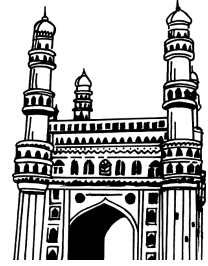


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*II Year III Semester*

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### SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

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## UNIT - I

Introduction to Investment - Investment, Speculation and Gambling, Features of Investment, Investment Avenues, Investment Process. The Investment Environment – Securities Market of India, – Securities Trading, and Settlement – Types of Orders - Margin Trading.

## UNIT - II

**Portfolio Analysis:** Risk and return Analysis - Markowitz Portfolio Theory, Mean- variance approach, portfolio selection - efficient portfolios, Single Index model - Capital Asset pricing model, Arbitrage Pricing Theory.

## UNIT - III

**Bond Valuation:** Classification of Fixed income securities, Types of bonds, Interest rates, Term Structure of interest rates, measuring bond yields, Yield to Maturity, Yield to Call, Yield to Maturity, Holding Period Return, Bond pricing theorems, bond duration, Active and Passive bond management Strategies, bond immunization, bond volatility, bond convexity.

## UNIT - IV

### Equity Valuation:

- a) Equity Analysis & Valuation, Equity Valuation Models, Relative Valuation techniques – Earnings Multiplier Approach, Valuation using P/E ratio, Price to Book Value, Price/sales ratio, Economic value added approach.
- b) Fundamental Analysis, Technical Analysis, Efficient Market Hypothesis.

## UNIT - V

- (a) **Derivatives:** Overview of Indian derivatives Markets, Option Markets, Option Strategies and Option Valuation, Forward & Future markets, Mechanics of Trading, Strategies.
- (b) **Performance Evaluation:** Mutual Funds, Types of Mutual Funds Schemes, Structure, Trends in Indian Mutual Funds, Net Asset Value, Risk and Return, Performance Evaluation Models- Sharpe Model, Treynor Model, Jensen Model, Fama's Decomposition.

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# UNIT I

Introduction to Investment - Investment, Speculation and Gambling, Features of Investment, Investment Avenues, Investment Process. The Investment Environment – Securities Market of India, – Securities Trading, and Settlement – Types of Orders - Margin Trading.

## 1.1 INVESTMENT MANAGEMENT

**Q1. Define investment. Explain the objectives of investment.**

**Ans :**

Investment is the employment of funds with the aim of achieving additional income or growth in value. The essential quality of an investment is that, it involves 'waiting' for a reward. It involves the commitment of resources which have been saved or put away from current consumption in the hope that some benefits will accrue in future. The term 'Investment' does not appear to be as simple as it has been defined. Investment has been categorized by financial experts and economists. It has also often been confused with the term speculation.

Investment is the allocation of monetary resources to assets that are expected to yield some gain or positive return over a given period of time. These assets range from safe investments to risky investments. Investments in this form are also called 'Financial Investments'.

### Meaning and Definition of Investment

**Investment means** "sacrificing the present value of money for future benefits".

In finance, Investment means the purchase of a financial product or other item of value with an expectation of favourable future returns. In general terms, investment means the use of money with the hope of making more money.

In business, producer purchase physical goods, such as durable equipment or inventory, in the hope of improving future business.

### Definition of Investment

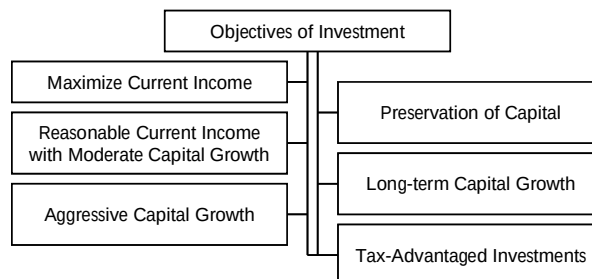
**According to Oxford Dictionary,** "Investment means the investing of money".

**According to an Individual Point of View,** "Investment refers to a money commitment of some sort. For example, a commitment of money to buy a new car is certainly an investment".

**According to Keynes, Investment is defined as,** "The addition to the value of the capital equipment which has resulted from the productive activity of the period".

### Objectives of Investment

The Objectives of Investment are given below:



#### 1. Maximize Current Income

This objective emphasizes on current yield over other factors. It is typical of people who must rely on investment income for part of their entire livelihood.

#### 2. Preservation of Capital

This is a common objective. In its purest form, it means that the dollar value of the portfolio should not fall. This is a rather rigorous form of this objective. However, in a more flexible form, it means investing so that the potential for declines in the overall value of the portfolio is within tolerable limits. In this form, it is a common and quite logical objective.

### 3. Reasonable Current Income with Moderate Capital Growth

This modifies the first objective in that current investment income is not the only aim. While current income is important, capital gains also are sought.

### 4. Long-Term Capital Growth

This objective aims primarily at capital gains over a relatively long period of time. It may be typical of investors who do not need current investment income to meet their living expenses. It implies a greater degree of risk in the portfolio.

### 5. Aggressive Capital Growth

This objective seeks maximum capital growth and implies making riskier investments with considerable investment analysis and management.

### 6. Tax-Advantages Investments

A person's top marginal income tax bracket may make tax-free or tax-sheltered investments attractive.

### Q2. Explain the types of Investment.

Ans :

Investments may be classified as financial investments or economic investments. In the financial sense, investment is the commitment of funds to derive future income in the form of interest, dividend, premium, pension benefits, or appreciation in the value of the initial investment. Hence, the purchase of shares, debentures, post office savings certificates, and insurance policies are all financial investments. Such investments generate financial assets. These activities are undertaken by anyone who desires a return and is willing to accept the risk from the financial instrument.

1. **Economic investments** are undertaken with an expectation of increasing the current economy's capital stock that consists of goods and services. Capital stock is used in the production of other goods and services desired by the society. Investment in this sense implies the expectation of formation of new and productive capital in the form of new

constructions, plant and machinery, inventories, and so on. Such investments generate physical assets and also industrial activity. These activities are undertaken by corporate entities that participate in the capital market.

2. **Financial investments** and economic investments are, however, related and dependent. The money invested in financial investments is ultimately converted into physical assets. Thus, all investments result in the acquisition of some asset, either financial or physical. In this sense, markets are also closely related to each other. Hence, the perfect financial market should reflect the progress pattern of the real market since, in reality, financial markets exist only as a support to the real market.

## 1.2 SPECULATION AND GAMBLING

### Q3. Define speculation. Explain the features of speculation.

Ans :

Speculation has a special meaning when talking about money. The person who speculates is called a speculator. A speculator does not buy goods to own them, but to sell them later. The reason is that he wants to make profit from the changes of market prices.

Speculation is the buying, holding, and selling of stocks, commodities, currencies, collectibles, real estate, or any valuable thing to profit from fluctuations in its price as opposed to buying it for use or for income - dividends, rent etc. Speculation is one of three market roles in western financial markets, distinct from hedging and arbitrage. Speculation bears part of the uncertainty about future random changes of investment periods and increases the investor's independence on the time horizon of the other investors, of their time schedule for their investment or disinvestment in stock. The profits from speculation are the price that the non-speculative investors must pay to the speculators for their provision of additional trading of stocks.

**Features of Speculation**

Following are the features of speculation:

1. One tries to buy the goods when they are cheap and to sell them when they are expensive. There is a good chance to do that as long as the market price of a good changes often in different directions.
2. Speculation includes the buying, holding, selling, and short-selling of stocks, bonds, commodities, currencies, collectibles, real estate, derivatives, or any valuable financial instrument.
3. Speculation is one of the market roles in western financial markets. The others are hedging, long-term investing, and arbitrage.
4. Speculators do not plan to keep an asset for a long time.

**Q4. Explain the Functions of Speculation.**

Ans :

1. Smoothen operating of price fluctuation process.
2. It maintains temporary equilibrium between capital supply and demand.
3. Consideration of future business prospects in determining the business value of existing capital funds.
4. Equating the risk to return in the infinitely varied utilisations of the social capital fund.

**Q5. Differences between Investment Vs Speculation.**

Ans :

The following are the important differences investment and speculation.

| Basis of Difference                              | Investment                                                         | Speculation                                                            |
|--------------------------------------------------|--------------------------------------------------------------------|------------------------------------------------------------------------|
| 1) <b>Meaning</b>                                | The investing of money.                                            | A message expressing an opinion based on incomplete evidence.          |
| 2) <b>Types of Contract</b>                      | Investor is a creditor of the investment.                          | Speculator is an owner of the speculation.                             |
| 3) <b>Length Commitment</b>                      | In the case of investment the length of commitment is a long-term. | In the case speculation the length of commitment is a short term only. |
| 4) <b>Source of Income</b>                       | The source of income is earning from the enterprise.               | The source of income is fluctuated and changes in market price.        |
| 5) <b>Quantity of Risk</b>                       | Quantity of risk is the low.                                       | Quantity of risk is the high.                                          |
| 6) <b>Stability of Income</b>                    | Income is very stable.                                             | Income is uncertain and erratic.                                       |
| 7) <b>Psychological Attitude of Participants</b> | Investor's psychological attitude is a cautious and conservative.  | Speculator psychological attitude is a daring and careless.            |
| 8) <b>Reasons for Purchase</b>                   | It is scientific analysis of intrinsic worth.                      | It is unscientific analysis of intrinsic worth.                        |

**Q6. Differences between investment vs. gambling.**

Ans :

Gambling refers to unlikes high risk with an expectation of high return Uncertainty, thrill, hunch, excitement, bumper gain or heavy loss etc. are the characteristics of gambling. Horse races, games of cards, lottery etc. are the examples of gambling. Gambling relies on tips, rumors and hunches and it is therefore considered as unplanned, unscientific and uncalculated risk.

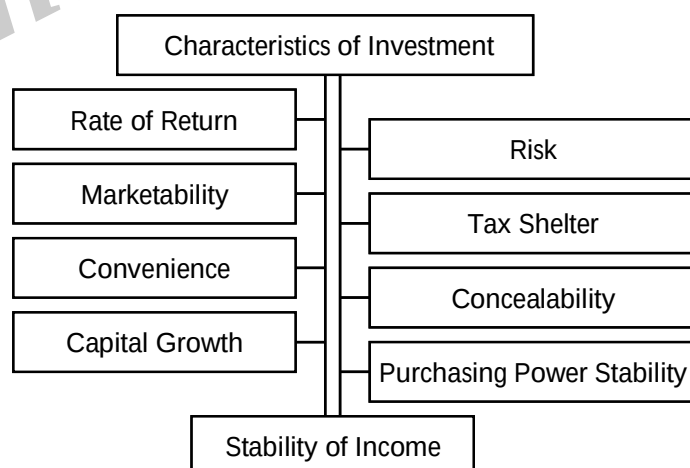
| Basis of difference |                            | Investment                                                                                | Gambling                                                                                            |
|---------------------|----------------------------|-------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| 1.                  | <b>Creation of Risk</b>    | In the case investment. the investors deal with pre-existing risk.                        | Here gambler creates risk.                                                                          |
| 2.                  | <b>Transfer of Risk</b>    | Transferring the risk from investors to insurance companies.                              | In the case of gambling, transferring or shifting the risks are not possible.                       |
| 3.                  | <b>Expected Return</b>     | Investing has a positive expected return.                                                 | Gambling has a negative expected return.                                                            |
| 4.                  | <b>Measure of Risk</b>     | The risk and uncertainty are measurable in the return on any investment.                  | The risk and uncertainty cannot be measured because of the high degree of uncertainty.              |
| 5.                  | <b>Activity</b>            | Investing is a productive activity that provides benefits to the society.                 | Gambling is an unproductive activity that harms the society.                                        |
| 6.                  | <b>Length of Proposals</b> | It implies long-term proposals, greater is the risk and expects long-term rate of return. | It implies short-term proposals, high risk and greater uncertainty, and expectation of high return. |

### 1.3 FEATURES OF INVESTMENT

**Q7. Explain the characteristics of investment.**

**Ans :**

Following are the various characteristics of investment :



#### 1. Rate of Return

Rate of return on an investment for a period is defined as follows :

$$\text{Rate of return} = \frac{\text{Annual income} + (\text{Ending price} - \text{Beginning price})}{\text{Beginning price}}$$

**2. Risk**

Risk of an investment refers to the variability of its rate of return. The greater the variability or dispersion of the possible outcomes or the broader the range of possible outcomes, the greater is the risk. Total risk of a security equals = Unsystematic risk + Systematic risk

**Standard Deviation** is used to measure unsystematic risk. Unsystematic risk is specific to the company and is reduced by diversification. Beta is used to measure systematic risk or Non-diversifiable risk that emanates or emerges from uncontrollable forces and is therefore not unique to the stock.

**3. Marketability**

An investment is highly marketable or liquid if :

- i) It can be transacted quickly.
- ii) The transaction cost is low.
- iii) The price change between two successive transactions is negligible.

High marketability is desirable characteristics and low marketability is an undesirability of any company.

**4. Tax Shelter**

Some investments provide tax benefits, others do not. Tax benefits are of following three kinds :

- i) **Initial Tax Benefit:** It refers to the tax relief enjoyed at the time of making the investment.
- ii) **Continuing Tax Benefits:** Tax shield associated with the periodic returns from the investment.
- iii) **Terminal Tax Benefit:** It refers to relief from taxation when an investment is realized or liquidated.

**5. Convenience**

Convenience broadly refers to the ease with which the investment can be made and looked after. Degree of convenience associated with investments varies widely. At one end of spectrum is the deposit in a saving

bank account that can be made readily and that does not require any maintenance effort. At the other end of the spectrum is purchase of a property that may involve a lot of procedural and legal hassles at the time of acquisition and a great deal of maintenance effort.

**6. Concealability**

It is another essential characteristic of the investment. Concealability means investment to be safe from social disorders, government confiscations or unacceptable levels of taxation, property must be concealable and leave no record of income received from its use or sale. Gold and precious stones have long been esteemed for these purposes, because they combine high value with small bulk and are readily transferable.

**7. Capital Growth**

It refers to appreciation of investment. Capital growth has today become an important character of investment. It is recognizing in connection between corporation and industry growth and very large capital growth. Investors and their advisers are constantly seeking 'growth stock' in the right industry and bought at the right time.

**8. Purchasing Power Stability**

It refers to the buying capacity of investment in market. Purchasing power stability has become one of the import traits of investment. Investment always involves the commitment of current funds with the objective of receiving greater amounts of future funds.

**9. Stability of Income**

It refers to constant return from an investment. Another major characteristic feature of the investment is the stability of income. Stability of income must look for different path just as security of principal. Every investor always considers stability of monetary income and stability of purchasing power of income.

### 1.4 INVESTMENT AVENUES / INVESTMENT ALTERNATIVES

**Q8. Discuss briefly the wide array of investment avenues.**

**Ans :**

A brief description of various investment alternatives or avenues is given below. They are discussed at length in the following chapters.

**Deposits** A good portion of the financial assets of individuals is held in the form of deposits. They can be broadly classified as:

- Bank deposits
- Post office deposits
- Company fixed deposits

#### 1. Government Savings Schemes

Government of India offers a number of small savings schemes to individual investors. These schemes are offered through the post office and select banks. The important savings schemes are:

- Public Provident Fund

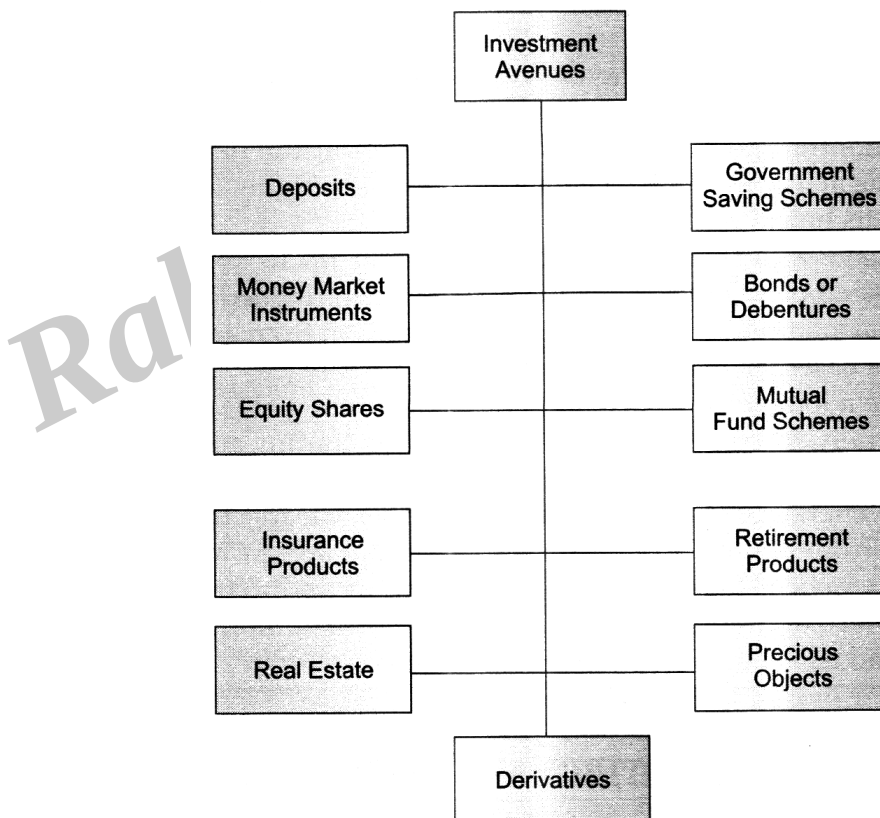


**Fig.: Investment Alternatives**

- Senior Citizens' Saving Scheme
- National Savings Certificate

**2. Money Market Instruments**

Debt instruments which have a maturity of less than one year at the time of issue are called money market instruments - these instruments are highly liquid and have negligible risk. The major money market instruments are:

- Treasury bills
- Certificates of deposit
- Commercial paper
- Repos

**3. Bonds or Debentures**

Bonds or debentures represent long-term debt instruments. The issuer of a bond promises to pay a stipulated stream of cash flow. Bonds may be classified into the following categories:

- Government securities
- PSU bonds
- Debentures of private sector companies
- Preference shares

**4. Equity Shares**

Equity shares represent ownership capital. As an equity shareholder, you have an ownership stake in the company. This essentially means that you have a residual interest in income and wealth. Perhaps the most romantic among various investment avenues, equity shares are classified into the following broad categories by stock market analysts:

- Blue chip shares
- Growth shares
- Income shares
- Cyclical shares
- Speculative shares

**5. Mutual Funds**

Mutual Funds instead of directly buying equity shares and / or fixed income instruments, you can participate in various schemes floated by

mutual funds which, in turn, invest in equity shares and fixed income securities. There are three broad types of mutual fund schemes:

- Equity schemes
- Debt schemes
- Balanced schemes

**6. Life Insurance**

Life Insurance In a broad sense, life insurance may be viewed as an investment. Insurance premiums represent the sacrifice and the assured sum, the benefit. The important types of insurance policies in India are:

- Endowment assurance policy
- Money back policy
- Whole life policy
- Term assurance policy

Retirement Products The important retirement products are:

- Employees' Provident Fund (EPF) Scheme, 1952
- Employees' Pension Scheme (EPS), 1952
- National Pension Scheme, 2004
- Pension schemes of insurance companies and mutual funds

**7. Real Estate**

Real Estate for the bulk of the investors the most important asset in their portfolio is a residential house. In addition to a residential house, the more affluent investors are likely to be interested in the following types of real estate:

- Agricultural land
- Semi-urban land
- Commercial property
- A resort home
- A second house

**8 Precious Objects**

Precious objects are items that are generally small in size but highly valuable in monetary terms. The important precious objects are:

- Gold and silver
- Precious stones
- Art objects

## 9 Financial Derivatives

A financial derivative is an instrument whose value is derived from the value of an underlying asset. It may be viewed as a side bet on the asset. The most important financial derivatives from the point of view of investors are:

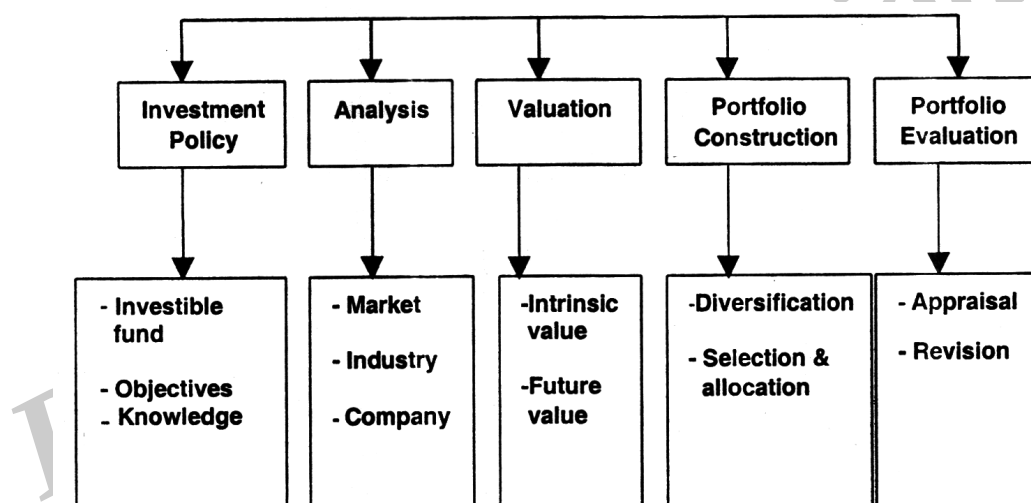
- Options
- Futures

### 1.5 INVESTMENT PROCESS

**Q9. Explain about investment process.**

*Ans :*

The investment process involves a series of activities leading to the purchase of securities or other investment alternatives. The investment process can be divided into five stages (i) framing of investment policy (ii) investment analysis (iii) valuation (iv) portfolio construction (v) portfolio evaluation. The flowchart explains the stages and factors connected thereof.



### I) Investment Policy

The government or the investor before proceeding into investment formulates the policy for the systematic functioning. The essential ingredients of the policy are the investible funds, objectives and the knowledge about the investment alternatives and market.

- (a) Investible funds:** The entire investment procedure revolves around the availability of investible funds. The fund may be generated through savings or from borrowings. If the funds are borrowed, the investor has to be extra careful in the selection of investment alternatives. The return should be higher than the interest he pays. Mutual funds invest their owners' money in securities.
- (b) Objectives:** The objectives are framed on the premises of the required rate of return, need for regularity of income, risk perception and the need for liquidity. The risk taker's objective is to earn high rate of return in the form of capital appreciation, whereas the primary objective of the risk averse is the safety of the principal.

- (c) **Knowledge:** The knowledge about the investment alternatives and markets plays a key role in the policy formulation. The investment alternatives range from security to real estate. The risk and return associated with investment alternatives differ from each other. Investment in equity is high yielding but has more risk than the fixed income securities. The tax sheltered schemes offer tax benefits to the investors.

The investor should be aware of the stock market structure and the functions of the brokers. The mode of operation varies among BSE, NSE and OTCEI. Brokerage charges are also different. The knowledge about the stock exchanges enables him to trade the stock intelligently.

## II) Security Analysis

After formulating the investment policy, the securities to be bought have to be scrutinised through the market, industry and company analysis.

- (a) **Market Analysis:** The stock market mirrors the general economic scenario. The growth in gross domestic product and inflation are reflected in the stock prices. The recession in the economy results in a bear market. The stock prices may be fluctuating in the short run but in the long run they move in trends i.e. either upwards or downwards. The investor can fix his entry and exit points through technical analysis.
- (b) **Industry Analysis:** The industries that contribute to the output of the major segments of the economy vary in their growth rates and their overall contribution to economic activity. Some industries grow faster than the GDP and are expected to continue in their growth. For example the information technology industry has experienced higher growth rate than the GDP in 1998. The economic significance and the growth potential of the industry have to be analysed.
- (c) **Company Analysis:** The purpose of company analysis is to help the investors to make better decisions. The company's earnings, profitability, operating efficiency, capital structure and management have to

be screened. These factors have direct bearing on the stock prices and the return of the investors. Appreciation of the stock value is a function of the performance of the company. Company with high product market share is able to create wealth to the investors in the form of capital appreciation.

## III) Valuation

The valuation helps the investor to determine the return and risk expected from an investment in the common stock.

- (a) **Intrinsic Value:** The intrinsic value of the share is measured through the book value of the share and price earning ratio. Simple discounting models also can be adopted to value the shares. The stock market analysts have developed many advanced models to value the shares. The real worth of the share is compared with the market price and then the investment decisions are made.
- (b) **Future Value:** Future value of the securities could be estimated by using a simple statistical technique like trend analysis. The analysis of the historical behaviour of the price enables the investor to predict the future value.

## IV) Construction of Portfolio

A portfolio is a combination of securities. The portfolio is constructed in such a manner to meet the investor's goals and objectives. The investor should decide how best to reach the goals with the securities available. The investor tries to attain maximum return with minimum risk. Towards this end he diversifies his portfolio and allocates funds among the securities.

- (a) **Diversification:** The main objective of diversification is the reduction of risk in the loss of capital and income. A diversified portfolio is comparatively less risky than holding a single portfolio. There are several ways to diversify the portfolio.
- **Debt and equity diversification:** Debt instruments provide assured return with limited capital appreciation. Common stocks provide income and capital gain but with the flavour of uncertainty. Both debt instruments and equity are combined to complement each other.

Industry diversification Industries' growth and their reaction to government policies differ from each other. Banking industry shares may provide regular returns but with limited capital appreciation. The information technology stock yields high return and capital appreciation but their growth potential after the year 2002 is not predictable. Thus, industry diversification is needed and it reduces risk.

- **Company diversification:** Securities from different companies are purchased to reduce risk. Technical analysts suggest the investors to buy securities based on the price movement. Fundamental analysts suggest the selection of financially sound and investor friendly companies.

**(b) Selection**

Based on the diversification level, industry and company analyses the securities have to be selected. Funds are allocated for the selected securities. Selection of securities and the allocation of funds and seals the construction of portfolio.

**V) Evaluation**

The portfolio has to be managed efficiently. The efficient management calls for evaluation of the portfolio. This process consists of portfolio appraisal and revision.

- (a) Appraisal:** The return and risk performance of the security vary from time to time. The variability in returns of the securities is measured and compared. The developments in the economy, industry and relevant companies from which the stocks are bought have to be appraised. The appraisal warns the loss and steps can be taken to avoid such losses.
- (b) Revision:** Revision depends on the results of the appraisal. The low yielding securities with high risk are replaced with high yielding securities with low risk factor. To keep the return at a particular level necessitates the investor to revise the components of the portfolio periodically.

## 1.6 INVESTMENT ENVIRONMENT

**Q10. Discuss briefly about Investment Environment.**

Ans :

**A) Securities**

Investments in capital markets is in various financial instruments, which are all claims on money. These instruments may be of various categories with different characteristics. These are called 'Securities' in market place.

Securities Contracts Regulation Act, 1956 has defined the security as inclusive of shares, scrips, stocks, bonds, debenture stock or any other marketable instruments of a like nature in or of any debentures of a company or body corporate, the government and semi-government body etc. It includes all rights & interests in them including warrants and loyalty coupons etc., issued by any of the bodies, organisations or the government. The derivatives of securities and Security Index are also included as securities.

**Characteristics of Securities**

1. Securities are tradable and represent a financial value.
2. Securities are fungible.

**Classification of Securities**

- (i) Debt Securities:** Tradable assets which have clearly defined terms and conditions are called debt securities. Financial instruments sold and purchased between parties with clearly mentioned interest rate, principal amount, maturity date as well as rate of returns are called debt securities.

- (ii) **Equity Securities:** Financial instruments signifying the ownership of an individual in an organization are called equity securities. An individual buying equities has an ownership in the company's profits and assets.
- (iii) **Derivatives:** Derivatives are financial instruments with specific conditions under which payments need to be made between two parties.

### Concept of Security

When someone borrows money from a pawnbroker, the borrower must leave some item of value as security. If the borrower fails to repay the loan (plus interest), the pawnbroker can sell the pawned item to recover the amount of the loan (plus interest) and perhaps make a profit. The terms of the agreement are recorded on pawn tickets. When a college student borrows money to buy a car, the lender usually holds formal title to the car until the loan is repaid.

In the event of default, the lender can repossess the car and sell it to recover costs. In this case the official certificate of title, issued by the state, serves as the security for the loan. A person who borrows money for a vacation may simply sign a piece of paper promising repayment with interest. The loan is unsecured in the sense that there is no collateral, meaning that no specific asset has been promised to the lender in the event of default. In such a situation the lender would have to take the borrower to court to try to recover the amount of the loan. Only a piece of paper called a promissory note stands as evidence of such a loan.

When a firm borrows money, it may or may not offer collateral. For example, some loans may be secured (backed) with specific pieces of property (buildings or equipment). Such loans are recorded by means of mortgage bonds, which indicate the terms of repayment and the particular assets pledged to the lender in the event of default. However, it is much more common for a corporation to simply pledge all of its assets, perhaps with some provision for the manner in which the division will take place in the event of default. Such a promise is known as a debenture bond.

Finally, a firm may promise a right to share in its profits in return for an investor's funds. Nothing is pledged, and no irrevocable promises are made. The firm simply pays whatever its directors deem reasonable from time to time. However, the investor is given the right to participate in the determination of who will be members of the board of directors. This right protects the investor against serious malfeasance. The investor's property right is represented by a share of common stock, which can be sold to someone else, who will then be able to exercise that right. The holder of common stock is said to be an *owner* of the corporation and can, in theory, exercise control over its operation through the board of directors.

By and large the focus here is on securities that may be easily and efficiently transferred from one owner to another. Thus the concern is with common stocks and bonds rather than with pawn tickets, although much of the material in this book applies to all three types of instruments.

1. Treasury Bills
2. Long-term Bonds
3. Common Stocks

### B) Risk, Return and Diversification

The Main Objectives of Investment Environment in India. They are :

1. Minimising the Risk
2. Maximising the Returns
3. Diversification of the Company

### 1. Minimising the Risk

The risk of holding securities is related to the probability of the actual return becoming less than the expected return. The word 'risk' is synonymous with the phrase 'variability of return'. Investment risk is just as important as measuring its expected rate of return because minimizing risk and maximizing the rate of return are interrelated objectives in investment management. An investment whose rate of return varies widely from one period to another is considered riskier than one whose return does not change much. Every investor likes to reduce the risk of his investment by proper combination of different securities. Investors, however, differ in their attitude towards risk.

### 2. Maximising the Returns

Investors always expect a good rate of return from their investments. The rate of return could be defined as the total income the investor receives during the holding period, stated as a percentage of the purchasing price at the beginning of the holding period.

$$\text{Return} = \frac{\text{End period value} - \text{Beginning period value} + \text{Dividend}}{\text{Beginning period value}} \times 100$$

The rate of return is stated semi-annually or annually to help compare among the different investment alternatives. If it is a stock, the investor gets the dividend as well as the capital appreciation as returns. Market return of the stock indicates the price appreciation for the particular stock. If a particular share is bought in 2011 at ₹50 and sold in 2012 at ₹60, and the dividend yield is ₹5, then the return would be calculated as shown below :

$$\text{Return} = \frac{\text{Capital appreciations and dividend}}{\text{Purchase price}} \times 100$$

$$\text{Return} = \frac{10 + 5}{50} \times 100 = 30\%.$$

### 3. Diversification of the Company

The main objective of diversification is the reduction of risk in the form of loss of capital and income. A diversified portfolio is comparatively less risky than holding a single portfolio. Several modes are available to diversify a portfolio.

- (i) **Debt and equity diversification** : Debt instruments provide assured returns with limited capital appreciation. Common stocks provide income and capital gain but with a flavour of uncertainty. Both debt instruments and equity are combined to complement each other.
- (ii) **Industry diversification** : Industries' growth and their reaction to government policies differ from each other. Banking industry shares may provide regular returns but with limited capital appreciation. Information technology stocks yield higher returns and capital appreciation, but their growth potential in the post-global crisis years was unpredictable. Thus, industry diversification is needed, and it reduces the risk.
- (iii) **Company diversification** : Securities from different companies are purchased to reduce the risk. Technical analysts suggest that investors buy securities based on price movement. Fundamental analysts suggest the selection of financially sound and investor-friendly companies.
- (iv) **Selection** : Securities have to be selected based on the level of diversification, industry and company analyses. Funds are allocated for selected securities. Selection of securities and the allocation of funds seal the construction of portfolio.

**C) Security Markets**

The securities market is the market for equity, debt and derivatives. The debt market, in turn, maybe divided into three parts, viz., the government securities market, the corporate debt market, and the money market. The derivatives market, in turn, may be divided into two parts viz, the options market and the future market. The following is the structure of security market.

Except the derivatives market, each of the above markets has two components viz, the primary market and secondary market. "The market where new securities are issued is called the primary market and the market where out standing securities are traded is called the secondary market.

**Participants in the Securities Market**

The participants of the securities market are listed below :

- The issuer
- The buyer
- Market intermediaries
- The regulators

**1. Issuer**

The following issuers are in the securities market :

- Corporate entities issue equity shares and debentures, while financial institutions and public sector enterprises issue equity shares as well as bonds.
- The Reserve Bank of India issues government dated securities, treasury bills and bonds.
- Mutual fund companies issue mutual fund units. Many mutual fund companies are subsidiaries of financial institutions and banks.

**2. Buyer**

The buyer segment consists of domestic institutional investors, corporate entities, banks, pension funds, mutual funds, retail investors and foreign institutional investors who are registered with the Securities and Exchange Board of India (SEBI).

**3. Market intermediaries**

A wide range of market intermediaries participate in the primary and secondary markets. Merchant bankers, clearing and settling houses, credit rating agencies, depositories, debenture trustees, banks and brokers act as market intermediaries at various levels.

**4. Regulators**

The smooth functioning of any market lies in the hands of regulators. The securities market also requires regulation for the following reasons :

- It involves a huge inflow and outflow of funds.
- The nature and the quantum of issue of securities differ widely among companies. This necessitates the prescription of issue norms.
- Proper functioning of the secondary market is essential.
- Investors' interests have to be protected.

The securities market is mainly regulated by the Ministry of Finance, the Reserve Bank of India and SEBI.

**d) Financial Intermediaries**

Financial intermediaries, also known as financial institutions, are organizations that issue financial claims against themselves (meaning that they sell financial assets rep-representing claims on themselves in return for cash) and use the proceeds from this is insurance to purchase primarily the financial assets of others. Financial claims simply represent the right-hand side of the balance sheet for any organization, so the key distinction between financial intermediaries and other types of organizations involves what is on the left-hand side of the balance sheet.

For example, a typical commercial bank issues financial claims against itself in the form of debt (such as checking and savings accounts) and equity, but then again so does a typical manufacturing firm. However, looking at the assets held by a commercial bank reveals that most of the bank's money is invested in loans to individuals and corporations as

well as in U.S. government securities such as Treasury bills, whereas the typical manufacturing firm has its money invested mostly in land, buildings, machinery, and inventory. Thus the bank has invested primarily in financial as-sets, whereas the manufacturing firm has invested primarily in real assets. Accordingly, banks are classified as financial intermediaries, and manufacturing firms are not. Other types of financial intermediaries include savings and loan associations, savings banks, credit unions, life insurance companies, mutual funds, and pension funds.

Financial intermediaries provide an indirect method for corporations to acquire funds. As illustrated in Figure (a), corporations can obtain funds directly from the general public by the use of the primary market, as mentioned earlier. Alternatively, they can obtain funds indirectly from the general public by using financial intermediaries, as shown in Figure (b). Here the corporation gives a security to the intermediary in return for funds. In turn, the intermediary acquires funds by allowing the general public to maintain such investments as checking and savings accounts with it.

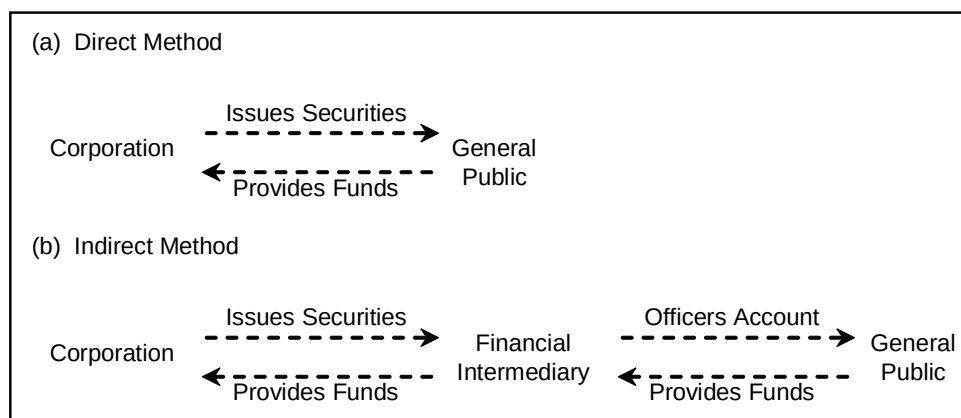


**Fig.: Corporate Funds Association**

## 1.7 SECURITIES MARKET OF INDIA

**Q11. What do you mean by Securities Market? Classify Security Market in detail.**

**Ans :**

### **Securities Market**

The securities market refers to the market for equity debt and derivatives. The debt market is further classified into three types i.e., the government securities market, the corporate debt market and the money market. The derivatives markets are also further classified into two types namely the options market and the futures market. Securities market is the market which influences the modern life greatly.

### **Classification of Securities Market**

Securities markets are broadly classified into two types as follows,

1. Primary markets and
2. Secondary markets.

#### **1. Primary Markets**

The market where in new securities are being issued in lieu of each from an investor is called as primary market. Investment bankers are mostly being used as the instrument of activities. New issue of securities which takes place in the primary market are the new sales of treasury bills or IBM stock, or North Carolina bonds.

In India Equity market is also called as primary market which functions as per the guidelines of SEBI (Securities Exchange Board of India). There are three different ways by which a company can raise its equity capital in the primary market. They are,

- (i) Public issue
- (ii) Rights issue
- (iii) Preferential allotment
- (iv) Global investment banking
- (v) Private Placements

**(i) Public Issue:** Public issue is the sale of securities to the public at large and is governed and controlled by the provisions of the companies Act, 1956, SEBI guidelines about Investor Protection and the listing agreement between the issuing company and the stock exchanges.

**(ii) Rights Issue:** Rights issue is an official invitation given by the company to its shareholders regarding the subscription for the purchase of further shares issued by a company. A 'right' represents an option or a choice that has to be made by a shareholder for the purchase of securities at a predetermined price. A limited company after obtaining the approval from its articles of association can issue new shares (either equity or preference) such terms ensure the equitable distribution of shares without altering the existing shareholdings in the company. Section 81 of the Companies Act, 1956 has laid down a procedure for a public limited company who want to increase their share allotments, after the expiry of two years from the incorporation and the formation of the company. It includes the following steps,

- (a) Issue of shares in proportion of their contributions made for the paid-up capital.
- (b) Issue of notice as an offer specifying the number of offered shares.
- (c) Accepting the offer for the purchase of allotted offer. Number of shares within the stipulated time period which should not exceed beyond 15 days of the issue of notice.

(d) Shareholders can use their rights for renouncing the offered shares to their nominees. The further subscription of shares offered to the existing shareholders are called "right shares" However, such shares become privileged subscription or right issue if they are offered to the equity shareholders.

**(iii) Preferential Allotment:** Preferential Allotment means an issue of an equity by a listed company to the selected investors at a price which may or may not be in accordance with the prevailing market price especially in the Indian Capital Market.

**(iv) Global Investment Banking:** Initially selling of new securities was restricted only in the domestic markets but, presently the scenario has been changed due to globalization. The globalization enables and helps the companies to raise new capital from different countries across the globe. A new concept has been introduced as "global equity offering" -in the investment banking. This investment banking emphasizes mainly upon global offering of securities and the lead investment banker acts as "global coordinator" who connects different underwriting syndicates throughout the globe for the purpose of issue of equity shares.

**(v) Private Placements:** Recently, many corporations have started introducing the "private placement" where in the new securities issues such as debt securities are being directly sold to the financial institution like Life Insurance Companies and pension by passing the open market. As the registration is necessary for these private placements, this results in time and money saving as well as saving fee for the investment bankers.

## 2. Secondary Markets

A secondary market is the market in which the remaining or the existing securities are traded between the investors. These markets helps the investors by providing them a mechanism for trading the existing securities. In this market, securities are resold when

investors considers these securities as attractive opportunities. Secondary market is the place where common and preferred stock, warranty, bonds and puts and calls are traded among the investors.

The Equities are traded in the below given markets,

- (i) **New York Stock Exchange (NYSE):** It is one of the oldest and most famous secondary market in the United States. It is considered as one of the most effectively controlled stock exchange in the world which also has the ability to function during units.

The NYSE is a not-for-profit organisation which has member firms who own seats and only these member firms can buy and sell securities on the trading floor.

NYSE outlines certain listing requirements which the firms must fulfill for listing their securities at the NYSE.

- (ii) **American Stock Exchange (AMEX):** The Amex is the second national organised exchange whose procedures are similar to the procedures of NYSE. However, when compared NYSE, AMEX is smaller whose membership is limited only upto 807 regular members the listing requirements of AMEX are less complicated on strict when compared to the NYSE. At present, AMEX trades nearly 135 NASDAQ-listed stocks.

- (iii) **The NASDAQ Stock Market:** The Nasdaq stock market is a competitive dealer market which consists of network of dealers or market makers who creates market and are ready to buy and sell securities at specified prices.

The actively traded stocks which are not traded at the NYSE or Amex are a part of NASDAQ stock market (NASDAQ). Nasdaq was initially introduced by the NASD (The National Association of Security Dealers) which is a self-governing body of brokers and dealers. Presently, NASDAQ is a privately owned corporation by its shareholders.

- (iv) **Over-the-Counter Stocks:** Over-the-counter securities means the securities which are not listed and traded at an organised

exchange on market. They are unusually traded at the over counter markets. Over-the-counter stocks does not denote a particular place or floor where dealers assemble and transact foreign currencies. Rather, it is a network of banks, brokers and dealers spread across the various financial centres of the world. The market relies more on communication network and that is why transactions are based normally on spoken and followed by written communication.

- (v) **Electronic Communications Net-works (ECN's):** Conventional form of Trading equity securities through agency auction markets have been replaced by fully computerized NASDAQ market. The modern changes of Electronic Communication Networks {ECN's} have a clear impact on the functioning of the conventional markets like NASDAQ and the NYSE.

An ECN is a computerized trading network for institutions and large traders. Electronic Communication network matches the buying and selling orders obtained from the subscribers and customers. After matching these orders, they can be transferred to brokerage firms for the trading of securities.

- (vi) **National Stock Exchange (NSE):** The National Stock Exchange was started in November 1992. Its initial capital outlay was ` 25 crores which was subscribed by the Industrial Development Bank of India (IDBI) and co-subscribed by other lending institutions such as GIC, LIC, other insurance companies, banks, financial institutions including the SBI capital market Ltd, Stock Holding Corporations Ltd, Infrastructure Leasing and Financial Services Ltd and International Securities Consultancy of Hongkong. NSE has an automated, electronic and screen based system of trading.

- (vii) **Bombay Stock Exchange (BSE):** Bombay Stock Exchange is an ancient stock exchange in India. It is regarded as the most important part of the economy which reveals the economic conditions. Basically BSE was operating in Mumbai alone but with the help of Bombay Online Trading System (BOLT),

its operations spread over to 275 cities by March 2000. The number of trade workstations was also increased to 3803. There was an increase in its daily turnover from ` 11 crores during 1979-1980 to ` 4587 crores in the year 2000-2001.

Initially, the membership fee in BSE was just ` 1 in 1857, which further increased to ` 5 in 1877, ` 1000 in 1896, ` 2500 in 1916, ` 6600 in 1929, ` 62000 at the time post World War II period and finally reached to ` 2.80 crore during the year 2000.

### 1.8 SECURITIES TRADING AND SETTLEMENT

#### Q12. Examine the recent trends in security market.

Ans :

Many recent trends occurred in stock markets in India. Several institutions were established which provided greater scope for Indian stock markets. These institutions are as follows,

#### 1. National Stock Exchange (NSE)

In November 1992, the NSE was established and started dealing with debt instruments such as treasury bills, UTI units, government securities, PSU-bonds and call money, but later the debentures and equities were also included in the list of trading. The headquarters of National Stock Exchange (NSE) is located in Mumbai and it carries out its transactions with the help of screen based online trading system. Its members are spread across the country and are connected through satellite and cables to the system.

#### 2. Securities Trading Corporation of India (STCI)

Reserve Bank of India started the STCI with a paid-up capital of ` 500 crore. The main aim of STCI is to encourage the growth of secondary market for the government securities and to extend the debt market. At present, the commercial banks and financial institutions are the owners of STCI, as RBI did not take the further responsibility of STCI after 2002.

#### 3. Securities Exchange Board of India (SEBI)

SEBI was established with the main objective of regulating the transactions in stock exchange in a fair manner and protect the interest of the investors. It has performed efficiently and there are several achievements to its credit, some of them are as follows,

- (i) Elimination of the control over capital issues and preserving the authority for governing new issues.
- (ii) Governing stock exchanges as per the provisions of securities contracts regulation act.
- (iii) Making it mandatory for the firms to disclose the material facts and certain risk factors that are related with the projects.
- (iv) Drawing all the primary and secondary market intermediaries under the regulatory framework.

#### 4. National Securities Depository Ltd (NSDL)

During 1996, NSDL was established which started the method of dematerialization process of shares of the participating firms and made an end to process of poor deliveries. The introduction of the depository system was one of the distinct feature of NSDL. In this system, the share certificate is submitted by the shareholder to the issuer firm and there the certificate will be dematerialized in the depository's computerized records, due to which the depositor will become the 'registered owner' of share and the shareholder will become the 'beneficial owner'. This system replaced the paper securities with electronic entry and removed the delays which occurs while settling the securities transactions, due to lost share certificates, electronic entry and the circulation of fake certificates.

### 1.9 TYPES OF ORDERS

#### Q13. What are the different types of orders ?

Ans :

There are several types of orders that investors can place with their brokers. The most common types are market and limit orders, although stop and stop limit orders can also be used. There are other special types of orders that are rarely used; readers interested in them should contact their broker.

#### 1. Market Order

Market order, wherein the broker is instructed to buy or sell a stated number of shares immediately. The broker is obligated to act on a best efforts basis to get the best possible price (as low as possible for a purchase order, as high as possible for a sell order) when the order is placed. An investor placing a market order can be fairly certain that the order will be executed but will be uncertain of the price. However, there is usually reliable information available beforehand about the likely price at which such an order will be executed. Not surprisingly, market orders are day orders.

#### 2. Limit Order

Limit order, wherein a limit price is specified by the investor when the order is placed with the broker. If the order is to purchase shares, the broker is to execute the order at a price less than or equal to the limit price. If the order is to sell shares, the broker is to execute the order at a price greater than or equal to the limit price. Thus, the investor specifies a ceiling on the price to purchase shares and a floor on the price to sell shares. In contrast to a market order, an investor using a limit order cannot be certain that the order will be executed.

#### 3. Stop Order

For a stop order the investor must specify a stop price. If it is a sell order, the stop price must be below the market price when the order is placed. Conversely, if it is a buy order, the stop price must be above the market price

when the order is placed. If someone later trades the stock at a price that reaches or passes the stop price, the stop order becomes, in effect, a market order. Hence a stop order can be considered as a conditional market order.

#### 4. Stop Limit Order

The stop limit order helps investors know with more certainty the execution price associated with a stop order. With a stop limit order the investor specifies not one but two prices - a stop price and a limit price. Once someone trades the stock at a price that reaches or passes the stop price, then a limit order is created at the limit price. Hence stop limit order can be viewed as a conditional limit order.

### 1.10 MARGIN TRADING

#### Q14. Discuss briefly about margin trading.

Ans :

In the stock market, margin trading refers to the process whereby individual investors buy more stocks than they can afford to. Margin trading also refers to intraday trading in India and various stock brokers provide this service. Margin trading involves buying and selling of securities in one single session. Over time, various brokerages have relaxed the approach on time duration. The process requires an investor to speculate or guess the stock movement in a particular session. Margin trading is an easy way of making a fast buck. With the advent of electronic stock exchanges, the once specialised field is now accessible to even small traders.

The process is fairly simple. A margin account provides you the resources to buy more quantities of a stock than you can afford at any point of time. For this purpose, the broker would lend the money to buy shares and keep them as collateral.

In order to trade with a margin account, you are first required to place a request with your broker to open a margin account. This requires you to pay a certain amount of money upfront to the broker in cash, which is called the minimum margin. This would help the broker recover some money by squaring off, should the trader lose the bet and fail to recuperate the money.

Once the account is open, you are required to pay an initial margin (IM), which is a certain percentage of the total traded value pre-determined by the broker. Before you start trading, you need to remember three important steps.

**First**, you need to maintain the minimum margin (MM) through the session, because on a very volatile day, the stock price can fall more than one had anticipated.

For example, if a Tata Steel stock priced at Rs 400 falls 4.25 per cent and the IM and MM are 8 per cent and 4 per cent of the total value of the shares bought, respectively, then the trade-off  $8\% - 4.25\% = 3.75\%$  will be less than the MM. In this case, you will either have to give more money to the broker to maintain the margin or the trade will get squared off automatically by the broker.

**Secondly**, you need to square off your position at the end of every trading session. If you have bought shares, you have to sell them. And if you have sold shares, you will have to buy them at the end of the session.

**Thirdly**, convert it into a delivery order after trade, in which case you will have to keep the cash ready to buy all the shares you had bought during the session and to pay the broker's fees and additional charges.

If even one of these steps is missed, the broker will automatically square off the position in the market.

## Short Question and Answers

### 1. Investment

Ans :

Investment means “sacrificing the present value of money for future benefits”.

In finance, Investment means the purchase of a financial product or other item of value with an expectation of favourable future returns. In general terms, investment means the use of money with the hope of making more money.

In business, producer purchase physical goods, such as durable equipment or inventory, in the hope of improving future business.

#### Definition of Investment

**According to Oxford Dictionary,** “Investment means the investing of money”.

**According to an Individual Point of View,** “Investment refers to a money commitment of some sort. For example, a commitment of money to buy a new car is certainly an investment”.

**According to Keynes, Investment is defined as,** “The addition to the value of the capital equipment which has resulted from the productive activity of the period”.

### 2. Types of Investment

Ans :

- (i) **Economic investments** are undertaken with an expectation of increasing the current economy's capital stock that consists of goods and services. Capital stock is used in the production of other goods and services desired by the society. Investment in this sense implies the expectation of formation of new and productive capital in the form of new constructions, plant and machinery, inventories, and so on. Such investments generate physical assets and also industrial activity. These activities are undertaken by corporate entities that participate in the capital market.

- (ii) **Financial investments** and economic investments are, however, related and dependent. The money invested in financial investments is ultimately converted into physical assets. Thus, all investments result in the acquisition of some asset, either financial or physical. In this sense, markets are also closely related to each other. Hence, the perfect financial market should reflect the progress pattern of the real market since, in reality, financial markets exist only as a support to the real market.

### 3. Functions of Speculation

Ans :

- (i) Smoothen operating of price fluctuation process.
- (ii) It maintains temporary equilibrium between capital supply and demand.
- (iii) Consideration of future business prospects in determining the business value of existing capital funds.
- (iv) Equating the risk to return in the infinitely varied utilisations of the social capital fund.

### 4. Investment Policy

Ans :

The government or the investor before proceeding into investment formulates the policy for the systematic functioning. The essential ingredients of the policy are the investible funds, objectives and the knowledge about the investment alternatives and market.

- (a) **Investible funds:** The entire investment procedure revolves around the availability of investible funds. The fund may be generated through savings or from borrowings. If the funds are borrowed, the investor has to be extra careful in the selection of investment alternatives. The return should be higher than the interest he pays. Mutual funds invest their owners' money in securities.

(b) **Objectives:** The objectives are framed on the premises of the required rate of return, need for regularity of income, risk perception and the need for liquidity. The risk taker's objective is to earn high rate of return in the form of capital appreciation, whereas the primary objective of the risk averse is the safety of the principal.

(c) **Knowledge:** The knowledge about the investment alternatives and markets plays a key role in the policy formulation. The investment alternatives range from security to real estate. The risk and return associated with investment alternatives differ from each other. Investment in equity is high yielding but has more risk than the fixed income securities. The tax sheltered schemes offer tax benefits to the investors.

### 5. Diversification of the Company

Ans :

The main objective of diversification is the reduction of risk in the form of loss of capital and income. A diversified portfolio is comparatively less risky than holding a single portfolio. Several modes are available to diversify a portfolio.

(i) **Debt and equity diversification :** Debt instruments provide assured returns with limited capital appreciation. Common stocks provide income and capital gain but with a flavour of uncertainty. Both debt instruments and equity are combined to complement each other.

(ii) **Industry diversification :** Industries' growth and their reaction to government policies differ from each other. Banking industry shares may provide regular returns but with limited capital appreciation. Information technology stocks yield higher returns and capital appreciation, but their growth potential in the post-global crisis years was unpredictable. Thus, industry diversification is needed, and it reduces the risk.

(iii) **Company diversification :** Securities from different companies are purchased to reduce the risk. Technical analysts suggest that

investors buy securities based on price movement. Fundamental analysts suggest the selection of financially sound and investor-friendly companies.

(iv) **Selection :** Securities have to be selected based on the level of diversification, industry and company analyses. Funds are allocated for selected securities. Selection of securities and the allocation of funds seal the construction of portfolio.

### 6. Secondary Markets

Ans :

A secondary market is the market in which the remaining or the existing securities are traded between the investors. These markets help the investors by providing them a mechanism for trading the existing securities. In this market, securities are resold when investors consider these securities as attractive opportunities. Secondary market is the place where common and preferred stock, warrant, bonds and puts and calls are traded among the investors.

### 7. Different Types of Orders

Ans :

#### (i) Market Order

Market order, wherein the broker is instructed to buy or sell a stated number of shares immediately. The broker is obligated to act on a best efforts basis to get the best possible price (as low as possible for a purchase order, as high as possible for a sell order) when the order is placed. An investor placing a market order can be fairly certain that the order will be executed but will be uncertain of the price. However, there is usually reliable information available beforehand about the likely price at which such an order will be executed. Not surprisingly, market orders are day orders.

#### (ii) Limit Order

Limit order, wherein a limit price is specified by the investor when the order is placed with the broker. If the order is to purchase shares, the broker is to execute the order at a price less than or equal to the limit price. If the order is to sell shares, the broker is to execute

the order at a price greater than or equal to the limit price. Thus, the investor specifies a ceiling on the price to purchase shares and a floor on the price to sell shares. In contrast to a market order, an investor using a limit order cannot be certain that the order will be executed.

**(iii) Stop Order**

For a stop order the investor must specify a stop price. If it is a sell order, the stop price must be below the market price when the order is placed. Conversely, if it is a buy order, the stop price must be above the market price when the order is placed. If someone later trades the stock at a price that reaches or passes the stop price, the stop order becomes, in effect, a market order. Hence a stop order can be considered as a conditional market order.

**(iv) Stop Limit Order**

The stop limit order helps investors know with more certainty the execution price associated with a stop order. With a stop limit order the investor specifies not one but two prices - a stop price and a limit price. Once someone trades the stock at a price that reaches or passes the stop price, then a limit order is created at the limit price. Hence stop limit order can be viewed as a conditional limit order.

