premium for both these two risk factors (beta for the risk factor 1 – interest rate, and beta of the risk factor 2 – sector growth rate; and,

(b) Adding the risk free rate of return.

Thus, the formula for APT is represented as –

$$R_f + \beta_1(RP_1) + \beta_2(RP_2) + \dots + \beta_n(RP_n)$$

It is thereby clear that APT strives to model $E(R)$ as 'a linear function of various macro-economic factors' where sensitivity to changes in each factor is represented by a factor-specific beta coefficient. Note that the APT by itself doesn't provide for the macro-economic factors that will be needed to be tested for its sensitivity – however these have to be judicially developed by the financial analysts keeping in mind the economy they are put in.

4.3 Estimating Beta and Valuation of Unlisted Companies

You would have by this time realized the fact that 'information' holds the key to a successful valuation of an enterprise. The above valuation approaches we have seen viz. asset based, earnings based and cash flow based, can be applied freely for publicly traded companies where key information as regards to earnings, assets employed, and board's opinion on future potential and growth areas are readily available. Already, audited financial statements are widely used by financial analysts for various funds and brokerage houses to prepare their 'review scorecards' that will help the investor to decide whether to hold or sell the scripts on the trade bourses.

However, in a developing economy like India, where there are many privately held firms into e-retail, service management, hospitality, and such other sunrise sectors that are holding out a lot of promise and are increasingly getting attention as 'dark horse' by venture capitalists, angel investors etc.; the moot question is how to value these entities in the absence of publicly available information? There are many a time that the directors of these companies do approach CAs for getting a 'valuation' done. The qualified accountant in private companies will also be involved in the valuation process. What needs to be appreciated is that valuation is indeed an onerous task, but if meticulously approached, can yield many advantages.

The biggest challenge in calculation of the 'value' of a privately held enterprise is arriving at the Cost of Capital which in turn depends on Beta for the private firm. We have to keep in mind that most of the publicly listed companies have leveraged capital, whereas the privately owned firms may not have either zero or insignificant amounts of debt. However, the strategic investor looking for stake would always like to grow it further on leveraged funds going forward. In fact, this is precisely the way forward – to raise funds through corporate bonds and debt instruments but as on the valuation date, the fact remains that the beta will have to reflect the 'unleveraged' position, and hence, we would use the 'unlevered beta', as opposed to levered beta.

Further this problem can also be faced in case of even an existing listed company which decides to invest in brand new line of business for it. In such a situation company should not use its WACC to evaluate this project. Instead of that it should assess the WACC for the appropriate risk level. For this the company needs Asset Beta or Ungearred Beta, which needs to be adjusted according to own

gearing level. The Asset Beta represents only systematic risk of the underlying project or asset of the company and it does not represent any financial risk.

In other words it can be said that Asset Beta represents only company's business risk. Applying similar logic of calculation of WACC, the Asset Beta of the company can be calculated using following equation.

$$\beta_a = \beta_e \left[\frac{E}{E + D(1-t)} \right] + \beta_d \left[\frac{D(1-t)}{E + D(1-t)} \right]$$

β_a = Ungearred or Asset Beta

β_e = Geared or Equity Beta

β_d = Debt Beta

E = Equity

D = Debt

t = Tax Rate

From the above equation it can be seen that company's Equity Beta shall always be greater than Asset Beta. In case company is debt free then Equity Beta shall be equal to Asset Beta.

Generally it is assumed that the Debt Beta tends to be Zero as Bonds' Returns are not linked to the volatility of market portfolio. In such situation the above mentioned equation shall become:

$$\beta_a = \beta_e \left[\frac{E}{E + D(1-t)} \right]$$

Thus, if we have been provided with figures of β_e of a company we can calculate β_a , which shall be common for the industry or Pure Play firm.

Now let us see what steps are exactly involved in computation of Equity Beta for a new business or project for the company.

Step 1: Identify the Pure Play firms or companies (engaged entirely in same business and also called proxy companies) and their Equity Betas to surrogate the Equity Beta of new Project or business.

Step 2: Once Beta of proxy companies have been identified we de-gear it and compute the Asset Beta as the different companies may have different gearing levels.

Step 3: In case if there is only one proxy company then Asset Beta of the same company shall be continued for further analysis. In case there are more than one proxy companies then we shall take average of Asset Betas of these companies. Otherwise we can also opt for the Asset Beta of the company that appears to be most appropriate.

Step 4: In next step we must re-gear the Asset Beta as per capital structure of the appraising company to reflect the financial risk using the following formula (changing the positions of Asset Beta mentioned earlier)

$$\beta_e = \beta_a \left[\frac{E + D(1-t)}{E} \right]$$

Step 5: In this step we can insert computed β_e in CAPM and can compute required rate of return for project under consideration or value of the business.

Illustration 1

There is a privately held company X Pvt. Ltd that is operating into the retail space, and is now scouting for angel investors. The details pertinent to valuing X Pvt. Ltd are as follows –

The company has achieved break even this year and has an EBITDA of 90. The unleveraged beta based on the industry in which it operates is 1.8, and the average debt to equity ratio is hovering at 40:60. The rate of return provided by risk free liquid bonds is 5%. The EV is to be taken at a multiple of 5 on EBITDA. The accountant has informed that the EBITDA of 90 includes an extraordinary gain of 10 for the year, and a potential write off of preliminary sales promotion costs of 20 are still pending. The internal assessment of rate of market return for the industry is 11%. The FCFs for the next 3 years are as follows:

	Y1	Y2	Y3
Future Cash flows	100	120	150

The pre-tax cost of debt is 12%. Assume a tax regime of 30%.

What is the potential value to be placed on X Pvt. Ltd?

Solution

The levered beta of the company will be $1.8[1+(1-0.3)*40/60] = 2.64$

The adjusted EBITDA would be $90 - 10 - 20 = 60$

The EV will be multiple of 5 on the 60 obtained above = 300

The Cost of equity in accordance with CAPM = $r(f) + \beta(R_m - R_f)$

= $5\% + 2.64(11\% - 5\%) = 20.84\%$

The WACC = Cost of Equity + Cost of Debt

= $20.84(60/100) + 12.0(1-0.3)(40/100) = 15.864$

Finally, the future cash flows can be discounted at the WACC obtained above as under –

	Y1	Y2	Y3
Future Cash flows	100	120	150
Discount factor	0.863	0.745	0.643
PVs of cash flows	86.30	89.40	96.45
VALUE OF THE FIRM			272.15

5. RELATIVE VALUATION

The three approaches that we saw to arriving at the value of an enterprise viz. the asset based, the earnings based and the cash flow based are for arriving at the 'intrinsic value' of the same. Relative Valuation is the method to arrive at a 'relative' value using a 'comparative' analysis to its peers or similar enterprises. However, increasingly the contemporary financial analysts are using relative valuation in conjunction to the afore-stated approaches to validate the intrinsic value arrived earlier.

The Concept of 'Relative Valuation': One way to look at the practical implementation of fair value within the valuation context would be to identify assets that are similar to the ones held by the acquiree company so that the values can be compared. This would be a significant departure from the 'intrinsic value' approach that we have seen until now. Trying to get a value that would be the nearest to the market price would mean that the valuation of a particular portfolio, or a divestiture in an entity, would happen at an agreeable price that fits into the normal distribution.

In one sense, we are indeed using the relative valuation in a limited approach when we speak about expected market returns, or when we are adopting an index based comparative. The more the asset pricing gets correlated to the similar assets in the market, the more inclusive it gets. Thus, when we are comparing bonds, the closer the YTM of the bond to the government index of return, the more credible it gets when it comes to pricing.

The Relative valuation, also referred to as 'Valuation by multiples,' uses financial ratios to derive at the desired metric (referred to as the 'multiple') and then compares the same to that of comparable firms. Comparable firms would mean the ones having similar asset and risk dispositions and assumed to continue to do so over the comparison period. In the process, there may be extrapolations set to the desired range to achieve the target set. To elaborate –

1. Find out the 'drivers' that will be the best representative for deriving at the multiple
2. Determine the results based on the chosen driver(s) through financial ratios
3. Find out the comparable firms, and perform the comparative analysis, and,
4. Iterate the value of the firm obtained to smoothen out the deviations

Step 1: Finding the correct driver that goes to determine the multiple is significant for relative valuation as it sets the direction to the valuation approach. Thereby, one can have two sets of multiple based approaches depending on the types of the drivers –

- (a) Enterprise value based multiples, which would consist primarily of EV/EBITDA, EV/Invested Capital and EV/Sales.
- (b) Equity value based multiples, which would comprise of P/E ratio and Price Earning Growth (PEG) Ratio.

We have already seen the concept and application of Enterprise Value in previous section. However, in light of relative valuation, we can definitely add that whereas EV/EBITDA is a popular ratio and does provide critical inputs, the EV/Invested Capital will be more appropriate to capital intensive enterprises, and EV/Sales will be used by companies who are cash rich, have a huge order book, and forecast organic growth through own capital.

The P/E has a celebrated status amongst Equity based multiples, and the PEG (PE Ratio/ Growth Rate i.e. the ratio of the PE to the expected growth rate of the firm) is more suitable where we are doing relative valuation of either high growth or sunrise industries.

Step 2: Choosing the right financial ratio is a vital part of success of this model. A factor based approach may help in getting this correct – for example – a firm that generates revenue mostly by exports will be highly influenced by future foreign exchange fluctuations. A pure P/E based ratio may not be reflective of this reality, which couldn't pre-empt the impacts that Brexit triggered on currency values. Likewise, an EV/Invested Capital would be a misfit for a company which may be light on core assets, or if has significant investment properties.

Step 3: Arriving at the right mix of comparable firms. This is perhaps the most challenging of all the steps – No two entities can be same – even if they may seem to be operating within the same risk and opportunity perimeter. So, a software company 'X' that we are now comparing to a similar sized company 'Y' may have a similar capital structure, a similar operative environment, and head count size – so far the two firms are on even platform for returns forecast and beta values. On careful scrutiny, it may be realized that the revenue generators are different – X may be deriving its revenues from dedicated service contracts having Full Time Equivalent (FTE) pricing, whereas Y earns through Unit Transfer Pricing (UTP) model. This additional set of information dramatically changes the risk structure – and this is precisely what the discerning investor has to watch for. In other words, take benchmarks with a pinch of salt.

Take another example – a firm is operating in a niche market, and that obviously leads to getting comparable firms become a difficult task. In such cases, one may have to look beyond the current operating market and identify similar structured companies from other industries.

The comparable firm can either be from a peer group operating within the same risks and opportunities perimeter, or alternatively can be just take closely relevant firms and then perform a regression to arrive at the comparable metrics. You would notice that in our example, the analyst is

adopting the later approach. Whereas the company 'X' will have to ignore 'Y' and search for a similar revenue-risk based company. However, as a last resort, it may adopt a regression based model as above.

Step 4: Iterate / extrapolate the results obtained to arrive at the correct estimate of the value of the firm.

Thus, we can conclude that 'Relative Valuation' is a comparative driven approach that assumes that the value of similar firms can form a good indicator for the value of the tested firm. There are some assumptions that are inherent to this model –

- i. The market is efficient
- ii. The function between the fundamentals and the multiples are linear
- iii. The firms that are comparable are similar in structure, risk and growth pattern

Further, we can approach Enterprise Value (EV) in two ways –

(a) Take Entity Value as the base, and then adjust for debt values for arriving the 'EV';

or

(b) Take a balance sheet based approach and arrive at EV.

Let's apply the above concepts into a relative valuation illustration:

Illustration 2

A Ltd. made a Gross Profit of ₹ 10,00,000 and incurred Indirect Expenses of ₹ 4,00,000. The number of issued Equity Shares is 1,00,000. The company has a Debt of ₹ 3,00,000 and Surplus Funds to the tune of ₹ 5,00,000. The market related details are as follows:

Risk Free Rate of Return	4.5%
Market Rate of Return	12%
β of the Company	0.9

Determine:

- (a) Per Share Earning Value of the Company.
- (b) Equity Value of the company if applicable EBITDA multiple is 5.

Solution

(a) Capitalization Rate using CAPM

$$4.5\% + 0.9(12\% - 4.5\%) = 11.25\%$$

Calculation of Earning Value Per Share

	(₹ 000)
Gross Profit	1000
Less: Indirect Expenses	(400)
EBITDA	600
Earning Value of Company (600/ 0.1125)	5333.33
Number of Shares	1,00,000
Earning Value Per Share	₹ 53.33

(b) Equity Value of Company

	(₹ 000)
EBITDA	600
EBITDA Multiple	5
Capitalized Value	3000
Less: Debt	(300)
Add: Surplus Funds	500
Equity Value	3200

Now let us see how EV can be arrived at using Balance Sheet approach in the following illustration.

Illustration 3

The balance sheet of H K Ltd. is as follows:

	₹ 000
Non-Current Assets	1000
<u>Current Assets</u>	
Trade Receivables	500
Cash and cash equivalents	500
	2000
Shareholders' funds	800
Long Term Debt	200
Current Liabilities and Provisions	1000
	2000

The shares are actively traded and the Current Market Price (CMP) is ₹ 12 per share. Shareholder funds represent 70,000 shares of ₹ 10 each and rest is retained earnings. Calculate the Enterprise Value of HK Ltd.

Solution

Shares outstanding	70,000
CMP	₹ 12
Market Capitalization	₹ 8,40,000
Add: Debt	₹ 2,00,000
Less: Cash & Cash equivalents	(₹ 5,00,000)
Enterprise Value (EV)	₹ 5,40,000

**6. OTHER APPROACHES TO VALUE MEASUREMENT****6.1 Contemporary Approaches to Valuation**

With businesses become exceedingly technology driven and managements now trying to position themselves as 'value creators' thereby venturing into a 'conglomerate' way of thinking and running business, the concept of value and valuation has also undergone a paradigm shift. The tag of 'MNC' and inorganic growth has given rise to complex structures and tiers of management styles and business houses. Of course, the more discerning of the lot would still stick to the original game-plan as has been ruminated by us in the sections of this guide till now – separate the seed from the chaff - by using the time honored 'asset' based, or 'income' based approaches or by adopting a more mature 'cash flow' based one; and even a meticulous combination of all the three; but it's not common to find the bull market referring to, and analysts liberally using terminologies like the 'PEs' and 'Exit Multiples', and to 'LBOs' and 'Brand Value'.

It is worth noting here that some of these concepts used in valuation have been borne out of the peculiarities of certain industries. An internet company would have virtually zero fixed assets – but a robust online presence and a huge brand recall value. This would give rise to a new method of valuation – Price Per Page visited. Or an online play store can be valued now using 'Price Per Subscriber'. However, like previously referred, the more discerning would still like to ask for the cash to sales ratio, apply a DCF model before they put the money in the pot.

Another contemporary way to value a company is to have 'Goodwill' based approach – a retail giant looking to desperately acquire a traditional mom-pop store in a particular hotspot that is giving a run for its money could rightfully adopt this method – firstly take an asset based valuation, and then value for the goodwill separately by linking a multiple to its annual sales or its footfall.

Price Earning Ratio (PER) - It equates the EPS (Earnings Per Share) to the price prevailing on the stock market – the logic being that the market prices the stock based on its fundamentals, and as a corollary you don't have to look beyond the same to value the stock! So, assume the EPS of a company is ₹ 40, and the average share price over the last quarter is ₹ 50, the PER would be 50/40 which works to 1.25. But we need to understand the important fact that PER is a relative figure, and

comparison across industries in the same sector can give a more median PER that may be acceptable for valuation purposes.

LBOs (Leveraged Buy Outs) – The increasing complex nature of commerce and its applications have given rise to a new category of ‘strategic investors’ – Private Equity (PE) firms who scout for enterprises in the ‘rough’, acquire the same using a clever mix of debt and equity (typically at 70:30 debt to equity), and then targeting to sell the same within a medium term period, say 3 to 5 years. In the process, they leverage on the debt and create value (both perceived and real), and then they either spin off the management control to another entity for a price, or go for an outright sale.

Example

X is a small software company that is providing a niche data control and testing service having 60 employees and some steady contracts, which generates an EBIDTA of ₹ 100 Lacs per year. A Venture Capitalist (VC) convinces the managing director of the company to sell off the majority stake to him – valued at a premium of 100% per share over the Book Value plus one time goodwill payoff of ₹ 50 Lacs, using an Income Based Valuation approach. Thus, the total consideration comes out ₹ 250 Lacs.

Next, the VC ropes a banker to pump in ₹ 200 Lacs for the acquisition-cum-expansion as well as to do brand marketing, thereby making the company a visible player in the market. The gap of ₹ 50 Lacs is his contribution as promoter equity towards securities premium. Since the core operations team is not dismantled, the company easily achieves an approximate 20% average growth in each of the next 3 years.

At the end of the third year, the VC puts the company on the ‘Sale Block’ and is able to garner interest of a leading MNC in the same. Assume if the exit multiple that the VC looks is at 7 times the EBDAT. The entity value is hypothetically can be worked out as under –

	(in ₹ Lacs)			
	Y ₀	Y ₁	Y ₂	Y ₃
EBIDTA	100.00	120.00	144.00	178.00
Less: Interest [#]	36.00	30.00	24.00	18.00
EBDTA	64.00	90.00	120.00	160.00
Less: Taxes @ 30%	19.20	27.00	36.00	48.00
EBDAT	44.80	63.00	84.00	112.00
Multiple				7
Capitalized Value at end of Y₃				784
Less: Debt				(100)
Equity Value				684
<small># Debt principal assumed to be repayable linearly in 6 years.</small>				

One of the prime casualties in a LBO model is that the future cannot be predicted with exactitude. Thus, if at end of third year, the industry is caught in a cyclical slowdown, the VC will find itself saddled with a huge loan and burgeoning interest costs difficult to recycle.

6.2 Chop-Shop Method

This approach attempts to identify multi-industry companies that are undervalued and would have more value if separated from each other. In other words as per this approach an attempt is made to buy assets below their replacement value. This approach involves following three steps:

Step 1: Identify the firm's various business segments and calculate the average capitalization ratios for firms in those industries.

Step 2: Calculate a "theoretical" market value based upon each of the average capitalization ratios.

Step 3: Average the "theoretical" market values to determine the "chop-shop" value of the firm.

Illustration 4

Using the chop-shop approach (or Break-up value approach), assign a value for Cornett GMBH. whose stock is currently trading at a total market price of €4 million. For Cornett, the accounting data set forth in three business segments: consumer wholesaling, specialty services, and assorted centers. Data for the firm's three segments are as follows:

Business segment	Segment sales	Segment assets	Segment income
Consumer wholesaling	€1,500,000	€ 750,000	€100,000
Specialty services	€800,000	€700,000	€150,000
Assorted centers	€2,000,000	€3,000,000	€600,000

Industry data for "pure-play" firms have been compiled and are summarized as follows:

Business segment	Capitalization/sales	Capitalization/assets	Capitalization/ operating income
Consumer wholesaling	0.75	0.60	10.00
Specialty services	1.10	0.90	7.00
Assorted centers	1.00	0.60	6.00

Solution

Cornett, GMBH. – Break-up valuation

Business Segment	Capital-to-Sales	Segment Sales	Theoretical Values
Consumer wholesaling	0.75	€1,500,000	€1,125,000
Specialty services	1.10	€800,000	€880,000
Assorted centers	1.00	€2,000,000	<u>€2,000,000</u>
Total value			<u>€4,005,000</u>

Business Segment	Capital-to-Sales	Segment Sales	Theoretical Values
Consumer wholesaling	0.60	€750,000	€450,000
Specialty services	0.90	€700,000	€630,000
Assorted centers	0.60	€3,000,000	<u>€1,800,000</u>
Total value			<u>€2,880,000</u>

Business Segment	Capital-to-Sales	Segment Sales	Theoretical Values
Consumer wholesaling	10.00	€100,000	€1,000,000
Specialty services	7.00	€150,000	€1,050,000
Assorted centers	6.00	€600,000	<u>€3,600,000</u>
Total value			<u>€5,650,000</u>

$$\text{Average theoretical value} = \frac{4,005,000 + 2,880,000 + 5,650,000}{3} = 4,178,333.33 \text{ say } 4,178,000$$

Average theoretical value of Cornett GMBH. = €4,178,000

6.3 Economic Value Added (EVA)

Economic Value Added (EVA) is a holistic method of evaluating a company's financial performance, which means that EVA is used not only as a mere valuation technique, but also to find the economic contribution of a company to the society at large. The core concept behind EVA is that a company generates 'value' only if there is a creation of wealth in terms of returns in excess of its cost of capital invested. EVA insists on separation of the firm's operation from its financing. So if a company's EVA is negative, it means the company is not generating value from the funds invested into the business. Conversely, a positive EVA shows a company is producing value from the funds invested in it.

Why EVA? Up to now we have seen several financial performance metrics like ROI, ROCE, etc. and also several approaches based on asset base / earnings / FCFs to finding out the 'worth' of the entity. Then what is the need for EVA? Or in other words, what is the gap that EVA is trying to fill in, that others couldn't?

The answer to the above is the way EVA looks at performance of the 'management' of a company. To elaborate, all the approaches seen up to now were just a function of 'number-crunching'. But EVA tries to make management more accountable to their individual decisions and the impact of decisions on the path to progress of the company. Take a simple example – if there are two dissimilar but equal risk opportunities that are feasible and the management needs to take a decision, it would most probably go by the project which would break-even earlier. In choosing so it is also cutting down the risk of future losses, fair enough. However, had the management invested in both the projects, still it would have generated a positive IRR, though the second one would have had a larger pay-back period. This impact of management's strategic decision making comes out evidently in

EVA computations, whereas under the techniques seen till now, this performance-driven aspect would have never been highlighted. The efficiency of the management gets highlighted in EVA, by evaluating whether returns are generated to cover the cost of capital.

EVA is a performance measure for management of the company, and this is as evident in its calculation formula as 'the excess of returns over the weighted average cost of invested capital'. The formula is as below –

$$\text{EVA} = \text{NOPAT} - (\text{Invested Capital} * \text{WACC})$$

OR

NOPAT – Capital Charge

The concept NOPAT (Net Operating Profit After Tax) is nothing but EBIT minus tax expense. The logic is that we are trying to find out the cash returns that business operations would make after tax payments. Note that we have left depreciation untouched here – it being an operational expense for the limited purposes of EVA. From this NOPAT we need to further identify the non-cash expenses and adjust for the same to arrive at the 'actual' cash earnings. One common non-cash adjustment would 'provision for bad and doubtful debts', as this would just be a book entry.

After arriving at the correct NOPAT, the next step would be finding the capital charge. This would involve finding out.

- (a) Invested Capital – Which would be easy from published financials, as it would be the difference between total assets subtracted by the non-interest bearing current liabilities, like sundry creditors, billing in advance, etc. Care should be taken to do the adjustments for non-cash elements like provision for bad and doubtful debts. Also, it means equity plus long-term debt and generally at the start of the year. Further some changes or adjustment are needed to be made on account of Non-Cash Expenses both in Invested Capital and NOPAT.
- (b) Applying the company's WACC on the invested capital arrived in step (a)

Finally, the EVA is computed by reducing the capital charge as calculated by applying the WACC on the invested capital from the adjusted NOPAT.

Illustration 5

Compute EVA of A Ltd. with the following information:

All Figure are in ₹ Lac

Profit and Loss Statement		Balance Sheet	
Revenue	1000	PPE	1000
Direct Costs	-390	Current Assets	300
Selling, General & Admin. Exp. (SGA)	-200		1300

EBIT	410	Equity	700
Interest	-10	Reserves	100
EBT	400	Non-Current Borrowings	100
Tax Expense	-120	Current Liabilities & Provisions	400
EAT	280		1300

Assume Bad Debts provision of ₹ 20 Lac is included in the SGA, and same amount is reduced from the trade receivables in current assets.

Also assume that the pre-tax Cost of Debt is 12%, Tax Rate is 30% and Cost of Equity (i.e. shareholder's expected return) is 8.45%.

Solution

Step I: Computation of NOPAT

<u>NOPAT</u>	
EBIT	410
Less: Taxes	-123
Add: Non-Cash Expenses	20
NOPAT	307

Step II: Finding out the Invested Capital:

<u>Invested Capital</u>	
Total Assets	1300
Less: Non Interest bearing liabilities	-400
	900
Add: Non Cash adjustment	20
	920

Note: It is assumed that the current liabilities also include the 100 of tax liability.

Step III: Compute the WACC

WACC = Cost of equity + Cost of debt

In this case, WACC = $(800/900 \times 8.45\%) + [100/900 \times 12\% (1 - 0.30)] = 8.44\%$

Step IV: Find out the Capital Charge

Capital Charge = Invested Capital * WACC = $920 \times 8.44\% = 77.65$

Step V: EVA = Adjusted NOPAT – Capital Charge = $307 - 77.65 = 229.35$

6.4 Market Value Added (MVA)

The 'MVA' (Market Value Added) simply means the Current Market Value of the firm minus the Invested Capital that we obtained above. Let the current MV of the firm be 1000. Hence MVA will be–

$$1000 - 920 = 80.$$

MVA is an attempt to resolve some of the issues involved in EVA e.g., ignoring Value Drivers, Book Value etc. Though MVA itself does not give any basis of share valuation but an alternative way to gauge performance efficiencies of an enterprise, albeit from a market capitalization point of view, the logic being that the market will discount the efforts taken by the management fairly. Hence, the MVA of 80 arrived in example above is the true value added that is perceived by the market. In contrast, EVA is a derived value added that is for the more discerning investor.

Since MVA represents market views regarding company's future value generation companies with a higher MVA will naturally become the darlings of the share market and would eventually become 'pricey' from a pure pricing perspective. In such cases, the EVA may also sometimes have a slightly negative correlation as compared to MVA. But this will be a short term phenomenon as eventually the gap will get closed by investors themselves. A stock going ex-dividend will exhibit such propensities.

We can conclude that the main objective of EVA is thus to show management efficiency in generating returns over and above the hurdle rate of invested capital.

6.5 Shareholder Value Analysis (SVA)

Now that we have seen 'EVA' and 'MVA', let's proceed to see the concept of 'SVA' but questions first – why SVA? And how does SVA behave?

We understand that the EVA is the residual that remains if the 'capital charge' is subtracted from the NOPAT. The 'residual' if positive simply states that the profits earned are adequate to cover the cost of capital.

However, is NOPAT the only factor that affects shareholder's wealth? The answer is not a strict 'no', but definitely it is 'inadequate', as it doesn't take future earnings and cash flows into account. In other words, NOPAT is a historical figure, albeit a good one though, but cannot fully represent for the future potencies of the entity. More importantly, it doesn't capture the future investment opportunities (or the opportunity costs, whichever way you look). SVA looks to plug in this gap by tweaking the value analysis to take into its foray certain 'drivers' that can expand the horizon of value creation. The key drivers considered are of 'earnings potential in terms of sales, investment opportunities, and cost of incremental capital.

The following are the steps involved in SVA computation:

- (a) Arrive at the Future Cash Flows (FCFs) by using a judicious mix of the 'value drivers' as discussed earlier

- (b) Discount these FCFs using the WACC
- (c) Add the terminal value to the present values computed in step (b)
- (d) Current market value of non-core assets and marketable investment.
- (e) Reduce the value of debt from the result in step (d) to arrive at value of equity.

Let's take a progressive case study to run through the SVA calculations:

Step a.1: Using the appropriate value drivers, arrive at the operating cash flows:

	(in \$ Millions)			
	Y1	Y2	Y3	Y4 onwards
EBIT (growing at 5% yearly)	100.00	105.00	110.25	115.76
Interest Cost	<u>5.00</u>	<u>6.00</u>	<u>7.00</u>	<u>8.00</u>
EBT	95.00	99.00	103.25	107.76
Taxes @ 33%	<u>31.35</u>	<u>32.67</u>	<u>34.07</u>	<u>35.56</u>
EAT	63.65	66.33	69.18	72.20
Add back : Depreciation	5.00	5.00	6.00	7.00
Add back : One time write offs	<u>1.00</u>	<u>-</u>	<u>-</u>	<u>-</u>
Operating Cash Flow	69.65	71.33	75.18	79.20

Step a(2):

Operating Cash Flow	69.65	71.33	75.18	79.20
Less: Forecasted Incremental Capital Invest.	--	12.00	6.00	9.00
Less: Forecasted Inc. in Net Working Capital	<u>5.00</u>	<u>5.00</u>	<u>6.00</u>	<u>7.00</u>
Free Cash Flow (FCFs)	64.65	54.33	63.18	63.20

Step b: Applying the WACC to find out the discounted values:

Free Cash Flow (FCFs)	64.65	54.33	63.18	63.20
WACC (discount rate) @ 12%	0.89	0.80	0.71	0.64
Present Value of FCFs	57.54	43.46	44.86	40.45

Step c: Finding out the proper TV:

Present Value of FCFs	57.54	43.46	44.86	40.45
Multiplier for TV (1 ÷ 0.12)				8.33
Present Value of FCFs	57.54	43.46	44.86	336.95

Step d & e:

Total PVs	482.81
Add: Investment Property (at FV)	35.00
Less: Carrying cost of Debt	<u>(19.00)</u>
Value of Equity	<u>498.81</u>

Thus, we observe that SVA brings out a futuristic sense of value for shareholders. In fact, this can be a good benchmark for shareholders from a cash return on investment perspective too.



7. ARRIVING AT FAIR VALUE

The ultimate purpose of a potential acquirer of the controlling stake and / or the takeover of a company is that 'he would purchase the same at the fair price – no less no more'.

In fact, the approaches to valuation seen in this chapter along with the different methods of performing a value added analysis is to identify entities that are 'attractive' in terms of the true value to a potential investor.

A Chartered Accountant's perspective to 'fair value' would automatically envisage a transaction to be measured at the arm's length. For a financial analyst, the term would be akin to the present value of an entity in cash terms, and for a speculative investor, the term would represent the arbitrage opportunities that open up among similar entities having dissimilar value numbers put to it.

However, it's an undeniable fact that in an upward boom time, the valuations defy fair value, for example, the dot com boom had companies getting valued for astronomical sums. And when the downturn arrived, some of these companies vanished and others were just able to stand up their ground.

In this chapter we have discussed various methods of valuation. Though they have their own pros and cons but it depends on the vision of the ultimate decision maker which method is suitable for his/ her purpose. Further it can be said that there is no single answer to method of valuation as correct one and it will be better if a range of values i.e. minimum acceptable by seller and maximum payable by the buyer could be determined. Ultimately the final deal would depend on the negotiation among the parties.

Accordingly, following approaches can be adopted to solve the question especially involving evaluation and synthesis skill assessment requirements.

- (i) Unless specified otherwise calculate valuation by as many as possible with available data.
- (ii) Give comments on the valuation by each of these methods.
- (iii) Supplement your conclusion with any additional information if available.



8. GOING CONCERN AND NON-GOING CONCERN VALUATION

One of the basic accounting assumptions is that an enterprise is a going concern and will continue in operation for the foreseeable future. Hence, it is assumed that the enterprise has neither the intention nor the need to liquidate or curtail materially the scale of its operations; if such an intention or need exists, the financial statements may have to be prepared on a different basis and, if so, the basis used needs to be disclosed.

The valuation of assets of a business entity is dependent on this assumption. Traditionally, historical costing is followed in majority of the cases.

Non-Going Concern Valuation is also known as Liquidation Valuation because it is the net value realised after disposing off all the assets and discharging all the liabilities. Since an on-going firm could continue to earn the profit, which contributes to its value in addition to its liquidation value the Going Concern Value is known as Total Value.

Generally, the going-concern value of a firm will be greater than its liquidation value because when it is acquired as on basis the value of its assets and considers the value of its future profitability, intangible assets, and goodwill and hence the acquired firm can charge premium for the same.

Another reason for lower valuation on non-going concern is that liquidation not only implies the laying off its employees and, but it creates a feeling of bad reputation among potential investors.

Thus, valuation based on non-going concern should be applied only when investors are of view that the firm has no longer value as a going concern.



9. VALUATION OF DISTRESSED COMPANIES

Some firms are clearly exposed to possible distress, though the source of the distress may vary across firms. For some firms, it is too much debt that creates the potential for failure to make debt payments and its consequences (bankruptcy, liquidation, and reorganization) whereas for other firms, distress may arise from the inability to meet operating expenses.

A company is said to be in distress when the company is unable to meet, or has difficulty paying off, its financial obligations to its creditors, typically due to high fixed costs, illiquid assets, or revenues being sensitive to economic downturns. Such distress can lead to operational distress as increasing costs of borrowings take a toll on the operations of the company as well.

Distressed companies are businesses that are likely to, or already have defaulted on their debts. Although a company may not be making payments on some, or all of its debt obligations, however there still may be some value remaining on the instruments they hold. Just because a company cannot make payments on its debt does not mean the company is entirely worthless.

Conventional methods are not usefully deployed when valuing companies in distress as:

- ❖ Discounted cashflow valuation method required terminal value calculation which is based upon an infinite life and ever-growing cashflows. However, the assumption of perpetuity of cash flows may not be relevant in case of distressed firm because of negative cash flows.
- ❖ A distressed firm generally has negative and declining revenues hence expects to lose money for some more time in the future. For such firms, estimating cash flows is difficult, since there is a high risk of bankruptcy. For firms expected to fail, DCF does not work very well, since DCF values a firm as a going concern – even if the firm is expected to survive, projections have to be made until the cash flows turn positive, else the DCF would yield a negative value for equity or firm.
- ❖ Discount rates used in conventional methods reflect companies which are operationally as well as financially sound. They have to be adjusted for the probabilities of failures of the companies to be used in case of distressed companies.

Methods of valuation of distressed companies

The above-mentioned reasons warrant adjustments or amendments and modifications to be made to the conventional methods to eliminate any issues that may arise in the valuation of a distressed company.

9.1 Modified Discounted Cash Flow Valuation

This method requires coming up with probability distributions for the cashflows (across all possible outcomes) to estimate the expected cashflow in each period. While computing this cash flow the likelihood of default should be adjusted for. In conjunction with these cashflow estimates, discount rates are also estimated:

- ❖ Using updated debt to equity ratios and unlevered beta to estimate the cost of equity.
- ❖ Using updated measures of the default risk of the firm to estimate the cost of debt.

However, in case of inability to estimate the entire distribution, probability of distress shall be estimated for each period and used as the expected cashflow:

$$\text{Expected cash flow}_t = \text{Cash flow}_t * (1 - \text{Probability of distress}_t)$$

9.2 DCF Valuation + Distress Value

A DCF valuation values a business as a going concern. However, DCF valuations will understate the value of the firm if there is a possibility that the firm will fail before it reaches stable growth, and the assets will be sold for a value less than the present value of the expected cashflows (a distress sale value).

Thus, the value of Distressed firm can be computing by following under-mentioned steps:

- (i) Value the business as a going concern by looking at the expected cashflows it will have if it follows the path back to financial health.
- (ii) Determine the probability of distress over the lifetime of the DCF analysis.
- (iii) Estimate the distress sale value as a percentage of book value or as a percentage of DCF value of equity estimated as a going concern.

Accordingly following formula can be used to calculate the value of equity of a distressed firm.

Value of Equity = DCF value of equity (1 - Probability of distress) + Distress sale value of equity (Probability of distress)

9.3 Adjusted Present Value Model

This approach is based on the logic of separating investment decision from financing decision. Accordingly, first the value of firm is computed without debt (the unlevered firm) and then effect of debt on firm value is adjusted in the same:

Firm Value = Unlevered Firm Value + (Tax Benefits of Debt - Expected Bankruptcy Cost from the Debt)

While the first part can be computed by discounting the free cashflows to the firm at the unlevered cost of equity the second part reflects the present value of the expected tax benefits from the use of debt. The expected bankruptcy cost can be estimated as the difference between the unlevered firm value and the distress sale value:

Expected Bankruptcy Costs = (Unlevered firm value - Distress Sale Value) * Probability of Distress

9.4 Relative Valuation

Relative Valuation multiples such as Revenue and EBITDA multiples are used more popular measures to value distressed firms than healthy firms because multiples such as Price Earnings or Price to Book Value etc. often cannot even be used for a distressed firm. Analysts who are aware of the possibility of distress often consider them subjectively at the point when they compare the multiple for the firm they are analysing to the industry average. For example, assume that the average telecom firm trades at 2 times revenues. So, adjust this multiple down to 1.25 times revenues for a distressed telecom firm.