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**8. Margin Trading**

*Ans :*

In the stock market, margin trading refers to the process whereby individual investors buy more stocks than they can afford to. Margin trading also refers to intraday trading in India and various stock brokers provide this service. Margin trading involves buying and selling of securities in one single session. Over time, various brokerages have relaxed the approach on time duration. The process requires an investor to speculate or guess the stock movement in a particular session. Margin trading is an easy way of making a fast buck. With the advent of electronic stock exchanges, the once specialised field is now accessible to even small traders.

The process is fairly simple. A margin account provides you the resources to buy more quantities of a stock than you can afford at any point of time. For this purpose, the broker would lend the money to buy shares and keep them as collateral.

In order to trade with a margin account, you are first required to place a request with your broker to open a margin account. This requires you to pay a certain amount of money upfront to the broker in cash, which is called the minimum margin. This would help the broker recover some money by squaring off, should the trader lose the bet and fail to recuperate the money.

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**9. Features of Speculation**

*Ans :*

Following are the features of speculation:

1. One tries to buy the goods when they are cheap and to sell them when they are expensive. There is a good chance to do that as long as the market price of a good changes often in different directions.
2. Speculation includes the buying, holding, selling, and short-selling of stocks, bonds, commodities, currencies, collectibles, real estate, derivatives, or any valuable financial instrument.
3. Speculation is one of the market roles in western financial markets. The others are hedging, long-term investing, and arbitrage.
4. Speculators do not plan to keep an asset for a long time.

**10. Investment vs. gambling.***Ans :*

| <b>Basis of difference</b> |                         | <b>Investment</b>                                                         | <b>Gambling</b>                                                                        |
|----------------------------|-------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| <b>1.</b>                  | <b>Creation of Risk</b> | In the case investment. the investors deal with pre-existing risk.        | Here gambler creates risk.                                                             |
| <b>2.</b>                  | <b>Transfer of Risk</b> | Transferring the risk from investors to insurance companies.              | In the case of gambling, transferring or shifting the risks are not possible.          |
| <b>3.</b>                  | <b>Expected Return</b>  | Investing has a positive expected return.                                 | Gambling has a negative expected return.                                               |
| <b>4.</b>                  | <b>Measure of Risk</b>  | The risk and uncertainty are measurable in the return on any investment.  | The risk and uncertainty cannot be measured because of the high degree of uncertainty. |
| <b>5.</b>                  | <b>Activity</b>         | Investing is a productive activity that provides benefits to the society. | Gambling is an unproductive activity that harms the society.                           |

## UNIT II

**Portfolio Analysis:** Risk and return Analysis - Markowitz Portfolio Theory, Mean- variance approach, portfolio selection - efficient portfolios, Single Index model - Capital Asset pricing model, Arbitrage Pricing Theory.

### 2.1 CONCEPT OF PORTFOLIO MANAGEMENT

**Q1. Define portfolio ? Explain the objectives of portfolio management.**

**Ans :**

#### Meaning of Portfolio

Portfolio means a collection or combination of financial assets or securities such as shares, debentures and govt securities. The term portfolio may be used synonymously with expression collection of assets, Which can even include physical assets such as gold, silver, Real estates etc., In portfolio context, assets are held for investment purposes but not for consumption purposes. The portfolio analysis begins where the security analysis ends and this fact important consequences for investor. Portfolio analysis considers the determination of future risk and return in holding various bonds of individual securities. Portfolio expected return is a weighed average of the expected return of individual securities.

#### Portfolio Management

Portfolio Management (PM) guides the investor in a method of selecting the best available securities that will provide the expected rate of return for any given degree of risk and also to mitigate (reduce) the risks. It is a strategic decision which is addressed by the top-level managers.

#### Objectives of Portfolio Management

**1. Security of Principal Investment :** Investment safety or minimization of risks is one of the most important objectives of portfolio management. Portfolio manage-

ment not only involves keeping the investment intact but also contributes towards the growth of its purchasing power over the period. The motive of a financial portfolio management is to ensure that the investment is absolutely safe. Other factors such as income, growth, etc., are considered only after the safety of investment is ensured.

- 2. Consistency of Returns :** Portfolio management also ensures to provide the stability of returns by reinvesting the same earned returns in profitable and good portfolios. The portfolio helps to yield steady returns. The earned returns should compensate the opportunity cost of the funds invested.
- 3. Capital Growth :** Portfolio management guarantees the growth of capital by reinvesting in growth securities or by the purchase of the growth securities. A portfolio shall appreciate in value, in order to safeguard the investor from any erosion in purchasing power due to inflation and other economic factors. A portfolio must consist of those investments, which tend to appreciate in real value after adjusting for inflation.
- 4. Marketability :** Portfolio management ensures the flexibility to the investment portfolio. A portfolio consists of such investment, which can be marketed and traded. Suppose, if your portfolio contains too many unlisted or inactive shares, then there would be problems to do trading like switching from one investment to another. It is always recommended to invest only in those shares and securities which are listed on major stock exchanges, and also, which are actively traded.

5. **Liquidity** : Portfolio management is planned in such a way that it facilitates to take maximum advantage of various good opportunities upcoming in the market. The portfolio should always ensure that there are enough funds available at short notice to take care of the investor's liquidity requirements.
6. **Diversification of Portfolio** : Portfolio management is purposely designed to reduce the risk of loss of capital and/or income by investing in different types of securities available in a wide range of industries. The investors shall be aware of the fact that there is no such thing as a zero risk investment. More over relatively low risk investment give correspondingly a lower return to their financial portfolio.
7. **Favorable Tax Status** : Portfolio management is planned in such a way to increase the effective yield an investor gets from his surplus invested funds. By minimizing the tax burden, yield can be effectively improved. A good portfolio should give a favorable tax shelter to the investors. The portfolio should be evaluated after considering income tax, capital gains tax, and other taxes.

The objectives of portfolio management are applicable to all financial portfolios. These objectives, if considered, results in a proper analytical approach towards the growth of the portfolio. Furthermore, overall risk needs to be maintained at the acceptable level by developing a balanced and efficient portfolio. Finally, a good portfolio of growth stocks often satisfies all objectives of portfolio management.

## Q2. Explain the Process of Portfolio Management.

Ans :

We own portfolios because we believe that investment risk can be diversified by spreading our investment across a number of assets. Ideally, we would like to own a portfolio which provides the maximum return for a given level of risk. Portfolio management is primarily concerned with the process of building and managing such portfolios.

We will define portfolio management as an ongoing process consisting of the following integrated set of steps,

### a) Specification of Investment Objectives, Constraints and Investment Policies

The first step in the process of portfolio management is to define the objectives of the investor in terms of return requirements and risk tolerance. Clearly, the objectives have to be framed in the context of constraints such as liquidity, time horizon, tax status and legal or regulatory considerations. Given the set of investment objectives and constraints, the investment policy for the investor is evolved. The investment policy specifies the actions to be taken to achieve the investment objectives within the constraints imposed.

### b) Forecasting Exceptional Inputs

This step involves forecasting measures of risk and return for the major asset classes like equities, bonds, money market securities and real estate.

The step begins with the identification of the macro economic variables that are relevant for assessing the risk return characteristics of each asset class and forming expectations about these variables. It culminates in translating the expectations into measures of risk and return.

### c) Asset Allocation

Given an investment policy and the expectational inputs, decisions have to be made regarding.

1. The key asset classes in which funds can be invested equities, bonds, money market instruments, real estate, etc.
2. The amount of money to be invested in each asset class. Within each asset class, decisions are made concerning,
  - i) The securities that must belong to the class
  - ii) The amount of money to be invested in each one of these securities.

Ideally, the portfolio must be a minimum variance portfolio. A portfolio that carries the minimum level of risk for a given level of return.

**d) Managing the Portfolio**

Having constructed a portfolio, the next step will be to manage the portfolio using active or passive or a combination of active and passive strategies. One can think about these styles of portfolio management as lying along a spectrum of risk taking with all portfolio managers along that spectrum having defined benchmarks.

The passive portfolio manager takes little, if any, risk vis-a-vis that benchmark. His sole objective is to equal the return of the benchmark.

On the other hand, the active portfolio manager does take risk in terms of market timing and stock selection because only by taking risk one can hope to add incremental return.

**e) Monitoring and Rebalancing the Portfolio**

Regardless of the strategy followed for managing the portfolio (active/passive), the portfolio manager must ensure that the portfolio remains appropriate to the ever changing environment.

The factors that can change include changes in the investment objectives and constraints, changes in the risk attributes or return prospects for individual investments and emergence of new investment alternatives.

The portfolio manager must monitor these changes and respond by rebalancing the portfolio to accommodate these changes.

**f) Evaluating Portfolio Performance**

This step involves measuring the risk adjusted performance of a portfolio in order to evaluate the investment strategy that has been developed based on investor objectives. While, there are a number of risk adjusted performance measures available for evaluating the performance of a portfolio.

**Modern Portfolio Theory**

The Modern Portfolio Theory (MPT) provides the conceptual frame for the portfolio management process.

The theory primarily deals with the framework for identifying the composition of efficient portfolios - portfolios which carry the minimum levels of risk for different levels of expected return.

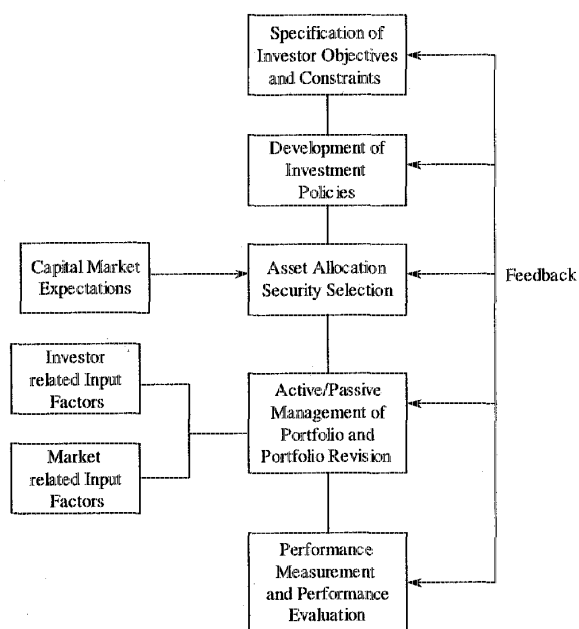


**Fig.: Portfolio Management Process**

**Q3. Explain the Benefits of Portfolio Management.**

**Ans :**

These days, many people are taking investment very seriously. Many folks always want the best advice in regards to investment and that is why they hire experts to manage their portfolios. In other words, portfolio services help to build and manage inventory of your company projects and products.

**1. Investors make informed decision**

Portfolio management is very important when it comes to investing to ascertain that investors make informed decisions based on all the risk factors. When investors learn how to control risks in their business portfolios, they often feel contented. A portfolio management service is therefore beneficial to investors as it helps them make informed decisions.

**2. Improves business performance**

Portfolio management facilitates good corporate and project governance as it uses

performance and corporate resources against key objectives. In addition to that, it helps to improve business performance by handling the priorities for better project delivery.

### 3. Equitable use of resources

Programs and business projects are often achieved by resources which are evenly shared alongside other project duties. Moreover, multiple projects may end up competing for resources. This is where portfolio management comes in handy, to help in planning so that resources are equitably distributed in all business processes.

### 4. Align objectives with goals

When you learn the importance of portfolio management, it will become easier to handle management issues since it helps improve your communication skills in order to ensure that projects are delivered on time. It will also show you the steps to take if the firm's objectives were to change, keeping you informed on how to improve your business.

### 5. Monitors all business processes

The main advantage of portfolio management is the fact that it helps companies manage all their processes, including personnel issues, finances, as well as set objectives.

Small businesses may not have a structure for portfolio management, but most companies often appoint someone to handle their projects.

#### Q4. Explain the construction of Optimum Portfolio.

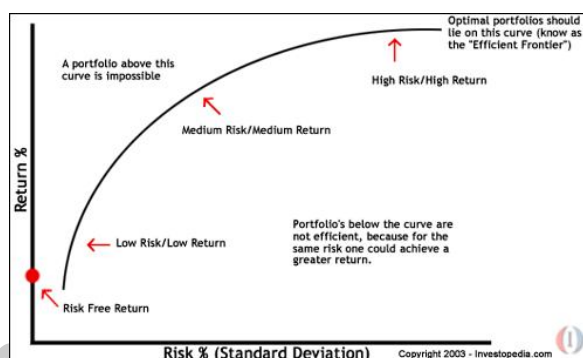
Ans :

The optimal portfolio concept falls under the modern portfolio theory. The theory assumes (among other things) that investors fanatically try to minimize risk while striving for the highest return possible. The theory states that investors will act rationally, always making decisions aimed at maximizing their return for their acceptable level of risk.

The optimal portfolio was used in 1952 by Harry Markowitz, and it shows us that it is possible for different portfolios to have varying levels of risk

and return. Each investor must decide how much risk they can handle and then allocate (or diversify) their portfolio according to this decision.

The chart below illustrates how the optimal portfolio works. The optimal-risk portfolio is usually determined to be somewhere in the middle of the curve because as you go higher up the curve, you take on proportionately more risk for a lower incremental return. On the other end, low risk/low return portfolios are pointless because you can achieve a similar return by investing in risk-free assets, like government securities.



You can choose how much volatility you are willing to bear in your portfolio by picking any other point that falls on the efficient frontier. This will give you the maximum return for the amount of risk you wish to accept. Optimizing your portfolio is not something you can calculate in your head. There are computer programs that are dedicated to determining optimal portfolios by estimating hundreds (and sometimes thousands) of different expected returns for each given amount of risk.

## 2.2 RISK AND RETURN ANALYSIS

### Q5. Define risk ? Explain the nature / scope of risk.

Ans :

Risk is virtually anything that threatens or limits the ability of a community or nonprofit organisation to achieve its mission. It can be unexpected and unpredictable events such as destruction of a building, the wiping of all your computer files, loss of funds through theft or an injury to a member or visitor who trips on a slippery floor and decides to sue.

### Meaning of Risk Management

Risk management is a process of thinking systematically about all possible risks, problems or disasters before they happen and setting up procedures that will avoid the risk, or minimise its impact, or cope with its impact. It is basically setting up a process where you can identify the risk and set up a strategy to control or deal with it.

### Risk Policy

In every market investment risk policy is identified. Based on this policy risk factor involved is estimated. The following factors are involved in risk policy.

1. Organisation has to identify its risk tolerance levels by considering return factors (high expected return - high risk involved).
2. The level of the organization at which the management is expected to be implemented.
3. Identification of risk and their consequences.
4. Risk performance of share holders.
5. Clarity of objectives in a particular business activities.
6. Identification of internal (or) external factors that limit the application of risk management strategies.
7. Establish the general rules for successful risk management.
8. Portfolio investment and its usages.
9. Tools and techniques to be used to reduce the risk factors.
10. Source of investment and the risk factors are identified in advance.
11. Strategic planning and better communication facilities must be introduced in the organization to achieve the better risk management process.

Risk policy must be determined by the management by using the above factors to achieve the better or returns.

### Nature and Scope of Risk

All organisations deal with risks, though the nature and magnitude may differ for each type of organisation. This is especially true for banks /

financial institutions, as they deal with money. They act as financial intermediaries in any economic system. They help in mobilising household / corporate savings and making them available to deficit units. In their role as financial intermediaries, banks and financial institutions are involved in the following activities which results in various types of risks :

- a) **Funds mobilisation:** Funds are mobilised by accepting term deposits as well as by allowing customers to operate their checking accounts by leaving balances in them.
- b) **Funds deployment:** The funds that are mobilised are first subject to regulatory investment requirements i.e., banks have to invest a specified proportion of their funds in certain instruments, often government securities. The surplus funds are available as loans for various segments of corporate and retail borrowers.
- c) **Funds transfer:** Banks and financial institutions are key vehicles for moving funds on behalf of their customers. Banks acts as settlement agents for their corporate clients in the realization and payment of their funds.
- d) **Risk transfer:** Manufacturing and other companies are exposed to a number of risks. Some of the risks are central to their business. The risk that arise from the financial markets should transfer to the Banks, since if is the latter's core competence to handle them.
- e) **Transaction services:** Banks assist their customers in carrying out various trade transactions, both domestic and international. International transactions involves dealing with multiple currencies. The global network of the banking system and its relationship constitute the backbone of such trade.
- f) **Credit enhancement services:** In the course of trade, the concerned parties may not be familiar with each other. Therefore, the suppliers of goods often expect the bank's help in evaluating or enhancing the credit worthiness of a customer.

**Q6. Explain the Sources of Risk.**

*Ans :*

Variety of sources lead towards risk and have an impact on the value of assets of a firm. The risk arises when the actual outcome is believed to be different from the expected outcome. The expected outcome depends upon various factors. Governments play a vital role and have a direct impact on the expected outcomes.

The factors or sources of risk are as follows :

1. The government policies related to prices and economy is one of the major sources of risk.
2. Consumer preference, consumption and savings habit are essential in deciding the market share. Therefore, is a source of risk.
3. The political, social, racial and ethnic issue also have an impact on expected outcome.
4. Technological factors are responsible for the introduction of new products in the market and therefore has an impact on expected outcomes.
5. Corporate governance and financial performance and financial structure adopted by the firm also has an impact on expected performance.

Therefore, these factor are some of the basic sources of risk.

Apart from there risks a firm also faces market risk. The following are the different sources of market risk.

**1. Price Level Risk**

The price level risk refers to the change in the level of foreign exchange rates, interest rates, commodity rates and equity prices. This one of the major sources of market risk.

**2. Foreign Exchange Rate Risk**

The cash flow expected from a portfolio in foreign currency is always subjected to foreign exchange rate risk. Fluctuations or change in exchange rates directly have an impact on expected cash flows.

**3. Interest Rate Risk**

The change in the interest rates has an impact on fixed income securities. The forward and future contracts are also subjected to interest rate risk. Therefore, interest rate risk is also a major source of market risk.

**4. Correlation and Concentration Risk**

The equity risk management is divided into two activities. Firstly, managing over all market risk, secondly, managing risk in individual equities. This uses factor models for yield curve analysis and is comparatively easier than variance- covariance matrix.

**5. Dividend and Stock Loan Risk**

The cost of borrowing the two deliverables is used to determine the forward price. The forward equity price is affected by the cash flows that are expected to be paid before forward rate.

**6. Index Bench marking Risk**

The banks have an absolute return on equity and profit and loss are managed in relation to the fixed budget. Its participants have a return target which is variable and has relation to the return on an index.

**7. Price Volatility Risk**

Change in price volatility has an impact on VaR option of products. The volatility of prices exposure is handled as the exposure to prices. Change in price leads to change in price volatility.

**8. Price Correlation Risk**

In 1990s, the market witnessed the risk faced by products whose payoffs depended upon more than one underlying price. Even today there are options that are dependend upon two or more prices. Therefore, price correlation risk is also one of the sources of market risk.

### 9. Prepayment Variance Risk

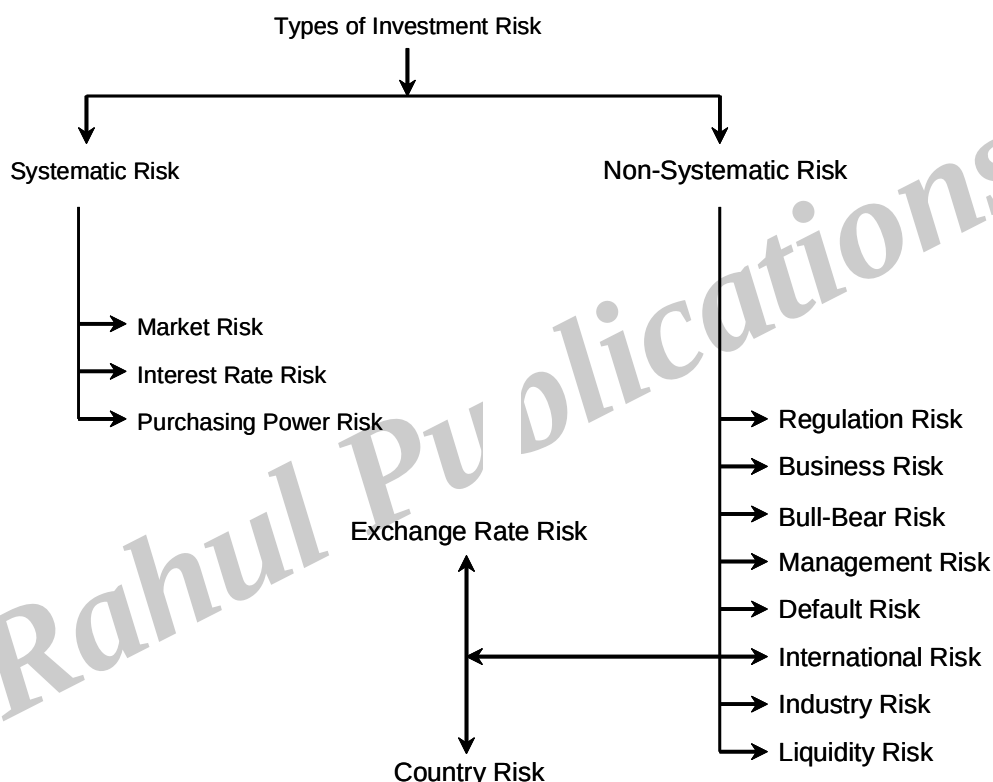
This risk is faced by Mortgage-Back-Securities (MBS) and Asset Backed Securities (ABS). The investor of securities sells the borrower the option to payoff their debt early. A fall in rate enables the house owners to refinance and the MBS principal is paid back to the investor which the MBS investors is to reinvest at a rate lower than the MBS coupon rate.

### Q7. Explain the classification of risk.

Ans :

#### Types of Risk

Investment Risks are :



Dividing total risk into its two components, a general (market) component and a specific (issuer) component, we have systematic risk and non-systematic risk, which are additive :

$$\begin{aligned}
 \text{Total Risk} &= \text{General Risk} + \text{Specific Risk} \\
 &= \text{Market Risk} + \text{Issuer Risk} \\
 &= \text{Systematic Risk} + \text{Non-Systematic Risk}
 \end{aligned}$$

#### A) SYSTEMATIC RISK

Variability in a security's total returns that is directly associated with overall movements in the general market or economy is called systematic risk. Virtually all securities have some systematic risk because systematic risk directly encompasses interest rate, market, and inflation risks. Systematic risk is attributable to broad macro factors affecting all securities. Different types of systematic risk are explained as under:

### 1. Market Risk

Market risk is referred to as stock variability due to changes in investor's attitudes and expectations. The investor's reaction towards tangible and intangible events is the chief cause affecting 'market risk'. The first set, that is, the tangible events has a 'real' basis but the intangible events are based on a 'psychological' basis or reaction to expectations or realities.

Market risk triggers off through real events comprising political, social and economic reasons. The initial decline or 'rise' in market price will create an emotional instability of investors and cause a fear of loss or create an undue confidence, relating possibility of profit. The reaction to loss will culminate in excessive selling and pushing prices down and the reaction to gain will bring in the activity of active buying of securities. However, investors are more reactive towards decline in prices rather than increase in prices.

Market risks cannot be eliminated while financial risks can be reduced. Through diversification also, market risk can be reduced but not eliminated because prices of all stocks move together and any equity stock investor will be faced by the risk of a downwards market and decline in security prices.

### 2. Interest Rate Risk

There are four types of movements in prices of stocks in the market. These may be termed as (a) long-term, (b) cyclical (bull and bear markets), (c) intermediate or within the cycle, and (d) short-term. The prices of securities will rise or fall, depending on the change in interest rates. The longer the maturity period of a security the higher the yield on an investment and lower the fluctuations in prices. Shorter-term interest rates fluctuate at a great speed and are now more volatile than long-term securities but their changes have a similar effect, price. Traditionally, investors could attempt to forecast cyclical swings in interest rates and prices merely by forecasting ups and downs in general business activity. However, in India a combination of factors have produced a situation where it is difficult to accurately find out the changes in interest rates. Some of the factors that are responsible for complicated analysis are the differences between

actual and expected inflation, monetary policies and industrial recessions in the economy. If interest rates could be calculated and forecasted accurately, investors would buy and sell securities with confidence.

Interest rates continuously change for bonds, preferred stock and equity stock. Interest rate risk can be reduced by diversifying in various kinds of securities and also buying securities of different maturity dates.

Interest rate risk can also be reduced by analyzing the different kinds of securities available for investment. A government bond or a bond issued by the financial institution like IDBI is a risk-less bond. Even if government bonds give a slightly lower rate of interest, in the long run they are better for a conservative investor because he is assured of his return. Moreover, government bonds are made more attractive by additional advantages of tax benefits. Therefore, one way to avert interest rate risk would be to purchase government securities. Then the price of securities in the private corporate sector will fall and interest rates will increase. This process will create a chain reaction in the securities. This is rarely possible in the real world situation.

### 3. Purchasing Power Risk

Purchasing power risk is also known as inflation risk. This risk arises out of change in the prices of goods and services and technically it covers both inflation and deflation periods. During the last two decades, it has been seen that inflationary have been continuously affecting the Indian economy. Therefore, in India purchasing power risk is associated with inflation and rising prices in the economy.

Inflation in India has been either 'cost push' or 'demand pull'. This type of inflation has been seen when costs of production rise or when there is a demand for products but there is no smooth supply and consequently prices rise. In India, the cost push inflation has led to enormous problems as the rise in prices of raw materials has greatly increased costs of production. The increase in costs of production has shown a rising trend in 'wholesale price index' and 'consumer price index'. A rising trend in price index reflects a price spiral in the economy.

The consumers who wanted to forego their present consumption level to purchase commodities in future found that they could not adjust their budgets because they were faced with rising prices and shortage of funds for allocation according to their preferences.

## B) UNSYSTEMATIC RISK

### 1. Business Risk

Every corporate organization has its own objectives and goals and aims at a particular gross profit and operating income-had also expects to provide a certain level of dividend income to its shareholders. It also hopes to plough back some profits. Once it identifies its operating level of earnings, the degree of variation from this operating level would measure business risk. For example, if operating income is expected to be 15% in a year, business risk will be low if the operating income varies between 14 and 16%. If the operating income is as low, as 10% or as high as 18% it would be said that the business risk is high.

Business risk is also associated with risks directly affecting the internal environment of the firm and those of circumstances beyond its control. The former is classified as internal business risk and the latter as external business risk. Within these two broad categories of risk, the firm operates.

Internal business risk may be represented by a firm's limiting environment within which it conducts its business. It is the framework within which the firm conducts its business drawing its efficiency largely from the constraints within which it functions. Internal business risk will be of differing degrees in each firm and the degree to which each firm achieves its goals and attainment level is reflected in its operating efficiency.

Each firm also has to deal with specific external factors. Many a times, these factors are beyond the control of a firm as they are responsive to specific operating environmental conditions. External risks of the business are due to many factors. Some of the factors that can be summarized are:

- **Business cycle:** Some industries move automatically with the business cycle, others move counter-cyclically;
- **Demographic factors:** Such as geographical distribution of population by age, group and race;

- **Political policies:** Change in decisions, toppling of State Governments to some extent affect the working of an industry;

- **Monetary policy:** Reserve Bank of India's policies with regard to monetary and fiscal policies may also affect revenues through an effect on cost as well as availability of funds. When the RBI controls its monetary policies in a way that money asset becomes expensive, people postpone their purchases and the impact of such factors can be seen in retailers' showrooms. As buying activity is restricted, sales slide down;

- **Environment:** The economic environment of the economy also influences the firm and costs and revenues.

### 2. Financial Risk

Financial risk in a company is associated with the method through which it plans its financial structure. If the capital structure of a company tends to make earnings unstable, the company may fail financially. How a company raises funds to finance its needs and growth will have an impact on its future earnings and consequently on the stability of earnings. Debt financing provides a low cost source of funds to a company, at the same time providing financial leverage for the common stock holders. As long as the earnings of the company are higher than the cost of borrowed funds, the earnings per share of common stock are increased. Unfortunately, large amounts of debt financing also increases the variability of the returns of the common stock holders and thus increases their risk. It is found that variation in returns for shareholders in levered firms (borrowed funds company) is higher than in unlevered firms. The variance in returns is the financial risk.

Financial risk and business risk are somewhat related. While business risk is concerned with an analysis of the income statement between revenues and earnings before interest and taxes (EBIT), financial risk can be stated as being between Earnings Before Interest and Taxes (EBIT) and Earnings Before Taxes (EBT). If the revenue, cost and EBIT of a firm is variable, it implies that there is business risk and in this situation borrowed funds can magnify risk especially in unprofitable years. Debt in modest

amounts is desirable. Excessive debt is to be avoided as the long range profitability of the company can be depressed. The company should constantly test its debt to fixed assets, debts to net worth, debts to working capital and give coverage of interest charges and preferred dividends by net income after taxes. These methods will check imbalance in the firm's financing method and help to reduce risk.

### 3. Regulation Risk

Some investments can be relatively attractive to other investments because of certain regulations or tax laws that give them an advantage of some kind. Municipal bonds, for example, pay interest that is exempt from local, state and federal taxation. As a result of that specific tax exemption, municipals can price bonds to yield a lower interest rate since the net after-tax yield may still make them attractive to investors.

### 4. Business Risk

The risk of doing business in a particular industry or environment is called business risk. For example, as one of the largest steel producers, U.S. Steel faces unique problems.

### 5. Bull-Bear Market Risk

This risk arises from the variability in the market returns resulting from alternating bull and bear market forces.

- When security index rises fairly consistently from a low point, this upward trend is called a bull market. The bull market ends when the market index reaches a peak and starts a downward trend.
- The period during which the market declines, this downward trend is called a bear market.

### 6. Management Risk

Management, all said and done, is made of people who are mortal, fallible and capable of making a mistake or a poor decision. Errors made by the management can harm those who invested in their firms.

### 7. Default Risk

It is that portion of an investment's total risk that results from changes in the financial integrity of the investment. For example, when a company that issues securities moves either further away from bankruptcy or closer to it, these changes in the firm's financial integrity will be reflected in the market price of its securities. The variability of return that investors experience, as a result of changes in the credit worthiness of a firm in which they invested, is their default risk.

### 8. International Risk

International risk can include country risk and exchange rate risk.

- i) **Exchange Rate Risk :** All investors who invest internationally in today's increasingly global investment arena face the prospect of uncertainty in the returns after they convert the foreign gains back to their own currency.
- ii) **Country Risk :** Country risk, also referred to as political risk, is an important risk for investors today. With more investors investing internationally, both directly and indirectly, the political and therefore economic stability and viability of a country's economy need to be considered.

### 9. Industry Risk

An industry may be viewed as group of companies that compete with each other to market a homogeneous product. Industry risk is that portion of an investment's total variability of return caused by events that affect the products and firms that make up an industry.

### 10. Liquidity Risk

Liquidity risk is the risk associated with the particular secondary market in which a security trades. An investment that can be bought or sold quickly and without significant price concession is considered liquid. The more uncertainty about the time element and the price concession, the greater the liquidity risk.

### 2.2.1 Measurement of Risk

#### Q8. Explain the various Measurements of Risk.

Ans :

To measure risk, an investor should first understand the fact that risk cannot be measured accurately because it is surrounded with complex environment factors and social, economic and political forces. The uncertainties make the measurement of risk an approximation or a fairly accurate estimation. The analyst must be very cautious while making predictions because much depends on his accuracy in predicting risks. The quantification of risk ensures comparison as well as uniformity in measurement, analysis and interpretation.

There are three methods :

#### 1. Standard Deviation and variance

The following example (Table) calculates return and risk through probability distribution and standard deviation and variance method of two companies.

**Table: Company - A**

| Possible Outcome k | Return RK  | Probability K | Weighted (2 × 3) $kR_k$ | Deviation $R_k - E_1$ | Deviation squared $(R_k - E_1)^2$ | Weight Deviation squared $k(R_k - E_1)^2$ |
|--------------------|------------|---------------|-------------------------|-----------------------|-----------------------------------|-------------------------------------------|
| 1.                 | 0.04 (4%)  | 0.25          | 0.010                   | - 0.075               | 0.005625                          | 0.001406                                  |
| 2.                 | 0.12 (12%) | 0.50          | 0.060                   | 0.005                 | 0.000025                          | 0.000013                                  |
| 3.                 | 0.18 (18%) | 0.25          | 0.045                   | 0.065                 | 0.004225                          | 0.001056                                  |
|                    |            |               |                         |                       |                                   | 0.002475                                  |

Expected Return = 0.115

$E_1 = (11.5\%)$

Standard Deviation =  $\theta = \sqrt{k(R_k - E_1)^2}$

Where  $K = \text{Outcome} = \sqrt{0.002475}$

$R_k = \text{Return } \theta = 0.049 \text{ or } (4.9\%)$

$\pi k = \text{Probability} = \theta^2 \text{ or Variance } 0.002475$

Weighted probability and Return  $\pi k R_k$

**Table : COMPANY - B**

| Possible Outcome k | Return RK | Probability K | Weighted (2 × 3) $kR_k$ | Deviation $R_k - E_1$ | Deviation squared $(R_k - E_1)^2$ | Weighted Deviation squared $k(R_k - E_1)^2$ |
|--------------------|-----------|---------------|-------------------------|-----------------------|-----------------------------------|---------------------------------------------|
| 1                  | 0.05 (5%) | 0.25          | 0.0125                  | -0.040                | 0.001600                          | 0.000400                                    |
| 2                  | 0.09 (9%) | 0.50          | 0.0450                  | 0.0000                | 0.000000                          | 0.000000                                    |
| 3                  | 0.18(13%) | 0.25          | 0.0325                  | 0.040                 | 0.001600                          | 0.000400                                    |
|                    |           |               | 0.0900                  |                       |                                   | 0.000800                                    |

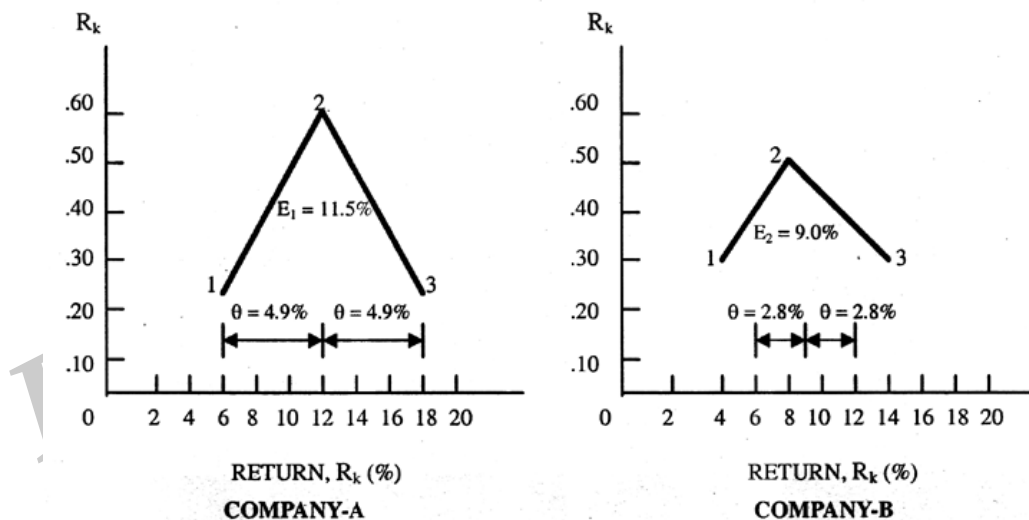
Expected Return = 0.0900

$$\begin{aligned}\theta &= \sqrt{k(R_k - E_2)^2} \\ &= 0.0008000 \\ &= 0.028 \text{ (2.8\%)}\end{aligned}$$

or Variance =  $\theta^2 = 0.000800$

Comparison of return and risk for stocks of Company-A and Company-B with standard deviation 4.9% of Company-A and 2.8% of Company-B.

The standard deviations and probability distributions show that stock of Company-A has a higher expected return, and a higher level of risk as measured by standard deviation. In figure are plotted probability distributions, expected returns and standard deviations of returns. Company-B's stocks are symmetrical about its expected return, Company A's is not. This diagram also highlights important properties of standard deviation and variance. The deviations are squared and added on both sides of expected return. Many investors are contented when deviations in return are higher than expected. Standard deviation and variance is the best method for calculations in upward returns but when deviations are below the expected return, then instead of standard deviation, the investors or the security analysts should use semi-variance as a measurement of risk as it reflects only downside variations in return.



Standard deviation measures risk for both individual assets and for portfolios. It measures the total variation return about expected return.

## 2. Beta

The most important part of the equation is  $\rho$  or beta. It is used to describe the relationship between the stock's return and market index's returns. If the regression line is at an exact  $45^\circ$  angle, beta will be equal to +1.0. A 1% change in the market index (horizontal axis) shows that it is on an average accompanied by a 1% change in the stock on the vertical axis. The percentage changes in the price of the stock are regressed against the percentage changes in the price of a market index. S&P 500 Price Index Beta may be positive or negative. Usually, betas are found to be positive. We rarely find a negative beta which reflects a movement contrary to the market. A .5 beta indicates that the market index change of 1% was reflected by a .5% price change in stocks. Similarly, a 1.5 beta would reflect that whenever the market index rose or fell by 1%, the stocks would rise and fall by 1.5%. Beta is referred to as systematic risk to the market and a + E the unsystematic risk. Beta is a useful piece of information both for individual stock as

well as portfolios, but as a measure of risk it is better used in the analysis of portfolios. Also, beta measures risk satisfactorily for diversified efficient portfolios but not inefficient portfolios. The concept of efficient and inefficient portfolios will be clarified later in the book. For the present, it may be said that beta is a satisfactory measure for portfolios because risk other than that reflected by beta is diversified.

### 3. Alpha

The distance between the inter-section and the horizontal axis is called (a) alpha. The size of the alpha exhibits the stock's unsystematic return and its average return independent of the market's return. If alpha gives a positive value it is a healthy sign but alphas expected value is zero. The belief of many of the investors is that they can find stocks with positive alpha's and have a profitable return. It must be recalled, however, that in an efficient market positive alphas cannot be predicted in advance. The portfolio theory also maintains that the alphas of stocks will average out to 0 in a properly diversified portfolio.

#### 2.2.2 Return Analysis

#### Q9. Explain the components of return analysis.

Ans :

Return is the amount or rate of produce, proceeds, profits which accrues to an economic agent from an undertaking or investment. It is a reward for and a motivating force behind investment, the objective of which is usually to maximize return.

Return is the primary motivating force that drives investment. It represents the reward for undertaking investment. Since the game of investing is about returns (after allowing for risk), measurement of realised (historical) returns is necessary to assess how well the investment manager has done. In addition, historical returns are often used as an important input in estimating future (prospective) returns.

#### Components of Return

The return of an investment consists of two components :

- a) **Current Return** : The first component that often comes to mind when one is thinking about return is the periodic cash flow (income), such as dividend or interest, generated by the investment. Current return is measured as the periodic income in relation to the beginning price of the investment.
- b) **Capital Return** : The second component of return is reflected in the price change called the capital return - it is simply the price appreciation (or depreciation) divided by the beginning price of the asset. For assets like equity stocks, the capital return predominates.

Thus, the total return for any security (or for that matter any asset) is defined as:

$$\text{Total return} = \text{Current} + \text{Capital return}$$

The current return can be zero or positive, whereas the capital return can be negative, zero, or positive.

#### Q10. Explain the types of return.

Ans :

#### 1. Internal Rate of Return (IRR)

The internal rate of return (IRR) is the rate of discount which makes the present value of all the revenues (cash flows) from the investment equal to the total cost of that investment. This is also known as the yield or yield rate.

#### 2. Bond Rate

It is the interest rate received on the face value or the par value of the bond. If a company or the government issues a 10-year bond with Rs. 100 as face value and 15 per cent rate of interest, it would be described as 15 per cent bond.

#### 3. Realised and Expected Return

Return is not as simple a concept as it appears to be because it is not guaranteed, it is mostly expected, and it may or may not be realized. Thus expected return is an anticipated, predicted, desired which is subject to uncertainty. Realised return, on the other hand, is actually earned.

**4. Holding Period Return**

Holding period yield (HPY) measures the total return from an investment during a given time period in which the asset is held by the investor. It is to be noted that HP does not mean that the security is actually sold and the gain or loss is actually realised by the investor. The concept of HPY is applicable whether one is measuring the realized return or estimating the future return. It can be calculated as follows:

$$\text{HPR} = \frac{\text{Income} + (\text{End of period value} - \text{Initial Value})}{\text{Initial Value}}$$

**5. Redemption Yield or Yield to Maturity (YTM)**

Redemption yield is the indicated or promised rate of return an investor will receive from a bond purchased at the current market price and held till maturity.

$Y_{TM} = (\text{Annual Interest}) + (\text{Average annual appreciation or depreciation Redemption or face value})$

**6. Dividend Yield**

Dividend yield is the ratio of per share expected dividends, to the current market price of the share.

**7. Earnings Yield**

Earnings yield is the ratio of expected earnings per share of the firm to the current market price of the share. The dividend yield and earnings yield do not differ if the firm distributes all net earnings in the form of dividends i.e. if it practices 100 per cent dividend payout ratio.

**8. Nominal and Real Return**

While the nominal return is the return in nominal rupees, the real return is equal to the nominal return adjusted for changes in prices i.e. rate of inflation.

**9. Gross and Net Yield**

While gross yield refers to the yield realized by the investor before paying taxes, the net yield is what remains with him after paying the taxes. The net yield can be calculated as follows:

$$\text{Net Yield} = \text{Gross Yield} (1 - \text{Tax Rate}).$$

**Realized Return and Expected Return****A) Realized Return**

Realized return is the actual amount of return earned on a security investment over a period of time. This period of time is typically the holding period which may differ from the expected yield at maturity. The realized yield also includes the returns that have been earned from reinvested interest, dividends and other cash distributions.

The realized yield tends to differ from the yield at maturity in scenarios where the holding period is less than that of the maturity date. In other words, the security is settled or sold prior to the maturity date given at the time of purchase.

**B) Expected Return**

The expected return is the weighted-average most likely outcome in gambling, probability theory, economics or finance.

Expected Return Mean is the average of a probability distribution of possible returns, calculated by using the following formula:

$E(R) = \text{Sum: probability (in scenario } i) * \text{ the return (in scenario } i)$

$$E(R) = \sum_{i=1}^n p_i r_i$$

To calculate the average of a probability distribution we simply take the probability of each possible return outcome and multiply it by the return outcome itself. For example, if you knew a given investment had a 50% chance of earning a 10% return, a 25% chance of earning 20% and a 25% chance of earning -10%, the expected return would be equal to 7.5%:

$$= (0.5) (0.1) + (0.25) (0.2) + (0.25) (-0.1) \\ = 0.075 = 7.5\%$$

Although this is what you expect the return to be, there is no guarantee that it will be the actual return.

## Ex-ante and Ex-post Returns

### A) Ex-Ante Return

The term ex-ante is a neo-Latin word meaning "before the event". Ex-ante is used most commonly in the commercial world, where results of a particular action, or series of actions, are forecast in advance. The opposite of ex-ante is ex-post (or ex post).

The ex-ante return is the expected return of an investment portfolio that is calculated from a proportional weighting of the expected returns of its component assets. In calculating this return, the results assumed for each possible expected return must be calculated as accurately as possible in order for the ex-ante return to be close to the actual return.

By using the ex-ante method, businesses are able to be thoroughly precise when planning, thus making sure the correct resources are available at the moment they are needed. The slightest slip in the quality of the professionalism and standards can result in a catastrophic effect for the businesses concerned.

### B) Ex-Post Return

The historical returns or Expost returns are derived from the cash flow received as well as the price changes that occur during the period of holding the stock or any asset. The income flow is the dividend he receives during the holding period.

To find out the export or historical average return of the stock, the common arithmetic mean is used.

$$R = 1/n (r_1 + r_2 + r_3 + \dots + r_n)$$

$r_1, r_2, r_3$  indicate the returns that occur in different periods of the stock.

### Q11. Explain the Measurement of Returns.

Ans :

The purpose of investment is to get a return or income on the funds invested in different financial assets. The most important characteristics of financial assets are the size and variability of their future returns. Since the return on income varies, various

statistical techniques are used to measure it. Over the years, many methods were adopted for quantifying returns. These are now categorized as traditional and modern techniques of measurement.

### A) Traditional Method of Measurement of Return

Computation of yield to measure a financial asset's return is the simplest and oldest technique of measurement. Yield can be both expected or estimated and actual for a particular period, the formula used to find yield is :

$$a) \quad \text{Estimated Yield} = \frac{\text{Expected cash income}}{\text{Current price of asset}}$$

$$b) \quad \text{Actual Yield} = \frac{\text{Cash income}}{\text{Amount invested}}$$

The yield that is calculated for a particular period to find out the return on the amount that is invested. For example, the annual yield on the Unit Trust certificate is the dividend income divided by the amount invested. Yields can be computed both for bonds and stocks.

### 1. Bonds

Bonds usually have a maturity period. Yield on them can be calculated either for the current period or to maturity. While it is advisable to find out yield to maturity and it is also the common practice, yet current yield on bonds can also be found out. The current yield on a bond is the annual coupon in rupees divided by the bond's purchase price.

#### Example 1

An investor buys a 20-year bond at Rs. 800 and it carries a Rs. 100 worth of coupons per year and its par value is Rs. 1,000, its current yield is :

$$\begin{aligned} \text{Current Yield} &= \frac{\text{Annual coupon price}}{\text{Purchase price}} \\ &= \frac{100}{800} \\ &= 0.125 \text{ or } 12.5\% \end{aligned}$$

**Example 2**

**Note:** The investor may sometimes buy the bond at par value. Then the coupon rate and current rate are identical.

An investor buys a Rs. 100 bond of 10-year maturity with Rs. 80 worth of coupons per year. The par value of the bond is Rs. 1,000. Its current yield is :

$$\text{Current yield} = \frac{80}{100} = .08 \text{ or } 8\%$$

Yield on bonds is more commonly calculated to the date of maturity. (YTM), i.e., the percentage yield that will be earned on bond from the purchase date to maturity date.

**Example 3**

An investor buys a bond in 1978, maturity in 1980, at Rs. 900. It has a maturity value of 10 years and par value of Rs. 1,000. It fetches Rs. 90 every year. Calculated yield.

$$\begin{aligned} \text{Current Yield} &= \frac{90}{900} \\ &= 10\% \end{aligned}$$

$$\text{Yield to Maturity} = \frac{\text{Average annual return}}{\text{Average investment}}$$

$$= \frac{C + \frac{M - P}{N}}{\frac{M + P}{2}}$$

C = Annual coupon rate

M = Maturity of par value of bond

P = Purchase price

N = Number of years remaining to maturity

$$\text{YTM} = \frac{90 + \frac{1000 - 900}{10}}{\frac{1000 + 900}{2}}$$

$$= \frac{100}{950} = 0.105$$

$$\text{YTM} = 10.5\%$$

This formula is an approximate method of calculating yield. It takes into account the values a par and the purchase price of bonds and average it. Bonds may sell either higher or lower than their par values. When bonds sell above their maturity value they are said to be at a 'Premium'. It follows then that bonds selling below their maturity value are at a 'Discount'.

Yield to maturity takes into account 'premium' or 'discount' factors arising out of the difference in purchase price and maturity value, since the yield to maturity takes several factors for finding out the returns as opposed to taking only coupon rate and purchase price to find out current yield, the yield derived from the two methods will differ. Return can also be found out for amounts invested in stocks.

## 2. Stocks

The return on stocks is measured by finding out dividend yields. Dividend yields can be estimated on expected yields as well as actual yields :

$$\text{Estimated Yield} = \frac{\text{Expected cash dividend}}{\text{Current share price}}$$

$$\text{Actual Yield} = \frac{\text{Dividend received}}{\text{Price of share in the beginning of the period}}$$

Another way of finding out returns in stock is by finding out 'earnings yield'.

### B) Modern Methods of Measurements

Following are the modern methods of measuring return :

**1) Holding Period Yield:** The holding period yield is one of the modern techniques on measuring return. It serves two purposes:

- i) It measures the total return per rupee of the original investment.
- ii) Through this method, comparisons can be drawn of any asset's expected return.

The holding period yield can be used for any assets. For example, return from saving accounts, stocks money, real estate and bonds can be compared through this measure. The formula for the holding period yield is:

$$\text{Holding Period Yield} = \frac{\text{Income payment received during the year in rupees} + \text{Capital change for the period in rupees}}{\text{Price in rupees of in original investment the beginning of the period}}$$

Or

$$\text{Holding Period Yield} = \frac{\text{Gain or loss} + \text{Coupon payment}}{\text{Purchase price}}$$

Or

$$\text{HPR} = \frac{(\text{Sale Price} - \text{Purchase Price}) + \text{Current Income}}{\text{Purchase Price}}$$

**2) Bonds Holding Period Yield:** The holding period yields for bonds are measured in the following way :

$$\text{BHPY} = \frac{\text{Income payment during period} + \text{Change in price during period t}}{\text{price at the beginning of the period of t}}$$

$$\text{BHPY or Bond Holding Period Yields} = \frac{I_t + P_t}{P_t}$$

where,  $t$  = holding period

$I_t$  = Bonds coupon interest during period  $t$

$P_t$  = Bonds price at the beginning of holding period

$P$  = Change in Bond Price over the period.

### Example

A company 9% bonds are bought at ₹1,000, retained for a holding period of 1 year and sold for ₹1,100. Find the Holding Period Yield ( $I_t = 9\%$  of 1,000).

**Solution :**

$$\text{Bond of Holding Period Yields} = \frac{I_t + P_t}{P_t} = \frac{90 + 100}{1000} = .19$$

### PROBLEMS

1. A portfolio consist of 40% of security X and 60% of security Y. It has the following probability distribution of returns. Calculate portfolio return and risk.

| State       | Probability | Return X(%) | Return Y(%) |
|-------------|-------------|-------------|-------------|
| Boom        | 0.1         | 14          | 20          |
| Recession   | 0.2         | -5          | -2          |
| Normal      | 0.4         | 10          | 9           |
| Recovery    | 0.1         | 9           | 14          |
| Slow growth | 0.2         | 12          | 18          |

*Sol :*

#### Calculation of Portfolio Return

| $P_s$ | $r_x$ | $r_x P_s$ | $r_y$ | $r_y P_s$ |
|-------|-------|-----------|-------|-----------|
| 0.1   | 14    | 1.4       | 20    | 2.0       |
| 0.2   | -5    | -1.0      | -2    | -0.4      |
| 0.4   | 10    | 4.0       | 9     | 3.6       |
| 0.1   | 9     | 0.9       | 14    | 1.4       |
| 0.2   | 12    | 2.4       | 18    | 3.6       |
|       |       | 7.7       |       | 10.2      |

$$\text{Return on X } (r_x) = \sum [r_x P_s] = 7.7\%$$

$$\text{Given that Weights, } W_x = 40\% = 0.40$$

$$W_y = 60\% = 0.60$$

#### Portfolio Return ( $r_p$ ) or $r_{xy}$

$$\begin{aligned} r_{xy} &= (7.7 \times 0.4) + (10.2 \times 0.6) \\ &= 3.08 + 6.12 = 9.2\% \end{aligned}$$

**Determination of Portfolio Risk**

| $P_s$ | $r_x$ | $r_y$ | $(r_x - \bar{r}_x)$ | $P_s(r_x - \bar{r}_x)^2$ | $(r_y - \bar{r}_y)^2$ | $P_s(r_y - \bar{r}_y)^2$ | $P_s(r_x - \bar{r}_x)(r_y - \bar{r}_y)$ |
|-------|-------|-------|---------------------|--------------------------|-----------------------|--------------------------|-----------------------------------------|
| 0.1   | 14    | 20    | 6                   | 3.6                      | 8.2                   | 6.724                    | 4.92                                    |
| 0.2   | -5    | -2    | -13                 | 33.8                     | -13.8                 | 38.088                   | 35.88                                   |
| 0.4   | 10    | 9     | 2                   | 1.6                      | -2.8                  | 3.136                    | -2.24                                   |
| 0.1   | 9     | 14    | 1                   | 0.1                      | 2.2                   | 0.484                    | 0.22                                    |
| 0.2   | 12    | 18    | 4                   | 3.2                      | 6.2                   | 7.688                    | 4.96                                    |
|       | 40    | 59    |                     | 42.3                     |                       | 56.12                    | 43.74                                   |

**Risk on (X) ( $\sigma_y$ )**

$$\begin{aligned}\sigma_y &= \sqrt{\sum [P_s(r_y - \bar{r}_y)^2]} \\ &= \sqrt{56.12} \\ &= 7.49\%\end{aligned}$$

**Risk on X ( $\sigma_x$ )**

$$\begin{aligned}\sigma_x &= \sqrt{\sum [P_s(r_x - \bar{r}_x)^2]} \\ &= \sqrt{42.3} \\ &= 6.5\%\end{aligned}$$

**Covariance of X and Y**

$$\begin{aligned}\text{COV}_{xy} &= \sum P_s(r_x - \bar{r}_x)(r_y - \bar{r}_y) \\ &= 43.74\end{aligned}$$

**Coefficient of Correlation**

$$\begin{aligned}\rho_{xy} &= \frac{\text{COV}_{xy}}{\sigma_x \sigma_y} \\ &= \frac{43.74}{6.5 \times 7.49} = 0.8987\%\end{aligned}$$

**Portfolio Risk ( $\sigma_p$ )**

$$\begin{aligned}\sigma_{xy} &= \sqrt{\sigma_1^2 W_1^2 + \sigma_2^2 W_2^2 + 2\rho_{xy} W_x W_y \sigma_1 \sigma_2} \\ \sigma_{xy} &= \sqrt{(42.3 \times 0.16) + (56.10 \times 0.36) + (2 \times 0.8987) \times 6.5 \times 7.49 \times 0.4 \times 0.6} \\ &= \sqrt{6.768 + 20.196 + 21.00} \\ &= 6.926\%\end{aligned}$$

2. Rahul Ltd. has a portfolio of five stocks with the following expected market values and returns.

| Stocks | Market value (Rs.) | Return (%) |
|--------|--------------------|------------|
| Ace    | 40,000             | 8          |
| Bell   | 50,000             | 20         |
| Crown  | 20,000             | 15         |
| Dell   | 1,00,000           | 9          |
| Egan   | 30,000             | 12         |
|        | 2,40,000           |            |

Determine Rahul Ltd's expected portfolio return.