10. VALUATION OF START UPS

As discussed, earlier following are three most common globally accepted methods of valuing a business:

(i) Earning/ Cash Flow Approach: In this approach, estimated cash flows for the foreseeable future are discounted to present value and business is valued accordingly.

(ii) Asset approach: This approach is generally used when the business is not a going concern viz. during liquidation, untimely losses etc. The assets and liabilities are valued based on their current realisable value and that is considered as value of the business.

(iii) Market approach: This approach assigns the value of a business based on the value of comparable companies in same/ similar industries, adjusted for their specific parameters.

One common feature in the above approaches is that it pre-supposes a business that is established and generates cash flows using its assets.

On the contrary it is difficult to call Start-ups “established” in any sense or assume that their cash flows (if not already spent on marketing) will remain constant. Profitability seems to be a cursed word in the startup investor circles.

Like the valuation of startups is often required for bringing in investments either by equity or debt. However, the most significant differentiating factor in the valuation of a startup is that there is no historical data available based on which future projections can be drawn.

The value rests entirely on its future growth potential, which, in many cases, is based on an untested idea and may not have been based on an adequate sampling of consumer behaviour or anticipated consumer behaviour. The estimates of future growth are also often based upon assessments of the competence, drive, and self-belief of, at times, very highly qualified and intelligent managers and their capacity to convert a promising idea into commercial success.

The major roadblock with startup valuation is the absence of past performance indicators. There is no ‘past’ track record, only a future whose narrative is controlled based on the founders’ skill. It can be equated as founders walking in the dark and making the investors believe that they are wearing night vision goggles. While this is exciting and fun for the founders, this is risky for the investors.

This is why valuation of startups becomes critical and the role of a professional comes in – it is a way of definitively helping investors navigate the dark using facts, rather than fairy tales.

10.1 Why traditional methods cannot be applied?

Each of the commonly used methods discussed above pre-suppose an established business – which is profitable, has established competitors and generates cash using its assets.

- However, this is missing in new age startups whose value can lie majorly in the concept and potential rather than numbers with a track record.

The failure of each of the traditional methods in case of new age startups is tabulated below:

Method	Why does it fail in case of new age startups
Income approach	A vast majority of startups operate under the assumption of not generating positive cash flows in the foreseeable future. Off late, this business model has been accepted and normalised by the investor community as well. Since there are no or minimal positive cash flows, it isn't easy to value the business correctly.
Asset approach	There are two reasons why this approach does not work for new age startups: <ul style="list-style-type: none"> (i) Startups have negligible assets because a large chunk of their assets are in the form of intellectual property and other intangible assets. Valuing them correctly is a challenge and arriving at a consensus with investors is even more difficult. (ii) Start ups are new, but usually operate under the going concern assumption; hence their value should not be limited to the realisable value of assets today.
Market approach	New-age startups are disruptors. They generally function in a market without established competitors. Their competition is from other startups working in the same genre. The lack of established competitors indicates that their numbers may be skewed and not be comparable enough to form a base. However, out of the three traditional approaches, we have seen a few elements of the market approach being used for valuing new-age startups, especially during advanced funding rounds.

10.2 Value Drivers for startups

While every startup can be vastly different, we now take a look at a few key value drivers and their impact on the valuation of a startup.

Drivers	Impact on valuation
Product	The uniqueness and readiness of the product or service offered by significantly impact the company's valuation. A company that is ready with a fully functional product (or prototype) or service offering will attract higher value than one whose offering is still an 'idea'. Further, market testing and customer responses are key sub-drivers to gauge how good the product is.
Management	More than half of Indian unicorn startups have founders from IIT or IIM. While it may seem unfair prima facie, it is a fact that if the founders are educated from elite schools and colleges, the startup is looked upon more favourably by the investors and stakeholders alike. Accordingly, it is imperative to consider the credentials and balance of the management. For instance, a team with engineers is not as well balanced as a team comprising engineers, finance professionals and MBA graduates. Keeping aside the apparent subjectivity in evaluating the management, the profile of the owners plays a crucial role in valuing the startup.
Traction	Traction is quantifiable evidence that the product or service works and there is a demand for it. The better the traction, the more valuable the startup will be.

Revenue	The more revenue streams, the more valuable the company. While revenues are not mandatory, their existence is a better indicator than merely demonstrating traction and makes the startup more valuable.
Industry attractiveness	The industry's attractiveness plays a vital role in the value of a company. As good as the idea may be, to sustainably scale, various factors like logistics, distribution channels and customer base significantly impacts the startup value. For example, a new-age startup in the tourism industry will be less valuable, as innovative or unique as their offering is if significant lockdowns are expected in the future.
Demand - supply	If the industry is attractive, there will be more demand from investors, making the industry's individual company more valuable.
Competitiveness	The lesser the competitors, the more valuable the startup will be. There is no escaping the first-mover advantage in any industry. While it is easier to convince investors about a business that already exists (for example, it must have been easier for Ola to convince investors when Uber was already running successfully), it also casts an additional burden on the startup to differentiate itself from the competition.

10.3 Methods for valuing startups

One key observation would be that most value drivers described above are highly subjective. Hence, there is a need to provide standard methods using value drivers above in order to value the startup in a manner comparable to others.

There are many innovative methods for valuing startups that try to reduce the subjectivity in the valuation of startups that have come in recent times.

Let us take a look at the most common methods of valuing startups:

10.3.1 Berkus Approach

The Berkus Approach, created by American venture capitalist and angel investor Dave Berkus, looks at valuing a startup enterprise based on a detailed assessment of five key success factors:

- (1) Basic value,
- (2) Technology,
- (3) Execution,
- (4) Strategic relationships in its core market, and
- (5) Production and consequent sales.

A detailed assessment is carried out evaluating how much value the five critical success factors in quantitative measure add up to the total value of the enterprise. Based on these numbers, the startup is valued.

This method caps pre-revenue valuations at \$2 million and post-revenue valuations at \$2.5 million. Although it doesn't consider other market factor, the limited scope is useful for businesses looking for an uncomplicated tool.

10.3.2 Cost-to-Duplicate Approach

The Cost-to-Duplicate Approach involves taking into account all costs and expenses associated with the startup and its product development, including the purchase of its physical assets. All such expenses are considered determine the startup's fair market value based on all the expenses. This approach is often criticized for not focusing on the future revenue projections or the assets of the startup.

10.3.3 Comparable Transactions Method

With the traditional market approach, this approach is lucrative for investors because it is built on precedent. The question being answered is, "How much were similar startups valued at?"

For instance, imagine XYZ Ltd., a logistics startup, was acquired for Rs 560 crores. It had 24 crore, active users. That's roughly Rs 23 per user.

Suppose you are valuing ABC Ltd, another logistics startup with 1.75 crore users. ABC Ltd. has a valuation of about Rs 40 crores under this method.

With any comparison model, one needs to factor in ratios or multipliers for anything that is a differentiating factor. Examples would be proprietary technologies, intangibles, industry penetration, locational advantages, etc. Depending on the same, the multiplier may be adjusted.

10.3.4 Scorecard Valuation Method

The Scorecard Method is another option for pre-revenue businesses. It also works by comparing the startup to others already funded but with added criteria.

First, we find the average pre-money valuation of comparable companies. Then, we consider how the business stacks up according to the following qualities.

- Strength of the team: 0-30%
- Size of the opportunity: 0-25%
- Product or service: 0-15%
- Competitive environment: 0-10%
- Marketing, sales channels, and partnerships: 0-10%
- Need for additional investment: 0-5%
- Others: 0-5%

Then we assign each quality a comparison percentage. Essentially, it can be on par (100%), below average (<100%), or above average (>100%) for each quality compared to competitors/ industry.

For example, the marketing team has a 150% score because it is thoroughly trained and has tested a customer base that has positively responded. You'd multiply 10% by 150% to get a factor of .15.

This exercise is undertaken for each startup quality and the sum of all factors is computed. Finally, that sum is multiplied by the average valuation in the business sector to get a pre-revenue valuation.

10.3.5 First Chicago Method

This method combines a Discounted Cash Flow approach and a market approach to give a fair estimate of startup value. It works out:

- Worst-case scenario
- Normal case scenario
- Best-case scenario

Valuation is done for each of these situations and multiplied with a probability factor to arrive at a weighted average value.

10.3.6 Venture Capital Method

As the name suggests, venture capital firms have made this famous. Such investors seek a return equal to some multiple of their initial investment or will strive to achieve a specific internal rate of return based on the level of risk they perceive in the venture.

The method incorporates this understanding and uses the relevant time frame in discounting a future value attributable to the firm.

The post-money value is calculated by discounting the rate representing an investor's expected or required rate of return.

The investor seeks a return based on some multiple of their initial investment. For example, the investor may seek a return of 10x, 20x, 30x, etc., their original investment at the time of exit.

New-age startups are disruptors in their own right and a necessary tool for global innovation and progress. By their very nature, startups disrupt set processes and industries to add value. In that process, they transcend traditional indicators of success like revenues, profitability, asset size, etc. Accordingly, it is no mean feat to uncover the actual value of a startup.

While the traditional methods fall short, there is no shortage of new innovative methods used to value startups based on their value drivers. However, the valuation of a startup is much more than the application of ways – it is about understanding the story of the future trajectory and communicating that narrative using substantial numbers.

11. VALUATION OF DIGITAL PLATFORMS

A digital platform is a software based online infrastructure that facilitates interactions and transactions between users. Principally platforms are built to facilitate many to many interactions. A few illustrations based on the kind of services provided are as under:

Category	Descriptions
Marketplace	Multiple buyers are matched to multiple suppliers. For example: Booking.com connects guests to hotels, while Uber links travelers to drivers, Amazon connects sellers and buyers through its platform.
Search engine	Multiple people looking for information are matched to multiple sources of information. As a search request triggers the system to actively seek out the desired information, it is also called a search engine. For example: Google, Bing, and Baidu
Repository	Multiple suppliers 'deposit' their materials into a type of library, to be retrieved by users at a later moment. For example: Spotify, YouTube, GitHub
Digital communication	Multiple users to send messages and/or documents to a variety of other people, or interact in real time via voice as well as video. For example: Whatsapp, Microsoft Teams, Telegram, Slack etc are internet-based communication platforms.
Digital community	On a digital community platform, people who want to remain virtually connected for a longer period of time can find each other and interact. For example: Facebook lets one build one's own network of friends, LinkedIn plays a similar role in the business context.
Payments Platform	On a digital payment platform, matching takes place between those owing money and those wanting to be paid. For example: Paytm, GPay, are directed at online consumers and facilities payments across vendors.

The principles of valuation for digital platform are largely like other types of companies with certain nuances which are peculiar to the digital platform industry.

11.1 Income Approach

As mentioned earlier, valuation methods under the Income Approach lay emphasis on projected financial performance which takes into consideration future revenues and costs using company specific revenue and cost drivers and applicable capital expenditure and working capital cycles.

Backward working is required under the **Top-Down Approach**, which starts with analysis of the total potential market for the Platform on a global or domestic level. This is often referred to as Total Addressable Market ('TAM'). The next step is to estimate the share in this target market, the company estimates to gain in the future, and the time to reach such share. These are often referred to as Serviceable Addressable Market ('SAM') and Serviceable Obtainable Market ('SOM'). The company then needs to estimate its business plan to accomplish its objectives and the strategy. This would involve estimating the manner in which the company will gain market share and increase its revenues while optimizing cash or utilizing cash. The financial forecast should take into consideration the types and features of the business model of the platform. A digital repository which allows streaming of content may earn revenue based on its subscribers while a payments solution platform may earn revenues based on the number of transactions done using the same. The direct operating costs for these types of platforms shall also be unique to each type of platform or platform business.

It has often been seen in the digital platforms businesses that in order to create market share companies and popularize the platform among end users, companies have to resort to penetrative strategies by burning cash on books and keeping lower margins. The cash requirement is expected to reduce with time as profit margins become stable and the rate of reinvestment reduces.

The Top-Down Approach can be ambitious for a company at a nascent stage as estimating market size and market share poses its practical challenges. Under the **Bottom-Up Approach** the Platform can estimate its earnings based on the limited resources it has. A young Platform can estimate its revenue and costs given its financial constraints. The promoters of such platform can deploy appropriate strategies to target high margin sales and cost cutting methodologies to generate more cash for the Platform. This is more in line to making efficient capital budgeting decision, which will ultimately help to forecast earnings and cash flows.

Under both the scenarios i.e Top-Down or Bottom-up, the value of a digital platform will depend on the quality of the financial forecasts. In the digital platform the growth and survival of an entity is highly dependent on its promoters, investors and stakeholders creating products or services that fill or meet a need in the market, and their capability to execute their products and services efficiently by adapting to unexpected circumstances.

11.1.1 Discounting Rate

The discounting rate used should be based upon the type of cash flows being discounted. The free cash flow to the Firm ('FCFF') should be discounted using the Weighted Average Cost of Capital ('WACC') and the free cash flow to Equity should be discounted at the Cost of Equity Capital ('Ke').

CAPM can be used to calculate the Cost of Equity which is calculated as under:

$$R = r_f + \beta (r_m - r_f)$$

Where R = expected rate of return

r_f = risk free rate of return

β = Beta value of the stock

r_m = market rate of return

11.1.2 Specific considerations

- (a) Beta measures the sensitivity of a stock or company to the market. Practically, the beta of a company is estimated based on the sensitivity of the share price of the stock, its comparable or the industry with respect to the market. Due to the unique nature of each digital platform and scarcity of listed traded comparable, estimating beta becomes challenging. One might need to draw a comparison between the general diversified sector, the industry driving the revenue or international comparable.
- (b) The survival of such a digital platform is highly dependent upon the quality of management, ability to adapt to change quickly, and foresee opportunity.

Thus, there are certain specific risks of a digital platform that cannot be estimated using CAPM with regard to only the industry or general sector beta. A Company Specific Risk Premium ('CSR P') or Alpha needs to be estimated and added to determine the appropriate cost of equity used to discount the estimated cash flows. The CSR P for nascent companies would be higher than mature digital platforms with adequately large operations having a large customer base.

11.2 Market Approach

The Market Approach values a company by drawing a comparison from similar valued companies based on multiples like profit to earnings ('P/E') ratio, Enterprise Value to Earnings before Interest, Tax, Depreciation and Amortization ('EV/EBITDA') ratio, Price to Book Value ratio, Price to Revenue/Sales Ratio. The selection of comparable to draw such comparison is vital and parameters like the market capitalization, revenue, Profit margins, capital structure etc. are used while making the selection.

However, in case of digital platform, such comparison becomes difficult due to the following reasons:

- The listed comparables are scarce and even absent for many platforms.
- The underlying value specifically Profit and EBITDA may be negative for certain digital platforms.
- Such digital platforms are capital-lite making their Book Value very low.

Due to the above complexity, the application of Market Approach for digital platform, lays emphasis on revenue of a digital platform. Comparison is sought on the manner the platform envisages its primary driver of revenue.

Certain examples of the drivers of revenue that can be used as a basis are as under:

Category of Digital Platform	Drivers of Revenue
Market Place (Matching Supply and Demand)	No of Booking made, No of registered users, volume of Transactions
Payment (Matching Billing and Payments)	No of active subscriber, No of merchants registered on the platform, Compatibility and speed of the operating system, Security, Ease of Use
Community (Network of Contacts)	Number of users, subscription fees, platform for professionals
Communication (Network for Messaging)	Number of users, sponsored links, advertising revenue
Repository (Supply Library)	Number of readers and contributors, authenticity of data, duration of use, quality and variety of data
Search (Machine Queries and Information)	Number of users, relevant search results, time taken per search

Two Search engines can be compared based on their total number of active users and the average time taken to show relevant search results. The one with more relevant search results in shorter time, shall be valued at a premium and can be used as a base for comparison.

For a repository platform that seeks to draw subscription or advertising revenue based on the number of times the content is viewed on its platform and the duration of such visit, comparison can be drawn based upon the number of users, the average number of views per user and the average revenue per user.

Example: A Search engine platform Company valued at 100.00 Cr with a subscriber base of 50 million users and content of 100,00 hours can be used to draw a comparison while valuing a similar platform with fewer users however having same or similar revenue parameters.

11.3 Cost Approach

The Cost Approach estimates the value based on the sum total of the cost to build the same platform or similar platform with the same utility. Since, the asset behind the digital platform is the code written, the numbers of hours spent to write the code by the developers is the primary cost of the platform. However, this approach may not be most appropriate as it fails to take into account the revenue generating capacity of the digital platform which may create significantly higher value for the shareholders of the company versus the cost spent on developing the platform.

The valuation of digital platform can be tricky based on the peculiarities as mentioned above. However, the fundamentals of valuation remain the same. The understanding of the business, the revenue model, the quality of management, and the risk-reward parameters determine the value of the digital platform.

12. VALUATION OF PROFESSIONAL/ CONSULTANCY FIRMS

The professional services firms can be defined as firms that provide customized, knowledge-based services to clients such as Chartered Accountants, Advocates, Management Consultancy firms etc. Even within industry firms vary significantly due to the different nature of services each firm provides.

Like any other business valuation understanding the present and projected industry trends plays a significant role in determining an accurate valuation amount but experts generally look at the firm's historical data to compare them with industry Key Performance Indicators (KPIs) and benchmarks. Further, generally valuation experts compare the company against its competitors. The main source of information are Audited Annual Statements and Income Tax Returns etc.

As mentioned earlier when using the income approach while historical data is important, projected growth (Terminal Value) also impacts the overall value. Although Valuation experts plan for future growth and compare it to the projected trends after conversations with management but there is an inherent risk associated with using future earnings potential, as results may or may not materialize. Hence, this risk should be factored into the overall calculation.

In addition to analysis of financial statements and their comparison to industry standards, normalisation of net income and cash flows is another important aspect. This step allows comparison of firms on equal footing. This step involves adding back of non-cash items and specific items, which might not apply to a new firm. Then these normalized cash flows are applied to the chosen valuation method and used in calculating overall value.

One commonly used method to analyse the extent that a firm meets expectations in comparison to current industry benchmarks and KPIs. Since professional services includes several different types of firms, KPIs can vary greatly and hence it is equally important to look at specific indicators which align with acquirer firm's goals.

To accurately value a professional services firm each piece of information contributes importantly.

13. IMPACT OF ESG ON VALUATION

As per Wikipedia Environmental, Social, Governance (ESG) is a framework designed to be embedded into an organization's strategy that considers the needs and ways in which to generate value for all organizational stakeholders (such as employees, customers and suppliers and financiers).

Illustrative list of contents included in these three factors are as follows:

Environmental	Social	Governance
Climate change	Employee development	Board Independence

Water	Diversity & inclusion	Board diversity
Waste generation	Community development	Anti-Corruption & Bribery
Emissions	Health & Safety	Tax transparency
Biodiversity	Customer	Ethical conduct

ESG is on the radar of several investors today. Focusing on ESG issues can bring out risk and opportunities for the company's ability for sustainable value creation. The key environmental aspects under consideration are climate change and natural resource scarcity. It covers social issues like diversity and inclusivity, labor practices, health & safety, and cyber security. There is greater emphasis on governance aspect covering topics like board diversity and independence, executive pay, and tax transparency.

There has been tremendous momentum in the whole ESG game plan and the summary of key developments are captured as below:

- ❖ *Investment pace in ESG funds:* ESG funds tapped in excess of \$ 50 billion in 2020 and total assets with ESG focus crossed more than \$35 trillion in the same period.
- ❖ *Green bonds have been of significant focus:* The green bonds market in 2020 crossed a major milestone of \$ 1 trillion dollars.
- ❖ *Sustainability taxonomy on the rise:* Key regions have already defined sustainability taxonomy for e.g. European Union (EU). Several other countries / region are in process of introducing taxonomy related to sustainability / ESG.
- ❖ *Up next - Convergence of ESG framework:* IFRS launched an important work to develop single global reporting standard on ESG.
- ❖ *SEBI - SEBI (Securities Exchange Board of India) in February 2023 proposed a regulatory framework on ESG disclosures by listed entities.*

The ESG performance and linked ratings have begun to play an influencing role for companies going to market to raise funds for future growth. The high ESG focus from investors, lenders and financial institution in the recent times has reached the tipping point and have started to impact the financing options for companies. Companies with high ESG focus stand to get benefits in the form of preferential / lower cost of debt or access to specialized financial products like the Green, Social and Sustainability linked Bonds.

Traditional belief was that ESG was 'good to have' in the area of business ethics, sustainability, diversity and community. However with the heightened interests from different stakeholders groups, directors realise that it is now moving into the 'must-to-have' territory. The business case for ESG generally begins with operational efficiency and risk reduction as primary goals and then extends to longer-term operational and organizational resiliency and sustainability. Boards recognize the strong and direct link to build a profitable business with a strong focus on environmental and social considerations. They also

know that focus on ESG issues requires robust governance practices which will fortify their company's portfolio as a strong contender with investors and shareholders.

Now question arises how the risks of ESG factors can be incorporated in the Valuation of any business. As mentioned earlier the most popular technique of valuing any business is discounting of Future Cash Flows. Accordingly, the impact of these risks can be incorporated either in discount rate or expected cash flows.

Generally, management and investors are more interested in adjusting discount rate by inclusion of risk premium in the same. Even though this approach is more practical but the impact of ESG factors may not be that much explicit. Hence adjustment of ESG factors in cash flows would be more explicit.

Now let see how the impact of each factor can be incorporated in computation of expected cash flows:

- (i) E of ESG: The risk of this factor (Environment) can be incorporated by carrying out 2-degree scenario analysis i.e. if temperature of the plant is increased by 2 degrees. Similarly, adjustment in cash flows can be made by considering carbon points.
- (ii) S of ESG: The risk of this factor (Social) can be considered by adjusting the impact of social measures cost on the revenue such as better labour working conditions, CSR, and other welfare measures for the various stakeholders.
- (iii) G of ESG: The risk of this factor (Governance) can be considered by adjusting the impact of poor governance on revenue in the form of penalty, fines, taxes etc.

CASE STUDIES

A couple of real life case studies would help us to understand the Concepts better –

Case Study 1

The application of 'valuation' in the context of the merger of Vodafone with Idea Cellular Ltd:

The valuation methods deployed by the appointed CA firms for the merger were as follows:

- (a) Market Value method: The share price observed on NSE (National Stock Exchange) for a suitable time frame has been considered to arrive at the valuation.
- (b) Comparable companies' market multiple method: The stock market valuations of comparable companies on the BSE and NSE were taken into account.
- (c) NAV method: The asset based approach was undertaken to arrive at the net asset value of the merging entities as of 31st December 2016.

Surprisingly, the DCF method was not used for valuation purposes. The reason stated was that the managements to both Vodafone and Idea had not provided the projected (future) cash flows and other parameters necessary for performing a DCF based valuation.

The final valuation done using methods a to c gave a basis to form a merger based on the 'Share Exchange' method.

Above information extracted from: 'Valuation report' filed by Idea Cellular with NSE

However, let's see how the markets have reacted to this news – the following article published in The Hindu Business Line dated 20th March 2017 will give a fair idea of the same:

"Idea Cellular slumped 9.6 per cent as traders said the implied deal price in a planned merger with Vodafone PLC's Indian operations under-valued the company shares. Although traders had initially reacted positively to the news, doubts about Idea's valuations after the merger sent shares downward.

Idea Cellular Ltd fell as much as 14.57 per cent, reversing earlier gains of 14.25 per cent, after the telecom services provider said it would merge with Vodafone Plc's Indian operations."

Hence, we can conclude that the valuation methods, though technically correct, may not elicit a positive impact amongst stockholders. That is because there is something called as 'perceived value' that's not quantifiable. It depends upon a majority of factors like analyst interpretations, majority opinion etc.

Case Study 2

Valuation model for the acquisition of 'WhatsApp' by Facebook

Facebook announced the takeover of WhatsApp for a staggering 21.8 billion USD in 2015. The key characteristics of WhatsApp that influenced the deal were –

- (a) It is a free text-messaging service and with a \$1 per year service fee, had 450 million users worldwide close to the valuation date.
- (b) 70% of the above users were active users.
- (c) An aggressive rate of user account increase of 1 million users a day would lead to pipeline of 1 billion users just within a year's range.

The gross per-user value would thus, come to an average of USD 55, which included a 4 billion payout as a sweetener for retaining WhatsApp employees post takeover. The payback for Facebook will be eventually to monetize this huge user base with recalibrated charges on international messaging arena. Facebook believes that the future lies in international, cross-platform communications.

Above information extracted from the official website of business news agency 'CNBC'

TEST YOUR KNOWLEDGE

Theoretical Questions

1. Differentiate between EVA and MVA.
2. Relative Valuation is the method to arrive at a 'relative' value using a 'comparative' analysis to its peers or similar enterprises. Elaborate this statement.

Practical Questions

1. ABC Company is considering acquisition of XYZ Ltd. which has 1.5 crores shares outstanding and issued. The market price per share is ₹ 400 at present. ABC's average cost of capital is 12%. Available information from XYZ indicates its expected cash accruals for the next 3 years as follows:

Year	₹ Cr.
1	250
2	300
3	400

Calculate the range of valuation that ABC has to consider. (PV factors at 12% for years 1 to 3 respectively: 0.893, 0.797 and 0.712).

2. Eagle Ltd. reported a profit of ₹ 77 lakhs after 30% tax for the financial year 2011-12. An analysis of the accounts revealed that the income included extraordinary items of ₹ 8 lakhs and an extraordinary loss of ₹10 lakhs. The existing operations, except for the extraordinary items, are expected to continue in the future. In addition, the results of the launch of a new product are expected to be as follows:

	₹ In lakhs
Sales	70
Material costs	20
Labour costs	12
Fixed costs	10

You are required to:

- Calculate the value of the business, given that the capitalization rate is 14%.
 - Determine the market price per equity share, with Eagle Ltd.'s share capital being comprised of 1,00,000 13% preference shares of ₹ 100 each and 50,00,000 equity shares of ₹ 10 each and the P/E ratio being 10 times.
3. ABC Co. is considering a new sales strategy that will be valid for the next 4 years. They want to know the value of the new strategy. Following information relating to the year which has just ended, is available:

Income Statement	₹
Sales	20,000
Gross margin (20%)	4,000
Administration, Selling & distribution expense (10%)	2,000

PBT	2,000
Tax (30%)	600
PAT	1,400
Balance Sheet Information	
Fixed Assets	8,000
Current Assets	4,000
Equity	12,000

If it adopts the new strategy, sales will grow at the rate of 20% per year for three years. From 4th year onward Cash Flow will be stabilized. The gross margin ratio, Assets turnover ratio, the Capital structure and the income tax rate will remain unchanged.

Depreciation would be at 10% of net fixed assets at the beginning of the year.

The Company's target rate of return is 15%.

Determine the incremental value due to adoption of the strategy.

4. H Ltd. agrees to buy over the business of B Ltd. effective 1st April, 2012. The summarized Balance Sheets of H Ltd. and B Ltd. as on 31st March 2012 are as follows:

Balance sheet as at 31st March, 2012 (In Crores of Rupees)

Liabilities:	H. Ltd	B. Ltd.
Paid up Share Capital		
-Equity Shares of ₹100 each	350.00	--
-Equity Shares of ₹10 each	--	6.50
Reserve & Surplus	950.00	25.00
Total	1,300.00	31.50
Assets:		
Net Fixed Assets	220.00	0.50
Net Current Assets	1,020.00	29.00
Deferred Tax Assets	60.00	2.00
Total	1,300.00	31.50

H Ltd. proposes to buy out B Ltd. and the following information is provided to you as part of the scheme of buying:

- (1) The weighted average post tax maintainable profits of H Ltd. and B Ltd. for the last 4 years are ₹ 300 crores and ₹ 10 crores respectively.
- (2) Both the companies envisage a capitalization rate of 8%.

- (3) H Ltd. has a contingent liability of ₹ 300 crores as on 31st March, 2012.
- (4) H Ltd. to issue shares of ₹ 100 each to the shareholders of B Ltd. in terms of the exchange ratio as arrived on a Fair Value basis. (Please consider weights of 1 and 3 for the value of shares arrived on Net Asset basis and Earnings capitalization method respectively for both H Ltd. and B Ltd.)

You are required to arrive at the value of the shares of both H Ltd. and B Ltd. under:

- (i) Net Asset Value Method
- (ii) Earnings Capitalisation Method
- (iii) Exchange ratio of shares of H Ltd. to be issued to the shareholders of B Ltd. on a Fair value basis (taking into consideration the assumption mentioned in point 4 above.)
5. AB Ltd., is planning to acquire and absorb the running business of XY Ltd. The valuation is to be based on the recommendation of merchant bankers and the consideration is to be discharged in the form of equity shares to be issued by AB Ltd. As on 31.3.2006, the paid up capital of AB Ltd. consists of 80 lakhs shares of ₹ 10 each. The highest and the lowest market quotation during the last 6 months were ₹ 570 and ₹ 430. For the purpose of the exchange, the price per share is to be reckoned as the average of the highest and lowest market price during the last 6 months ended on 31.3.06.

XY Ltd.'s Balance Sheet as at 31.3.2006 is summarised below:

	₹ lakhs
Sources	
Share Capital	
20 lakhs equity shares of ₹10 each fully paid	200
10 lakhs equity shares of ₹10 each, ₹5 paid	50
Loans	<u>100</u>
Total	<u>350</u>
Uses	
Fixed Assets (Net)	150
Net Current Assets	<u>200</u>
	<u>350</u>

An independent firm of merchant bankers engaged for the negotiation, have produced the following estimates of cash flows from the business of XY Ltd.:

Year ended	By way of	₹ lakhs
31.3.07	after tax earnings for equity	105
31.3.08	do	120
31.3.09	Do	125
31.3.10	Do	120
31.3.11	Do	100
	Terminal Value estimate	200

It is the recommendation of the merchant banker that the business of XY Ltd. may be valued on the basis of the average of (i) Aggregate of discounted cash flows at 8% and (ii) Net assets value. Present value factors at 8% for years

1-5: 0.93 0.86 0.79 0.74 0.68

You are required to:

- (i) Calculate the total value of the business of XY Ltd.
 - (ii) The number of shares to be issued by AB Ltd.; and
 - (iii) The basis of allocation of the shares among the shareholders of XY Ltd.
6. The valuation of Hansel Limited has been done by an investment analyst. Based on an expected free cash flow of ₹ 54 lakhs for the following year and an expected growth rate of 9 percent, the analyst has estimated the value of Hansel Limited to be ₹ 1800 lakhs. However, he committed a mistake of using the book values of debt and equity.
- The book value weights employed by the analyst are not known, but you know that Hansel Limited has a cost of equity of 20 percent and post tax cost of debt of 10 percent. The value of equity is thrice its book value, whereas the market value of its debt is nine-tenths of its book value. What is the correct value of Hansel Ltd?
7. Following information are available in respect of XYZ Ltd. which is expected to grow at a higher rate for 4 years after which growth rate will stabilize at a lower level:

Base year information:

Revenue	- ₹ 2,000 crores
EBIT	- ₹ 300 crores
Capital expenditure	- ₹ 280 crores
Depreciation	- ₹ 200 crores

Information for high growth and stable growth period are as follows:

	High Growth	Stable Growth
Growth in Revenue & EBIT	20%	10%
Growth in capital expenditure and depreciation	20%	Capital expenditure are offset by depreciation
Risk free rate	10%	9%
Equity beta	1.15	1
Market risk premium	6%	5%
Pre tax cost of debt	13%	12.86%
Debt equity ratio	1 : 1	2 : 3

For all time, working capital is 25% of revenue and corporate tax rate is 30%.

What is the value of the firm?

8. Following information is given in respect of WXY Ltd., which is expected to grow at a rate of 20% p.a. for the next three years, after which the growth rate will stabilize at 8% p.a. normal level, in perpetuity.

	For the year ended March 31, 2014
Revenues	₹ 7,500 Crores
Cost of Goods Sold (COGS)	₹ 3,000 Crores
Operating Expenses	₹ 2,250 Crores
Capital Expenditure	₹ 750 Crores
Depreciation (included in Operating Expenses)	₹ 600 Crores

During high growth period, revenues & Earnings before Interest & Tax (EBIT) will grow at 20% p.a. and capital expenditure net of depreciation will grow at 15% p.a. From year 4 onwards, i.e. normal growth period revenues and EBIT will grow at 8% p.a. and incremental capital expenditure will be offset by the depreciation. During both high growth & normal growth period, net working capital requirement will be 25% of revenues.

The Weighted Average Cost of Capital (WACC) of WXY Ltd. is 15%.

Corporate Income Tax rate will be 30%.

Required:

Estimate the value of WXY Ltd. using Free Cash Flows to Firm (FCFF) & WACC methodology.

The PVIF @ 15 % for the three years are as below:

Year	t_1	t_2	t_3
PVIF	0.8696	0.7561	0.6575

9. With the help of the following information of Jatayu Limited compute the Economic Value Added:

Capital Structure	Equity capital ₹ 160 Lakhs Reserves and Surplus ₹ 140 lakhs 10% Debentures ₹ 400 lakhs
Cost of equity	14%
Financial Leverage	1.5 times
Income Tax Rate	30%

10. RST Ltd.'s current financial year's income statement reported its net income after tax as ₹ 25,00,000. The applicable corporate income tax rate is 30%.

Following is the capital structure of RST Ltd. at the end of current financial year:

	₹
Debt (Coupon rate = 11%)	40 lakhs
Equity (Share Capital + Reserves & Surplus)	125 lakhs
Invested Capital	165 lakhs

Following data is given to estimate cost of equity capital:

Equity Beta of RST Ltd.	1.36
Risk –free rate i.e. current yield on Govt. bonds	8.5%
Average market risk premium (i.e. Excess of return on market portfolio over risk-free rate)	9%

Required:

- (i) Estimate Weighted Average Cost of Capital (WACC) of RST Ltd.; and
 - (ii) Estimate Economic Value Added (EVA) of RST Ltd.
11. Tender Ltd has earned a net profit of ₹ 15 lacs after tax at 30%. Interest cost charged by financial institutions was ₹ 10 lacs. The invested capital is ₹ 95 lacs of which 55% is debt. The company maintains a weighted average cost of capital of 13%. Required,
- (a) Compute the operating income.
 - (b) Compute the Economic Value Added (EVA).
 - (c) Tender Ltd. has 6 lac equity shares outstanding. How much dividend can the company pay before the value of the entity starts declining?
12. The following information is given for 3 companies that are identical except for their capital structure:

	Orange	Grape	Apple
Total invested capital	1,00,000	1,00,000	1,00,000
Debt/assets ratio	0.8	0.5	0.2
Shares outstanding	6,100	8,300	10,000
Pre tax cost of debt	16%	13%	15%
Cost of equity	26%	22%	20%
Operating Income (EBIT)	25,000	25,000	25,000

The tax rate is uniform 35% in all cases.

- (i) Compute the Weighted average cost of capital for each company.
 - (ii) Compute the Economic Valued Added (EVA) for each company.
 - (iii) Based on the EVA, which company would be considered for best investment? Give reasons.
 - (iv) If the industry PE ratio is 11x, estimate the price for the share of each company.
 - (v) Calculate the estimated market capitalisation for each of the Companies.
13. Delta Ltd.'s current financial year's income statement reports its net income as ₹ 15,00,000. Delta's marginal tax rate is 40% and its interest expense for the year was ₹ 15,00,000. The company has ₹ 1,00,00,000 of invested capital, of which 60% is debt. In addition, Delta Ltd. tries to maintain a Weighted Average Cost of Capital (WACC) of 12.6%.
- (i) Compute the operating income or EBIT earned by Delta Ltd. in the current year.
 - (ii) What is Delta Ltd.'s Economic Value Added (EVA) for the current year?
 - (iii) Delta Ltd. has 2,50,000 equity shares outstanding. According to the EVA you computed in (ii), how much can Delta pay in dividend per share before the value of the company would start to decrease? If Delta does not pay any dividends, what would you expect to happen to the value of the company?
14. The following data pertains to XYZ Inc. engaged in software consultancy business as on 31 December 2010.

(\$ Million)

Income from consultancy	935.00
EBIT	180.00
Less: Interest on Loan	<u>18.00</u>
EBT	162.00
Tax @ 35%	<u>56.70</u>
	<u>105.30</u>

Balance Sheet

(\$ Million)

Liabilities	Amount	Assets	Amount
Equity Stock (10 million share @ \$ 10 each)	100	Land and Building	200
Reserves & Surplus	325	Computers & Softwares	295
Loans	180	Current Assets:	
Current Liabilities	180	Debtors	150
		Bank	100
		Cash	<u>40</u>
	<u>785</u>		<u>785</u>

With the above information and following assumption you are required to compute

(a) Economic Value Added®

(b) Market Value Added.

Assuming that:

(i) WACC is 12%.

(ii) The share of company currently quoted at \$ 50 each

15. Herbal Gyan is a small but profitable producer of beauty cosmetics using the plant Aloe Vera. This is not a high-tech business, but Herbal's earnings have averaged around ₹ 12 lakh after tax, largely on the strength of its patented beauty cream for removing the pimples.

The patent has eight years to run, and Herbal has been offered ₹ 40 lakhs for the patent rights. Herbal's assets include ₹ 20 lakhs of working capital and ₹ 80 lakhs of property, plant, and equipment. The patent is not shown on Herbal's books. Suppose Herbal's cost of capital is 15 percent. What is its Economic Value Added (EVA)?

16. Constant Engineering Ltd. has developed a high tech product which has reduced the Carbon emission from the burning of the fossil fuel. The product is in high demand. The product has been patented and has a market value of ₹ 100 Crore, which is not recorded in the books. The Net Worth (NW) of Constant Engineering Ltd. is ₹ 200 Crore. Long term debt is ₹ 400 Crore. The product generates a revenue of ₹ 84 Crore. The rate on 365 days Government bond is 10 percent per annum. Market portfolio generates a return of 12 percent per annum. The stock of the company moves in tandem with the market. Calculate Economic Value added of the company.

ANSWERS/ SOLUTIONS**Answers to Theoretical Questions**

1. Please refer paragraph 6.4.
2. Please refer paragraph 5.

Answers to the Practical Questions**1. VALUATION BASED ON MARKET PRICE**

Market Price per share ₹ 400

Thus value of total business is (₹ 400 x 1.5 Cr.) ₹ 600 Cr.

VALUATION BASED ON DISCOUNTED CASH FLOW

Present Value of cash flows

(₹ 250 cr x 0.893) + (₹ 300 cr. X 0.797) + (₹ 400 cr. X 0.712) = ₹ 747.15 Cr.

Value of per share (₹ 747.15 Cr. / 1.5 Cr) ₹ 498.10 per share

RANGE OF VALUATION

	Per Share ₹	Total ₹ Cr.
Minimum	400.00	600.00
Maximum	498.10	747.15

2. (i) Computation of Business Value

		(₹ Lakhs)
Profit before tax	$\frac{77}{1-0.30}$	110
Less: Extraordinary income		(8)
Add: Extraordinary losses		<u>10</u>
		112
Profit from new product	(₹ Lakhs)	
Sales	70	
Less: Material costs	20	
Labour costs	12	
Fixed costs	<u>10</u>	<u>(42)</u>
		140.00
Less: Taxes @30%		<u>42.00</u>
Future Maintainable Profit after taxes		<u>98.00</u>

Relevant Capitalisation Factor	0.14
Value of Business (₹98/0.14)	700

(ii) Determination of Market Price of Equity Share

Future maintainable profits (After Tax)	₹ 98,00,000
Less: Preference share dividends 1,00,000 shares of ₹ 100 @ 13%	<u>₹ 13,00,000</u>
Earnings available for Equity Shareholders	<u>₹ 85,00,000</u>
No. of Equity Shares	50,00,000
Earning per share = $\frac{₹ 85,00,000}{50,00,000} =$	₹ 1.70
PE ratio	10
Market price per share	₹ 17

3. Projected Balance Sheet

	Year 1	Year 2	Year 3	Year 4
Fixed Assets (40% of Sales)	9,600	11,520	13,824	13,824
Current Assets (20% of Sales)	4,800	5,760	6,912	6,912
Total Assets	14,400	17,280	20,736	20,736
Equity	14,400	17,280	20,736	20,736

Projected Cash Flows:-

	Year 1	Year 2	Year 3	Year 4
Sales	24,000	28,800	34,560	34,560
PBT (10% of sale)	2,400	2,880	3,456	3,456
PAT (70%)	1,680	2,016	2,419.20	2,419.20
Depreciation	800	960	1,152	1,382
Addition to Fixed Assets	2,400	2,880	3,456	1,382
Increase in Current Assets	800	960	1,152	-
Operating cash flow (FCFF)	(720)	(864)	(1,036.80)	2,419.20

Projected Cash Flows:-

Present value of Projected Cash Flows:-

Cash Flows	PVF at 15%	PV
-720	0.870	-626.40
-864	0.756	-653.18
-1,036.80	0.658	<u>-682.21</u>
		-1,961.79

Residual Value - $2419.20/0.15 = 16,128$

Present value of Residual value = $16128/(1.15)^3$
 = $16128/1.521 = 10603.55$

Total shareholders' value = $10,603.55 - 1,961.79 = 8,641.76$

Pre strategy value = $1,400 / 0.15 = 9,333.33$

∴ Value of strategy = $8,641.76 - 9,333.33 = - 691.57$

Conclusion: The strategy is not financially viable

4. (i) Net asset value

H Ltd.	$\frac{\text{₹ } 1300 \text{ Crores} - \text{₹ } 300 \text{ Crores}}{3.50 \text{ Crores}} = \text{₹ } 285.71$
B Ltd.	$\frac{\text{₹ } 31.50 \text{ Crores}}{0.65 \text{ Crores}} = \text{₹ } 48.46$

(ii) Earning capitalization value

H Ltd.	$\frac{\text{₹ } 300 \text{ Crores} / 0.08}{3.50 \text{ Crores}} = \text{₹ } 1071.43$
B Ltd.	$\frac{\text{₹ } 10 \text{ Crores} / 0.08}{0.65 \text{ Crores}} = \text{₹ } 192.31$

(iii) Fair value

H Ltd.	$\frac{\text{₹ } 285.71 \times 1 + \text{₹ } 1071.43 \times 3}{4} = \text{₹ } 875$
B Ltd.	$\frac{\text{₹ } 48.46 \times 1 + \text{₹ } 192.31 \times 3}{4} = \text{₹ } 156.3475$
Exchange ratio	$\text{₹ } 156.3475 / \text{₹ } 875 = 0.1787$

H Ltd should issue its 0.1787 share for each share of B Ltd.

Note: In above solution it has been assumed that the contingent liability will materialize at its full amount.

5. Price/share of AB Ltd. for determination of number of shares to be issued

$$= (\text{₹ } 570 + \text{₹ } 430)/2 = \text{₹ } 500$$

Value of XY Ltd based on future cash flow capitalization (105×0.93)+(120×0.86)+(125×0.79)+(120×0.74)×(300×0.68)	₹ lakhs	592.40
Value of XY Ltd based on net assets	₹ lakhs	250.00
Average value (592.40+250)/2		421.20
No. of shares in AB Ltd to be issued ₹ 4,21,20,000/500	Nos.	84240
Basis of allocation of shares		
Fully paid equivalent shares in XY Ltd. (20+5) lakhs		2500000
Distribution to fully paid shareholders 84240×20/25		67392
Distribution to partly paid shareholders 84240-67392		16848

6. Cost of capital by applying Free Cash Flow to Firm (FCFF) Model is as follows:-

$$\text{Value of Firm} = V_0 = \frac{\text{FCFF}_1}{K_c - g_n}$$

Where –

FCFF_1 = Expected FCFF in the year 1

K_c = Cost of capital

g_n = Growth rate forever

Thus, ₹ 1800 lakhs = ₹ 54 lakhs / ($K_c - g$)

Since $g = 9\%$, then $K_c = 12\%$

Now, let X be the weight of debt and given cost of equity = 20% and cost of debt = 10%, then
 $20\% (1 - X) + 10\% X = 12\%$

Hence, $X = 0.80$, so book value weight for debt was 80%

∴ Correct weight should be 60 of equity and 72 of debt.

∴ Cost of capital = $K_c = 20\% (60/132) + 10\% (72/132) = 14.5455\%$ and correct firm's value
 = ₹ 54 lakhs / (0.1454 – 0.09) = ₹ 974.73 lakhs.

7. **High growth phase :**

$$k_e = 0.10 + 1.15 \times 0.06 = 0.169 \text{ or } 16.9\%$$

$$k_d = 0.13 \times (1 - 0.3) = 0.091 \text{ or } 9.1\%$$

$$\text{Cost of capital} = 0.5 \times 0.169 + 0.5 \times 0.091 = 0.13 \text{ or } 13\%$$

Stable growth phase :

$$k_e = 0.09 + 1.0 \times 0.05 = 0.14 \text{ or } 14\%.$$

$$k_d = 0.1286 \times (1 - 0.3) = 0.09 \text{ or } 9\%.$$

$$\text{Cost of capital} = 0.6 \times 0.14 + 0.4 \times 0.09 = 0.12 \text{ or } 12\%.$$

Determination of forecasted Free Cash Flow of the Firm (FCFF)

(₹ in crores)

	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Terminal Year
Revenue	2,400	2,880	3,456	4,147.20	4,561.92
EBIT	360	432	518.40	622.08	684.29
EAT	252	302.40	362.88	435.46	479.00
Capital Expenditure	96	115.20	138.24	165.89	-
Less Depreciation					
Δ Working Capital	<u>100.00</u>	<u>120.00</u>	<u>144.00</u>	<u>172.80</u>	<u>103.68</u>
Free Cash Flow (FCF)	<u>56.00</u>	<u>67.20</u>	<u>80.64</u>	<u>96.77</u>	<u>375.32</u>

Alternatively, it can also be computed as follows:

(₹ in crores)

	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Terminal Year
Revenue	2,400	2,880	3,456	4,147.20	4,561.92
EBIT	360	432	518.40	622.08	684.29
EAT	252	302.40	362.88	435.46	479.00
Add: Depreciation	<u>240</u>	<u>288</u>	<u>345.60</u>	<u>414.72</u>	<u>456.19</u>
	492	590.40	708.48	850.18	935.19
Less: Capital Exp.	336	403.20	483.84	580.61	456.19
Δ WC	<u>100.00</u>	<u>120.00</u>	<u>144.00</u>	<u>172.80</u>	<u>103.68</u>
	<u>56.00</u>	<u>67.20</u>	<u>80.64</u>	<u>96.77</u>	<u>375.32</u>

Present Value (PV) of FCFF during the explicit forecast period is:

FCFF (₹ in crores)	PVF @ 13%	PV (₹ in crores)
56.00	0.885	49.56
67.20	0.783	52.62
80.64	0.693	55.88
96.77	0.613	59.32
		₹ 217.38

Terminal Value of Cash Flow

$$\frac{375.32}{0.12 - 0.10} = ₹ 18,766.00 \text{ Crores}$$

PV of the terminal, value is:

$$₹ 18,766.00 \text{ Crores} \times \frac{1}{(1.13)^4} = ₹ 18,766.00 \text{ Crores} \times 0.613 = ₹ 11,503.56 \text{ Crores}$$

The value of the firm is :

$$₹ 217.38 \text{ Crores} + ₹ 11,503.56 \text{ Crores} = ₹ 11,720.94 \text{ Crores}$$

8. Determination of forecasted Free Cash Flow of the Firm (FCFF)

(₹ in crores)

	Yr. 1	Yr. 2	Yr. 3	Terminal Year
Revenue	9000.00	10800.00	12960.00	13996.80
COGS	3600.00	4320.00	5184.00	5598.72
Operating Expenses	1980.00*	2376.00	2851.20	3079.30
Depreciation	720.00	864.00	1036.80	1119.74
EBIT	2700.00	3240.00	3888.00	4199.04
Tax @30%	810.00	972.00	1166.40	1259.71
EAT	1890.00	2268.00	2721.60	2939.33
Capital Exp. – Dep.	172.50	198.38	228.13	-
Δ Working Capital	375.00	450.00	540.00	259.20
Free Cash Flow (FCF)	1342.50	1619.62	1953.47	2680.13

* Excluding Depreciation.

Present Value (PV) of FCFF during the explicit forecast period is:

FCFF (₹ in crores)	PVF @ 15%	PV (₹ in crores)
1342.50	0.8696	1167.44
1619.62	0.7561	1224.59
1953.47	0.6575	1284.41
		3676.44

PV of the terminal, value is:

$$\frac{2680.13}{0.15 - 0.08} \times \frac{1}{(1.15)^3} = ₹ 38287.57 \text{ Crore} \times 0.6575 = ₹ 25174.08 \text{ Crore}$$

The value of the firm is :

$$₹ 3676.44 \text{ Crores} + ₹ 25174.08 \text{ Crores} = ₹ 28,850.52 \text{ Crores}$$

9. Financial Leverage = PBIT/PBT

$$1.5 = \text{PBIT} / (\text{PBIT} - \text{Interest})$$

$$1.5 = \text{PBIT} / (\text{PBIT} - 40)$$

$$1.5 (\text{PBIT} - 40) = \text{PBIT}$$

$$1.5 \text{ PBIT} - 60 = \text{PBIT}$$

$$1.5 \text{ PBIT} - \text{PBIT} = 60$$

$$0.5 \text{ PBIT} = 60$$

$$\text{or PBIT} = \frac{60}{0.5} = ₹120 \text{ lakhs}$$

$$\text{NOPAT} = \text{PBIT} - \text{Tax} = ₹120 \text{ lakhs} (1 - 0.30) = ₹84 \text{ lakhs.}$$

Weighted Average Cost of Capital (WACC)

$$= 14\% \times (300 / 700) + (1 - 0.30) \times (10\%) \times (400 / 700) = 10\%$$

$$\text{EVA} = \text{NOPAT} - (\text{WACC} \times \text{Total Capital})$$

$$\text{EVA} = ₹84 \text{ lakhs} - 0.10 \times ₹ 700 \text{ lakhs}$$

$$\text{EVA} = ₹ 14 \text{ lakhs}$$

10. Cost of Equity as per CAPM

$$\begin{aligned} k_e &= R_f + \beta \times \text{Market Risk Premium} \\ &= 8.5\% + 1.36 \times 9\% \\ &= 8.5\% + 12.24\% = 20.74\% \end{aligned}$$

Cost of Debt	k_d	$= 11\%(1 - 0.30) = 7.70\%$
WACC	(k_o)	$= k_e \times \frac{E}{E+D} + k_d \times \frac{D}{E+D}$ $= 20.74 \times \frac{125}{165} + 7.70 \times \frac{40}{165} = 15.71 + 1.87 = 17.58\%$
Taxable Income		$= ₹ 25,00,000 / (1 - 0.30)$ $= ₹ 35,71,429$ or ₹ 35.71 lakhs
Operating Income		$= \text{Taxable Income} + \text{Interest}$ $= ₹ 35,71,429 + ₹ 4,40,000$ $= ₹ 40,11,429$ or ₹ 40.11 lacs
EVA		$= \text{EBIT} (1 - \text{Tax Rate}) - \text{WACC} \times \text{Invested Capital}$ $= ₹ 40,11,429 (1 - 0.30) - 17.58\% \times ₹ 1,65,00,000$ $= ₹ 28,08,000 - ₹ 29,00,700 = - ₹ 92,700$
11. Taxable Income		$= ₹ 15 \text{ lac} / (1 - 0.30)$ $= ₹ 21.43 \text{ lacs}$ or ₹ 21,42,857
Operating Income		$= \text{Taxable Income} + \text{Interest}$ $= ₹ 21,42,857 + ₹ 10,00,000$ $= ₹ 31,42,857$ or ₹ 31.43 lacs
EVA		$= \text{EBIT} (1 - \text{Tax Rate}) - \text{WACC} \times \text{Invested Capital}$ $= ₹ 31,42,857 (1 - 0.30) - 13\% \times ₹ 95,00,000$ $= ₹ 22,00,000 - ₹ 12,35,000 = ₹ 9,65,000$
EVA Dividend		$= \frac{₹ 9,65,000}{₹ 6,00,000} = ₹ 1.6083$

12. (i) Working for calculation of WACC

	Orange	Grape	Apple
Total debt	80,000	50,000	20,000
Post tax Cost of debt	10.40%	8.45%	9.75%
Equity Fund	20,000	50,000	80,000

WACC

Orange:	$(10.4 \times 0.8) + (26 \times 0.2)$	=	13.52%
Grape:	$(8.45 \times 0.5) + (22 \times 0.5)$	=	15.225%
Apple:	$(9.75 \times 0.2) + (20 \times 0.8)$	=	17.95%

(ii)

	Orange	Grape	Apple
WACC	13.52	15.225	17.95
EVA [EBIT (1-T)-(WACC x Invested Capital)]	2,730	1,025	-1,700

(iii) Orange would be considered as the best investment since the EVA of the company is highest and its weighted average cost of capital is the lowest

(iv) Estimated Price of each company shares

	Orange	Grape	Apple
EBIT (₹)	25,000	25,000	25,000
Interest (₹)	12,800	6,500	3,000
Taxable Income (₹)	12,200	18,500	22,000
Tax 35% (₹)	4,270	6,475	7,700
Net Income (₹)	7,930	12,025	14,300
Shares	6,100	8,300	10,000
EPS (₹)	1.30	1.45	1.43
Stock Price (EPS x PE Ratio) (₹)	14.30	15.95	15.73

Since the three entities have different capital structures they would be exposed to different degrees of financial risk. The PE ratio should therefore be adjusted for the risk factor.

(v) **Market Capitalisation**

Estimated Stock Price (₹)	14.30	15.95	15.73
No. of shares	6,100	8,300	10,000
Estimated Market Cap (₹)	87,230	1,32,385	1,57,300

13. (i) Taxable income = Net Income / (1 - 0.40)

or, Taxable income = ₹ 15,00,000 / (1 - 0.40) = ₹ 25,00,000

Again, taxable income = EBIT – Interest

or, EBIT = Taxable Income + Interest

$$= ₹ 25,00,000 + ₹ 15,00,000 = ₹ 40,00,000$$

$$\begin{aligned} \text{(ii) EVA} &= \text{EBIT} (1 - T) - (\text{WACC} \times \text{Invested capital}) \\ &= ₹ 40,00,000 (1 - 0.40) - (0.126 \times ₹ 1,00,00,000) \\ &= ₹ 24,00,000 - ₹ 12,60,000 = ₹ 11,40,000 \end{aligned}$$

$$\text{(iii) EVA Dividend} = ₹ 11,40,000 / 2,50,000 = ₹ 4.56$$

If Delta Ltd. does not pay a dividend, we would expect the value of the firm to increase because it will achieve higher growth, hence a higher level of EBIT. If EBIT is higher, then all else equal, the value of the firm will increase.

14. (a) Determination of Economic Value Added (EVA)

	<i>\$ Million</i>
EBIT	180.00
Less: Taxes @ 35%	<u>63.00</u>
Net Operating Profit after Tax	117.00
Less: Cost of Capital Employed [W. No.1]	<u>72.60</u>
Economic Value Added	<u>44.40</u>

(b) Determination of Market Value Added (MVA)

	<i>\$ Million</i>
Market value of Equity Stock [W. No. 2]	500
Equity Fund [W. No. 3]	<u>425</u>
Market Value Added	<u>75</u>

Working Notes:

(1) Total Capital Employed

Equity Stock	\$ 100 Million
Reserve and Surplus	\$ 325 Million
Loan	<u>\$ 180 Million</u>
	<u>\$ 605 Million</u>
WACC	12%

Cost of Capital employed \$ 605 Million x 12%	\$ 72.60 Million
(2) Market Price per equity share (A)	\$ 50
No. of equity share outstanding (B)	10 Million
Market value of equity stock (A) x (B)	\$ 500 Million
(3) Equity Fund	
Equity Stock	\$ 100 Million
Reserves & Surplus	<u>\$ 325 Million</u>
	<u>\$ 425 Million</u>

15. EVA = Income earned – (Cost of capital x Total Investment)

Total Investments

Particulars	Amount
Working capital	₹ 20 lakhs
Property, plant, and equipment	₹ 80 lakhs
Patent rights	<u>₹ 40 lakhs</u>
Total	<u>₹ 140 lakhs</u>

Cost of Capital 15%

EVA = ₹ 12 lakh – (0.15 x ₹ 140 lakhs) = ₹ 12 lakh – ₹ 21 lakh = -₹ 9 lakh

Thus, Herbal Gyan has a negative EVA of ₹ 9 lakhs.

16. EVA = Income Earned – (Cost of Capital x Total Investment)

Total Investments

	Amount (₹ Crore)
Net Worth	200.00
Long Term Debts	400.00
Patent Rights	100.00
Total	700.00

$$WACC \quad (k_o) = k_e \times \frac{E}{E+D} + k_d \times \frac{D}{E+D}$$

EVA

$$= 12 \times \frac{300}{700} + 10 \times \frac{400}{700}$$

$$= 5.14\% + 5.71\% = 10.85\%$$

$$= \text{Profit Earned} - \text{WACC} \times \text{Invested Capital}$$

$$= ₹ 84 \text{ crore} - 10.85\% \times ₹ 700 \text{ crore}$$

$$= ₹ 8.05 \text{ crore}$$

MERGERS, ACQUISITIONS & CORPORATE RESTRUCTURING



LEARNING OUTCOMES

After going through the chapter student shall be able to understand

- Conceptual Framework
- Rationale
- Forms
- Financial Framework
- Takeover Defensive Tactics
- Reverse Merger
- Divestiture
- Financial Restructuring
- Ownership Restructuring
- Unlocking the value through Mergers & Acquisitions and Business Restructuring
- Mergers and Acquisitions Failures
- Cross Border Mergers
- Special Purpose Acquisition Companies (SPACs)

1. CONCEPTUAL FRAMEWORK

Restructuring of business is an integral part of modern business enterprises. The globalization and liberalization of Control and Restrictions has generated new waves of competition and free trade. This requires Restructuring and Re-organisation of business to create new synergies to face the competitive environment and changed market conditions.

Restructuring usually involves major organizational changes such as shift in corporate strategies. Restructuring can be internally in the form of new investments in plant and machinery, Research and Development of products and processes, hiving off non-core businesses, divestment, sell-offs, de-merger etc. Restructuring can also take place externally through Mergers and Acquisitions (M&As), by forming joint-ventures and having strategic alliances with other firms.

The aspects relating to expansion or contraction of a firm's operations or changes in its assets or financial or ownership structure are known as corporate re-structuring. While there are many forms of corporate re-structuring, mergers, acquisitions and takeovers, financial restructuring and re-organisation, divestitures de-mergers and spin-offs, leveraged buyouts and management buyouts are some of the most common forms of corporate restructuring.

The most talked about subject of the day is Mergers & Acquisitions (M&A). In developed economies, corporate Mergers and Acquisition is a regular feature. In Japan, the US and Europe, hundreds of mergers and acquisition take place every year. In India, too, mergers and acquisition have become a part of corporate strategy today.

Mergers, acquisitions and corporate restructuring of businesses in India have grown by leaps and bounds in the last decade. From about \$4.5 billion in 2004, the market for corporate control zoomed to \$ 13 billion in 2005 and reached to record \$56.2 billion in 2016. This tremendous growth was attributed to the fact that the foreign investors were looking for an alternative destination, preferably a growing economy as their own country was reeling under the pressure of recession. This was caused by the tough macro-economic climate created due to Euro Zone crisis and other domestic reasons such as inflation, fiscal deficit and currency depreciation.

The terms 'mergers; 'acquisitions' and 'takeovers' are often used interchangeably in common parlance. However, there are differences. While merger means unification of two entities into one, acquisition involves one entity buying out another and absorbing the same. In India, in legal sense merger is known as 'Amalgamation'.

The amalgamations can be by merger of companies within the provisions of the Companies Act, and acquisition through takeovers. While takeovers are regulated by SEBI, Mergers and Acquisitions (M&A) deals fall under the Companies Act. In cross border transactions, international tax considerations also arise.

Halsbury's Laws of England defined amalgamation as a blending of two or more existing undertakings, the shareholders of each **amalgamating** company becoming substantially the

shareholders in the **amalgamating** company. Accordingly, in a merger, two or more companies combine into a single unit.

The term “amalgamation” is used when two or more companies are amalgamated or where one is merged with another or taken over by another. In *Inland Steam Navigation Workers Union vs. R.S. Navigation Company Ltd.*, it was observed that in case of amalgamation, the rights and liabilities of a company are amalgamated into another so that the transferee company becomes vested with all rights and liabilities of the transferor company.

An **acquisition** is when both the acquiring and acquired companies are still left standing as separate entities at the end of the transaction. A **merger** results in the legal dissolution of one of the companies, and a **consolidation** dissolves both of the parties and creates a new one, into which the previous entities are merged.

In India corporate takeovers were started by Swaraj Paul when he tried to takeover Escorts. The other major takeovers are that of Ashok Leyland by the Hindujas Shaw Wallace, Dunlop, and Falcon Tyres by the Chabbria Group; Ceat Tyres by the Goenkas; and Consolidated Coffee by Tata Tea. The BIFR arranged for the takeover of companies by giants like ITC, McDowells, Lakshmi Machine Works, and the Somani Group.

Many new companies are being incorporated as a result of the fast-growing industrialization of the country which is mainly dependent on agriculture. With the new trends of globalization, not only in this country but also worldwide, there has been increasing interaction of companies and persons of one country with those of other countries. Today, corporate restructuring has gained momentum as a result, undertakings and companies are merging, demerging, divesting and taking over, both unregistered and registered in India as well as outside India.

Against this corporate backdrop, mergers and acquisitions have to be encouraged in the interest of the general public and for the promotion of industry and trade. At the same time the government has to safeguard the interest of the citizens, the consumers and the investors on the one hand and the shareholders, creditors and employees/workers on the other.

Chapter XV (Section 230 to 240) of Companies Act, 2013 (the Act) contains provisions on ‘Compromises, Arrangements and Amalgamations’, that covers compromise or arrangements, mergers and amalgamations, Corporate Debt Restructuring, demergers, fast track mergers for small companies/holding subsidiary companies, cross border mergers, takeovers, amalgamation of companies in public interest etc.

Special restructuring processes such as ‘Reconstruction’ of sick industrial companies envisaged by the Sick Industries (Special Provisions) Act, 1985 and ‘Revival’ of financially unviable companies envisaged by sec 72A of the Income Tax Act, 1961. However, all such mergers and acquisitions are also governed or controlled through relevant provisions of the Foreign Exchange Management Act, 1999; Income Tax Act, 1961; Industries (Development and Regulation) Act, 1951, the Competition Act 2002; the restrictions imposed by other relevant Acts including SEBI Act, 1992, as the case may be.

“Generally, where only one company is involved in a scheme and the rights of the shareholders and creditors are varied, it amounts to **reconstruction or reorganization or scheme of arrangement**. In an amalgamation, two or more companies are fused into one by merger or by one taking over the other. Amalgamation is a blending of two or more existing undertakings into one undertaking, the shareholders of each blending company become substantially the shareholders of the company which is to carry on the blended undertaking. There may be amalgamation either by the transfer of two or more undertakings to a new company, or by the transfer of one or more undertaking to an existing company. Strictly, ‘amalgamation’ does not cover the mere acquisition of share capital of the other company which remains in existence and continues its undertaking but the context in which the term is used may show that it is intended to include such an acquisition.”



2. RATIONALE FOR MERGERS AND ACQUISITIONS

The most common reasons for Mergers and Acquisition (M&A) are:

- **Synergistic operating economics:** Synergy may be defined as follows:

$$V(AB) > V(A) + V(B).$$

In other words, the combined value of two firms or companies shall be more than their individual value. Synergy is the increase in performance of the combined firm over what the two firms are already expected or required to accomplish as independent firms (Mark L Sirower of Boston Consulting Group, in his book “The Synergy Trap”). This may be the result of complimentary services or economies of scale or both.

A good example of complimentary activities can be a company having a good network of branches and other company having an efficient production system. Thus, the merged companies will be more efficient than individual companies.

On similar lines, economies of large scale is also one of the reasons for synergy benefits. The main reason is that, the large scale production results in lower average cost of production e.g. reduction in overhead costs on account of sharing of central services such as accounting and finances, office executives, top level management, legal, sales promotion and advertisement etc.

These economies can be “real” arising out of reduction in factor input per unit of output, whereas pecuniary economics are realized from paying lower prices for factor inputs for bulk transactions. Other factors for Synergies are as follows:

- **Diversification:** Merger between two unrelated companies would lead to reduction in business risk, which in turn will increase the market value consequent upon the reduction in discount rate/ required rate of return. Normally, greater the combination of statistically independent or negatively correlated income streams of merged companies, higher will be the reduction in business risk in comparison to companies having income streams which are positively correlated to each other.

- **Taxation:** The provisions of set off and carry forward of losses as per Income Tax Act may be another strong reason for the merger and acquisition. Thus, there will be Tax saving or reduction in tax liability of the merged firm. Similarly, in the case of acquisition the losses of the target company will be allowed to be set off against the profits of the acquiring company.
- **Growth:** Merger and acquisition mode enables the firm to grow at a rate faster than the other mode viz., organic growth. The reason being the shortening of 'Time to Market'. The acquiring company avoids delays associated with purchasing of building, site, setting up of the plant and hiring personnel etc.
- **Consolidation of Production Capacities and increasing market power:** Due to reduced competition, marketing power increases. Further, production capacity is increased by the combination of two or more plants. The following table shows the key rationale for some of the well-known transactions which took place in India in the recent past.

Rationale for M & A

Instantaneous growth, Snuffing out competition, Increased market share.	<ul style="list-style-type: none"> • Airtel – Loop Mobile (2014) (Airtel bags top spot in Mumbai Telecom Circle)
Acquisition of a competence or a capability	<ul style="list-style-type: none"> • Google – Motorola (2011) (Google got access to Motorola's 17,000 issued patents and 7500 applications)
Entry into new markets/product segments	<ul style="list-style-type: none"> • Airtel – Zain Telecom (2010) (Airtel enters 15 nations of African Continent in one shot)
Access to funds	<ul style="list-style-type: none"> • Ranbaxy – Sun Pharma (2014) (Daiichi Sankyo sold Ranbaxy to generate funds)
Tax benefits	<ul style="list-style-type: none"> • Burger King (US) – Tim Hortons (Canada) (2014) (Burger King could save taxes in future)
Instantaneous growth, Snuffing out competition, Increased market share.	<ul style="list-style-type: none"> • Facebook – Whatsapp (2014) (Facebook acquired its biggest threat in chat space)
Acquisition of a competence or a capability	<ul style="list-style-type: none"> • Flipkart – Myntra (2014) (Flipkart poised to strengthen its competency in apparel e-commerce market)
Entry into new markets/product segments	<ul style="list-style-type: none"> • Cargill – Wipro (2013) (Cargill acquired Sunflower Vanaspati oil business to enter Western India Market)

Access to funds	<ul style="list-style-type: none"> Jaypee – Ultratech (2014) (Jaypee sold its cement unit to raise funds for cutting off its debt)
Tax benefits	<ul style="list-style-type: none"> Durga Projects Limited (DPL) – WBPDCCL (2014) (DPL's loss could be carry forward and setoff)



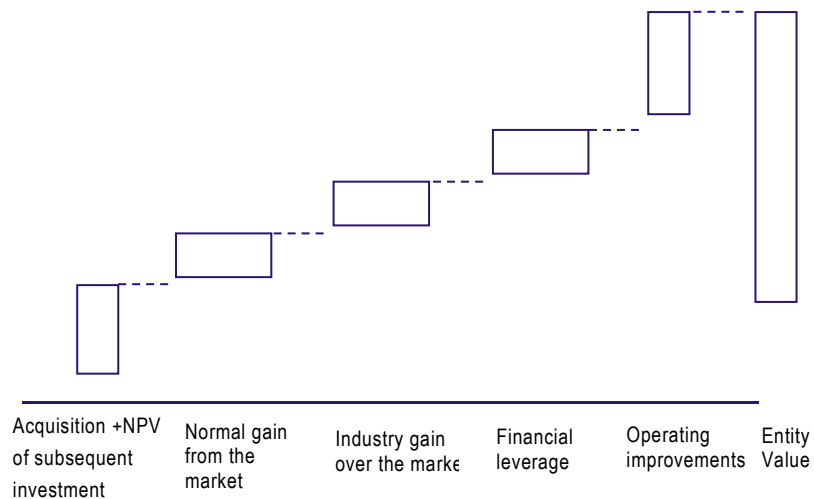
3. FORMS (TYPES) OF MERGERS

A merger is generally understood to be a fusion of two companies. The term “merger” means the dissolution of one or more companies or firms or proprietorships to form or get absorbed into another company. By concept, merger increases the size of the undertakings. Following are the major types of mergers:

- (i) **Horizontal Merger:** The two companies which have merged are in the same industry, normally the market share of the new consolidated company would be larger and it is possible that it may move closer to being a monopoly or a near monopoly to avoid competition.
- (ii) **Vertical Merger:** This merger happens when two companies that have ‘buyer-seller’ relationship (or potential buyer-seller relationship) come together.
- (iii) **Conglomerate Mergers:** Such mergers involve firms engaged in unrelated type of business operations. In other words, the business activities of acquirer and the target are neither related to each other horizontally (i.e., producing the same or competing products) nor vertically (having relationship of buyer and supplier). In a pure conglomerate merger, there are no important common factors between the companies in production, marketing, research and development and technology. There may however be some degree of overlapping in one or more of these common factors. Such mergers are in fact, unification of different kinds of businesses under one flagship company. The purpose of merger remains utilization of financial resources, enlarged debt capacity and also synergy of managerial functions.
- (iv) **Congeneric Merger:** In these mergers, the acquirer and the target companies are related through basic technologies, production processes or markets. The acquired company represents an extension of product-line, market participants or technologies of the acquirer. These mergers represent an outward movement by the acquirer from its current business scenario to other related business activities within the overarching industry structure.
- (v) **Reverse Merger:** Such mergers involve acquisition of a public (Shell Company) by a private company, as it helps the same private company to by-pass lengthy and complex process required to be followed in case it is interested in going public.
- (vi) **Acquisition:** This refers to the purchase of controlling interest by one company in the share capital of an existing company. This may be by:

- (i) an agreement with majority holder of Interest.
- (ii) Purchase of new shares by private agreement.
- (iii) Purchase of shares in open market (open offer)
- (iv) Acquisition of share capital of a company by means of cash, issuance of shares.
- (v) Making a buyout offer to general body of shareholders.

When a company is acquired by another company, the acquiring company has two choices, one, to merge both the companies into one and function as a single entity or two, to operate the taken-over company as an independent entity with changed management and policies. 'Merger' is the fusion of two independent firms on co-equal terms. 'Acquisition' is buying out of a company by another company and the acquired company usually loses its identity. Normally, this process is friendly.



Source: Patricia Anslinger and Thomas E Copeland, "Growth through Acquisitions : A Fresh look, Harvard Business Review Jan. – Feb -1996.

Acquisition of one of the businesses of a company, as a going concern by an agreement need not necessarily be routed through court, if the transfer of business is to be accomplished without allotting shares in the transferee company to the shareholders of the transferor company. This would tantamount to a simple acquisition. In this case the transferor company continues to exist and no change in shareholding is expected. If the sale takes place for a lumpsum consideration without attributing any individual values to any class of assets, such sales are called slump sales. The capital gains arising on slump sales were being exempt from income tax based on a decision of the Supreme Court of India.