Sol :

#### Calculation of Portfolio Return

| Stock | Market value (Rs.) | Weights ( $W_i$ )                   | $r_i$ (%) | $w_i \times r_i$ |
|-------|--------------------|-------------------------------------|-----------|------------------|
| Ace   | 40,000             | $\frac{40,000}{2,40,000} = 0.167$   | 8         | 1.34             |
| Bell  | 50,000             | $\frac{50,000}{2,40,000} = 0.208$   | 20        | 4.16             |
| Crown | 20,000             | $\frac{20,000}{2,40,000} = 0.083$   | 15        | 1.25             |
| Dell  | 1,00,000           | $\frac{1,00,000}{2,40,000} = 0.417$ | 9         | 3.75             |
| Egam  | 30,000             | $\frac{30,000}{2,40,000} = 0.125$   | 12        | 1.50             |
|       | 2,40,000           |                                     |           | 12.00            |

#### Portfolio Return

$$r_p = \sum_{i=1}^{N=5} w_i r_i = 12.00\%$$

3. Calculate portfolio return and risk from the following information. The portfolio consist of equal weights of securities X and Y.

|           |    |    |    |    |    |
|-----------|----|----|----|----|----|
| $r_x$ (%) | 12 | 14 | 12 | 16 | 13 |
| $r_y$ (%) | 20 | 22 | 25 | 18 | 23 |

Sol :

**Determination of Portfolio Risk and Return**

| $r_x(\%)$ | $r_y(\%)$ | $(r_x - \bar{r}_x)$ | $(r_y - \bar{r}_y)$ | $(r_x - \bar{r}_x)^2$ | $(r_y - \bar{r}_y)^2$ | $(r_x - \bar{r}_x)(r_y - \bar{r}_y)$ |
|-----------|-----------|---------------------|---------------------|-----------------------|-----------------------|--------------------------------------|
| 12        | 20        | -1.4                | -1.6                | 1.96                  | 2.56                  | 2.24                                 |
| 14        | 22        | 0.6                 | 0.4                 | 0.36                  | 0.16                  | 0.24                                 |
| 12        | 25        | -1.4                | 3.4                 | 1.96                  | 11.56                 | -4.76                                |
| 16        | 18        | 2.6                 | -3.6                | 6.76                  | 12.96                 | -9.36                                |
| 13        | 23        | -0.4                | 1.4                 | 0.16                  | 1.96                  | -0.56                                |
| 67        | 108       | 0                   | 0                   | 11.2                  | 29.2                  | -12.2                                |

**Return on X**

$$\bar{r}_x = \frac{\sum r_x}{n} = \frac{67}{5} = 13.4\%$$

**Return on Y**

$$\bar{r}_y = \frac{\sum r_y}{n} = \frac{108}{5} = 21.6\%$$

$$\text{Risk, } \sigma_x = \sqrt{\frac{\sum (r_x - \bar{r}_x)^2}{n}} = \sqrt{\frac{11.20}{5}} = \sqrt{2.24} = 1.50$$

$$\sigma_y = \sqrt{\frac{\sum (r_y - \bar{r}_y)^2}{n}} = \sqrt{\frac{29.2}{5}} = \sqrt{5.84} = 2.42$$

**Covariance of X and Y**

$$\text{COV}_{xy} = \frac{\sum [(r_x - \bar{r}_x)(r_y - \bar{r}_y)]}{n} = \frac{-12.2}{5} = -2.44$$

**Coefficient of Correlation**

$$\rho_{xy} = \frac{\text{COV}_{xy}}{\sigma_x \sigma_y} = \frac{-2.44}{1.50 \times 2.42} = \frac{-2.44}{3.63} = -0.67$$

Portfolio is equally weighted and hence,

$$w_x = 50\% \text{ or } 0.5$$

$$w_y = 50\% \text{ or } 0.5$$

**Portfolio Return ( $r_p$ )**

$$\begin{aligned} r_{xy} &= (\bar{r}_x w_x) + (\bar{r}_y w_y) \\ &= (13.4 \times 0.5) + (21.6 \times 0.5) \\ &= 6.7 + 10.8 = 17.5\% \end{aligned}$$

**Portfolio Risk ( $\sigma_p$ )**

$$\begin{aligned}\sigma_{xy} &= \sqrt{\sigma_x^2 W_x^2 + \sigma_y^2 W_y^2 + 2\rho_{xy}\sigma_x\sigma_y W_x W_y} \\ &= \{[(1.5)^2 (0.5)^2] + [(2.42)^2 (0.5)^2] + [2(-0.67)(1.5)(2.42)(0.5)^2]\}^{1/2} \\ &= \sqrt{0.5625 + 1.4641 - 1.2161} = \sqrt{0.8105} = 0.90\%\end{aligned}$$

4. A company manages a stock fund consisting of fund stocks with the following market values and betas.

| Stock | Market value | Beta |
|-------|--------------|------|
| P     | 1,00,000     | 1.10 |
| Q     | 50,000       | 1.20 |
| R     | 75,000       | 0.75 |
| S     | 1,25,000     | 0.80 |
| T     | 1,50,000     | 1.40 |
|       | 5,00,000     |      |

Calculate beta of the portfolio.

Sol :

Calculation of Beta of the Portfolio

| Stock | Market value (Rs.) | Weights ( $W_i$ )                  | $r_i(\%)$ | $w_i \times r_i(\beta_i)$ |
|-------|--------------------|------------------------------------|-----------|---------------------------|
| P     | 1,00,000           | $\frac{1,00,000}{5,00,000} = 0.20$ | 1.10      | 0.2200                    |
| Q     | 50,000             | $\frac{50,000}{5,00,000} = 0.10$   | 1.20      | 0.1200                    |
| R     | 75,000             | $\frac{75,000}{5,00,000} = 0.15$   | 0.75      | 0.1125                    |
| S     | 1,25,000           | $\frac{1,25,000}{5,00,000} = 0.25$ | 0.80      | 0.2000                    |
| T     | 1,50,000           | $\frac{1,50,000}{5,00,000} = 0.30$ | 1.40      | 0.4200                    |
|       | 5,00,000           |                                    |           | 1.0725                    |

$$\begin{aligned}\therefore \beta_p &= \sum_{i=1}^N N_i \beta_i \quad [\because N = 5] \\ &= 1.0725 \times 5 = 5.3625\end{aligned}$$

5. Two securities X and Y have the following data. Returns on X and Y are 17% and 23% respectively. Standard deviations of X and Y are 12% and 18% respectively. Determine minimum risk portfolio with X and Y if the correlation coefficient between their returns is (i) + 1 and (ii) - 0.36. For these minimum risk portfolios what would be the portfolio risk and return ?

Sol :

Return on X,  $R_x = 17\%$

Return on Y,  $R_y = 23\%$

$\sigma_x = 12\%$

$\sigma_y = 18\%$

#### Minimum Risk Portfolio

$$\text{Weight of (X) } W_x = \frac{\sigma_y^2 - \rho_{xy} \cdot \sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2 - 2\rho_{xy} \cdot \sigma_x \cdot \sigma_y}$$

#### (i) When Correlation Coefficient is + 1

i.e.,  $\rho_{xy} = 1$

$$\text{Then, } W_x = \frac{\sigma_y^2 - \sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2 - 2 \cdot \sigma_x \sigma_y}$$

$$\begin{aligned} \therefore W_x &= \frac{(0.18)^2 - (0.12 \times 0.18)}{(0.12)^2 + (0.18)^2 - 2(0.12 \times 0.18)} \\ &= \frac{0.0324 - 0.0216}{0.0144 + 0.0324 - 0.0432} = \frac{0.0108}{0.0036} = 3 \end{aligned}$$

$$W_x = 3$$

$$\text{Weight of (Y) } W_y = 1 - W_x = 1 - 3 = -2$$

#### Portfolio Return

$$\begin{aligned} R_p &= R_x W_x + R_y \cdot W_y \\ &= 0.17 (3) + 0.23 (-2) \\ &= 0.51 - 0.46 \end{aligned}$$

Portfolio return,  $R_p = 0.05$

#### Portfolio Risk

$$\begin{aligned} \sigma_p &= \sqrt{W_x^2 \sigma_x^2 + W_y^2 \sigma_y^2 + 2W_x W_y \rho_{xy} \sigma_x \sigma_y} \\ &= \sqrt{3^2 \times 0.12^2 + (-2)^2 (0.18)^2 + 2 \times 3(-2) \times 1 \times 0.12 \times 0.18} \\ &= \sqrt{(9 \times 0.0144) + 0.1296 - 0.2592} \\ &= \sqrt{0.2592 - 0.2592} \\ \therefore \sigma_p &= 0 \end{aligned}$$

**(ii) When Correlation Coefficient is -0.36**

$$\rho_{xy} = -0.36$$

Weight of X,

$$W_x = \frac{(0.18)^2 - (-0.36 \times 0.12 \times 0.18)}{(0.12)^2 + (0.18)^2 - 2(-0.36 \times 0.12 \times 0.18)}$$

$$= \frac{(0.0324) - (-0.0078)}{0.0144 + 0.0324 - 2(-0.0078)} = \frac{0.0402}{0.0624} = 0.6443$$

$$W_x = 0.6443$$

$$W_y = 1 - W_x = 1 - 0.6443$$

$$\therefore W_y = 0.3557$$

**Portfolio Return**

$$R_p = R_x W_x + R_y W_y = (17 \times 0.6443) + (23 \times 0.3557)$$

$$= 10.9531 + 8.1811 = 19.13\%$$

**Portfolio Risk**

$$\sigma_p = \sqrt{W_x^2 \sigma_x^2 + W_y^2 \sigma_y^2 + 2W_x W_y \text{Cov}_{xy}} = \sqrt{(0.6443)^2 (0.12)^2 + (0.3557)^2 (-0.0077)}$$

$$= \sqrt{0.0059 - 0.00097} = \sqrt{0.00493}$$

$$= 0.07$$

**Working Notes**

$$\rho_{xy} = \frac{\text{Cov}_{xy}}{\sigma_x \sigma_y}$$

$$-0.36 = \frac{\text{Cov}_{xy}}{0.12 \times 0.18}$$

$$\text{Cov}_{xy} = 0.12 \times 0.18 \times (-0.36)$$

$$= 0.0216 \times -0.36 = -0.0077$$

**6. Based on five years of monthly data, you derive the following information for the companies listed.**

| Company        | Intercept | Standard deviation | Rim  |
|----------------|-----------|--------------------|------|
| Intel          | 0.22      | 12.10%             | 0.72 |
| Ford           | 0.10      | 14.60              | 0.33 |
| Anheuser Busch | 0.17      | 7.60               | 0.55 |
| Merck          | 0.05      | 10.20              | 0.60 |
| S & P Co.      | 0.00      | 5.50               | 1.00 |

- (a) Compute the beta coefficient for each stock.
- (b) Assuming risk free rate of 8% and an expected return for the market. Portfolio 15%, Compute the expected (required rate of return) for all the stocks.
- (c) Based on the following estimated return information indicate which stocks are undervalued and overvalued.
- Intel - 20%, Ford - 15%, Anheuser Busch - 19% and Merck - 10%.

Sol :

- (a) Computation of Beta Coefficient for Each Stock

$$\text{Cov}_{i,m} = (r_{i,m}) (\sigma_i) (\sigma_m)$$

$$\beta_i = \frac{\text{Cov}_{i,m}}{\sigma_m^2}; r_{i,m} \text{ is given,}$$

**Intel**

$$\begin{aligned}\text{Cov}_{i,m} &= (0.72) (0.121) (0.055) \\ &= 0.00479\end{aligned}$$

$$\begin{aligned}\text{Beta } (\beta_i) &= \frac{0.00479}{(0.055)^2} = \frac{0.00479}{0.0030} \\ &= 1.597\end{aligned}$$

**Ford**

$$\begin{aligned}\text{Cov}_{i,m} &= (0.33) (0.1460) (0.055) \\ &= 0.00265\end{aligned}$$

$$\begin{aligned}\text{Beta } (\beta_i) &= \frac{0.00265}{(0.055)^2} = \frac{0.00265}{0.0030} \\ &= 0.883\end{aligned}$$

**Anheuser Busch**

$$\begin{aligned}\text{Cov}_{i,m} &= (0.55) (0.0760) (0.055) \\ &= 0.0023\end{aligned}$$

$$\begin{aligned}\text{Beta } (\beta_i) &= \frac{0.0023}{(0.055)^2} = \frac{0.0023}{0.0030} = 0.767\end{aligned}$$

**Merck**

$$\begin{aligned}\text{Cov}_{i,m} &= (0.60) (0.1020) (0.055) \\ &= 0.00337\end{aligned}$$

$$\text{Beta } (\beta_i) = \frac{0.00337}{(0.055)^2}$$

$$= \frac{0.00337}{0.0030}$$

$$= 1.123$$

- (b) Computation of Expected Required Rate of Return for all the stocks given that

Given that,

$$\text{RFR} = 8\%$$

$$R_m = 15\%$$

$$\begin{aligned}E(R_i) &= r_f + \beta_i (r_m - r_f) \\ &= 0.08 + \beta_i (0.15 - 0.08) \\ &= 0.08 + \beta_i (0.07) \\ &= 0.08 + 0.07 \beta_i\end{aligned}$$

**Intel**

$$\begin{aligned}\text{Beta} &= 1.597 \\ E(R_i) &= 0.08 + 0.07(1.597) \\ &= 0.1918 \cong 19.179\%\end{aligned}$$

**Ford**

$$\begin{aligned}\text{Beta} &= 0.883 \\ E(R_i) &= 0.08 + 0.07(0.883) \\ &= 0.1418 \cong 14.18\%\end{aligned}$$

**Merck**

$$\begin{aligned}\text{Beta} &= 1.123 \\ E(R_i) &= 0.08 + 0.07(1.123) \\ &= 0.1586 \cong 15.86\%\end{aligned}$$

- (c) Ascertaining Overvalued and Under-valued Stocks

| Company        | Given | Calculated | Remark      |
|----------------|-------|------------|-------------|
| Intel          | 20%   | 19.18%     | Undervalued |
| Ford           | 15%   | 14.18%     | Undervalued |
| Anheuser Busch | 19%   | 13.37%     | Undervalued |
| Merck          | 10%   | 15.86%     | Overvalued  |

**7. Following data relates to two securities i and j**

| Security | Expected return (%) | Risk in (%) |
|----------|---------------------|-------------|
| i        | 9%                  | 7.56        |
| j        | 8%                  | 3.75        |

If  $\rho(i, j)$  is - 0.5 and the proportion of investment 28% and 72% in i and j securities find out

(a) Return on port folio

(b) Risk on port folio

**Sol/:**

Given

$$\bar{R}_i = 9\% \quad \Sigma_i = 7.56$$

$$\bar{R}_j = 8\% \quad \Sigma_j = 3.75$$

$$\rho(i, j) = -0.5$$

$$W_i = 28\% \text{ or } .028$$

$$W_j = 72\% \text{ or } 0.72$$

**Calculating Return Portfolio**

$$\bar{R}_p = 9(0.28) + 8(0.72)$$

$$= 2.52 + 5.76$$

$$\bar{R}_p = 8.28\%$$

Calculating Risk on Portfolio when coefficient of correlation is given

$$\sigma_p = \sqrt{\sigma_i^2 w_i^2 + \sigma_j^2 w_j^2 + 2\rho(i, j) \sigma_i \sigma_j w_i w_j}$$

$$\sigma_p = \sqrt{(7.56)^2 (0.28)^2 + (3.75)^2 (0.72)^2 + 2(-0.50)(7.56 \times 3.75)(0.28 \times 0.72)}$$

$$\sigma_p = \sqrt{(57.1536)(0.0784) + (14.0625)(0.5184) + 2(-0.50)(28.35)(0.2016)}$$

$$\sigma_p = \sqrt{4.48 + 7.29 + (-1)(5.72)}$$

$$\sigma_p = \sqrt{4.48 + 7.29 - 5.72}$$

$$\sigma_p = \sqrt{11.77 - 5.72}$$

$$\sigma_p = \sqrt{6.05}$$

$$\sigma_p = 2.46\%$$

**8. Calculate return and risk on port folio from the following information**

| Security | Expected Return (%) | Proportion ( %) | Standard deviation |
|----------|---------------------|-----------------|--------------------|
| I        | 10%                 | 20%             | 0.2                |
| II       | 15%                 | 20%             | 0.3                |
| III      | 20%                 | 60%             | 0.5                |

*Sol :*

The coefficient of correlation are as follows :

$$P_{12} = 0.5$$

$$P_{13} = 0.1$$

$$P_{23} = -0.3$$

$$\bar{R}_p = \frac{R}{N} \quad [\text{sum of the proportions} = 1 \text{ i.e., } = N]$$

$$\bar{R}_1 = 10\%$$

$$\bar{R}_2 = 15\%$$

$$\bar{R}_3 = 20\%$$

$$\begin{aligned} \bar{R}_p &= \bar{R}_1 W_1 + \bar{R}_2 W_2 + \bar{R}_3 W_3 \\ &= 10 \times 0.20 + 15 \times 0.20 + 20 \times 0.60 \end{aligned}$$

$$= 2 + 3 + 12$$

$$\bar{R}_p = 17\%$$

**9. Compute Risk on port folio from the following information**

| Securities | Standard deviation | Proportion |
|------------|--------------------|------------|
| A          | 0.2                | 20%        |
| B          | 0.3                | 20%        |
| C          | 0.5                | 60%        |

Co-Variance

$$\text{Cov (AB)} = 0.03$$

$$\text{Cov (AC)} = 0.01$$

$$\text{Cov (BC)} = -0.045$$

Sol :

Calculating Risk on Portfolio ( $\sigma_p$ ). Co-variance is given

$$\sigma_p = \sqrt{\sigma_A^2 w_A^2 + \sigma_B^2 w_B^2 + \sigma_C^2 w_C^2 + 2\text{Cov}(A,B)w_A w_B + 2\text{Cov}(B,C)w_B w_C + 2\text{Cov}(A,C)w_A w_C}$$

$$\sigma_p = \sqrt{(0.2)^2(0.2)^2 + (0.3)^2(0.2)^2 + (0.5)^2(0.6)^2 + 2(0.03 \times 0.2 \times 0.2) + 2(0.01 \times 0.2 \times 0.6) + 2(-0.045 \times 0.2 \times 0.6)}$$

$$\sigma_p = \sqrt{0.04 \times 0.04 + 0.09 \times 0.04 + 0.25 \times 0.36 + 2(0.0012) + 2(0.0012) + 2(-0.0054)}$$

$$\sigma_p = \sqrt{0.0016 + 0.0036 + 0.09 + 0.0024 + 0.0024 - 0.0108}$$

$$\sigma_p = \sqrt{0.1 - 0.0108}$$

$$\sigma_p = \sqrt{0.0892}$$

$$\sigma_p = 0.2987 \text{ (or) } 29.87\%$$

**10. Calculate risk Return of port folio. Using the following data**

| Security           | A   | B   | C   |
|--------------------|-----|-----|-----|
| Expected Return    | 10% | 12% | 8%  |
| Standard deviation | 10% | 15% | 5%  |
| Investment         | 20% | 40% | 40% |

Co – relation Matrix

|   | A | B   | C   |
|---|---|-----|-----|
| A | 1 | 0.3 | 0.5 |
| B | - | 1   | 0.4 |
| C | - | -   | 1   |

Sol :

Given

$$P_{AB} = 0.3$$

$$P_{AB} = 0.5$$

$$P_{AB} = 0.4$$

Calculating Return

$$\bar{R}_p = 10 \times 0.20 + 12 \times (0.40) + 8 (0.40)$$

$$\bar{R}_p = 2 + 4.8 + 3.2$$

$$\bar{R}_p = 10$$

$$\sigma_p = \sqrt{\sigma_A^2 w_A^2 + \sigma_B^2 w_B^2 + \sigma_C^2 w_C^2 + 2.P_{AB}\sigma_A\sigma_B w_A w_B + 2.P_{AC}\sigma_A\sigma_C w_A w_C + 2.P_{BC}\sigma_B\sigma_C w_B w_C}$$

$$\sigma_p = \sqrt{(0.10)^2(0.2)^2 + (0.15)^2(0.40)^2 + (0.05)^2(0.40)^2 + 2(0.3)(0.10)(0.15)(0.20)(0.40) + 2(0.5)(0.10)(0.05)(0.2)(0.4) + 2(0.4)(0.15)(0.05)(0.40)(0.40)}$$

$$\sigma_p = \sqrt{(0.01)(0.04) + (0.0225)(0.16) + (0.0025)(0.16) + 2(0.3)(0.015)(0.018) + 2(0.5)(0.005)(0.08) + 2(0.4)(0.0075)(0.16)}$$

$$\sigma_p = \sqrt{0.01(0.04) + 0.0225(0.16) + 0.0025(0.16) + 0.048 + 0.08 + 0.128}$$

$$\sigma_p = \sqrt{0.0004 + 0.0036 + 0.0004 + 0.266}$$

$$\sigma_p = \sqrt{0.2604}$$

$$\sigma_p = 0.51 \text{ or } 51\%$$

### 2.3 MARKOWITZ PORTFOLIO THEORY

**Q12. What is Markowitz Model ? Explain its assumptions and limitations.**

**Ans :**

Harry Markowitz opened new vistas to modern portfolio selection by publishing an article in the Journal of Finance in March 1952. His publication indicated the importance of correlation among the different stocks' returns in the construction of a stock portfolio. Markowitz also showed that for a given level of expected return in a group of securities, one security dominates the other. To find out this, the knowledge of the correlation coefficients between all possible securities combinations is required.

After the publication of his paper, numerous investment firms and portfolio managers developed "Markowitz algorithms" to minimise portfolio variance i.e. risk. Even today the term Markowitz diversification is used to refer to the portfolio construction accomplished with the help of security covariances.

Markowitz Portfolio Selection Method identifies an investor's unique risk-return preferences, namely utilities.

#### **Assumptions of Markotwiz Model**

The Markowiz model is based on several assumptions regarding investor behavior.

Markowitz theory is based on the modern portfolio theory under several assumptions. The assumptions are :

- a) The market is efficient and all investors have in their knowledge all the facts about the stock market and so an investor can continuously make superior returns.
- b) All investors before making any investments have a common goal. This is the avoidance of risk because they are risk averse.
- c) All investors would like to earn the maximum rate of return that they can achieve from their investments.
- d) The investors base their decisions on the expected rate of return of an investment.
- e) Markowitz brought out the theory that it was a useful insight to find out how the security returns are correlated to each other. By combining the assets in such a way that they give the lowest risk, maximum returns could be brought out by the investor.

- f) Every investor assumes that while making an investment, he will combine his investments in such a way that he gets a maximum return and is surrounded by minimum risk.
- g) The investor assumes that greater or larger the return that he achieves on his investments, the higher the risk factor that surrounds him. On the contrary, when risks are low, the return can also be expected to be low.
- h) The investor can reduce his risk if he adds investments to his portfolio.

### Limitations

The Markowitz model makes a systematic and rational attempt to establish a relationship between risk and return. It helps in determining the efficient portfolio. However, it suffers from several weaknesses as follows :

- (i) It requires large amount of input data. An investor must obtain estimates of return, variances of return and covariances of returns for each pair of securities included in the portfolio. For example, if there are N number of securities in the portfolio, then N estimates of return, N estimates of variances and  $(N^2 - N)/2$  estimates of covariances are required. In other words, for a N-security case, total input required is  $(N^2 + 3N)/2$ . So, for a portfolio of 100 securities, total estimates required are  $[100 + 100 + 100(100 - 1)/2] = 5,150$ . For 200 securities, the estimates required are 20,300 and for 500 securities, the estimates required are 1,25,750.
- (ii) In the Markowitz Model, complex and numerous computations are required. The reason being that from a given set of securities, a large number, or sometimes an infinite number, of portfolios can be constructed. The expected return and variance of returns for each of the portfolios will have to be computed.

So far, only risky securities have been considered for portfolio formation. However, it is also possible to include risk-free securities in a portfolio. A risk-free security gives a guaranteed return, and there is no fluctuation in income and no risk of default. The government securities are generally considered as risk-free securities. Introduction of risk free securities is a significant step in the development of Capital Market Theory. Investors invest partly in risk-free securities and partly in risky portfolio as per Markowitz Model. It allows Markowitz model to be extended in such a way that the efficient frontier is totally changed.

### 2.3.1 Mean Variance Approach

#### Q13. Discuss in detail about Mean Variance Approach.

Ans :

In 1952, Markowitz introduced mean variance analysis which is essential for both finance researchers and practitioners, theory enables to solve the problems relating to optimal portfolio selection.

Mean variance analysis is the process of weighing risk which is referred as variance against expected return. It helps the investors in making decisions relating to financial instruments in which they invest depending on level of risk and rewards. It also enables the investors to determine maximum reward at given level of risk or minimum risk at given level of return.

Mean variance analysis constitutes a part of modern portfolio theory which believes that if investors possess complete information then they will make rational decisions relating to investments. Mean variance analysis involves two important parts i.e., variance and expected return. Variance refers to spreading of returns of a specific security on daily or weekly basis. The expected return is a probability which expresses the estimated return of investment in the security. If two securities have same expected return but variance is less for one security then security with less variance must be selected. In the same way, if securities have same variance but different return then security with higher return must be selected. In modern portfolio theory, an investor will be choosing different securities to make investments in different levels of variance and expected return.

## 2.4 PORTFOLIO SELECTION

### 2.4.1 Efficient Portfolios

**Q14. Explain briefly about Portfolio Selection. Write about feasible set-of portfolio and efficient set-of portfolio?**

**Ans :**

#### Approach

The objective of every rational investor is to maximise his returns and minimise the risk. Diversification is the method adopted for reducing risk. It essentially results in the construction of portfolios. The proper goal of portfolio construction would be to generate a portfolio that provides the highest return and the lowest risk. Such a portfolio would be known as the optimal portfolio. The process of finding the optimal portfolio is described as portfolio selection.

The conceptual framework and analytical tools for determining the optimal portfolio in disciplined and objective manner have been provided by Harry Markowitz in his pioneering work on portfolio analysis described in his 1952 *Journal of Finance* article and subsequent book in 1959. His method of portfolio selection has come to be known as the Markowitz model. In fact, Markowitz's work marks the beginning of what is known today as modern portfolio theory.

#### Feasible Set of Portfolios

With a limited number of securities an investor can create a very large number of portfolios by combining these securities in different proportions. These constitute the feasible set of portfolios in which the investor can possibly invest. This is also known as the portfolio opportunity set.

Each portfolio in the opportunity set is characterised by an expected return and a measure of risk, viz., variance or standard deviation of returns. Not every portfolio in the portfolio opportunity set is of interest to an investor. In the opportunity set some portfolios will obviously be dominated by others. A portfolio will dominate another if it has either a lower standard deviation and the same expected return as the other, or a higher expected return and the same standard deviation as the other.

Portfolios that are dominated by other portfolios are known as inefficient portfolios. An investor would not be interested in all the portfolios in the opportunity set. He would be interested only in the efficient portfolios.

#### Efficient Set of Portfolios

To understand the concept of efficient portfolios, let us consider various combinations of securities and designate them as portfolios 1 to n. The expected returns of these portfolios may be worked out. The risk of these portfolios may be estimated by measuring the standard deviation of portfolio returns. The table below shows illustrative figures for the expected returns and standard deviations of some portfolios.

| Portfolio Number | Expected return (per cent) | Standard deviation (Risk) |
|------------------|----------------------------|---------------------------|
| 1                | 5.6                        | 4.5                       |
| 2                | 7.8                        | 5.8                       |
| 3                | 9.2                        | 7.6                       |
| 4                | 10.5                       | 8.1                       |
| 5                | 11.7                       | 8.1                       |
| 6                | 12.4                       | 9.3                       |
| 7                | 13.5                       | 9.5                       |
| 8                | 13.5                       | 11.3                      |
| 9                | 15.7                       | 12.7                      |
| 10               | 16.8                       | 12.9                      |

If we compare portfolio nos. 4 and 5, for the same standard deviation of 8.1 portfolio no. 5 gives a higher expected return of 11.7, making it more efficient than portfolio no. 4. Again, if we compare portfolio nos. 7 and 8, for the same expected return of 13.5 per cent, the standard deviation is lower for portfolio no. 7, making it more efficient than portfolio no. 8. Thus, the selection of portfolios by the investor will be guided by two criteria:

1. Given two portfolios with the same expected return, the investor would prefer the one with the lower risk.
2. Given two portfolios with the same risk, the investor would prefer the one with the higher expected return.

These criteria are based on the assumption that investors are rational and also risk-averse. As they are rational they would prefer more return to less return. As they are risk-averse, they would prefer less risk to more risk.

The concept of efficient sets can be illustrated with the help of a graph. The expected return and standard deviation of portfolios can be depicted on an XY graph, measuring the expected return on the Y axis and the standard deviation on the X axis. Figure depicts such a graph.

As each possible portfolio in the opportunity set or feasible set of portfolios has an expected return and standard deviation associated with it, each portfolio would be represented by a single point in the risk-return space enclosed within the two axes of the graph. The shaded area in the graph represents the set of all possible portfolios that can be constructed from a given set of securities. This opportunity set of portfolios takes a concave shape because it consists of portfolios containing securities that are less than perfectly correlated with each other.

Let us closely examine the diagram in Figure. Consider portfolios F and E. Both the portfolios have the same expected return but portfolio E has less risk. Hence, portfolio E would be preferred to portfolio F. Now consider portfolios C and E. Both have the same risk, but portfolio E offers more return for the same risk. Hence, portfolio E would be preferred to portfolio C. Thus, for any point in the risk-return space, an investor would like to move as far as possible in the direction of increasing returns and also as far as possible in the direction of decreasing risk. Effectively, he would be moving towards the left in search of decreasing risk and upwards in search of increasing returns.

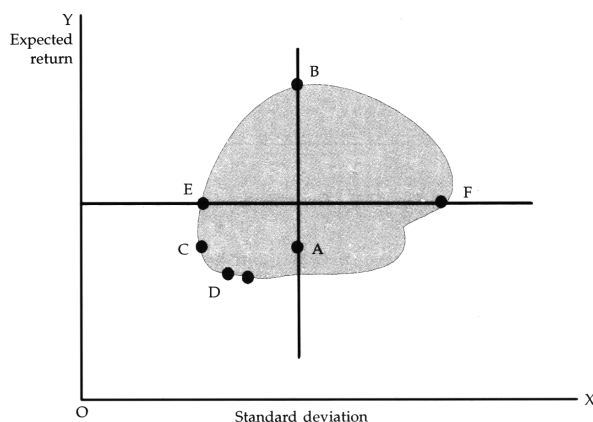


**Fig.: Feasible set of portfolios**

Let us consider portfolios C and A. Portfolio C would be preferred to portfolio A because it offers less risk for the same level of return. In the opportunity set of portfolios represented in the diagram, portfolio C has the lowest risk compared to all other portfolios. Here portfolio C in this diagram represents the global minimum variance portfolio.

Comparing portfolios A and B, we find that portfolio B is preferable to portfolio A because it offers higher return for the same level of risk. In this diagram, point B represents the portfolio with the highest expected return among all the portfolios in the feasible set.

Thus, we find that portfolios lying in the north west boundary of the shaded area are more efficient than all the portfolios in the interior of the shaded area. This boundary of the shaded area is called the Efficient Frontier because it contains all the efficient portfolios in the opportunity set. The set of portfolios lying between the global minimum variance portfolio and the maximum return portfolio on the efficient frontier represents the efficient set of portfolios. The efficient frontier is shown separately in Figure.

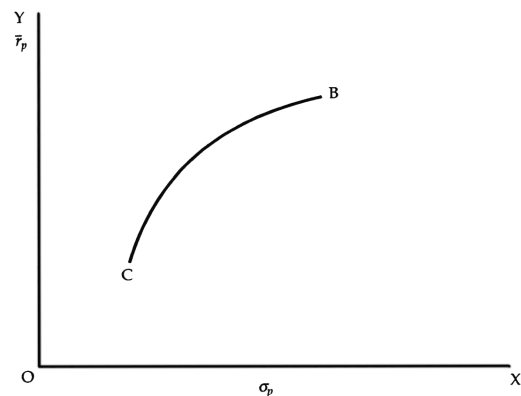


**Fig.: The Efficient Frontier**

The efficient frontier is a concave curve in the risk-return space that extends from the minimum variance portfolio to the maximum return portfolio.

#### **Q15. Write about Selection of Optimal Portfolio.**

**Ans :**

The portfolio selection problem is really the process of delineating the efficient portfolios and then selecting the best portfolio from the set.

Rational investors will obviously prefer to invest in the efficient portfolios. The particular portfolio that an individual investor will select from the efficient frontier will depend on that investor's degree of aversion to risk. A highly risk averse investor will hold a portfolio on the lower left hand segment of the efficient frontier, while an investor who is not too risk averse will hold one on the upper portion of the efficient frontier.

The selection of the optimal portfolio thus depends on the investor's risk aversion, or conversely on his risk tolerance. This can be graphically represented through a series of risk return utility curves or indifference curves. The indifference curves of an investor are shown in Figure. Each curve represents different combinations of risk and return all of which are equally satisfactory to the concerned investor. The investor is indifferent between the successive points in the curve. Each successive curve moving upwards to the left represents a higher level of satisfaction or utility. The investor's goal would be to maximise his utility by moving upto the higher utility curve. The optimal portfolio for an investor would be the one at the point of tangency between the efficient frontier and his risk-return utility or indifference curve.

This is shown in Figure. The point O' represents the optimal portfolio.

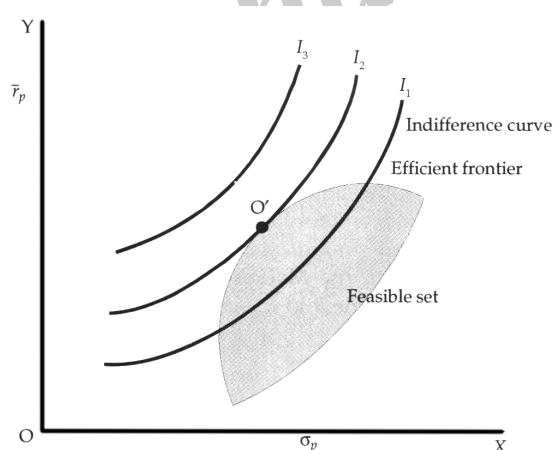


**Fig.: Optimal Portfolio**

Markowitz used the technique of quadratic programming to identify the efficient portfolios. Using the expected return and risk of each security under consideration and the covariance estimates for each pair of securities, he calculated risk and

return for all possible portfolios. Then, for any specific value of expected portfolio return, he determined the least risk portfolio using quadratic programming. With another value of expected portfolio return, a similar procedure again gives the minimum risk portfolio. The process is repeated with different values of expected return, the resulting minimum risk portfolios constitute the set of efficient portfolios.

The selection of a portfolio depends on the objectives of the investor. These are discussed below:

### 1. Objectives and Asset Mix

If the main goal is ensuring adequate current income, then 60 per cent of the investment is on debt instruments and 40 per cent on equities. The proportions of investments in debt and equities will differ according to the individual's preferences. Money will be invested in short-term debt and fixed-income securities. Here, the growth of income becomes the secondary objective and stability of the principal amount ranks third even within the debt portfolio, the amount of funds invested in short-term bonds depends on the need for stability of the principal amount in comparison to the stability of income. If appreciation of capital is given third priority, the investor will opt for long-term debt instead of short-term debt. The maturity period may not be a constraint.

### 2. Growth of Income and Asset Mix

Here, the investor looks for a certain percentage of growth in income from his investment. The investor's portfolio may consist of 60-100 per cent equities and 0-40 per cent debt instruments. The debt portion of the portfolio may consist of investments entitled to tax exemptions. Appreciation of the principal amount is given third priority. For example, computer software, hardware, and non-conventional energy producing companies' shares provide adequate prospects of growth in dividend.

### 3. Capital Appreciation and Asset Mix

Capital appreciation means that the value of the original investment increases over the years. Investment in real estate may provide

a faster rate of capital appreciation, but it lacks liquidity. In the capital market, values of shares are much higher than their original issue prices. For example, Green Computers' share value was `306 in April 2002, but in October 2012, the value was ,658. Several such examples can be cited. The market capitalization also increased. Next to real assets, the stock markets offer the best opportunity for capital appreciation. If the investor's goal is capital appreciation, 90-100 per cent of his portfolio should consist of equities and 0-10 per cent of debt. The growth in income becomes the secondary objective.

#### 4. Safety of the Principal and Asset Mix

Usually, risk-averse investors are highly particular about the stability of the principal. According to the life cycle theory, people in the third stage of life give more weight to the safety of principal. All investors have this objective. No one wants to lose his money invested in different assets. The investor's portfolio may comprise more debt instruments, and within the debt portfolio, there would be more of short-term debts.

#### 5. Risk and Return Analysis

The traditional approach to portfolio building is based on some basic assumptions. First, an individual prefers larger to smaller returns from securities. An investor has to take risks to achieve this goal. The ability to achieve high returns depends on his ability to assess risks and take risks. These risks are interest rate risk, purchasing power risk, financial risk and market risk.

The investor analyses the varying degrees of risk and constructs his portfolio. At first, he establishes the minimum income that he must have to avoid hardships under the most adverse economic condition and then decides what loss of income can be tolerated. The investor makes a series of compromises on risk and no-risk factors such as taxation and marketability after assessing and minimizing the main risks.

#### 6. Diversification

Once the asset mix is determined, and the risks and returns are analysed, the final step is the diversification of the portfolio. Financial risks can be minimized by commitments to top-quality bonds, but these securities offer limited resistance to inflation. Stocks provide more inflation protection than bonds but are more vulnerable to financial risks. Good quality convertibles may balance financial risk and purchasing power risk. The portfolio is diversified according to the investor's need for income and his risk tolerance level. In the bond portfolio, the investor has to strike a balance between short-term and long-term bonds. Short-term fixed-income securities mean more income risk while long-term fixed-income securities mean more risk with regard to the principal.

### 2.5 SINGLE INDEX MODEL

**Q16. Discuss briefly about sharpe's single index model.**

**Ans :**

The basic notion underlying the single index model is that all stocks are affected by governments in the stock market. Casual observation of share prices reveals that when the market moves up (as measured by any of the widely used stock market indices), prices of most shares tend to increase. When the market goes down, the prices of most shares tend to decline. This suggests that one reason why security returns might be correlated and there is co-movement between securities, is because of a common response to market changes. This co-movement of stocks with a market index may be studied with the help of a simple linear regression analysis, taking the returns on an individual security as the dependent variable ( $R_i$ ) and the returns on the market index ( $R_m$ ) as the independent variable.

The return of an individual security is assumed to depend on the return on the market index. The return of an individual security may be expressed as:

$$R_i = \alpha_j + \beta_j R_m + e_i$$

where

$\alpha_i$  = Component of security i's return that is independent of the market's performance.

$R_m$  = Rate of return on the market index.

$\beta_i$  = Constant that measures the expected change in R, given a change in  $R_m$ .

$e_i$  = Error term representing the random or residual return.

This equation breaks the return on a stock into two components, one part due to the market and the other part independent of the market. The beta parameter in the equation,  $\beta_i$ , measures how sensitive a stock's return is to the return on the market index. It indicates how extensively the return of a security will vary with changes in the market return.

### Measuring Security Return and Risk under Single Index Model

Using the single index model, expected return of an individual security may be expressed as:

$$\bar{R}_i = \alpha_i + \beta_i \bar{R}_m$$

The return of the security is a combination of two components: (a) a specific return component represented by the alpha of the security; and (b) a market related return component represented by the term  $\beta_i \bar{R}_m$ . The residual return disappears from the expression because its average value is zero, i.e. it has an expected value of zero.

Correspondingly, the risk of a security becomes the sum of a market related component and a component that is specific to the security. Thus,

Total risk = Market related risk + Specific risk

$$\sigma_i^2 = \beta_i^2 \sigma_m^2 + \sigma_{ei}^2$$

where

$\sigma_i^2$  = Variance of individual security.

$\sigma_m^2$  = Variance of market index returns.

$\sigma_{ei}^2$  = Variance of residual returns of individual security.

$\beta_i$  = Beta coefficient of individual security.

The market related component of risk is referred to as systematic risk as it affects all securities. The specific risk component is the unique risk or unsystematic risk which can be reduced through diversification. It is also called diversifiable risk.

### PROBLEMS ON SHARPE'S INDEX MODEL

11. An investor owns a portfolio composed of five securities with the following characteristics:

| Security | Beta | Random error term<br>standard deviation (per cent) | Proportion |
|----------|------|----------------------------------------------------|------------|
| 1        | 1.35 | 5                                                  | 0.10       |
| 2        | 1.05 | 9                                                  | 0.20       |
| 3        | 0.80 | 4                                                  | 0.15       |
| 4        | 1.50 | 12                                                 | 0.30       |
| 5        | 1.12 | 8                                                  | 0.25       |

If the standard deviation of the market index is 20 per cent, what is the total risk of the portfolio?

**Sol :**

The total portfolio risk may be expressed as:

$$\sigma_i^2 = \beta_p^2 \sigma_m^2 + \sum_{i=1}^n w_i^2 \sigma_{ei}^2$$

where

$\beta_p$  = Portfolio beta.

$\sigma_m^2$  = Variance of the market index.

$W_i$  = Proportion of investment in each security.

$\sigma_{ei}^2$  = Residual variance (random error) of individual securities.

$\beta_p$  or portfolio beta has to be calculated using the formula.

$$\begin{aligned} \beta_p &= \sum_{i=1}^n w_i \beta_i \\ &= (0.1) (1.35) + (0.2) (1.05) + (0.15) (0.80) + (0.3) (1.5) + (0.25) (1.12) \\ &= 1.195 \end{aligned}$$

Portfolio residual variance  $\left( \sum_{i=1}^n w_i^2 \sigma_{ei}^2 \right)$  can be calculated as:

$$= (0.1)^2(5)^2 + (0.2)^2(9)^2 + (0.15)^2(4)^2 + (0.30)^2(12)^2 + (0.25)^2(8)^2 = 20.81$$

Portfolio total risk can now be calculated as:

$$\begin{aligned} \sigma_p^2 &= \beta_p^2 \sigma_m^2 + \sum_{i=1}^n w_i^2 \sigma_{ei}^2 \\ &= (1.195)^2(20)^2 + 20.81 \\ &= 571.21 + 20.81 = 592.02 \end{aligned}$$

- 12. Consider a portfolio composed of five securities. All the securities have a beta of 1.0 and unique or specific risk (standard deviation) of 25 per cent. The portfolio distributes weight equally among its component securities. If the standard deviation of the market index is 18 per cent, calculate the total risk of the portfolio.**

**Sol :**

The input data may be arranged in the form of the following table:

| Security | Beta | Specific risk<br>(Standard deviation) | Proportion |
|----------|------|---------------------------------------|------------|
| 1        | 1.0  | 25                                    | 0.2        |
| 2        | 1.0  | 25                                    | 0.2        |
| 3        | 1.0  | 25                                    | 0.2        |
| 4        | 1.0  | 25                                    | 0.2        |
| 5        | 1.0  | 25                                    | 0.2        |

Standard deviation of market index is 18 per cent.

$$\beta_p = \sum_{i=1}^n w_i \beta_i = (0.2 \times 1.0) \times 5 = 1.0$$

$$\text{Portfolio residual variance} = \sum_{i=1}^n w_i^2 \beta_{ei}^2 = (0.2)^2 (25)^2 \times 5 = 125$$

Portfolio total risk

$$\begin{aligned} \sigma_p^2 &= \beta_p^2 \sigma_m^2 + \sum_{i=1}^n w_i^2 \sigma_{ei}^2 = (1.195)^2 (20)^2 + 20.81 \\ &= 571.21 + 20.81 = 592.02 \end{aligned}$$

- 13. How many parameters must be estimated to analyses the risk-return profile of a 50-stock portfolio using (a) the original Markowitz model, and (b) the Sharpe single index model?**

*Sol :*

In Markowitz model we require the following estimates:

N return estimates

N variance estimates

N (N-1)/2 covariance estimates

$$\begin{aligned} \text{Total estimates} &= 2N + [N(N-1)/2] \\ &= (2 \times 50) + [50(50-1)/2] \\ &= 100 + 1225 = 1325 \end{aligned}$$

In the Sharpe single index model we must have N a estimates N p estimates

N residual variance estimates.

Market return,  $R_m$

Variance of market return,  $\sigma_m^2$

$$\text{Total estimates} = 3N + 2 = (3 \times 50) + 2 = 152$$

**14.**

| Security | Weighting | $\alpha_i$ | $\beta_i$ | Residual variance ( $\sigma_{ei}^2$ ) |
|----------|-----------|------------|-----------|---------------------------------------|
| 1        | 0.2       | 2.0        | 1.2       | 320                                   |
| 2        | 0.3       | 1.7        | 0.8       | 450                                   |
| 3        | 0.1       | -0.8       | 1.6       | 270                                   |
| 4        | 0.4       | 1.2        | 1.3       | 180                                   |

**Calculate the return and risk of the portfolio under single index model, if the return on market index is 16.4 per cent and the standard deviation of return on market index is 14 per cent.**

Sol :

1. Portfolio return under single index model is calculated using the formula:

$$R_p = \alpha_p + \beta_p R_m$$

For applying this formula,  $\alpha_p$  and  $\beta_p$  have to be calculated as:

$$\begin{aligned}\alpha_p &= \sum_{i=1}^n \omega_i \alpha_i \\ &= (0.2)(2.0) + (0.3)(1.7) + (0.1)(-0.8) + (0.4)(1.2) \\ &= 1.31\end{aligned}$$

$$\begin{aligned}\beta_p &= \sum_{i=1}^n \omega_i \beta_i \\ &= (0.2)(1.2) + (0.3)(0.8) + (0.1)(1.6) + (0.4)(1.3) \\ &= 1.16\end{aligned}$$

$$\begin{aligned}R_p &= \alpha_p + \beta_p R_m \\ &= 1.31 + (1.16)(16.4) \\ &= 1.31 + 19.024 \\ &= 20.334\end{aligned}$$

2. Portfolio risk under single index model is calculated as:

$$\sigma_p^2 = \beta_p^2 \sigma_m^2 + \sum_{i=1}^n w_i^2 \sigma_{ei}^2$$

For applying this, portfolio residual variance needs to be calculated as:

$$\sum_{i=1}^n w_i^2 \sigma_{ei}^2$$

Thus,

$$\begin{aligned}&(0.2)^2 (320) + (0.3)^2 (450) + (0.1)^2 (270) + (0.4)^2 (180) \\ &= 12.8 + 40.5 + 2.7 + 28.8 \\ &= 84.8\end{aligned}$$

Now,

$$\begin{aligned}\sigma_p^2 &= \beta_p^2 \sigma_m^2 + \sum_{i=1}^n w_i^2 \sigma_{ei}^2 \\ &= (1.16)^2 (14)^2 + 84.8 \\ &= 263.74 + 84.8 = 348.54\end{aligned}$$

Hence,

$$\sigma_p = \sqrt{348.54} = 18.67$$

15. The data for three stocks are given. The data are obtained from correlating returns on these stocks with the returns on the market index.

| Stock | $a_i$ | $P_i$ | Residual Variance (Per cent) ( $\sigma_{ei}^2$ ) |
|-------|-------|-------|--------------------------------------------------|
| 1     | -2.1  | 1.6   | 14                                               |
| 2     | 1.8   | 0.4   | 8                                                |
| 3     | 1.2   | 1.3   | 18                                               |

Which single stock would an investor prefer to own from a risk-return view point if the market index were expected to have a return of 15 per cent and a variance of return of 20 per cent?

Sol :

Here we have to calculate the expected return and risk of each security under the single index model.

#### Expected return

$$\bar{R}_i = \alpha_i + \beta_i R_m$$

$$\text{Security 1} = -2.1 + (1.6)(15) = -2.1 + 24 = 21.9$$

$$\text{Security 2} = 1.8 + (0.4)(15) = 1.8 + 6 = 7.8$$

$$\text{Security 3} = 1.2 + (1.3)(15) = 1.2 + 19.5 = 20.7$$

Security risk

$$\sigma_i^2 = \beta_i^2 \sigma_m^2 + \sigma_{ei}^2$$

$$\text{Security 1} = (1.6)^2 (20) + 14 = 51.2 + 14 = 65.2$$

$$\text{Security 2} = (0.4)^2 (20) + 8 = 3.2 + 8 = 11.2$$

$$\text{Security 3} = (1.3)^2 (20) + 18 = 33.8 + 18 = 51.8$$

Now we can calculate the ratio of return to risk to assess the return per unit of risk.

$$\text{Security 1} = \frac{21.9}{65.2} = 0.34$$

$$\text{Security 2} = \frac{7.8}{11.2} = 0.70$$

$$\text{Security 3} = \frac{20.7}{51.8} = 0.40$$

The investor would prefer 'security 2' as it provides the highest return per unit of risk.

## 2.6 CAPITAL ASSET PRICING MODEL

**Q17. Define Capital Asset Pricing Model. Explain its assumptions.**

**Ans :**

The CAPM was developed to explain how risky securities are priced in market and this was attributed to experts like Sharpe and Linter. Markowitz theory being more theoretical, CAPM aims at a more practical approach to stock valuation. It is no doubt based on the mean-variance approach to risk for assessment of investment as developed by Markowitz. It explains the behavioral pattern of investors in building up portfolios. It is based on economic model. It aims the investor at maximizing the utility of wealth.

The capital asset pricing model is a relationship explaining how assets should be priced in the capital markets. It reveals the relationship between the expected return, unavoidable risk and the valuation of securities. The unavoidable risk means, the risk which cannot be avoided by diversification. If a security does not provide adequate returns, then the security will not favour the investor. The CAPM is built upon the Markowitz Portfolio Model and capital market line.

### Assumptions of the CAPM

The capital asset pricing model is based on certain explicit assumptions regarding the behaviour of investors. The assumptions are listed below:

1. Investors make their investment decisions on the basis of risk-return assessments measured in terms of expected returns and standard deviation of returns.
2. The purchase or sale of a security can be undertaken in infinitely divisible units.
3. Purchases and sales by a single investor cannot affect prices. This means that there is perfect competition where investors in total determine prices by their actions.
4. There are no transaction costs. Given the fact that transaction costs are small, they are probably of minor importance in investment decision-making, and hence they are ignored.

5. There are no personal income taxes. Alternatively, the tax rates on dividend income and capital gains are the same, thereby making the investor indifferent to the form in which the return on the investment is received (dividends or capital gains).
6. The investor can lend or borrow any amount of funds desired at a rate of interest equal to the rate for riskless securities.
7. The investor can sell short any amount of any shares.
8. Investors share homogeneity of expectations. This implies that investors have identical expectations with regard to the decision period and decision inputs. Investors are presumed to have identical holding periods and also identical expectations regarding expected returns, variances of expected returns and covariances of all pairs of securities.

It is true that many of the above assumptions are untenable. However, they do not materially alter the real world. Moreover, the model describes the risk return relationship and the pricing of assets fairly well.

**Q18. Explain briefly about Efficient Frontier with Riskless Lending and Borrowing.**

**Ans :**

The portfolio theory deals with portfolios of risky assets. According to the theory, an investor faces an efficient frontier containing the set of efficient portfolios of risky assets.

Now it is assumed that there exists a riskless asset available for investment. A riskless asset is one whose return is certain such as a government security. Since the return is certain, the variability of return or risk is zero. The investor can invest a portion of his funds in the riskless asset which would be equivalent to lending at the risk free asset's rate of return, namely  $R_f$ . He would then be investing in a combination of risk free asset and risky assets.

Similarly, it may be assumed that an investor may borrow at the same risk free rate for the purpose of investing in a portfolio of risky assets. He would then be using his own funds as well as some borrowed funds for investment.

The efficient frontier arising from a feasible set of portfolios of risky assets is concave in shape. When an investor is assumed to use riskless lending and borrowing in his investment activity the shape of the efficient frontier transforms into a straight line. Let us see how this happens.

Consider Figure The concave curve ABC represents an efficient frontier of risky portfolios. B is the optimal portfolio in the efficient frontier with  $R_p = 15$  per cent and  $\sigma_p = 8$  per cent. A risk free asset with rate of return  $R_f = 7$  per cent is available for investment. The risk or standard deviation of this asset would be zero because it is a riskless asset. Hence, it would be plotted on the Y axis. The investor may lend a part of his money at the riskless rate, i.e. invest in the risk free asset and invest the remaining portion of his funds in a risky portfolio.

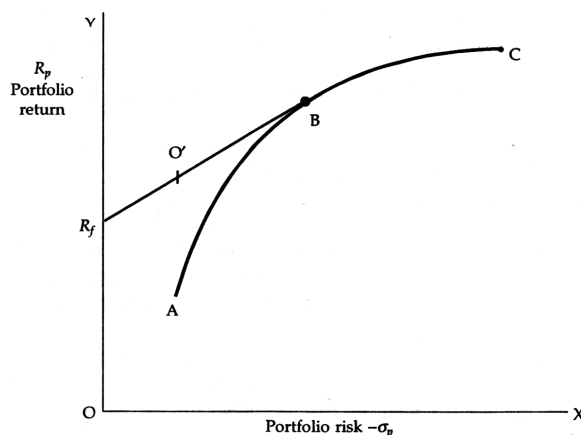


**Fig.: Efficient Frontier with Introduction of Lending**

If an investor places 40 per cent of his funds in the riskfree asset and the remaining 60 per cent in portfolio B, the return and risk of this combined portfolio O' may be calculated using the following formulas.

#### Return

$$R_c = \omega R_m + (1 - \omega) R_f$$

where

$R_c$  = Expected return on the combined portfolio.

$\omega$  = Proportion of funds invested in risky portfolio.

$(1 - \omega)$  = Proportion of funds invested in riskless asset.

$R_m$  = Expected return on risky portfolio.

$R_f$  = Rate of return on riskless asset.

#### Risk

$$\sigma_c = \omega \sigma_m + (1 - \omega) \sigma_f$$

where

$\sigma_c$  = Standard deviation of the combined portfolio.

$\omega$  = Proportion of funds invested in risky portfolio.

$\sigma_m$  = Standard deviation of risky portfolio.

$\sigma_f$  = Standard deviation of riskless asset.

The second term on the right hand side of the equation,  $(1 - \omega) \sigma_f$  would be zero as  $\sigma_f =$  zero. Hence, the formula may be reduced as

$$\sigma_c = \omega \sigma_m$$

The return and risk of the combined portfolio in our illustration is worked out below:

$$\begin{aligned} R_c &= (0.60)(15) + (0.40)(7) \\ &= 11.8 \text{ per cent} \end{aligned}$$

$$\sigma_c = (0.60)(8) = 4.8 \text{ per cent}$$

Both return and risk are lower than those of the risky portfolio B.

If we change the proportion of investment in the risky portfolio to 75 per cent, the return and risk of the combined portfolio may be calculated as shown below:

$$\begin{aligned} R_c &= (0.75)(15) + (0.25)(7) \\ &= 13 \text{ per cent} \end{aligned}$$

$$\sigma_c = (0.75)(8) = 6 \text{ per cent}$$

Here again, both return and risk are lower than those of the risky portfolio B.

Similarly, the return and risk of all possible combinations of the riskless asset and the risky portfolio B may be worked out. All these points will lie in the straight line from  $R_f$  to B in Figure.

Now, let us consider borrowing funds by the investor for investing in the risky portfolio an amount which is larger than his own funds.

If  $\omega$  is the proportion of investor's funds invested in the risky portfolio, then we can envisage three situations. If  $\omega = 1$ , the investor's funds are fully committed to the risky portfolio. If  $\omega < 1$ , only a fraction of the funds is invested in the risky portfolio and the remainder is lent at the risk free rate. If  $\omega > 1$ , it means the investor is borrowing at the risk free rate and investing an amount larger than his own funds in the risky portfolio.

The return and risk of such a levered portfolio can be calculated as follows:

$$R_L = \omega R_m - (\omega - 1) R_f$$

where

$R_L$  = Return on the levered portfolio.

$\omega$  = Proportion of investor's funds invested in the risky portfolio.

$R_m$  = Return on the risky portfolio.

$R_f$  = The risk free borrowing rate which would be the same as the risk free lending rate, namely the return on the riskless asset.

The first term of the equation represents the gross return earned by investing the borrowed funds as well as investor's own funds in the risky portfolio. The second term of the equation represents the cost of borrowing funds which is deducted from the gross returns to obtain the net return on the levered portfolio. The risk of the levered portfolio can be calculated as:

$$\sigma_L = \omega \sigma_m$$

The return and risk of the investor in our illustration may be calculated assuming  $\omega = 1.25$

$$R_L = (1.25)(15) - (0.25)(7)$$

$$= 17 \text{ per cent}$$

$$\sigma_L = (1.25)(8)$$

$$= 10 \text{ per cent}$$

The return and risk of the levered portfolio are larger than those of the risky portfolio. The levered portfolio would give increased returns with increased risk. The return and risk of all levered portfolios would lie in a straight line to the right of the risky portfolio B. This is depicted in Figure.

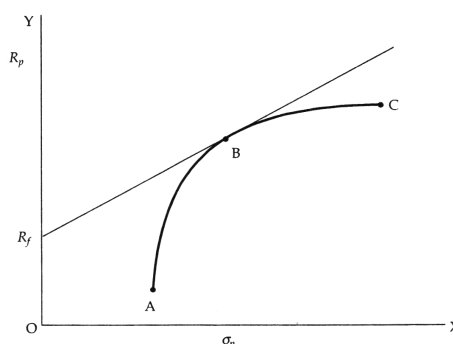


**Fig.: Efficient Frontier with Borrowing and Lending**

Thus, the introduction of borrowing and lending gives us an efficient frontier that is a straight line throughout. This line sets out all the alternative combinations of the risky portfolio B with risk free borrowing and lending.

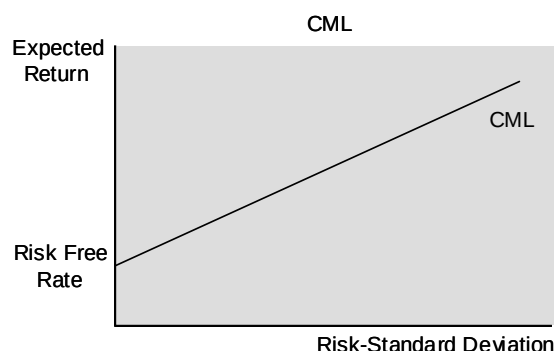
The line segment from  $R_f$  to B includes all the combinations of the risky portfolio and the risk free asset. The line segment beyond point B represents all the levered portfolios (that is combinations of the risky portfolio with borrowing). Borrowing increases both the expected return and the risk, while lending (that is, combining the risky portfolio with risk free asset) reduces the expected return and risk. Thus, the investor can use borrowing or lending to attain the desired risk level. Those investors with a high risk aversion will prefer to lend and thus, hold a combination of risky assets and the risk free asset. Others with less risk aversion will borrow and invest more in the risky portfolio.

#### **Q19. Explain briefly about the Capital Market Line.**

**Ans :**

As seen previously, adjusting for the risk of an asset using the risk-free rate, an investor can easily alter his risk profile. Keeping that in mind, in the context of the capital market line (CML), the market portfolio consists of the combination of all risky assets and the risk-free asset, using market value of the assets to determine the weights. The CML line is derived by the CAPM, solving for expected return at various levels of risk.

Markowitz' idea of the efficient frontier, however, did not take into account the risk-free asset. The CML does and, as such, the frontier is extended to the risk-free rate as illustrated below:



### Systematic and Unsystematic Risk

Total risk to a stock not only is a function of the risk inherent within the stock itself, but is also a function of the risk in the overall market. Systematic risk is the risk associated with the market. When analyzing the risk of an investment, the systematic risk is the risk that cannot be diversified away.

Unsystematic risk is the risk inherent to a stock. This risk is the aspect of total risk that can be diversified away when building a portfolio.

**Formula :** Total risk = Systematic risk + Unsystematic risk

When building a portfolio, a key concept is to gain the greatest return with the least amount of risk. However, it is important to note, that additional return is not guaranteed for an increased level of risk. With risk, reward can come, but losses can be magnified as well.

### Q20. Explain briefly about the Security Market Line (SML).

**Ans :**

The security market line (SML) is the line that reflects an investment's risk versus its return, or the return on a given investment in relation to risk. The measure of risk used for the security market line is beta.

The line begins with the risk-free rate (with zero risk) and moves upward and to the right. As the risk of an investment increases, it is expected that the return on an investment would increase. An investor with a low risk profile would choose an investment at the beginning of the security market line. An investor with a higher risk profile would thus choose an investment higher along the security market line.

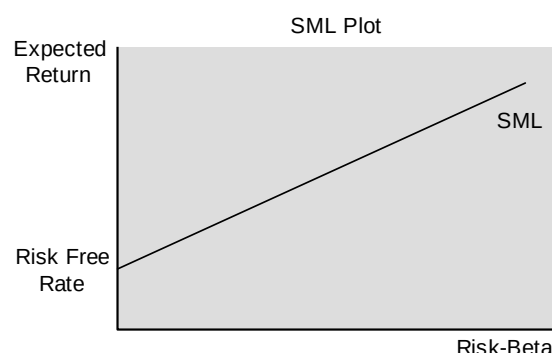


**Fig.: Security Market Line**

Given the SML reflects the return on a given investment in relation to risk, a change in the slope of the SML could be caused by the risk premium of the investments. Recall that the risk premium of an investment is the excess return required by an investor to help ensure a required rate of return is met. If the risk premium required by investors was to change, the slope of the SML would change as well.

When a shift in the SML occurs, a change that affects all investments' risk versus return profile has occurred. A shift of the SML can occur with changes in the following:

1. Expected real growth in the economy.
2. Capital market conditions.
3. Expected inflation rate.

### SML and CML

It is necessary to contrast SML with CML. Both postulate a linear (straight line) relationship between risk and return. In CML the risk is defined as total risk and is measured by standard deviation, while in SML the risk is defined as systematic risk and is measured by  $\beta$ . Capital market line is valid only for efficient portfolios while security market line is valid for all portfolios and all individual securities as well. CML is the basis of the capital market theory while SML is the basis of the capital asset pricing model.

### Q21. Discuss the Pricing of Securities with CAPM

**Ans :**

The capital asset pricing model can also be used for evaluating the pricing of securities. The CAPM provides a framework for assessing whether

a security is underpriced, overpriced or correctly priced. According to CAPM, each security is expected to provide a return commensurate with its level of risk. A security may be offering more returns than the expected return, making it more attractive. On the contrary, another security may be offering less return than the expected return, making it less attractive.

The expected return on a security can be calculated using the CAPM formula. Let us designate it as the theoretical return. The real rate of return estimated to be realised from investing in a security can be calculated by the following formula:

$$R_i = \frac{(P_1 - P_0) + D_1}{P_0}$$

where

$P_0$  = Current market price.

$P_1$  = Estimated market price after one year.

$D_1$  = Anticipated dividend for the year.

This may be designated as the estimated return.

The CAPM framework for evaluation of pricing of securities can be illustrated with Figure.

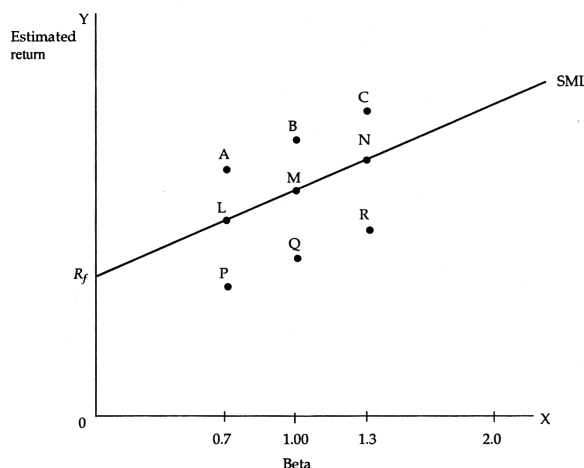


**Fig.: CAPM and Security Valuation**

Figure shows the security market line. Beta values are plotted on the X axis, while estimated returns are plotted on the Y axis. Nine securities are plotted on the graph according to their beta values and estimated return values.

Securities A, L and P are in the same risk class having an identical beta value of 0.7. The security market line shows the expected return for each level of risk. Security L plots on the SML indicating that the estimated return and expected return on security L is identical. Security A plots above the SML indicating that its estimated return is higher than its theoretical return. It is offering higher return than what is commensurate with its risk. Hence, it is attractive and is presumed to be underpriced. Stock P which plots below the SML has an estimated return which is lower than its theoretical or expected return. This makes it undesirable. The security may be considered to be overpriced.

Securities B, M and Q constitute a set of securities in the same risk class. Security B may be assumed to be underpriced because it offers more return than expected, while security Q may be assumed to be overpriced as it offers lower return than that expected on the basis of its risk. Security M can be considered to be correctly priced as it provides a return commensurate with its risk.

Securities C, N and R constitute another set of securities belonging to the same risk class, each having a beta value of 1.3. It can be seen that security C is underpriced, security R is overpriced and security N is correctly priced.

### Calculation of CAPM Model

Under this model, the expected return of the security and return portfolio and other values can be calculated as follows.

#### 1. Expected Return on Security

$$R_i = T + \beta (R_m - T)$$

Where

$R_i$  = Expected return of the security

$T$  = Riskless interest rate

$R_m$  = Expected return on the market portfolio (or) S.D. of the portfolio

$\beta$  = Beta value

#### 2) Expected Return on Portfolio

$$E(R_p) = T + \sigma_p \left[ \frac{R_m - T}{\sigma_m} \right]$$

Where

$E(R_p)$  = Expected return on the portfolio

$T$  = Riskless interest rate

$\sigma_p$  = S.D of the portfolio

$\sigma_m$  = SD of market portfolio

$R_m$  = Expected return on index.

3) Construction of efficient Portfolio

$$R_p = W (R_m) + (1 - w)T$$

Where

$w$  = Weightage or proportion of Market portfolio

**PROBLEMS**

16. B.V. prasad considering several investments the risk free rate of return is 6.75% and the expected return for the market is 12% what should be the required rates of return for each investment using the CAPM.

| Security | A    | B    | C    | D    | E    |
|----------|------|------|------|------|------|
| Beta     | 1.20 | 0.80 | 1.50 | 0.60 | 1.25 |

Sol :

$$T = 6.75$$

$$R_m = 12$$

**Security A**

$$\begin{aligned} R_i &= T + \text{bim} (R_m - T) \\ &= 6.75 + 1.20 (12 - 6.75) \\ &= 6.75 + 1.20 (5.25) \\ &= 6.75 + 6.30 = 13.05\% \end{aligned}$$

**Security B**

$$\begin{aligned} R_i &= 6.75 + 0.80 (12 - 6.75) \\ &= 6.75 + 0.80 (5.25) \\ &= 6.75 + 4.0 = 10.95\% \end{aligned}$$

**Security C**

$$\begin{aligned} R_i &= 6.75 + 1.50 (12 - 6.75) \\ &= 6.75 + 1.50 (5.25) \\ &= 6.75 + 7.87 = 14.62\% \end{aligned}$$

**Security D**

$$\begin{aligned} R_i &= 6.75 + 0.60 (12 - 6.75) \\ &= 6.75 + 0.60 (5.25) \\ &= 6.75 + 3.15 = 9.9\% \end{aligned}$$

**Security E**

$$\begin{aligned}
 R_i &= 6.75 + 1.25 (12 - 6.75) \\
 &= 6.75 + 1.25 (5.25) \\
 &= 6.75 + 6.6 = 13.35\% .
 \end{aligned}$$

- 17. If the risk free return is 10% and the expected return on BSE is 18% and risk measurement by std deviation is 5%. How do you construct an efficient portfolio to produce a 16% expected return and what would be its risk.**

*Sol :*

$$\begin{aligned}
 R_p &= W(R_m) + (1-W)T \\
 T &= 10 \quad R_m = 18\% \\
 \sigma_m &= 5\%, \quad R_p = 16\% \\
 16 &= W(18) + (1-W)10 \\
 16 &= 18W + 10 - 10W \\
 -18W + 10W &= 10 - 16 \\
 -8W &= -6 \\
 \therefore W &= \frac{-6}{-8} = 0.75
 \end{aligned}$$

Therefore 75% of funds should be placed in market portfolio and the balance 25% should be invested in riskfree securities.

The portfolio risk can be measured as follows:

$$\begin{aligned}
 E(R_p) &= T + \sigma_p \sigma_p \left[ \frac{R_m - T}{\sigma_m} \right] \\
 &= 16 = 10 + \sigma_p \left[ \frac{18 - 10}{5} \right] \\
 &= 16 = 10 + \sigma_p \left[ \frac{8}{5} \right] \\
 &= 16 = 10 + \sigma_p (1.6) \\
 16 &= 10 + 1.6 \sigma_p \\
 -1.6 \sigma_p &= 10 - 16
 \end{aligned}$$

$$-1.6 \sigma_p = -6$$

$$\sigma_p = \frac{-6}{-1.6} = 3.75$$

$$\sigma_p = 3.75.$$

- 18. From the following information, construct the efficient portfolio when its expected return is 18% and also findout the portfolio risk. T = 8%, Rm = 20%. S.D on market index is 8%.**

*Sol :*

$$\begin{aligned}
 \text{Risk free return (T)} &= 8\% \\
 \text{Expected return on index is } &20\% (R_m) \\
 \text{Risk measurement by S.D} &= 8\% \\
 R_m = 20\% \quad T = 8\% \quad R_p &= 18\% \quad \sigma_m = 8\% \\
 R_p &= W(R_m) + (1-W)T \\
 18 &= W(20) + (1-W)8 \\
 18 &= 20W + 8 - 8W \\
 -20W + 8W &= 8 - 18 \\
 -12W &= -10 \\
 W &= \frac{-10}{-12} = 0.83
 \end{aligned}$$

Therefore 83% of funds should be placed in market portfolio and the balance 17% should be invested in the riskfree securities.

**Portfolio Risk**

$$\begin{aligned}
 R_p &= T + \sigma_p \left[ \frac{R_m - T}{\sigma_m} \right] \\
 T &= 8 \quad \sigma_m = 8 \\
 R_m &= 20 \quad \sigma_p = ? \\
 R_p &= 18 \\
 18 &= 8 + \sigma_p \left[ \frac{20 - 8}{8} \right]
 \end{aligned}$$

$$18 = 8 + \sigma_p \left[ \frac{12}{8} \right]$$

$$18 = 8 + \sigma_p (1.5)$$

$$18 = 8 + 1.5 \sigma_p$$

$$-1.5 \sigma_p = -10$$

$$\sigma_p = \frac{-10}{-1.5} = 6.67.$$

19. Based on the risk and return relationship of the CAPM, find the missing data in the following table.

| Security | Expected Ri<br>return | Beta<br>bim | Rm<br>Exp rate on Index. |
|----------|-----------------------|-------------|--------------------------|
| A        | 0.1305                | 1.20        | -                        |
| B        | -                     | 0.80        | 0.12                     |
| C        | 0.1462                | --          | 0.12                     |
| D        | 0.099                 | 0.60        | --                       |
| E        | --                    | 1.26        | 0.18                     |

Consider the riskfree interest rate is 0.525 (T)

Sol :

**Security A**

$$R_i = T + b_{im} (R_m - T)$$

$$0.1305 = 0.525 + 1.20 (R_m - 0.525)$$

$$0.1305 = 0.525 + 1.20 R_m - 0.63$$

$$-1.20 R_m = 0.525 - 0.63 - 0.1305$$

$$-1.20 R_m = -0.2355$$

$$R_m = \frac{-0.235}{-1.20}$$

$$= 0.196$$

**Security B**

$$R_i = T + b_{im} (R_m - T)$$

$$= 0.525 + 0.80 (0.12 - 0.525)$$

$$= 0.525 + 0.80 (-0.405)$$

$$= 0.525 - 0.324 \Rightarrow 0.525 - 0.324$$

$$= 0.201$$

**Security C**

$$\begin{aligned}
 R_i &= T + b_{im} (R_m - T) \\
 0.1462 &= 0.525 + b_{im} (0.12 - 0.525) \\
 0.1462 &= 0.525 + b_{im} (-0.405) \\
 0.1462 &= 0.525 - 0.405 b_{im} \\
 0.405 b_{im} &= 0.525 - 0.1462 \\
 0.405 b_{im} &= 0.3788 \\
 b_{im} &= \frac{0.3788}{0.405} \\
 &= 0.935
 \end{aligned}$$

**Security D**

$$\begin{aligned}
 R_i &= T + b_{im} (R_m - T) \\
 0.099 &= 0.525 + 0.60 (R_m - 0.525) \\
 0.099 &= 0.525 + 0.60 (R_m - 0.525) \\
 0.099 &= 0.525 - 0.315 + 0.60 R_m \\
 0.099 &= 0.21 + 0.60 R_m \\
 -0.60 R_m &= 0.21 - 0.099 \\
 -0.60 R_m &= 0.111 \\
 &= \frac{0.111}{-0.60} \\
 &= -0.185
 \end{aligned}$$

**Security E**

$$\begin{aligned}
 R_i &= T + b_{im} (R_m - T) \\
 &= 0.525 + 1.26 (0.18 - 0.525) \\
 &= 0.525 + 1.26 (-0.345) \\
 &= 0.525 - 0.435 \\
 &= 0.09
 \end{aligned}$$

**2.7 ARBITRAGE PRICING THEORY****Q22. Explain the concept of Arbitrage Pricing Theory.***Ans :*

The formation for Arbitrage pricing theory is the law of one price. The law of one price states that two identical goods should sell at the same price. If they sold at differing prices any one could engage in arbitrage by simultaneously buying at the lower price & selling at higher price and make a riskless profit. Arbitrage also applies to financial assets. If two financial assets have the same risk, they should have the same expected return. If they do not have the same expected return, the riskless profit could be earned by simultaneously it eliminates the limitations of CAPM.

The expected return on arbitrage portfolio is calculated as follows :

### 1. Expected return on Security

$$E(R_i) = R_f + I_1 b_1 + I_2 b_2 + I_3 b_3 + \dots$$

Where

$\Sigma(R_i)$  = expected return on individual security.

$R_f$  = Risk free rate

$I_1$  = Market price of first factor

$I_2$  = Market price of second factor

$I_3$  = Market price of third factor

$b_1$  = Sensitivity factor of first stock

$b_2$  = Sensitivity factor of second stock

### 2. Expected return on arbitrage portfolio

$$\Sigma(R_p) = X_1 \Sigma R_1 + X_2 \Sigma R_2 + X_3 \Sigma R_3 \dots$$

Where,

$\Sigma(R_p)$  = Expected return on portfolio

$X_1$  = Weightage of 1<sup>st</sup> security.

$X_2$  = Weightage of 2<sup>nd</sup> security.

$X_3$  = Weightage of 3<sup>rd</sup> security.

$\Sigma R_1$  = Expected return on 1<sup>st</sup> stock

$\Sigma R_2$  = Expected return on 2<sup>nd</sup> stock

$\Sigma R_3$  = Expected return on 3<sup>rd</sup> stock

### PROBLEMS

20. The reaction coefficients for two stocks and the market prices (I) are given below :

| Factor | $\lambda$ | Stock |     |
|--------|-----------|-------|-----|
|        |           | bA    | bB  |
| 1      | 0.09      | 0.5   | 0.7 |
| 2      | -0.03     | 0.4   | 0.8 |
| 3      | 0.04      | 1.2   | 0.2 |

using APT model and riskfree rate at 6% what is expected return, if two stocks are 50% equally weighted.

Sol :

**Calculation of expected return of Stock "A"**

$$\begin{aligned}
 \Sigma(R_A) &= R_f + I_1 b_1 + I_2 b_2 + I_3 b_3 + \text{-----} \\
 &= 0.06 + (0.09 \times 0.5) + (-0.03 \times 0.4) + (0.04 \times 1.2) \\
 &= 0.06 + 0.045 - 0.012 + 0.048 \\
 &= 0.06 + 0.033 + 0.048 \\
 &= 0.141 \text{ or } 14.1\%
 \end{aligned}$$

**Expected return of Stock "B"**

$$\begin{aligned}
 \Sigma(R_B) &= R_f + I_1 b_1 + I_2 b_2 + I_3 b_3 + \text{-----} \\
 &= 0.06 + (0.09 \times 0.7) + (-0.03 \times 0.8) + (0.04 \times 0.2) \\
 &= 0.06 + 0.063 - 0.024 + 0.008 \\
 &= 0.06 + 0.039 + 0.008 \\
 &= 0.107 \text{ or } 10.7\%
 \end{aligned}$$

**Calculation of expected return on portfolio**

$$\begin{aligned}
 \Sigma(R_p) &= X_1 \Sigma R_A + X_2 \Sigma R_B \\
 &= (0.5 \times 14.1) + (0.5 \times 10.7) \\
 &= 7.05 + 5.35 = 12.4
 \end{aligned}$$

21. There are two stocks X and Y and 3 factors. Given risk free rate at 8% corresponds to return on risk free asset or the risk free in general reflects the markets price of risk of or expected excess return over the risk free return

| Factor | $\lambda$ | Stock |     |
|--------|-----------|-------|-----|
|        |           | Bx    | By  |
| 1      | 0.06      | 0.5   | 0.8 |
| 2      | 0.03      | 0.6   | 0.3 |
| 3      | 0.09      | 1.3   | 0.7 |

If you are investing  $\frac{1}{3}$  rd in "X" and  $\frac{2}{3}$  rd in "Y" What would be the expected return using APT method.

Sol :

Expected return on stock Bx.

$$\begin{aligned}
 \Sigma(R_x) &= R_f + I_1 b_1 + I_2 b_2 + I_3 b_3 + \text{-----} \\
 &= 0.08 + (0.06 \times 0.5) + (0.03 \times 0.6) + (0.09 \times 1.3) \\
 &= 0.08 + 0.03 + 0.018 + 0.117 \\
 &= 0.245 \text{ or } 24.5\%
 \end{aligned}$$

Expected return on stock "Y"

$$\begin{aligned}\Sigma(R_y) &= R_f + I_1b_1 + I_2b_2 + I_3b_3 + \dots \\ &= 0.08 + (0.06 \times 0.8) + (0.03 \times 0.3) + (0.09 \times 0.7) \\ &= 0.08 + 0.048 + 0.009 + 0.063 = 0.2 \text{ or } 20\%\end{aligned}$$

Expected return on Arbitrage Portfolio

$$\begin{aligned}\Sigma(R_p) &= X_1 \Sigma R_x + X_2 \Sigma R_y \\ &= \frac{1}{3} \times 0.245 + \frac{2}{3} \times 0.2 \\ &= 0.0816 + (0.66 \times 0.2) \\ &= 0.0816 + 0.133 \\ &= 0.2146 \text{ or } 21.46\%\end{aligned}$$

### Q23. Differences between Arbitrage Pricing Theory and Capital Asset Pricing Model.

Ans :

#### APT and CAPM

The simplest form of APT model is consistent with the simple form of the CAPM model. When only one factor is taken into consideration, the APT can be stated as:

$$R_i = \lambda_i + b_i \lambda_i$$

It is similar to the capital market line equation

$$R_i = R_f + b_i(R_m - R_f)$$

which is similar to the CAPM model.

APT is more general and less restrictive than CAPM. In APT, the investor has no need to hold the market portfolio because it does not make use of the market portfolio concept. The portfolios are constructed on the basis of the factors to eliminate arbitrage profits. APT is based on the law of one price to hold for all possible portfolio combinations.

The APT model takes into account of the impact of numerous factors on the security. The macro economic factors are taken into consideration and it is closer to reality than CAPM.

The market portfolio is well defined conceptually. In APT model, factors are not well specified. Hence the investor finds it difficult to establish equilibrium relationship. The well defined market portfolio is a significant advantage of the CAPM leading to the wide usage of the model in the stock market.

The factors that have impact on one group of securities may not affect another group of securities. There is a lack of consistency in the measurements of the APT model.

Further, the influences of the factors are not independent of each other. It may be difficult to identify the influence that corresponds exactly to each factor. Apart from this, not all variables that exert influence on a factor are measurable.

## Exercise Problems

1. Given  $r_f = 8\%$ ,  $r_m = 15\%$  and  $r_A = 18\%$
- Find out the beta for stock A
  - What is stock A's return, if its beta falls to 0.75 ?

Ans :

$[\beta_A : 1.43, r_A = 13.25\%]$

2. Following data is available to you as a portfolio manager.

| Stock                                | Rate of Return | Beta |
|--------------------------------------|----------------|------|
| Blue star                            | 32%            | 1.70 |
| Wipro Limited                        | 30%            | 1.40 |
| Reliance Industries                  | 25%            | 1.10 |
| GE Shipping                          | 22%            | 0.95 |
| ICICI Bank                           | 20%            | 1.05 |
| ITC                                  | 14%            | 0.70 |
| BSE Index                            | 12%            | 1.00 |
| Treasury bills<br>(Risk free return) | 8%             | 0    |

Using security market line identify over-valued and under-valued securities.

Ans :

4.22 conclusion

3. The expected returns and betas are given below for three stocks.

| Stock | Expected Return | Expected Beta |
|-------|-----------------|---------------|
| Hero  | 14 Percent      | 1.20          |
| Icon  | 15 percent      | 0.75          |
| Jack  | 20 percent      | 1.50          |

Assume risk-free return as 9 percent and market return as 15 percent. Determine which stock (s) are undervalued? Overvalued ?

Hint :  $\bar{r}_p = r_f + \beta_i (\bar{r}_m - r_f)$

Ans :

$\bar{r}_x = 16.2\%$ ,  $\bar{r}_y = 13.5\%$ ,  $\bar{r}_z = 18\%$

4. An investment company manages an equity fund consisting of five stocks, with the following market values and betas

| Stock | Expected Return (Rs.) | Expected Beta (Rs.) |
|-------|-----------------------|---------------------|
| A     | 1,00,000              | 1.10                |
| B     | 25,000                | 1.20                |
| C     | 50,000                | 0.75                |
| D     | 1,25,000              | 0.60                |
| E     | 1,65,000              | 1.30                |
|       | <u>4,65,000</u>       |                     |

If  $r_f = 7\%$  and  $\bar{r}_m = 14\%$ , What is the portfolio's expected return ?

Ans :

- i)  $W_A = 0.22, W_B = 0.05, W_C = 0.11, W_D = 0.27, W_E = 0.35$   
 ii)  $\beta_p = 1.0015$   
 iii)  $(\bar{r}_p) = 14.01\%$

5. The return of Flex stock is related to factors 1 and 2 as given below.

$\bar{r}_j = \lambda_0 + 0.6\lambda_1 + 1.3\lambda_2$  is where 0.6 and 1.3 are sensitivity coefficients,  $\lambda_1$ , risk premium is 6% and is 3% and risk-free return,  $\lambda_0 = 7\%$ . What is the stock's expected return ?

Ans :

$$\bar{r}_j = 14.5\%$$

6. The reaction coefficients for two stocks and the market price  $\lambda$ , are given below,

| Factor | $\lambda$ | $\beta_A$ | $\beta_B$ |
|--------|-----------|-----------|-----------|
| 1      | 0.09      | 0.5       | 0.7       |
| 2      | -0.03     | 0.4       | 0.8       |
| 3      | 0.04      | 1.2       | 0.2       |

Using APT model and risk-free rate at 6%, determine the expected return if two stocks are equally weighted.

Sol :

Calculation of Expected Return for Stock A and B using APT Model

$$r_A = 14.10\%$$

$$\bar{r}_B = 10.7\%$$

$$\bar{r}_p = 12.4\%$$

## Short Question and Answers

### 1. Objectives of Portfolio Management

Ans :

- i) **Security of Principal Investment** : Investment safety or minimization of risks is one of the most important objectives of portfolio management. Portfolio management not only involves keeping the investment intact but also contributes towards the growth of its purchasing power over the period. The motive of a financial portfolio management is to ensure that the investment is absolutely safe. Other factors such as income, growth, etc., are considered only after the safety of investment is ensured.
- ii) **Consistency of Returns** : Portfolio management also ensures to provide the stability of returns by reinvesting the same earned returns in profitable and good portfolios. The portfolio helps to yield steady returns. The earned returns should compensate the opportunity cost of the funds invested.
- iii) **Capital Growth** : Portfolio management guarantees the growth of capital by reinvesting in growth securities or by the purchase of the growth securities. A portfolio shall appreciate in value, in order to safeguard the investor from any erosion in purchasing power due to inflation and other economic factors. A portfolio must consist of those investments, which tend to appreciate in real value after adjusting for inflation.
- iv) **Marketability** : Portfolio management ensures the flexibility to the investment portfolio. A portfolio consists of such investment, which can be marketed and traded. Suppose, if your portfolio contains too many unlisted or inactive shares, then there would be problems to do trading like switching from one investment to another. It is always recommended to invest only in those shares and securities which are listed on major stock exchanges, and also, which are actively traded.

### 2. Sources of Risk.

Ans :

- i) The government policies related to prices and economy is one of the major sources of risk.
- ii) Consumer preference, consumption and savings habit are essential in deciding the market share. Therefore, is a source of risk.
- iii) The political, social, racial and ethnic issue also have an impact on expected outcome.
- iv) Technological factors are responsible for the introduction of new products in the market and therefore has an impact on expected outcomes.
- v) Corporate governance and financial performance and financial structure adopted by the firm also has an impact on expected performance.

### 3. Purchasing Power Risk

Ans :

Purchasing power risk is also known as inflation risk. This risk arises out of change in the prices of goods and services and technically it covers both inflation and deflation periods. During the last two decades, it has been seen that inflationary have been continuously affecting the Indian economy. Therefore, in India purchasing power risk is associated with inflation and rising prices in the economy.

Inflation in India has been either 'cost push' or 'demand pull'. This type of inflation has been seen when costs of production rise or when there is a demand for products but there is no smooth supply and consequently prices rise. In India, the cost push inflation has led to enormous problems as the rise in prices of raw materials has greatly increased costs of production. The increase in costs of production has shown a rising trend in 'wholesale

price index' and 'consumer price index'. A rising trend in price index reflects a price spiral in the economy.

The consumers who wanted to forego their present consumption level to purchase commodities in future found that they could not adjust their budgets because they were faced with rising prices and shortage of funds for allocation according to their preferences.

#### 4. Financial Risk

Ans :

Financial risk in a company is associated with the method through which it plans its financial structure. If the capital structure of a company tends to make earnings unstable, the company may fail financially. How a company raises funds to finance its needs and growth will have an impact on its future earnings and consequently on the stability of earnings. Debt financing provides a low cost source of funds to a company, at the same time providing financial leverage for the common stock holders. As long as the earnings of the company are higher than the cost of borrowed funds, the earnings per share of common stock are increased. Unfortunately, large amounts of debt financing also increases the variability of the returns of the common stock holders and thus increases their risk. It is found that variation in returns for shareholders in levered firms (borrowed funds company) is higher than in unlevered firms. The variance in returns is the financial risk.

#### 5. Ex-Ante Return

Ans :

The term ex-ante is a neo-Latin word meaning "before the event". Ex-ante is used most commonly in the commercial world, where results of a particular action, or series of actions, are forecast in advance. The opposite of ex-ante is ex-post (or ex post).

The ex-ante return is the expected return of an investment portfolio that is calculated from a proportional weighting of the expected returns of

its component assets. In calculating this return, the results assumed for each possible expected return must be calculated as accurately as possible in order for the ex-ante return to be close to the actual return.

By using the ex-ante method, businesses are able to be thoroughly precise when planning, thus making sure the correct resources are available at the moment they are needed. The slightest slip in the quality of the professionalism and standards can result in a catastrophic effect for the businesses concerned.

#### 6. Ex-Post Return

Ans :

The historical returns or Expost returns are derived from the cash flow received as well as the price changes that occur during the period of holding the stock or any asset. The income flow is the dividend he receives during the holding period.

To find out the export or historical average return of the stock, the common arithmetic mean is used.

$$R = 1/n (r_1 + r_2 + r_3 + \dots + r_n)$$

$r_1, r_2, r_3$ , indicate the returns that occur in different periods of the stock.

#### 7. Assumptions of Markotwiz Model

Ans :

- The market is efficient and all investors have in their knowledge all the facts about the stock market and so an investor can continuously make superior returns.
- All investors before making any investments have a common goal. This is the avoidance of risk because they are risk averse.
- All investors would like to earn the maximum rate of return that they can achieve from their investments.
- The investors base their decisions on the expected rate of return of an investment.

- e) Markowitz brought out the theory that it was a useful insight to find out how the security returns are correlated to each other. By combining the assets in such a way that they give the lowest risk, maximum returns could be brought out by the investor.
- f) Every investor assumes that while making an investment, he will combine his investments in such a way that he gets a maximum return and is surrounded by minimum risk.
- g) The investor assumes that greater or larger the return that he achieves on his investments, the higher the risk factor that surrounds him. On the contrary, when risks are low, the return can also be expected to be low.
- h) The investor can reduce his risk if he adds investments to his portfolio.

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**8. Mean Variance Approach.**

*Ans :*

In 1952, Markowitz introduced mean variance analysis which is essential for both finance researchers and practitioners, theory enables to solve the problems relating to optional portfolio selection.

Mean variance analysis is the process of weighing risk which is referred as variance against expected return. It helps the investors in making decisions relating to financial instruments in which they invest depending on level of risk and rewards. It also enable the investors to determine maximum reward at given level of risk or minimum risk at given level of return.

Mean variance analysis constitutes a part of modern portfolio theory which believes that if investors possess complete information then they will make rational decisions relating to investments. Mean variance analysis involves two important parts i.e., variance and expected return. Variance refers to spreading of returns of a specific security on daily or weekly basis. The expected return is a probability which express the estimated return of investment in the security. If two securities have same expected return but variance is less for one security then security with less variance must be selected. In the same way, if securities have same variance but different return then security with higher return must be selected. In modern portfolio theory, an investor will be choosing different securities to make investments in different levels of variance and expected return.

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**9. Feasible Set of Portfolios**

*Ans :*

With a limited number of securities an investor can create a very large number of portfolios by combining these securities in different proportions. These constitute the feasible set of portfolios in which the investor can possibly invest. This is also known as the portfolio opportunity set.

Each portfolio in the opportunity set is characterised by an expected return and a measure of risk, viz., variance or standard deviation of returns. Not every portfolio in the portfolio opportunity set is of interest to an investor. In the opportunity set some portfolios will obviously be dominated by others. A portfolio will dominate another if it has either a lower standard deviation and the same expected return as the other, or a higher expected return and the same standard deviation as the other. Portfolios that are dominated by other portfolios are known as inefficient portfolios. An investor would not be interested in all the portfolios in the opportunity set. He would be interested only in the efficient portfolios.

**10. Sharpe's single index model**

Ans :

The basic notion underlying the single index model is that all stocks are affected by governments in the stock market. Casual observation of share prices reveals that when the market moves up (as measured by any of the widely used stock market indices), prices of most shares tend to increase. When the market goes down, the prices of most shares tend to decline. This suggests that one reason why security returns might be correlated and there is co-movement between securities, is because of a common response to market changes. This co-movement of stocks with a market index may be studied with the help of a simple linear regression analysis, taking the returns on an individual security as the dependent variable ( $R_i$ ) and the returns on the market index ( $R_m$ ) as the independent variable.

The return of an individual security is assumed to depend on the return on the market index. The return of an individual security may be expressed as:

$$R_i = \alpha_i + \beta_i R_m + e_i$$

where

$\alpha_i$  = Component of security i's return that is independent of the market's performance.

$R_m$  = Rate of return on the market index.

$\beta_i$  = Constant that measures the expected change in  $R_i$ , given a change in  $R_m$ .

$e_i$  = Error term representing the random or residual return.

**11. Capital Asset Pricing Model**

Ans :

The CAPM was developed to explain how risky securities are priced in market and this was attributed to experts like Sharpe and Linter. Markowitz theory being more theoretical, CAPM aims at a more practical approach to stock valuation. It is no doubt based on the mean-variance approach to risk for assessment of investment as developed by Markowitz. It explains the behavioral pattern of investors in building up portfolios. It is based on economic model. It aims the investor at maximizing the utility of wealth.

The capital asset pricing model is a relationship explaining how assets should be priced in the capital markets. It reveals the relationship between the expected return, unavoidable risk and the valuation of securities. The unavoidable risk means, the risk which cannot be avoided by diversification. If a security does not provide adequate returns, then the security will not favour the investor. The CAPM is build upon the Markovitz Portfolio Model and capital market line.

**12. Assumptions of the CAPM**

Ans :

- i) Investors make their investment decisions on the basis of risk-return assessments measured in terms of expected returns and standard deviation of returns.
- ii) The purchase or sale of a security can be undertaken in infinitely divisible units.
- iii) Purchases and sales by a single investor cannot affect prices. This means that there is perfect competition where investors in total determine prices by their actions.

- iv) There are no transaction costs. Given the fact that transaction costs are small, they are probably of minor importance in investment decision-making, and hence they are ignored.
- v) There are no personal income taxes. Alternatively, the tax rates on dividend income and capital gains are the same, thereby making the investor indifferent to the form in which the return on the investment is received (dividends or capital gains).
- vi) The investor can lend or borrow any amount of funds desired at a rate of interest equal to the rate for riskless securities.
- vii) The investor can sell short any amount of any shares.
- viii) Investors share homogeneity of expectations. This implies that investors have identical expectations with regard to the decision period and decision inputs. Investors are presumed to have identical holding periods and also identical expectations regarding expected returns, variances of expected returns and covariances of all pairs of securities.

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**13. Capital Market Line**

*Ans :*

As seen previously, adjusting for the risk of an asset using the risk-free rate, an investor can easily alter his risk profile. Keeping that in mind, in the context of the capital market line (CML), the market portfolio consists of the combination of all risky assets and the risk-free asset, using market value of the assets to determine the weights. The CML line is derived by the CAPM, solving for expected return at various levels of risk.

Markowitz' idea of the efficient frontier, however, did not take into account the risk-free asset. The CML does and, as such, the frontier is extended to the risk-free rate

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**14. Security Market Line (SML)**

*Ans :*

The security market line (SML) is the line that reflects an investment's risk versus its return, or the return on a given investment in relation to risk. The measure of risk used for the security market line is beta.

The line begins with the risk-free rate (with zero risk) and moves upward and to the right. As the risk of an investment increases, it is expected that the return on an investment would increase. An investor with a low risk profile would choose an investment at the beginning of the security market line. An investor with a higher risk profile would thus choose an investment higher along the security market line.

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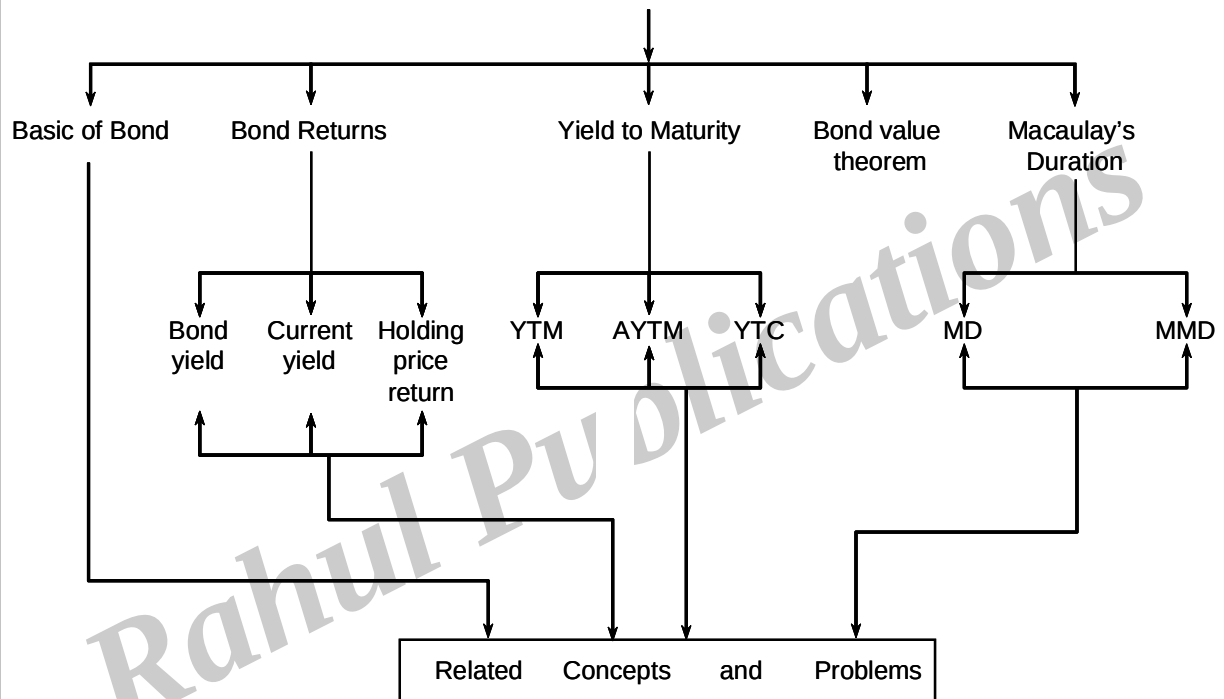
**15. Arbitrage Pricing Theory**

*Ans :*

The formation for Arbitrage pricing theory is the law of one price. The law of one price states that two identical goods should sell at the same price. If they sold at differing prices any one could engage in arbitrage by simultaneously buying at the lower price & selling at higher price and make a riskless profit. Arbitrage also applies to financial assets. If two financial assets have the same risk, they should have the same expected return. If they do not have the same expected return, the riskless profit could be earned by simultaneously it eliminates the limitations of CAPM.

## UNIT - III

### Fixed Income Securities - Analysis, Valuation and Management



## UNIT III

**Bond Valuation:** Classification of Fixed income securities, Types of bonds, Interest rates, Term Structure of interest rates, measuring bond yields, Yield to Maturity, Yield to Call, Yield to Maturity, Holding Period Return, Bond pricing theorems, bond duration, Active and Passive bond management Strategies, bond immunization, bond volatility, bond convexity.

### 3.1 BOND ANALYSIS AND VALUATION

**Q1. Define bond ? Explain the features of bond.**

**Ans :**

#### Meaning of Bond

A bond is more or less the same as a debenture. In India, the two terms are generally interchangeable. There is no significant distinction between the two and the difference if any, is for all practical purposes negligible. While some consider a bond as an American term for a debenture others reserve the term for public debt securities belonging to the government and public sector undertakings. In India, it is common to refer to the long-term debt securities issued by the state governments, or by undertakings owned by them or by development financial institutions, as bonds.

A bond is a contract that requires the borrower to pay the interest income to the lender. It resembles the promissory note and issued by the government and corporate. The par value of the bond indicates the face value of the bond i.e., the value stated on the bond paper. Generally, the face values of bonds are Rs. 1000, 2000, 5000 and alike. Most of the bonds make fixed interest payment till the maturity period. This specific rate of interest is known as coupon rate. Coupons are paid quarterly, semiannually and annually. At the end of the maturity period, the value is repaid.

#### Features of Bonds

**1) A Sealed Agreement :** The indenture is a long, complicated legal instrument containing the restrictions, pledges and promises of the

contract. Bond indenture involves three parties. The first party is the debtor corporation that borrows the money, promises to pay interest, and promises to repay the principal borrowed. The bond holders are the second party; they lend the money. They automatically accept the indenture by acquiring their bonds. The trustee is the third party with whom the bond contract is made. The trustee ensures that the corporation keeps its promises and follows the provisions contained in the indenture. In other words, the trustee does the "watchdog" job for all the bond holders.

**2) Repayment of Principal :** Bonds are issued in denominations of Rs.1,000 but there are also bonds of values of Rs.500 and Rs.100 and of values as high as Rs.5,000 and Rs.10,000. Financial institutions are known to buy corporate bonds bearing higher values. The value of the bond is called the 'face value, par value or maturity value.' The face value of the bond represents the promise to repay the amount to the bondholder at the end of the specified period. This, in other words, may be called the most important feature of bond, return of the principal to the lender on a fixed date specified earlier.

**3) Specified Time Period (Maturities) :** Maturities vary widely. Bonds are usually grouped by their maturity classes. Short-term bonds are usually bonds maturing within 5 years. They may be secured or unsecured. These are common in industrial financing. Medium-term bonds mature in 5 to 10 years. If a bond is originally issued on a medium-

term bond, it is usually secured by a real estate or equipment mortgage, or it may be backed by other security. Long-term bonds may run 20 years or more. Capital-intensive industries with long expectation of equipment life are the greatest users of this for bond financing.

- 4) **Interest Payment :** Bond interest is usually paid semi-annually, though annual payments are also popular. The method of payment depends upon whether the bond is a coupon (bearer) or registered bond.
- 5) **Call :** Bonds have an additional feature of 'call.' This is a privilege to the issuing company to repurchase bonds at a slightly higher price above the par value. For example, a bond of face value of Rs.1,000 and maturity of 20 years yields an interest of Rs.70 annually. After the first five years of issue, the market rate of interest on bonds falls considerably. The ruling rate being 5%, the company may choose to use the call feature and buy back the bond for Rs.1,050. This is a little higher than the face value of Rs.1,000. By calling the bonds, the company saves money. It may call back the bonds yielding interest of Rs. 70 and issue fresh bonds which will yield Rs. 50 per year. The firm has been able to save Rs. 20 per year per bond for the next 15 years till the maturity of the bond. By paying Rs. 50 higher than the face value on the bond for early redemption of the bond, the company saves a much higher amount. The bondholder is on the losing side because he gets the return of the principal amount earlier than he expected.
- 6) **Pledge of Security :** The issuing company sometimes promises to pay to the bondholder by offering some security like property. The pledge of security is a promise to the bondholders in writing and signed under seal and presented to the trustee by the company. A simple promise to pay without the proper formalities is not considered as a Pledge of security.

## Q2. Explain the Reasons for Issuing Bonds.

Ans :

- 1) **Reduce the Cost of Capital :** Bonds are the cheapest source of financing. A corporation is Willing to incur the risk of borrowing in order to reduce the cost of capital by financing a portion of its assets with securities bearing a fixed rate of return in hope of increasing the ultimate return to the equity holder.
- 2) **Gain the Benefit of Leverage :** The presence of debt and/or preference shares in the company's financial structure means that it is using financial leverage. When financial leverage is use changes in earnings before interest and tax (EBIT) translate into the larger changes in earnings per share. However, leverage is a two-edged sword as EBIT can rise or fall. If it falls, and financial leverage is used, the equity holders endure negative changes in EPS that are larger than the relative decline in EBIT.
- 3) **Effect of Tax Saving :** Unlike. dividends on equity, the interest on bonds is deductible in figuring up corporate income for tax purposes. Hence, the EPS increases if the financing is through bonds rather than with preference or equity shares.
- 4) **Widen the Sources of Funds :** By issuing bonds, the corporation can attract funds from individual investors and especially from those investing institutions which are reluctant or not permitted to purchase equity shares.
- 5) **Preserve and Control :** An increase in debt does not diminish the voting power of present owners since bonds ordinarily carry no voting right.

### 3.2 CLASSIFICATION OF FIXED INCOME SECURITIES

## Q3. What are the different types of Fixed Income Securities.

Ans :

### Fixed Income Securities

It refers to securities such as debentures, saving certificates, bonds etc., which earns interest or

divided at fixed rate for a stipulated period of time, usually the life of a 12% bond of ₹ 1000 means that the issuer has to pay the bond holder ₹ 120 per year for the use of money.

### Types of Fixed Income Securities

The different type of fixed income securities that are available in India are as follows,

#### 1. Bank Deposits

Deposits with banks are the safest mode of investment and earns a fixed rate of interest. Fixed deposits up to ₹ 1 lakh, in individual accounts covered by deposits insurance scheme.

They are highly liquid as fixed deposit receipts can be enhanced before maturity at a discount of 1% on interest. They are neither tradable nor transferable. Nomination facility is available.

#### 2. Company Deposits

These deposits are with manufacturing and non-banking financial companies and earns a fixed rate of interest usually higher than bank fixed deposits rate.

These deposits are neither secured nor guaranteed by RBI and noted for untimely payment of principal amount. They are not exactly liquid. These are neither tradeable nor transferable. They are without nomination facility.

#### 3. Small Saving Schemes

These are the safest means of investment and initial investment gets doubled in 5 - 6 years time. In section 88, they are not tradeable and most instruments are accepted by banks as collateral.

#### 4. Debentures and Bonds

These are long term debt instruments usually, yield high rate of interest. The safety factor with these investments can be analyzed by considering credit rating. They are freely tradeable and transferable and hence provides for liquidity. Fixed income securities provide investors with two kinds of income. They are :

- (i) Current income (periodical receipt of interest or dividend)
- (ii) Capital gains

The funds mobilized by ICICI and IDBI through debt issues accounted for high percentage of funds mopped in primary market. Financial institutions, banks and corporate bonds are offering attractive bonds like deep discount bond, education bonds, flexi-bonds etc.

### 3.3 TYPES OF BONDS

#### Q4. Explain the classifications of bonds.

Ans :

A bond is a long-term debt instrument that promises to pay a fixed annual sum as interest for a specified period of time. The basic features of the bonds are given below :

#### 1. Secured Bonds and Unsecured Bonds

The secured bond is secured by the real assets of the issuer. In case of the unsecured bond, the name and fame of an issuer may be the only security.

#### 2. Perpetual Bonds and Redeemable Bonds

Bonds that do not mature or never mature are called perpetual bonds. The interest alone would be paid. In redeemable bonds, the bond is redeemed after a specific period of time. The redemption value is specified by the issuer.

#### 3. Fixed Interest Rate Bonds and Floating Interest Rate Bonds

In fixed interest rate bonds, the interest rate bonds, the interest rate is fixed at the time of the issue, where as in the floating interest rate bonds, the interest rates change according to already fixed norms. For example, in December 1993 the State Bank of India issued floating interest rate bonds worth ₹ 500 crore, pegging the interest rate with its three and five years' fixed deposit rates to provide built-in yield flexibility to the investors.

#### 4. Zero Coupon Bonds

These bonds sell at a discount and the face value is repaid at maturity. The origin of this type of bond can be traced to the US Security Market. The high value of the US government security prevented investors from investing their money in government security. Big brokerage companies like Merrill Lynch, Pierce and others purchased government securities in large quantities and sold them in smaller denominations - at a discounted rate. The difference between the purchase cost and face value of the bond is the gain for the investor. Since the investor does not receive any interest on the bond, the conversion price is suitably arranged to protect the loss of interest to the investor. The discounted value is calculated using the formula:

$$\text{Present value} = \frac{\text{Face value of the bond}}{(1 + R)^n}$$

R = interest rate and n = number of years.

For example, a zero coupon bond with a face value of ₹50,000 that matures in 20 years' time would be sold at ₹5,185 to give a return of 12 per cent per annum.

The merit of this bond is that the company does not have the burden of servicing the debt during the execution period of the project. The repayment could be adjusted to fall after the completion of the project. This could result in considerable cost savings for the company.

#### 5. Deep Discount Bonds

A deep discount bond is another form of zero coupon bond. The bonds are sold at a large discount on their nominal value and interest is not paid on them. Also, they mature at par value. The difference between the maturity value and the issue price serves as an interest return. The deep discount bonds' maturity

period may range from three years to 25 years or more. IDBI first issued deep discount bonds in India in 1992 with varying maturity period options. Later, ICICI in 1997 issued deep discount bonds with four optional maturity periods. Early redemption option is provided at the end of the 6<sup>th</sup>, 12<sup>th</sup> and 18<sup>th</sup> year.

#### 6. Capital Indexed Bonds

In the capital indexed bond, the principal amount of the bond is adjusted for inflation for every year. For example, an investment of ₹1000 in inflation indexed bonds earns the investor a semiannual interest income for a five-years' period. The reselling of the principal amount is done semiannually based on the wholesale price index (WPI) movements. The principal amount of the bond is adjusted for inflation for each of the years. A coupon rate of 6 per cent is worked on the inflation-adjusted principal.

The bond is advantageous because it gives the investor more returns by taking inflation into account. The investor enjoys the benefit of a return on his principal, which is equal to the average inflation between the issue (purchase) and maturity period of the instrument. The investor has to keep the instruments for the entire five-year period, to avail the benefit of inflated principal amount.

If the investor wants to exit early, he can do it through the secondary market. The value of the principal repayment is adjusted by the Index Rate (IR), which is announced by the RBI two weeks prior to the repayment of the principal. The IR is worked out as follows:

IR = Reference WPI as in Aug 2002/Base WPI

Financial institutions, banks, insurance companies or firm attorneys act as trustees to the investors. In the indenture, the terms of agreement, description of debentures, rights of debenture holders and of the issuing company, and responsibilities of the company are specified clearly. Rates change according to already fixed norms.

### 3.4 INTEREST RATES

#### Q5. Write brief note on interest rates.

Ans :

Another reason for variation in the returns from bonds is the change in market interest rates. An investor in bonds receives interest annually or semi-annually. He reinvests these interest amounts each year at the market interest rate. Thus, interest is earned on the interest received from the bonds each year. Finally, at the end of a certain holding period, the investor may sell off the bond at a price which is equal to its face value.

The opposite would be true when the market interest rate moves down. The investor would be able to reinvest the interest only at lower rate than what was expected. However, the bond price will move above its face value as the market interest rate declines. The investor loses on reinvestment of interest but gains on selling the bond.

Thus, the interest rate risk is composed of two risks: reinvestment risk and price risk. The reinvestment risk and the price risk derived from a change in the market interest have an opposite effect on the bond returns. For any bond there is a holding period at which these two effects exactly balance each other. What is lost on reinvestment is exactly compensated by a capital gain on sale of bond and Vice versa. For this holding period there is no interest rate risk. This particular holding period at which interest rate risk disappears is known as the duration of the bond.

An investor can, therefore, eliminate interest rate risk of a bond by holding the bond for its duration. Where the desired holding, period of an investor is significantly different from the duration of the bond, the bond is subject to interest rate risk.

#### 3.4.1 Term Structure of Interest Rates

#### Q6. Explain the concept of Term Structure of Interest Rates.

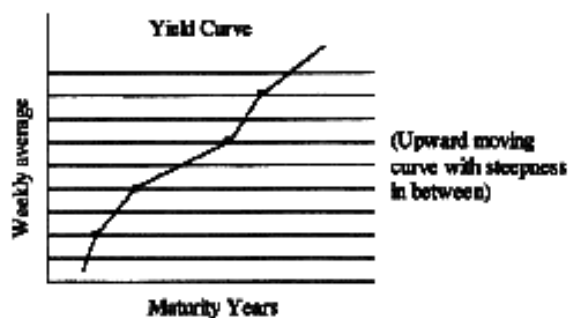
Ans :

It is a connection between time to maturity and yield for a particular category of bonds at a particular time by keeping all the factors constant,

especially the default risk. Mostly if the length of time to maturity is more, the more will be the interest rates.

The term structure scenario is outlined by yield curve.

Yield curve is a graphical representation, which shows the connection between the length of time to maturity and yields, where the X-axis represents time to maturity and Y-axis represents yield to maturity.



The yield curve basically includes the instincts but not the actual connection between the yield and time to maturity. Therefore, this yield curve is not fit for showing the connection between yield and time to maturity.

#### Term Structure Theories

The term structure theories of interest rates are used for describing the shape, slope and reasons for its changes (shifts of the yield curve). The term structure theories are,

1. Pure or unbiased expectation hypothesis theory
2. Liquidity preference theory
3. Segmented market theory
4. Preferred habitat theory.

#### 1. Pure or Unbiased Expectation Hypothesis Theory

This theory specifies that there exists evenly balanced amount between long term rate of interest and an average returns of short-term rates. Apart from these, the expected present short-term returns which are expected to prevail for the long period of time.

In expectation theory, the long term rates should be an average of present short term rates and also be an average of future short term rates.

This expectation theory states that, today's rates and future expected rates have a connection and after ascertaining under the hypothesis, this theory concludes that "investors may anticipate identical return by not considering the option of investment". The yield curve for expectation hypothesis will be flat.

### Explanation

${}_tR_n \rightarrow$  Securities current known yield at time 't' with periods to maturity

${}_{t+1}r_n \rightarrow$  The yield that is likely to prevail an year from today at time 't+1' for V periods (i.e., the forward rates)

The 3 years bond rate should be a geometric average of the current 1 year rate (i.e.,  ${}_tR_1$ ) and the expected forward rates for subsequent 2 years.