4. FINANCIAL FRAMEWORK

4.1 Gains from Mergers or Synergy

The first step in merger analysis is to identify the economic gains from the merger. There are gains if the combined entity is more than the sum of its parts.

That is, Combined value > (Value of acquirer + Stand-alone value of target)

The difference between the combined value and the sum of the values of individual companies is usually attributed to **synergy**.

$$\text{Value of acquirer} + \text{Stand-alone value of target} + \text{Value of synergy} = \text{Combined value}$$

There is also a cost attached to an acquisition. The cost of acquisition is the premium paid over the market value plus other costs of integration. Therefore, the net gain is the value of synergy minus premium paid.

$$V_A = ₹100$$

$$V_B = ₹50$$

$$V_{AB} = ₹175$$

Where, V_A = Value of Acquirer

V_B = Standalone value of target

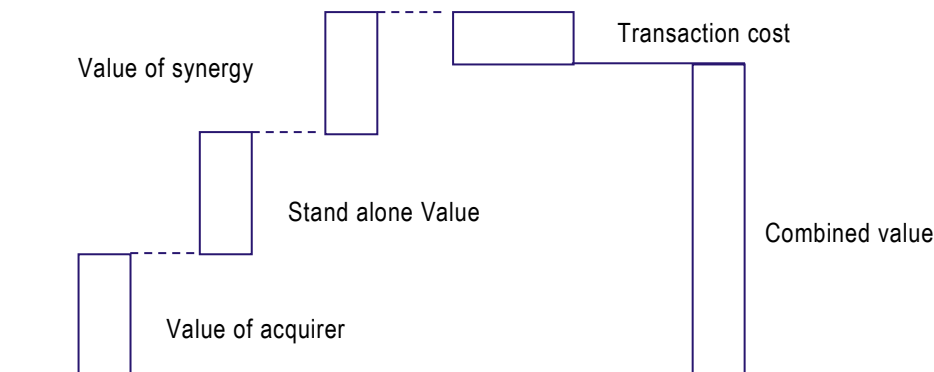
And, V_{AB} = Combined Value

$$\text{So, Synergy} = V_{AB} - (V_A + V_B) = 175 - (100 + 50) = 25$$

If premium is ₹10, then, Net gain = Synergy – Premium = 25 – 10 = 15

Acquisition need not be made with synergy in mind. It is possible to make money from non-synergistic acquisitions as well. As can be seen from the Exhibit, operating improvements are a big source of value creation. Better post-merger integration could lead to abnormal returns even when the acquired company is in unrelated business. Obviously, managerial talent is the single most important instrument in creating value by cutting down costs, improving revenues, operating profit margin and cash flow position, etc. Many a time, executive compensation is tied to the performance in the post-merger period. Providing equity stake in the company induces executives to think and behave like shareholders.

Exhibit: Merger gains



Source : Patricia L Anslinger and Thomas E Copeland, 'Growth Through Acquisitions : A Fresh Look', Harvard Business Review, Jan–Feb., 1996.

4.2 Scheme of Amalgamation or Merger

The scheme of any arrangement or proposal for a merger is the heart of the process and has to be drafted with care.

There is no prescribed form for a scheme, and it is designed to suit the terms and conditions relevant to the proposal and should take care of any special feature peculiar to the arrangement.

An essential component of a scheme is the provision for vesting all the assets and liabilities of the transferor company in its transferee company. If the transferee company does not want to take over any asset or liability, the transferor company before finalizing the draft scheme should dispose off or settle them. Otherwise, the scheme would be considered defective and incomplete, and the court would not sanction it.

It is equally important to define the **effective date** from which the scheme is intended to come into operation. This would save time and labour in explaining to the court the intention behind using several descriptions in the scheme. For accounting purposes, the amalgamation shall be affected with reference to the audited accounts and balance sheets as on a particular date (which precedes the date of notification) of the two companies and the transactions thereafter shall be pooled into a common account.

Another aspect relates to the **valuation of shares** to decide the exchange ratio. Objections have been raised as to the method of valuation even in cases where the scheme had been approved by a large majority of shareholders and the financial institutions as lenders. The courts have declared their unwillingness to engage in a study of fitness of the mode of valuation. A High Court stated: "There are bound to be differences of opinion as to what the correct value of the shares of the company is. Simply because it is possible to value the share in a manner different from the one adopted in each case, it cannot be said that the valuation agreed upon has been unfair." Similarly, in the case of Hindustan Lever the Supreme Court held that it would not interfere with the valuation

of shares when more than 99 per cent of the shareholders have approved the scheme and the valuations having been perused by the financial institutions.

4.3 Financial Evaluation

Financial evaluation addresses the following issues:

- (a) What is the maximum price that should be paid for the target company?
- (b) What are the principal areas of Risk?
- (c) What are the cash flow and balance sheet implications of the acquisition? And,
- (d) What is the best way of structuring the acquisition?

4.4 Arranging Finance for Acquisition

Once the Definitive Agreement is signed, the Company Secretarial aspects relating to putting through the acquisition process will be taken up by the legal and secretarial department of both the companies. Side by side, the CFO of the acquiring company will move to the next stage which is 'Financing the Acquisition'.

One of the most important decisions is how to pay for the acquisition – cash or stock or part of each and this would be part of the Definitive Agreement. If the acquisition is an 'all equity deal', the CFO's can breathe easy. However, if cash payout is significant, the acquirer has to plan for financing the deal. Sometimes acquirers do not pay all of the purchase consideration as, even though they could have sufficient funds. This is part of the acquisition strategy to keep the war chest ready for further acquisitions. Another reason to pay by shares would be when the acquirer considers that their company's shares are 'overpriced' in the market.

Financing the acquisition can be quite challenging where the acquisition is an LBO. Many times, strong companies plan to shore up their long-term funds subsequent to the takeover. The immediate funding is accomplished with bridge financing.

5. TAKEOVER DEFENSIVE TACTICS

Normally acquisitions are made friendly, however when the process of acquisition is unfriendly (i.e., hostile) such acquisition is referred to as 'takeover'. Hostile takeover arises when the Board of Directors of the acquiring company decide to approach the shareholders of the target company directly through a Public Announcement (Tender Offer) to buy their shares consequent to the rejection of the offer made to the Board of Directors of the target company.

5.1 Take Over Strategies

Other than Tender Offer the acquiring company can also use the following techniques:

- Street Sweep: This refers to the technique where the acquiring company accumulates larger number of shares in a target before making an open offer. The advantage is that the target

company is left with no choice but to agree to the proposal of acquirer for takeover.

- **Bear Hug:** When the acquirer threatens the target company to make an open offer, the board of target company agrees to a settlement with the acquirer for change of control.
- **Strategic Alliance:** This involves disarming the acquirer by offering a partnership rather than a buyout. The acquirer should assert control from within and takeover the target company.
- **Brand Power:** This refers to entering into an alliance with powerful brands to displace the target's brands and as a result, buyout the weakened company.

5.2 Defensive Tactics

A target company can adopt a number of tactics to defend itself from hostile takeover through a tender offer.

- **Divestiture** - In a divestiture the target company divests or spins off some of its businesses in the form of an independent, subsidiary company. Thus, reducing the attractiveness of the existing business to the acquirer.
- **Crown jewels** - When a target company uses the tactic of divestiture it is said to sell the crown jewels. In some countries such as the UK, such tactic is not allowed once the deal becomes known and is unavoidable.
- **Poison pill** - The tactics used by the acquiring company to make itself unattractive to a potential bidder is called poison pills. For instance, the acquiring company may issue substantial amount of convertible debentures to its existing shareholders to be converted at a future date when it faces a takeover threat. The task of the bidder would become difficult since the number of shares having voting control of the company increases substantially.
- **Poison Put** - In this case the target company issues bonds that encourage the holder to cash in at higher prices. The resultant cash drainage would make the target unattractive.
- **Greenmail** - Greenmail refers to an incentive offered by management of the target company to the potential bidder for not pursuing the takeover. The management of the target company may offer the acquirer a higher price for its shares than the market price.
- **White knight** - In this a target company offers to be acquired by a friendly company to escape from a hostile takeover. The possible motive for the management of the target company to do so is not to lose the management of the company as the hostile acquirer may change the management.
- **White squire** - This strategy is essentially the same as white knight and involves sell out of shares to a company that is not interested in the takeover. Consequently, the management of the target company retains its control over the company.

- **Golden parachutes** - When a company offers hefty compensations to its managers if they get ousted due to takeover, the company is said to offer golden parachutes. This reduces acquirer's interest for takeover.
- **Pac-man defence** - This strategy aims at the target company making a counter bid for the acquirer company. This would force the acquirer to defend itself and consequently may call off its proposal for takeover.

It is needless to mention that hostile takeovers, as far as possible, should be avoided as they are more difficult to consummate. In other words, friendly takeover is a better course of action to follow.

6. REVERSE MERGER

In ordinary cases, the company taken over is the smaller company; in a 'reverse takeover', a smaller company gains control of a larger one. The concept of takeover by reverse bid, or of reverse merger, is thus not the usual case of amalgamation of a sick unit which is non-viable with a healthy or prosperous unit but is a case whereby the entire undertaking of the healthy and prosperous company is to be merged and vested in the sick company which is non-viable. A company becomes a sick industrial company when there is erosion in its net worth. This alternative is also known as taking over by reverse bid.

The three tests to be fulfilled before an arrangement can be termed as a reverse takeover are specified as follows:

- (i) the assets of the transferor company are greater than the transferee company,
- (ii) equity capital to be issued by the transferee company pursuant to the acquisition exceeds its original issued capital, and
- (iii) the change of control in the transferee company through the introduction of a minority holder or group of holders.

This type of merger is also known as 'back door listing'. This kind of merger has been started as an alternative to go for public issue without incurring huge expenses and passing through the cumbersome process. Thus, it can be said that reverse merger leads to the following benefits for the acquiring company:

- Easy access to capital market.
- Increase in visibility of the company in corporate world.
- Tax benefits on carry forward losses acquired (public) company.
- Cheaper and easier route to become a public company.

7. DIVESTITURE

It means a company selling one of the portions of its divisions or undertakings to another company or creating an altogether separate company. There are various reasons for divestment or demerger viz.,

- (i) To pay attention on core areas of business;
- (ii) The Division's/business may not be sufficiently contributing to the revenues;
- (iii) The size of the firm may be too big to handle;
- (iv) The firm may be requiring cash urgently in view of other investment opportunities.

7.1 Seller's Perspective

It is necessary to remember that for every buyer there must be a seller. Although the methods of analysis for selling are the same as for buying, the selling process is termed **divestiture**. The decision to sell a company is at least as important as buying one but selling generally lacks the kind of planning that goes into buying. Quite often, the decision and the choice of the buyer is arbitrary, resulting in a raw deal for the selling company's shareholders. It is important to understand that selling needs the same skillset required for buying. At some point of time the executives of a company may have to take the decision to divest a division There is nothing wrong in selling a division if it is worth more to someone else. The decision to sell may be prompted by poor growth prospects for a division or consolidation in the industry. Given the fact that the need to sell may arise any time, it makes sense for executives to be prepared. More specifically, executives need to know their company's worth. Consideration may be given to strengths and weakness in production, marketing, general management, value of synergy to potential buyers, value of brand equity, skill base of the organization, etc.

To summarise, the following are some of the 'sell-side' imperatives.

- Competitor's pressure is increasing.
- Sale of company seems to be inevitable because company is facing serious problems like:
 - No access to new technologies and developments
 - Strong market entry barriers. Geographical presence could not be enhanced
 - Badly positioned on the supply and/or demand side
 - Critical mass could not be realised
 - Inefficient utilisation of distribution capabilities
 - New strategic business units for future growth could not be developed
 - Not enough capital to complete the project

- Window of opportunity: Possibility to sell the business at an attractive price
- Focus on core competencies
- In the best interest of the shareholders – where a large well known firm brings-up the proposal, the target firm may be more than willing to give-up.

7.2 Different Forms

Different ways of divestment or demerger or divestitures are as follows:

7.2.1 Sell off / Partial Sell off

A sell off is the sale of an asset, factory, division, product line or subsidiary by one entity to another for a purchase consideration payable either in cash or in the form of securities. Partial Sell off, is a form of divestiture, wherein the firm sells its business unit or a subsidiary to another because it is deemed to be unfit with the company's core business strategy.

Normally, sell-offs are done because the subsidiary doesn't fit into the parent company's core strategy. The market may be undervaluing the combined businesses due to a lack of synergy between the parent and the subsidiary. So, the management and the board decide that the subsidiary is better off under a different ownership. Besides getting rid of an unwanted subsidiary, sell-offs also raise cash, which can be used to pay off debts. In the late 1980s and early 1990s, corporate raiders used debt to finance acquisitions. Then, after making a purchase they used to sell-off its subsidiaries to raise cash to service the debt. The raiders' method certainly makes sense if the sum of the parts is greater than the whole. When it isn't, deals are unsuccessful.

7.2.2 Spin-off

In this case, a part of the business is separated and created as a separate firm. The existing shareholders of the firm get proportionate ownership. So, there is no change in ownership and the same shareholders continue to own the newly created entity in the same proportion as previously in the original firm. The management of spin-off division is however, parted with. Spin-off does not bring fresh cash. The reasons for spin off may be:

- (i) To give separate identity to a part/division.
- (ii) To avoid the takeover attempt by a predator by making the firm unattractive to him since a valuable division is spun-off.
- (iii) To create separate Regulated and unregulated lines of business.

Example: Kishore Biyani led Future Group spin off its consumer durables business, Ezone, into a separate entity in order to maximise value from it.

7.2.3 Split-up

This involves breaking up of the entire firm into a series of spin off (by creating separate legal entities). The parent firm no longer legally exists and only the newly created entities survive. For

instance, a corporate firm has 4 divisions namely A, B, C, D. All these 4 divisions shall be split-up to create 4 new corporate firms with full autonomy and legal status. The original corporate firm is to be wound up. Since de-merged units are relatively smaller in size, they are logistically more convenient and manageable. Therefore, it is understood that spin-off and split-up are likely to enhance shareholders value and bring efficiency and effectiveness.

7.2.4 Equity Carve outs

This is like spin off, however, some shares of the new company are sold in the market by making a public offer, so this brings cash. More and more companies are using equity carve-outs to boost shareholder value. A parent firm makes a subsidiary public through an initial public offering (IPO) of shares, amounting to a partial sell-off. A new publicly listed company is created, but the parent keeps a controlling stake in the newly traded subsidiary.

A carve-out is a strategic avenue a parent firm may take when one of its subsidiaries is growing faster and carrying higher valuations than other businesses owned by the parent. A carve-out generates cash because shares in the subsidiary are sold to the public, but the issue also unlocks the value of the subsidiary unit and enhances the parent's shareholder value.

The new legal entity of a carve-out has a separate board, but in most carve-outs, the parent retains some control over it. In these cases, some portion of the parent firm's board of directors may be shared. Since the parent has a controlling stake, meaning that both firms have common shareholders, the connection between the two is likely to be strong. That said, sometimes companies carve-out a subsidiary not because it is doing well, but because it is a burden. Such an intention won't lead to a successful result, especially if a carved-out subsidiary is too loaded with debt or trouble, even when it was a part of the parent and lacks an established track record for growing revenues and profits.

7.2.5 Demerger or Division of Family-Managed Business

Around 80 per cent of private sector companies in India are family-managed companies. The family-owned companies are, under extraordinary pressure to yield control to professional managements, as, in the emerging scenario of a liberalised economy the capital markets are broadening, with attendant incentives for growth. So, many of these companies are arranging to hive off their unprofitable businesses or divisions with a view to meeting a variety of succession problems.

Even otherwise, a group of such family-managed companies may undertake restructuring of its operations with a view also to consolidating its core businesses. For this, the first step that may need to be taken is to identify core and non-core operations within the group. The second step may involve reducing interest burden through debt restructuring along with sale of surplus assets. The proceeds from the sale of assets may be employed for expanding by acquisitions and rejuvenation of its existing operations. The bottom line is that an acquisition must improve economies of scale, lower the cost of production, and generate and promote synergies. Besides acquisitions, therefore, the group may necessarily have to take steps to improve productivity of its existing operations.

8. FINANCIAL RESTRUCTURING

Financial restructuring refers to the kind of internal changes made by the management in Assets and Liabilities of a company with the consent of its various stakeholders. This is a suitable mode of restructuring for corporate entities who have suffered from sizeable losses over a period of time. Consequent upon losses the share capital or net worth of such companies get substantially eroded. In fact, in some cases, the accumulated losses are even more than the share capital and thus leads to negative net worth, putting the firm on the verge of liquidation. In order to revive such firms, financial restructuring is one of the techniques that brings health into such firms having potential and promise for better financial performance in the years to come. To achieve this desired objective, such firms need to re-start with a fresh balance sheet free from losses and fictitious assets and show share capital at its true worth.

To nurse back such firms a plan of restructuring needs to be formulated involving a number of legal formalities (which includes consent of court, and other stake-holders viz., creditors, lenders and shareholders etc.). An attempt is made to do refinancing and rescue financing. In restructuring normally equity shareholders make the maximum sacrifice by foregoing certain accrued benefits, followed by preference shareholders and debenture holders, lenders, and creditors etc. The sacrifice may be in the form of waving a part of the sum payable to various liability holders. The foregone benefits may be in the form of new securities with lower coupon rates to reduce future liabilities. The sacrifice may also lead to the conversion of debt into equity. Sometime, creditors, apart from reducing their claim, may also agree to convert their dues into securities to avert pressure of payment. These measures will lead to better financial liquidity. The financial restructuring leads to significant changes in the financial obligations and capital structure of a corporate firm, leading to a change in the financing pattern, ownership and control and payment of various financial charges.

In a nutshell it may be said that financial restructuring (also known as internal re-construction) is aimed at reducing the debt/payment burden of the corporate firm. This results into:

- (i) Reduction/Waiver in the claims from various stakeholders;
- (ii) Real worth of various properties/assets by revaluing them timely;
- (iii) Utilizing profit accruing on account of appreciation of assets to write off accumulated losses and fictitious assets (such as preliminary expenses and cost of issue of shares and debentures) and creating provision for bad and doubtful debts. In practice, the financial restructuring scheme is drawn in such a way that all the above requirements of write off are duly met. The following illustration is a good example of financial restructuring.

Illustration 1

The following is the Balance-sheet of XYZ Ltd. as on March 31st, 2013.

(₹ in lakh)			
Liabilities	Amount	Assets	Amount
6 lakh Equity Shares of ₹100/- each	600	Land & Building	200
2 Lakh 14% Preference shares of ₹100/- each	200	Plant & Machinery	300
13% Debentures	200	Furniture & Fixtures	50
Debenture Interest accrued and Payable	26	Inventory	150
Loan from Bank	74	Sundry debtors	70
Trade Creditors	300	Cash at Bank	130
		Preliminary Expenses	10
		Cost of Issue of debentures	5
		Profit & Loss A/c	485
	1,400		1,400

The Company did not perform well and has suffered sizable losses during the last few years. However, it is now felt that the company can be nursed back to health by proper financial restructuring and consequently the following scheme of reconstruction has been devised:

- (i) Equity shares are to be reduced to ₹ 25/- per share, fully paid up;
- (ii) Preference shares are to be reduced (with Dividend rate of 10%) to equal number of shares of ₹50 each, fully paid up.
- (iii) Debenture holders have agreed to forego interest accrued to them. Beside this, they have agreed to accept new debentures carrying a coupon rate of 9%.
- (iv) Trade creditors have agreed to forgo 25 per cent of their existing claim; for the balance sum they have agreed to convert their claims into equity shares of ₹ 25/- each.
- (v) In order to make payment for bank loan and augment the working capital, the company issues 6 lakh equity shares at ₹ 25/- each; the entire sum is required to be paid on application. The existing shareholders have agreed to subscribe to the new issue.
- (vi) While Land and Building is to be revalued at ₹ 250 lakh, Plant & Machinery is to be written down to ₹ 104 lakh. A provision amounting to ₹ 5 lakh is to be made for bad and doubtful debts.

You are required to show the impact of financial restructuring/re-construction. Also, prepare the new balance sheet assuming the scheme of re-construction is implemented in letter and spirit.

Solution

Impact of Financial Restructuring

(i) Benefits to XYZ Ltd.

		₹ in lakhs
(a)	Reduction of liabilities payable	
	Reduction in Equity Share capital (6 lakh shares x ₹75 per share)	450
	Reduction in Preference Share capital (2 lakh shares x ₹50 per share)	100
	Waiver of outstanding Debenture Interest	26
	Waiver from Trade Creditors (₹300 lakhs x 0.25)	<u>75</u>
		651
(b)	Revaluation of Assets	
	Appreciation of Land and Building (₹250 lakhs - ₹200 lakhs)	<u>50</u>
		<u>701</u>

(ii) Amount of ₹ 701 lakhs utilized to write off losses, fictitious assets and over- valued assets.

		₹ in lakhs
	Writing off Profit and Loss account	485
	Cost of issue of debentures	5
	Preliminary expenses	10
	Provision for bad and doubtful debts	5
	Revaluation of Plant and Machinery (₹300 lakhs – ₹104 lakhs)	<u>196</u>
		<u>701</u>

Balance sheet of XYZ Ltd as at _____ (after re-construction)

(₹ in lakhs)

Liabilities	Amount	Assets	Amount
21 lakhs Equity Shares of ₹25/- each	525	Land & Building	250
2 lakhs 10% Preference shares of ₹50/- each	100	Plant & Machinery	104
9% Debentures	200	Furnitures & Fixtures	50
		Inventory	150
		Sundry debtors	70
			<u>-5</u>
			65

		Cash-at-Bank (Balancing figure)*	206
	825		825

*Opening Balance of ₹ 130/- lakhs + Sale proceeds from issue of new equity shares ₹ 150/- lakhs – Payment of bank loan of ₹ 74/- lakhs = ₹ 206 lakhs.

It is worth mentioning that financial restructuring is unique in nature and is company specific. It is carried out, in practice when all shareholders sacrifice and understand that the restructured firm (reflecting its true value of assets, capital and other significant financial parameters) can now be nursed back to health. This type of corporate restructuring helps in the revival of firms that otherwise would have faced closure/liquidation.

9. OWNERSHIP RESTRUCTURING

9.1 Going Private

This refers to the situation wherein a listed company is converted into a private company by buying back all the outstanding shares from the markets.

Example:

The Essar group successfully completed Essar Energy Plc delisting process from London Stock Exchange in 2014.

Going private is a transaction or a series of transactions that convert a publicly traded company into a private entity. Once a company goes private, its shareholders are no longer able to trade their stocks in the open market.

A company typically goes private when its stakeholders decide that there are no longer significant benefits to be garnered as a public company. Privatization will usually arise either when a company's management wants to buy out the public shareholders and take the company privately (a management buyout), or when a company or individual makes a tender offer to buy most or all of the company's stock. Going private transactions generally involve a significant amount of debt.

9.2 Management Buyouts

Buyouts initiated by the management team of a company are known as management buyouts. In this type of acquisition, the company is bought by its own management team.

MBOs are considered as a useful strategy for exiting those divisions that do not form part of core business of the entity.

9.3 Leveraged Buyout (LBO)

An acquisition of a company or a division of another company which is financed entirely or partially (50% or more) using borrowed funds is termed as a leveraged buyout. The target company no longer

remains public after the leveraged buyout; hence the transaction is also known as going private. The deal is usually secured by the acquired firm's physical assets.

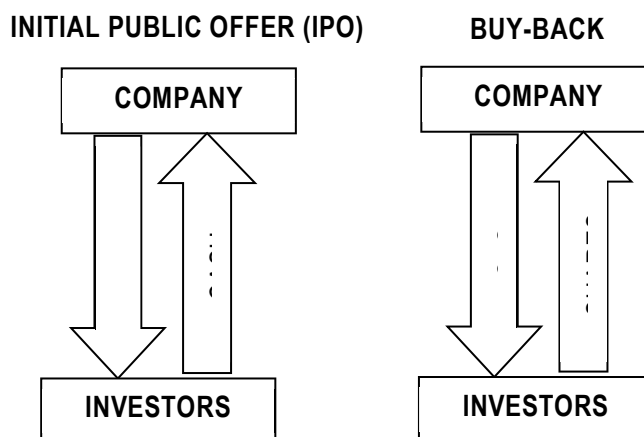
The intention behind an LBO transaction is to improve the operational efficiency of a firm and increase the volume of its sales, thereby increasing the cash flow of the firm. This extra cash flow generated will be used to pay back the debt in LBO transaction. After an LBO, the target entity is managed by private investors, which makes it easier to have a close control over its operational activities. The LBOs do not stay permanent. Once the LBO is successful in increasing its profit margin and improving its operational efficiency, the debt is paid back and it will go public again. Companies that are in a leading market position with proven demand for product, have a strong management team, strong relationships with key customers and suppliers and steady growth are likely to become the target for LBOs. In India the first LBO took place in the year 2000 when Tata Tea acquired Tetley in the United Kingdom. The deal value was ₹ 2135 crores out of which almost 77% was financed by the company using debt. The intention behind this deal was to get direct access to Tetley's international market. One of the largest LBO deals in terms of deal value (7.6 billion) by an Indian company is the buyout of Corus by Tata Steel.

9.4 Equity buyback

This refers to the situation wherein a company buys back its own shares back from the market. This results in reduction in the equity capital of the company. This strengthens the promoter's position by increasing his stake in the equity of the company.

The buyback is a process in which a company uses its surplus cash to buy shares from the public. It is almost the opposite of initial public offer in which shares are issued to the public for the first time. In buyback, shares which have already been issued are bought back from the public and once the shares are bought back, they get absorbed and cease to exist.

For example, a company has one crore outstanding shares and owing a huge cash pile of ₹ 5 crores. Since, the company has very limited investment options it decides to buy back some of its outstanding shares from the shareholders, by utilizing some portion of its surplus cash. Accordingly, it purchases 10 lakh shares from the existing shareholders by paying ₹ 20 per share utilizing total cash of ₹ 2 crore. The process of buyback can be shown with the help of following diagram:



Example

Cairn India bought back 3.67 crores shares and spent nearly ₹ 1230 crores by May 2014.

Effects of Buyback

There are several effects or consequences of buyback some of which are as follows:

- (i) It increases the proportion of shares owned by controlling shareholders as the number of outstanding shares decreases after the buyback.
- (ii) Earning Per Share (EPS) escalates as the number of shares reduces leading the market price of shares to step up.
- (iii) A share repurchase also effects a company's financial statements as follows:
 - (a) In balance sheet, a share buyback will reduce the company's total assets position as cash holdings will be reduced and consequently as shareholders' equity reduced it results in reduction on the liabilities side by the same amount.
 - (b) Amount spent on share buybacks shall be shown in Statement of Cash Flows in the "Financing Activities" section, as well as from the Statement of Changes in Equity or Statement of Retained Earnings.
- (iv) Ratios based on performance indicators such as Return on Assets (ROA) and Return on Equity (ROE) typically improve after a share buyback. This can be understood with the help of following Statement showing Buyback Effect of a hypothetical company using ₹ 1.50 crore of cash out of total cash of ₹ 2.00 for buyback.

	Before Buyback	After Buyback (₹)
Cash (₹)	2,00,00,000	50,00,000
Assets (₹)	5,00,00,000	3,50,00,000
Earnings (₹)	20,00,000	20,00,000
No. of Shares outstanding (Nos.)	10,00,000	9,00,000
Return on Assets (%)	4.00%	5.71%
Earnings Per Share (EPS) (₹)	2.00	2.22

As visible from the above figure, the company's cash pile has been reduced from ₹ 2 crore to ₹ 50 lakh after the buyback because cash is an asset, this will lower the total assets of the company from ₹ 5 crore to ₹ 3.5 crore. Now, this leads to an increase in the company's ROA, even though earnings have not changed. Prior to the buyback, its ROA was 4% but after the repurchase, ROA increases to 5.71%. A similar effect can be seen in the EPS, which increases from ₹ 2.00 to ₹ 2.22.

10. UNLOCKING THE VALUE THROUGH MERGERS & ACQUISITIONS AND BUSINESS RESTRUCTURING

The value is unlocked through mergers, acquisitions, and business restructuring because of following reasons:

- Horizontal growth helps to achieve optimum size, enlarge the market share, curb competition and use of unutilised capacity;
- Vertical combination helps to economise costs and eliminate avoidable taxes /duties;
- Diversification of business;
- Mobilising financial resources by utilising the idle funds lying with another company for the expansion of business. (For example, nationalisation of banks provided this opportunity and the erstwhile banking companies merged with industrial companies);
- Merger of an export, investment or trading company with an industrial company or vice versa with a view to increase cash flow;
- Merging subsidiary company with the holding company with a view to improving cash flow;
- Taking over a 'shell' company which may have the necessary industrial licences etc., but whose promoters do not wish to proceed with the project.
- An amalgamation may also be resorted to for the purpose of nourishing a sick unit in the group and this is normally a merger for keeping up the image of the group.
- The business restructuring helps the company in:
 - ❖ Positioning the company to be more competitive,
 - ❖ Surviving an adverse economic climate,
 - ❖ positioning the company into in an entirely new direction.

11. PREMIUM AND DISCOUNT

Premiums and discounts are typically attached to a business valuation, based on the situation. These could be market share premium, controlling stake premium, brand value premium, small player discount or unlisted company discount. In addition, it may be required to work out various potential scenarios in each methodology and arrive at the likely probabilities of each while deriving the values.

Timing is very critical while divesting a business since valuation depends on the timing. Timing of sale is crucial keeping in mind economic cycles (deal valuation takes into consideration GDP growth rates), stock market situations (which would decide market multiples) and global situations (like a war or terrorist attacks).

In times like the above, the price expectations between the buyer and the seller would widely vary. For example, during a bullish stock market, there could be a situation where there are more buyers but not sellers due to the low valuation.

The basis for M&A is the expectation of several future benefits arising out of **synergies** between businesses. There is a risk involved in realizing this synergy value. This could be due to corporate, market, economic reasons, or wrong estimation of the benefits/synergies. A key case in point here is the high valuations at which internet companies were acquired in the year 2000 (such as Satyam Infoway acquisition of India World).

As observed in the chapter on Corporate Valuation it is also important to try and work out valuations from as many of the above methods as possible. Then try to see which methodology is to be taken in and which are to be rejected that helps to derive a range of values for the transaction in different situations in case one is called upon to assist in advising the transaction valuation. Some methods like Net Asset Value or past Earnings Based methods may prove inadequate in case of growing businesses or those with intangible assets.

12. MERGERS AND ACQUISITIONS FAILURES

There are five principal steps in a successful M&A programme.

1. Manage the pre-acquisition phase.
2. Screening candidates.
3. Eliminate those who do not meet the criteria and value the rest.
4. Negotiate.
5. Post-merger integration.

During the pre-acquisition phase, the acquirer should maintain secrecy about its intentions. Otherwise, the resulting price increase due to rumours may kill the deal.

Academic studies indicate that success in creating value through acquisitions in a competitive market is extremely difficult. Jensen and Ruback (1983) highlighted this point by summarizing results from mergers and acquisitions over a period of 11 years. They found that in case of a merger, the average return, around the date of announcement, to shareholders of the acquired company is 20 per cent, whereas the average return to the shareholders of acquiring company is 0 per cent. Another study by McKinsey indicates that 61 per cent of the 116 acquisitions studied were failures, 23 per cent were successes. Despite such statistics why do companies acquire? Why do mergers fail? The reasons for merger failures can be numerous. Some of the key reasons are:

- Acquirers generally overpay.
- The value of synergy is over-estimated.

- Poor post-merger integration; and
- Psychological barriers.

Companies often merge in the fear that the bigger competitors have economies of scale and may destroy them by exercising a stranglehold on raw material supply, distribution etc. What they do not realize is the drawbacks of being big. The acquiring company's executives would have drawn up elaborate plans for the target without consulting its executives which leads to resentment and managerial attrition. This can be avoided by honest discussions with the target company's executives.

Most companies merge with the hope that the benefits of synergy will be realized. Synergy will be there only if the merged entity is managed better after the acquisition than it was managed before. It is the quality of the top management that determines the success of the merger. Quite often the executives of the acquiring company lose interest in the target company due to its smallness. The small company executives get bogged down repairing vision and mission statements, budgets, forecasts, profit plans which were hitherto unheard of. The elaborateness of the control system depends on the size and culture of the company. To make a merger successful:

- Decide what tasks need to be accomplished in the post-merger period,
- Choose managers from both the companies (and from outside),
- Establish performance yardstick and evaluate the managers on that yardstick; and
- Motivate them.

13. ACQUISITION THROUGH SHARES

The acquirer can pay the target company in cash or exchange shares in consideration. The analysis of acquisition for shares is slightly different. The steps involved in the analysis are:

- Estimate the value of acquirer's (self) equity.
- Estimate the value of target company's equity.
- Calculate the maximum number of shares that can be exchanged with the target company's shares; and
- Conduct the analysis for pessimistic and optimistic scenarios.

Exchange ratio is the number of acquiring firm's shares exchanged for each share of the selling firm's stock. Suppose company A is trying to acquire company B's 100,000 shares at ₹ 230. So, the cost of acquisition is ₹ 230,00,000. Company A has estimated its value at ₹ 200 per share. To get one share of company B, A has to exchange $(230/200)$ 1.15 share, or 115,000 shares for 100,000 shares of B. The relative merits of acquisition for cash or shares should be analyzed after giving due consideration to the impact on EPS, capital structure, etc.

Normally, when shares are issued as payment to the selling company's shareholders, stockholders will find the merger desirable only if the value of their shares is higher with the merger than without the merger. The number of shares that the buying company will issue in acquiring the selling company is determined as follows:

- (1) The acquiring company will compare its value per share with and without the merger.
- (2) The selling company will compare its value with the value of shares that they would receive from acquiring company under the merger.
- (3) The managements of acquiring company and selling company will negotiate the final terms of the merger in the light of (1) and (2); the ultimate terms of the merger will reflect the relative bargaining position of the two companies.

The fewer of acquiring company's shares that it issues to the acquired company, the better off the shareholders of the acquiring company are and worse off are the shareholders of acquired company. However, for the merger to be effective, the shareholders of both the acquiring and acquired company will have to anticipate some benefits from the merger even though their share swap deal is subject to synergy risk for both.

Impact of Price Earning Ratio: The reciprocal of cost of equity is Price-Earning (P/E) ratio. The cost of equity, and consequently the P/E ratio reflects risk as perceived by the shareholders. The risk of merging entities and the combined business can be different. In other words, the combined P/E ratio can very well be different from those of the merging entities. Since market value of a business can be expressed as product of earning and P/E ratio ($P/E \times E = P$), the value of combined business is a function of combined earning and combined P/E ratio. A lower combined P/E ratio can offset the gains of synergy or a higher P/E ratio can lead to higher value of business, even if there is no synergy. In ascertaining the exchange ratio of shares due care should be exercised to take the possible combined P/E ratio into account.

Illustration 2

Company X is contemplating the purchase of Company Y, Company X has 3,00,000 shares having a market price of ₹ 30 per share, while Company Y has 2,00,000 shares selling at ₹ 20 per share. The EPS are ₹ 4.00 and ₹ 2.25 for Company X and Y respectively. Managements of both companies are discussing two alternative proposals for exchange of shares as indicated below:

- (i) in proportion to the relative earnings per share of two companies.
- (ii) 0.5 share of Company X for one share of Company Y (0.5:1).

You are required:

- (i) to calculate the Earnings Per share (EPS) after merger under two alternatives; and
- (ii) to show the impact of EPS for the shareholders of two companies under both the alternatives.