### Equation

Where,

$${}_tR_3 \rightarrow [(1 + {}_tR_1)(1 + {}_{t+1}r_1)(1 + {}_{t+2}r_1)]^{1/3} - 1.0$$

${}_tR_3 \rightarrow$  Rate on 3-year bond

$(1 + {}_tR_1) \rightarrow$  Known rate on a current 1 year bond

$(1 + {}_{t+1}r_1) \rightarrow$  Expected rate on a bond with 1 year to maturity beginning 1 year from the current year.

$(1 + {}_{t+2}r_1) \rightarrow$  Expected rate on a bond with 1 year to maturity beginning 2 years from the current year.

### Example

If the current one-year bond rate ( ${}_tR_1$ ) is 0.06 and forward rate 0.085 for ( ${}_{t+1}r_1$ ) and 0.092 for ( ${}_{t+2}r_1$ ). What would be the rate for 3 year bond  ${}_tR_3$ ?

**Sol :**

### Equation

$${}_tR_3 = [(1 + {}_tR_1)(1 + {}_{t+1}r_1)(1 + {}_{t+2}r_1)]^{1/3} - 1.0$$

$${}_tR_3 = [(1 + 0.06)(1 + 0.085)(1 + 0.092)]^{1/3} - 1.0$$

$$= [(1.06)(1.085)(1.092)]^{1/3} - 1.0$$

$$= (1.2559092)^{1/3} - 1.0$$

$$= 1.07890 - 1.0$$

$$= 0.0789 \text{ or } 7.89\%$$

The identical rule is followed for various number of periods. All long term rates are a geometric average of subsequent one-period rates.

**2. Liquidity Preference Theory**

This theory specifies the same rule as of the expectation theory, but it also includes the risk premiums for its hypothesis.

Liquidity preference theory = Expectation theory + Liquidity risk premiums.

The distinguished features between liquidity preference theory and expectation hypothesis theory are,

- i) Uncertainty in expected interest rates and
- ii) Expected future rates are not similar when compared to forward rates.

Ultimately, this theory concludes that the prolonged term bonds have to be put forward for the higher yields. Thus, yield curve under this theory has upward sloping direction.

**3. Segmented Market Theory**

In segmented market theory, several investors, instead of containing distinctive maturity requirements, restrict themselves to a particular maturity segment. The investor does not want to move from one to the other maturity sector even though it possesses benefits from the consequences which occurs.

The yield curve in this segmentated market theory depends upon the supply and demand determinants, curve can come to any shape, it can slope downwards or upwards accordingly.

**4. Preferred Habitat Theory**

This theory of preferred Habitat is like segmentated market theory but varies to a certain extent. The investor has option for maturity sector and different habitats. The investor who wishes to move to any maturity sector, provided, if they fairly obtain a suitable risk premiums under this theory.

The expected future interest rates and risk premiums play a crucial role in this hypothesis and yield curve can have any shape.

**3.5 MEASURING BOND YIELDS -  
YTM, YTC, HOLDING PERIOD RETURN**

**Q7. What is Bond Yields ? Explain the various techniques in which the bond is calculated.**

**Ans :**

Bond Yield may be defined as the rate of interest that is paid by the company issuing bonds to the owner of a particular bond. The Bond Yield for any specific bond, is commonly determined by dividing the effective coupon rate of a bond by its current market price.

The Bond Markets function in a manner that the Coupon Rate or rather the Coupon payments for every particular type of bond that is issued in the Bond Market, is fixed. Which implies that irrespective of the current market prices of the bonds in the Bond Market, the payments received by each particular bond remains the same or constant.

The Bond Yield, as a rule, is expressed as a percentage on the face value of the particular bond.

**Calculation of Bond Yield**

The Bond Yield can be calculated following other methods of calculation. The Bond Yield begotten from the Bond Markets are also calculated as follows :

- 1) Coupon Yield or Nominal Yield
- 2) Current Yield
- 3) Yield To Maturity or YTM

**1) Coupon Yield :** Coupon Yield or Nominal Yield, is also referred to as the Coupon Rate in the Bond Market parlance. As already mentioned above, this type of Bond Yield is calculated at the end of a financial year and is paid as a fixed coupon amount on the original face value of the particular bond. However, this Bond Yield is expressed as a percentage on the face value of the Bond.

**2) Current Yield :** Current Yield, in contrast to the Coupon Yield or Nominal Yield, is a Bond Yield that is determined by dividing the fixed coupon amount (that is paid as a percentage on the face or original value of the specific

bond) by the current price value of the particular bond. In other words, Current Bond Yield = Coupon amount / current price of a bond.

The difference between these two Bond Yields (that is, Current Yield and Coupon Yield) is that in one where the coupon payment is divided by the face value of the bond, in the other method, the same amount that is paid annually by the issuer to the bond owner, is divided by the current market price of the bond.

- 3) Yield to Maturity :** Yield To Maturity or YTM is generally calculated at the end of the term for which the bond was issued in the Bond Market. This type of a Bond Yield is calculated taking into account the eventual payment made by the company, which had issued the Bond in the first place, to the owner of the bond. Also taken into account, are the annual coupon interest payments made by the issuer together with the capital gain earned or the capital loss suffered by the lender on the investment. The calculation is carried out taking for granted that the investor (or the lender of the capital sum) can reinvest the coupon payments received, at an interest rate which equal to the Bond Yield named Yield to Maturity.

### Holding Period of Return

Holding period return an investor buys a bond and sells it after holding for a period. The rate of return in that holding period is :

$$\text{Holding period return} = \frac{\text{Price gain or loss during the holding period} + \text{Coupon interest rate, if any}}{\text{Price at the beginning of the holding period}}$$

The holding period rate of return is also called the one period rate of return. This holding period return can be calculated daily or monthly or annually. If the fall in the bond price is greater than the coupon payment the holding period return will turn to be negative.

### Yield to Maturity

The concept of yield-to-maturity (YTM) is one of the widely used tools in bond investment management. Arithmetically, YTM is the single discount factor that makes present value of future cashflows from a bond equal to the current price of the bond. Intuitively, YTM is the rate of return, which an investor can expect to earn if the bond is held till maturity.

The yield to maturity is calculated based on certain assumptions. They are :

1. There should not be any default. Coupon and principal should be paid as per schedule.
2. The investor has to hold the bond till maturity.
3. All the coupon payments should be reinvested immediately at the same interest rate as the same yield to maturity of the bond.

Any difference in the re-investment rate will cause a difference between the actual return and the YTM. In this sense, the YTM is only a measure of yield. It cannot be regarded as a measure of return from a coupon-paying bond.

The YTM concept has a slightly different meaning for Zero Coupon Bonds (ZCB), popularly known as Deep Discount Bonds (DDB). ZCB's do not carry any coupon but are issued at a price discounted to the face value. On maturity, these bonds are redeemed at face value. Since these bonds do not have any coupon payments during the life of the bond, the question of re-investment of coupon payment doesn't arise at all. There is no re-investment risk for ZCBs.

To find out the yield to maturity the present value technique is adopted. The formula is,

$$\text{Present value} = \frac{\text{Coupon}_1}{(1+y)^1} + \frac{\text{Coupon}_2}{(1+y)^2} + \dots + \frac{\text{Coupon}_n + \text{face value}}{(1+y)^n}$$

Y = The yield to maturity.

### 3.6 BOND PRICING THEOREMS

**Q8. Explain briefly about various bond theorems.**

*Ans :*

The value of the bonds depends upon three factors namely, the coupon rate, years to maturity and the expected yield to maturity or the required rate of return. On the basis of this, bond value theorems have been evolved.

#### Theorem 1

If the market price of the bond increases, the yield would decline and vice versa.

| Example         | Bond A    | Bond B      |
|-----------------|-----------|-------------|
| Par value       | Rs 1000   | Rs 1000     |
| Coupon rate     | 10%       | 10%         |
| Maturity period | 2 years   | 2 years     |
| Market price    | Rs 874.75 | Rs. 1035.66 |
| Yield           | 18%       | 8%          |

Even though the bonds are of same maturity and coupon rate, the difference in the market price leads to difference in the yield. The bond with low price has high yield because with lesser amount of money more return is earned.

#### Theorem 2

If the bond's yield remains the same over its life, the discount or premium depends on the maturity period.

| Example         | Bond A   | Bond B    |
|-----------------|----------|-----------|
| Par value       | Rs 1000  | Rs 1000   |
| Coupon rate     | 10%      | 10%       |
| Yield           | 15%      | 15%       |
| Maturity Period | 2        | 3         |
| Market Price    | 918.71   | 885.86    |
| Discount        | Rs.81.29 | Rs.114.14 |

This means, the bond with a short term to maturity sells at a lower discount than the bond with a long term to maturity.

**Theorem 3**

If a bond's yield remains constant over its life, the discount or premium amount will decrease at an increasing rate as its life gets shorter. Consider a bond with the face value of Rs.1000, and maturity period of 5 years with 10% yield to maturity. The calculated values are given below:

| Years to Maturity | The Present of Value |
|-------------------|----------------------|
| 5                 | 620.9                |
| 4                 | 683.0                |
| 3                 | 751.3                |
| 2                 | 826.4                |
| 1                 | 909.1                |

The above example shows that the discount rate declines when the bond approaches to maturity. The same point is given in figure below.

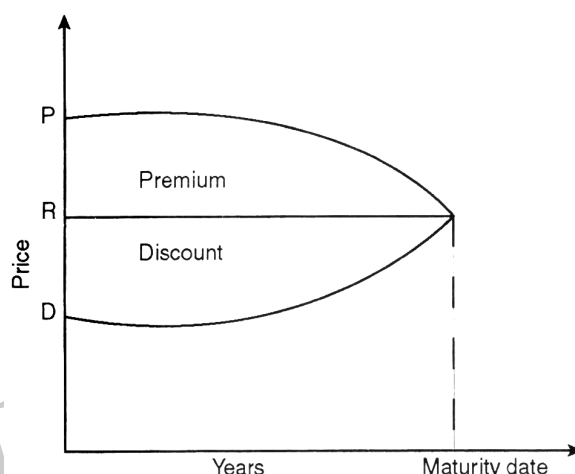


**Fig. : Bond's Price Changes during its Life**

**Theorem 4**

A raise in the bond's price for a decline in the bond's yield is greater than the fall in the bond's price for a raise in the yield. Take a bond of 10% coupon rate, maturity period of five years with the face value of Rs 1000. If the yield declines by 2%, that is to 8% then the bond price will be Rs 1079. 87

$$\begin{aligned}
 &= \text{Rs } 100(\text{PVIFA } 8\%, 5 \text{ yrs}) + 1000(\text{PVIF } 8\%, 5\text{yrs}) \\
 &= \text{Rs } 100 \times 3.9927 + \text{Rs. } 1000 \times 0.6806 \\
 &= \text{Rs.}1079.87.
 \end{aligned}$$

If, the yield increases by 2% then, the bond price will be Rs 927.88.

$$\begin{aligned}
 &= \text{Rs. } 100(\text{PVIFA } 12\%, 5 \text{ yrs}) + 1000 (\text{PVIF } 12\%, 5 \text{ yrs}) \\
 &= \text{Rs. } 100 \times 3.6048 + \text{Rs. } 1000 \times .0.5674 \\
 &= \text{Rs. } 927.88
 \end{aligned}$$

Now the fall in yield has resulted in a raise of Rs 79.86 but the raise in the yield caused a variation of Rs 72.22 in the price.

**Theorem 5**

The change in the price will be lesser for a percentage change in bond's yield if its coupon rate is higher. It is explained by the following example

| Example                    | Bond A    | Bond B    |
|----------------------------|-----------|-----------|
| Coupon rate                | 10%       | 8%        |
| Yield                      | 8%        | 8%        |
| Maturity Period            | 3         | 3         |
| Price                      | Rs 105.15 | Rs 100    |
| Face Value                 | Rs 100.00 | Rs 100.00 |
| Yield Raise                | 1%        | 1%        |
| Price after yield raises   | Rs 102.53 | Rs 97.47  |
| Percentage Change in price | 2.4%      | 2.53%     |

### 3.7 BOND DURATION

**Q9. What is Bond Duration ?**

Ans :

Bond Duration

Duration is an estimated measure of the price sensitivity of a bond to a change in interest rates. It can be stated as a percentage or in dollar amounts. It can be helpful to “shock” or analyze what will happen to a bond when market rates increase or decrease.

The duration of a financial asset measures the sensitivity of the asset's price to interest rate movements, expressed as a number of years. The reason for expressing this sensitivity in years is that the time that will elapse until a cash flow is received allows more interest to accumulate. Therefore the price of an asset with long term cashflows has more interest rate sensitivity than an asset with cashflows in the near future.

Because of this relationship, duration is sometimes calculated as the weighted average number of years to receive each cashflow. Thus the duration of a zero coupon bond with a maturity period of  $n$  years is  $n$  years, since the only cashflow will occur in  $n$  years. If there are coupon payments, the duration will be less than  $n$  years.

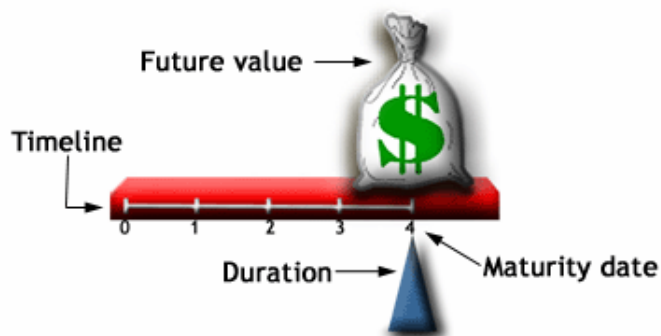


Figure : Duration of a Bond

This measure is closely related to the derivative of the bond's price function with respect to the interest rate, and some authors define the duration to be this derivative divided by the price. This ratio is the weighted average term, with appropriate weightings for a non-callable bond.

The standard definition of duration:

$$D = \sum_{i=1}^n \frac{P(i) t(i)}{V}$$

where  $P(i)$  is the present value of each cash payment from an asset (or each expense from a liability)  $i$ ,  $t(i)$  is the time in years until each payment will be received (or when each expense is due),  $V$  is the present value of all cash payments from the asset (or all expenses from the liability) until maturity.  $D$  is the duration.

#### Q10. Explain the Macaulay's Duration.

Ans :

##### Macaulay Duration

The formula usually used to calculate a bond's basic duration is the Macaulay duration, which was created by Frederick Macaulay in 1938, although it was not commonly used until the 1970s. Macaulay duration is calculated by adding the results of multiplying the present value of each cash flow by the time it is received and dividing by the total price of the security. Macaulay duration, named for Frederick Macaulay who introduced the concept, is the weighted average maturity of a bond where the weights are the relative discounted cash flows in each period.

$$\text{Macaulay Duration} = \frac{\sum (\text{Cashflow discounted with yield to maturity} \times \text{Time to cashflow})}{\text{Price of the bond}}$$

Macaulay showed that an unweighted average maturity is not useful in predicting interest rate risk. He gave two alternative measures that are useful:

- The theoretically correct Macaulay-Weil duration which uses zero-coupon bond prices as discount factors, and
- the more practical form (shown above) which uses the bond's yield to maturity to calculate discount factors.

The key difference between the two is that the Macaulay-Weil duration allows for the possibility of a sloping yield curve, whereas the algebra above is based on a constant value of  $r$ , the yield, not varying by term to payment.

With the use of computers, both forms may be calculated, but the Macaulay duration is still widely used.

The formula for Macaulay duration is as follows :

$$\text{Macaulay Duration} = \frac{\sum_{t=1}^n \frac{t * C}{(1+i)^t} + \frac{n * M}{(1+i)^n}}{P}$$

$n$  = number of cash flows

$t$  = time to maturity

$C$  = cash flow

$i$  = required yield

$M$  = maturity (par) value

$P$  = bond price

Remember that bond price equals :

$$C * \frac{\left[1 - \frac{1}{(1+i)^n}\right]}{i} + \frac{M}{(1+i)^n}$$

So the following is an expanded version of Macaulay duration :

$$\text{Macaulay Duration} = \frac{\sum_{t=1}^n \frac{t * C}{(1+i)^t} + \frac{n * M}{(1+i)^n}}{C * \frac{\left[1 - \frac{1}{(1+i)^n}\right]}{i} + \frac{M}{(1+i)^n}}$$

### 3.8 ACTIVE AND PASSIVE BOND MANAGEMENT STRATEGIES

**Q11. Discuss various Active and Passive Bond Management Strategies.**

Ans :

#### A. Active Bond Management

Active bond management need to adopt more/ enhanced investment strategies so as to attain effective bond portfolio. The prime objective is to expect appropriate interest rates as they tend to deviate frequently and tries to trace out the mispriced bonds thereby valuing them correctly.

Based on the estimations of interest rates, investors would be able to render specific durations for their investments. If the interest rates are high then duration assigned would be less and if the interest rates are reasonable then duration will be more. After identifying the mispriced bonds, investors would be able to recognize the bonds which have been underpriced and overpriced and hence can be valued correctly. However, fulfilling these two objectives is a complicated activity and hence involves collection of accurate information and effective analysis which can be accomplished by adopting various investment strategies.

#### Active Strategies

While bonds are often purchased to be held to maturity, many a time they are not. Henry Kaufman, a renowned bond expert, argues that "bonds are bought for their price appreciation potential and not for income protection". Many bond investors subscribe to this view and pursue active strategies. They seek to profit by :

##### 1) Forecasting Interest Rate Changes

Bond prices and interest rates are inversely related. Hence, if an investor expects interest rates to fall, he should buy bonds, preferably bonds with longer maturity (more precisely, longer duration), for price appreciation. On the other hand, if an investor expects interest rates to rise, he should sell

bonds, particularly bonds with longer maturity. While this approach may appear tempting, it must be borne in mind that interest rate forecasting is a difficult and up certain task. Hence betting on interest rate movements is a risky proposition.

- i) Select a particular investment period and predict bond yields at the end of that period.
- ii) Calculate the bond price at the end of the investment period.
- iii) Estimate the future value of coupon incomes earned over the investment period.
- iv) Add the future value of coupon incomes over the investment period to the predicted capital gain or loss to get a forecast of the total return on the bond for the holding period.
- v) Annualize the holding period return.

A particular version of horizon analysis is riding the yield curve. An investor pursuing his strategy buys an intermediate or long-term bond when the yield curve is upward sloping and the investor expects the yield curve to remain unchanged. As the bond approaches maturity it moves toward the lower end of the upward sloping yield curve and hence appreciates in value. Thus, the investor earns interests well enjoys capital appreciation. The risk in this strategy is that the level of interest rates may rise or the yield curve may become downward sloping thereby causing the bond value to erode.

## 2) Exploiting Relative Mispricings among Securities

Bond portfolio managers regularly monitor the bond market to identify temporary relative mispricings. They try to exploit such opportunities by engaging in bond swaps-purchase and sale of a bond-to improve the rate of the return. The most popular bond swaps are described below.

- i) **Substitution Swap** : A substitution swap involves bonds that are very similar

in terms of credit rating coupon payments, maturity, call provisions, and liquidity. The only difference between them, at a particular time, is that they sell at different prices and hence different yields. The swap is made from the lower yield bond to the higher yield bond. If the yield on the latter declines to that of the former, the bond holder enjoys capital appreciation.

- ii) **Pure Yield Pickup Swap** : A pure yield pickup swap involves a switch from a lower yield bond to a higher yield bond of almost identical quality and maturity. Unlike a substitution swap, this swap is not based on expectations about price changes. It is motivated strictly by a desire to earn a higher yield.

- iii) **Intermarket Spread Swap** : An intermarket spread swap seeks to benefit from the expected changes in the yield differences between various sectors of the bond market. For example, bond investor may believe that the yields of utility bonds and Treasury bonds are misaligned. If the difference between the yields is perceived to be too wide, the bond investor would switch from Treasury bonds to utility bonds, in the hope that the difference will become narrow in future.

- iv) **Tax Swap** : A tax swap involves selling an existing bond at a capital loss, using the capital loss to offset capital gains in other securities, and purchasing another bond with similar features.

## B. Passive Strategies

Bonds have acquired tremendous significance and managing a portfolio of bonds has become fairly complex. Bond investors may follow a variety of strategies ranging from passive to active.

Many investors believe that securities are fairly priced in the sense that expected returns are commensurate with risks. Such a belief supports a passive strategy, implying that the investor does not actively try to outperform the market.

Of course, a passive strategy does not mean that the investor does nothing. Even a passive investor will have to :

- 1) Determine whether bonds are suitable investment avenues for him,
- 2) Assess risks (default risk, call risk, and so on) and reasonably diversify his holdings, and
- 3) Periodically monitor his bond portfolio to ensure that his holdings match his risk preferences and objectives.

Two commonly followed strategies by passive bond investors are: buy and hold strategy and indexing strategy.

**1) Buy and Hold Strategy :** An investor who follows a buy and hold strategy selects a bond portfolio and stay with it. He does not churn his bond portfolio in an attempt to improve returns and/or reduce risks. Obviously, such an investor chooses a bond portfolio that promises to meet his investment objectives and hence spends time and effort in his initial selection.

**2) Indexing Strategy :** If the capital market is efficient, efforts to find under-priced securities or to time the market may be futile. Empirical research on this issue suggests that most investors are unlikely to outperform the market. Hence, they may find an indexing strategy appealing. Such a strategy calls for building a portfolio that mirrors a well-known bond index. In the US, two well known bond indices are the Shearson Lehman Index and the Salomon Brothers Index. i-BEX is a popular bond index in India.

### 3.9 BOND IMMUNIZATION

**Q12. Explain in detail about Bond Immunization.**

**Ans :**

Immunization is a technique that makes the bond portfolio holder to be relatively certain about

the promised stream of cash flows. The bond interest rate risk arises from the changes in the market interest rate. The market rate affects the coupon rate and the price of the bond. In the immunization process, the coupon rate risk and the price risk can be made to offset each other. Whenever there is an increase in the market interest rate, the prices of the bonds fall. At the same time the newly issued bonds offer higher interest rate.

The coupon can be reinvested in the bonds offering higher interest rate and losses that occur due to the fall in the price of bond can be offset and the portfolio is said to be immunized.

#### Process of Immunization

The bond portfolio manager or investor has to calculate the duration of the promised outflow of the funds and invest in a portfolio of bonds which has an identical duration. The bond portfolio duration is the weighted average of the durations of the individual bonds in the portfolio.

For example if an investor has invested equal amount of money in three bonds namely A, B and C with duration of 2, 3 and 4 years respectively, then the bond portfolio duration is

$$\begin{aligned} D &= \frac{1}{3} \times 2 + \frac{1}{3} \times 3 + \frac{1}{3} \times 4 \\ &= 0.66 + 1 + 1.33 \\ D &= 2.77 \text{ (or) } 3 \text{ years.} \end{aligned}$$

By matching the outflow duration with cash inflow duration from bond investment the bond manager can offset the interest rate risk and price risk. The portfolio of money to be invested between the different types of bonds also can be found. The equation is

Investment outflow =  $(X_1, x)$  Duration of bond 1) +  $(X_2, x)$  Duration of bonds 2)  $X_1, X_2$  proportion of investment on bond 1 and 2.

#### Limitation of Immunization

There are limitations to immunization. Every time market interest rates change the duration of every bond changes. Duration tends to diminish more slowly than calendar time for coupon-paying bonds when interest rates do not change. Therefore, periodic rebalancing will be necessary to continuously immunize portfolio of bonds. In addition, yield curves are not necessarily flat and do not shift in a parallel fashion, so the use of duration will not be exact.

### 3.9.1 Bond Volatility

#### Q13. Explain in detail about Bond Volatility.

Ans :

A bond's price volatility is in part a function of its term to maturity and in part of its coupon yield. Unfortunately, there is no exact relationship between bond maturities and bond price volatilities with respect to interest rate changes. There is, however, a fairly close relationship between bond duration and price volatility - at least, so long as the market does not experience wide swings in yield. That is, duration can be used as a viable prediction of price volatility so long as the yield swings are relatively small.

The problem is, because the price- yield relationship of a bond is convex in form (but duration is not), when the market (or bond) undergoes a big change in yield, duration will understate price appreciation when rates fall and will overstate the price decline when rates increase. Assuming that is not the case (i.e., that the investor is dealing with relatively small changes in the market yield), then multiplying a bond's duration value by -1 results in its price elasticity with respect to interest rate changes. Thus, by calculating a bond's duration, it is possible to obtain a fairly accurate measure of how much its price will change relative to a given (reasonably small) change in market interest rates.

The mathematical link between bond price and interest rate changes involves the concept of modified duration. The formula for modified duration is :

$$\text{Modified duration} = \frac{\text{Duration in years}}{1 + \text{yield to maturity}}$$

Thus, the modified duration value for the 10-year bond discussed above is as follows:

$$\text{Modified duration} = \frac{5.02}{1 + 0.18} = 4.24$$

To determine the bond's percentage price change resulting from an increase in market interest rates from, say 18 to 20 per cent, the modified duration value calculated above is first multiplied by -1 (due to the inverse relationship between bond

price and interest rate) and then by the change in the level of the market interest rates, that is

Percent change in bond price

$$= -1 \times \text{modified duration} \times \text{change in interest rates}$$

$$= -1 \times 4.25 \times 2.0 = -8.50\%$$

Thus, a 2 per cent change in market interest rates will lead to 8.50 per cent drop in the price of 10-year bond. Such information is useful to bond investors seeking (or trying to avoid) high price volatility.

### 3.9.2 Bond Convexity

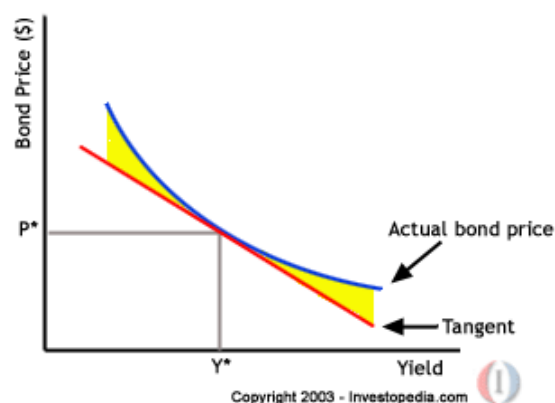
#### Q14. Explain in detail about Bond Convexity.

Ans :

#### Bond Convexity

As bond yields go higher, price goes lower. This relationship between price and yield has a convex structure in nature. The term used to describe this relationship is also known as convexity.

If we graph a tangent at a particular price of the bond (touching a point on the curved price-yield curve), the linear tangent is the bond's duration, which is shown in red on the graph below. The exact point where the two lines touch represents Macaulay duration. Modified duration, as we saw in the preceding section of this tutorial, must be used to measure how duration is affected by changes in interest rates. But modified duration does not account for large changes in price. If we were to use duration to estimate the price resulting from a significant change in yield, the estimation would be inaccurate.



Furthermore, as yield moves further from  $Y^*$ , the yellow space between the actual bond price and the prices estimated by duration (tangent line) increases.

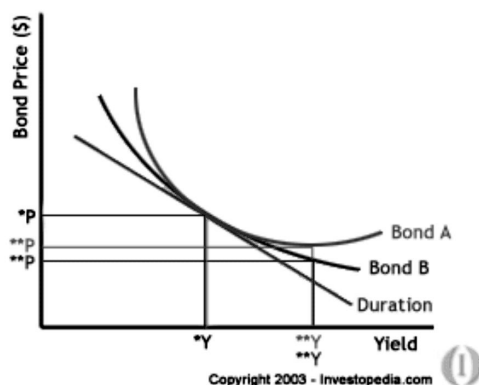
The convexity calculation, therefore, accounts for the inaccuracies of the linear duration line. This calculation that plots the curved line uses a Taylor series, a very complicated calculus theory that we won't be describing here. The main thing for you to remember about convexity is that it shows how much a bond's yield changes in response to changes in price.

### Q15. What are the properties of convexity ?

Ans :

#### Properties of Convexity

Convexity is also useful for comparing bonds. If two bonds offer the same duration and yield but one exhibits greater convexity, changes in interest rates will affect each bond differently. A bond with greater convexity is less affected by interest rates than a bond with less convexity. Also, bonds with greater convexity will have a higher price than bonds with a lower convexity, regardless of whether interest rates rise or fall. This relationship is illustrated in the following diagram :



As you can see Bond A has greater convexity than Bond B, but they both have the same price and convexity when price equals  $P^*$  and yield equals  $Y^*$ . If interest rates change from this point by a very small amount, then both bonds would have approximately the same price, regardless of the convexity. When yield increases by a large amount,

however, the prices of both Bond A and Bond B decrease, but Bond B's price decreases more than Bond A's. Notice how at  $**Y$  the price of Bond A remains higher, demonstrating that investors will have to pay more money (accept a lower yield to maturity) for a bond with greater convexity.

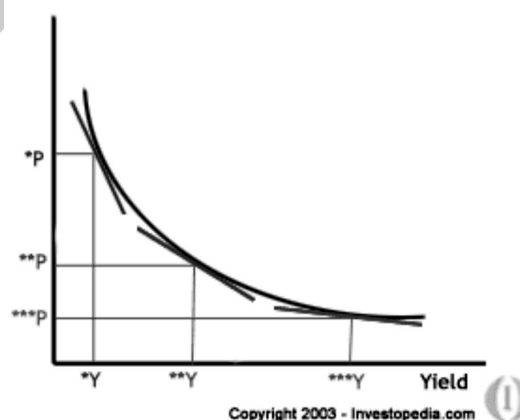
### Q16. What Factors Affect Convexity ?

Ans :

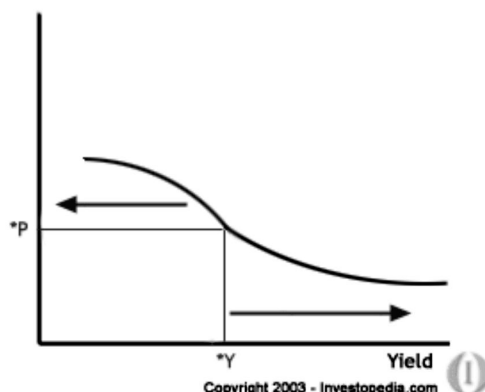
#### Factors Affecting Convexity

The following are the different kinds of convexities produced by different types of bonds:

- (1) The graph of the price-yield relationship for a plain vanilla bond exhibits positive convexity. The price-yield curve will increase as yield decreases, and vice versa. Therefore, as market yields decrease, the duration increases (and vice versa).



- 2) In general, the higher the coupon rate, the lower the convexity of a bond. Zero-coupon bonds have the highest convexity.
- 3) Callable bonds will exhibit negative convexity at certain price-yield combinations. Negative convexity means that as market yields decrease, duration decreases as well. See the chart below for an example of a convexity diagram of callable bonds.



Convexity is the final major concept you need to know for gaining insight into the more technical aspects of the bond market. Understanding even the most basic characteristics of convexity allows the investor to better comprehend the way in which duration is best measured and how changes in interest rates affect the prices of both plain vanilla and callable bonds.

### PROBLEMS ON BOND VALUATION (YTM, AYTM & YTC)

1. An investor is considering the purchase of the following debentures :

| Maturity | Coupon | Par     |
|----------|--------|---------|
| 3 years  | 11%    | Rs. 100 |

- If the investor requires a YTM of 13 percent on debentures of equivalent risk and maturity, what does he believe is a fair market price ?
- If the debenture is selling for a price of Rs. 97.59, what is its promised YTM?
- If the investor expect the debenture to provide a final payment of Rs. 105 in year 3 instead of the promised Rs. 11 (par plus coupon). Using the debenture's market price of Rs. 97.59, what is his expected annual return? If the return on three-year risk-free securities is equal to 10.0 percent, why might this debentures sell at a higher expected return ?
- Why is the expected return different from the yield to maturity calculated in part (b) ?
- What is the duration of this debenture ?
- If an investor 'X' has a horizon date of 4.0 years, why is this debenture risky to investor 'X' ?
- If an investor 'Y' has a horizon date of 2.0 years, why is this debenture risky to investor 'Y' ?

**Sol. :**

$$(a) \quad \frac{Rs.11}{(1+.13)} + \frac{Rs.11}{(1+.13)^2} + \frac{Rs.111}{(1+.13)^3} = Rs. 95.28$$

- (b) By trial and error, YTM is found to be 12 percent :

$$\frac{Rs.11}{(1+.12)} + \frac{Rs.11}{(1+.12)^2} + \frac{Rs.111}{(1+.12)^3} = Rs. 97.59$$

- (c) Again, by trial and error, the expected return is 10.16 percent :

$$\frac{\text{Rs. } 11}{1.1016} + \frac{\text{Rs. } 11}{(1.1016)^2} + \frac{\text{Rs. } 105}{(1.1016)^3} = \text{Rs. } 97.59.$$

If the default risk on this debenture is systematic (undiversifiable), a risk premium above the risk-free rate of 10 percent will be required.

- (d) The yield to maturity is the return which is expected only if all promised payments are indeed expected. If this is not the case, YTM will be upwardly biased measure of the true expected return.
- (e) Consider the debenture to be a portfolio of three zero-coupon debentures :

| Debenture | Duration | Value        | Xi            | Weighted Duration                       |
|-----------|----------|--------------|---------------|-----------------------------------------|
| 1         | 1 Year   | Rs. 9.82*    | 10.06 percent | $0.1006 = (1 \times 0.1006) = 10.06\%$  |
| 2         | 2 Years  | Rs. 8.77**   | 8.99 percent  | $.1798 = (2 \times 0.0899) = 17.98\%$   |
| 3         | 3 Years  | Rs. 79.01*** | 80.95 percent | $2.4285 = (3 \times 0.80985) = 24.29\%$ |
|           |          | Rs. 97.60    | 100.00        | 2.7087                                  |

\*  $\text{Rs. } 11/1.12 = \text{Rs. } 9.82$

\*\*  $\text{Rs. } 11/1.12^2 = \text{Rs. } 8.77$

\*\*\*  $\text{Rs. } 111/1.12^3 = \text{Rs. } 97.01$

- (f) Investor 'X' faces net reinvestment risk since the average date at which cash is to be received (2.7 years) is sooner than the date when cash is needed (4.0 years). The portfolio will have to be reinvested at unknown future interest rates.
- (g) Investor 'Y' faces a price risk since cash is needed in 2.0 years but the portfolio measures (on average) is 2.7 years. To obtain this cash, the portfolio will have to be sold at unknown future prices.

2. R.D. Gupta recently purchased a bond with a Rs. 1000 face value, a 10 percent coupon rate, and four years to maturity. The bond makes annual interest payments, the first to be received one year from today. Mr. Gupta paid Rs. 1,032.40 for the bond.

- (i) What is the bond's yield-to-maturity ?
- (ii) If the bond can be called two years from now at a price of Rs. 1,100, what is its yield-to-call ?

**Sol. :**

- (i) A bond YTM is that interest rate that equals the bond's price to the discounted value of its promised cash flows. In this case :

$$\text{Rs. } 1032.40 = \frac{\text{Rs. } 100}{(1 + \text{YTM})} + \frac{\text{Rs. } 100}{(1 + \text{YTM})^2} + \frac{\text{Rs. } 100}{(1 + \text{YTM})^3} + \frac{\text{Rs. } 100}{(1 + \text{YTM})^4}$$

- (ii) If the bond can be called in two years for Rs. 1,100 its yield-to-call is found by solving for the YTM assuming the receipt of only two coupon payments and a call price of Rs. 1,100. That is:

$$\text{Rs. } 1032.40 = \frac{\text{Rs. } 100}{(1 + \text{YTC})^1} + \frac{\text{Rs. } 100}{(1 + \text{YTC})^2}$$

where : YTC = Yield-to-call

By solving : YTC = 125 percent

3. Venkat purchased at par a bond with a face value of Rs 1,000. The bond had five years to maturity and a 10 percent coupon rate. The bond was called two years later for a price of Rs. 1,200, after making its second annual interest payment. Venkat then reinvested the proceeds in a bond selling at its face value of Rs. 1,000, with three years to maturity and a 7 percent coupon rate. What was Venkat's actual YTM over the five-years period ?

**Sol. :**

The actual YTM is :

$$\begin{aligned} \text{YTM} = & \frac{\text{Rs. 100}}{(1 + \text{YTM})^1} + \frac{\text{Rs. 1300}}{(1 + \text{YTM})^2} - \frac{\text{Rs. 1000}}{(1 + \text{YTM})^3} + \frac{\text{Rs. 70}}{(1 + \text{YTM})^3} \\ & + \frac{\text{Rs. 70}}{(1 + \text{YTM})^4} + \frac{\text{Rs. 70}}{(1 + \text{YTM})^5} + \frac{\text{Rs. 1,000}}{(1 + \text{YTM})^5} \\ \text{YTM} = & 12.9 \text{ percent} \end{aligned}$$

4. Arvind considers Rs.1000 per value bond bearing a coupon rate of 11% that matures after 5 years. He wants a minimum yield to maturing of 15%. The bond is currently sold at Rs. 870/-. Should he buy the bond?

**Sol. :**

Face value of a bond = Rs. 1,000

Coupon rate = 11%

Coupon payment = 1,000 × 11% = 110

YTM = 15%

Current market value = Rs. 870

Number of years to maturity = 5 years

$$\begin{aligned} V = & \frac{C_1}{(1 + \text{YTM})^1} + \frac{C_2}{(1 + \text{YTM})^2} + \frac{C_3}{(1 + \text{YTM})^3} + \frac{C_4}{(1 + \text{YTM})^4} + \frac{C_5}{(1 + \text{YTM})^5} \\ & + \frac{M}{(1 + \text{YTM})^5} \\ V = & \frac{110}{(1 + 0.15)^1} + \frac{110}{(1 + 0.15)^2} + \frac{110}{(1 + 0.15)^3} + \frac{110}{(1 + 0.15)^4} + \frac{110}{(1 + 0.15)^5} + \frac{1000}{(1 + 0.15)^5} \end{aligned}$$

| Year | Cash flows | PV @ 15% | PV of CFAT        |
|------|------------|----------|-------------------|
| 1    | 110        | 0.869    | 95.59             |
| 2    | 110        | 0.756    | 83.16             |
| 3    | 110        | 0.657    | 72.27             |
| 4    | 110        | 0.572    | 62.92             |
| 5    | 110        | 0.497    | 54.67             |
| 6    | 1000       | 0.497    | 497               |
|      |            |          | <u>V = 865.61</u> |

Since the intrinsic value of the bond is Rs. 866 which is less than the current market value of the bond. It is advisable not to buy the bond.

5. The face value of a bond is Rs. 1000/- with a coupon of 14% payable semi-annually. It have a life of 8 years after which it would be redeemed at a premium of 6% over F.V. Find the YTM of the bond, if is market price is Rs. 896/-.

**Sol. :**

Face value of a bond = ` 1000

Coupon rate = 14%

Incase of semiannual bond = Coupon rate =  $\frac{14}{2} = 7\%$

Coupon payment =  $1000 \times 7\% = 70$ .

Life of the bond =  $8 \times 2 = 16$  years

Redeemable value =  $1000 + 6\% \text{ on } 1000$

RV = 1060 `

Market price of the bond = 896 `

Using approximate YTM method,

$$\begin{aligned} \text{YTM} &= \frac{I + \frac{RV - MV}{n}}{\frac{RV + MV}{2}} \\ &= \frac{70 + \frac{1060 - 896}{16}}{\frac{1060 + 896}{2}} \\ &= \frac{70 + 10.25}{978} \\ &= \frac{80.25}{978} \end{aligned}$$

$$\text{AYTM} = 8\%$$

6. Mr. Sagar is considering the purchase of bond currently selling at Rs. 878.50. The bond has four years to maturity with a face value of Rs. 1000/- and 8% coupon rate. The next annual interest payment is due after one year from today. The require rate of return is 10%.
- Calculate the intrinsic value of the bond. Should sagar buy the bond?
  - Calculate the YTM of the bond.

**Sol. :**

Face value of the bond = ` 1000

Coupon rate = 8%

Coupon payment =  $1000 \times 8\% = ` 80$

Years to maturity = 4 yrs

Market value of the bond = 878.75

YTM = 10%

### Calculation of Interinsic Values of the Bond

| Year | Cash flow | YTM @ 10% | PvCFAT            |
|------|-----------|-----------|-------------------|
| 1    | 80        | 0.909     | 72.72             |
| 2    | 80        | 0.826     | 66.08             |
| 3    | 80        | 0.751     | 60.08             |
| 4    | 80        | 0.683     | 54.64             |
| 5    | 1000      | 0.683     | 683               |
|      |           |           | <u>V = 936.52</u> |

Since the intrinsic value of the bond is ` 936.52 is more than market value of the bond i.e. ` 878.5. It indicates that sagar should buy the bond.

### Calculation of YTM using AYTM Method

$$\text{AYTM} = \frac{I + \frac{RV - MV}{n}}{\frac{RV + MV}{2}}$$

$$= \frac{80 + \frac{1000 - 878.5}{4}}{\frac{1000 + 878.5}{2}}$$

$$= \frac{80 + 30.38}{939.25}$$

$$= 11.75$$

$$\text{ATM} = 12\%$$

7. A Rs. 1000 par value bond bears a coupon rate of 14% and matures after 10 years. Interest is payable semiannually. Compute the value of the bond if the required rate of return is 16%. Determine the yield-to-maturity if it is purchased for Rs. 1100 and is held till its maturity by an investor.

**Sol. :**

- (i) Face value of the bond = 1000

Coupon rate = 14%

Coupon payment =  $1000 \times 14\% = \text{Rs. } 140$

Interest is payable semiannually

Maturity period of the bond = 10 years

YTM = 16%

Calculate the value of the bond:

| Year | CFAT | PV@16% | PV of CFAT        |
|------|------|--------|-------------------|
| 1    | 140  | 0.862  | 120.68            |
| 2    | 140  | 0.743  | 104.02            |
| 3    | 140  | 0.641  | 89.74             |
| 4    | 140  | 0.552  | 77.28             |
| 5    | 140  | 0.476  | 66.64             |
| 6    | 140  | 0.410  | 57.4              |
| 7    | 140  | 0.354  | 49.56             |
| 8    | 140  | 0.305  | 42.7              |
| 9    | 140  | 0.263  | 36.82             |
| 10   | 140  | 0.227  | 31.78             |
| 10   | 1000 | 0.227  | 227               |
|      |      |        | <u>V = 903.62</u> |

Value of the bond = Rs. 904

(ii) If the bond is purchased for Rs. 1100

YTM = ?

$$P_0 = \frac{C_1}{(1 + YTM)^1} + \frac{C_2}{(1 + YTM)^2} + \dots + \frac{C_n}{(1 + YTM)^n} + \frac{M}{(1 + YTM)^n}$$

YTM can be calculated by using AYTM method:

$$YTM = \frac{C + \frac{RV - SP}{n}}{\frac{RV + SP}{2}}$$

Coupon payment (C) = Rs. 140

RV = Rs. 1,000

SP = Rs. 1,100

n = 10 yrs

$$\begin{aligned}
 YTM &= \frac{140 + \frac{1,000 - 1,100}{10}}{\frac{1,000 + 1,100}{2}} \\
 &= \frac{140 - 10}{\frac{2100}{2}} = \frac{140 - 10}{1050}
 \end{aligned}$$

$$= \frac{130}{1050}$$

$$= 0.1238$$

$$\therefore \text{YTM} = 12\%$$

8. Mr. Gupta recently purchased a bond with a Rs. 1000 face value, a 10 percent coupon rate and four years to maturity. The bond makes annual interest payments, the first to be received one year from today. Mr. Gupta paid Rs. 1032.40 for the bond. What is the bonds yield-to-maturity ?

*Sol. :*

Face value of a bond = Rs. 1000

Coupon rate = 10%

Coupon payment =  $1000 \times 10\% = 100$

Coupon payment = Rs. 100

Years to maturity = 4 yrs

Price of the band = Rs. 1032.40

Bond yield - to maturity (YTM) is calculated as follows :

$$V = \frac{C_1}{(1 + \text{YTM})^1} + \frac{C_2}{(1 + \text{YTM})^2} + \dots + \frac{C_n}{(1 + \text{YTM})^n} + \frac{M}{(1 + \text{YTM})^n}$$

where  $V \rightarrow$  Present value or price of the bond

$C \rightarrow$  Coupon payment

$M \rightarrow$  face value of a bond

$$1032.40 = \frac{100}{(1 + \text{YTM})^1} + \frac{100}{(1 + \text{YTM})^2} + \dots + \frac{100}{(1 + \text{YTM})^3} + \frac{100}{(1 + \text{YTM})^4} + \frac{1000}{(1 + \text{YTM})^4}$$

YTM can be calculated using trial and error method :

$\rightarrow$  Take a trial rate which is nearer to coupon rate.

$\rightarrow$  Take trial rate as 12% and calculate present value of cashflows :

| Year | Cashflows | Pv@12% | Pv of CFAT                          |
|------|-----------|--------|-------------------------------------|
| 1    | 100       | 0.893  | 89.3                                |
| 2    | 100       | 0.797  | 79.7                                |
| 3    | 100       | 0.712  | 71.2                                |
| 4    | 100       | 0.636  | 63.6                                |
| 4    | 1000      | 0.636  | 63.6                                |
|      |           |        | $\Sigma \text{ Pv of CFAT} = 939.8$ |

$$\Sigma \text{Pv of CFAT} = 939.8$$

At 12% trial rate

$$1032.40 > 939.8$$

Take another trial rate, which is lesser than previous trial rate.

→ The second trial rate is 8%.

| Year | Cashflows | Pv@12% | Pv of CFAT                          |
|------|-----------|--------|-------------------------------------|
| 1    | 100       | 0.926  | 92.6                                |
| 2    | 100       | 0.857  | 85.7                                |
| 3    | 100       | 0.794  | 79.4                                |
| 4    | 100       | 0.735  | 73.5                                |
| 4    | 1000      | 0.735  | 735                                 |
|      |           |        | $\Sigma \text{Pv of CFAT} = 1066.2$ |

At 8% trial rate

$$1032.4 < 1066.2$$

∴ Price of the bond Rs. 1032.4 lies in between Rs. 1066.2 and Rs. 939.8

∴  $r_1 = 8\%$ ,  $r_2 = 12\%$ , Pv of CFAT  $r_1 = 1066.2$ , Pv of CFAT  $r_2 = 939.8$

Pv of Cash outlay = Rs. 1032.4

$$\text{YTM} = r_1 + \frac{\text{PVCFAT} - \text{PV of cashoutlay}}{\Delta \text{Pv of CFAT}} \times (r_2 - r_1)$$

$$= 8 + \frac{1066.2 - 1032.4}{1066.2 - 939.8} \times (12 - 8)$$

$$\boxed{\text{YTM} = 9.07\%}$$

9. Calculate the value and duration for the following bonds assuming a YTM of 8% for both ABC and XYZ.

| Bond | Years of Maturity | Annual Interest | Maturity Value |
|------|-------------------|-----------------|----------------|
| ABC  | 10                | ` 80            | ` 1000         |
| XYZ  | 15                | ` 65            | ` 1000         |

Sol. :

i) ABC Bond :

| Year       | Cashflows | YTM @ 8% | PV of CFAT | $W = \frac{\text{PV of CFAT}}{V}$ | $D = W_x Y_r$ |
|------------|-----------|----------|------------|-----------------------------------|---------------|
| 1          | 80        | 0.926    | 74.08      | 0.074                             | 0.074         |
| 2          | 80        | 0.857    | 68.56      | 0.068                             | 0.136         |
| 3          | 80        | 0.794    | 63.52      | 0.063                             | 0.189         |
| 4          | 80        | 0.736    | 58.88      | 0.059                             | 0.236         |
| 5          | 80        | 0.681    | 54.48      | 0.054                             | 0.27          |
| 6          | 80        | 0.631    | 50.48      | 0.050                             | 0.3           |
| 7          | 80        | 0.584    | 46.72      | 0.047                             | 0.329         |
| 8          | 80        | 0.541    | 43.28      | 0.043                             | 0.344         |
| 9          | 80        | 0.501    | 40.08      | 0.040                             | 0.36          |
| 10         | 80        | 0.464    | 37.12      | 0.037                             | 0.37          |
| 10         | 1000      | 0.464    | 464        | 0.463                             | 4.63          |
| V = 1001.2 |           |          |            |                                   | 7.238         |

∴ Value of the bond (V) = Rs. 1001.20, Duration of the bond = 7 yrs 2 months.

ii) for XYZ :

| Year       | Cashflows | YTM @ 8% | PV of CFAT | $W = \frac{\text{PV of CFAT}}{V}$ | $D = W_x Y_r$ |
|------------|-----------|----------|------------|-----------------------------------|---------------|
| 1          | 65        | 0.926    | 60.19      | 0.072                             | 0.072         |
| 2          | 65        | 0.857    | 55.71      | 0.066                             | 0.132         |
| 3          | 65        | 0.794    | 51.61      | 0.061                             | 0.183         |
| 4          | 65        | 0.736    | 47.84      | 0.057                             | 0.228         |
| 5          | 65        | 0.681    | 44.27      | 0.053                             | 0.265         |
| 6          | 65        | 0.631    | 41.02      | 0.049                             | 0.294         |
| 7          | 65        | 0.584    | 37.96      | 0.045                             | 0.315         |
| 8          | 65        | 0.541    | 35.17      | 0.042                             | 0.336         |
| 9          | 65        | 0.501    | 32.57      | 0.039                             | 0.351         |
| 10         | 65        | 0.464    | 30.16      | 0.036                             | 0.36          |
| 11         | 65        | 0.397    | 25.81      | 0.031                             | 0.341         |
| 12         | 65        | 0.368    | 23.92      | 0.028                             | 0.336         |
| 13         | 65        | 0.341    | 22.17      | 0.026                             | 0.338         |
| 14         | 65        | 0.315    | 20.48      | 0.024                             | 0.336         |
| 15         | 65        | 0.292    | 18.98      | 0.023                             | 0.345         |
| 15         | 1000      | 0.292    | 292        | 0.348                             | 5.22          |
| V = 839.86 |           |          |            |                                   | D = 9.452     |

Value of the bond = Rs. 839.86

Duration of the bond = 9 yrs 5 months

10. R.S. Verma is considering investing in a bond currently selling for Rs. 8,785.07. The bond has four years to maturity, a Rs. 10,000 face value, and a 8 percent coupon rate. The next annual interest payment is due one year from today. The approximate discount factor for investments of similar risk is 10 percent.
- (i) Calculate the intrinsic value of the bond. Based on this calculation, should Verma purchase the bond ?
- (ii) Calculate the YTM of the bond. Based on this calculation, should Verma purchase the bond ?

**Sol. :**

- (i) The intrinsic value of a bond is equal to the discounted value of the cash flows.

$$\begin{aligned}
 V &= \frac{\text{Rs. } 800}{(1+10)^1} + \frac{\text{Rs. } 800}{(1+10)^2} + \frac{\text{Rs. } 800}{(1+10)^3} + \frac{\text{Rs. } 10,800}{(1+10)^4} \\
 &= \text{Rs. } 727.27 + \text{Rs. } 661.16 + \text{Rs. } 601.05 + \text{Rs. } 7,376.55 \\
 &= \text{Rs. } 9,366.03
 \end{aligned}$$

Because the bond is actually selling for Rs. 8,785.07, the bond is underpriced and Verma should purchase it.

- (ii) The YTM is the interest rate that equates the price of the bond to the discounted value of the bond's cash flows. In this particular problem :

$$\text{Rs. } 8,785.07 = \frac{\text{Rs. } 800}{(1+YTM)^1} + \frac{\text{Rs. } 800}{(1+YTM)^2} + \frac{\text{Rs. } 800}{(1+YTM)^3} + \frac{\text{Rs. } 10,800}{(1+YTM)^4}$$

YTM = 12 percent

Because the YTM (12 percent) is greater than the appropriate discount rate (10 percent) for this bond, Verma should purchase it.

11. From the price data that follow, compute the holding period returns :

| Time | Stock Price |
|------|-------------|
| 1    | Rs. 25      |
| 2    | 30          |
| 3    | 24          |
| 4    | 32          |

**Sol. :**

| Time | Stock Price | Holding-Period Return               |
|------|-------------|-------------------------------------|
| 1    | Rs. 25      |                                     |
| 2    | 30          | (Rs. 30 / Rs. 25) – 1 = 20 percent  |
| 3    | 24          | (Rs. 24 / Rs. 30) – 1 = –30 percent |
| 4    | 32          | (Rs. 32 / Rs. 24) – 1 = 33 percent  |

12. (a) An investor 'A' purchased a bond at a price of Rs. 900 with Rs. 100 as coupon payment and sold it at Rs. 1000. What is his holding period return?
- (b) If the bond is sold for Rs. 750 after receiving Rs. 100 as coupon payment, then what is the holding period return ?

**Sol. :**

$$\begin{aligned} \text{(a) Holding period return} &= \frac{\text{Price gain} + \text{Coupon payment}}{\text{Purchase price}} \\ &= \frac{100 + 100}{900} = \frac{200}{900} = .2222 \end{aligned}$$

$$\text{Holding period return} = 22.22\%$$

$$\begin{aligned} \text{(b) Holding period return} &= \frac{\text{Gain or loss} + \text{Coupon payment}}{\text{Purchase price}} \\ &= \frac{-150 + 100}{900} = \frac{-50}{900} = -0.555 \end{aligned}$$

$$\text{Holding period return} = -5.5\%.$$

13. A four year bond with the 7% coupon rate and maturity value of Rs. 1000 is currently selling at Rs. 905. What is its yield to maturity ?

**Sol. :**

Since all the three values are known out of the four values, it can be found out by using trial and error procedure. Let us try ten percent.

| Cashflow | PV for 10% | PV of CF          |
|----------|------------|-------------------|
| 70       | 0.9091     | 63.64             |
| 70       | 0.8264     | 57.85             |
| 70       | 0.7513     | 52.59             |
| 1070     | 0.6830     | 730.82            |
|          |            | <u>Rs. 904.90</u> |

The yield to maturity is 10 percent

The approximate yield to maturity can be found out by using the following formula too.

$$Y = \frac{C + (P \text{ or } D / \text{years to maturity})}{(P_0 + F) / 2}$$

Y = Yield to maturity

C = Coupon interest

P or D = Premium or discount

P<sub>0</sub> = Present value

F = Face value

In the case of previous sum

$$= \frac{70 + (95/4)}{(905 + 1000)/2} = \frac{93.75}{952.5} = 0.098$$

Y = 9.8%

Yield to maturity is 9.8%

14. (a) An investor 'A' purchased a bond at a price of Rs. 900 with Rs. 100 as coupon payment and sold it at Rs.1000
- (b) If the bond is sold for Rs. 750 after receiving Rs. 100 as coupon payment, then what is the holding period return ?

*Sol. :*

$$\begin{aligned} \text{a) Holding period return} &= \frac{\text{Price gain} + \text{Coupon Payment}}{\text{Purchase price}} \\ &= \frac{100 + 100}{900} = \frac{200}{900} = .2222 \end{aligned}$$

Holding period return = 22.22%

$$\begin{aligned} \text{b) Holding period return} &= \frac{\text{Gain or loss} + \text{Coupon Payment}}{\text{Purchase price}} \\ &= \frac{-150 + 100}{900} = \frac{-50}{900} = -.0555 \end{aligned}$$

Holding period return = 5.5%

The current yield The current yield is the coupon payment as a percentage of current market price.

$$\text{Current yield} = \frac{\text{Annual coupon payment}}{\text{Current market price}}$$

With this measure the investors can find out the rate of cashflow from their investments every year. The current yield differs from the coupon rate, since the market price differs from the face value of the bond. When the bond's face value and market price are same, the coupon rate and the current yield would be the same. For example, when the coupon payment is 8% for Rs. 100 bond with the same market price, the current yield is 8% If the current market price is Rs. 80 then the current yield would be 10%

15. Arvind considers Rs. 1000 par value bond bearing a coupon rate of 11% that matures after 5 years. He wants a minimum yield to maturity of 15%. The bond is currently sold at Rs. 870. Should he buy the bond ?

*Sol. :*

$$P_0 = \frac{\text{Coupon}}{(1+Y)} + \dots + \frac{\text{Coupon} + \text{Face value}}{(1+Y)^5}$$

$$P_0 = (\text{Coupon}) (\text{PVIFA}, n) + (\text{Principal amount}) (\text{PVIF}/k, n)$$

$$P_0 = 110 (\text{PVIFA } 15\%, 5 \text{ years}) + 1000 (\text{PVIF}/15\%, 5 \text{ years})$$

$$= 110 (3.352) + 1000 (.497)$$

$$= 368.7 + 497 = 865.7.$$

At Arvind's anticipated minimum yield of 15% the price should be Rs. 865.70 but the market price is higher. Hence, he should not buy.

16. A bond of Rs. 1000 face value, bearing a coupon rate of 12% will mature after 7 years. What is the value of the bond if the discount rates are 14% and 12% ?

*Sol. :*

$$P_0 = C (PVIFA k, n) + F (PVIF k, n)$$

$$= 120 (PVIFA 14\%, 7 \text{ years}) + 1000 (PVIF k, n)$$

$$= 120 (4.288) + 1000 (.400)$$

$$= 514.56 + 400$$

$$= 914.56$$

$$P_0 = 120 (PVIFA 12\%, 7 \text{ years}) + 1000 (PVIF 12\%, 7 \text{ years})$$

$$= 120 (4.564) + 1000 (.452)$$

$$= 547.68 + 452 = 999.68$$

17. Anand owns Rs. 1000 face value bond with five years to maturity. The bond has an annual coupon of Rs. 75. The bond is currently priced at Rs. 970. Given an appropriate discount rate of 10%, should Anand hold or sell the bond ?

*Sol. :*

$$P_0 = \text{Coupon} (PVIFA k, n) + \text{Principal amount} (PVIF k, n)$$

$$= 75 (PVIFA 10\%, 5 \text{ years}) + 1000 (PVIF 10\%, 5 \text{ years})$$

$$= 75 \times 3.7908 + 1000 (.6209)$$

$$= \text{Rs. } 284.31 + 620.9$$

$$= \text{Rs. } 905.21$$

The market price Rs. 970 is higher than the estimated price Rs. 905.2. It is better for Anand to sell the bond.

### Problems on Maculay's Duration (MD)

18. Prem is considering the purchase of a bond currently selling at Rs. 878.50. The bond has four years to maturity, face value of Rs. 1,000 and 8% coupon rate. The next annual interest payment is due after one year from today. The required rate of return is 10%.

a) Calculate the intrinsic value (Present value) of the bond. Should Prem buy the bond ?

b) Calculate the yield to maturity of the bond

*Sol. :*

a) Intrinsic value of the bond

$$P_0 = \frac{C_1}{(1+Y)} + \frac{C_2}{(1+Y)^2} + \frac{C_3}{(1+Y)^3} + \frac{C_4 + F}{(1+Y)^4}$$

$$\begin{aligned}
 &= C \times PVIFA_{k,n} + F \times PVIF_{k,n} \\
 &= 80 \times 3.1699 + 1000 \times 0.6830 \\
 P_o &= \text{Rs. } 936.592
 \end{aligned}$$

The intrinsic value is Rs. 936.596 and the market price of the bond is Rs. 878.50. the bond is underpriced and Prem should buy

b) The yield to maturity is to be found out by trial and error method

$$\begin{aligned}
 P_o &= \frac{C_1}{(1+Y)} + \frac{C_2}{(1+Y)^2} + \frac{C_3}{(1+Y)^3} + \frac{C_4 + F}{(1+Y)^4} \\
 P_o &= \frac{80}{(1+Y)} + \frac{80}{(1+Y)^2} + \frac{80}{(1+Y)^3} + \frac{1080}{(1+Y)^4}
 \end{aligned}$$

12% can be tried

$$\begin{aligned}
 P_o &= C \times (PVIFA_{k,n}) + F \times (PVIF_{k,n}) \\
 878.50 &= 80 \times 3.0373 + 1000 \times 0.6355 \\
 878.50 &= 242.98 + 635.5 \\
 878.50 &= 878.50
 \end{aligned}$$

The calculated bond yield is 12%, which is higher than the required rate of return. Hence, Prem should purchase it.

19. Anand owns Rs. 1,000 face value bond with five years to maturity. The bond has an annual coupon of Rs. 75. The bond is currently priced at Rs. 970. Given an appropriate discount rate of 10%, should Anand hold or sell the bond ?

Sol. :

$$\begin{aligned}
 P_o &= (\text{Coupon}) (PVIFA, k, n) + (\text{Principal amount}) (PVIF/k, n) \\
 &= 75 (PVIFA 10\%, 5 \text{ years}) + 1000 (PVIF/10\%, 5 \text{ yrs}) \\
 &= \text{Rs. } 75 \times 3.7908 + \text{Rs. } 1000 \times 0.6209 \\
 &= \text{Rs. } 284.31 + 620.9 \\
 &= \text{Rs. } 905.21
 \end{aligned}$$

The market price Rs. 970 is higher than the estimated price Rs. 905.2. It is better for Anand to sell the bond.

20. A bond of Rs. 1000 face value, bearing a coupon rate of 12% will mature after 7 years. What is the value of the bond if the discount rates are 14% and 12% ?

Sol. :

$$\begin{aligned}
 P_o &= C (PVIFA k, n) + F (PVIFk, n) \\
 P_o &= 120 (PVIFA 14\%, 7 \text{ years}) + 1000 (PVIF/k, n)
 \end{aligned}$$

$$= 120 (4.288) + 1000 (.400)$$

$$= 514.56 + 400$$

$$= 914.56$$

$$P_o = 120 (\text{PVIFA } 12\%, 7 \text{ years}) + 1000 (\text{PVIF } 12\%, 7 \text{ years})$$

$$= 120 (4.564) + 1000 (.452)$$

$$= 547.68 + 452 = 999.68$$

21. Arvind considers Rs. 1000 par value bond bearing a coupon rate of 11% that matures after 5 years. He wants a minimum yield to maturity of 15%. The bond is currently sold at Rs. 870. Should he buy the bond ?

*Sol. :*

$$P_o = \frac{\text{Coupon}}{(1+Y)} + \dots + \frac{\text{Coupon} + \text{Face Value}}{(1+Y)^5}$$

$$P_o = (\text{Coupon}) (\text{PVIFA}, n) + (\text{Principal amount}) (\text{PVIF}/k, n)$$

$$P_o = 110 (\text{PVIFA } 15\%, 5 \text{ years}) + 1000 (\text{PVIF}/15\%, 5 \text{ yrs})$$

$$= 110 (3.352) + 1000 (.497)$$

$$= 368.7 + 497 = 865.7$$

At Arvind's anticipated minimum yield of 15% the price should be Rs. 865.70 but the market price is higher. Hence, he should not buy.

22. The value of the bonds depends upon three factors namely, the coupon rate, years to maturity and the expected yield to maturity or the required rate of return. On the basis of this, bond value theorems have been evolved

### Theorem 1

If the market price of the bond increases, the yield would decline and vice versa

| Example         | Bond A     | Bond B      |
|-----------------|------------|-------------|
| Par value       | Rs. 1000   | Rs. 1000    |
| Coupon rate     | 10%        | 10%         |
| Maturity period | 2 years    | 2 years     |
| Market price    | Rs. 874.75 | Rs. 1035.66 |
| Yield           | 18%        | 8%          |

Even though the bonds are of same maturity and coupon rate, the difference in the market price leads to difference in the yield. The bond with low price has high yield because with lesser amount of money more return is earned

### Theorem 2

If the bond's yield remains the same over its life, the discount or premium depends on the maturity period.

| Example         | Bond A    | Bond B    |
|-----------------|-----------|-----------|
| Par value       | Rs. 1000  | Rs. 1000  |
| Coupon rate     | 10%       | 10%       |
| Yield           | 15%       | 15%       |
| Maturity period | 2 years   | 3 years   |
| Market price    | 918.71    | 885.86    |
| Discount        | Rs. 81.29 | Rs.114.14 |

This means, the bond with a short term to maturity sells at a lower discount than the bond with a long term to maturity

### Theorem 3

A raise in the bond's price for a decline in the bond's yield is greater than the fall in the bond's price for a raise in the yield. Take a bond of 10% coupon rate, maturity period of a five years with the face value of Rs. 1000. If the yield declines by 2%, that is to 8% then the bond price will be Rs. 1079.87

$$= \text{Rs. } 100 (\text{PVIFA } 8\%, 5 \text{ yrs}) + 1000 (\text{PVIF } 8\%, 5 \text{ yrs})$$

$$= \text{Rs. } 100 \times 3.9927 + \text{Rs. } 1000 \times 0.6806$$

$$= \text{Rs. } 1079.87$$

If, the yield increases by 2% then the bond price will be Rs. 927.88

$$= \text{Rs. } 100 (\text{PVIFA } 12\%, 5 \text{ yrs}) + 1000 (\text{PVIF } 12\%, 5 \text{ yrs})$$

$$= \text{Rs. } 100 \times 3.6048 + \text{Rs. } 1000 \times 0.5674$$

$$= \text{Rs. } 927.88$$

Now the fall in yield has resulted in a raise of Rs. 79.86 but the raise in the yield caused a variation of Rs. 72.22 in the price.

23. A Rs. 100 per value bond bearing a coupon rate of 11% matures after 5 years. The expected yield to maturity is 15%. The present market price is Rs. 82. Can the investor buy it ?

Sol. :

$$\begin{aligned}
 \text{NPV} &= \frac{\text{Coupon}}{(1+y)^t} + \frac{P_m}{(1+y)^t} \\
 &= 11 \times 3.3522 + 100 \times 0.4972 \\
 &= 36.87 + 49.72 = 86.59 \\
 &= 86.59 - 82 = 4.59.
 \end{aligned}$$

The net present value is higher that is, market value is lower than the calculated value and hence the bond is underpriced and hence, the investor can buy the bond.

24. (a) Determine the price of Rs. 1,000 zero coupon bond with yield to maturity of 18 percent and 10 years to maturity.
- (b) What is YTM of this bond if its price is Rs. 220 ?

Sol. :

$$(a) \text{ Price} = \frac{\text{Face value}}{(1 + \text{YTM})^n} = \frac{1,000}{(1 + .18)^{10}} = \frac{1,000}{5.2338} = \text{Rs. } 191.07$$

$$(b) \left( \frac{\text{Face value}}{\text{Bond value}} \right)^{1/T} - 1 = \text{YTM}$$

$$\left( \frac{\text{Rs. } 1000}{\text{Rs. } 220} \right)^{1/10} - 1 = \text{YTM}$$

$$(4.55)^{.1} - 1 = \text{YTM} ; 1.163 - 1 = .163$$

$$\text{YTM} = 16.3$$

25. Calculate the duration for a bond A and B with 7% and 8% coupons having maturity period of 4 years. The face value is ` 1000 and both the bonds are currently yielding 6%.

Sol. :

**(i) Bond A**

Face value of bond A = Rs. 1000

Coupon rate = 7%

Coupon payment =  $1000 \times 7\% = \text{` } 70$

Bond YTM = 6%

Maturity Period = 4 yrs.

Bond duration / Maculays duration can be calculated as follows:

| Year                                   | Cash | YTM<br>flows | PV of<br>@ 6% | $w = \frac{\text{Pv of CFAT}}{\text{V cash flows}}$ | $D = w \times \text{year}$ |
|----------------------------------------|------|--------------|---------------|-----------------------------------------------------|----------------------------|
| 1                                      | 70   | 0.943        | 66.01         | 0.064                                               | 0.064                      |
| 2                                      | 70   | 0.889        | 62.23         | 0.06                                                | 0.12                       |
| 3                                      | 70   | 0.839        | 58.73         | 0.057                                               | 0.171                      |
| 4                                      | 70   | 0.792        | 55.44         | 0.054                                               | 0.216                      |
| 4                                      | 1000 | 0.792        | 792           | 0.766                                               | 3.064                      |
| v = 1034.41                            |      |              |               | D = 3.635                                           |                            |
| Duration = 3.635 years                 |      |              |               |                                                     |                            |
| Duration for Band A = 3 years 6 months |      |              |               |                                                     |                            |

**(ii) Bond B**

Face value of Bond B = 1000

Coupon rate = 8%

Coupon payment =  $1000 \times 8\% = \text{Rs. } 80$

Yield to maturity = 6%

Maturity period = 4 years

Bond duration/Maculays duration can be calculated as follows :

| Year                               | Cash | YTM<br>flows | PV of<br>@ 6% | $w = \frac{\text{Pv of CFAT}}{V}$<br>cash flows | D = w × year |
|------------------------------------|------|--------------|---------------|-------------------------------------------------|--------------|
| 1                                  | 80   | 0.943        | 75.44         | 0.071                                           | 0.071        |
| 2                                  | 80   | 0.889        | 71.12         | 0.067                                           | 0.134        |
| 3                                  | 80   | 0.839        | 67.12         | 0.063                                           | 0.189        |
| 4                                  | 80   | 0.792        | 63.36         | 0.059                                           | 0.236        |
| 4                                  | 1000 | 0.792        | 792           | 0.741                                           | 2.964        |
| v = 1069.04                        |      |              |               | D = 3.594                                       |              |
| Bond Duration = 3.594 years        |      |              |               |                                                 |              |
| Bond B duration = 3 years 6 months |      |              |               |                                                 |              |

26. Betty holds a five-year bond with a par value of \$1,000 and coupon rate of 5%. For simplicity, let's assume that the coupon is paid annually and that interest rates are 5%. What is the Macaulay duration of the bond ?

Sol. :

$$\begin{aligned}
 &= \frac{\sum_{t=1}^n \frac{t \cdot C}{(1+i)^t} + \frac{n \cdot M}{(1+i)^n}}{C \cdot \left[ \frac{1 - \left[ \frac{1}{(1+i)^n} \right]}{i} \right] + \frac{M}{(1+i)^n}} \\
 &= \frac{\frac{1 \cdot 50}{(1+0.05)} + \frac{2 \cdot 50}{(1+0.05)^2} + \frac{3 \cdot 50}{(1+0.05)^3} + \frac{4 \cdot 50}{(1+0.05)^4} + \frac{5 \cdot 50}{(1+0.05)^5} + \frac{5 \cdot 1000}{(1+0.05)^5}}{50 \cdot \left[ \frac{1 - (1+0.05)^{-5}}{0.05} \right] + \frac{1000}{(1+0.05)^5}} \\
 &= \frac{47.619 + 90.7029 + 129.5756 + 164.5405 + 195.8815 + 3917.6308}{216.4738335 + 783.5261665} \\
 &= 4.55 \text{ years}
 \end{aligned}$$

Fortunately, if you are seeking the Macaulay duration of a zero-coupon bond, the duration would be equal to the bond's maturity, so there is no calculation required.

27. A company had issued bond with a face value of Rs. 1000, coupon of 12% payable semi-annually and time to maturity of 8 years. The market rate of interest is 14%. Find the duration of the bond two years after is issued.

**Sol. :**

Face value of bond = Rs. 1000

Coupon rate = 12%

Coupon payment =  $1000 \times 12\% = \text{Rs. } 120$

Time to maturity = 8 years

YTM = 14%

| Year       | Cash flows | PV @ 14% | PV of CFAT | $W_x = \frac{\text{PV of CFAT}}{V_0}$ | MD = $\sum W_x \cdot \text{year}$ |
|------------|------------|----------|------------|---------------------------------------|-----------------------------------|
| 1          | 120        | 0.877    | 105.24     | 0.114                                 | 0.114                             |
| 2          | 120        | 0.769    | 92.28      | 0.100                                 | 0.2                               |
| 3          | 120        | 0.675    | 81         | 0.088                                 | 0.264                             |
| 4          | 120        | 0.592    | 71.04      | 0.077                                 | 0.308                             |
| 5          | 120        | 0.519    | 62.28      | 0.068                                 | 0.34                              |
| 6          | 120        | 0.456    | 54.72      | 0.059                                 | 0.354                             |
|            | 1000       | 0.456    | 456        | 0.494                                 | 2.964                             |
| V = 922.56 |            |          |            |                                       | 4.544 yr                          |

Bond duration = 4.5 yrs.

28. Calculate the duration for bond 'A' and bond 'B' with 7% and 8% coupons having a maturity period of 4 years. The face value of the bonds are Rs. 1000/- and both the bonds are currently yielding 6%. Which one is advisable and why?

**Sol. :**

### Calculation of Bond Duration

#### For Bond A

| Year            | Cash flows | PV @ 6% | PV of CFAT | $W_x = \frac{\text{PV of CFAT}}{V_0}$ | MD = $\sum W_x \cdot \text{year}$ |
|-----------------|------------|---------|------------|---------------------------------------|-----------------------------------|
| 1               | 70         | 0.943   | 66.01      | 0.064                                 | 0.064                             |
| 2               | 70         | 0.89    | 62.3       | 0.060                                 | 0.12                              |
| 3               | 70         | 0.839   | 58.73      | 0.057                                 | 0.171                             |
| 4               | 70         | 0.792   | 55.44      | 0.054                                 | 0.216                             |
| 4               | 1000       | 0.792   | 792        | 0.766                                 | 3.064                             |
| $V_0 = 1034.48$ |            |         |            |                                       | 3.635                             |

Bond duration = 3.635 yrs.

**For Bond B**

| Year            | Cash flows | PV @ 6% | PV of CFAT | $W_x = \frac{\text{PV of CFAT}}{V_0}$ | $MD = \sum W_x \cdot \text{year}$ |
|-----------------|------------|---------|------------|---------------------------------------|-----------------------------------|
| 1               | 80         | 0.943   | 75.44      | 0.071                                 | 0.071                             |
| 2               | 80         | 0.89    | 71.2       | 0.067                                 | 0.134                             |
| 3               | 80         | 0.839   | 67.12      | 0.063                                 | 0.189                             |
| 4               | 80         | 0.792   | 63.36      | 0.059                                 | 0.236                             |
| 4               | 1000       | 0.792   | 792        | 0.741                                 | 2.964                             |
| $V_0 = 1069.12$ |            |         |            |                                       | 3.594                             |

Bond duration = 3.594 yrs.

Since the Bond A duration is less than Bond B. It is advisable to select Bond A

29. An investor finds the following position in x respect of two bonds I and II

|         | Face value | Coupon rate | Life    | Market price |
|---------|------------|-------------|---------|--------------|
| Bond I  | Rs. 50000  | 8.50%       | 3 years | Rs.4950      |
| Bond II | Rs.10000   | 8.75%       | 4 years | Rs.9900      |

Given that coupon interest is payable annually and the required rate 9% find out the value of both bonds. Which one is better to invest ?

**Ans :**

**Bond I**

Face value of bond  $P_m = \text{Rs. } 50,000$

Market value of bond,  $P_0 = \text{Rs. } 4950$

Coupon rate,  $r = 8.50\%$

$\therefore$  Coupon amount,  $C = 8.50\% \text{ of } 50,000 = \text{Rs. } 4,250$

Nominal yield = Coupon rate = 8.50%

Current yield =  $\frac{C}{P_0} = \frac{4,250}{4,950} = 0.858 = 85.8\%$

**Bond II**

Face value of bond,  $P_m = \text{Rs. } 10,000$

Market value of bond,  $P_0 = \text{Rs. } 9,900$

Coupon rate,  $r = 8.75\%$

$\therefore$  Coupon amount,  $C = 8.75\% \text{ of } 10,000 = 875$

Nominal yield = coupon rate = 8.75%

Current yield =  $\frac{C}{P_0} = \frac{875}{9,900} = 0.088 = 8.88\%$

30.

| Particulars | Bond A  | Bond B  |
|-------------|---------|---------|
| Per value   | ` 1000  | ` 1000  |
| Coupon rate | 10%     | 10%     |
| Yield       | 15%     | 15%     |
| Maturity    | 2 years | 3 years |

Calculate the market price and price change for bond A and B.

**Solution :**

**i) Calculate Market Price and Price Change for Bond A**

$$\begin{aligned}
 P_0 &= C(PVIFA_{15\%, 2}) + P_n(PVIF_{15\%, 2}) \\
 &= 100(1.6257) + 1000(0.7561) \\
 &= 162.57 + 756.1 \\
 &= 918.67
 \end{aligned}$$

$$\begin{aligned}
 \therefore \text{Price change} &= P_n - P_0 \\
 &= 1000 - 918.67 \\
 &= ` 81.33
 \end{aligned}$$

**ii) Calculate Market Price and Price Change for Bond B**

$$\begin{aligned}
 P_0 &= C(PVIFA_{15\%, 3}) + P_n(PVIF_{15\%, 3}) \\
 &= 100(2.2832) + 1000(0.658) \\
 &= 228.32 + 658 = ` 886.32
 \end{aligned}$$

$$\begin{aligned}
 \therefore \text{Price change} &= P_n - P_0 \\
 &= 1000 - 886.32 \\
 &= ` 113.68
 \end{aligned}$$

For a given difference between coupon rate (10%) and YTM (15%), the price change for bond A having 2 years of maturity is ` 81.33 whereas for B with a maturity of 3 years is ` 113.68. Hence, it is proved that larger the maturity the greater will be the price change.

31. Consider a bond with a face value of ` 1000 and carrying a coupon rate of 10%. Calculate market value of a bond with maturities of 3, 5 and 8 years at a YTM of 12% and 14%.

**Solution :**

Given that,

Face value,  $P_n = ` 1000$

Coupon rate,  $r = 10\%$

The computation of market value with different maturities and at different yields can be summarized as follows,

| YTM/Maturities    | 3 years | 5 years | 8 years |
|-------------------|---------|---------|---------|
| 12%               | 952.20  | 927.5   | 900.8   |
| 14%               | 907.2   | 862.30  | 814.9   |
| Percentage change | 73%     | 7.02%   | 9.54%   |
| Rate of change    | 48.41%  |         | 35.89%  |

It is proved that, the bond prices increases with a diminishing rate as the term to maturity increases.

### Working Notes

$$\begin{aligned}
 1. \quad & P_n = ₹ 1000 \\
 & r = 10\% \\
 & n = 3 \text{ years} \\
 & \text{YTM} = 12\% \\
 \therefore & P_0 = C(PVIFA_{12\%, 3}) + P_n(PVIF_{12\%, 3}) \\
 & = 100(2.402) + 1000(0.712) \\
 & = 240.20 + 712.00 = ₹ 952.20
 \end{aligned}$$

Similarly,

$$\begin{aligned}
 2. \quad & P_n = ₹ 1000 \\
 & r = 10\% \\
 & n = 3 \text{ years} \\
 & \text{YTM} = 14\% \\
 & = 100(2.322) + 1000(0.675)
 \end{aligned}$$

$$\begin{aligned}
 \therefore & P_0 = ₹ 907.2 \\
 3. \quad & P_n = ₹ 1000 \\
 & r = 10\% \\
 & n = 5 \text{ years} \\
 & \text{YTM} = 12\% \\
 & = 100(3.605) + 1000(0.567)
 \end{aligned}$$

$$\begin{aligned}
 \therefore & P_0 = ₹ 927.5 \\
 4. \quad & P = ₹ 1000 \\
 & r = 10\% \\
 & n = 5 \text{ years} \\
 & \text{YTM} = 14\% \\
 & = 100(3.433) + 1000(0.519)
 \end{aligned}$$

$$\begin{aligned}
 \therefore & P_0 = ₹ 862.3 \\
 5. \quad & P_n = ₹ 1000 \\
 & r = 10\%
 \end{aligned}$$

$$\begin{aligned}
 n &= 8 \text{ years} \\
 \text{YTM} &= 12\% \\
 &= 100(4.968) + 1000(0.404) \\
 \therefore P_0 &= ₹ 900.8 \\
 6. \quad P_n &= ₹ 1000 \\
 r &= 10\% \\
 n &= 8 \text{ years} \\
 \text{YTM} &= 14\% \\
 &= 100(4.639) + 1000(0.351) \\
 \therefore P_0 &= ₹ 814.9
 \end{aligned}$$

7. Percentage change,  
With 3 years of maturity,

$$\begin{aligned}
 &= \frac{952.20 - 907.2}{952.20} \times 100 \\
 &= 4.73\%
 \end{aligned}$$

Similarly, for 5 years = 7.02 % and

For 8 years = 9.54%

$$8. \quad \text{Rate of change} = \frac{7.02 - 4.73}{4.73} \times 100 = 48.41\%$$

and then similarly for 8 years it is 35.89%.

32. Prem is considering the purchase of a bond currently selling at Rs.,878.50. The bond has four years to maturity, face value of Rs , 1,000 and 8% coupon rate. The next annual interest payment is due after one year from today. The required rate of return is 10%.
- Calculate the intrinsic value (Present value) of the bond. Should Prem buy the bond?
  - Calculate the yield to maturity of the bond.

### Solution

- a) Intrinsic value of the bond

$$\begin{aligned}
 P_0 &= \frac{C_1}{(1+Y)} + \frac{C_2}{(1+Y)^2} + \frac{C_3}{(1+Y)^3} + \frac{C_4 + F}{(1+Y)^4} \\
 &= C \times \text{PVIFA}_{k,n} + F \times \text{PVIF}_{k,n} \\
 &= 80 \times 3.1699 + 1000 \times 0.6830 \\
 P_0 &= \text{Rs. } 936.592
 \end{aligned}$$

The intrinsic value is Rs.936.596 and the market price of the bond is Rs. 878.50. The bond is underpriced and Prem should buy.

$$P_0 = \frac{C_1}{(1+Y)} + \frac{C_2}{(1+Y)^2} + \frac{C_3}{(1+Y)^3} + \frac{C_4 + F}{(1+Y)^4}$$

$$P_0 = \frac{80}{(1+Y)^1} + \frac{80}{(1+Y)^2} + \frac{80}{(1+Y)^3} + \frac{1080}{(1+Y)^4}$$

12% can be tried

$$P_0 = C \times (PVIFA_{k,n}) + F \times (PVIF_{k,n})$$

$$878.50 = 80 \times 3.073 + 1000 \times .6355$$

$$878.50 = 242.98 + 635.5$$

$$878.50 = 878.5$$

The calculated bond yield is 12%, which is higher than the required rate of return. Hence, Prem should purchase it.

33. Arun buys a bond with four years to maturity. The bond has a coupon rate of 9 per cent and is priced Rs. 100 in the market.
- What is the duration of the bond ?
  - What will be the percentage change in the price of the bond if the interest rate rises to 10 per cent ?

**Solution :**

$$\text{Duration } D = \left[ \sum_{t=1}^T \frac{P_v(C_t)}{P_0} \times t \right]$$

| Year | Cash (C <sub>t</sub> ) | PVIF   | PVIF Cash flow | $\frac{PV(C_t)}{P_0}$ | PVIF of Coupon x Time |
|------|------------------------|--------|----------------|-----------------------|-----------------------|
| 1    | 9                      | 0.9174 | 8.256          | 0.0825                | 0.0826                |
| 2    | 9                      | 0.8417 | 7.575          | 0.0758                | 0.1515                |
| 3    | 9                      | 0.7722 | 6.950          | 0.0695                | 0.2085                |
| 4    | 109                    | 0.7084 | 77.215         | 0.7722                | 3.0888                |
|      |                        |        | 99.996         |                       | 3.5314                |

Duration is 3.53 years.

$$\text{b) Change in price} = \frac{-MD[\Delta BP]}{100}$$

$$\text{Modified duration} = \frac{D}{\frac{1+r}{P}}$$

$$D = \text{Duration (Year)}$$

$r$  = market yield (decimal)

$P$  = Interest payments per year.

$$= \frac{3.531}{10/9} = \frac{3.531}{1.11}$$

$$= 3.181$$

$$= \frac{-MD[\Delta BP]}{100}$$

$$= \frac{-3.181[100]}{100}$$

$$= -3.181\%$$

For 1 per cent rise in the interest rate the price declines by 3.181 per cent.

34. A bond with face value of ₹ 1000 has left over period of maturity of 4 years. Its coupon rate is 8% and YTM is 10%. Calculate Macaulay's Duration and Modified Duration.

**Solution :**

#### Macaulay's Duration

CF = Cash flows i.e., coupon amount

$$= ₹ 80$$

Received in year 1, 2 and 3 but in 4<sup>th</sup> year it is coupon amount and principal.

#### I. Calculation of Price of a Bond

| Year                                | CFs  | PVIF@10% | PV <sub>s</sub> |
|-------------------------------------|------|----------|-----------------|
| 1                                   | 80   | 0.9091   | 72.73           |
| 2                                   | 80   | 0.8264   | 66.11           |
| 3                                   | 80   | 0.7513   | 60.10           |
| 4                                   | 1080 | 0.6830   | 737.64          |
| Bond price, P <sub>0</sub> = 936.58 |      |          |                 |

#### II. Determination of Macaulay's Duration

| Year | PVCF (PV <sub>s</sub> ) | PVCF as Proportion of (W <sub>i</sub> ) = $\frac{PV_s}{P_0}$ | n × W <sub>i</sub> |
|------|-------------------------|--------------------------------------------------------------|--------------------|
| 1    | 72.73                   | 0.0777                                                       | 0.0777             |
| 2    | 66.11                   | 0.0706                                                       | 0.1412             |
| 3    | 60.10                   | 0.0641                                                       | 0.1923             |
| 4    | 737.64                  | 0.7876                                                       | 3.1504             |
|      | P <sub>0</sub> = 936.58 |                                                              | MD = 3.5616        |

∴ Macaulay's duration = 3.65 years

**Modified Duration**

$$\begin{aligned} \text{MMD} &= \frac{\text{MD}}{1 + \text{YTM}} \\ &= \frac{3.56}{1 + 0.10} = \frac{3.56}{1.10} = 3.24 \text{ years} \end{aligned}$$

35. Calculate the Macaulay duration of an 8 percent, \$ 1000 par bond that matures in three years if the bond's YTM is 10 percent and interest is paid semiannually.

*Solution :*

Given that,

$$C = 40$$

$$i = 8\%$$

$$I = 4\% \left( \frac{8}{2} \right)$$

$$t = 6$$

$$T = 12(6 \times 2)$$

Macaulay Duration (Semiannually)

$$\begin{aligned} & \frac{C[Z^{Tm+1} - Z - \text{YTM}(T)] + MV(T)(m) \left[ \frac{\text{YTM}}{m} \right]^2}{C \left[ \frac{\text{YTM}}{m} \right] [(Z)^{Tm} - 1] + MV \left[ \frac{\text{YTM}}{m} \right]^2} \\ &= \frac{40[(1 + 0.04)^{13} - 1.04 - 0.48] + (1000)(12)(2)(0.04)^2}{[40(0.04)(1.04)^{12} - 1] + 1000(0.04)} \\ &= \frac{40(1.665 - 1.04 - 0.48) + 38.4}{40(-0.936) + 40} \\ &= \frac{5.8 + 38.4}{-37.44 + 40} \\ &= \frac{44.2}{2.56} = 17.226 \text{ semiannual period} \\ & \quad \text{(or)} \\ &= \frac{17.266}{2} = 8.633 \text{ years.} \end{aligned}$$

## Exercise Problems

1. A four year bond with a 7% coupon rate and maturity of Rs. 1000 is currently selling at Rs. 905. What is its yield to maturity?

Ans :

Current price  $[P_0] = 905$ , Yield to Maturity (YTM) = 10%

2. Rahul recently purchased a bond with a Rs. 1000 face value, at 10% coupon rate and four years to maturity. The bond makes annual interest payments, the first to be received one year from today. Mr. Rahul paid Rs. 1032 for the bond. What is the bond's yield to maturity ?

Ans :

Current Market Price  $[P_0] = 1032$ , Yield to Maturity (YTM) = 18.55%

3. A 10 year bond with 14% coupon rate and with maturity value of Rs. 100 is currently selling at Rs. 80. What is its yield to maturity?

Ans :

Present value  $(P_0) = 80$ , Yield to Maturity (YTM) = 14.74%

4. The Madsoft Company recently issued a Rs. 1000, 12% semiannual bond with 20 years of maturity (a) What will be the price of the bond, if the market rate of interest is 14%? (b) Determine the bond's Macaulay's duration when it was issued and (c) Two years later.

Ans :

Current Price  $[P_0] = 866.70$ , Macaulay's Duration (MD) = 7.279%

5. Mr. Parthik will be making a car payment of Rs. 316 per month for the next 4 years. If the rate of interest on his loan is 1% per month, what is the duration of the loan?

Ans :

Macaulay's Duration (MD) = 22.5%

6. Strong muscles sports equipment had issued a 14% semiannual bonds with a life of 15 years and a face value of Rs. 600. These bonds are currently available for Rs. 690 and have 12 more years for maturity. Find the YTM.

Further, if the bond is callable five years from now at a premium of 15% on its face value, find the YTC.

Ans :

[Yield to Call = 12.37]

## Short Question and Answers

**Q1. Define the terms :**

- i) **Maturity**
- ii) **Coupon rate**
- iii) **Principal amount**

**Ans :**

**a) Maturity**

Maturity of a bond refers to the date, on which the bond matures, which is the date on which the borrower has agreed to repay the principal. Term-to-Maturity refers to the number of years remaining for the bond to mature. The Term-to-Maturity changes everyday, from date of issue of the bond until its maturity. The term to maturity of a bond can be calculated on any date, as the distance between such a date and the date of maturity. It is also called the term or the tenure of the bond.

**b) Coupon**

Coupon refers to the periodic interest payments that are made by the borrower (who is also the issuer of the bond) to the lender (the subscriber of the bond). Coupon rate is the rate at which interest is paid, and is usually represented as a percentage of the par value of a bond.

**c) Principal**

Principal is the amount that has been borrowed, and is also called the par value or face value of the bond. The coupon is the product of the principal and the coupon rate. The name of the bond itself conveys the key features of a bond. For example, a GS CG2008 11.40% bond refers to a Central Government bond maturing in the year 2008 and paying a coupon of 11.40%. Since Central Government bonds have a face value of Rs. 100 and normally pay coupon semi-annually, this bond will pay Rs. 5.70 as six-monthly coupon, until maturity.

**Q2. YTM**

**Ans :**

**Yield to Maturity (YTM)**

The concept of yield-to-maturity (YTM) is one of the widely used tools in bond investment management. Arithmetically, YTM is the single discount factor that makes present value of future cashflows from a bond equal to the current price of the bond. Intuitively, YTM is the rate of return, which an investor can expect to earn if the bond is held till maturity.

The yield to maturity is calculated based on certain assumptions. They are :

1. There should not be any default. Coupon and principal should be paid as per schedule.
2. The investor has to hold the bond till maturity.
3. All the coupon payments should be reinvested immediately at the same interest rate as the same yield to maturity of the bond.

Any difference in the re-investment rate will cause a difference between the actual return and the YTM. In this sense, the YTM is only a measure of yield. It cannot be regarded as a measure of return from a coupon-paying bond.

The YTM concept has a slightly different meaning for Zero Coupon Bonds (ZCB), popularly known as Deep Discount Bonds (DDB). ZCB's do not carry any coupon but are issued at a price discounted to the face value. On maturity, these bonds are redeemed at face value. Since these bonds do not have any coupon payments during the life of the bond, the question of re-investment of coupon payment doesn't arise at all. There is no re-investment risk for ZCBs.

To find out the yield to maturity the present value technique is adopted. The formula is,

$$\text{Present value} = \frac{\text{Coupon}_1}{(1+y)^1} + \frac{\text{Coupon}_2}{(1+y)^2} + \dots + \frac{\text{Coupon}_n + \text{face value}}{(1+y)^n}$$

$Y$  = The yield to maturity.

**Q3. Define the terms :**

- i) **Coupon yield**
- ii) **Current yield**
- iii) **Holding period return**

**Ans :**

- 1) **Coupon Yield :** Coupon Yield or Nominal Yield, is also referred to as the Coupon Rate in the Bond Market parlance. As already mentioned above, this type of Bond Yield is calculated at the end of a financial year and is paid as a fixed coupon amount on the original face value of the particular bond. However, this Bond Yield is expressed as a percentage on the face value of the Bond.
- 2) **Current Yield :** Current Yield, in contrast to the Coupon Yield or Nominal Yield, is a Bond Yield that is determined by dividing the fixed coupon amount (that is paid as a percentage on the face or original value of the specific bond) by the current price value of the particular bond. In other words, Current Bond Yield = Coupon amount / current price of a bond.

The difference between these two Bond Yields (that is, Current Yield and Coupon Yield) is that in one where the coupon payment is divided by the face value of the bond, in the other method, the same amount that is paid annually by the issuer to the bond owner, is divided by the current market price of the bond.

**3) Holding Period of Return**

Holding period return an investor buys a bond and sells it after holding for a period. The rate of return in that holding period is :

Holding period return

$$= \frac{\text{Price gain or loss during the holding period} + \text{Coupon interest rate, if any}}{\text{Price at the beginning of the holding period}}$$

The holding period rate of return is also called the one period rate of return. This holding period return can be calculated daily or monthly or annually. If the fall in the bond price is greater than the coupon payment the holding period return will turn to be negative.

**Q4. Define the terms :**

- i) **Straight Bond Value**
- ii) **Conversion Value**
- iii) **Option Value**

**Ans :**

- 1) **Straight Bond value:** The straight bond value of a convertible bond is the discounted value of the interest and principal repayments receivable on it, if it is retained as a straight debt instrument. The discount rate used in this calculation depends on the general rates and the credit rating of the bond.

The value of straight bond depends on the value of the firm. If a firm's value declines, the value of its straight bond may fall. In the extreme, if the value of a firm shrinks to zero, the value of its straight bonds becomes nil. The maximum value of a firm's straight bond would be equal to the value of an equivalent risk free bond.

- 2) **Conversion Value :** The conversion value is the value of the bond if the bond holders seek conversion. It is equal to the stock price multiplied by the conversion rate. Thus the conversion value is linearly related to the value of the firm as shown. The value of convertible bond theoretically cannot fall below its straight bond value as well as its conversion value. Put differently, the convertible bond has two floor values: its straight bond value and its conversion value.

- 3) Option Value :** In a convertible bond you are not compelled to make an immediate choice in favor of or against conversion. You can wait, learn from hindsight and finally choose the most profitable alternative. The option to wait is valuable. Hence, the value of the convertible bond lies above its floor value.

Value of the convertible bond = Max (Straight bond value, Conversion value) + Option value.

#### Q5. Deep Discount Bond (Or) Zero Coupon Bond

Ans :

##### Valuation of Deep Discount Bonds

The deep discount bond does not carry any interest but it is sold by the issuer company at deep discount from its eventual maturity (nominal) value. The Industrial Development Bank of India (IDBI) issued such DDBs for the first time in the Indian capital market at a price of Rs. 2700 against the nominal value of Rs. 1,00,000 payable after 25 years. Since there is no intermediate payment of interest between the date of issue and the maturity date, these DDBs may also be called zero coupon bonds (ZBBs).

The valuation of a deep discount bond can also be made in the same manner as that of the ordinary bond or debenture. The only point to remember is that there shall be only one cashflow at the time of maturity in case of a deep discount bond. Thus, the value of a DDB may be taken as equal to the present value of this future cashflow discounted at the required rate of return of the investor for number of years equal to the life of the bond.

The following formula can be used to determine the value of a DDB :

$$V_{ddb} = \frac{FV}{(1 + r^n)}$$

where,

$V_{ddb}$  = Value of a deep discount bond

FV = Face value of a DDB payable at maturity

r = Required rate of return

n = Number of years to maturity / Lifeto

DDB.

We can also make use of the present value tables to simplify our calculations.

Symbolically :

$$V_{ddb} = (FV) \times (DF_{i,n}).$$

#### Q6. Macaulay's Duration (MD) Vs Modified Macaulay's Duration (MMD)

Ans :

##### Macaulay Duration

The formula usually used to calculate a bond's basic duration is the Macaulay duration, which was created by Frederick Macaulay in 1938, although it was not commonly used until the 1970s. Macaulay duration is calculated by adding the results of multiplying the present value of each cash flow by the time

it is received and dividing by the total price of the security. Macaulay duration, named for Frederick Macaulay who introduced the concept, is the weighted average maturity of a bond where the weights are the relative discounted cash flows in each period.

$$\text{Macaulay Duration} = \frac{\sum (\text{Cashflow discounted with yield to maturity} \times \text{Time to cashflow})}{\text{Price of the bond}}$$

Macaulay showed that an unweighted average maturity is not useful in predicting interest rate risk. He gave two alternative measures that are useful:

- The theoretically correct **Macaulay-Weil duration** which uses zero-coupon bond prices as discount factors, and
- the more practical form (shown above) which uses the bond's yield to maturity to calculate discount factors.

The key difference between the two is that the Macaulay-Weil duration allows for the possibility of a sloping yield curve, whereas the algebra above is based on a constant value of  $r$ , the yield, not varying by term to payment.

With the use of computers, both forms may be calculated, but the Macaulay duration is still widely used.

The formula for Macaulay duration is as follows :

$$\text{Macaulay Duration} = \frac{\sum_{t=1}^n \frac{t \cdot C}{(1+i)^t} + \frac{n \cdot M}{(1+i)^n}}{P}$$

$n$  = number of cash flows

$t$  = time to maturity

$C$  = cash flow

$i$  = required yield

$M$  = maturity (par) value

$P$  = bond price.

### Modified Macaulay's Duration

Modified duration is a modified version of the Macaulay model that accounts for changing interest rates. Because they affect yield, fluctuating interest rates will affect duration, so this modified formula shows how much the duration changes for each percentage change in yield. For bonds without any embedded features, bond price and interest rate move in opposite directions, so there is an inverse relationship between modified duration and an approximate 1% change in yield. Because the modified duration formula shows how a bond's duration changes in relation to interest rate movements, the formula is appropriate for investors wishing to measure the volatility of a particular bond. Modified duration is calculated as the following :

$$\text{Modified Macaulay's Duration} = \left[ \frac{\text{Macaulay Duration}}{1 + \frac{\text{yield - to - maturity}}{\text{number of coupon periods per year}}} \right]$$

OR

$$\text{Modified Duration} = \left[ \frac{\text{Macaulay Duration}}{\left(1 + \frac{\text{YTM}}{n}\right)} \right]$$

**Q7. Bond Immunisation***Ans :*

Bond Immunization

Bond immunization strategy is a strategy to derive a specified rate of return regardless of what happens to market interest rates over holding period.

Seeks to offset the opposite changes in bond valuation caused by price effect and reinvestment effect

- **Price Effect** : change in bond value caused by interest rate changes
- **Reinvestment Effect** : as coupon payments are received, they are reinvested at higher or lower rates than original coupon rate.

Bond immunization occurs when the average duration of the bond portfolio just equals the investment time horizon. Bond immunization minimizes risk

The financial community has witnessed a wide variation of interest rates in recent years. It is virtually impossible to invest a portfolio of fixed income securities to a certain maturity without paying the price of interest rate changes. One strategy that healthcare organizations can use to eliminate the uncertainty of interest rate changes is bond immunization.

A major problem often encountered in managing a bond portfolio is assuring a given rate of return over specified future periods. Classical immunization is defined as the process by which a fixed income portfolio is created that has an assured rate of return for a specific time horizon irrespective of interest rate changes.

Bond immunization requires a portfolio structure that balances the change in value (prices)

of the portfolio at the end of the investment horizon with the return from the reinvestment of the portfolio cash flows. Immunization may be appropriate to the cash manager who seeks a high degree of assurance of compounded return over a specified investment horizon.

**Q9. Types of Fixed Income Securities.***Ans :*

The different type of fixed income securities that are available in India are as follows,

**1. Bank Deposits**

Deposits with banks are the safest mode of investment and earns a fixed rate of interest. Fixed deposits up to ₹ 1 lakh, in individual accounts covered by deposits insurance scheme.

They are highly liquid as fixed deposit receipts can be enhanced before maturity at a discount of 1% on interest. They are neither tradable nor transferable. Nomination facility is available.

**2. Company Deposits**

These deposits are with manufacturing and non-banking financial companies and earns a fixed rate of interest usually higher than bank fixed deposits rate.

These deposits are neither secured nor guaranteed by RBI and noted for untimely payment of principal amount. They are not exactly liquid. These are neither tradeable nor transferable. They are without nomination facility.

**3. Small Saving Schemes**

These are the safest means of investment and initial investment gets doubled in 5 - 6 years time. In section 88, they are not tradeable and most instruments are accepted by banks as collateral.

#### 4. Debentures and Bonds

These are long term debt instruments usually, yield high rate of interest. The safety factor with these investments can be analyzed by considering credit rating. They are freely tradeable and transferable and hence provides for liquidity. Fixed income securities provide investors with two kinds of income.

#### Q10. Interest Rates.

Ans :

Another reason for variation in the returns from bonds is the change in market interest rates. An investor in bonds receives interest annually or semi-annually. He reinvests these interest amounts each year at the market interest rate. Thus, interest is earned on the interest received from the bonds each year. Finally, at the end of a certain holding period, the investor may sell off the bond at a price which is equal to its face value.

The opposite would be true when the market interest rate moves down. The investor would be able to reinvest the interest only at lower rate than what was expected. However, the bond price will move above its face value as the market interest rate declines. The investor loses on reinvestment of interest but gains on selling the bond.

Thus, the interest rate risk is composed of two risks: reinvestment risk and price risk. The reinvestment risk and the price risk derived from a change in the market interest have an opposite effect on the bond returns. For any bond there is a holding period at which these two effects exactly balance each other. What is lost on reinvestment is exactly compensated by a capital gain on sale of bond and Vice versa. For this holding period there is no interest rate risk. This particular holding period at which interest rate risk disappears is known as the duration of the bond.

#### Q11. Passive Bond Management Strategies

Ans :

Bonds have acquired tremendous significance and managing a portfolio of bonds has become fairly complex. Bond investors may follow a variety of strategies ranging from passive to active.

Many investors believe that securities are fairly priced in the sense that expected returns are commensurate with risks. Such a belief supports a passive strategy, implying that the investor does not actively try to outperform the market.

Of course, a passive strategy does not mean that the investor does nothing. Even a passive investor will have to :

- 1) Determine whether bonds are suitable investment avenues for him,
- 2) Assess risks (default risk, call risk, and so on) and reasonably diversify his holdings, and
- 3) Periodically monitor his bond portfolio to ensure that his holdings match his risk preferences and objectives.

Two commonly followed strategies by passive bond investors are: buy and hold strategy and indexing strategy.

- 1) Buy and Hold Strategy :** An investor who follows a buy and hold strategy selects a bond portfolio and stay with it. He does not churn his bond portfolio in an attempt to improve returns and/or reduce risks. Obviously, such an investor chooses a bond portfolio that promises to meet his investment objectives and hence spends time and effort in his initial selection.
- 2) Indexing Strategy :** If the capital market is efficient, efforts to find under-priced securities or to time the market may be futile. Empirical research on this issue suggests that most investors are unlikely to outperform the market. Hence, they may find an indexing strategy appealing. Such a strategy calls for building a portfolio that mirrors a well-known bond index. In the US, two

well known bond indices are the Shearson Lehman Index and the Salomon Brothers Index. i-BEX is a popular bond index in Index.

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**Q12. Bond Convexity**

*Ans :*

As bond yields go higher, price goes lower. This relationship between price and yield has a convex structure in nature. The term used to describe this relationship is also known as convexity.

If we graph a tangent at a particular price of the bond (touching a point on the curved price-yield curve), the linear tangent is the bond's duration, which is shown in red on the graph below. The exact point where the two lines touch represents Macaulay duration. Modified duration, as we saw in the preceding section of this tutorial, must be used to measure how duration is affected by changes in interest rates. But modified duration does not account for large changes in price. If we were to use duration to estimate the price resulting from a significant change in yield, the estimation would be inaccurate.

Rahul Publications

## UNIT IV

### Equity Valuation:

- a) Equity Analysis & Valuation, Equity Valuation Models, Relative Valuation techniques – Earnings Multiplier Approach, Valuation using P/E ratio, Price to Book Value, Price/sales ratio, Economic value added approach.
- b) Fundamental Analysis, Technical Analysis, Efficient Market Hypothesis.

### 4.1 EQUITY ANALYSIS AND VALUATION

#### Q1. What is equity valuation ? Explain the scope of equity valuation.

Ans :

A stock is a security which possess an ownership in the form of shares. If lends to someone then it would be in the form of bonds and debentures. This is declared publicly.

Stocks are classified in two types, namely,

- 1. Preferred stocks
- 2. Common stocks.

Shareholders who possess preference stocks are given first priority at the time of rendering profits when compared to shareholders who possess common stocks. Therefore, preferred stocks have an edge over the common stocks.

Equity shares are quite easier to be explained than the fixed income securities, but it is quite difficult to be ascertained. The fundamental principles of evaluating the equity shares is similar to the fixed income securities, valuation. In case of equity shares, the factors relating to growth and risk results in greater complexities.

The techniques which are used in the fundamental equity valuation are classified into three categories i.e., Balance Sheet Techniques which involves Book value, Liquidation value and Replacement cost, Discounted Cash Flow Techniques which involves dividend discount model and free cash flow model, relative valuation techniques which involves price-earnings ratio, price-book value ratio and price sales ratio.

### Scope of Equity Valuation

Investment analysts work in a wide variety of organizations and positions; as a result, they find themselves applying the tools of equity valuation to address a range of practical problems. In particular, analysis uses valuation concepts and models to accomplish the following:

- 1) **Selecting Stocks** : Stock selection is the primary use of the tools of equity valuation. Equity analysts must continually address the same question for every common stock that is either a current or prospective portfolio holding or for every stock that he or she is professionally assigned to analyze: Is this a security may clients should purchase, sell or continue to own? Equity analysts attempt to identify securities as fairly valued, over-valued or undervalued, relative to either their own market price or the prices of comparable securities.
- 2) **Inferring (Extracting) Market Expectation** : Market prices reflect the expectations of investors about the future prospects of companies. Analysts may ask what expectations about a company's future performance are consistent with the current market price for that company's stock. This question may concern the analyst for several reasons:
  - i) There are historical and economic reasons that certain values for earnings growth rates and other company

fundamentals may or may not be reasonable. (Fundamentals are characteristics of a company related to profitability, financial strength or risk.)

- ii) The extracted expectation for a fundamental characteristic may be useful as a benchmark or comparison value of the same characteristic for another company.
- 3) **Evaluating Corporate Events** : Investment bankers, corporate analysts and investment analysts use valuation tools to assess the impact of corporate events such as mergers, acquisitions, divestitures, spin-offs, Management Buy-Outs (MBOs) and leveraged recapitalizations. Each of these events may affect a company's future cash-flows and so the value of equity. Furthermore, in mergers and acquisitions, the company's own common stock is often used as currency for the purchase; investors then want to know whether the stock is fairly valued.
- 4) **Seeking Fair Opinions** : The parties to a merger may be required to seek a fair opinion on . The terms of the merger from a third party such as an investment bank. Valuation is at the center of such opinions.
- 5) **Evaluating Business Strategies and Models** : Companies concerned with maximizing shareholder value must evaluate the impact of alternative strategies on share value.
- 6) **Communicating with Analysts and Shareholders** : Valuation concepts facilitate communication and discussion among company management, shareholders and analysts on a range of corporate issues affecting company value.

## 4.2 EQUITY VALUATION MODELS

### Q2. Discuss the Equity Valuation Models.

Ans :

#### i) Book Value

The book value per share is simply the net worth of the company (which is equal to paid up equity capital plus reserves and surplus) divided by the number of outstanding equity shares).

#### ii) Liquidation Value

The liquidation value per share is equal to:

Value realised from liquidating Amount to be paid to all the creditors and

$$\frac{\text{Value realised from liquidating all the assets of the firm} - \text{Amount to be paid to all the creditors and preference shareholders}}{\text{Number of outstanding equity shares}}$$

#### iii) Replacement Cost

Another balance sheet measure considered by analysts in valuing a firm is the replacement cost of its assets less liabilities. The use of this measure is based on the premise that the market value of a firm cannot deviate too much from its replacement cost. If it did so, competitive pressures will tend to align the two.

'A major limitation of the replacement cost concept is that organisational capital, a very- valuable asset, is not shown on the balance sheet. Organisational capital is the value created by bringing together employees, customers, suppliers, managers, and others in a mutually beneficial and productive relationship. An important characteristic of organisational capital is that it cannot be easily separated from the firm as a going entity.

According to the dividend discount model, conceptually a very sound and appealing Model, the value of an equity share is equal to the present value of dividends expected from its ownership plus the present value of the sale price expected when the equity share is sold. For applying the dividend discount model, we will make the following assumptions: (i) dividends are paid annually—this seems to be a common practice for business firms in India; and (ii) the first dividend is received one year after the equity share is bought.

#### iv) Single-period Valuation Model

Let us begin with the case where the investor expects to hold the equity share for one year. The price of the equity share will be :

$$P_0 = \frac{D_1}{(1+r)} + \frac{P_1}{(1+r)}$$

where  $P_0$  is the current price of the equity share,  $D_1$  is the dividend expected a year hence,  $P_1$  is the price of the share expected a year hence, and  $r$  is the rate of return required on the equity share.

#### v) Multi-period Valuation Model

Having learnt the basics of equity share valuation in a single-period framework, we now discuss the more realistic, and also the more complex, case of multi period valuation.

Since equity shares have no maturity period, they may be expected to bring a dividend stream of infinite duration. Hence the value of an equity share may be put as :

$$P_0 = \frac{D_1}{(1+r)} + \frac{D_2}{(1+r)^2} + \dots + \frac{D_\infty}{(1+r)^\infty} = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t}$$

where  $P_0$  is the price of the equity share today,  $D_x$  is the dividend expected a year hence,  $D_2$  is the dividend expected two years hence,  $D_{rx}$  is the dividend expected at the end of infinity, and  $r$  is the expected return.

Equation above represents the valuation model for an infinite horizon. Is it applicable to a finite horizon? Yes. To demonstrate this, consider how an equity share would be valued by an investor who plans to hold it for  $n$  years and sell it thereafter for a price of  $P_n$ . The value of the equity share to him is :

$$P_0 = \frac{D_1}{(1+r)^1} + \frac{D_2}{(1+r)^2} + \dots + \frac{D_n}{(1+r)^n} + \frac{P_n}{(1+r)^n}$$

$$= \sum_{t=1}^n \frac{D_t}{(1+r)^t} + \frac{P_n}{(1+r)^n}$$

#### vi) Free Cash Flow Model

The free cash flow model broadly involves determining the value of the firm as a whole (this value is called the enterprise value) by discounting the free cash flow to investors and then subtracting the value of preference and debt to obtain the value of equity. More specifically, it involves the following procedure.

Note that the total return is the sum of the dividend yield and the capital gain yield:

$$\frac{D_t + P_t - P_{t-1}}{P_{t-1}} = \frac{D_t}{P_{t-1}} + \frac{P_t - P_{t-1}}{P_{t-1}}$$

Total return = Dividend yield + Capital gains yield

1. **Divide the future into two parts, the explicit forecast period and the balance period.** The explicit forecast period (which is usually 5 to 15 years) represents the period during which the firm is expected to evolve and finally reach a steady state—a state in which the return on invested capital (or return on capital employed), growth rate, and cost of capital stabilise.
2. **Forecast the free cash flow, year by year, during the explicit forecast period.** The free cash flow (FCF) is the cash flow available for distribution to capital providers (shareholders and debt holders) after providing for the investments in fixed assets and net working capital required to support the growth of the firm. The FCF is equal to :

NOPAT - Net investment

NOPAT is net operating profit adjusted for taxes. It is equal to: Profit before interest and tax (1 - tax rate). Net investment is simply: Change in net fixed assets + Change in net working capital.