Solution**Working Notes:** Calculation of total earnings after merger

Particulars	Company X	Company Y	Total
Outstanding shares	3,00,000	2,00,000	
EPS (₹)	4	2.25	
Total earnings (₹)	12,00,000	4,50,000	16,50,000

- (i) (a) Calculation of EPS when exchange ratio is in proportion to relative EPS of two companies

Company X		3,00,000
Company Y	$2,00,000 \times 2.25/4$	1,12,500
Total number of shares after merger		4,12,500

Company X

EPS before merger	= ₹ 4
EPS after merger = ₹ 16,50,000/4,12,500 shares	= ₹ 4

Company Y

EPS before merger	= ₹ 2.25
EPS after merger	
= EPS of Merged Entity after merger x Share Exchange ratio on EPS basis = ₹ $4 \times \frac{2.25}{4}$	= ₹ 2.25

- (b) Calculation of EPS when share exchange ratio is 0.5 : 1

Total earnings after merger = ₹ 16,50,000

Total number of shares after merger = 3,00,000 + (2,00,000 x 0.5) = 4,00,000 shares

EPS after merger = ₹ 16,50,000/4,00,000 = ₹ 4.125

- (ii) Impact of merger on EPS for shareholders of Company X and Company Y

- (a) Impact on Shareholders of Company X

	(₹)
EPS before merger	4.000
EPS after merger	4.125
Increase in EPS	0.125

(b) Impact on Shareholders of Company Y

	(₹)
Equivalent EPS before merger	2.2500
Equivalent EPS after merger	2.0625
Decrease in EPS	0.1875

Illustration 3

A Ltd. is studying the possible acquisition of B Ltd. by way of merger. The following data are available:

Firm	After-tax earnings	No. of equity shares	Market price per share
A Ltd.	₹ 10,00,000	2,00,000	₹ 75
B Ltd.	₹ 3,00,000	50,000	₹ 60

- (i) If the merger goes through by exchange of equity shares and the exchange ratio is set according to the current market prices, what is the new earnings per share for A Ltd.
- (ii) B Ltd. wants to be sure that its earning per share is not diminished by the merger. What exchange ratio is relevant to achieve the objective?

Solution

- (i) The current market price is the basis of exchange of equity shares, in the proposed merger, shareholders of B Ltd. will get only 40,000 shares in all or 4 shares of A Ltd. for every 5 shares held by them, i.e.,

$$\frac{50,000 \times 60}{75} = 40,000$$

The total number of shares in A Ltd. will then be 2,40,000 and, ignoring any synergistic effect, the profit will be ₹ 13,00,000. The new earning per share (EPS) of A Ltd. will be ₹ 5.42, i.e., ₹ 13,00,000/2,40,000.

- (ii) The present earnings per share of B Ltd. is ₹6/- (₹ 3,00,000 ÷ 50,000) and that of A Ltd. is ₹5/-, i.e., ₹ 10,00,000 ÷ 2,00,000. If B Ltd. wants to ensure that, even after merger, the earning per share of its shareholders should remain unaffected, then the exchange ratio will be 6 shares for every 5 shares.

The total number of shares of A Ltd. that will produce ₹ 3,00,000 profit is 60,000, (3,00,000 ÷ 5), to be distributed among, shareholders of B Ltd., giving a ratio of 6 shares in A for 5 shares in B.

Proof:

The shareholders of B Ltd. will get in all 60,000 share for 50,000 shares. It means after merger, their earning per share will be ₹ 5/-, i.e. $\frac{₹ 13,00,000}{2,60,000}$.

In all they will get ₹ 3,00,000, i.e., 60,000 x 5, as before.

Illustration 4

Simpson Ltd. is considering a merger with Wilson Ltd. The data below are in the hands of both Board of Directors. The issue at hand is how many shares of Simpson should be exchanged for Wilson Ltd. Both boards are considering three possibilities 20,000, 25,000 and 30,000 shares. You are required to construct a table demonstrating the potential impact of each scheme on each set of shareholders:

		Simpson Ltd.	Wilson Ltd.	Combined Post merger Firm 'A'
1.	Current earnings per year	2,00,000	1,00,000	3,50,000
2.	Shares outstanding	50,000	10,000	?
3.	Earnings per share (₹) (1 ÷ 2)	4	10	?
4.	Price per share (₹)	40	100	?
5.	Price-earning ratio [4 ÷ 3]	10	10	10
6.	Value of firm (₹)	20,00,000	10,00,000	35,00,000
7.	Expected Annual growth rate in earnings in foreseeable future	0	0	0

Solution

The following table demonstrates the potential impact of the three possible schemes, on each set of shareholders:-

Number of Simpson Ltd.'s shares issued to shareholders of Wilson Ltd.	Exchange ratio [(1)/10,000 shares of Wilson Ltd.]	Number of Simpson Ltd.'s shares outstanding after merger [50,000+(1)]	Fraction of Simpson Ltd. (Post merger) owned by Wilson Ltd.'s shareholders [(1)/(3)]	Value of shares owned by Wilson Ltd.'s shareholders [(4)x 35,00,000]	Fraction of Simpson Ltd. (combined Post-merger owned by Simpson Ltd.'s shareholders [50,000/(3)]	Value of shares owned by Simpson Ltd.'s shareholders [(6) x 35,00,000]
(1)	(2)	(3)	(4)	(5)	(6)	(7)
20,000	2	70,000	2/7	10,00,000	5/7	25,00,000
25,000	2.5	75,000	1/3	11,66,667	2/3	23,33,333
30,000	3	80,000	3/8	13,12,500	5/8	21,87,500

14. CROSS-BORDER M&A

Cross-border M&A is a popular route for global growth and overseas expansion. Cross-border M&A is also playing an important role in global M&A. This is especially true for developing countries such as India. Kaushik Chatterjee, CFO, of Tata Steel in an interview with McKinsey Quarterly in September 2009 articulates this point very clearly. To the following question

The Quarterly: Last year was the first in which Asian and Indian companies acquired more businesses outside of Asia than European or US multinationals acquired within it. What's behind the Tata Group's move to go global?

His response is as follows:-

“India is clearly a very large country with a significant population and a big market, and the Tata Group's companies in a number of sectors have a pretty significant market share. India remains the main base for future growth for Tata Steel Group, and we have substantial investment plans in India, which are currently being pursued but meeting our growth goals through organic means in India, unfortunately, is not the fastest approach, especially for large capital projects, due to significant delays on various fronts. Nor are there many opportunities for growth through acquisitions in India, particularly in sectors like steel, where the value to be captured is limited—for example, in terms of technology, product profiles, the product mix, and good management.”

Other major factors that motivate multinational companies to engage in cross-border M&A in Asia include the following:

- Globalization of production and distribution of products and services.
- Integration of global economies.
- Expansion of trade and investment relationships on international level.
- Many countries are reforming their economic and legal systems and providing generous investment and tax incentives to attract foreign investment.
- Privatization of state-owned enterprises and consolidation of the banking industry.

15. SPECIAL PURPOSE ACQUISITION COMPANIES

In recent times, the concept of Special Purpose Acquisition Companies (SPACs) has come into existence wherein an entity is set up with the objective to raise funds through an IPO to finance a merger or acquisition of an unidentified target within a specific time. It is commonly known as a blank cheque company.

The main objective of SPAC is to raise money, despite not having any operations or revenues. The money raised from the public is kept in an escrow account, which can be accessed while making the acquisition. However, in case the acquisition is not made within stipulated period of the IPO, the

SPAC is delisted, and the money is returned to the investors. Shareholders have the option to redeem their shares if they are not interested in participating in the proposed merger. Finally, if the merger is approved by shareholders, it is executed, and the target private company or companies become public entities. Once a formal merger agreement has been executed the SPAC target is usually publicly announced.

New investment opportunities in Indian companies have resurfaced and have set up new platform for SPAC transactions. The implementation of SPACs might face certain challenges since India does not have a specific regulatory framework guarding these transactions.

The current regulatory framework in India does not support the SPAC transactions. Further as per the Companies Act, 2013, the Registrar of Companies is authorized to strike-off the name of companies that do not commence operation within one year of incorporation. SPACs generally take 2 to 3 years to identify a target and performing due diligence and before it could get operationalized its name can be stricken off and hence enabling provisions relating to SPAC need to be inserted in the Companies Act in order to make it functional in India.

Though, SPACs do not find acceptance under the Securities and Exchange Board of India (SEBI) Act as it does not meet the eligibility criteria for public listing however SEBI is planning to come out with a framework for SPACs.

The International Financial Services Centres Authority (IFSCA), being the regulatory authority for development and regulation of financial services, financial products and financial institutions in the Gujarat International Finance Tec-City, has recently released a consultation paper defining critical parameters such as offer size to public, compulsory sponsor holding, minimum application size, minimum subscription of the offer size, etc.

SPAC approach offers several advantages over traditional IPO, such as providing companies access to capital, even when market volatility and other conditions limit liquidity. SPACs help to lower the transaction fees as well as expedite the timeline in becoming a public company. Raising money through a SPAC is easier as compared to traditional IPO since the SPAC has already raised money through an IPO. This implies the company in question only has to negotiate with a single entity, as opposed to thousands of individual investors. This makes the process of fundraising a lot easier and quicker than an IPO. The involvement of skilled professionals in identifying the target makes the investment a well thought and a well governed process.

However, the merger of a SPAC with a target company presents several challenges, such as complex accounting and financial reporting/registration requirements, to meet a public company readiness timeline and being ready to operate as a public company within a period of three to five months of signing a letter of intent.

It is typically more expensive for a company to raise money through a SPAC than an IPO. Investors' money invested in a SPAC trust to earn a suitable return for up to two years, could be put to better use elsewhere.

TEST YOUR KNOWLEDGE

Theoretical Questions

1. Explain synergy in the context of Mergers and Acquisitions.
2. What is take over by reverse bid or Reverse Merger.
3. What is an equity curve out? How does it differ from a spin off.
4. Write a short note on Horizontal Merger and Vertical Merger.

Practical Questions

1. B Ltd. is a highly successful company and wishes to expand by acquiring other firms. Its expected high growth in earnings and dividends is reflected in its PE ratio of 17. The Board of Directors of B Ltd. has been advised that if it were to take over firms with a lower PE ratio than it own, using a share-for-share exchange, then it could increase its reported earnings per share. C Ltd. has been suggested as a possible target for a takeover, which has a PE ratio of 10 and 1,00,000 shares in issue with a share price of ₹ 15. B Ltd. has 5,00,000 shares in issue with a share price of ₹ 12.

Calculate the change in earnings per share of B Ltd. if it acquires the whole of C Ltd. by issuing shares at its market price of ₹12. Assume the price of B Ltd. shares remains constant.

2. Elrond Limited plans to acquire Doom Limited. The relevant financial details of the two firms prior to the merger announcement are:

	Elrond Limited	Doom Limited
Market price per share	₹ 50	₹ 25
Number of outstanding shares	20 lakhs	10 Lakhs

The merger is expected to generate gains, which have a present value of ₹200 lakhs. The exchange ratio agreed to is 0.5.

What is the true cost of the merger from the point of view of Elrond Limited?

3. MK Ltd. is considering acquiring NN Ltd. The following information is available:

Company	Earning after Tax (₹)	No. of Equity Shares	Market Value Per Share (₹)
MK Ltd.	60,00,000	12,00,000	200.00
NN Ltd.	18,00,000	3,00,000	160.00

Exchange of equity shares for acquisition is based on current market value as above. There is no synergy advantage available.

- (i) Find the earning per share for company MK Ltd. after merger, and
- (ii) Find the exchange ratio so that shareholders of NN Ltd. would not be at a loss.

4. ABC Ltd. is intending to acquire XYZ Ltd. by merger and the following information is available in respect of the companies:

	ABC Ltd.	XYZ Ltd.
Number of equity shares	10,00,000	6,00,000
Earnings after tax (₹)	50,00,000	18,00,000
Market value per share (₹)	42	28

Required:

- What is the present EPS of both the companies?
 - If the proposed merger takes place, what would be the new earning per share for ABC Ltd.? Assume that the merger takes place by exchange of equity shares and the exchange ratio is based on the current market price.
 - What should be exchange ratio, if XYZ Ltd. wants to ensure the earnings to members are same as before the merger takes place?
5. The CEO of a company thinks that shareholders always look for EPS. Therefore, he considers maximization of EPS as his company's objective. His company's current Net Profits are ₹ 80.00 lakhs and P/E multiple is 10.5. He wants to buy another firm which has current income of ₹ 15.75 lakhs & P/E multiple of 10.

What is the maximum exchange ratio which the CEO should offer so that he could keep EPS at the current level, given that the current market price of both the acquirer and the target company are ₹ 42 and ₹ 105 respectively?

If the CEO borrows funds at 15% and buys out Target Company by paying cash, how much cash should he offer to maintain his EPS? Assume tax rate of 30%.

6. A Ltd. wants to acquire T Ltd. and has offered a swap ratio of 1:2 (0.5 shares for every one share of T Ltd.). Following information is provided:

	A Ltd.	T. Ltd.
Profit after tax	₹18,00,000	₹3,60,000
Equity shares outstanding (Nos.)	6,00,000	1,80,000
EPS	₹3	₹2
PE Ratio	10 times	7 times
Market price per share	₹30	₹14

Required:

- The number of equity shares to be issued by A Ltd. for acquisition of T Ltd.
- What is the EPS of A Ltd. after the acquisition?

- (iii) Determine the equivalent earnings per share of T Ltd.
 - (iv) What is the expected market price per share of A Ltd. after the acquisition, assuming its PE multiple remains unchanged?
 - (v) Determine the market value of the merged firm.
7. The following information is provided related to the acquiring Firm Mark Limited and the target Firm Mask Limited:

	Firm Mark Limited	Firm Mask Limited
Earning after tax (₹)	2,000 lakhs	400 lakhs
Number of shares outstanding	200 lakhs	100 lakhs
P/E ratio (times)	10	5

Required:

- (i) What is the Swap Ratio based on current market prices?
 - (ii) What is the EPS of Mark Limited after acquisition?
 - (iii) What is the expected market price per share of Mark Limited after acquisition, assuming P/E ratio of Mark Limited remains unchanged?
 - (iv) Determine the market value of the merged firm.
 - (v) Calculate gain/loss for shareholders of the two independent companies after acquisition.
8. XYZ Ltd. wants to purchase ABC Ltd. by exchanging 0.7 of its share for each share of ABC Ltd. Relevant financial data are as follows:

Equity shares outstanding	10,00,000	4,00,000
EPS (₹)	40	28
Market price per share (₹)	250	160

- (i) Illustrate the impact of merger on EPS of both the companies.
- (ii) The management of ABC Ltd. has quoted a share exchange ratio of 1:1 for the merger. Assuming that P/E ratio of XYZ Ltd. will remain unchanged after the merger, what will be the gain from merger for ABC Ltd.?
- (iii) What will be the gain/loss to shareholders of XYZ Ltd.?
- (iv) Determine the maximum exchange ratio acceptable to shareholders of XYZ Ltd.

9. XYZ Ltd., is considering merger with ABC Ltd. XYZ Ltd.'s shares are currently traded at ₹ 20. It has 2,50,000 shares outstanding and its earnings after taxes (EAT) amount to ₹ 5,00,000. ABC Ltd., has 1,25,000 shares outstanding; its current market price is ₹ 10 and its EAT are ₹ 1,25,000. The merger will be effected by means of a stock swap (exchange). ABC Ltd., has agreed to a plan under which XYZ Ltd., will offer the current market value of ABC Ltd.'s shares:
- What is the pre-merger earnings per share (EPS) and P/E ratios of both the companies?
 - If ABC Ltd.'s P/E ratio is 6.4, what is its current market price? What is the exchange ratio? What will XYZ Ltd.'s post-merger EPS be?
 - What should be the exchange ratio; if XYZ Ltd.'s pre-merger and post-merger EPS are to be the same?
10. Following information is provided relating to the acquiring company Mani Ltd. and the target company Ratnam Ltd:

	Mani Ltd.	Ratnam Ltd.
Earnings after tax (₹ lakhs)	2,000	4,000
No. of shares outstanding (lakhs)	200	1,000
P/E ratio (No. of times)	10	5

Required:

- What is the swap ratio based on current market prices?
 - What is the EPS of Mani Ltd. after the acquisition?
 - What is the expected market price per share of Mani Ltd. after the acquisition, assuming its P/E ratio is adversely affected by 10%?
 - Determine the market value of the merged Co.
 - Calculate gain/loss for the shareholders of the two independent entities, due to the merger.
11. You have been provided the following Financial data of two companies:

	Krishna Ltd.	Rama Ltd.
Earnings after taxes	₹ 7,00,000	₹ 10,00,000
No. of Equity shares (outstanding)	2,00,000	4,00,000
EPS	3.5	2.5
P/E ratio	10 times	14 times
Market price per share	₹ 35	₹ 35

Company Rama Ltd. is acquiring the company Krishna Ltd., exchanging its shares on a one-to-one basis for company Krishna Ltd. The exchange ratio is based on the market prices of the shares of the two companies.

Required:

- (i) What will be the EPS subsequent to merger?
 - (ii) What is the change in EPS for the shareholders of companies Rama Ltd. and Krishna Ltd.?
 - (iii) Determine the market value of the post-merger firm. PE ratio is likely to remain the same.
 - (iv) Ascertain the profits accruing to shareholders of both the companies.
12. M Co. Ltd. is studying the possible acquisition of N Co. Ltd., by way of merger. The following data are available in respect of the companies:

Particulars	M Co. Ltd.	N Co. Ltd.
Earnings after tax (₹)	80,00,000	24,00,000
No. of equity shares	16,00,000	4,00,000
Market value per share (₹)	200	160

- (i) If the merger goes through by exchange of equity and the exchange ratio is based on the current market price, what is the new earning per share for M Co. Ltd.?
 - (ii) N Co. Ltd. wants to be sure that the earnings available to its shareholders will not be diminished by the merger. What should be the exchange ratio in that case?
13. Longitude Limited is in the process of acquiring Latitude Limited on a share exchange basis. Following relevant data are available:

		Longitude Limited	Latitude Limited
Profit after Tax (PAT)	₹ in Lakhs	120	80
Number of Shares	Lakhs	15	16
Earning per Share (EPS)	₹	8	5
Price Earnings Ratio (P/E Ratio) (Ignore Synergy)		15	10

You are required to determine:

- (i) Pre-merger Market Value per Share, and
- (ii) The maximum exchange ratio Longitude Limited can offer without the dilution of
 - (1) EPS and
 - (2) Market Value per Share

Calculate Ratio/s up to four decimal points and amounts and number of shares up to two decimal points.

14. P Ltd. is considering take-over of R Ltd. by the exchange of four new shares in P Ltd. for every five shares in R Ltd. The relevant financial details of the two companies prior to merger announcement are as follows:

	P Ltd	R Ltd
Profit before Tax (₹ Crore)	15	13.50
No. of Shares (Crore)	25	15
P/E Ratio	12	9
Corporate Tax Rate	30%	

You are required to determine:

- Market value of both the company.
 - Value of original shareholders.
 - Price per share after merger.
 - Effect on share price of both the company if the Directors of P Ltd. expect their own pre-merger P/E ratio to be applied to the combined earnings.
15. Simple Ltd. and Dimple Ltd. are planning to merge. The total value of the companies are dependent on the fluctuating business conditions. The following information is given for the total value (debt + equity) structure of each of the two companies.

Business Condition	Probability	Simple Ltd. ₹ Lacs	Dimple Ltd. ₹ Lacs
High Growth	0.20	820	1050
Medium Growth	0.60	550	825
Slow Growth	0.20	410	590

The current debt of Dimple Ltd. is ₹ 65 lacs and of Simple Ltd. is ₹ 460 lacs.

Calculate the expected value of debt and equity separately for the merged entity.

16. Yes Ltd. wants to acquire No Ltd. and the cash flows of Yes Ltd. and the merged entity are given below:

(₹ In lakhs)					
Year	1	2	3	4	5
Yes Ltd.	175	200	320	340	350
Merged Entity	400	450	525	590	620

Earnings would have witnessed 5% constant growth rate without merger and 6% with merger on account of economies of operations after 5 years in each case. The cost of capital is 15%.

The number of shares outstanding in both the companies before the merger is the same and the companies agree to an exchange ratio of 0.5 shares of Yes Ltd. for each share of No Ltd.

PV factor at 15% for years 1-5 are 0.870, 0.756; 0.658, 0.572, 0.497 respectively.

You are required to:

- (i) Compute the Value of Yes Ltd. before and after merger.
- (ii) Value of Acquisition and
- (iii) Gain to shareholders of Yes Ltd.

17. The following information is provided relating to the acquiring company Efficient Ltd. and the target Company Healthy Ltd.

	Efficient Ltd.	Healthy Ltd.
No. of shares (F.V. ₹ 10 each)	10.00 lakhs	7.5 lakhs
Market capitalization	500.00 lakhs	750.00 lakhs
P/E ratio (times)	10.00	5.00
Reserves and Surplus	300.00 lakhs	165.00 lakhs
Promoter's Holding (No. of shares)	4.75 lakhs	5.00 lakhs

Board of Directors of both the Companies have decided to give a fair deal to the shareholders and accordingly for swap ratio the weights are decided as 40%, 25% and 35% respectively for Earning, Book Value and Market Price of share of each company:

- (i) Calculate the swap ratio and also calculate Promoter's holding % after acquisition.
 - (ii) What is the EPS of Efficient Ltd. after acquisition of Healthy Ltd.?
 - (iii) What is the expected market price per share and market capitalization of Efficient Ltd. after acquisition, assuming P/E ratio of Firm Efficient Ltd. remains unchanged.
 - (iv) Calculate free float market capitalization of the merged firm.
18. Abhiman Ltd. is a subsidiary of Janam Ltd. and is acquiring Swabhiman Ltd. which is also a subsidiary of Janam Ltd. The following information is given :

	Abhiman Ltd.	Swabhiman Ltd.
% Shareholding of promoter	50%	60%
Share capital	₹ 200 lacs	100 lacs
Free Reserves and surplus	₹ 900 lacs	600 lacs
Paid up value per share	₹ 100	10
Free float market capitalization	₹ 500 lacs	156 lacs
P/E Ratio (times)	10	4

Janam Ltd., is interested in doing justice to both companies. The following parameters have been assigned by the Board of Janam Ltd., for determining the swap ratio:

Book value	25%
Earning per share	50%
Market price	25%

You are required to compute

- (i) The swap ratio.
 - (ii) The Book Value, Earning Per Share and Expected Market Price of Swabhiman Ltd., (assuming P/E Ratio of Abhiman remains the same and all assets and liabilities of Swabhiman Ltd. are taken over at book value.)
19. The following information is provided relating to the acquiring company E Ltd., and the target company H Ltd:

Particulars	E Ltd. (₹)	H Ltd. (₹)
Number of shares (Face value ₹ 10 each)	20 Lakhs	15 Lakhs
Market Capitalization	1000 Lakhs	1500 Lakhs
P/E Ratio (times)	10.00	5.00
Reserves and surplus in ₹	600.00 Lakhs	330.00 Lakhs
Promoter's Holding (No. of shares)	9.50 Lakhs	10.00 Lakhs

The Board of Directors of both the companies have decided to give a fair deal to the shareholders. Accordingly, the weights are decided as 40%, 25% and 35% respectively for earnings (EPS), book value and market price of share of each company for swap ratio.

Calculate the following:

- (i) Market price per share, earnings per share and Book Value per share;
 - (ii) Swap ratio;
 - (iii) Promoter's holding percentage after acquisition;
 - (iv) EPS of E Ltd. after acquisitions of H Ltd;
 - (v) Expected market price per share and market capitalization of E Ltd.; after acquisition, assuming P/E ratio of E Ltd. remains unchanged; and
 - (vi) Free float market capitalization of the merged firm.
20. The following information relating to the acquiring Company Abhiman Ltd. and the target Company Abhishek Ltd. are available. Both the Companies are promoted by Multinational

Company, Trident Ltd. The promoter's holding is 50% and 60% respectively in Abhiman Ltd. and Abhishek Ltd.:

	Abhiman Ltd.	Abhishek Ltd.
Share Capital (₹)	200 lakh	100 lakh
Free Reserve and Surplus (₹)	800 lakh	500 lakh
Paid up Value per share (₹)	100	10
Free float Market Capitalisation (₹)	400 lakh	128 lakh
P/E Ratio (times)	10	4

Trident Ltd. is interested to do justice to the shareholders of both the Companies. For the swap ratio weights are assigned to different parameters by the Board of Directors as follows:

Book Value	25%
EPS (Earning per share)	50%
Market Price	25%

- (a) What is the swap ratio based on above weights?
- (b) What is the Book Value, EPS and expected Market price of Abhiman Ltd. after acquisition of Abhishek Ltd. (assuming P.E. ratio of Abhiman Ltd. remains unchanged and all assets and liabilities of Abhishek Ltd. are taken over at book value).
- (c) Calculate:
 - (i) Promoter's revised holding in the Abhiman Ltd.
 - (ii) Free float market capitalization.
 - (iii) Also calculate No. of Shares, Earning per Share (EPS) and Book Value (B.V.), if after acquisition of Abhishek Ltd., Abhiman Ltd. decided to :
 - (1) Issue Bonus shares in the ratio of 1 : 2; and
 - (2) Split the stock (share) as ₹ 5 each fully paid.

21. T Ltd. and E Ltd. are in the same industry. The former is in negotiation for acquisition of the latter. Important information about the two companies as per their latest financial statements is given below:

	T Ltd.	E Ltd.
₹ 10 Equity shares outstanding	12 Lakhs	6 Lakhs
Debt:		
10% Debentures (₹ Lakhs)	580	--
12.5% Institutional Loan (₹ Lakhs)	--	240

Earning before interest, depreciation and tax (EBIDAT) (₹ Lakhs)	400.86	115.71
Market Price/share (₹)	220.00	110.00

T Ltd. plans to offer a price for E Ltd., business as a whole which will be 7 times EBIDAT reduced by outstanding debt, to be discharged by own shares at market price.

E Ltd. is planning to seek one share in T Ltd. for every 2 shares in E Ltd. based on the market price. Tax rate for the two companies may be assumed as 30%.

Calculate and show the following under both alternatives - T Ltd.'s offer and E Ltd.'s plan:

- (i) Net consideration payable.
- (ii) No. of shares to be issued by T Ltd.
- (iii) EPS of T Ltd. after acquisition.
- (iv) Expected market price per share of T Ltd. after acquisition.
- (v) State briefly the advantages to T Ltd. from the acquisition.

Note: Calculations (except EPS) may be rounded off to 2 decimals in lakhs.

22. The following information is relating to Fortune India Ltd. having two division, viz. Pharma Division and Fast Moving Consumer Goods Division (FMCG Division). Paid up share capital of Fortune India Ltd. is consisting of 3,000 Lakhs equity shares of Re. 1 each. Fortune India Ltd. decided to de-merge Pharma Division as Fortune Pharma Ltd. w.e.f. 1.4.2009. Details of Fortune India Ltd. as on 31.3.2009 and of Fortune Pharma Ltd. as on 1.4.2009 are given below:

Particulars	Fortune Pharma Ltd. ₹	Fortune India Ltd. ₹
Outside Liabilities		
Secured Loans	400 lakh	3,000 lakh
Unsecured Loans	2,400 lakh	800 lakh
Current Liabilities & Provisions	1,300 lakh	21,200 lakh
Assets		
Fixed Assets	7,740 lakh	20,400 lakh
Investments	7,600 lakh	12,300 lakh
Current Assets	8,800 lakh	30,200 lakh
Loans & Advances	900 lakh	7,300 lakh
Deferred tax/Misc. Expenses	60 lakh	(200) lakh

Board of Directors of the Company have decided to issue necessary equity shares of Fortune Pharma Ltd. of Re. 1 each, without any consideration to the shareholders of Fortune India Ltd. For that purpose following points are to be considered:

- (a) Transfer of Liabilities & Assets at Book value.
- (b) Estimated Profit for the year 2009-10 is ₹ 11,400 Lakh for Fortune India Ltd. & ₹ 1,470 lakhs for Fortune Pharma Ltd.
- (c) Estimated Market Price of Fortune Pharma Ltd. is ₹ 24.50 per share.
- (d) Average P/E Ratio of FMCG sector is 42 & Pharma sector is 25, which is to be expected for both the companies.

Calculate:

- 1. The Ratio in which shares of Fortune Pharma are to be issued to the shareholders of Fortune India Ltd.
 - 2. Expected Market price of Fortune India (FMCG) Ltd.
 - 3. Book Value per share of both the Companies immediately after Demerger.
23. H Ltd. agrees to buy over the business of B Ltd. effective 1st April, 2012. The summarized Balance Sheets of H Ltd. and B Ltd. as on 31st March 2012 are as follows:

Balance sheet as at 31st March, 2012 (In Crores of Rupees)

Liabilities:	H. Ltd	B. Ltd.
Paid up Share Capital		
-Equity Shares of ₹100 each	350.00	
-Equity Shares of ₹10 each		6.50
Reserve & Surplus	950.00	25.00
Total	1,300.00	31.50
Assets:		
Net Fixed Assets	220.00	0.50
Net Current Assets	1,020.00	29.00
Deferred Tax Assets	60.00	2.00
Total	1,300.00	31.50

H Ltd. proposes to buy out B Ltd. and the following information is provided to you as part of the scheme of buying:

- (a) The weighted average post tax maintainable profits of H Ltd. and B Ltd. for the last 4 years are ₹ 300 crores and ₹ 10 crores respectively.

- (b) Both the companies envisage a capitalization rate of 8%.
- (c) H Ltd. has a contingent liability of ₹ 300 crores as on 31st March, 2012.
- (d) H Ltd. to issue shares of ₹ 100 each to the shareholders of B Ltd. in terms of the exchange ratio as arrived on a Fair Value basis. (Please consider weights of 1 and 3 for the value of shares arrived on Net Asset basis and Earnings capitalization method respectively for both H Ltd. and B Ltd.)

You are required to arrive at the value of the shares of both H Ltd. and B Ltd. under:

- (i) Net Asset Value Method
- (ii) Earnings Capitalisation Method
- (iii) Exchange ratio of shares of H Ltd. to be issued to the shareholders of B Ltd. on a Fair value basis (taking into consideration the assumption mentioned in point 4 above.)
24. Reliable Industries Ltd. (RIL) is considering a takeover of Sunflower Industries Ltd. (SIL). The particulars of 2 companies are given below:

Particulars	Reliable Industries Ltd	Sunflower Industries Ltd.
Earnings After Tax (EAT)	₹ 20,00,000	₹ 10,00,000
Equity shares O/s	10,00,000	10,00,000
Earnings per share (EPS)	2	1
PE Ratio (Times)	10	5

Required:

- (i) What is the market value of each Company before merger?
- (ii) Assume that the management of RIL estimates that the shareholders of SIL will accept an offer of one share of RIL for four shares of SIL. If there are no synergic effects, what is the market value of the Post-merger RIL? What is the new price per share? Are the shareholders of RIL better or worse off than they were before the merger?
- (iii) Due to synergic effects, the management of RIL estimates that the earnings will increase by 20%. What are the new post-merger EPS and Price per share? Will the shareholders be better off or worse off than before the merger?
25. AFC Ltd. wishes to acquire BCD Ltd. The shares issued by the two companies are 10,00,000 and 5,00,000 respectively:
- (i) Calculate the increase in the total value of BCD Ltd. resulting from the acquisition on the basis of the following conditions:

Current expected growth rate of BCD Ltd. 7%

Expected growth rate under control of AFC Ltd., (without any additional capital investment and without any change in risk of operations)	8%
Current Market price per share of AFC Ltd.	₹ 100
Current Market price per share of BCD Ltd.	₹ 20
Expected Dividend per share of BCD Ltd.	₹ 0.60

- (ii) On the basis of aforesaid conditions calculate the gain or loss to shareholders of both the companies, if AFC Ltd. were to offer one of its shares for every four shares of BCD Ltd.
- (iii) Calculate the gain to the shareholders of both the Companies, if AFC Ltd. pays ₹22 for each share of BCD Ltd., assuming the P/E Ratio of AFC Ltd. does not change after the merger. EPS of AFC Ltd. is ₹8 and that of BCD is ₹2.50. It is assumed that AFC Ltd. invests its cash to earn 10%.
26. AB Ltd., is planning to acquire and absorb the running business of XY Ltd. The valuation is to be based on the recommendation of merchant bankers and the consideration is to be discharged in the form of equity shares to be issued by AB Ltd. As on 31.3.2006, the paid up capital of AB Ltd. consists of 80 lakhs shares of ₹10 each. The highest and the lowest market quotation during the last 6 months were ₹570 and ₹430. For the purpose of the exchange, the price per share is to be reckoned as the average of the highest and lowest market price during the last 6 months ended on 31.3.06.

XY Ltd.'s Balance Sheet as at 31.3.2006 is summarised below:

	₹ lakhs
Sources	
Share Capital	
20 lakhs equity shares of ₹10 each fully paid	200
10 lakhs equity shares of ₹10 each, ₹5 paid	50
Loans	<u>100</u>
Total	<u>350</u>
Uses	
Fixed Assets (Net)	150
Net Current Assets	<u>200</u>
	<u>350</u>

An independent firm of merchant bankers engaged for the negotiation, have produced the following estimates of cash flows from the business of XY Ltd.:

Year ended	By way of	₹ lakhs
31.3.07	after tax earnings for equity	105
31.3.08	do	120
31.3.09	Do	125
31.3.10	Do	120
31.3.11	Do	100
	Terminal Value estimate	200

It is the recommendation of the merchant banker that the business of XY Ltd. may be valued on the basis of the average of (i) Aggregate of discounted cash flows at 8% and (ii) Net assets value. Present value factors at 8% for years

1-5: 0.93 0.86 0.79 0.74 0.68

You are required to:

- Calculate the total value of the business of XY Ltd.
- The number of shares to be issued by AB Ltd.; and
- The basis of allocation of the shares among the shareholders of XY Ltd.

27. R Ltd. and S Ltd. are companies that operate in the same industry. The financial statements of both the companies for the current financial year are as follows:

Balance Sheet

Particulars	R. Ltd. (₹)	S. Ltd (₹)
Equity & Liabilities		
Shareholders Fund		
Equity Capital (₹ 10 each)	20,00,000	16,00,000
Retained earnings	4,00,000	-
Non-current Liabilities		
16% Long term Debt	10,00,000	6,00,000
Current Liabilities	<u>14,00,000</u>	<u>8,00,000</u>
Total	<u>48,00,000</u>	<u>30,00,000</u>
Assets		
Non-current Assets	20,00,000	10,00,000
Current Assets	<u>28,00,000</u>	<u>20,00,000</u>
Total	<u>48,00,000</u>	<u>30,00,000</u>

Income Statement

	Particulars	R. Ltd. (₹)	S. Ltd. (₹)
A.	Net Sales	69,00,000	34,00,000
B.	Cost of Goods sold	<u>55,20,000</u>	<u>27,20,000</u>
C.	Gross Profit (A-B)	13,80,000	6,80,00
D.	Operating Expenses	4,00,000	2,00,000
E.	Interest	<u>1,60,000</u>	<u>96,000</u>
F.	Earnings before taxes [C-(D+E)]	8,20,000	3,84,000
G.	Taxes @ 35%	2,87,000	1,34,400
H.	Earnings After Tax (EAT)	5,33,000	2,49,600

Additional Information:

No. of equity shares	2,00,000	1,60,000
Dividend payment Ratio (D/P)	20%	30%
Market price per share	₹ 50	₹ 20

Assume that both companies are in the process of negotiating a merger through exchange of Equity shares:

You are required to:

- (i) Decompose the share price of both the companies into EPS & P/E components. Also segregate their EPS figures into Return On Equity (ROE) and Book Value/Intrinsic Value per share components.
 - (ii) Estimate future EPS growth rates for both the companies.
 - (iii) Based on expected operating synergies, R Ltd. estimated that the intrinsic value of S Ltd. Equity share would be ₹ 25 per share on its acquisition. You are required to develop a range of justifiable Equity Share Exchange ratios that can be offered by R Ltd. to the shareholders of S Ltd. Based on your analysis on parts (i) and (ii), would you expect the negotiated terms to be closer to the upper or the lower exchange ratio limits and why?
28. BA Ltd. and DA Ltd. both the companies operate in the same industry. The Financial statements of both the companies for the current financial year are as follows:

Balance Sheet

Particulars	BA Ltd. (₹)	DA Ltd. (₹)
Current Assets	14,00,000	10,00,000
Fixed Assets (Net)	<u>10,00,000</u>	<u>5,00,000</u>

	Total (₹)	<u>24,00,000</u>	<u>15,00,000</u>
Equity capital (₹10 each)		10,00,000	8,00,000
Retained earnings		2,00,000	--
14% long-term debt		5,00,000	3,00,00
Current liabilities		<u>7,00,000</u>	<u>4,00,000</u>
	Total (₹)	<u>24,00,000</u>	<u>15,00,000</u>

Income Statement

	BA Ltd. (₹)	DA Ltd. (₹)
Net Sales	34,50,000	17,00,000
Cost of Goods sold	<u>27,60,000</u>	<u>13,60,000</u>
Gross profit	6,90,000	3,40,000
Operating expenses	2,00,000	1,00,000
Interest	70,000	42,000
Earnings before taxes	4,20,000	1,98,00
Taxes @ 50%	<u>2,10,000</u>	<u>99,000</u>
Earnings after taxes (EAT)	<u>2,10,000</u>	<u>99,000</u>
Additional Information :		
No. of Equity shares	1,00,000	80,000
Dividend payment ratio (D/P)	40%	60%
Market price per share	₹40	₹15

Assume that both companies are in the process of negotiating a merger through an exchange of equity shares. You have been asked to assist in establishing equitable exchange terms and are required to:

- (i) Decompose the share price of both the companies into EPS and P/E components; and also segregate their EPS figures into Return on Equity (ROE) and book value/intrinsic value per share components.
- (ii) Estimate future EPS growth rates for each company.
- (iii) Based on expected operating synergies BA Ltd. estimates that the intrinsic value of DA's equity share would be ₹20 per share on its acquisition. You are required to develop a range of justifiable equity share exchange ratios that can be offered by BA Ltd. to the shareholders of DA Ltd. Based on your analysis in part (i) and (ii), would you expect the negotiated terms to be closer to the upper, or the lower exchange ratio limits and why?

- (iv) Calculate the post-merger EPS based on an exchange ratio of 0.4: 1 being offered by BA Ltd. and indicate the immediate EPS accretion or dilution, if any, that will occur for each group of shareholders.
- (v) Based on a 0.4: 1 exchange ratio and assuming that BA Ltd.'s pre-merger P/E ratio will continue after the merger, estimate the post-merger market price. Also show the resulting accretion or dilution in pre-merger market prices.
29. During the audit of the Weak Bank (W), RBI has suggested that the Bank should either merge with another bank or may close down. Strong Bank (S) has submitted a proposal of merger of Weak Bank with itself. The *relevant information and Balance Sheets of both the companies are as under:*

Particulars	Weak Bank (W)	Strong Bank (S)	Assigned Weights (%)
Gross NPA (%)	40	5	30
Capital Adequacy Ratio (CAR)	5	16	28
Total Capital/ Risk Weight Asset			
Market price per Share (MPS)	12	96	32
Book value			10
Trading on Stock Exchange	Irregular	Frequent	

Balance Sheet

(₹ in Lakhs)

Particulars	Weak Bank (W)	Strong Bank (S)
Paid up Share Capital (₹ 10 per share)	150	500
Reserves & Surplus	80	5,500
Deposits	4,000	44,000
Other Liabilities	<u>890</u>	<u>2,500</u>
Total Liabilities	<u>5,120</u>	<u>52,500</u>
Cash in Hand & with RBI	400	2,500
Balance with Other Banks	-	2,000
Investments	1,100	19,000
Advances	3,500	27,000
Other Assets	70	2,000
Preliminary Expenses	<u>50</u>	-
Total Assets	<u>5,120</u>	<u>52,500</u>

You are required to

- Calculate Swap ratio based on the above weights;
- Ascertain the number of Shares to be issued to Weak Bank;
- Prepare Balance Sheet after merger; and
- Calculate CAR and Gross NPA of Strong Bank after merger.

30. M/s Tiger Ltd. wants to acquire M/s. Leopard Ltd. The balance sheet of Leopard Ltd. as on 31st March, 2012 is as follows:

Liabilities	₹	Assets	₹
Equity Capital (70,000 shares)	7,00,000	Cash	50,000
Retained earnings	3,00,000	Debtors	70,000
12% Debentures	3,00,000	Inventories	2,00,000
Creditors and other liabilities	3,20,000	Plants & Eqpt.	13,00,000
	16,20,000		16,20,000

Additional Information:

- Shareholders of Leopard Ltd. will get one share in Tiger Ltd. for every two shares. External liabilities are expected to be settled at ₹ 5,00,000. Shares of Tiger Ltd. would be issued at its current price of ₹ 15 per share. Debenture holders will get 13% convertible debentures in the purchasing company for the same amount. Debtors and inventories are expected to realize ₹ 2,00,000.
- Tiger Ltd. has decided to operate the business of Leopard Ltd. as a separate division. The division is likely to give cash flows (after tax) to the extent of ₹ 5,00,000 per year for 6 years. Tiger Ltd. has planned that, after 6 years, this division would be demerged and disposed of for ₹ 2,00,000.
- The company's cost of capital is 16%.

Make a report to the Board of the company advising them about the financial feasibility of this acquisition.

Net present values for 16% for ₹ 1 are as follows:

Years	1	2	3	4	5	6
PV	0.862	0.743	0.641	0.552	0.476	0.410

31. The equity shares of XYZ Ltd. are currently being traded at ₹ 24 per share in the market. XYZ Ltd. has total 10,00,000 equity shares outstanding in number; and promoters' equity holding in the company is 40%.

PQR Ltd. wishes to acquire XYZ Ltd. because of likely synergies. The estimated present value of these synergies is ₹ 80,00,000.

Further PQR feels that management of XYZ Ltd. has been over paid. With better motivation, lower salaries and fewer perks for the top management, will lead to savings of ₹ 4,00,000 p.a. Top management with their families are promoters of XYZ Ltd. Present value of these savings would add ₹ 30,00,000 in value to the acquisition.

Following additional information is available regarding PQR Ltd.:

Earnings per share	: ₹ 4
Total number of equity shares outstanding	: 15,00,000
Market price of equity share	: ₹ 40

Required:

- (i) What is the maximum price per equity share which PQR Ltd. can offer to pay for XYZ Ltd.?
- (ii) What is the minimum price per equity share at which the management of XYZ Ltd. will be willing to offer their controlling interest?

ANSWERS/ SOLUTIONS

Answers to Theoretical Questions

1. Please refer paragraph 2.
2. Please refer paragraph 6.
3. Please refer paragraph 7.2.
4. Please refer paragraph 3.

Answers to the Practical Questions

1. Total market value of C Ltd is = 1,00,000 x ₹ 15 = ₹ 15,00,000
 PE ratio (given) = 10
 Therefore, earnings = ₹ 15,00,000 / 10
 = ₹ 1,50,000
 Total market value of B Ltd. is = 5,00,000 x ₹ 12 = ₹ 60,00,000
 PE ratio (given) = 17
 Therefore, earnings = ₹ 60,00,000 / 17
 = ₹ 3,52,941

The number of shares to be issued by B Ltd.

₹ 15,00,000 ÷ 12	= 1,25,000
Total number of shares of B Ltd	= 5,00,000 + 1,25,000 = 6,25,000
The EPS of the new firm is	= (₹ 3,52,941 + ₹ 1,50,000) / 6,25,000
	= ₹ 0.80
The present EPS of B Ltd is	= ₹ 3,52,941 / 5,00,000
	= ₹ 0.71

So the EPS of firm B will increase from Re. 0.71 to ₹ 0.80 as a result of merger

2. Shareholders of Doom Ltd. will get 5 lakh share of Elrond Limited, so they will get:

$$= \frac{5 \text{ lakh}}{20 \text{ lakh} + 5 \text{ lakh}} = 20\% \text{ of shares Elrond Limited}$$

The value of Elrond Ltd. after merger will be:

$$= ₹ 50 \times 20 \text{ lakh} + ₹ 25 \times 10 \text{ lakh} + ₹ 200 \text{ lakh}$$

$$= ₹ 1000 \text{ lakh} + ₹ 250 \text{ lakh} + ₹ 200 \text{ lakh} = ₹ 1450 \text{ lakh}$$

True Cost of Merger will be:

$$(₹ 1450 \times 20\%) \quad ₹ 290 \text{ lakhs} - ₹ 250 \text{ lakhs} = ₹ 40 \text{ lakhs}$$

3. (i) Earning per share of company MK Ltd after merger:-

$$\text{Exchange ratio } 160 : 200 = 4 : 5.$$

that is 4 shares of MK Ltd. for every 5 shares of NN Ltd.

$$\therefore \text{Total number of shares to be issued} = 4/5 \times 3,00,000 = 2,40,000 \text{ Shares.}$$

$$\therefore \text{Total number of shares of MK Ltd. and NN Ltd.} = 12,00,000 \text{ (MK Ltd.)} + 2,40,000 \text{ (NN Ltd.)}$$

$$= 14,40,000 \text{ Shares}$$

$$\text{Total profit after tax} \quad = ₹ 60,00,000 \quad \text{MK Ltd.}$$

$$= ₹ 18,00,000 \quad \text{NN Ltd.}$$

$$= ₹ 78,00,000$$

\therefore EPS. (Earning Per Share) of MK Ltd. after merger

$$₹ 78,00,000 / 14,40,000 = ₹ 5.42 \text{ per share}$$

- (ii) To find the exchange ratio so that shareholders of NN Ltd. would not be at a Loss:

Present earning per share for company MK Ltd.

$$= ₹ 60,00,000/12,00,000 = ₹ 5.00$$

Present earning per share for company NN Ltd.

$$= ₹ 18,00,000/3,00,000 = ₹ 6.00$$

∴ Exchange ratio should be 6 shares of MK Ltd. for every 5 shares of NN Ltd.

∴ Shares to be issued to NN Ltd. = $3,00,000 \times 6/5 = 3,60,000$ shares

Now, total No. of shares of MK Ltd. and NN Ltd. = $12,00,000$ (MK Ltd.) + $3,60,000$ (NN Ltd.)

$$= 15,60,000 \text{ shares}$$

∴ EPS after merger = $₹ 78,00,000/15,60,000 = ₹ 5.00$ per share

Total earnings available to shareholders of NN Ltd. after merger = $3,60,000$ shares \times $₹ 5.00 = ₹ 18,00,000$.

This is equal to earnings prior merger for NN Ltd.

∴ Exchange ratio on the basis of earnings per share is recommended.

4. (i) Earnings per share = Earnings after tax /No. of equity shares

$$\text{ABC Ltd.} = ₹ 50,00,000/10,00,000 = ₹ 5$$

$$\text{XYZ Ltd.} = ₹ 18,00,000 / 6,00,000 = ₹ 3$$

- (ii) Number of Shares XYZ Limited's shareholders will get in ABC Ltd. based on market value per share = $₹ 28/ 42 \times 6,00,000 = 4,00,000$ shares

Total number of equity shares of ABC Ltd. after merger = $10,00,000 + 4,00,000 = 14,00,000$ shares

Earnings per share after merger = $₹ 50,00,000 + 18,00,000/14,00,000 = ₹ 4.86$

- (iii) Calculation of exchange ratio to ensure shareholders of XYZ Ltd. to earn the same as was before merger:

Shares to be exchanged based on EPS = $(₹ 3/₹ 5) \times 6,00,000 = 3,60,000$ shares

EPS after merger = $(₹ 50,00,000 + 18,00,000)/13,60,000 = ₹ 5$

Total earnings in ABC Ltd. available to shareholders of XYZ Ltd. = $3,60,000 \times ₹ 5 = ₹ 18,00,000$.

Thus, to ensure that Earning to members are same as before, the ratio of exchange should be 0.6 share for 1 share.

5. (i)

	Acquirer Company	Target Company
Net Profit	₹ 80 lakhs	₹ 15.75 lakhs
PE Multiple	10.50	10.00
Market Capitalization	₹ 840 lakhs	₹ 157.50 lakhs
Market Price	₹ 42	₹ 105
No. of Shares	20 lakhs	1.50 lakhs
EPS	₹ 4	₹ 10.50

Maximum Exchange Ratio 4 : 10.50 or 1 : 2.625

Thus, for every one share of Target Company 2.625 shares of Acquirer Company.

(ii) Let x lakhs be the amount paid by Acquirer company to Target Company. Then to maintain same EPS i.e. ₹ 4 the number of shares to be issued will be:

$$\frac{(80 \text{ lakhs} + 15.75 \text{ lakhs}) - 0.70 \times 15\% \times x}{20 \text{ lakhs}} = 4$$

$$\frac{95.75 - 0.105x}{20} = 4$$

x = ₹ 150 lakhs

Thus, ₹ 150 lakhs shall be offered in cash to Target Company to maintain same EPS.

6. (i) **The number of shares to be issued by A Ltd.:**

The Exchange ratio is 0.5

So, new Shares = 1,80,000 x 0.5 = 90,000 shares.

(ii) **EPS of A Ltd. After a acquisition:**

Total Earnings	(₹ 18,00,000 + ₹ 3,60,000)	₹ 21,60,000
No. of Shares	(6,00,000 + 90,000)	6,90,000
EPS	(₹ 21,60,000)/6,90,000)	₹ 3.13

(iii) **Equivalent EPS of T Ltd.:**

No. of new Shares	0.5
EPS	₹ 3.13
Equivalent EPS (₹ 3.13 x 0.5)	₹ 1.57

(iv) **New Market Price of A Ltd. (P/E remaining unchanged):**

Present P/E Ratio of A Ltd. 10 times

Expected EPS after merger	₹ 3.13
Expected Market Price (₹3.13 x 10)	₹ 31.30
(v) Market Value of merged firm:	
Total number of Shares	6,90,000
Expected Market Price	₹ 31.30
Total value (6,90,000 x 31.30)	₹ 2,15,97,000

7. Particulars	Mark Ltd.	Mask Ltd.
EPS	₹ 2,000 Lakhs/ 200 lakhs = ₹ 10	₹ 400 lakhs / 100 lakhs ₹ 4
Market Price	₹ 10 × 10 = ₹ 100	₹ 4 × 5 = ₹ 20

(i) The Swap ratio based on current market price is
 $\text{₹ } 20 / \text{₹ } 100 = 0.2$ or 1 share of Mark Ltd. for 5 shares of Mask Ltd.

No. of shares to be issued = 100 lakh × 0.2 = 20 lakhs.

(ii) $\text{EPS after merger} = \frac{\text{₹ } 2,000 \text{ lakhs} + \text{₹ } 400 \text{ lakhs}}{200 \text{ lakhs} + 20 \text{ lakhs}} = \text{₹ } 10.91$

(iii) Expected market price after merger assuming P/E 10 times.
 $= \text{₹ } 10.91 \times 10 = \text{₹ } 109.10$

(iv) Market value of merged firm
 $= \text{₹ } 109.10 \text{ market price} \times 220 \text{ lakhs shares} = 240.02 \text{ crores}$

(v) Gain from the merger

Post merger market value of the merged firm	₹ 240.02 crores
Less: Pre-merger market value	
Mark Ltd. 200 Lakhs × ₹ 100 = 200 crores	
Mask Ltd. 100 Lakhs × ₹ 20 = 20 crores	<u>₹ 220.00 crores</u>
Gain from merger	<u>₹ 20.02 crores</u>

Appropriation of gains from the merger among shareholders:

	Mark Ltd.	Mask Ltd.
Post merger value	218.20 crores	21.82 crores
Less: Pre-merger market value	200.00 crores	20.00 crores
Gain to Shareholders	18.20 crores	1.82 crores

8. Working Notes

(a)

	<i>XYZ Ltd.</i>	<i>ABC Ltd.</i>
Equity shares outstanding (Nos.)	10,00,000	4,00,000
EPS	₹ 40	₹ 28
Profit	₹ 400,00,000	₹ 112,00,000
PE Ratio	6.25	5.71
Market price per share	₹ 250	₹ 160

(b) EPS after merger

No. of shares to be issued (4,00,000 x 0.70)	2,80,000
Exiting Equity shares outstanding	10,00,000
Equity shares outstanding after merger	12,80,000
Total Profit (₹ 400,00,000 + ₹ 112,00,000)	₹ 512,00,000
EPS	₹ 40

(i) Impact of merger on EPS of both the companies

	<i>XYZ Ltd.</i>	<i>ABC Ltd.</i>
EPS after Merger	₹ 40	₹ 28
EPS before Merger	₹ 40	₹ 28*
	Nil	Nil

* ₹ 40 x 0.70

(ii) Gain from the Merger if exchange ratio is 1: 1

No. of shares to be issued	4,00,000
Exiting Equity shares outstanding	10,00,000
Equity shares outstanding after merger	14,00,000
Total Profit (₹ 400,00,000 + ₹ 112,00,000)	₹ 512,00,000
EPS	₹ 36.57
Market Price of Share (₹ 36.57 x 6.25)	₹ 228.56
Market Price of Share before Merger	₹ 160.00
Impact (Increase/ Gain)	₹ 68.56

(iii) Gain/ loss from the Merger to the shareholders of XYZ Ltd.

Market Price of Share	₹ 228.56
Market Price of Share before Merger	₹ 250.00
Loss from the merger (per share)	₹ 21.44

(iv) Maximum Exchange Ratio acceptable to XYZ Ltd. shareholders

	₹ Lakhs
Market Value of Merged Entity (₹ 228.57 x 1400000)	3199.98
Less: Value acceptable to shareholders of XYZ Ltd.	2500.00
Value of merged entity available to shareholders of ABC Ltd.	699.98
Market Price Per Share	250
No. of shares to be issued to the shareholders of ABC Ltd. (lakhs)	2.80

Thus maximum ratio of issue shall be 2.80 : 4.00 or 0.70 share of XYZ Ltd. for one share of ABC Ltd.

Alternatively, it can also be computed as follows:

Earning after Merger (40 x 1000000 + 28 x 400000)	₹ 512 lakhs
PE Ratio of XYZ Ltd.	6.25
Market Value of Firm after Merger (512 x 6.25)	₹ 3200 lakhs
Existing Value of Shareholders of XYZ Ltd.	₹ 2500 lakhs
Value of Merged entity available to Shareholders of ABC Ltd.	₹ 700 lakhs
Market Price per Share	₹ 250
Total No. of shares to be issued	2.8 lakh

Thus, maximum acceptable ratio shall be 2.80:4.00 i.e. 0.70 share of XYZ Ltd. for one share of ABC Ltd.

9. (i) Pre-merger EPS and P/E ratios of XYZ Ltd. and ABC Ltd.

Particulars	XYZ Ltd.	ABC Ltd.
Earnings after taxes	5,00,000	1,25,000
Number of shares outstanding	2,50,000	1,25,000
EPS	2	1
Market Price per share	20	10
P/E Ratio (times)	10	10

(ii) **Current Market Price of ABC Ltd.** if P/E ratio is 6.4 = ₹ 1 × 6.4 = ₹ 6.40

$$\text{Exchange ratio} = \frac{\text{₹ } 20}{\text{₹ } 6.40} = 3.125 \text{ or } \frac{\text{₹ } 6.40}{\text{₹ } 20} = 0.32$$

Post-merger EPS of XYZ Ltd.

$$= \frac{\text{₹ } 5,00,000 + \text{₹ } 1,25,000}{2,50,000 + (1,25,000/3.125)}$$

$$= \frac{\text{₹ } 6,25,000}{2,90,000} = 2.16$$

(iii) **Desired Exchange Ratio**

Total number of shares in post-merged company

$$= \frac{\text{Post-merger earnings}}{\text{Pre-merger EPS of XYZ Ltd}} = \frac{\text{₹ } 6,25,000}{2} = 3,12,500$$

Number of shares required to be issued

$$= 3,12,500 - 2,50,000 = 62,500$$

Therefore, the exchange ratio is

$$62,500 : 1,25,000$$

$$= \frac{62,500}{1,25,000} = 0.50$$

10. (i) **SWAP ratio based on current market prices:**

EPS before acquisition:

Mani Ltd. : ₹2,000 lakhs / 200 lakhs: ₹10

Ratnam Ltd.: ₹4,000 lakhs / 1,000 lakhs: ₹ 4

Market price before acquisition:

Mani Ltd.: ₹10 × 10 ₹100

Ratnam Ltd.: ₹4 × 5 ₹ 20

SWAP ratio: 20/100 or 1/5 i.e. 0.20

(ii) **EPS after acquisition:**

$$\frac{\text{₹}(2,000 + 4,000) \text{ Lakhs}}{(200 + 200) \text{ Lakhs}} = ₹15.00$$

(iii) Market Price after acquisition:

EPS after acquisition :	₹15.00
P/E ratio after acquisition 10×0.9	9
Market price of share (₹ 15 X 9)	₹135.00

(iv) Market value of the merged Co.:

₹135 × 400 lakhs shares	₹ 540.00 Crores
	or ₹ 54,000 Lakhs

(v) Gain/loss per share:

	₹ Crore	
	<i>Mani Ltd.</i>	<i>Ratnam Ltd.</i>
Total value before Acquisition	200	200
Value after acquisition	<u>270</u>	<u>270</u>
Gain (Total)	<u>70</u>	<u>70</u>
No. of shares (pre-merger) (lakhs)	200	1,000
Gain per share (₹)	35	7

11.

(i) Exchange Ratio	1:1
New Shares to be issued	2,00,000
Total shares of Rama Ltd. (4,00,000+2,00,000)	6,00,000
Total earnings (₹ 10,00,000 + ₹ 7,00,000)	₹ 17,00,000
New EPS (₹ 17,00,000/6,00,000)	₹ 2.83
(ii) Existing EPS of Rama Ltd.	₹ 2.50
Increase in EPS of Rama Ltd (₹ 2.83 – ₹ 2.50)	₹ 0.33
Existing EPS of Krishna Ltd.	₹ 3.50
Decrease in EPS of Krishna Ltd. (₹ 3.50 – ₹ 2.83)	₹ 0.67
(iii) P/E ratio of new firm (expected to remain same)	14 times
New market price (14 × ₹ 2.83)	₹ 39.62
Total No. of Shares	6,00,000
Total market Capitalization (6,00,000 × ₹ 39.62)	₹ 2,37,72,000
Existing market capitalization (₹ 70,00,000 + ₹ 1,40,00,000)	<u>₹ 2,10,00,000</u>
Total gain	<u>₹ 27,72,000</u>

(iv)

	Rama Ltd.	Krishna Ltd	Total
No. of shares after merger	4,00,000	2,00,000	6,00,000
Market price	₹ 39.62	₹ 39.62	₹ 39.62
Total Mkt. Values	₹ 1,58,48,000	₹ 79,24,000	₹ 2,37,72,000
Existing Mkt. values	<u>₹ 1,40,00,000</u>	<u>₹ 70,00,000</u>	<u>₹ 2,10,00,000</u>
Gain to share holders	₹ 18,48,000	₹ 9,24,000	₹ 27,72,000

or ₹ 27,72,000 ÷ 3 = ₹ 9,24,000 to Krishna Ltd. and ₹ 18,48,000 to Rama Ltd. (in 2:1 ratio)

12. (i) Calculation of new EPS of M Co. Ltd.

No. of equity shares to be issued by M Co. Ltd. to N Co. Ltd.

$$= 4,00,000 \text{ shares} \times \frac{₹ 160}{₹ 200} = 3,20,000 \text{ shares}$$

Total no. of shares in M Co. Ltd. after acquisition of N Co. Ltd.

$$= 16,00,000 + 3,20,000 = 19,20,000$$

Total earnings after tax [after acquisition]

$$= 80,00,000 + 24,00,000 = 1,04,00,000$$

$$\text{EPS} = \frac{₹ 1,04,00,000}{19,20,000 \text{ equity shares}} = ₹ 5.42$$

(ii) Calculation of exchange ratio which would not diminish the EPS of N Co. Ltd. after its merger with M Co. Ltd.

Current EPS:

$$\text{M Co. Ltd.} = \frac{₹ 80,00,000}{16,00,000 \text{ equity shares}} = ₹ 5$$

$$\text{N Co. Ltd.} = \frac{₹ 24,00,000}{4,00,000 \text{ equity shares}} = ₹ 6$$

$$\text{Exchange ratio} = 6/5 = 1.20$$

No. of new shares to be issued by M Co. Ltd. to N Co. Ltd.

$$= 4,00,000 \times 1.20 = 4,80,000 \text{ shares}$$

Total number of shares of M Co. Ltd. after acquisition

$$= 16,00,000 + 4,80,000 = 20,80,000 \text{ shares}$$

$$\text{EPS [after merger]} = \frac{\text{₹ } 1,04,00,000}{20,80,000 \text{ shares}} = \text{₹ } 5$$

Total earnings in M Co. Ltd. available to new shareholders of N Co. Ltd.
 = 4,80,000 × ₹ 5 = ₹ 24,00,000

Recommendation: The exchange ratio (6 for 5) based on market shares is beneficial to shareholders of 'N' Co. Ltd.

13. (i) Pre Merger Market Value of Per Share

P/E Ratio X EPS

Longitude Ltd. ₹ 8 X 15 = ₹ 120.00

Latitude Ltd. ₹ 5 X 10 = ₹ 50.00

(ii) (1) Maximum exchange ratio without dilution of EPS

Pre Merger PAT of Longitude Ltd.	₹ 120 Lakhs
Pre Merger PAT of Latitude Ltd.	₹ 80 Lakhs
Combined PAT	₹ 200 Lakhs
Longitude Ltd. 's EPS	₹ 8
Maximum number of shares of Longitude after merger (₹ 200 lakhs/₹ 8)	25 Lakhs
Existing number of shares	15 Lakhs
Maximum number of shares to be exchanged	10 Lakhs

Maximum share exchange ratio 10:16 or 5:8

(2) Maximum exchange ratio without dilution of Market Price Per Share

Pre Merger Market Capitalization of Longitude Ltd. (₹ 120 × 15 Lakhs)	₹ 1800 Lakhs
Pre Merger Market Capitalization of Latitude Ltd. (₹ 50 × 16 Lakhs)	₹ 800 Lakhs
Combined Market Capitalization	₹ 2600 Lakhs
Current Market Price of share of Longitude Ltd.	₹ 120
Maximum number of shares to be exchanged of Longitude (surviving company) (₹ 2600 Lakhs/₹ 120)	21.67 Lakhs
Current Number of Shares of Longitude Ltd.	15.00 Lakhs
Maximum number of shares to be exchanged (Lakhs)	6.67 Lakhs

Maximum share exchange ratio 6.67:16 or 0.4169:1

14.

	P Ltd.	R Ltd.
Profit before Tax (₹ in crore)	15	13.50
Tax 30% (₹ in crore)	<u>4.50</u>	<u>4.05</u>
Profit after Tax (₹ in crore)	<u>10.50</u>	<u>9.45</u>
Earning per Share (₹)	$\frac{10.50}{25} = ₹ 0.42$	$\frac{9.45}{15} = ₹ 0.63$
Price of Share before Merger (EPS x P/E Ratio)	₹ 0.42 x 12 = ₹ 5.04	₹ 0.63 x 9 = ₹ 5.67

(i) ∴ Market Value of company

P Ltd. = ₹ 5.04 x 25 Crore = ₹ 126 crore

R Ltd. = ₹ 5.67 x 15 Crore = ₹ 85.05 crore

Combined = ₹ 126 + ₹ 85.05 = ₹ 211.05 Crores

After Merger

	P Ltd.	R Ltd.
No. of Shares	25 crores	$15 \times \frac{4}{5} = 12$ crores
Combined		37 crores
% of Combined Equity Owned	$\frac{25}{37} \times 100 = 67.57\%$	$\frac{12}{37} \times 100 = 32.43\%$

(ii) ∴ Value of Original Shareholders

P Ltd.	R Ltd.
₹ 211.05 crore x 67.57%	₹ 211.05 crore x 32.43%
= ₹ 142.61	= ₹ 68.44

Alternatively, it can also be computed as follows:

Combined Value of Entity	211.05 crore
No. of shares after Merger	37 crore
Value of Per Share	₹ 5.70405
Value of P Ltd. Shareholders (25 crores x ₹ 5.70405)	₹ 142.60 crore
Value of R Ltd. Shareholders (12 crores x ₹ 5.70405)	₹ 68.45 crore

(iii) ∴ Price per Share after Merger

$$\text{EPS} = \frac{\text{₹}19.95 \text{ crore}}{37 \text{ crore}} = \text{₹} 0.539 \text{ per share}$$

$$\text{P/E Ratio} = 12$$

$$\text{Market Value Per Share} = \text{₹} 0.539 \times 12 = \text{₹} 6.47$$

$$\text{Total Market Value} = \text{₹} 6.47 \times 37 \text{ crore} = \text{₹} 239.39 \text{ crore}$$

$$\text{Price of Share} = \frac{\text{Market Value}}{\text{Number of Shares}} = \frac{239.39 \text{ crore}}{37 \text{ crore}} = \text{₹} 6.47$$

(iv) Effect on Share Price

P Ltd.

$$\text{Gain/loss (-) per share} = \text{₹} 6.47 - \text{₹} 5.04 = \text{₹} 1.43$$

$$\text{i.e. } \frac{6.47 - 5.04}{5.04} \times 100 = 0.284 \text{ or } 28.4\%$$

∴ Share price would rise by 28.4%

R Ltd.

$$6.47 \times \frac{4}{5} = \text{₹} 5.18$$

$$\text{Gain/loss (-) per share} = \text{₹} 5.18 - \text{₹} 5.67 = (-\text{₹} 0.49)$$

$$\text{i.e. } \frac{5.18 - 5.67}{5.67} \times 100 (-) 0.0864 \text{ or } (-) 8.64\%$$

∴ Share Price would decrease by 8.64%.

15. Compute Value of Equity

Simple Ltd.

₹ in Lacs

	High Growth	Medium Growth	Slow Growth
Debit + Equity	820	550	410
Less: Debt	460	460	460
Equity	360	90	-50

Since the Company has limited liability the value of equity cannot be negative therefore the value of equity under slow growth will be taken as zero because of insolvency risk and the value of debt is taken at 410 lacs. The expected value of debt and equity can then be calculated as:

Simple Ltd.

₹ in Lacs

	High Growth		Medium Growth		Slow Growth		Expected Value
	Prob.	Value	Prob.	Value	Prob.	Value	
Debt	0.20	460	0.60	460	0.20	410	450
Equity	0.20	360	0.60	90	0.20	0	126
		820		550		410	576

Dimple Ltd.

₹ in Lacs

	High Growth		Medium Growth		Slow Growth		Expected Value
	Prob.	Value	Prob.	Value	Prob.	Value	
Equity	0.20	985	0.60	760	0.20	525	758
Debt	0.20	65	0.60	65	0.20	65	65
		1050		825		590	823

Expected Values

₹ in Lacs

Equity		Debt	
Simple Ltd.	126	Simple Ltd.	450
Dimple Ltd.	758	Dimple Ltd.	65
	884		515

16. (i) Working Notes:

Present Value of Cash Flows (CF) upto 5 years

Year End	CF of Yes Ltd. (₹ lakhs)	PVF @15%	PV of CF (₹ lakhs)	CF of Merged Entity (₹ lakhs)	PV of CF of Merged Entity (₹ lakhs)
1	175	0.870	152.25	400	348.00
2	200	0.756	151.20	450	340.20
3	320	0.658	210.56	525	345.45
4	340	0.572	194.48	590	337.48
5	350	0.497	<u>173.95</u>	620	<u>308.14</u>
			<u>882.44</u>		<u>1679.27</u>

PV of Cash Flows of Yes Ltd. after the forecast period

$$TV_5 = \frac{CF_5(1+g)}{K_e - g} = \frac{350(1+0.05)}{0.15-0.05} = \frac{367.50}{0.10} = ₹3675 \text{ lakhs}$$

PV of $TV_5 = ₹3675 \text{ lakhs} \times 0.497 = ₹1826.475 \text{ lakhs}$

PV of Cash Flows of Merged Entity after the forecast period

$$TV_5 = \frac{CF_5(1+g)}{K_e - g} = \frac{620(1+0.06)}{0.15-0.06} = \frac{657.20}{0.09} = ₹7302.22 \text{ lakhs}$$

PV of $TV_5 = ₹7302.22 \text{ lakhs} \times 0.497 = ₹3629.20 \text{ lakhs}$

Value of Yes Ltd.

	Before merger (₹lakhs)	After merger (₹lakhs)
PV of CF (1-5 years)	882.440	1679.27
Add: PV of TV_5	<u>1826.475</u>	<u>3629.20</u>
	<u>2708.915</u>	<u>5308.47</u>

(ii) **Value of Acquisition**

= Value of Merged Entity – Value of Yes Ltd.

= ₹5308.47 lakhs – ₹2708.915 lakhs = ₹2599.555 lakhs

(iii) **Gain to Shareholders of Yes Ltd.**

Share of Yes Ltd. in merged entity = ₹5308.47 lakhs $\times \frac{1}{1.5} = ₹3538.98 \text{ lakhs}$

Gain to shareholder = Share of Yes Ltd. in merged entity – Value of Yes Ltd. before merger

= ₹3538.98 lakhs - ₹2708.915 = ₹830.065 lakhs

17. Swap Ratio

	Efficient Ltd.	Healthy Ltd.
Market capitalization	500 lakhs	750 lakhs
No. of shares	10 lakhs	7.5 lakhs
Market Price per share	₹ 50	₹ 100
P/E ratio	10	5
EPS	₹ 5	₹ 20
Profit	₹ 50 lakh	₹ 150 lakh

Share capital	₹ 100 lakh	₹ 75 lakh
Reserves and surplus	₹ 300 lakh	₹ 165 lakh
Total	₹ 400 lakh	₹ 240 lakh
Book Value per share	₹ 40	₹ 32

(i) Calculation of Swap Ratio

EPS	1 : 4 i.e.	$4.0 \times 40\%$	1.6
Book value	1 : 0.8 i.e.	$0.8 \times 25\%$	0.2
Market price	1 : 2 i.e.	$2.0 \times 35\%$	<u>0.7</u>
		Total	<u>2.5</u>

Swap ratio is for every one share of Healthy Ltd., to issue 2.5 shares of Efficient Ltd. Hence, total no. of shares to be issued $7.5 \text{ lakh} \times 2.5 = 18.75 \text{ lakh shares}$.

Promoter's holding = $4.75 \text{ lakh shares} + (5 \times 2.5 = 12.5 \text{ lakh shares}) = 17.25 \text{ lakh i.e.}$
 Promoter's holding % is $(17.25 \text{ lakh}/28.75 \text{ lakh}) \times 100 = 60\%$.

Calculation of EPS, Market price, Market capitalization and free float market capitalization.

- (ii) Total No. of shares $10 \text{ lakh} + 18.75 \text{ lakh} = 28.75 \text{ lakh}$
 Total capital $100 \text{ lakh} + 187.5 \text{ lakh} = ₹ 287.5 \text{ lakh}$

$$\text{EPS} = \frac{\text{Total profit}}{\text{No. of shares}} = \frac{50 \text{ lakh} + 150 \text{ lakh}}{28.75 \text{ lakh}} = \frac{200}{28.75} = ₹ 6.956$$

- (iii) Expected market price $\text{EPS } 6.956 \times \text{P/E } 10 = ₹ 69.56$
 Market capitalization $= ₹ 69.56 \text{ per share} \times 28.75 \text{ lakh shares}$
 $= ₹ 1,999.85 \text{ lakh}$
- (iv) Free float of market capitalization $= ₹ 69.56 \text{ per share} \times (28.75 \text{ lakh} \times 40\%)$
 $= ₹ 799.94 \text{ lakh}$

18. SWAP RATIO

	Abhiman Ltd. (₹)	Swabhiman Ltd. (₹)
Share capital	200 lacs	100 lacs
Free reserves & surplus	900 lacs	600 lacs
Total	1100 lacs	700 lacs
No. of shares	2 lacs	10 lacs

Book value for share	₹ 550	₹ 70
Promoters Holding	50%	60%
Non promoters holding	50%	40%
Free float market capitalization (Public)	500 lacs	₹ 156 lacs
Total Market Cap	1000 lacs	390 lacs
No. of shares	2 lacs	10 lacs
Market Price	₹ 500	₹ 39
P/E ratio	10	4
EPS	₹ 50.00	₹ 9.75

Calculation of SWAP Ratio

Book Value	1:0.1273	$0.1273 \times 25\%$	0.031825
EPS	1:0.195	$0.195 \times 50\%$	0.097500
Market Price	1:0.078	$0.078 \times 25\%$	<u>0.019500</u>
Total			<u>0.148825</u>

- (i) SWAP Ratio is 0.148825 shares of Abhiman Ltd. for every share of Swabhiman Ltd.