3. **Calculate the weighted average cost of capital** The weighted average cost of capital (WACC) is the blended post-tax cost of equity, preference, and debt employed by the firm.

$$WACC = W_e r_e + W_p r_p + W_d r_d (1 - f)$$

where  $W_e$ ,  $W_p$ , and  $W_d$  are the weights associated with equity, preference, and debt and  $r_e$ ,  $r_p$ , and  $r_d$  are the costs associated with equity, preference, and debt. Note that the cost of debt,  $r_d$ , is adjusted for taxes because the interest on debt is a tax-deductible payment.

4. **Establish the horizon value of the firm.** The horizon value ( $V_H$ ) is the value placed on the firm at the end of the explicit forecast period (H years). Since the FCF is expected to grow at a constant rate of  $g$  beyond H, the horizon value is equal to :

$$V_H = \frac{FCF_{H+1}}{WACC - g}$$

5. **Estimate the enterprise value.** The enterprise value (EV) or the firm value is the present value of the FCF during the explicit forecast period plus the present value of the horizon value.

$$EV = \underbrace{\frac{FCF_1}{(1+WACC)} + \frac{FCF_2}{(1+WACC)^2} + \dots + \frac{FCF_H}{(1+WACC)^H}}_{\text{Present value of the FCF during the explicit forecast period}} + \underbrace{\frac{V_H}{(1+WACC)^H}}_{\text{Present value of horizon value}}$$

6. **Derive the equity value.** The equity value is :  
Enterprise value – Preference value - Debt value
7. **Compute the value per share.** The value per share is simply the equity value divided by the number of outstanding equity shares.

## PROBLEMS

1. Prestige's equity share is expected to provide a dividend of Rs. 2.00 and fetch a price of Rs. 18.00 a year hence. What price would it sell for now if investors' required rate of return is 12 percent ?

**Sol. :**

The current price will be :

$$P_0 = \frac{D_1}{(1+r)} + \frac{P_1}{(1+r)}$$

$$P_0 = \frac{2.0}{(1.12)} + \frac{18.00}{(1.12)} = \text{Rs. } 17.86$$

2. The expected dividend per share on the equity share of Road king Limited is Rs. 2.00. The dividend per share of Roadking Limited has grown over the past five years at the rate of 5 percent per year. This growth rate will continue in future. Further, the market price of the equity share of Roadking Limited, too, is expected to grow at the same rate. What is a fair estimate of the intrinsic value of the equity share of Roadking Limited if the required rate is 15 percent ?

**Sol. :**

$$P_0 = \frac{D_1}{r-g}$$

$$P_0 = \frac{2.00}{0.15 - 0.05} = \text{Rs. } 20.00$$

### Problems on Single Growth Model

3. The current price of a company's share is Rs. 75 and dividend per share is Rs. 5. Calculate the dividend growth rate, if its capitalisation rate is 12 percent.

**Sol. :**

$$P_0 = \frac{D_1}{K_e - g} = \frac{D_0(1+g)}{K_e - g}$$

$$75 = \frac{5(1+g)}{0.12 - g}$$

$$9.0 - 75g = 5 + 5g$$

$$\text{or, } -80g = -4$$

$$\text{or, } g = \frac{-4}{-80}$$

$$= 0.05 \text{ or } 5\%$$

4. The book value per share of a company is Rs. 145.50 and its rate of return on equity is 10 percent. The company follows a dividend policy of 60% pay out. What is the price of its share if the capitalisation rate is 12 percent?

**Sol. :**

Earning per share (EPS)

$$= 145.50 \times \frac{10}{100} = \text{Rs. } 14.55$$

Dividend per share ( $D_1$ )

$$= 14.55 \times \frac{60}{100} = \text{Rs. } 8.73$$

Growth in dividend (g)

$$= 0.10 \times \frac{40}{100} = \text{Rs. } 0.04$$

Price of the share,  $P_0 = \frac{D_1}{K_e - g}$

$$= \frac{8.73}{0.12 - 0.04}$$

$$= \frac{8.73}{0.08}$$

$$= \text{Rs. } 109.13$$

5. Anil estimate that from investment on stock A he would get 15 per cent dividend next year. It would continue to grow by 10 per cent for the rest of the years. The selling price is Rs. 40. He needs a return of 20 per cent per year for his son's educational expenses. Can he invest on stock 'A' ?

Sol. :

$$r = \frac{D_1}{P} + g$$

$$r = \frac{.15}{40} + .10$$

$$= .00375 + .1$$

$$r = .10375$$

$$r = .10375 \times 100$$

$$r = 10.37\%$$

The rate of return from the investment on stock 'A' would be only 10.37 per cent. Since Anil needs 20 per cent return, he should not invest in this stock. He should look for an alternate investment.

6. The company ABC's next year dividend per share is expected to be Rs. 3.50. The dividend in subsequent years is expected to grow at a rate of 10 per cent per year. If the required rate of return is 15 per cent per year, what should be its price? The prevailing market price is Rs. 75.

Sol. :

$$P_0 = \frac{D_1}{r - g}$$

$$D_1 = 3.50$$

$$r = 0.15$$

$$g = 0.10$$

$$= \frac{3.5}{.05}$$

$$= \text{Rs. } 70$$

The investor would be willing to pay Rs. 70 for the share. Since the theoretical price is less than the market price, the investor is advised not to buy.

7. An investor owns the share of Rise company whose current cash dividend is Rs. 3. The constant growth rate is dividend is 16 per cent per year and the required rate of return is 20 per cent. What is the value of the Rise company's share?

Sol. :

We have to use cash dividends expected one year hence.

$$P_0 = \frac{D_1}{(K + g)} + \frac{D_0(1 + g)}{(K - g)}$$

$$= \frac{3.000(1 + .16)}{0.20 - 0.16}$$

$$P_0 = \text{Rs. } 87$$

8. Antique Arts Company would pay Rs. 2.50 as dividend per share for the next year and expected to grow indefinitely at 12%. What would be the equity value if the investor requires 20% return?

Sol. :

$$P_0 = \frac{D_1}{K - g}$$

$$D_1 = 2.50 \text{ (next year dividend)}$$

$$K = 20\%$$

$$g = 12\%$$

$$= \frac{2.5}{.20 - .12} = 31.25$$

9. The equity share of a company sells for Rs. 23 per share and the anticipated growth rate in dividends is Rs. 10.5 percent. In the current year it has paid a dividend of Rs. 2.50 per share.

a) What is the expected rate of return?

b) If the investor requires a 17% return, should he purchase the stock?

Sol. :

Current selling price of share ( $P_0$ ) = Rs. 23

Growth rate = 10.5%

Current year dividend ( $D_0$ ) = Rs. 2.5

$$D_1 = D_0(1 + g)$$

$$= 2.5(1 + 0.105)$$

$$D_1 = \text{Rs. } 2.7625$$

Expected return ( $k_e$ ) = ?

$$P_0 = \frac{D_1}{K_e - g}$$

$$23 = \frac{2.7625}{K_e - 0.105}$$

$$23 (K_e - 0.105) = 2.7625$$

$$23 K_e - 2.415 = 2.7625$$

$$23 K_e - 2.7625 + 2.415$$

$$23 K_e - 5.1775$$

$$K_e = \frac{5.1775}{23} = 0.225$$

$$K_e = 22.5$$

when the required rate of return is 17%

$$P_0 = \frac{D_1}{K_e - g}$$

$$P_0 = \frac{2.7625}{0.17 - 0.105} = \frac{2.7625}{0.065}$$

$$P_0 = 42.5$$

10. Ashok wants to buy Watchful company's stock and hold on it for five years. He estimates that Rs. 3.44 dividend would be paid by the company continuously for the next five years. He hopes to sell the shares at Rs. 60 at the end of the fifth year. What is the present price ? His required rate of return is 10%.

Sol. :

$$P_0 = \frac{D_1}{(1+r)^1} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} + \frac{D_4}{(1+r)^4} + \frac{D_5}{(1+r)^5} + \frac{P_n}{(1+r)^5}$$

$$P_0 = \frac{3.44}{(1.1)^1} + \frac{3.44}{(1.1)^2} + \frac{3.44}{(1.1)^3} + \frac{3.44}{(1.1)^4} + \frac{3.44}{(1.1)^5} + \frac{60}{(1+0.1)^5}$$

$$P_0 = \frac{3.44}{(1.1)^1} + \frac{3.44}{(1.21)^2} + \frac{3.44}{(1.331)^3} + \frac{3.44}{(1.4641)^4} + \frac{3.44}{(1.6105)^5} + \frac{60}{(1+0.105)^5}$$

$$= 3.13 + 2.84 + 2.58 + 2.35 + 2.14 + 37.25$$

$$= \text{Rs. } 50.29$$

11. Vigilant company stock is currently selling at Rs.25 per share. The stock is expected to pay Re.1 as dividend per share at the end of the next year. It is reliably estimated that the stock will be available for as Rs. 29 at the end of one year.

- a) If the forecasts about the dividend and price are accurate, is it advisable to buy at the present price? His required rate of return is 20%
- b) If the investor requires 15% return when the dividend remains constant what should be the price at the end of the first year?

*Sol. :*

$$\begin{aligned} \text{a) } P_0 &= \frac{D_1}{1+r} + \frac{P_1}{1+r} \\ &= \frac{1}{1.2} + \frac{29}{1.2} = 0.833 + 24.16 \end{aligned}$$

$$P_0 = \text{Rs.}25.0$$

Since the estimated price and the actual price are equal, the investor could buy it.

$$\begin{aligned} \text{b) } P_0 &= \frac{D_1}{1+r} + \frac{P_1}{1+r} \\ 25 &= \frac{1}{1.15} + \frac{P_1}{1.15} \\ 25 &= .87 + \frac{P_1}{1.15} \\ 25 - 0.87 &= \frac{P_1}{1.15} \\ P_1 &= 24.13 \times 1.15 \\ P_1 &= 27.75 \end{aligned}$$

The value of the stock at the end of the period should be Rs. 27.75, if the required rate of return is 15%.

12. The balance sheet of Azura Limited at the end of year 0 (the present point of time) is as follows.

Rs. in crore

| <i>Liabilities</i>                                |     | <i>Assets</i>         |     |
|---------------------------------------------------|-----|-----------------------|-----|
| ■ Shareholders' funds                             | 250 | ■ Net fixed assets    | 400 |
| ■ Equity capital (10 crore shares of Rs. 10 each) | 100 | ■ Net working capital | 100 |
| ■ Reserves and surplus                            | 150 |                       |     |
| ■ Loan funds                                      |     |                       |     |
| (9 percent)                                       | 250 |                       |     |
|                                                   | 500 |                       | 500 |

The return on invested capital (ROIC), which is defined as NOPAT/Invested capital, of Azura is expected to be 12 percent. The growth rate in assets and revenues will be 20 percent for the first three years, 12 percent for the next two years, and 8 percent thereafter. The cost of equity is 16 percent.

The effective tax rate of the firm is 33.33 percent and the pre-tax cost of debt is 9 percent. The debt-equity ratio of the firm will be maintained at 1 : 1.

Based on the above information we can calculate the intrinsic value of the equity share as follows:

- a. The explicit forecast period is 6 years because the firm reaches a steady state at the end of 6 years.
- b. The free cash flow forecast for the explicit forecast period is given in Exhibit below.

Rs. in crore

| Year                    | 1      | 2      | 3      | 4     | 5     | 6      |
|-------------------------|--------|--------|--------|-------|-------|--------|
| Asset value (Beginning) | 500.0  | 600.0  | 720.0  | 864.0 | 967.7 | 1083.2 |
| NOPAT                   | 60.0   | 72.0   | 86.4   | 103.7 | 116.1 | 130.1  |
| Net investment          | 100.0  | 120.0  | 144.0  | 103.7 | 116.1 | 86.7   |
| FCF                     | (40.0) | (48.0) | (57.6) | -     | -     | 43.4   |
| Growth rate (%)         | 20     | 20     | 20     | 12    | 12    | 8      |

- c. The weighted average cost of capital is:

$$WACC = 0.5 \times 16 + 0.5 \times 9 (1 - 0.333) = 11 \text{ percent}$$

- d. The horizon value of the firm is

$$V_H = \frac{FCF_{H+1}}{r-g} = \frac{FCF_H(1+g)}{0.11-0.08} = \frac{43.4(1.08)}{0.11-0.08} = \text{Rs. } 1562.4 \text{ crore}$$

- e. The enterprise value of Azura is :

$$EV = \frac{-40.00}{(1.11)} - \frac{48}{(1.11)^2} - \frac{57.6}{(1.11)^3} + \frac{0}{(1.11)^4} + \frac{0}{(1.11)^5} + \frac{43.4}{(1.11)^6} + \frac{1562.4}{(1.11)^6}$$

$$= 741.4 \text{ crore}$$

- f. The equity value of Azura is :

$$\text{Enterprise value} - \text{Debt value} = 741.4 - 250.0 = \text{Rs. } 491.4 \text{ crore}$$

- g. The value per share of Azura is :

$$\text{Rs. } 491.4 \text{ crore} / 10 \text{ crore} = \text{Rs. } 49.1$$

13. XYZ's balance sheet at the end of year 0 is given below,

| Liabilities                |     | Assets              |     |
|----------------------------|-----|---------------------|-----|
| Shareholders funds         | 300 | Net fixed asset     | 450 |
| Equity capital             | 150 |                     |     |
| [15 crore of Rs. 10 each]  |     | Net working capital | 150 |
| Reserves and surplus       | 150 |                     |     |
| Loan funds rate 10 percent | 300 |                     |     |
|                            | 600 |                     | 600 |

XYZ Ltd ROIC also referred as NOPAT/Invested capital is expected upto 10 percent. Growth rate in assets, revenues and NOPAT is estimated at 15 percent for the first two years, 10 percent for the next two years and 8 percent thereafter.

The effective tax rate of the company is 30 percent and the pre tax cost of debt is 10 percent where the debt equity ratio of the company will be maintained at 1:1.

From the above information compute the intrinsic value of the equity shares.

Sol :

**Step 1.** Explicit forecast period is 5 years as the company reaches at stable level after 5 years.

**Step 2.** Free cash flow forecast for the explicit forecast period can be estimated as follows.

| Year                                                                | I Year | II Year | III Year | IV Year | V Year |
|---------------------------------------------------------------------|--------|---------|----------|---------|--------|
| a) Asset value                                                      | 600.0  | 690.0   | 793.5    | 872.9   | 960.2  |
| b) NOPAT                                                            | 60.0   | 69.0    | 79.4     | 87.3    | 96.0   |
| c) Net investment                                                   | 90.0   | 103.5   | 79.4     | 87.3    | 76.8   |
| Asset value of succeeding year,<br>(asset value of preceding year)] |        |         |          |         |        |
| FCF (b-c)                                                           | (30.0) | (34.5)  | -        | -       | 19.2   |
| Growth rate (%)                                                     | 15     | 15      | 10       | 10      | 8      |

**Step 3. Computation of weighted average cost of capital [WACC]**

$$WACC = W_q r_q + W_e r_e (1 - t)$$

$$0.5 \times 10 + 0.5 \times 10 (1 - 0.3)$$

$$\Rightarrow 8.50 \text{ percent.}$$

**Step 4.** The horizon value of the company is,

$$u_N = \frac{FCF_{N+1}}{WACC - g}$$

$$\Rightarrow \frac{FCF_N(1+g)}{r-g} \Rightarrow \frac{19.2(1.08)}{0.085 - 0.08} \Rightarrow \frac{20.736}{0.005}$$

$$\Rightarrow \text{Rs. 4,147.2 crores}$$

**Step 5.** Enterprise value of XYZ is,

$$\begin{aligned} EV &= \left[ \frac{-30.00}{(1.085)} \right] - \left[ \frac{34.50}{(1.085)^2} \right] + \left[ \frac{0}{(1+1.085)^4} \right] + \left[ \frac{19.2}{(1.085)^5} \right] + \left[ \frac{4,147.2}{(1.085)^2} \right] \\ &= 27.65 - 29.310 + 0 + 0 + 12.77 + 2758.08 \\ &= \text{Rs. 2713.89 crores} \end{aligned}$$

**Step 6.** Calculation of equity value of XYZ Ltd.,

Enterprise value = Debt value

$$\Rightarrow 2713.89 - 300$$

$$EV = \text{Rs. 2713.89 crores}$$

$$\Rightarrow \text{Rs. 2,413.89 crores}$$

$$DV = \text{Rs. 300 crores (Given)}$$

**Step 7.** Calculation of value per share of XYZ Ltd.,

$$= \frac{\text{Equity value}}{\text{Number of outstanding equity shares}} = \frac{2,413.89 \text{ crores}}{15 \text{ crores}}$$

$$= 160.926 \text{ crores.}$$

14. An investor owns the share of Rise Company, whose current cash dividend is ₹ 3. The constant growth rate in dividend is 16 per cent per year and the required rate of return is 20 per cent. What is the value of the Rise Company's share ?

**Sol :**

$$P_0 = \frac{D_1}{(K - g)} = \frac{D_0(1 + g)}{(K - g)}$$

$$= \frac{3.00(1 + 0.16)}{0.20 - 0.16}$$

$$P_0 = ₹ 87$$

We have to use cash dividends expected one year hence.

15. Find the 'Intrinsic value of the following shares.

| Share                        | A        | B                                                              |
|------------------------------|----------|----------------------------------------------------------------|
| Next year dividend per share | Rs. 3.50 | Rs. 2                                                          |
| Growth rate of dividend      | 10% p.a. | First four year at 10% p.a. After four year at 6% indefinitely |
| Required rate of return      | 15% p.a. | 14% p.a.                                                       |

**Sol :**

The intrinsic value of share A can be calculated as,

$$P_0 = \frac{D_1}{k - g}$$

Given that,

$$D_1 = 3.50$$

$$g = 10\%$$

$$k = 15\%$$

$$P_0 = \frac{D_1}{k - g} = \frac{3.50}{0.15 - 0.10} = \frac{3.50}{0.05}$$

∴ Intrinsic value of share = Rs. 70

The intrinsic value of share B can be calculated as,

$$P_0 = \sum_{t=1}^N \left[ \frac{D_t(1 + g_1)^t}{(1 + k)^t} + \frac{D_N(1 + g_2)}{(k - g_2)(1 + k)^N} \right]$$

Where,

$D_t$  = Dividend at the time period  $t$

$D_N$  = Dividends per share in time period  $N$

$g_1$  = Initial dividend growth rate

$g_2$  = Longer-run dividend growth rate

$N$  = Number of years that the  $g_1$  lasts.

Given,

$$D_1 = \text{Rs. } 2$$

$$g_1 = 10\% = 0.1$$

$$g_2 = 6\% = 0.06$$

$$k = 14\% = 0.14$$

$$P_0 = \frac{D_1}{(1+k)^1} + \frac{D_2}{(1+k)^2} + \frac{D_3}{(1+k)^3} + \frac{D_4}{(1+k)^4} + \frac{D_4(1+g_2)}{(k-g_2)(1+k)^N}$$

Substituting the above values, we get,

$$P_0 = \frac{2}{(1+0.14)} + \frac{2.2}{(1+0.14)^2} + \frac{2.42}{(1+0.14)^3} + \frac{2.66}{(1+0.14)^4} + \frac{2.66(1+0.06)}{(0.14-0.06)(1+0.14)^4}$$

$$= \frac{2}{1.14} + \frac{2}{1.30} + \frac{2.42}{1.48} + \frac{2.66}{1.69} + \frac{2.82}{0.14}$$

$$= 1.75 + 1.69 + 1.64 + 1.57 + 20$$

$$P_0 = 26.25$$

$\therefore$  Intrinsic value of share  $B = 26.65$ .

16. An investor expects to receive Rs. 3.50, and Rs. 4 and Rs. 4.50 as dividend from an equity share, during the next three years. He hopes to sell the share of Rs. 75 at the end of the third year. If the required rate of return is 25%, find the current value of the share.

**Sol :**

Given that,

$$D_1 = \text{Rs. } 3.50$$

$$D_2 = \text{Rs. } 4.00$$

$$D_3 = \text{Rs. } 4.50$$

$$P_3 = \text{Rs. } 75.00$$

$$r = 25\%$$

$$n = 3 \text{ years}$$

The current value of the share,

$$\begin{aligned}
 P_0 &= \frac{D_1}{(1+r)^1} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} + \frac{P_3}{(1+r)^3} \\
 &= \frac{3.50}{(1+0.25)^1} + \frac{4.00}{(1+0.25)^2} + \frac{4.50}{(1+0.25)^3} + \frac{75.00}{(1+0.25)^3} \\
 &= \frac{3.50}{1.25} + \frac{4.00}{1.5625} + \frac{4.50}{1.9531} + \frac{75.00}{1.9531} \\
 &= 2.80 + 2.56 + 2.30 + 38.40 \\
 &= \text{Rs. } 46.06.
 \end{aligned}$$

∴ Current value of a share is Rs. 46.06.

17. Fashions Ltd operates a large readymade garment system in the textile industry. Assume that its common stock can be purchased in the beginning of 2009 at ₹ 40. The dividend per share would be ₹ 2 for the next three years. It is estimated that at the end of 2012, the stock will be sold for ₹ 55. What is the rate of return for Fashion's stock ?

Sol :

$$\begin{aligned}
 P_0 &= \frac{D_1}{(1+r)^1} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} + \frac{P_3}{(1+r)^3} \\
 40 &= \frac{2}{(1+r)} + \frac{2}{(1+r)^2} + \frac{2}{(1+r)^3} + \frac{55}{(1+r)^3}
 \end{aligned}$$

This requires trial and error procedure. Let us try 15 per cent return at first.

$$\begin{aligned}
 &= \frac{2}{1.15} + \frac{2}{1.3225} + \frac{2}{1.5209} + \frac{55}{1.5209} \\
 &= 40.728
 \end{aligned}$$

The rate of return is 15 per cent.

18. Antique Arts Company would pay ₹ 2.50 as dividend per share for the next year and it is expected to grow indefinitely at 12%. What would be the equity value if the investor requires 20% return?

Sol :

$$P_0 = \frac{D_1}{K - g}$$

$D_1$  = 2.50 (next year dividend)

$K$  = 20%

$g$  = 12%

$$= \frac{2.5}{0.20 - 0.12}$$

$$P_0 = ₹ 31.25$$

19. Anil has bought the Everest Company stock that has paid ₹ 3.00 as dividend per share during the last financial year. He anticipates two situations either a 5 per cent decline in the dividend or 5 % growth in the dividend in the next year. His anticipated return is 20%. Fix the price for both the situations.

*Sol :*

- a) 5% growth :

$$P_0 = \frac{D_1}{K - g}$$

$$= \frac{3(1.05)}{0.20 - 0.05} = 21$$

- b) 5% decline :

$$P_0 = \frac{D_1}{K - g} = \frac{3(1 - 0.05)}{0.20 - (-0.05)} = 11.4.$$

20. The common stock of Bulls Corporation is currently selling for ₹ 70 per share. Dividend per share has grown from ₹ 2 to the current level of ₹ 6 over the past ten years and this dividend growth is expected continue in future. What is the required rate of return of the Bulls Corporation ?

*Sol :*

$$P_0 = \frac{D_0(1 + g)}{K - g}$$

K and g are not given

$$g = \left[ \frac{\text{future value}}{\text{present value}} \right]^{1/n} - 1$$

$$g = \left( \frac{6}{2} \right)^{1/10} - 1$$

$$= 1.116 - 1 = 0.116$$

$$g = 11.6\%$$

$$K = \frac{D_0(1 + g)}{P_0 + g} = \frac{6(1.116)}{70 + 0.116}$$

$$K = 9.5\%.$$

### 4.3 RELATIVE VALUATION TECHNIQUES

#### 4.3.1 Earnings Multiplier Approach, Valuation using P/E ratio

#### Q3. Discuss briefly about P/E Ratio or Earnings Multiplier Approach.

*Ans :*

Price-earnings ratios are used to estimate the value of the stocks by the investors rather than adopting the discounting models. Every financial magazine and the newspaper at regular interval publish price earnings per share. The P/E ratio models have three distinct advantages over the discounting models.

1. P/E ratios indicates price per rupee of share earnings. This would help to compare the prices of stocks, which have different earnings per share.
2. P/E ratios are helpful in analysing the stocks of the companies that do not pay dividend but have earnings. It should be noted that when there is a loss, the P/E ratio analysis is difficult to use.
3. The variables used in P/E ratio models are easier to estimate than the variables used in the discounting model.

We know that, by definition  $D = E(1 - b)$ , where  $D$  is dividend per share,  $E$  is earning per share and  $b$  is the earnings retention rate [ $(1 - b)$  is the dividend payout ratio]. Therefore, an equivalent earnings based valuation model is,

$$P_0 = \frac{E_1(1 - b)}{k - g}$$

Where,

$P_0$  = Stocks present value

$E_1$  = Expected earnings at the end of year 1

$b$  = Retention rate

$g$  = Expected growth rate and

$k$  = Required rate of return.

It is also true that  $E_1 = E_0(1 + g)$ , where  $E_0$  is current earnings per share. The above equation can be stated in terms of P/E ratio as follows,

$$\frac{P_0}{E_0} = \frac{(1+g) \left( \frac{D_0}{E_0} \right)}{k-g}$$

### Determinants of the P/E Ratio

Initially, estimated value of a stock need to be considered which is denoted as P and in terms of a constant growth of dividends discount model.

$$\therefore P_0 = \frac{D_1}{k-g}$$

Divided both sides of equation (1) with  $E_1$ , which is expected earnings of year 1.

$$\frac{P_0}{E_1} = \frac{D_1 / E_1}{k-g}$$

P/E ratio depends on the factors present in equation (2).

Where,

$D_1/E_1$  = Expected dividend payout ratio

$g$  = Expected growth rate of dividends

$k$  = Required rate of return.

PIE ratio exists in a relationship with the above three factors in the following way.

Other things being equal;

- The P/E ratio would be higher, when the expected payout ratio is high ( $D_1/E_1$ ).
- PIE ratio would be higher, when the expected growth rate,  $g$  is high,
- PIE ratio would be low, when the required rate of return,  $k$  is too high.

It is necessary for the other things to be equal. If they are not equal then the above mentioned relationships do not exist because P/E ratio would be effected to a large extent with a small change in these relationships.

### PROBLEMS

- The Logan corporation currently has earnings that are Rs. 4 per share. In recent years, earnings have been growing at a rate of 5%

and will continue in future. If 40% is the retention rate and required rate of return is 14%, what is its current value ?

**Sol :**

Given that,

$$E_0 = \text{Rs. } 4.00, \quad g = 0.05$$

$$b = 0.40 \quad \text{and} \quad k = 0.14$$

$$\begin{aligned} P_0 &= \frac{E_1(1-b)}{k-g} = \frac{4.20(1-0.40)}{0.14-0.05} \\ &= \frac{4.20(0.60)}{0.09} \\ &= \frac{2.52}{0.09} = \text{Rs. } 28 \end{aligned}$$

$\therefore$  The current value of a share is Rs. 28.

### Working Notes

$$\begin{aligned} E_1 &= E_0(1+g) = 4(1+0.05) \\ &= \text{Rs. } 4.20. \end{aligned}$$

- The Almas corporation's cash dividend payout ratio is 60%, its risk adjusted cost of capital is 10%, the current earnings per share are Rs. 4.04 and have been growing at 3% per year. A technological break through is expected to increase Almas growth rate to 60% for the foreseeable future. Almas corporations common stock has been selling at 8 to 9 times its earnings. What do you expect the price-earnings ratio will be after technological development is publicly announced ?

**Sol :**

Using the fact that,

$$D_1 = D_0(1+g) = E_0(1-b)(1+g)$$

$$\therefore D_0 = 4.04(0.60)(1+0.03) = \text{Rs. } 2.50$$

$$\begin{aligned} \text{But, } \frac{P_0}{E_0} &= \frac{\frac{D_1}{E_0}}{k-g} = \frac{\frac{2.50}{4.04}}{0.10-0.03} \\ &= \frac{0.62}{0.07} = 8.9 \text{ times} \end{aligned}$$

- ∴ Almas corporation's stock was selling at about 8.9 times its earnings per share before the new technology.

Technological break through will increase growth rate to 6% and hence,

$$D_1 = 4.04 (0.60) (1+0.06) = 2.569$$

And then,

$$\frac{P_0}{E_0} = \frac{\frac{2.569}{4.04}}{0.10 - 0.06} = \frac{0.636}{0.04} = 15.9 \text{ times}$$

- ∴ After the new technology elevates Almas corporations growth rate to 6%, the common stock will be worth 15.9 times its earnings per share.

### Finite Earnings Model

Rather than using a perpetual constant earnings growth model an investor may prefer to use a finite earnings growth model and in that case, the stocks price is calculated as follows,

$$P_0 = \left( \sum_{t=1}^n \frac{E_0(1+g)^t \left( \frac{D}{P_0} \right)}{(1+k)^t} \right) + \frac{E_0(1+g)^n \left( \frac{P}{E} \right)_n}{(1+k)^n}$$

Where,

$$\frac{D}{P_0} = (1 - b) \text{ that is dividend payout ratio}$$

$n$  = Holding period in years

$$\left( \frac{P}{E} \right)_n = \text{Price-earnings ratio expected at time period } n.$$

23. The returns of Moon company at present is 21%. This is assumed to continue for the next five years and after that it is assumed to have a growth rate of 10% indefinitely. The dividend paid for the current year is 3.2 Rs. The required rate of return is 20% and the present price is Rs. 57. What is the estimated price according to the two stage model ?

Sol :

According to two - stage model

$$P_0 = \left[ \sum_{t=1}^n \frac{D_0 + (1+g_s)^t}{(1+k)^t} \right] + \left[ \frac{D_{n+1}}{(k - g_n)} \times \frac{1}{(1+k)^n} \right]$$

Here,  $D_0$  = Rs. 3.20,

$g_s$  = 21%

$g_n$  = 0.10

$$k = 20\%$$

$$n = 5 \text{ years}$$

By substituting the above values in a given formula, we get,

$$\begin{aligned} \therefore P_0 &= \left[ \frac{3.20(1+0.21)}{(1+0.20)^1} + \frac{3.20(1+0.21)^2}{(1+0.20)^2} + \frac{3.20(1+0.21)^3}{(1+0.20)^3} + \right. \\ &\quad \left. \frac{3.20(1+0.21)^4}{(1+0.20)^4} + \frac{3.20(1+0.21)^5}{(1+0.20)^5} \right] + \left[ \frac{8.30(1+0.10)}{(0.20-0.10)(1+0.20)^5} \right] \\ &= \frac{3.872}{1.20} + \frac{4.6851}{1.44} + \frac{5.669}{1.728} + \frac{6.8595}{2.0736} + \frac{8.30}{2.4883} + \frac{9.13}{0.24883} \\ &= 3.2267 + 3.2535 + 3.2807 + 3.3080 + 3.3356 + 36.69 \\ \therefore P_0 &= \text{Rs. } 53.09. \end{aligned}$$

#### 4.3.2 Price to Book Value

##### Q4. Define Price to Book Value Ratio.

Ans :

Apart from the price-earnings ratio, perhaps the most commonly used comparative valuation ratio, equity analysts use several other comparative valuation ratios. Two of them are worth discussing: price to book value ratio and price to sales ratio.

##### 1. Price to Book Value Ratio

The book value per share is the net worth of the company (total assets minus total liabilities) divided by the number of equity shares issued. The book value is determined by economic events as well as accounting conventions. The market price of the share, in contrast, is mainly determined by how the market assesses its earning power. The ratio of market price to book value is :

$$\text{PBV ratio} = \text{Price/book value ratio} = \frac{\text{Market price per share at time } t}{\text{Book value per share at time } t}$$

The PBV ratio has always drawn the attention of investors. During the 1990s Eugene Fama and others suggested that the PBV ratio explained to a significant extent the returns from stocks. The findings of other researches like Kim and others, however, have cast some shadow over the role of the PBV ratio.

##### Determinants of the Price to Book Value Ratio

To understand the determinants of the PBV ratio, let us start with the constant growth dividend discount model :

$$P_0 = \frac{D_1}{r-g} \quad (9)$$

$D_1$  the dividend for the next period, may be stated in terms of this period's earnings per share,  $E_0$  growth rate,  $g$ , and the dividend payout ratio,  $(1-b)$ , as follows:

$$D_1 = E_1(1-b) = E_0(1+g)(1-b) \quad (10)$$

Substituting this in Eq. (9) gives:

$$P_0 = \frac{E_0(1+g)(1-b)}{r-g} \quad (11)$$

Since  $E_0$  is the product of book value per share ( $BV_0$ ) and return on equity (ROE), Eq. (11) can be rewritten as:

$$P_0 = \frac{BV_0(ROE)(1+g)(1-b)}{r-g} \quad (12)$$

Dividing both sides of Eq. (12) by ( $BV_0$ ) results in:

$$\frac{P_0}{BV_0} = \frac{(ROE)(1+g)(1-b)}{r-g}$$

The numerator of Eq. (13) shows that, other things being equal, a higher ROE increases the PBV ratio. The denominator of Eq. (13) shows that a higher ROE increases the PBV ratio indirectly as well because  $g = (\text{Retention ratio})(ROE) - (b)(ROE)$ .

#### 4.3.3 Price to Sales Ratio

##### Q5. Explain how price to sales ratio is calculated.

Ans :

In the last few years, the price / sales ratio (PS ratio) has gained much importance as a valuation technique. The PS ratio is computed by dividing the company's current stock price by its revenue per share for the last twelve months. On the other hand, it can also be computed by dividing the present market value of equity capital by the yearly sales value of the firm. Basically, the PS ratio explains and indicates the market's willingness as to pay in exchange of one rupee of sales.

The following are some of the problems which the investors may face while using the PE ratio,

1. Highly inconsistent earnings.
2. Negative earnings.
3. Earnings may be explained in various ways.
4. Possibility of Managed earnings.

In order to remove or reduce such type of problems, PS ratio must be used continuously. James O'shaugnessy after evaluating various tools and techniques of investment like book value, return on equity, PE ratio, yield, PS ratio etc., have suggested and recommended that out of all the investment tools PS ratio has been considered as the most useful tool. This is because the portfolios of low PS ratio stocks are more effective than the portfolios of high PS ratio stocks.

According to a famous thumb rule a standard PS ratio of 1.0 can be used by all companies. The stocks which are traded at PS ratio and which are less than 1.0 Example 0.5 are considered as 'bargains'. PS ratio is not same for all industries. It basically differs from one industry to another industries firms because the factors like net profit margin, growth rate, asset turnover, etc. are not same for all, they vary from one firms to another firm.

The PS ratio is a technique of relative valuation and is being interpreted in terms of drivers. One of the key drivers of P.S ratio is the net profit margin which implies that P.S ratio is considered as P.S ratio/Net profit margin. P.S ratio being one of the technique of relative valuation must be compared with the industry average and its own history.

### Determinants of the P.S Ratio

The determinants of the PS ratio can be understood clearly with the help of the following equation,

$$P_0 = \frac{e_0(1+G)(1-a)}{R-G}$$

Since, the earnings per share ( $e_0$ ) is equal to sales per share ( $s_0$ ) times net profit margin (NPM). Then it can be written as,

$$P_0 = \frac{s_0(\text{NPM})(1+G)(1-a)}{R-G}$$

Both the sides of equation are divided by further resulting into,

$$\text{PS ratio} = \frac{P_0}{s_0} = \frac{(\text{NPM})(1+G)(1-a)}{R-G}$$

Where,

G = Growth rate

R = Rate of return

(1 - a) = Dividend payout ratio

NPM = Net profit margin

$s_0$  = Sales per share.

### 4.4 ECONOMIC VALUE ADDED APPROACH

#### Q6. Discuss briefly about Economic Value Added Approach.

Ans :

Economic Value Added (EVA) approach was developed by Stern Stewart and company. In present scenario, it is very popular and many persons refer it with different names like Peter Drucker referred it as measure of total factor productivity and feature magazine referred it as "today's hottest financial idea and getting hotter".

EVA is basically the excess amount left on after making a proper charge for the capital invested in the business. EVA can be evaluated in different ways. They are,

$$\text{EVA} = \text{NOPAT} - C^* \times \text{CAPITAL}$$

$$\text{EVA} = \text{CAPITAL} (r - C^*)$$

$$\text{EVA} = [\text{PAT} + \text{INT} (1 - t)] - C^* \text{CAPITAL}$$

$$\text{EVA} = \text{PAT} - K_e \text{EQUITY}$$

Where,

EVA = Economic Value Added

NOPAT = Net Operating Profit After Tax

$C^*$  = Cost of Capital

CAPITAL = Economic book value of the capital j invested in the firm.

$r$  = Return on capital'

= NOPAT/CAPITAL

PAT = Profit After Tax

INT = Interest expense of the firm

$t$  = Marginal tax rate of the firm

$K$  = Cost of equity

EQUITY = Equity utilized in the firm.

### Important Features of EVA Approach

- ▶ It acts as performance measure which is linked to shareholder value creation in all directions.
- ▶ It is useful in providing business knowledge to everyone.
- ▶ It is an efficient method for communicating to investors.
- ▶ It transforms the accounting information into economic quality which can be easily understood nonfinancial managers.
- ▶ It is useful in evaluating net present value of project in capital budgeting which is contradictory to IRR.
- ▶ Instead of writing the value of firm in terms of discounted cash flow, it can be expressed in EVA of projects.

## 4.5 FUNDAMENTAL ANALYSIS

### Q7. What do you mean by Fundamental Analysis ?

Ans :

#### Introduction

Investment decisions are a part of our economic life. Everybody makes such decisions in different contexts at different times. Some are able to reap more profits through them; while other simply lose their money. Attempts should, therefore, be made to understand and know the way sound investments decision can be made in order to improve the change of making profit through them.

Thus, investment decision-making is an important area probing further.

In the fundamental approach an attempt is made to analyze various fundamental or basic factors that affect the risk-return of the securities. The effort here is to identify those securities that on perceives as mispriced in the stock market. The assumption in this case is that the 'market price' of security and the price is justified by its fundamental factors called 'intrinsic value' are different and their market place provides an opportunity for a discerning investor to detect such discrepancy. The moment such a description is identified, a decision to invest or disinvest is made.

The price prevailing in market is called "market price" (MP) and the one justified by its fundamentals is called "intrinsic value" (IV).

### Criteria for selecting an Investment :

- 1) If  $IV > MP$ , buy the security
- 2) If  $IV < MP$ , sell the security
- 3) If  $IV = MP$ , no action.

The fundamental factors mentioned above may relate to the economy or industry or company or all some of this. Thus Fundamental Approach includes three analysis :

- 1) Economic Analysis
- 2) Industry Analysis
- 3) Company Analysis

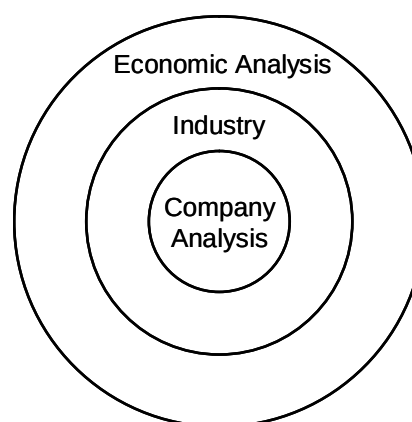


Figure : Fundamental Analysis

**Q8. What is Economic Analysis ? Explain the Significance of Economic Analysis.**

Ans :

**Economic Analysis**

In actual practice, you must have noticed that investment decisions of individuals and the institutions made in the economy set-up of a particular country. It becomes essential, therefore, to understand the state economy of that country at the macro level. The analysis of the state of the economy at the macro level incorporates the performance of the economy in the past, how it is performing in the present and how it is expected to perform in future.

**Macro Economic Analysis :** The analysis of the following factors indicates the trends in macro economic changes that effect the risk and return on investment:

i) **Growth Rate of Gross Domestic Product :** The gross domestic product is a measure of the total production of final goods and services in the economy during a specified period usually a year. The growth rate of GDP is the most important indicator of the performance of the economy. The higher the growth rate of GDP, other things being equal, the more favourable it is for the stock market.

ii) **Industrial Growth Rate :** The GDP growth rate represents the average of the growth rates of the three principal sectors of the economy, viz. the services sector, the industry sector, and the agricultural sector.

Publicly listed companies play a major role in the industrial sector but only a minor role in the service sector and the agricultural sector. Hence stock market analyst focus more on the industrial sector. They look at the overall industrial growth rate as well as the growth rates of different industries.

The higher the growth rate of the industrial sector, other things being equal, the more favourable it is for the stock market.

iii) **Monsoons :** Agriculture accounts for about a quarter of the Indian economy and has important linkages, direct and indirect, with industry. Hence, the increase or decrease of agricultural production has a significant bearing in industrial production and corporate performance. Companies using agricultural raw materials as inputs or supplying inputs to agriculture are directly affected by the changes in agricultural production. Other companies also tend to be affected due to indirect linkages.

A spell of good and monsoons imparts dynamism to the industrial sector and buoyancy to the stock market. Likewise, a streak of bad monsoons casts its shadow over the industrial sector and the stock market.

iv) **Fiscal Deficit :** Government play an important role in most economies, including the Indian economy. The central budget as well as the state budgets prepared annually provides information on revenues, expenditures and deficit or surplus.

In India, governmental revenues come more from indirect taxes such as excise duty and custom duty and less from direct taxes such as income tax. The bulk of the government expenditures goes toward administration, interest payment, defence and subsidies etc.

If Government Expenditure > Government Revenues Deficit

If Government Revenues > Government Expenditure Surplus

Investment analyst examines the government budget to assess how it is likely to impact on the stock market.

v) **Interest Rate :** A rise in interest rates depresses corporate profitability and

also leads to an increase in the discount rate applied by equity investors, both of which have an adverse impact on stock prices. On the other hand, a fall in interest rates improves corporate profitability and also leads to a decline in the discount rate applied by equity investors, both of which have a favourable impact on stock prices.

**vi) Inflation :** The effect of inflation on the corporate sector tends to be uneven. While certain industries benefit, others tend to suffer. Industries that enjoy a strong market for their products and which do not come under the purview of price control may benefit. On the other hand, industries have a weak and which come under the purview of price control tend to lose.

**vii) Balance of Payments, Forex Reserves, and Exchange Rates :** Balance of Payment Deficit = Balance of Trade Deficit (Imports minus exports) + Balance on 'invisible' like tourism and interest rates (payment on account of invisibles minus receipts on account of invisibles) + Balance on account of capital account ( Repayment on account of loans minus receipt of loans)

A balance of payments deficit depletes the forex reserves of the country and has an adverse impact on the exchange rate; on the other hand a balance of payments surplus augments the force reserves of the country and has a favourable impact on the exchange rate.

Other economic factors are :

- viii) Capacity Utilisation
- ix) Unemployment
- x) Institutional Lending
- xi) Productivity of factors of production.
- xii) Industrial Wages
- xiii) Status of political and economic stability
- xiv) Technological innovations

- xv) Infrastructural facilities
- xvi) Economic and industrial policies of the government
- xvii) Debt recovery and loans outstanding.
- xviii) Trends in capital market
- xix) Foreign Investment.
- xx) Stage of the business cycle.

**Q9. Define Industry Analysis. Explain the classification of industries.**

**Ans :**

After conducting an analysis of the economy, the analyst must - look into various sectors of the economy in terms of various industries. An industry is a homogeneous group of companies. That is, companies with similar characteristic can be divided into one industrial group. There are many bases on which grouping of companies can be done.

**Classification of Industries :**

- i) Growth Industry :** This is an industry that is expected to grow consistently and its growth may exceed the average growth of the economy.
- ii) Cyclical Industry :** In this category of the industry, the firms included are those that move closely with the rate of industrial growth of the economy and fluctuate cyclically as the economy fluctuates.
- iii) Defensive Industry :** It is a grouping that includes firms, which move steadily with the economy and less than the average decline of the economy in a cyclical downturn.

**Q10. Explain the Key Indicators of Industrial Analysis.**

**Ans :**

The analyst is free to choose his or her own indicators for analyzing the prospectus of an industry. However, many commonly adopt the following factors.

- i) Performance Factors :** Performance factors like :
  - Past Sales

- Past Earnings
- ii) **Environment Factors :** Environment factors like :
  - Attitude of government
  - Labour conditions
  - Competitive conditions
  - Technological progress
- iii) **Outcome factors :** Outcome factors like :
  - Industry share prices
  - Strengths and weaknesses
  - Opportunities and threats.

### Q11. Describe the industry life cycle.

Ans :

#### A. Industry Life-Cycle Stages

Every industry passes through different stages in its lifetime. The stages can be identified as follows:

- i) **Pioneering Stage :** This stage is characterized by introduction of a new product, and an up trend in business cycle that encourages new product introductions. Demand keeps on growing at an increasing rate. Competition is generated by the entry of new firms to grab the market opportunities. Weaker firms face premature death while stronger one survives to grow and expand.
- ii) **Expansion Stage :** This is characterized by the hectic activity of firms surviving the pioneering stage. The market continues to grow but slowly, offering steady and slow growth in sales of the industry. It is a phase of consolidation wherein companies establish durable policies relating to dividends and investments.
- iii) **Stabilization Stage :** This stage shows signs of slow progress and also prospects of decay.
- iv) **Decay Stage :** An industry reaches this stage when it fails to detect the death

signal and implement- pro-actively or reactively-appropriate strategies. Obsolescence manifests itself, effecting a decline in sales, profit, dividends and share prices.

#### B. Business Cycle

The other way to analyze industries is by their operating ability in relation to the economy as a whole and that is classifying industries on the basis of the business cycle. There are three stages of business cycle. They are,

- i) **Growth Industry :** In growth industries, earnings are expected to be above the average of all industries and such growth occur regardless of setbacks of the economy.
- ii) **Cyclical Industry :** The industries are mostly volatile and companies do well when the economy prospers and during depression they suffer a setback.
- iii) **Defensive Industry :** They are least affected by recessions and economic adversity. The stocks of the defensive industries can be held by the investor for income earning purpose.

Finally, the structural analysis helps to understand the nature of competition existing in the industry as increasing competition drives down the rate of return on invested capital.

Therefore, an analyst must evaluate all the factors before making an investment. If the above factors indicate that the industry has favourable future prospects, funds may be committed to that industry.

### Q12. Explain the importance of company/OSO analysis.

Ans :

It is the final stage of fundamental analysis. The economy analysis provides the investor a broad outline of the prospects of growth in the economy. The industry analysis helps in investor to select the industry in which investment would be rewarding. Now he has to decide the company in which he should invest his money. Company analysis provides the answer to this question.

Company analysis deals with the estimates return and risk of individual shares. This calls for information regarding companies which can be broadly classified into two broad groups, internal and external. Internal information consists of data and events made public by companies concerning their operations.

The internal information sources include annual reports to shareholders, public and private statements of officers of the company, the company's financial statements, etc. External sources of information are those generated independently outside the company. These are prepared by investment services and the financial press.

In company analysis, the analyst tries to forecast the future earnings of the company because there is strong evidence that earnings have a direct and powerful effect upon share prices. The level, trend and stability of earnings of a company, however, depend upon a number of factors concerning the operation of company.

#### A. Financial Statements

The prosperity of a company would depend upon its profitability and financial health. The financial statements published by the company periodically help us to assess the profitability and financial health of the company. The two basic statements provided by the company are as follows,

- i) **Balance Sheet.** It helps to assess the financial position of the company at a particular point of time. It shows the list of assets and liabilities of a company on a specific data.
- ii) **Profit and Loss Account.** It determines the performance of the company during a particular period. It reveals the revenue earned, the cost incurred and the resulting profit or loss of the company.

#### B. Analysis of Financial Statements

The analysis of financial statements reveals the nature of relationship between income and expenditure, the sources and application

of funds. This can be done by using the following,

- i) **Comparative Financial Statements** : In the comparative statement, balance sheet figures are provided for more than one year. The comparative financial statement provides time perspective to the balance sheet figures. The annual data are compared with similar data of previous years, either in absolute terms or in percentages.
- ii) **Trend Analysis** : Here percentages are calculated with a base year. This would provide insight into growth or decline of the sale or profit over the years. Here in, the investor has to look into the cost and management efficiency of the company by examining the trends prevailing.
- iii) **Common Size Statement** : Common size balance sheet shows the percentage of each asset item to the total assets and each liability item to the total liabilities. Similarly, a common size income statement shows each item of expense as a percentage of net sales. With common size statements comparison can be made between two different size firms belonging to the same industry.
- iv) **Funds Flow Analysis** : This statement provides an insight into the movement of funds and helps in understanding the changes in the structure of assets, liabilities and owners equity. It reveals how funds have been raised and used during an accounting period.
- v) **Cash Flow Analysis** : It categorically provides an insight into the inflow and outflow of cash during an accounting period. It shows changes in cash balance between the two balance sheet dates.
- vi) **Ratio Analysis** : It helps an investor to determine the strengths and weakness of a company by establishing the relationship between various elements of financial statements.

Different ratios measures different aspects of a company's health. Four groups of ratios are as follows,

**vii) Liquidity Ratios :** These measures the company's ability to fulfill its short-term obligations and reflects its short-term financial strength. The commonly used liquidity ratios are current ratio, quick ratio and super-quick ratio.

**viii) Leverage Ratios :** These ratios are also known as capital structure ratios. They measure the company's ability to meets its long-term debt obligations. They throw light on long-term solvency of a company. The commonly used leverage ratios are debt-equity ratio, debt to total assets ratio, proprietary ratio, interest coverage ratio.

**ix) Profitability Ratios :** The profitability of a company can be measured by the profitability ratios. These ratios are calculated by relating the profits either to sales, or to investment, or to the equity shares. Thus we have three groups of profitability ratios. The overall profitability is measured by the return on investment, which is a central measure of the earning power or operating efficiency of a company.

**x) Activity Ratios :** These are also known as turnover ratios. These ratios measure the efficiency in asset management. They express the relationship between sales and the different types of assets, showing the speed with which these assets generate sales.

### C. Assessment of Risk

Company analysis involves not only an estimation of future returns but also an assessment of the variability in returns called risk. The variability in returns arises primarily because of variability in sales. The sensitivity of profits of changes in the level of sales is measured by a ratio called Degree of Total Leverage (DTL). This ratio is used as a measure of risk. It is calculated as follows,

$$DTL = \frac{\text{Contribution}}{\text{Profit Before Tax (PBT)}}$$

It may be noted that contribution means sales minus the variable cost. DTL may be subdivided into two components,

- i) The Degree of Operating leverage (DOL) arising from the cost structure of the company and
- ii) The Degree of Financial Leverage (DFL) arising from the capital structure of the company.

DOL measures the percentage change in EBIT for a 1% change in sales and is computed as,

$$DFL = \frac{EBIT}{PBIT}$$

The Degree of Total Leverage (DTL) is the product of DOL and DFL and measures the percentage change in PBT for a 1% change in sales.

### D. Non-financial Parameters

The important non-financial parameters to be examined by an investor are as follows,

**i) Top Management :** The quality of top management team, particularly, the competence and the commitment of the chief executive officer matters a lot in shaping the destiny of the company.

**ii) Product Range :** Progressive companies like ITC and Hindustan Lever creates competition for their existing products by launching new product with regular frequency. Hence, investors must examine whether the company under review belongs to this group or not.

**iii) Foreign Collaboration :** When a company has entered into technical collaboration with a foreign company, the investor must find out more about the nature of the collaboration agreement.

- iv) Research and Development Progressive companies spend substantial sum of money on R and D to upgrade their existing products, introduce new products, adapt foreign technology to suit the local conditions, achieve import substitution etc.
- v) **Governmental Regulations :** The investor must assess the implication of governmental regulation such as MRTP act, FERA etc, for the company under review. The investment decision is ultimately a decision to invest in the shares of one or more specific companies. Company analysis deals with an analysis of various factors affecting the performance of companies so as to forecast the future earning of a company is also its variability better known as risk.

#### 4.6 TECHNICAL ANALYSIS

**Q13. What is technical analysis ? Explain the assumptions of technical analysis.**

**Ans :**

Technical analysis is a method of evaluating securities by analyzing the statistics generated by market activity, such as past prices and volume. Technical analysts do not attempt to measure a security's intrinsic value, but instead use charts and other tools to identify patterns that can suggest future activity.

Unlike fundamental analysts, technical analysts don't care whether a stock is undervalued- the only thing that matters is a security's past trading data and what information this data can provide about where the security might move in the future.

#### **Basic Technical Assumptions**

The basic technical assumptions are:

- i) **The market Discounts Everything :** A major criticism of technical analysis is that it only considers price movement, ignoring the fundamental factors of the company. However, technical analysis assumes that, at a given time, a stock's

price reflects everything that has or could affect the company-including fundamental factors.

- ii) **Price Moves in Trends :** In technical analysis, price movements are believed to follow trends. This means that after a trend has been established, the future price movement is more likely to be in the same direction as the trend than to be against it. Most technical strategies are based on this assumption.

- iii) **History Tends to Repeat Itself :** Another important postulate in technical analysis is that history tends to repeat itself, mainly in terms of price movement. The repetitive nature of price movements is attributed to market psychology; in other words, market participants tend to provide a consistent reaction to similar market stimuli over time. Technical analysis uses chart patterns to analyze market movements and understand trends.

**Q14. Explain the Tools of Technical Analysis.**

**Ans :**

The tools of technical analysis are :

#### **1. Dow Theory**

The Dow Theory is one of the oldest and most famous technical tools. It was originated by Charles Dow, who founded the Dow Jones company and was the editor of The Wall Street,

#### **According to Dow**

"The market is always considered as having three movements, all going at the same time. The first is the narrow movement from day-to-day. The second is the short swing running from two weeks to a month or more, the third is the main movement covering at least four years in duration".

**These movements are called :**

- (a) **Daily Fluctuations (Minor Trends):** The minor trends have little analytical value, because of their short duration and variations in amplitude.

**(b) Secondary Movements (trends):**

The secondary trend acts as a restraining force on the primary trend. It ends to correct deviations from its general boundaries.

**(c) Primary Trends:** The primary trends are the long range cycle that carries the entire market up or down (bull or bear markets).**Types of Averages**

The Dow Theory is build upon the assertion that measured of stock prices tend to move together. It employs two of the Dow Jones Averages.

- (a) Dow-jones Industrial Average
- (b) Dow-jones Transportation Average

**Types of Market**

There are three types of market

- (a) BullMarket:** If both the averages are rising.
- (b) Bear Market:** If both the averages are falling
- (c) Uncertain:** If one rising and other is falling

**Criticism of Dow Theory**

Several criticisms are leveled against the Dow Theory :

- (a) It is not a theory but an interpretation of known data. A theory should be able to explain why a phenomenon occurs. No attempt was made by Dow or his followers to explain why the two averages should be able to forecast future stock prices.
- (b) It has poor predictive power.

**2. Trend Analysis**

There are three types of tend.

- (a) Upward Trend :** As the name imply, when each successive peak and trough s higher, it's referred to as an upward trend.

- (b) Downward Trend:** If the peaks and troughs are getting lower, its a downtrend.

- (c) Horizontal Trend :** When there little movement up or down in the peaks and troughs, it's aside ways orthorizontal trend.