Total No. of shares to be issued = 10 lakh \times 0.148825 = 148825 shares

- (ii) Book value, EPS & Market Price.

Total No. shares = 200000 + 148825 = 348825

Total capital = ₹200 lakh + ₹148.825 lac = ₹ 348.825 lac

Reserves = ₹ 900 lac + ₹ 551.175 lac = ₹ 1451.175 lac

Book value Per Share = $\frac{₹ 348.825 \text{ lac} + ₹ 1451.175 \text{ lac}}{3.48825 \text{ lac}}$ = ₹ 516.02

or ₹ 516.02 \times 0.148825 = ₹ 76.80

or = $\frac{\text{Total Capital}}{\text{No. of Shares}} = \frac{1100 \text{ lac} + 700 \text{ lac}}{348825}$ = ₹ 516.02

EPS = $\frac{\text{Total Profit}}{\text{No. of shares}} = \frac{₹ 100 \text{ lac} + ₹ 97.50 \text{ lac}}{3.48825 \text{ lac}}$ = ₹ 56.62

or ₹ 56.62 \times 0.148825 = ₹ 8.43

Expected market price = ₹ 56.62 \times PE Ratio = ₹ 56.62 \times 10 = ₹ 566.20

or ₹ 566.20 \times 0.148825 = ₹ 84.26

19.

(i)	E Ltd.	H Ltd.
Market capitalisation	1000 lakhs	1500 lakhs
No. of shares	20 lakhs	15 lakhs
Market Price per share	₹ 50	₹ 100
P/E ratio	10	5
EPS	₹ 5	₹ 20
Profit	₹ 100 lakh	₹ 300 lakh
Share capital	₹ 200 lakh	₹ 150 lakh
Reserves and surplus	₹ 600 lakh	₹ 330 lakh
Total	₹ 800 lakh	₹ 480 lakh
Book Value per share	₹ 40	₹ 32

(ii) **Calculation of Swap Ratio**

EPS	1 : 4 i.e.	4.0 × 40%	1.6
Book value	1 : 0.8 i.e.	0.8 × 25%	0.2
Market price	1 : 2 i.e.	2.0 × 35%	<u>0.7</u>
		Total	<u>2.5</u>

Swap ratio is for every one share of H Ltd., to issue 2.5 shares of E Ltd. Hence, total no. of shares to be issued 15 lakh × 2.5 = 37.50 lakh shares

(iii) Promoter's holding = 9.50 lakh shares + (10 × 2.5 = 25 lakh shares) = 34.50 lakh i.e. Promoter's holding % is (34.50 lakh/57.50 lakh) × 100 = 60%.

(iv) Calculation of EPS after merger

Total No. of shares 20 lakh + 37.50 lakh = 57.50 lakh

$$\text{EPS} = \frac{\text{Total profit}}{\text{No. of shares}} = \frac{100 \text{ lakh} + 300 \text{ lakh}}{57.50 \text{ lakh}} = \frac{400}{57.50} = ₹ 6.956$$

(v) Calculation of Market price and Market capitalization after merger

Expected market price = EPS 6.956 × P/E 10 = ₹ 69.56

Market capitalization = ₹ 69.56 per share × 57.50 lakh shares

= ₹ 3,999.70 lakh or ₹ 4,000 lakh

(vi) Free float of market capitalization = ₹ 69.56 per share × (57.50 lakh × 40%) = ₹ 1599.88 lakh

20. (a) Swap Ratio

	Abhiman Ltd.	Abhishek Ltd.
Share Capital	200 Lakh	100 Lakh
Free Reserves	<u>800 Lakh</u>	<u>500 Lakh</u>
Total	<u>1000 Lakh</u>	<u>600 Lakh</u>
No. of Shares	2 Lakh	10 Lakh
Book Value per share	₹ 500	₹ 60
Promoter's holding	50%	60%
Non promoter's holding	50%	40%
Free Float Market Cap. i.e. relating to Public's holding	400 Lakh	128 Lakh
Hence Total market Cap.	800 Lakh	320 Lakh
No. of Shares	2 Lakh	10 Lakh
Market Price	₹ 400	₹ 32
P/E Ratio	10	4
EPS	40	8
Profits (₹ 2 X 40 lakh)	₹ 80 lakh	-
(₹ 8 X 10 lakh)	-	₹ 80 lakh

Calculation of Swap Ratio

Book Value	1 : 0.12 i.e.	0.12 x 25%	0.03
EPS	1 : 0.2	0.20 x 50%	0.10
Market Price	1 : 0.08	0.08 x 25%	<u>0.02</u>
		Total	<u>0.15</u>

Swap ratio is for every one share of Abhishek Ltd., to issue 0.15 shares of Abhiman Ltd. Hence total no. of shares to be issued.

$$10 \text{ Lakh} \times 0.15 = 1.50 \text{ lakh shares}$$

(b) Book Value, EPS & Market Price

$$\text{Total No of Shares} \quad 2 \text{ Lakh} + 1.5 \text{ Lakh} = 3.5 \text{ Lakh}$$

$$\text{Total Capital} \quad ₹ 200 \text{ Lakh} + ₹ 150 \text{ Lakh} = ₹ 350 \text{ Lakh}$$

$$\text{Reserves} \quad ₹ 800 \text{ Lakh} + ₹ 450 \text{ Lakh} = ₹ 1,250 \text{ Lakh}$$

$$\text{Book Value} \quad \frac{₹ 350 \text{ Lakh} + ₹ 1,250 \text{ Lakh}}{3.5 \text{ Lakh}} = ₹ 457.14 \text{ per share}$$

$$\text{EPS} \quad \frac{\text{Total Profit}}{\text{No. of Share}} = \frac{₹ 80 \text{ Lakh} + ₹ 80 \text{ Lakh}}{3.5 \text{ Lakh}} = \frac{₹ 160 \text{ Lakh}}{3.5} = ₹ 45.71$$

$$\text{Expected Market Price} \quad \text{EPS (₹ 45.71)} \times \text{P/E Ratio (10)} = ₹ 457.10$$

- (c) (i) Promoter's holding
- | | | |
|----------------------------|-------------------|-------------------------|
| Promoter's Revised Holding | Abhiman 50% i.e. | 1.00 Lakh shares |
| | Abhishek 60% i.e. | <u>0.90 Lakh shares</u> |
| | Total | <u>1.90 Lakh shares</u> |
- Promoter's % = $1.90/3.50 \times 100 = 54.29\%$
- (ii) Free Float Market Capitalisation
- | | |
|----------------------------------|------------------------------------|
| Free Float Market Capitalisation | = (3.5 Lakh – 1.9 Lakh) x ₹ 457.10 |
| | = ₹ 731.36 Lakh |
- (iii) (a) & (b)
- | | |
|--|--------------------------------------|
| Revised Capital | ₹ 350 Lakh + ₹ 175 Lakh = ₹ 525 Lakh |
| No. of shares before Split (F.V ₹ 100) | 5.25 Lakh |
| No. of Shares after Split (F.V. ₹ 5) | 5.25 x 20 = 105 Lakh |
| EPS | 160 Lakh / 105 Lakh = 1.523 |
| Book Value | <u>Cap. ₹ 525 Lakh + ₹ 1075 Lakh</u> |
| | No. of Shares = 105 Lakh |
| | = ₹ 15.238 per share |

21. As per T Ltd.'s Offer

	₹ in lakhs
(i) Net Consideration Payable	
7 times EBIDAT, i.e. 7 x ₹ 115.71 lakh	809.97
Less: Debt	<u>240.00</u>
	<u>569.97</u>
(ii) No. of shares to be issued by T Ltd	
₹ 569.97 lakh/₹ 220 (rounded off) (Nos.)	2,59,000
(iii) EPS of T Ltd after acquisition	
Total EBIDT (₹ 400.86 lakh + ₹ 115.71 lakh)	516.57
Less: Interest (₹ 58 lakh + ₹ 30 lakh)	<u>88.00</u>
	428.57
Less: 30% Tax	<u>128.57</u>

Total earnings (NPAT)	<u>300.00</u>
Total no. of shares outstanding (12 lakh + 2.59 lakh)	14.59 lakh
EPS (₹ 300 lakh/ 14.59 lakh)	₹ 20.56
(iv) Expected Market Price:	
Pre-acquisition P/E multiple:	
EBIDAT (₹ in lakhs)	400.86
Less: Interest $(580 \times \frac{10}{100})$ (₹ in lakhs)	<u>58.00</u>
	342.86
Less: 30% Tax (₹ in lakhs)	<u>102.86</u>
EAT (₹ in lakhs)	<u>240.00</u>
No. of shares (lakhs)	12.00
EPS	₹ 20.00
Hence, PE multiple $\frac{220}{20}$	11
Expected market price after acquisition (₹ 20.56 x 11)	₹ 226.16

As per E Ltd's Plan

	₹ in lakhs
(i) Net consideration payable	
6 lakhs shares x ₹ 110	660
(ii) No. of shares to be issued by T Ltd	
₹ 660 lakhs ÷ ₹ 220	3 lakh
(iii) EPS of T Ltd after Acquisition	
NPAT (as per earlier calculations)	300.00
Total no. of shares outstanding (12 lakhs + 3 lakhs)	15 lakh
Earning Per Share (EPS) ₹ 300 lakh/15 lakh	₹ 20.00
(iv) Expected Market Price (₹ 20 x 11)	220.00

(v) Advantages of Acquisition to T Ltd

Since the two companies are in the same industry, the following advantages could accrue:

- Synergy, cost reduction and operating efficiency.
- Better market share.
- Avoidance of competition

22. Share holders' funds

(₹ Lakhs)

Particulars	Fortune India Ltd.	Fortune Pharma Ltd.	Fortune India (FMCG) Ltd.
Assets	70,000	25,100	44,900
Outside liabilities	<u>25,000</u>	<u>4,100</u>	<u>20,900</u>
Net worth	<u>45,000</u>	<u>21,000</u>	<u>24,000</u>

1. Calculation of Shares of Fortune Pharma Ltd. to be issued to shareholders of Fortune India Ltd.

	Fortune Pharma Ltd.
Estimated Profit (₹ in lakhs)	1,470
Estimated market price (₹)	24.5
Estimated P/E	25
Estimated EPS (₹)	0.98
No. of shares lakhs	1,500

Hence, Ratio is 1 share of Fortune Pharma Ltd. for 2 shares of Fortune India Ltd.

OR for 0.50 share of Fortune Pharma Ltd. for 1 share of Fortune India Ltd.

2. Expected market price of Fortune India (FMCG) Ltd.

	Fortune India (FMCG) Ltd.
Estimated Profit (₹ in lakhs)	11,400
No. of equity shares (₹ in lakhs)	3,000
Estimated EPS (₹)	3.8
Estimated P/E	42
Estimated market price (₹)	159.60

3. Book value per share

	Fortune Pharma Ltd.	Fortune India (FMCG) Ltd.
Net worth (₹ in lakhs)	21,000	24,000
No. of shares (₹ in lakhs)	1,500	3,000
Book value of shares	₹ 14	₹ 8

23. (i) Net asset value

H Ltd.	$\frac{\text{₹ 1300 Crores} - \text{₹ 300 Crores}}{3.50 \text{ Crores}} = \text{₹ 285.71}$
B Ltd.	$\frac{\text{₹ 31.50 Crores}}{0.65 \text{ Crores}} = \text{₹ 48.46}$

(ii) Earning capitalization value

H Ltd.	$\frac{\text{₹ 300 Crores} / 0.08}{3.50 \text{ Crores}} = \text{₹ 1071.43}^*$
B Ltd.	$\frac{\text{₹ 10 Crores} / 0.08}{0.65 \text{ Crores}} = \text{₹ 192.31}$

* Alternatively, Contingent Liability can also be deducted from this Valuation.

(iii) Fair value

H Ltd.	$\frac{\text{₹ 285.71} \times 1 + \text{₹ 1071.43} \times 3}{4} = \text{₹ 875}$
B Ltd.	$\frac{\text{₹ 48.46} \times 1 + \text{₹ 192.31} \times 3}{4} = \text{₹ 156.3475}$

Exchange ratio $\text{₹ 156.3475} / \text{₹ 875} = 0.1787$

H Ltd should issue its 0.1787 share for each share of B Ltd.

Note: In above solution it has been assumed that the contingent liability will materialize at its full amount.

24. (i) Market value of Companies before Merger

Particulars	RIL	SIL
EPS	₹ 2	Re.1
P/E Ratio	10	5
Market Price Per Share	₹ 20	₹ 5
Equity Shares	10,00,000	10,00,000
Total Market Value	2,00,00,000	50,00,000

(ii) Post Merger Effects on RIL

	₹
Post-merger earnings	30,00,000
Exchange Ratio (1:4)	
No. of equity shares o/s (10,00,000 + 2,50,000)	12,50,000

Cost of Capital i.e., $K_e = (0.60/20) + 0.07 = 0.10$

After acquisition g (i.e. growth) becomes 0.08

Therefore, price per share after acquisition = $0.60/(0.10-0.08) = ₹30$

The increase in value therefore is = $₹(30-20) \times 5,00,000 = ₹50,00,000/-$

(ii) To share holders of BCD Ltd. the immediate gain is $₹100 - ₹20 \times 4 = ₹20$ per share

The gain can be higher if price of shares of AFC Ltd. rise following merger which they should undertake.

To AFC Ltd. shareholders	(₹ (In lakhs))
Value of Company now	1,000
Value of BCD Ltd.	<u>150</u>
	1,150
No. of shares	11.25
∴ Value per share	$1150/11.25 = ₹102.22$

Gain to shareholders of BCD Ltd. = $₹102.22 - ₹(4 \times 20) = ₹22.22$

Gain to shareholders of AFC Ltd. = $₹102.22 - ₹100.00 = ₹2.22$

(iii) Gain to shareholders of AFC Ltd:-

Earnings of BCD Ltd. (5,00,000 x 2.50)	₹12,50,000/-
Less: Loss of earning in cash (5,00,000 x ₹ 22 x 0.10)	<u>₹11,00,000/-</u>
Net Earning	<u>₹ 1,50,000/-</u>
Number of shares	10,00,000
Net increase in earning per share	0.15

P/E ratio of AFC Ltd. = $100/8 = 12.50$

Therefore, Gain per share of shareholders of AFC Ltd. = $0.15 \times 12.50 = ₹ 1.88$

Gain to the shareholders of BCD Ltd. $₹ (22-20) = ₹ 2/-$ per share

Alternatively, it can also be computed as follows:

Post-Merger Earnings (10,00,000 x ₹ 8 + 5,00,000 x ₹ 2.5 - 11,00,000)	₹ 81,50,000
EPS after Merger $\left(\frac{81,50,000}{10,00,000} \right)$	₹ 8.15
PE Ratio	12.50
Post Merger Price of Share (₹ 8.15 x 12.50)	₹ 101.875

Less: Price before merger	₹ 100.00
	<u>₹ 1.875</u>
Say	₹ 1.88

26. Price/share of AB Ltd. for determination of number of shares to be issued

$$= (\text{₹ } 570 + \text{₹ } 430) / 2 = \text{₹ } 500$$

Value of XY Ltd based on future cash flow capitalization (105×0.93)+(120×0.86)+(125×0.79)+(120×0.74)×(300×0.68)	₹ lakhs	592.40
Value of XY Ltd based on net assets	₹ lakhs	250.00
Average value (592.40+250)/2		421.20
No. of shares in AB Ltd to be issued ₹ 4,21,20,000/500	Nos.	84240
Basis of allocation of shares		
Fully paid equivalent shares in XY Ltd. (20+5) lakhs		2500000
Distribution to fully paid shareholders 84240×20/25		67392
Distribution to partly paid shareholders 84240-67392		16848

27. (i) Determination of EPS, P/E Ratio, ROE and BVPS of R Ltd. & S Ltd.

	R Ltd.	S Ltd.
EAT (₹)	5,33,000	2,49,600
N	200000	160000
EPS (EAT÷N)	2.665	1.56
Market Price Per Share	50	20
PE Ratio (MPS/EPS)	18.76	12.82
Equity Fund (Equity Value)	2400000	1600000
BVPS (Equity Value ÷ N)	12	10
ROE (EAT ÷ EF) or	0.2221	0.156
ROE (EAT ÷ EF) x 100	22.21%	15.60%

- (ii) Determination of Growth Rate of EPS of R Ltd. & S Ltd.

	R Ltd.	S Ltd.
Retention Ratio (1-D/P Ratio)	0.80	0.70
Growth Rate (ROE x Retention Ratio) or	0.1777	0.1092
Growth Rate (ROE x Retention Ratio) x 100	17.77%	10.92%

(iii) Justifiable equity share exchange ratio

(a) Market Price Based = $MPS_S/MPS_R = ₹ 20/ ₹ 50 = 0.40:1$ (lower limit)

(b) Intrinsic Value Based = $₹ 25/ ₹ 50 = 0.50:1$ (max. limit)

Since R Ltd. has higher EPS, PE, ROE and higher growth expectations the negotiated term would be expected to be closer to the lower limit, based on existing share price.

28. Market price per share (MPS) = EPS X P/E ratio or P/E ratio = MPS/EPS

(i) **Determination of EPS, P/E ratio, ROE and BVPS of BA Ltd. and DA Ltd.**

		BA Ltd.	DA Ltd.
Earnings After Tax	(EAT)	₹ 2,10,000	₹ 99,000
No. of Shares	(N)	100000	80000
EPS	(EAT/N)	₹ 2.10	₹ 1.2375
Market price per share	(MPS)	40	15
P/E Ratio	(MPS/EPS)	19.05	12.12
Equity Funds	(EF)	₹ 12,00,000	₹ 8,00,000
BVPS	(EF/N)	12	10
ROE	(EAT/EF) × 100	17.50%	12.37%

(ii) **Estimation of growth rates in EPS for BA Ltd. and DA Ltd.**

Retention Ratio	(1-D/P ratio)	0.6	0.4
Growth Rate	(ROE × Retention Ratio)	10.50%	4.95%

(iii) **Justifiable equity shares exchange ratio**

(a) Intrinsic value based = $₹20 / ₹40 = 0.5:1$ (upper limit)

(b) Market price based = $MPS_{DA}/MPS_{BA} = ₹15 / ₹40 = 0.375:1$ (lower limit)

Since, BA Ltd. has a higher EPS, ROE, P/E ratio and even higher EPS growth expectations, the negotiable terms would be expected to be closer to the lower limit, based on the existing share prices.

(iv) **Calculation of Post merger EPS and its effects**

Particulars			BA Ltd.	DA Ltd.	Combined
EAT	(₹)	(i)	2,10,000	99,000	3,09,000
Share outstanding		(ii)	100000	80000	132000*
EPS	(₹)	(i) / (ii)	2.1	1.2375	2.341
EPS Accretion (Dilution)	(Re.)		0.241	(0.301***)	

(v) Estimation of Post merger Market price and other effects

Particulars			BA Ltd.	DA Ltd.	Combined
EPS	(₹)	(i)	2.1	1.2375	2.341
P/E Ratio		(ii)	19.05	12.12	19.05
MPS	(₹)	(i) / (ii)	40	15	44.6
MPS Accretion	(₹)		4.6	2.84***	

* Shares outstanding (combined) = 100000 shares + (0.40 × 80000) = 132000 shares

** EPS claim per old share = ₹ 2.34 × 0.4 = ₹ 0.936

EPS dilution = ₹ 1.2375 – ₹ 0.936 = ₹ 0.3015

***S claim per old share (₹ 44.60 × 0.4) = ₹ 17.84

Less: MPS per old share = ₹ 15.00

₹ 2.84

29. (a) Swap Ratio

Gross NPA	5:40	5/40 × 30%	0.0375
CAR	5:16	5/16 × 28%	0.0875
Market Price	12:96	12/96 × 32%	0.0400
Book Value Per Share	12:120	12/120 × 10%	0.0100
			0.1750

Thus, for every share of Weak Bank, 0.1750 share of Strong Bank shall be issued.

Calculation of Book Value Per Share

Particulars	Weak Bank (W)	Strong Bank (S)
Share Capital (₹ Lakhs)	150	500
Reserves & Surplus (₹ Lakhs)	80	5,500
	230	6,000
Less: Preliminary Expenses (₹ Lakhs)	50	--
Net Worth or Book Value (₹ Lakhs)	180	6,000
No. of Outstanding Shares (Lakhs)	15	50
Book Value Per Share (₹)	12	120

(b) No. of equity shares to be issued:

$$\frac{150}{10} \times 0.1750 = 2.625 \text{ lakh shares}$$

(c) **Balance Sheet after Merger**

Calculation of Capital Reserve

Book Value of Shares	₹ 180.00 lac
Less: Value of Shares issued	₹ 26.25 lac
Capital Reserve	₹ 153.75 lac

Balance Sheet

	₹ lac		₹ lac
Paid up Share Capital	526.25	Cash in Hand & RBI	2900.00
Reserves & Surplus	5500.00	Balance with other banks	2000.00
Capital Reserve	153.75	Investment	20100.00
Deposits	48000.00	Advances	30500.00
Other Liabilities	3390.00	Other Assets	2070.00
	57570.00		57570.00

(d) **Calculation CAR & Gross NPA % of Bank 'S' after merger**

$$\text{CAR / CRWAR} = \frac{\text{Total Capital}}{\text{Risky Weighted Assets}}$$

	Weak Bank	Strong Bank	Merged
Capital Adequacy Ratio (CAR)	5%	16%	
Total Capital	₹ 180 lac	₹ 6000 lac	₹ 6180 lac
Risky Weighted Assets	₹ 3600 lac	₹ 37500 lac	₹ 41100 lac

$$\text{CAR} = \frac{6180}{41100} \times 100 = 15.04\%$$

$$\text{GNPA Ratio} = \frac{\text{Gross NPA}}{\text{Gross Advances}} \times 100$$

	Weak Bank	Strong Bank	Merged
GNPA (Given)	0.40	0.05	
	$0.40 = \frac{\text{GNPA}_R}{₹ 3500 \text{ lac}}$	$0.05 = \frac{\text{GNPA}_S}{₹ 27000 \text{ lac}}$	
Gross NPA	₹ 1400 lac	₹ 1350 lac	₹ 2750 lac

30. Calculation of Purchase Consideration

	₹
Issue of Share 35000 x ₹15	5,25,000
External Liabilities settled	5,00,000
13% Debentures	3,00,000
	13,25,000
Less: Realization of Debtors and Inventories	2,00,000
Cash	50,000
	10,75,000

$$\begin{aligned}
 \text{Net Present Value} &= \text{PV of Cash Inflow} + \text{PV of Demerger of Leopard Ltd.} - \text{Cash Outflow} \\
 &= ₹ 5,00,000 \text{ PVAF}(16\%, 6) + ₹ 2,00,000 \text{ PVF}(16\%, 6) - ₹ 10,75,000 \\
 &= ₹ 5,00,000 \times 3.684 + ₹ 2,00,000 \times 0.410 - ₹ 10,75,000 \\
 &= ₹ 18,42,000 + ₹ 82,000 - ₹ 10,75,000 \\
 &= ₹ 8,49,000
 \end{aligned}$$

Since NPV of the decision is positive it is advantageous to acquire Leopard Ltd.

31. (i) Calculation of maximum price per share at which PQR Ltd. can offer to pay for XYZ Ltd.'s share

Market Value (10,00,000 x ₹ 24)	₹ 2,40,00,000
Synergy Gain	₹ 80,00,000
Saving of Overpayment	₹ 30,00,000
	₹ 3,50,00,000
Maximum Price (₹ 3,50,00,000/10,00,000)	₹ 35

Alternatively, it can also be computed as follows:

Let ER be the swap ratio then,

$$40 = \frac{24 \times 10,00,000 + 40 \times 15,00,000 + 80,00,000 + 30,00,000}{15,00,000 + 10,00,000 \times \text{ER}}$$

$$\text{ER} = 0.875$$

$$\text{MP} = \text{PE} \times \text{EPS} \times \text{ER} = \frac{40}{4} \times ₹ 4 \times 0.875 = ₹ 35$$

- (ii) Calculation of minimum price per share at which the management of XYZ Ltd.'s will be willing to offer their controlling interest

Value of XYZ Ltd.'s Management Holding (40% of 10,00,000 x ₹ 24)	₹ 96,00,000
Add: PV of loss of remuneration to top management	₹ 30,00,000
	₹ 1,26,00,000
No. of Shares	4,00,000
Minimum Price (₹ 1,26,00,000/4,00,000)	₹ 31.50

STARTUP FINANCE



LEARNING OUTCOMES

After going through the chapter student shall be able to understand:

- Introduction including Pitch Presentation
- Concept of Unicorn
- Startup Initiative of GOI
- Sources of Funding
- Succession planning in Business

1. THE BASICS OF STARTUP FINANCING

Startup financing means some initial infusion of money needed to turn an idea (by starting a business) into reality. Traditional lenders like banks etc. are not interested in a startup business. The reason is that when you are just starting out, you're not at the point yet where a conservative lender or investor can rely on security of your assets or be able to forecast cashflows to secure their investments or estimate your repayment capacity with certainty. So that leaves one with the option of selling some assets, borrowing against one's home, asking loved ones i.e. family and friends for loans etc. But that involves a lot of risk, including the risk of bankruptcy and strained relationships with friends and family.

So, the pertinent question is how to keep loans from family and friends strictly business like. This is the hard part behind starting a business -- putting so much at risk but doing so is essential. It's what sets entrepreneurs apart from people who collect regular salaries as employees.

A good way to get success in the field of entrepreneurship is to speed up initial operations as quickly as possible to get to the point where outside investors can see and feel the business venture, as well as understand that a person has taken some risk reaching to that level.

Some businesses can also be bootstrapped (start and build a company from personal finances or from the operating revenues of the new company).They can be set up and grown quickly enough to make money without any help from investors who might otherwise come in and start dictating the terms.

In order to successfully launch a business and get it to a level where large investors are interested in putting their money, requires a strong business plan. It also requires seeking advice from experienced entrepreneurs and experts -- people who might invest in the business sometime in the future.

2. SOME OF THE INNOVATIVE WAYS TO FINANCE A STARTUP

Every startup needs access to capital, whether for funding product development, acquiring machinery and inventory or paying salaries to its employee. Most entrepreneurs think first of bank loans as the primary source of money, only to find out that banks are really the least likely benefactors for startups. So, innovative measures include maximizing non-bank financing.

Here are some of the sources for funding a startup:

- (i) **Personal financing:** It may not seem to be innovative but you may be surprised to note that most budding entrepreneurs never thought of saving any money to start a business. This is important because most of the investors will not put money into a deal if they see that you have not contributed any money from your personal sources.
- (ii) **Personal credit lines:** One qualifies for personal credit line based on one's personal credit efforts. Credit cards are a good example of this. However, banks are very cautious while granting personal credit lines. They provide this facility only when the business has enough cash flow to repay the line of credit.
- (iii) **Family and friends:** These are the people who generally believe in you, without even thinking that your idea works or not. However, the loan obligations to friends and relatives should always be in writing as a promissory note or otherwise.
- (iv) **Peer-to-peer lending:** In this process a group of people come together and lend money to each other. Peer to peer lending has been there for many years. Many small and ethnic business groups having similar faith or interest generally support each other in their start up endeavors.
- (v) **Crowdfunding:** Crowdfunding is the use of small amounts of capital from a large number of individuals to finance a new business initiative. Crowdfunding makes use of the easy accessibility

of vast networks of people through social media and crowdfunding websites to bring investors and entrepreneurs together.

(vi) Microloans: Microloans are small loans that are given by individuals at lower interest rates to new business ventures. These loans can be issued by a single individual or aggregated across a number of individuals who each contribute a portion of the total amount.

(vii) Vendor financing: Vendor financing is the form of financing in which a company lends money to one of its customers so that he can buy products from the company itself. Vendor financing also takes place when many manufacturers and distributors are convinced to defer payment until the goods are sold. This means extending the payment terms to a longer period for e.g. 30 days payment period can be extended to 45 days or 60 days. However, this depends on one's credit worthiness and payment of more money.

(viii) Purchase order financing: The most common scaling problem faced by startups is the inability to find a large new order. The reason is that they don't have the necessary cash to produce and deliver the product. Purchase order financing companies often advance the required funds directly to the supplier. This allows the completion of transaction and profit flows up to the new business.

(ix) Factoring accounts receivables: In this method, a facility is given to the seller who has sold the good on credit to fund his receivables till the amount is fully received. So, when the goods are sold on credit, and the credit period (i.e. the date upto which payment shall be made) is for example 6 months, the factoring company will pay most (say 80-90%) of the outstanding amount upfront. The balance amount will be paid on due date once the factoring company has received the full amount from customer after deducting its interest charges. In this way, a startup can raise funds to pay its day-to-day expenses.

3. PITCH PRESENTATION

Pitch presentation is a short and brief presentation (not more than 20 minutes) to investors explaining about the prospects of the company and why they should invest into the startup business. So, pitch deck presentation is a brief presentation using PowerPoint to provide a quick overview of business plan and convincing the investors to put some money into the business. A pitch presentation can be made either during face-to-face meetings or online meetings with potential investors, customers, partners, and co-founders. Here are some points to be kept in mind while preparing a pitch presentation:

(i) Introduction: To start with, first step is to give a brief account of yourself i.e. who are you? What are you doing? But care should be taken to make it short. Also, use this opportunity to get your investors interested in your company. You can also mention the most interesting facts about your business, as well as any major milestones you may have achieved.

(ii) **Team:** The next step is to introduce the audience to the people behind the scenes. The reason is that the investors will want to know the people who are going to make the product or service successful. Moreover, the investors are not only putting money towards the idea but they are also investing in the team. Also, an attempt should be made to include the background of the promoter, and how it relates to the new company. Moreover, in case the team has worked together in the past then highlight significant results achieved by the team members.

(iii) **Problem:** Further, the promoter should be able to explain the problem that the startup is going to solve and solutions emerging from it. It is important to convince the investors that the newly introduced product or service will solve the problem.

For instance, when Facebook was launched in 2004, it added some new features which made it stand out in comparison to Orkut which was there for some time. Customers have no privacy while using Orkut. However, in Facebook, you can view a person's profile only if he adds you to his list. This simple yet effective advantage that Facebook has over Orkut made it an extremely popular social networking site. It enabled Facebook to become an instant hit.

(iv) **Solution:** It is very important to describe in the pitch presentation as to how the company is planning to solve the problem. For instance, when Flipkart first started its business in 2007, it brought the concept of e-commerce in India but when they started, payment through credit card was rare. So, they introduced the system of cash on delivery which was later followed by other e-commerce companies in India. The second problem was the entire supply chain system. Delivering goods on time is one of the most important factors that determines the success of an e-commerce company. Flipkart addressed this issue by launching their own supply chain management system to deliver orders in a timely manner. These innovative techniques used by Flipkart enabled them to raise a large amount of capital from the investors.

(v) **Marketing/Sales:** This is a very important part where investors will be deeply interested. The market size of the product must be communicated to the investors. This can include profiles of target customers, but one should be prepared to answer questions about how the promoter is planning to attract the customers. If a business is already selling goods, the promoter can also brief the investors about the growth and future revenue forecasts.

(vi) **Projections or Milestones:** It is true that it is difficult to make financial projections for a startup concern. If an organization doesn't have a long financial history, an educated guess can be made. Projected financial statements can be prepared which gives potential investors a brief idea about where is the business heading. It tells us that whether the business will be making profit or loss.

Financial projections include three basic documents that make up a business's financial statements.

- **Income statement:** This estimate how much money the business will generate by projecting income and expenses. It will show:
 - ❖ How much revenue did the business generate?

- ❖ How much did it cost to generate and support that revenue?
- ❖ How much did the business pay its employees?
- ❖ How much did it pay towards rent?

For your first year in business, you'll want to create a monthly income statement. For the second year, quarterly statements will suffice. For the following years, you'll just need an annual income statement.

- **Cash flow statement:** A projected cash flow statement will depict how much cash will be coming into the business and how much cash will be utilized. At the end of each period (e.g. monthly, quarterly, annually), one can tally it all up to show either the cash burn or the cash generated during the period and the cash balance remaining at the end of the period.
- **Balance sheet:** The balance sheet shows the business's overall finances including assets, liabilities and equity. Typically, one will create an annual balance sheet for one's financial projections. It shows:
 - ❖ How much cash is in the bank?
 - ❖ How much money does the company owe to suppliers?
 - ❖ How much money has been invested in the company?

(vii) Competition: Every business organization has competition even if the product or service offered is new and unique. It is necessary to highlight in the pitch presentation as to how the products or services are different from their competitors. If any of the competitors have been acquired, their complete details like name of the organization, acquisition prices etc. should also be highlighted.

(viii) Business Model: The term business model is a wide term denoting core aspects of a business including purpose, business process, target customers, offerings, strategies, infrastructure, organizational structures, sourcing, trading practices, operational processes and policies including culture.

Further, as per Investopedia, a business model is the way in which a company generates revenue and makes a profit from its operations. Analysts use the term gross profit as a way to compare the efficiency and effectiveness of a firm's business model. Gross profit is calculated by subtracting the cost of goods sold from revenues.

A business model can be illustrated with the help of an example. There are two companies – company A and company B. Both the companies are engaged in the business of renting movies. Prior to the advent of internet both the companies rent movies physically. Both the companies made ₹ 5 crore as revenues. Cost of goods sold was ₹ 4 crore. So, the companies made ₹ 1 crore as gross profit. After the introduction of internet, company A started to offer movies online instead of renting or selling it physically. This change affected the business model of company A positively. Revenue is still ₹ 5 crore but the significant part is that cost of goods sold is now ₹ 2 crore only.

This is because online sales lead to significant reduction of storage and distribution costs. So, the gross profit margin increases from 20% to 60%.

Therefore, Company A isn't making more in sales, but it figured out a way to revolutionize its business model, which greatly reduces costs. Managers at company A have an additional 40% more in margin to play with than managers at company A. Managers at company A have little room for error and must tread carefully.

Every investor wants to get his money back, so it's important to tell them in a pitch presentation as to how the startup is planning to generate revenue. It is better to show the investors a list of the various revenue streams for a business model and the timeline for each of them. Further, the pitch should clarify how the startup is planning to price the product and how does it compare to what the competitors charge for the same or similar product. It is also beneficial to discuss the cost of acquisition, lifetime value of the customer and what strategy the startup is planning to use to retain the customer.

(ix) Financing: If a startup has raised money, it is preferable to talk about how much money has already been raised, who invested money and how that money has been used. If no money has been raised till date, an explanation can be made regarding how much work has been accomplished with the help of minimum funding that the company is managed to raise.

It is true that investors like to see entrepreneurs who have invested their own money. If a promoter is pitching to raise capital, he should list out how much he is looking to raise and how he intends to use the funds.

4. CONCEPT OF UNICORN

A Unicorn is a privately held start-up company which has achieved a valuation US\$ 1 billion. This term was coined by venture capitalist Aileen Lee, first time in 2013. Unicorn, a mythical animal represents the statistical rarity of successful ventures.

A start-up is referred as a Unicorn if it has following features:

- (i) A privately held start-up.
- (ii) Valuation of start-up reaches US\$ 1 Billion.
- (iii) Emphasis is on the rarity of success of such start-up.
- (iv) Other common features are new ideas, disruptive innovation, consumer focus, high on technology etc.

However, it is important to note that in case the valuation of any start-up slips below US\$ 1 billion it can lose its status of 'Unicorn'. Hence a start-up may be Unicorn at one point of time and may not be at another point of time.

In September 2011, InMobi, an ad-tech startup, became the first Unicorn of India. SoftBank invested US\$ 200 million in InMobi valuing the mobile advertising company at over US\$ 1 billion, making it India's first unicorn. InMobi was founded in 2007 and took four years to achieve the Unicorn status in 2011. In 2018, Udaan, a B2B e-commerce marketplace, became the fastest growing startup by becoming a Unicorn in just over two years' time.

The names of various startups that became Unicorn during last decade is as follows:

Year of becoming Unicorn	Unicorn Name
2011	<ul style="list-style-type: none"> • Inmobi
2012	<ul style="list-style-type: none"> • Flipkart
2013	<ul style="list-style-type: none"> • Mu Sigma
2014	<ul style="list-style-type: none"> • Ola • Snapdeal
2015	<ul style="list-style-type: none"> • Paytm • Quikr • Zomato
2016	<ul style="list-style-type: none"> • Shopclues • Hike
2017	<ul style="list-style-type: none"> • ReNew
2018	<ul style="list-style-type: none"> • BillDesk • Byju's • Freshworks • Oyo • Paytm mall • PhonePe • Policy bazaar • Rivigo • Swiggy • Udaan
2019	<ul style="list-style-type: none"> • Bigbasket • Delhivery • Druva • Dream 11

	<ul style="list-style-type: none">• Icertis• Lenskart• Ola Electric
2020	<ul style="list-style-type: none">• Cars 24• Firstery• Glance• Nykaa• Pine Labs• POSTMAN• Razorpay• Unacademy• Dailyhunt• Zenoti• Zerodha
2021	<ul style="list-style-type: none">• Acko• Apna• BharatPe• Blackbuck• Blinkit• BrowserStack• CarDekho• Chargebee• CoinDCX• Coinswitch• Cred• Cult fit• Digit• Droom• EaseMyTrip• ERUDITIS• GlobalBees• The Good Glamm Group• Groww• Gupshup

	<ul style="list-style-type: none">• Infra.Market• Innovaccer• Licious• Mamaearth• MapMyIndia• Meesho• MENSA• Mindtickle• MobiKwik• MPL• Moglix• NoBroker• Of business• PharmEasy• Pristyn Care• Rebel Foods• ShareChat• Slice• Spinny• UpGrad• Urban Company• Vedantu• Zeta• Zetwerk
2022	<ul style="list-style-type: none">• Amagi• CredAvenue• Darwinbox• DealShare• Elasticrun• Fractal• Games24x7• Hasura• Lead• Leadsquared

	<ul style="list-style-type: none"> • Livspace • One Card • Open • Oxyzo • Physicswallah • Purple • Shiprocket • Tata 1mg • Uniphore • Xpressbees • 5ire
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India has now emerged as the 3rd largest ecosystem for startups globally, after US and China, with over 59,000 DPIIT-recognized startups. As per data available on InvestIndia.gov.in, as of 7th September 2022, India had 107 unicorns with a combined valuation of US\$ 340.79 billion. The next milestone for a Unicorn to achieve is to become a Decacorn, i.e., a company which has attained a valuation of more than US\$ 10 billion. There should be no doubt that within a few years the Unicorns would be a thing of the past and we would be talking about the Decacorns of India.

5. MODES OF FINANCING FOR STARTUPS

5.1 Sources of financing

5.1.1 Bootstrapping

An individual is said to be bootstrapping when he or she attempts to start and build a company from personal finances or from the operating revenues of the new company.

A common mistake made by most founders is that they make unnecessary expenses towards marketing, offices and equipment they cannot really afford. So, it is true that more money at the inception of a business leads to complacency and wasteful expenditure. On the other hand, investment by startups from their own savings leads to a cautious approach. It curbs wasteful expenditures and enable the promoter to be on their toes all the time.

Here are some of the methods by which a startup firm can bootstrap:

(a) *Trade Credit:* When a person is starting his business, suppliers are reluctant to give trade credit. They will insist on payment of their goods supplied either by cash or by credit card. However, a way out in this situation is to prepare a well-crafted financial plan. The next step is to pay a visit to the supplier's office. If the business organization is small, the owner can be directly contacted. On the other hand, if it is a big firm, the Chief Financial Officer can be contacted and convinced about the financial plan.

Communication skills are important here. The financial plan has to be shown. The owner or the financial officer has to be explained about the business and the need to get the first order on credit in order to launch the venture. It will also help to get reference of someone known to the supplier who can confirm your credentials, integrity and if possible professional competence. The owner or financial officer may give half the order on credit and balance on delivery. The trick here is to get the goods shipped and sell them before paying to them. One can also borrow to pay for the good sold but there is interest cost also. So, trade credit is one of the most important way to reduce the amount of working capital one needs. This is especially true in retail operations.

(b) *Factoring*: This is a financing method where accounts receivable of a business organization is sold to a commercial finance company to raise capital. The factor then gets hold of the accounts receivable and assumes the task of collecting the receivables as well as doing what would've been the paperwork. Factoring can be performed on a non-notification basis. It means customers may not be told that their accounts have been sold.

However, there are merits and demerits to factoring. The process of factoring may reduce costs for a business organization. It can reduce costs associated with maintaining accounts receivable such as bookkeeping, collections and credit verifications. If comparison can be made between these costs and fee payable to the factor, in many cases it has been observed that it is fruitful to utilize this financing method.

In addition to reducing internal costs of a business, factoring also frees up money that would otherwise be tied to receivables. This is especially true for businesses that sell to other businesses or to government; there are often long delays in payment that this would offset. This money can be used to generate profit through other avenues of the company. Factoring can be a very useful tool for raising money and keeping cash flowing.

(c) *Leasing*: Another popular method of bootstrapping is to take the equipment on lease rather than purchasing it. It will reduce the capital cost and help lessee (person who take the asset on lease) to claim tax exemption. So, it is better to take a photocopy machine, an automobile, or a van on lease to avoid paying out lump sum money which is not at all feasible for a startup organization.

Further, if you are able to shop around and get the best kind of leasing arrangement when you're starting up a new business, it's much better to lease. It's better, for example, to lease a photocopier say at ₹ 5,000 per month, rather than pay ₹ 1,00,000 or more for it; or lease your automobile or van to avoid paying out ₹ 5,00,000 or more.

There are advantages for both the startup businessman using the property or equipment (i.e. the *lessee*) and the owner of that property or equipment (i.e. the *lessor*.) The lessor enjoys tax benefits in the form of depreciation on the fixed asset leased and may gain from capital appreciation on the property, as well as making a profit from the lease. The lessee benefits by making smaller payments retain the ability to walk away from the equipment at the end of the lease term. The lessee may also claim tax benefit in the form of lease rentals paid by him.

5.1.2 Angel Investors

Despite being a country of many cultures and communities traditionally inclined to business and entrepreneurship, India still ranks low on comparative ratings across entrepreneurship, innovation, and ease of doing business. The reasons are obvious. These include our old and outdated draconian rules and regulations which provides a hindrance to our business environment for a long time. Other reasons are red tapism, our time-consuming procedures, and lack of general support for entrepreneurship. Of course, things are changing in recent times.

As per Investopedia, Angel investors invest in small startups or entrepreneurs. Often, angel investors are among an entrepreneur's family and friends. The capital angel investors provide may be a one-time investment to help the business propel or an ongoing injection of money to support and carry the company through its difficult early stages.

Angel investors provide more favorable terms compared to other lenders, since they usually invest in the entrepreneur starting the business rather than the viability of the business. Angel investors are focused on helping startups take their first steps, rather than the possible profit they may get from the business. This makes their approach slightly different from venture capitalists.

Angel investors are also called informal investors, angel funders, private investors, seed investors or business angels. They are affluent individuals who inject capital for startups in exchange for ownership equity or convertible debt. Some angel investors invest through crowdfunding platforms online or build angel investor networks to pool in capital.

Angel investors typically use their own money, unlike venture capitalists who take care of pooled money from many other investors and place them in a strategically managed fund.

Though angel investors usually represent individuals, the entity that actually provides the fund may be a limited liability company, a business, a trust or an investment fund, among many other kinds of vehicles.

Angel investors who seed startups that fail during their early stages lose their investments completely. This is why professional angel investors look for opportunities for a defined exit strategy, acquisitions or initial public offerings (IPOs).

5.1.3 Venture Capital Fund

Venture Capital Fund means investment vehicle that manage funds of investors seeking to invest in startup firms and businesses with exceptional growth potential. Venture capital is money provided by professionals who alongside management invest in young, rapidly growing companies that have the potential to develop into significant economic contributors.

5.1.3.1 Venture Capitalists generally

- Finance new and rapidly growing companies
- Purchase equity securities

- Assist in the development of new products or services.
- Add value to the company through active participation.

5.1.3.2 Characteristics of Venture Capital Financing

- Long time horizon:** The fund would invest with a long-term horizon in mind. Minimum period of investment would be 3 years and maximum period can be 10 years.
- Lack of liquidity:** When VC invests, it takes into account the liquidity factor. It assumes that there would be less liquidity on the equity it gets and accordingly it would be investing in that format. They add an illiquidity premium in the price and required return.
- High Risk:** VC would not hesitate to take risk. It works on principle of high risk and high return. So, high risk would not eliminate the investment choice for a venture capital.
- Equity Participation:** Most of the time, VC would be investing in the form of equity of a company. This would help the VC participate in the management and help the company grow. Besides, a lot of board decisions can be supervised by the VC if they participate in the equity of a company and have a Board seat.

5.1.3.3 Advantages of bringing VC in the company

- It injects long- term equity finance which provides a solid capital base for future growth.
- The venture capitalist is a business partner, sharing both the risks and rewards. Venture capitalists are rewarded with business success and capital gain.
- The venture capitalist is able to provide practical advice and assistance to the company based on past experience with other companies which were in similar situations.
- The venture capitalist also has a network of contacts in many areas that can add value to the company.
- The venture capitalist may be capable of providing additional rounds of funding should it be required to finance growth.
- Venture capitalists are experienced in the process of preparing a company for an Initial Public Offering (IPO) of its shares onto the stock exchanges or overseas stock exchange such as NASDAQ.
- They can also facilitate a trade sale.

5.1.3.4 Stages of funding for VC

1. **Seed Money:** Low level financing needed to prove a new idea.
2. **Start-up:** Early-stage firms that need funding for expenses associated with marketing and product development.
3. **First-Round:** Early sales and manufacturing funds.

4. **Second-Round:** Working capital for early stage companies that are selling product, but not yet turning in a profit.
5. **Third Round:** Also called Mezzanine financing, this is expansion money for a newly profitable company.
6. **Fourth-Round:** Also called bridge financing, it is intended to finance the "going public" process.

Risk in each stage is different. An indicative Risk matrix is given below:

Financial Stage	Period (Funds locked in years)	Risk Perception	Activity to be financed
Seed Money	7-10	Extreme	For supporting a concept or idea or R&D for product development and involves low level of financing.
Start Up	5-9	Very High	Initializing prototypes operations or developing products and its marketing.
First Stage	3-7	High	Started commercial production and marketing.
Second Stage	3-5	Sufficiently high	Expanding market and growing working capital needs though not earning profit.
Third Stage	1-3	Medium	Market expansion, acquisition & product development for a profit making company. Also called Mezzanine Financing.
Fourth Stage	1-3	Low	Facilitating public issue i.e. going public. Also called Bridge Financing.

5.2 VC Investment Process

The entire VC Investment process can be segregated into the following steps:

1. **Deal Origination:** VC operates directly or through intermediaries. Mainly practicing Chartered Accountants work as intermediaries and through them VC gets the deal.

Before sourcing the deal, the VC would inform the intermediary or its employees about the following so that the sourcing entity does not waste time:

- Sector focus
- Stages of business focus
- Promoter focus
- Turn over focus

Here the company would give a detailed business plan which consists of business model, financial plan and exit plan. All these aspects are covered in a document which is called Investment Memorandum (IM). A tentative valuation is also carried out in the IM.

2. **Screening:** Once the deal is sourced the same would be sent for screening by the VC. The screening is generally carried out by a committee consisting of senior level people of the VC. Once the screening happens, it would select the company for further processing.
3. **Due Diligence:** The screening decision would take place based on the information provided by the company. Once the decision is taken to proceed further, the VC would now carry out due diligence. This is mainly the process by which the VC tries to verify the veracity of the documents taken. This is generally handled by external bodies, mainly renowned consultants. The fees of due diligence is generally paid by the VC. However, in many cases, this can be shared between the investor (VC) and Investee (the company) depending on the veracity of the document agreement.
4. **Deal Structuring:** Once the case passes through the due diligence it would now go through the deal structuring. The deal is structured in such a way that both parties win. In many cases, the convertible structure is brought in to ensure that the promoter retains the right to buy back the share. Besides, in many structures to facilitate the exit, the VC may put a condition that promoter must sell a part of his/ her stake along with the VC. Such a clause is called tag-along clause.
5. **Post Investment Activity:** In this section, the VC nominates its nominee in the board of the company. The company must adhere to certain guidelines like strong MIS, strong budgeting system, strong corporate governance and other covenants of the VC and periodically keep the VC updated about certain milestones. If any milestone has not been met, the company has to give explanation to the VC. Besides, VC would also ensure that professional management is set up in the company.
6. **Exit plan:** At the time of investing, the VC would ask the promoter or company to spell out in detail the exit plan. Mainly, exit happens in two ways:
 - (a) One way is 'sell to third party(ies)'. This sale can be in the form of IPO or Private Placement to other VCs.
 - (b) The second way to exit is that promoter would give a buy back commitment at a pre agreed rate (generally between IRR of 18% to 25%). In case the exit is not happening in the form of IPO or third-party sell, the promoter would buy back. In many deals, the promoter buyback is the first refusal method adopted i.e., the promoter would get the first right of buyback.

6. VENTURE CAPITAL FUNDS IN INDIA

6.1 Evolution

Venture Capital in India started in the decade of 1970, when the Government of India appointed a committee to tackle the issue of inadequate funding to entrepreneurs and start-ups. However, it is only after ten years that the first all India venture capital funding was started by IDBI, ICICI and IFCI.

With the institutionalization of the industry in November 1988, the government announced its guidelines in the “CCI” (Controller of Capital Issues). These focused on a very narrow description of Venture Capital and proved to be extremely restrictive and encumbering, requiring investment in innovative technologies started by first generation entrepreneurs. This made investment in VC highly risky and unattractive.

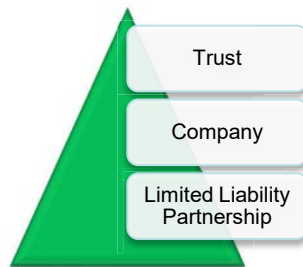
At about the same time, the World Bank organized a VC awareness seminar, giving birth to players like: TDICICI, GVFL, Canbank and Pathfinder. Along with the other reforms the government decided to liberalize the VC Industry and abolish the “CCI”, while in 1995 Foreign Finance companies were allowed to invest in the country.

Nevertheless, the liberalization was short spanned, with new calls for regulation being made in 1996. The new guidelines’ loopholes created an unequal playing ground that favoured the foreign players and gave no incentives to domestic high net worth individuals to invest in this industry.

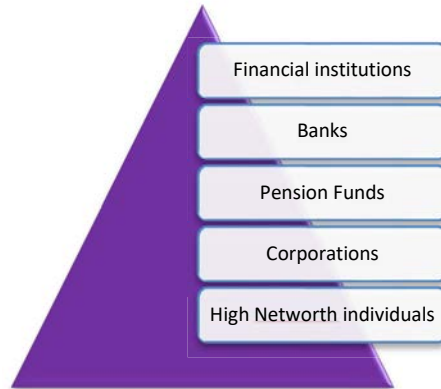
VC investing got considerably boosted by the IT revolution in 1997, as the venture capitalists became prominent founders of the growing IT and telecom industry.

Many of these investors later floundered during the dotcom bust and most of the surviving ones shifted their attention to later stage financing, leaving the risky seed and start-up financing to a few daring funds.

Formation of venture capital has been depicted in the diagram below:



Investors in venture capital funds are shown in the following diagram:



6.2 Structure of Venture Capital Fund in India

Three main types of fund structure exist: one for domestic funds and two for offshore ones:

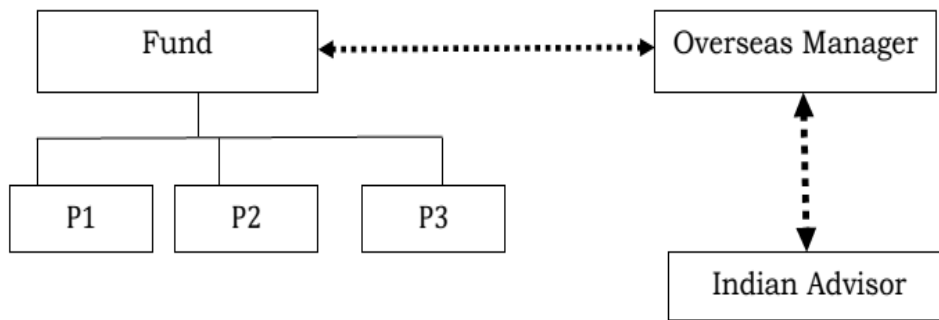
- (a) **Domestic Funds** : Domestic Funds (i.e. one which raises funds domestically) are usually structured as:
- i) a domestic vehicle for the pooling of funds from the investor, and
 - ii) a separate investment adviser that carries those duties of asset manager.

The choice of entity for the pooling vehicle falls between a trust and a company, (India, unlike most developed countries does not recognize a limited partnership), with the trust form prevailing due to its operational flexibility.

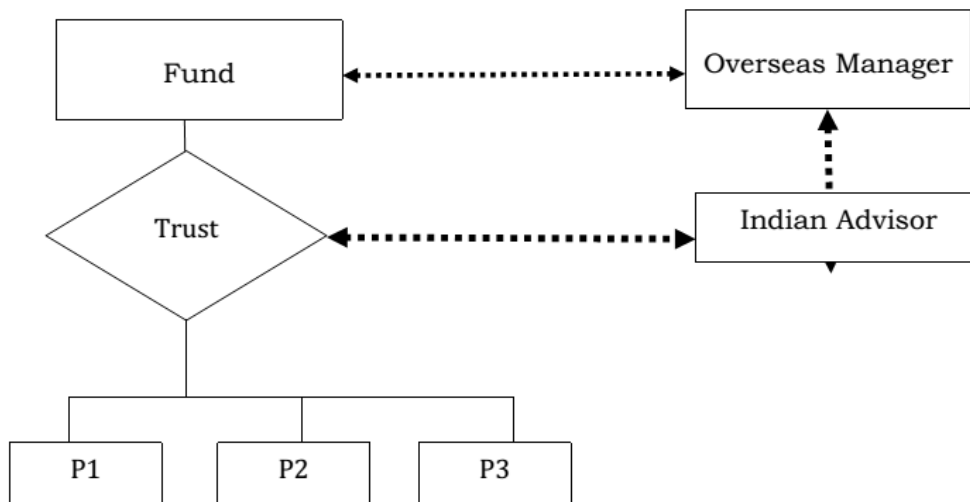
- (b) **Offshore Funds** : Two common alternatives available to offshore investors are: the “offshore structure” and the “unified structure”.

Offshore structure

Under this structure, an investment vehicle (an LLC or an LP organized in a jurisdiction outside India) makes investments directly into Indian portfolio companies. Typically, the assets are managed by an offshore manager, while the investment advisor in India carries out the due diligence and identifies deals.

*Off shore structure**Unified Structure*

When domestic investors are expected to participate in the fund, a unified structure is used. Overseas investors pool their assets in an offshore vehicle that invests in a locally managed trust, whereas domestic investors directly contribute to the trust. This is later used to make the local portfolio investments.

*Unified Structure*

7. STARTUP INDIA INITIATIVE

Startup India scheme was initiated by the Government of India on 16th of January, 2016. As per GSR Notification 127 (E) dated 19th February 2019, an entity shall be considered as a Startup:

- i. Upto a period of ten years from the date of incorporation/ registration, if it is incorporated as a private limited company (as defined in the Companies Act, 2013) or registered as a partnership firm (registered under section 59 of the Partnership Act, 1932) or a limited liability partnership (under the Limited Liability Partnership Act, 2008) in India.
- ii. Turnover of the entity for any of the financial years since incorporation/ registration has not exceeded one hundred crore rupees.
- iii. Entity is working towards innovation, development or improvement of products or processes or services, or if it is a scalable business model with a high potential of employment generation or wealth creation.

Provided that an entity formed by splitting up or reconstruction of an existing business shall not be considered a 'Startup'.

What is a Startup to avail government schemes?



Up to 10 years from its date of incorporation / registration



Incorporated as either a Private Limited Company or a Registered Partnership Firm or a Limited Liability Partnership in India



Turnover for any fiscal year has not exceeded INR 100 crore



Entity should not have been formed by splitting up or reconstructing a business already in existence



Working towards innovation, development, deployment or commercialization of new product, processes or services driven by technology or intellectual property

Source: <http://www.startupindia.gov.in/>

The start-ups story of India got a major boost with the launch of Startup India and StandUp India programs in year 2016. It helped in creating widespread awareness in general public about start-ups and gave a boost to the entrepreneurial mindset. By setting up a SIDBI-run Electronic Development Fund (EDF), the Indian Government became a Limited Partner (LP) in a fund for the first time ever. Easy finance options such as Mudra Scheme, tax benefits such as 100% tax holiday under section 80-IAC and exemption from angel taxation also provided the much-needed push to the young Indian start-ups.

In January 2021, the Department for Promotion of Industry and Internal Trade (DPIIT) created the Startup India Seed Fund Scheme (SISFS) with an outlay of INR 945 Crore to provide financial assistance to start-ups for Proof of Concept, prototype development, product trials, market entry, and commercialization. It will support an estimated 3,600 entrepreneurs through 300 incubators in the next 4 years. A start-up, recognized by DPIIT, incorporated not more than 2 years ago at the time of application and having a business idea to develop a product or a service with a market fit, viable commercialization, and scope of scaling, can apply for SISFS. A start-up can get seed fund of as much as INR 50 Lakh under SISFS. The priority sectors for SISFS are social impact, waste management, water management, financial inclusion, education, agriculture, food processing, biotechnology, healthcare, energy, mobility, defence, space, railways, oil and gas, and textiles.

Apart from the support from government, there are quite a few other reasons why India became such a sustainable environment for start-ups to thrive in. Some of the major reasons are:

(i) The Pool of Talent - Our country has a big pool of talent. There are millions of students graduating from colleges and B-schools every year. Many of these students use their knowledge and skills to begin their own ventures, and that has contributed to the startup growth in India. In the past, much of this talent was attracted to only the big companies, but now that is slowly changing.

(ii) Cost Effective Workforce - India is a young country with over 10 million people joining the workforce every year. The workforce is also cost effective. So, compared to some other countries, the cost of setting up and running a business is comparatively lower.

(iii) Increasing use of the Internet - India has the world's second-highest population, and after the introduction of affordable telecom services, the usage of internet has increased significantly. It has even reached the rural areas. India has the second-largest internet user base after China, and companies as well as start-ups are leveraging this easy access to the internet.

(iv) Technology - Technology has made the various processes of business very quick, simple and efficient. There have been major developments in software and hardware systems due to which data storage and recording has become an easy task. Indian startups are now increasingly working in areas of artificial intelligence and blockchain technologies which is adding to the growth of businesses.

(v) Variety of Funding Options Available - Earlier there were only some very traditional methods available for acquiring funds for a new business model, which included borrowing from the bank or borrowing from family and friends. However, this concept has now changed. There are numerous

options and opportunities available. Start-up owners can approach angel investors, venture capitalists, seed funding stage investors, etc. The easing of Foreign Direct Investment norms and opening up of majority of sectors to 100% automatic route has also opened the floodgates for foreign funding in the Indian start-up ecosystem.

8. SUCCESSION PLANNING IN BUSINESS

8.1 Meaning of Succession Planning

Succession planning is the process of identifying the critical positions within an organization and developing action plans for individuals to assume those positions. A succession plan identifies future need of people with the skills and potential to perform leadership roles. Succession planning is an important priority for family owned businesses as most of them are managed by a non-family leader even though the ownership lies with the family. Taking a holistic view of current and future goals, this type of preparation ensures that the right people are available for the right jobs today and in the years to come. It can also provide a liquidity event, which enables the transfer of ownership in a going concern to rising employees. Succession planning is a good way for companies to ensure that businesses are fully prepared to promote and advance all employees—not just those who are at the management or executive levels.

8.2 Why is there a need for succession planning?

- ❖ **Risk mitigation** – If existing leader quits, then searches can take six-nine months for suitable candidate to close. Keeping an organization without leader can invite disruption, uncertainty, conflict and endangers future competitiveness.
- ❖ **Cause removal** – If the existing leader is culpable of gross negligence, fraud, willful misconduct, or material breach while discharging duties and has been barred from undertaking further activities by court, arbitral tribunal, management, stakeholders or any other agency.
- ❖ **Talent pipeline** – Succession planning keep employees motivated and determined as it can help them obtaining more visibility around career paths expected, which would help in retaining the knowledge bank created by company over a period of time and leverage upon the same.
- ❖ **Conflict Resolution Mechanism** – This planning is very helpful in promoting open and transparent communication and settlement of conflicts.
- ❖ **Aligning** – In family owned business succession planning helps to align with the culture, vision, direction and values of the business.

8.3 Business succession strategy

Step 1 – Evaluate key leadership positions: - To evaluate which roles are critical, risk or impact assessment can be performed. Generally, these are such positions which would bring transformation to the entire business or create strategic direction for the organization.

Step 2 – Map competencies required for above positions: - In this step, one needs to identify qualifications, behavioral and technical competencies required to perform the role successfully.

Step 3 – Identify competencies of current workforce: - Identifying what are possible internal options that can deliver results as expected in Step-2, and also if there is a need for training and development of certain skills required. The organization should also place weight on whether is there a need to search outside the organization.

Step 4 – Bridge Leader: - In family owned business appointment of an outsider as 'bridge leaders' will help to develop the business and prepare young family members for leadership role.

8.4 Challenges

In context of Start-up following challenges are faced in implementing Succession Planning.

(1) Founder mindset might be different than the corporate mindset – The way founder's brains are wired is different from the way that a traditional corporate manager thinks, and this puts off seasoned corporate leaders from joining even matured start-ups.

(2) Premature for startups to implement business succession - Certain startups are at early growth stage and too much of processes would lead to growth slow-down and hence they are not in a current stage for implementing business succession planning.

(3) Founders are the face of startups – One cannot imagine a startup without a founder who initiated the idea and executed it and in his/ her absence succession planning can become difficult.

TEST YOUR KNOWLEDGE

Theoretical Questions

1. Explain some of the innovative sources for funding a start-up.
2. What do you mean by Pitch Presentation in context of Start-up Business?

ANSWERS/ SOLUTIONS

Answers to Theoretical Questions

1. Please refer paragraph 2.
2. Please refer paragraph 3.

APPENDIX



1. EXPONENTIAL TABLE

	0.00	0.001	0.002	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.00	1.0000	1.0010	1.0020	1.0030	1.0040	1.0050	1.0060	1.0070	1.0080	1.0090
0.01	1.0101	1.0111	1.0121	1.0131	1.0141	1.0151	1.0161	1.0171	1.0182	1.0192
0.02	1.0202	1.0212	1.0222	1.0233	1.0243	1.0253	1.0263	1.0274	1.0284	1.0294
0.03	1.0305	1.0315	1.0325	1.0336	1.0346	1.0356	1.0367	1.0377	1.0387	1.0398
0.04	1.0408	1.0419	1.0429	1.0439	1.0450	1.0460	1.0471	1.0481	1.0492	1.0502
0.05	1.0513	1.0523	1.0534	1.0544	1.0555	1.0565	1.0576	1.0587	1.0597	1.0608
0.06	1.0618	1.0629	1.0640	1.0650	1.0661	1.0672	1.0682	1.0693	1.0704	1.0714
0.07	1.0725	1.0736	1.0747	1.0757	1.0768	1.0779	1.0790	1.0800	1.0811	1.0822
0.08	1.0833	1.0844	1.0855	1.0865	1.0876	1.0887	1.0898	1.0909	1.0920	1.0931
0.09	1.0942	1.0953	1.0964	1.0975	1.0986	1.0997	1.1008	1.1019	1.1030	1.1041
0.10	1.1052	1.1063	1.1074	1.1085	1.1096	1.1107	1.1118	1.1129	1.1140	1.1152
0.11	1.1163	1.1174	1.1185	1.1196	1.1208	1.1219	1.1230	1.1241	1.1252	1.1264
0.12	1.1275	1.1286	1.1298	1.1309	1.1320	1.1331	1.1343	1.1354	1.1366	1.1377
0.13	1.1388	1.1400	1.1411	1.1422	1.1434	1.1445	1.1457	1.1468	1.1480	1.1491
0.14	1.1503	1.1514	1.1526	1.1537	1.1549	1.1560	1.1572	1.1584	1.1595	1.1607
0.15	1.1618	1.1630	1.1642	1.1653	1.1665	1.1677	1.1688	1.1700	1.1712	1.1723
0.16	1.1735	1.1747	1.1759	1.1770	1.1782	1.1794	1.1806	1.1818	1.1829	1.1841
0.17	1.1853	1.1865	1.1877	1.1889	1.1901	1.1912	1.1924	1.1936	1.1948	1.1960
0.18	1.1972	1.1984	1.1996	1.2008	1.2020	1.2032	1.2044	1.2056	1.2068	1.2080
0.19	1.2092	1.2105	1.2117	1.2129	1.2141	1.2153	1.2165	1.2177	1.2190	1.2202
0.20	1.2214	1.2226	1.2238	1.2251	1.2263	1.2275	1.2288	1.2300	1.2312	1.2324

2. NATURAL LOG TABLE

	0	1	2	3	4	5	6	7	8	9
1.0	0.00000	0.009950	0.019803	0.029559	0.039221	0.048790	0.058269	0.067659	0.076961	0.086178
1.1	0.095310	0.104360	0.113329	0.122218	0.131028	0.139762	0.148420	0.157004	0.165514	0.173953
1.2	0.182322	0.190620	0.198851	0.207014	0.215111	0.223144	0.231112	0.239017	0.246860	0.254642
1.3	0.262364	0.270027	0.277632	0.285179	0.292670	0.300105	0.307485	0.314811	0.322083	0.329304
1.4	0.336472	0.343590	0.350657	0.357674	0.364643	0.371564	0.378436	0.385262	0.392042	0.398776
1.5	0.405465	0.412110	0.418710	0.425268	0.431782	0.438255	0.444686	0.451076	0.457425	0.463734
1.6	0.470004	0.476234	0.482426	0.488580	0.494696	0.500775	0.506818	0.512824	0.518794	0.524729
1.7	0.530628	0.536493	0.542324	0.548121	0.553885	0.559616	0.565314	0.570980	0.576613	0.582216
1.8	0.587787	0.593327	0.598837	0.604316	0.609766	0.615186	0.620576	0.625938	0.631272	0.636577
1.9	0.641854	0.647103	0.652325	0.657520	0.662688	0.667829	0.672944	0.678034	0.683097	0.688135
2.0	0.693147	0.698135	0.703098	0.708036	0.712950	0.717840	0.722706	0.727549	0.732368	0.737164
2.1	0.741937	0.746688	0.751416	0.756122	0.760806	0.765468	0.770108	0.774727	0.779325	0.783902
2.2	0.788457	0.792993	0.797507	0.802002	0.806476	0.810930	0.815365	0.819780	0.824175	0.828552
2.3	0.832909	0.837248	0.841567	0.845868	0.850151	0.854415	0.858662	0.862890	0.867100	0.871293
2.4	0.875469	0.879627	0.883768	0.887891	0.891998	0.896088	0.900161	0.904218	0.908259	0.912283
2.5	0.916291	0.920283	0.924259	0.928219	0.932164	0.936093	0.940007	0.943906	0.947789	0.951658
2.6	0.955511	0.959350	0.963174	0.966984	0.970779	0.974560	0.978326	0.982078	0.985817	0.989541
2.7	0.993252	0.996949	1.000632	1.004302	1.007958	1.011601	1.015231	1.018847	1.022451	1.026042

2.8	1.029619	1.033184	1.036737	1.040277	1.043804	1.047319	1.050822	1.054312	1.057790	1.061257
2.9	1.064711	1.068153	1.071584	1.075002	1.078410	1.081805	1.085189	1.088562	1.091923	1.095273
3.0	1.098612	1.101940	1.105257	1.108563	1.111858	1.115142	1.118415	1.121678	1.124930	1.128171
3.1	1.131402	1.134623	1.137833	1.141033	1.144223	1.147402	1.150572	1.153732	1.156881	1.160021
3.2	1.163151	1.166271	1.169381	1.172482	1.175573	1.178655	1.181727	1.184790	1.187843	1.190888
3.3	1.193922	1.196948	1.199965	1.202972	1.205971	1.208960	1.211941	1.214913	1.217876	1.220830
3.4	1.223775	1.226712	1.229641	1.232560	1.235471	1.238374	1.241269	1.244155	1.247032	1.249902
3.5	1.252763	1.255616	1.258461	1.261298	1.264127	1.266948	1.269761	1.272566	1.275363	1.278152
3.6	1.280934	1.283708	1.286474	1.289233	1.291984	1.294727	1.297463	1.300192	1.302913	1.305626
3.7	1.308333	1.311032	1.313724	1.316408	1.319086	1.321756	1.324419	1.327075	1.329724	1.332366
3.8	1.335001	1.337629	1.340250	1.342865	1.345472	1.348073	1.350667	1.353255	1.355835	1.358409
3.9	1.360977	1.363537	1.366092	1.368639	1.371181	1.373716	1.376244	1.378766	1.381282	1.383791
4.0	1.386294	1.388791	1.391282	1.393766	1.396245	1.398717	1.401183	1.403643	1.406097	1.408545
4.1	1.410987	1.413423	1.415853	1.418277	1.420696	1.423108	1.425515	1.427916	1.430311	1.432701
4.2	1.435085	1.437463	1.439835	1.442202	1.444563	1.446919	1.449269	1.451614	1.453953	1.456287
4.3	1.458615	1.460938	1.463255	1.465568	1.467874	1.470176	1.472472	1.474763	1.477049	1.479329
4.4	1.481605	1.483875	1.486140	1.488400	1.490654	1.492904	1.495149	1.497388	1.499623	1.501853
4.5	1.504077	1.506297	1.508512	1.510722	1.512927	1.515127	1.517323	1.519513	1.521699	1.523880
4.6	1.526056	1.528228	1.530395	1.532557	1.534714	1.536867	1.539015	1.541159	1.543298	1.545433
4.7	1.547563	1.549688	1.551809	1.553925	1.556037	1.558145	1.560248	1.562346	1.564441	1.566530
4.8	1.568616	1.570697	1.572774	1.574846	1.576915	1.578979	1.581038	1.583094	1.585145	1.587192
4.9	1.589235	1.591274	1.593309	1.595339	1.597365	1.599388	1.601406	1.603420	1.605430	1.607436



3. CUMULATIVE AREA UNDER STANDARD NORMAL DISTRIBUTION

	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990

	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
-0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
-0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
-0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
-0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
-0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
-0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
-0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
-0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
-0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
-1	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
-1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
-1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
-1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
-1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
-1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
-1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
-1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
-1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
-1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
-2	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
-2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
-2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
-2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
-2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
-2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
-2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
-2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
-2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
-2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
-3	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010