**3. Charts Types**

Technical analysis use three basic types of charts:

- (a) Line Charts :** The most basic chart is the line chart because it represents only the closing prices ewer a set period of time. The line of formed by connecting the closing prices over the time frame. Line charts do not provide visual information of the trading range for the individual points such as the high, low and opening prices. However, the closing price is often considered to be the most important price in stock data compared to the high and low for the day and this is why t is the only value used in line charts.
- (b) Bar Charts :** Most investors interested in charting use bar charts-primarily because they have meanings familiar to a technical analysts, but also because these charts are easy to draw. The procedure for preparing a vertical line or bar chart is simple. The vertical dimensions of the line represent price, the horizontal dimension indicates the time involved by the chart as a whole.

**4. Chart Pattern**

A chart pattern is a distinct formation on a stock chart that creates a trading signal, or a sign of future price movements. Chartists use these patterns to identify current trends and trend reversals and to trigger buy and sell signals.

**5. Moving Averages**

Most chart patterns show a lot of variation in price movement. This can make it difficult for traders to get an idea of a security's overall trend. One simple method traders use to combat this is to apply moving averages.

A moving average is the average price of a security over a set amount of time. It simply takes the sum of all of the past closing prices over the time period and divides the results by the number of prices used in the calculation. For instance, in a 10-day moving average, the last 10 closing prices are added together and then divided by 10. Criticism of Technical Analysis : The various limitations of technical analysis were pointed out by its critics as given under:

- (i) **Difficult in interpretation :** Technical analysis is not as simple as it appears to be. While the charts are fascinating to look at, interpreting them correctly is very difficult.
- (ii) **Frequent Changes :** With changes in market, chart patterns keep on changing. Accordingly, technical analysts change their opinions about a particular investment frequently. One day they put signal. A couple of weeks later, they see a change pattern and put up a sell signal.
- (iii) **Unreliable Changes:** Changes in market behaviour observed and studied by technical analysts may not always be reliable owing to ignorance or intelligence or manipulative tendencies of some participants.
- (iv) **History does not repeat itself:** One of the major limitations of technical analysis is that the entire data is based on the past. It is presumed that future resembles the past. There is no guarantee that history repeats itself.
- (v) **False signals can occur :** Technical analysis is a signaling device. Like a thermometer, it may give a false indication when there is no alarm.

**Q15. Explain the charts used in technical analysis.**

**Ans :**

The most commonly used charts are :

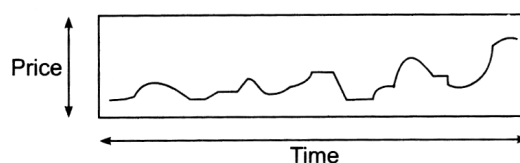
1. Line Charts/Line and Volume Charts
2. Bar Charts

3. Point-and-Figure Charts

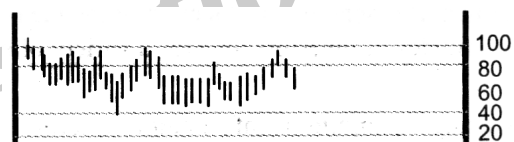
4. Candle Stick Charts

A brief comparison of these four types of charts is given below.

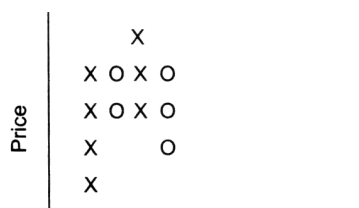
1. **Line chart.** The line chart connects the prices over a time period and is more useful for identifying long-term trends. It has a line that connects the closing price against time.



2. **Bar chart.** The bar chart gives the chartist information on price changes at a time. In this, the high, low, open, close share price or index level is plotted against time.



3. **Point-and-figure chart.** The point-and-figure chart shows only the price changes. It eliminates noise of detail, focusing only on trends. The two distinct marks of cross/round indicate respectively a rise/fall in a price range.



4. **Candlestick chart.** Candlesticks plot information similar to bar charts but could reveal an extra intuitive interpretation. Candlesticks are shown as a vertical rectangle with wicks at both ends. When the closing price is higher than the opening, the rectangle is transparent, and in the reverse case, it is black.



**Q16. Explain briefly about Dow Theory.***Ans :***Dow Theory**

Charles Dow who was editor of Wall Street Journal in 1900, is known for the most important theory developed by him with technical indicators. In fact, the theory gained so much significance that the theory was named after him. The Dow Theory has been further developed by other technical analysts and it forms the basis of the technician's theory. This theory predicts trends in the market for individual and total existing securities. It also shows reversals in stock prices.

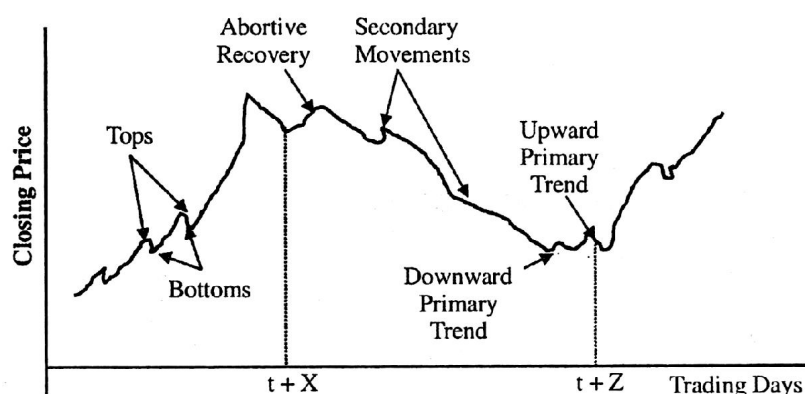
According to 'Dow Theory', the market always has three movements and the movements are simultaneous in nature. These movements may be described as: (i) the narrow movement which occurs from day-to-day, (ii) the short swing which usually moves for short time like two weeks and extends upto a month; this movement can be called a short-term movement, and (iii) the third movement is also the main movement and it covers four years in its duration. According to the type of movements, they have been given special names. The narrow movement is called 'fluctuations', the short swing is better known as 'secondary movements' and the main movement is also called the 'primary trends'.

Narrow movements or the 'fluctuations' are called "random wiggles".

Secondary movements are those which last only for a short while and they are also known as "corrections".

Primary trends are, therefore, the main movements in the stock market. It is also called 'Bears' and 'Bulls' market.

According to the Dow theory, the price movements in a market can be identified by means of a line-chart. In this chart, the technical analyst should plot the price of the share. With it, he should also mark the market average every day.



**Dow Theory Signals**

*Fig.(a) : Line Chart Showing Dow Theory Signals*

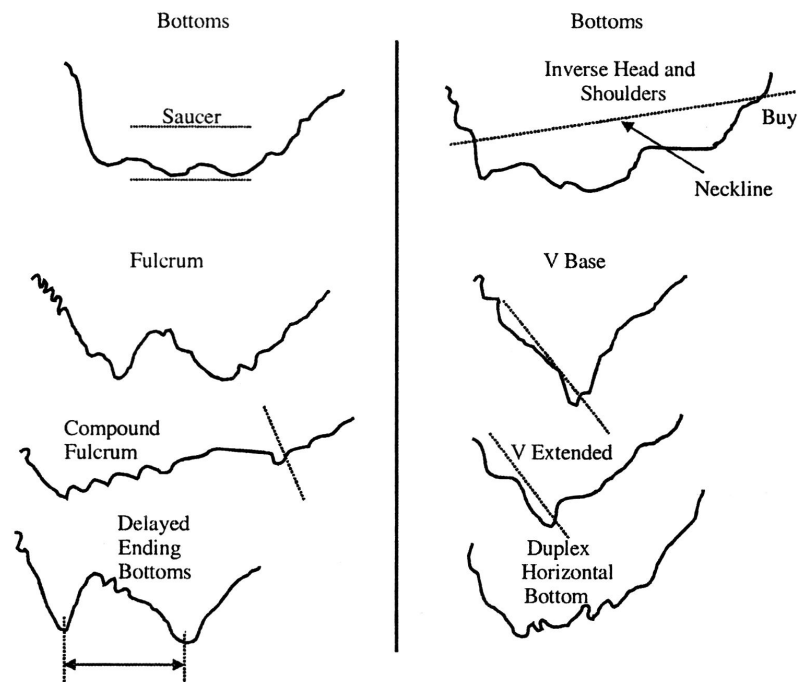


Fig.(b) : Chart Patterns

This would help in identifying the primary and secondary movements. Figures (a), (b) and (c) depict upward, downward primary trends, abortive recovery, secondary movements, tops and bottoms and closing prices per trading days. Figures (b) and (c) indicate some chart patterns as identified by fundamental analysts. The description on the figure (a) shows primary upward trend or period 'T' to time of peak price before  $T + X$  of trading day.  $T + X$  and 'abortive recovery' is noticed showing a change in the direction of the market's primary trend. Abortive recovery means secondary movement does not rise above the preceding top and after the abortive recovery the tops descend till they find their place at  $T + Z$ . When secondary movement falls to reach a new bottom, it signals the beginning of bull market.

The majority of the Dow theorists feel that a new primary trend will emerge only after ascending and descending top occurs simultaneously in industrial and transportation averages.

Dow theorists believe in 'momentum' which, according to them, keeps the price moving in the same direction. They believe in primary trends which according to them, are momentum or bear and bull markets. The momentum will carry the prices further but momentum of primary trend will be halted by the terminology used by technical analysts called 'support areas' and 'resistance areas.'

### Support Areas and Resistance Areas

The peak price of the stock is called the resistance area. After that, the stock moves downwards. Speculators do not usually sell at one peak price. They wait for the next peak and because of this selling cost resistance is met and the price does not move above the previous peak or resistance area. If price rises above the peak, it breaks its level of resistance and moves upwards under the power of bullish momentum.

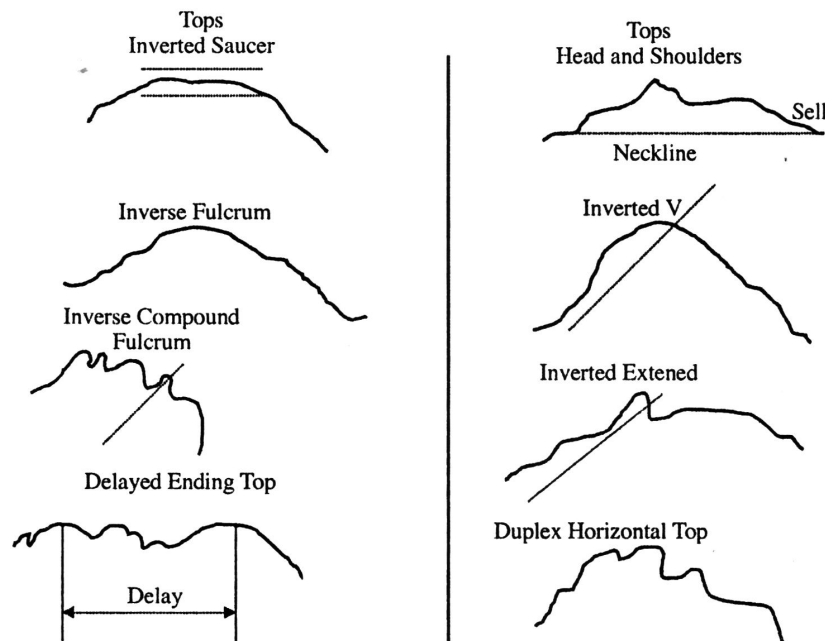


Fig.(c) : Chart Patterns

Support areas shows the previous low price of stock. If price goes below previous support area then it penetrates support and stock price will continue to fall. This is also the 'sell' signal.

According to technical analysts, an investor should 'buy' when prices go higher than peak level and sell when it is lower than previous low price.

Technical analysts limit primary trends and resistance support area for complicated patterns. The patterns used by the technical analysis are popularly called line charts, bar charts, point and figure charts.

### Q17. Discuss briefly about evaluation of technical analysis.

Ans :

Technical analysis appears to be a highly controversial approach to security analysis. It has its ardent votaries; it has its severe critics. The advocates of technical analysis offer the following interrelated arguments in support of their position.

1. Under the influence of crowd psychology, trends persist for quite some time. Tools of technical analysis that help in identifying these trends early are helpful aids in investment decision making.
2. Shifts in demand and supply are gradual rather than instantaneous. Technical analysis helps in detecting these shifts rather early and hence provides clues to future price movements.
3. Fundamental information about a company is absorbed and assimilated by the market over a period of time. Hence, the price movement tends to continue in more or less the same direction till the information is fully assimilated in the stock price.
4. Charts provide a picture of what has happened in the past and hence give a sense of volatility that can be expected from the stock. Further, the information on trading volume which is ordinarily provided at the bottom of a bar chart gives a fair idea of the extent of public interest in the stock.

**Q18. Differentiate Fundamental Analysis Vs. technical analysis.***Ans :***Meaning of Fundamental Analysis**

In the fundamental approach an attempt is made to analyze various fundamental or basic factors that affect the risk-return of the securities. The effort here is to identify those securities that are perceived as mispriced in the stock market. The assumption in this case is that the 'market price' of security and the price is justified by its fundamental factors called 'intrinsic value' are different and their market place provides an opportunity for a discerning investor to detect such discrepancy. The moment such a description is identified, a decision to invest or disinvest is made.

**Meaning of Technical Analysis**

Technical analysis is a method of evaluating securities by analyzing the statistics generated by market activity, such as past prices and volume. Technical analysts do not attempt to measure a security's intrinsic value, but instead use charts and other tools to identify patterns that can suggest future activity.

**Difference between Fundamental and Technical Analysis**

| S.No. | Basis of Difference                                 | Fundamental Analysis                                                                                                                                                                                                        | Technical Analysis                                                                                                                                |
|-------|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.    | Nature                                              | His perspective is long-term in nature. He is conservative in his approach. He acts on 'What should be'                                                                                                                     | His outlook is short-term oriented. He is aggressive. He acts on 'what is'                                                                        |
| 2.    | Difference between current income and capital gains | He considered total gain from equity investment consists of current yield by way of dividends and long-term gains by way of capital appreciation.                                                                           | He does not distinguish between current income and capital gains. He is interested in short-term profits.                                         |
| 3.    | Base of Analysis                                    | He forecasts stock prices on the basis of economic, industry and company statistics. The principal decision variables take the form of earnings and dividends. He makes a judgment of the stock's value with a risk-return. | He forecasts security prices by studying patterns of supply of and demand for securities. Technical analysis study of stock exchange information. |
| 4.    | Tools                                               | He uses tools of financial analysis and statistical forecasting techniques                                                                                                                                                  | He uses mainly changes of financial variables besides some quantitative tools.                                                                    |

**4.6 EFFICIENT MARKET HYPOTHESIS (EMH)****Q19. Explain the concept of EMH.***Ans :***Introduction**

An efficient market hypothesis is one in which security prices adjust rapidly to the arrival of new information and, therefore, the current prices of securities reflect all information about the security. You need to understand the meaning of the terms efficient capital market and efficient market hypothesis because of its importance and controversy associated with it.

**Why Should Capital Market be Efficient :** As noted earlier, in an efficient capital market, security prices adjust rapidly to the infusion of new information, and therefore currency security prices fully reflect all available information. To be absolutely correct, this is referred to as an informationally efficient market. Although the idea of an efficient capital market is relatively straightforward, we often fail to consider why capital markets should be efficient. What set of assumptions imply an efficient capital market ?

- 1) An initial and important premise of an efficient market requires that a large number of profit maximizing participants analyze and value securities, each independently of the others.
- 2) A second assumption is that new information regarding securities comes to the market in a random fashion, and timing of one announcement is generally independent of others.
- 3) The third assumption is especially crucial: profit maximizing investors adjust security prices rapidly to reflect the effect of new information.

#### Q20. Explain the forms of EMH.

Ans :

The early work on efficient capital markets focused mainly on the empirical analysis in support of random walk hypothesis, without much underlying theory. In a seminal article published in 1970, Eugene Fama organised the growing empirical evidence and presented the theory in terms of a **fair game model**, arguing that the current price of a security fully reflects all available information. As a result, its expected return would be consistent with its risk.

Eugene Fama suggested that it is useful to describe three forms of efficient market hypothesis (EMH): weak-form EMH, semistrong-form EMH, and strong-form EMH.

1. **Weak-Form Efficient Market Hypothesis** - The weak-form EMH asserts that security prices fully impound all security market information relating to prices, trading volumes, rates of return, block trades, insider transactions, odd-lot transactions, and so on.
2. **Semistrong-Form Efficient Market Hypothesis** - The semistrong-form EMH argues that the security prices fully reflect all public information. They reflect market information (so, the weak-form EMH is subsumed under semistrong-form EMH) as well as non-market information such as macroeconomic data, industry reports, corporate announcements, price-earning ratios, price-book value ratios, dividend yields, and so on.
3. **Strong-Form Efficient Markets Hypothesis** - The strong-form EMH contends that security prices reflect all available information, public as well as private. So, the strong-form EMH subsumes both the weak-form EMH and semistrong-form EMH as shown in Exhibit below. The strong-form EMH implies that no group of investors has monopolistic access to information which enables it to earn superior risk-adjusted returns.

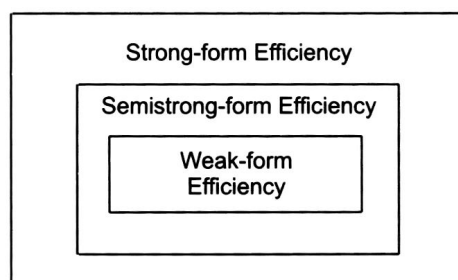


Fig. : Three Levels of Market Efficiency

## Exercise Problems

1. The expected dividend per share is Rs. 2, which is likely to grow at the rate of 5%. If the required rate of return is 15%. Calculate price per share.

Ans :

Price per share  $[P_0 = 20\%]$

2. The Jackson corporation has a required rate of return of 16% and its current dividend is Rs. 3 per share. If the current price is Rs. 55 per share. What is the growth rate of its dividend?

Beta corporations previous dividend was Rs. 10 per share. Earnings and dividends are expected to grow at the rate of 20%. The required rate of return and current market price are 25% and Rs. 240 respectively. Is the share underpriced, overpriced or reasonably priced?

Ans :

The share is reasonably priced  $[P_0 = 240]$

3. The Jackson corporation has a required rate of return of 16% and its current dividend is Rs. 3 per share. If the current price is Rs. 55 per share. What is the growth rate of its dividend?

Ans :

(Growth rate  $(g) = 10\%$ )

4. The Babet corporation has been experiencing an above normal dividend growth rate of 20% per year for the last 5 years. This above normal growth rate is expected to continue for another 5 years before it levels off at a more normal rate of 6% Babet's last dividend was Rs. 0.50 per share. Determine the current value, if its required rate of return is 15%.

Ans :

[Current value  $P_0 = 10.14\%$ ]

5. The Babet corporation has been experiencing an above normal dividend growth rate of 20% per year for the last 5 years. This above normal growth rate is expected to continue for another 5 years before it levels off at a more normal rate of 6% Babet's last dividend was Rs. 0.50 per share. Determine the current value, if its required rate of return is 15%.

The current dividend on an equity share of Dixie limited is Rs. 4.00. Dixie is expected to enjoy an above-normal growth rate of 18 percent for 6 years. Thereafter the growth rate will fall and stabilize at 10 percent. Equity investors require a return of 16 percent from Dixie's stock. What price you would like to place on the stock of Dixie ?

Ans :

Current Price  $(P_0) = 106.27$

6. The current dividend on an equity share of Polar Technology is Rs. 3.00. Polar is expected to enjoy an above normal growth rate of 40 percent for 5 years. Thereafter, the growth rate will fall and stabilize at 12 percent. Equity investors require a return of 18 percent from polar stock. What is the intrinsic value of the equity shares of polar ?

Ans :

Intrinsic Value  $(P_0) = 157.3\%$

7. Ms Ruhi is trying to determine the value of Frank corporation's common stock. The earnings growth rate over his planned 6-year holding is estimated to be 10% and dividend payout ratio is 60%. The ending P/E ratio is expected to be 20 and current EPS is Rs. 4.00. If the required rate of return for this stock is 15%. What should be the price of Frank's common stock ?

Ans :

Price of Frank's Common Stock  $P_0 = 73.62$

## Short Question and Answers

### 1. Equity Valuation.

Ans :

A stock is a security which possess an ownership in the form of shares. If lends to someone then it would be in the form of bonds and debentures. This is declared publicly.

Stocks are classified in two types, namely,

1. Preferred stocks
2. Common stocks.

Shareholders who possess preference stocks are given first priority at the time of rendering profits when compared to shareholders who possess common stocks. Therefore, preferred stocks have an edge over the common stocks.

Equity shares are quite easier to be explained than the fixed income securities, but it is quite difficult to be ascertained. The fundamental principles of evaluating the equity shares is similar to the fixed income securities, valuation. In case of equity shares, the factors relating to growth and risk results in greater complexities.

The techniques which are used in the fundamental equity valuation are classified into three categories i.e., Balance Sheet Techniques which involves Book value, Liquidation value and Replacement cost, Discounted Cash Flow Techniques which involves dividend discount model and free cash flow model, relative valuation techniques which involves price-earnings ratio, price-book value ratio and price sales ratio.

### 2. Scope of Equity Valuation

Ans :

- 1) **Selecting Stocks :** Stock selection is the primary use of the tools of equity valuation. Equity analysts must continually address the same question for every common stock that is either a current or prospective portfolio holding or for every stock that he or she is professionally assigned to analyze: Is this

a security may clients should purchase, sell or continue to own? Equity analysts attempt to identify securities as fairly valued, over-valued or undervalued, relative to either their own market price or the prices of comparable securities.

### 2) Inferring (Extracting) Market Expectation :

Market prices reflect the expectations of investors about the future prospects of companies. Analysts may ask what expectations about a company's future performance are consistent with the current market price for that company's stock. This question may concern the analyst for several reasons:

- i) There are historical and economic reasons that certain values for earnings growth rates and other company fundamentals may or may not be reasonable. (Fundamentals are characteristics of a company related to profitability, financial strength or risk.)
- ii) The extracted expectation for a fundamental characteristic may be useful as a benchmark or comparison value of the same characteristic for another company.

### 3) Evaluating Corporate Events :

Investment bankers, corporate analysts and investment analysts use valuation tools to assess the impact of corporate events such as mergers, acquisitions, divestitures, spin-offs, Management Buy-Outs (MBOs) and leveraged recapitalizations. Each of these events may affect a company's future cash-flows and so the value of equity. Furthermore, in mergers and acquisitions, the company's own common stock is often used as currency for the purchase; investors then want to know whether the stock is fairly valued.

**4) Seeking Fair Opinions :** The parties to a merger may be required to seek a fair opinion on . The terms of the merger from a third party such as an investment bank. Valuation is at the center of such opinions.

**5) Evaluating Business Strategies and Models :** Companies concerned with maximizing shareholder value must evaluate the impact of alternative strategies on share value.

**6) Communicating with Analysts and Shareholders :** Valuation concepts facilitate communication and discussion among company management, shareholders and analysts on a range of corporate issues affecting company value.

### Q3. Earnings Multiplier Approach

Ans :

Price-earnings ratios are used to estimate the value of the stocks by the investors rather than adopting the discounting models. Every financial magazine and the newspaper at regular interval publish price earnings per share. The P/E ratio models have three distinct advantages over the discounting models.

1. P/E ratios indicates price per rupee of share earnings. This would help to compare the prices of stocks, which have different earnings per share.
2. P/E ratios are helpful in analysing the stocks of the companies that do not pay dividend but have earnings. It should be noted that when there is a loss, the P/E ratio analysis is difficult to use.
3. The variables used in P/E ratio models are easier to estimate than the variables used in the discounting model.

We know that, by definition  $D = E(1 - b)$ , where  $D$  is dividend per share,  $E$  is earning per share and  $b$  is the earnings retention rate [ $(1 - b)$  is the dividend payout ratio]. Therefore, an equivalent earnings based valuation model is,

$$P_0 = \frac{E_1(1 - b)}{k - g}$$

Where,

$P_0$  = Stocks present value

$E_1$  = Expected earnings at the end of year 1

$b$  = Retention rate

$g$  = Expected growth rate and

$k$  = Required rate of return.

### Q4. Price to Book Value Ratio

Ans :

The book value per share is the net worth of the company (total assets minus total liabilities) divided by the number of equity shares issued. The book value is determined by economic events as well as accounting conventions. The market price of the share, in contrast, is mainly determined by how the market assesses its earning power. The ratio of market price to book value is :

PBV ratio = Price/book value ratio

$$= \frac{\text{Market price per share at time } t}{\text{Book value per share at time } t}$$

The PBV ratio has always drawn the attention of investors. During the 1990s Eugene Fama and others suggested that the PBV ratio explained to a significant extent the returns from stocks. The findings of other researches like Kim and others, however, have cast some shadow over the role of the PBV ratio.

### Q5. Price to Sales Ratio

Ans :

In the last few years, the price / sales ratio (PS ratio) has gained much importance as a valuation technique. The PS ratio is computed by dividing the company's current stock price by its revenue per share for the last twelve months. On the other hand, it can also be computed by dividing the present market value of equity capital by the yearly sales value of the firm. Basically, the PS ratio explains and indicates the market's willingness as to pay in exchange of one rupee of sales.

The following are some of the problems which the investors may face while using the PE ratio,

1. Highly inconsistent earnings.
2. Negative earnings.
3. Earnings may be explained in various ways.
4. Possibility of Managed earnings.

In order to remove or reduce such type of problems, PS ratio must be used continuously. James O'shaugnessy after evaluating various tools and techniques of investment like book value, return on equity, PE ratio, yield, PS ratio etc., have suggested and recommended that out of all the investment tools PS ratio has been considered as the most useful tool. This is because the portfolios of low PS ratio stocks are more effective than the portfolios of high PS ratio stocks.

According to a famous thumb rule a standard PS ratio of 1.0 can be used by all companies. The stocks which are traded at PS ratio and which are less than 1.0 Example 0.5 are considered as 'bargains'. PS ratio is not same for all industries. It basically differs from one industry to another industries firms because the factors like net profit margin, growth rate, asset turnover, etc. are not same for all, they vary from one firms to another firm.

The P.S ratio is a technique of relative valuation and is being interpreted in terms of drivers. One of the key drivers of P.S ratio is the net profit margin which implies that P.S ratio is considered as P.S ratio/Net profit margin. P.S ratio being one of the technique of relative valuation must be compared with the industry average and its own history.

#### Q6. Features of EVA Approach

Ans :

- ▶ It acts as performance measure which is linked to shareholder value creation in all directions.
- ▶ It is useful in providing business knowledge to everyone.
- ▶ It is an efficient method for communicating to investors.

- ▶ It transforms the accounting information into economic quality which can be easily understood nonfinancial managers.
- ▶ It is useful in evaluating net present value of project in capital budgeting which is contradictory to IRR.
- ▶ Instead of writing the value of firm in terms of discounted cash flow, it can be expressed in EVA of projects.

#### Q7. Fundamental Analysis

Ans :

##### Introduction

Investment decisions are a part of our economic life. Everybody makes such decisions in different contexts at different times. Some are able to reap more profits through them; while other simply lose their money. Attempts should, therefore, be made to understand and know the way sound investments decision can be made in order to improve the change of making profit through them. Thus, investment decision-making is an important area probing further.

In the fundamental approach an attempt is made to analyze various fundamental or basic factors that affect the risk-return of the securities. The effort here is to identify those securities that on perceives as mispriced in the stock market. The assumption in this case is that the 'market price' of security and the price is justified by its fundamental factors called 'intrinsic value' are different and their market place provides an opportunity for a discerning investor to detect such discrepancy. The moment such a description is identified, a decision to invest or disinvest is made.

The price prevailing in market is called "market price" (MP) and the one justified by its fundamentals is called "intrinsic value" (IV).

##### Criteria for selecting an Investment :

- 1) If  $IV > MP$ , buy the security
- 2) If  $IV < MP$ , sell the security
- 3) If  $IV = MP$ , no action.

**Q8. Define Industry Analysis. Explain the classification of industries.**

**Ans :**

After conducting an analysis of the economy, the analyst must - look into various sectors of the economy in terms of various industries. An industry is a homogeneous group of companies. That is, companies with similar characteristic can be divided into one industrial group. There are many bases on which grouping of companies can be done.

**Classification of Industries :**

- i) **Growth Industry :** This is an industry that is expected to grow consistently and its growth may exceed the average growth of the economy.
- ii) **Cyclical Industry :** In this category of the industry, the firms included are those that move closely with the rate of industrial growth of the economy and fluctuate cyclically as the economy fluctuates.
- iii) **Defensive Industry :** It is a grouping that includes firms, which move steadily with the economy and less than the average decline of the economy in a cyclical downturn.

**Q9. Industry Life-Cycle Stages**

**Ans :**

Every industry passes through different stages in its lifetime. The stages can be identified as follows:

- i) **Pioneering Stage :** This stage is characterized by introduction of a new product, and an up trend in business cycle that encourages new product introductions. Demand keeps on growing at an increasing rate. Competition is generated by the entry of new firms to grab the market opportunities. Weaker firms face premature death while stronger one survives to grow and expand.
- ii) **Expansion Stage :** This is characterized by the hectic activity of firms surviving the pioneering stage. The market

continues to grow but slowly, offering steady and slow growth in sales of the industry. It is a phase of consolidation wherein companies establish durable policies relating to dividends and investments.

- iii) **Stabilization Stage :** This stage shows signs of slow progress and also prospects of decay.
- iv) **Decay Stage :** An industry reaches this stage when it fails to detect the death signal and implement- pro-actively or reactively-appropriate strategies. Obsolescence manifests itself, effecting a decline in sales, profit, dividends and share prices.

**Q10. Company Analysis**

**Ans :**

It is the final stage of fundamental analysis. The economy analysis provides the investor a broad outline of the prospects of growth in the economy. The industry analysis helps in investor to select the industry in which investment would be rewarding. Now he has to decide the company in which he should invest his money. Company analysis provides the answer to this question.

Company analysis deals with the estimates return and risk of individual shares. This calls for information regarding companies which can be broadly classified into two broad groups, internal and external. Internal information consists of data and events made public by companies concerning their operations.

The internal information sources include annual reports to shareholders, public and private statements of officers of the company, the company's financial statements, etc. External sources of information are those generated independently outside the company. These are prepared by investment services and the financial press.

In company analysis, the analyst tries to forecast the future earnings of the company because there is strong evidence that earnings have a direct and powerful effect upon share prices. The level, trend and stability of earnings of a company,

however, depend upon a number of factors concerning the operation of company.

**Q11. Technical analysis**

**Ans :**

Technical analysis is a method of evaluating securities by analyzing the statistics generated by market activity, such as past prices and volume. Technical analysts do not attempt to measure a security's intrinsic value, but instead use charts and other tools to identify patterns that can suggest future activity.

Unlike fundamental analysts, technical analysts don't care whether a stock is undervalued—the only thing that matters is a security's past trading data and what information this data can provide about where the security might move in the future.

**Q12. Dow Theory.**

**Ans :**

**Dow Theory**

Charles Dow who was editor of Wall Street Journal in 1900, is known for the most important theory developed by him with technical indicators. In fact, the theory gained so much significance that the theory was named after him. The Dow Theory has been further developed by other technical analysts and it forms the basis of the technician's theory. This theory predicts trends in the market for individual and total existing securities. It also shows reversals in stock prices.

According to 'Dow Theory', the market always has three movements and the movements are simultaneous in nature. These movements may be described as: (i) the narrow movement which occurs from day-to-day, (ii) the short swing which usually moves for short time like two weeks and extends upto a month; this movement can be called a short-term movement, and (iii) the third movement is also the main movement and it covers four years in its duration. According to the type of movements, they have been given special names. The narrow movement is called 'fluctuations', the short swing is better known as 'secondary movements' and the main movement is also called the 'primary trends'.

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According to the Dow theory, the price movements in a market can be identified by means of a line-chart. In this chart, the technical analyst should plot the price of the share. With it, he should also mark the market average every day.

**Q13. Evaluation of Technical Analysis**

**Ans :**

Technical analysis appears to be a highly controversial approach to security analysis. It has its ardent votaries; it has its severe critics. The advocates of technical analysis offer the following interrelated arguments in support of their position.

1. Under the influence of crowd psychology, trends persist for quite some time. Tools of technical analysis that help in identifying these trends early are helpful aids in investment decision making.
2. Shifts in demand and supply are gradual rather than instantaneous. Technical analysis helps in detecting these shifts rather early and hence provides clues to future price movements.
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4. Charts provide a picture of what has happened in the past and hence give a sense of volatility that can be expected from the stock. Further, the information on trading volume which is ordinarily provided at the bottom of a bar chart gives a fair idea of the extent of public interest in the stock.

**Q14. EMH.**

Ans :

**Introduction**

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- 2) A second assumption is that new information regarding securities comes to the market in a random fashion, and timing of one announcement is generally independent of others.
- 3) The third assumption is especially crucial: profit maximizing investors adjust security prices rapidly to reflect the effect of new information.

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**Q15. Forms of EMH**

Ans :

1. **Weak-Form Efficient Market Hypothesis** - The weak-form EMH asserts that security prices fully impound all security market information relating to prices, trading volumes, rates of return, block trades, insider transactions, odd-lot transactions, and so on.
2. **Semistrong-Form Efficient Market Hypothesis** - The semistrong-form EMH argues that the security prices fully reflect all public information. They reflect market information (so, the weak-form EMH is subsumed under semistrong-form EMH) as well as non-market information such as macroeconomic data, industry reports, corporate announcements, price-earning ratios, price-book value ratios, dividend yields, and so on.
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## UNIT V

- (a) **Derivatives:** Overview of Indian derivatives Markets, Option Markets, Option Strategies and Option Valuation, Forward & Future markets, Mechanics of Trading, Strategies.
- (b) **Performance Evaluation:** Mutual Funds, Types of Mutual Funds Schemes, Structure, Trends in Indian Mutual Funds, Net Asset Value, Risk and Return, Performance Evaluation Models- Sharpe Model, Treynor Model, Jensen Model, Fama's Decomposition.

### 5.1 DERIVATIVES

#### Q1. Define derivatives ? Explain the types of derivatives.

Ans :

A derivative is a financial instrument whose value depends on underlying assets. The underlying assets could be prices of traded securities of gold, copper, aluminum and may even cover prices of fruits and flowers.

Derivatives have become important in India since 1995, with the amendment of the Securities Contract Regulation Act of 1956. Derivatives such as options and futures are traded actively on many exchanges. Forward contracts, swap and different types of options are regularly traded outside exchanges by financial institutions, banks and corporate client in over-the-counter markets. There is no single market place or an organized exchange.

Organized exchanges began trading in options on securities in 1973, whereas exchange traded debt options started trading in 1982. On the other hand, fixed income futures began trading in 1975, but equity related futures started trading in 1982. The reasons for debt options being stronger than futures are that stock exchanges tend to introduce those instruments that they think will be successful in trading.

In the equity market, a relatively large proportion of the total risk of a security is unsystematic. At the same time many securities display a high degree of liquidity that can be expected to be maintained for long periods of time. These to be successful, the underlying instruments have to be traded in large quantities and with some

price continuity so that the option related transactions need not create more than a minor disturbance in the market.

#### Classification of Derivatives

Derivatives can be classified as :

1. **Commodities derivatives:** These are derivatives on commodities like sugar, jute, paper, gur, castor seeds,
2. **Financial Derivatives:** These derivatives deal in shares, currencies and gilt-edged securities.
3. **Basic Derivatives:** Futures and Options are basic derivatives.
4. **Complex Derivatives:** Interest rate futures and swaps are classified as complex derivatives.
5. **Exchange traded derivatives :** Exchange traded derivatives are standard contracts traded according to the rules and regulations of a stock exchange. Only members can trade in exchange traded derivatives and they are guaranteed against counter-party default. Contracts are settled daily.
6. **OTC Derivatives :** OTC Derivatives are regulated by statutory provisions. Swaps, forward contracts in foreign exchange are usually OTC derivatives and have a high risk of default.

#### Types of Derivatives

The most commonly used derivatives contracts are forwards, futures and options which we shall discuss in detail later.

1. **Forwards** : A forward contract is a customised contract between two entities, where settlement takes place on a specific date in the future at today's pre agreed price.
2. **Futures** : A futures contract is an agreement between two parties to buy or sell an asset at a certain time in the future at a certain price. Futures contracts are special types of forward contracts in the sense that the former are standardised exchange-traded contracts.
3. **Options** : Options are of two types – calls and puts. Calls give the buyer the right but not the obligation to buy a given quantity of the underlying asset, at a given price on or before a given future date. Puts give the buyer the right, but not the obligation to sell a given quantity of the underlying asset at a given price on or before a given date.
4. **Warrants** : Options generally have lives of upto one year, the majority of options traded on options exchanges having maximum maturity of nine months. Longer-dated options are called warrants and are generally traded over-the-counter.
5. **LEAPS** : The acronym LEAPS means Long Term Equity Anticipation Securities. These are options having a maturity of upto three years.
6. **Baskets** : Basket options are options on portfolios of underlying assets. The underlying asset is usually a moving average or a basket of assets. Equity index options are a form of basket options.
7. **Swaps** : Swaps are private agreements between two parties to exchange cash flows in the future according to a prearranged formula. They can be regarded as portfolios of forward contracts. The two commonly used swaps are:
  - (i) **Interest rate swaps** : These entail swapping only the interest related cash flows between the parties in the same currency.
  - (ii) **Currency Swaps** : These entail swapping both principal and interest between the parties, with the cash flows in one direction being in a different currency than those in the opposite direction.

8. **Swaptions** : Swaptions are options to buy or sell a swap that will become operative at the expiry of the options. Thus, swaptions is an option on a forward swap. Rather than have calls and puts, the swaptions market has receiver swaptions and payer swaptions. A receiver swaption is an option to receive fixed and pay floating. A payer swaption is an option to pay fixed and receive floating.

## 5.2 OVERVIEW OF INDIAN DERIVATIVES MARKETS

### Q2. Explain in detail about overview of derivative markets in India.

Ans :

#### An Overview of Indian Derivatives Market

From the past, it was evident that commodity markets were favouring the trading of derivative but in the late 1990s, the trading of financial derivatives came into existence. In 1995, various restrictions made on the options trading were prohibited with the introduction of the securities laws (amendments) ordinance. Dramatic growth was observed with the introduction of equity derivatives and stock and index derivatives. Even, it had attracted wide range of investors as several risk containment measures or regulatory measures were adopted by LC Gupta committee and JR Verma committee which have reduced the risk associated with the derivative markets.

During June, 2000, trading of index futures was common on different Indian stock exchanges followed by the trading of index options and options of individual securities in 2001. In Indian capital markets, the major type of securities are traded on BSE (Bombay Stock Exchange) and NSE (National Stock Exchange). Even the derivatives are traded at NSE and BSE. Recently even banks are managing their risks, namely credit risk and interest rate risk by investing into credit derivatives and interest rate derivatives. This became possible only after the promulgation of regulatory mechanisms by Reserve Bank of India (RBI). However, credit derivatives and interest rate derivatives are incapable of making expected volume of trade.

The derivative trading in commodity market has picked up expected growth after the initiatives taken by the three major stock exchanges i.e., National Multi Commodity Exchange of India, Multi Commodity Exchange of India and National Commodity and Derivative Exchange.

The derivatives growth in Indian capital market can be studied with the help of the following figure.

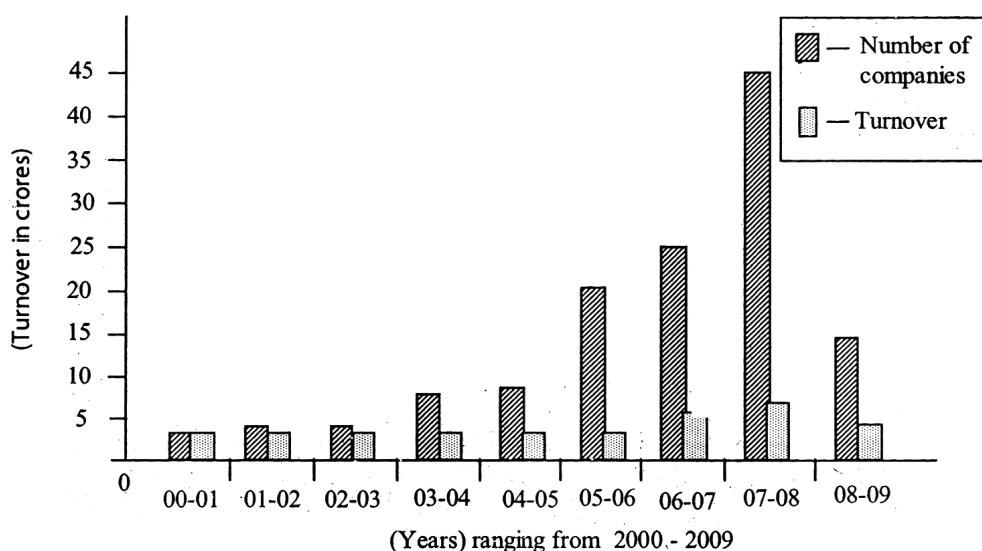


Fig. : Derivative Growth in India

It was observed that there was a drastic growth in derivatives from 2000-2007. Such growth was mediated by the reduction in the lot size of options contract from 200 to 100, then to only 50 in 2007 and also by the increased participation from the foreign institutions and domestic investors (Example, Arbitrage Funds and Portfolio Hedgers).

### 5.3 OPTION MARKETS

**Q3. Define option ? Explain features of options.**

Ans :

Options are the important financial derivatives where the instruments have additional features of exercising an option which is a right and not the obligation. Hence, options provide better scope for risk coverage and making profit at any time within the expiration date. The price of the underlying is also derived from the underlying asset.

Options are of different types. Some are related to stock index, some with currency and interest rates. During the last three decades the option trading gained momentum though the first option in commodity was launched in 1860 in USA. Based on the sale and purchase there are two types of options: put and call. The exercise-time of an option makes it in American or European. The other category of option includes- over the counter (OTC) or exchange traded. Options can be valued either with the help of intrinsic value or with time value. There are two positions in option trading- long and short position.

#### Definition of an Option

Option may be defined as a contract between two parties where one gives the other the right (not the obligation) to buy or sell an underlying asset at a specified price within or on a specific time. The underlying may be commodity, index, currency or any other asset.

As an example, suppose that a party has 1000 shares of Satyam Computer whose current price is Rs. 4000 per share and other party agrees to buy these 1000 shares on or before a fixed date (i.e. suppose after 4 month) at a particular price say it is become Rs. 4100 per share. In future within that specific time period he will definitely purchase the shares because by exercising the option, he gets Rs. 100 profit from purchase of a single share. In the reverse case suppose that the price goes below Rs. 4000 and declines to Rs. 3900 per share, he will not exercise at all the option to purchase a share already available at a lower rate.

Thus option gives the holder the right to exercise or not to exercise a particular deal. In present time options are of different varieties like-foreign exchange, bank term deposits, treasury securities, stock indices, commodity, metal etc. Similarly the example can be explained in case of selling right of an underlying asset.

### Features of Options

The following features are common in all types of options.

- **Contract:** Option is an agreement to buy or sell an asset obligatory on the parties.
- **Premium:** In case of option a premium in cash is to be paid by one party (buyer) to the other party (seller).
- **Pay off:** From an option in case of buyer is the loss in option price and the maximum profit a seller can have in the options price.
- **Holder and writer** Holder of an option is the buyer while the writer is known as seller of the option. The writer grants the holder a right to buy or sell a particular underlying asset in exchange for a certain money for the obligation taken by him in the option contract.
- **Exercise price** There is call strike price or exercise price at which the option holder buys (call) or sells (put) an underlying asset.

- **Variety of underlying asset** The underlying asset traded as option may be variety of instruments such as commodities, metals, stocks, stock indices, currencies etc.
- **Tool for risk management** Options is a versatile and flexible risk management tools which can mitigate the risk arising from interest rate, hedging of commodity price risk. Hence options provide custom-tailored strategies to fight against risks.

### Q4. Explain the types of options.

Ans :

There are various types of options depending upon the time, nature and exchange of trading. The following is a brief description of different types of options:

1. Put and call option
2. American and European option
3. Exchange traded and OTC options.

#### 1. Put and call option

- (i) **Put option** is an option which confers the buyer the right to sell an underlying asset against another underlying at a specified time on or before a predetermined date. The writer of a put must take delivery if this option is exercised. In other words put is an option contract where the buyer has the right to sell the underlying to the writer of the option at a specified time on or before the option's maturity date.
- (ii) **Call option** is an option which grants the buyer (holder) the right to buy an underlying asset at a specific date from the writer (seller) a particular quantity of underlying asset on a specified price within a specified expiration/maturity date. The call option holder pays premium to the writer for the right taken in the option.

## 2. American and European option

**American option** provides the holder or writer to buy or sell an underlying asset, which can be exercised at any time before or on the date of expiry of the option. On the other hand a European option can be exercised only on the date of expiry or maturity.

This is clear that American options are more popular because there is timing flexibility to exercise the same. But in India, European options are prevalent and permitted.

## 3. Exchange traded and OTC options.

**Exchange traded** options can be traded on recognized exchanges like the futures contracts. Over the counter options are custom tailored agreement traded directly by the dealer without the involvement of any organized exchange. Generally large commercial bankers and investment banks trade in OTC options.

Exchange traded options have specific expiration date, quantity of underlying asset but in OTC traded option trading there is no such specification and terms are subjective and mutually agreed upon by the parties. Hence OTC traded options are not bound by strict expiration date, specific limited strike price and uniform underlying asset.

Since exchange traded options are guaranteed by the exchanges, hence they have less risk of default because the deals are cleared by clearing houses. On the other side OTC options have higher risk element of default due to noninvolvement of any third party like clearing houses. Offsetting the position by buyer or seller.

## Q5. Differences between Call Option and Put Option.

Ans :

| Call Option |                                                                                                                       | Put Option |                                                                                                                  |
|-------------|-----------------------------------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------------------------------------------------------|
| 1.          | The owner has the right but not the obligation to buy an asset on a specified date at a specified price.              | 1.         | The owner has the right but not the obligation to sell the asset on a specified date at the specified price.     |
| 2.          | Call option consists of two persons namely, call buyers and call sellers.                                             | 2.         | Put option consists of two persons namely, put buyers and put sellers.                                           |
| 3.          | Call buyers are bulls who are optimistic in nature. Call buyers assume that the prices would increase in future.      | 3.         | Put buyers are bears who are pessimistic in nature. Put buyers assume that the prices would decrease in future.  |
| 4.          | Therefore, call buyers buys shares in advance or makes a long position.                                               | 4.         | Hence, put buyers sells shares in advance or makes a sell position.                                              |
| 5.          | Calls sellers are bears who are pessimistic in nature. Call sellers assumes that the prices would decrease in future. | 5.         | Put sellers are bulls who are optimistic in nature. Put sellers assume that the prices would increase in future. |
| 6.          | Call buyer makes a premium amount to call seller.                                                                     | 6.         | Put buyer makes a premium amount to put seller.                                                                  |
| 7.          | If prices increase, call seller has to pay to call buyer.                                                             | 7.         | If prices decrease, put seller has to pay to put buyer.                                                          |
| 8.          | If prices decrease in future then call call buyer will just loose his premium and the option is closed.               | 8.         | If prices increase then put buyer will just loose his premium and the option comes to an end.                    |
| 9.          | For call buyers, profits are unlimited and losses are limited.                                                        | 9.         | For put buyers, profits are unlimited and losses are limited.                                                    |
| 10.         | For call sellers, profits are limited and losses are unlimited.                                                       | 10.        | For put sellers, profits are limited and losses are unlimited.                                                   |

**Q6. Differences between American and European Options**

Ans :

| American Option                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | European Option                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>Options are exercised on or before the settlement date i.e., either today, tomorrow or at any trading day until the life of the contract. No specific expiration date.</li> <li>Majority of stock options opt for American options.</li> <li>The price of the option is usually high as it assumes high risk thereby charging high risk premium.</li> <li>Firm, as soon as it realises profits is liable to take delivery of the underlying asset on any day and hence can end the contract.</li> </ol> | <ol style="list-style-type: none"> <li>Options are exercised only on the settlement date but not on today, tomorrow or any trading day. Expiration date is specific.</li> <li>European options are less frequently traded when compared to American option.</li> <li>The price of the option is low because it is less risky and charges less risk premium.</li> <li>Even though firm realises profits, is liable to take delivery of the underlying asset only on the expiration date.</li> </ol> |

**5.4 OPTION STRATEGIES**

**Q7. Discuss briefly about various option strategies.**

Ans :

**Introduction**

Option strategies are plans implemented by an options trader to maximize profits and minimize risk. An option strategy involves combining options' positions on an underlying asset, typically a stock. Option strategy is the purchase and/or sale of one or various option positions and possibly on underlying option. Options strategy is a set of options positions to achieve a particular risk/return profile.

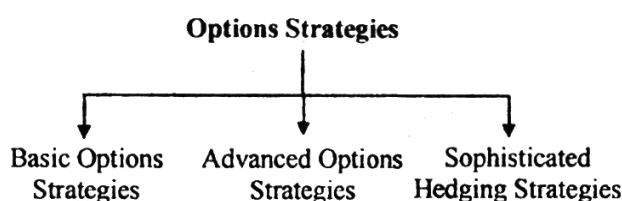
Through the option strategy, a trader can increase the value of his/her holidays significantly irrespective of the direction of the stock price movement. With this options strategy, an investor can lose money only if the underlying stock retains its value over a period of time or its price deviates only marginally.

Finally, the hedge can be constructed by buying an option and selling the option or by combination of both i.e., (basic and advanced option strategies) and there are other more advanced sophisticated hedging techniques with options which are use by option traders.

**Classification Option Strategies**

The option strategies can be broadly classified into three:

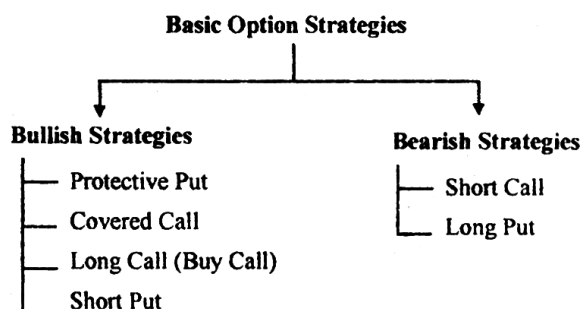
1. Basic option strategies,
2. Advanced options strategies, and
3. Advanced sophisticated hedging strategies with options.



### A) Basic Option Strategies

There are two advanced strategies of option are as follows:

1. Bullish Strategies
2. Bearish Strategies



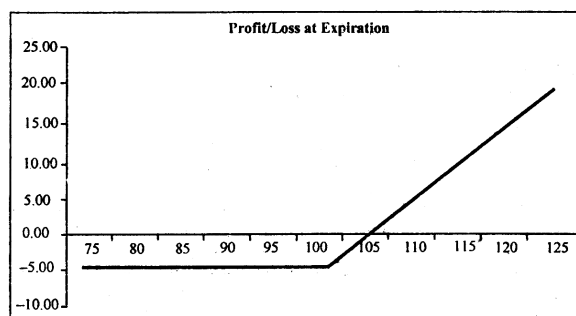
### A) Bullish Strategies

Following are the bullish strategies:

1. **Protective Put:** This is the result of long the underlying asset and long put options. A protective put strategy has a very similar payoff profile to the long call. The maximum loss is limited to the premium paid for the option and can have an unlimited profit potential.

Protective puts are ideal for investors whom are very risk averse, i.e., they hold stock and are concerned about a stock market correction. So, if the market does sell off rapidly, the value of the put options that the trader holds will increase while the value of the stock will decrease. If the combined position is hedged then the profits of the put options will offset the losses of the stock and all the investor will loose will be the premium paid.

However, if the market rises substantially past the exercise price of the put options, then the puts will expire worthless while the stock position increases. But, the loss of the put position is limited, while the profits gained from the increase in the stock position are unlimited. So, in this case the losses of the put option and the gains from the stock do not offset each other; the profits gained from the increase in the underlying out weight the loss sustained from the put option premium.



**Maximum Loss:** Limited to the premium paid for the put option.

**Maximum Gain:** Unlimited as the market rallies.

### Example 1

Jerry Evans is considering purchasing 100 shares of Rome Company's stock at a current price of Rs. 50 per share. However, Jerry is afraid that the price of Rome's stock could fall in the 2 months after he buys it. A current 3-month at-the-money put option for Rome is selling for Rs. 2 premium per share.

- i) What profit or loss will Jerry make if he purchases Rome for Rs. 50 per share and the price of Rome's stock falls in 1 month to Rs. 40 per share without a protective put ?
- ii) Determine Jerry's profit or loss if he had purchased the Rs. 2 put.

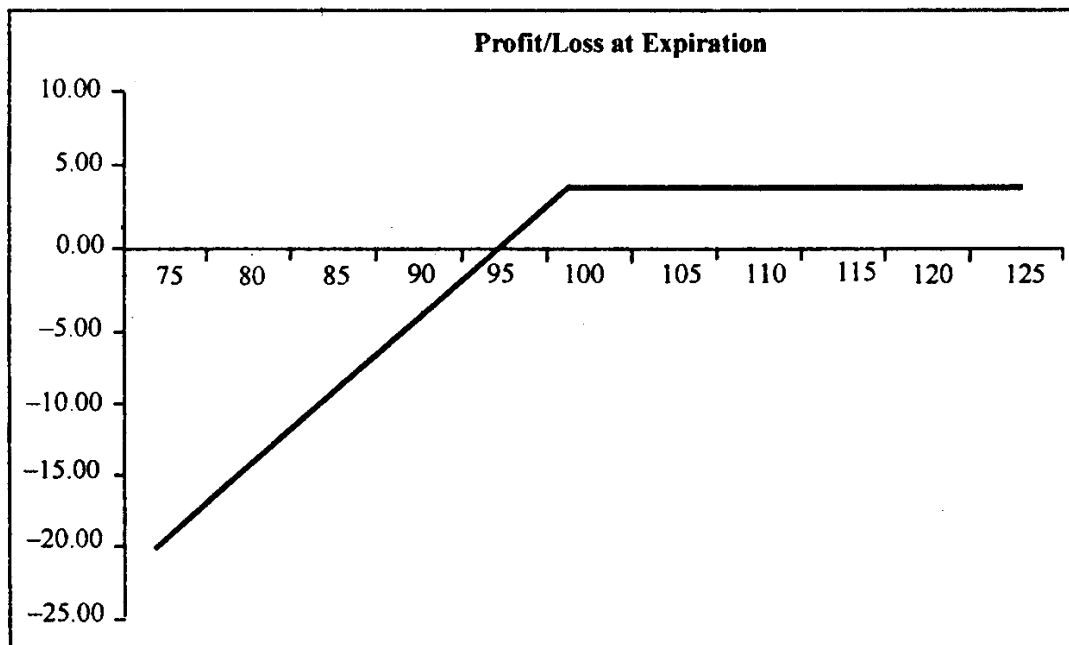
### Solution :

- i) Cost of stock = Rs. 50 x 100 shares = 5,000  
 Ending position = Rs. 40 x 100 – 5,000  
 = 4,000 – 5,000 = 1,000 loss  
 Cost of put = (Rs. 2 per share) x (100 shares) = 200
- ii) Since Jerry has the right to put the stock to the seller at an exercise price of Rs. 50, his losses are limited to the cost of the put, Rs. 200 total premium.

2. **Covered Call:** This is the result of long the underlying asset and short the call options. This strategy is used by many investors who hold stock. It is also used by many large funds as a method of generating consistent income from the sold options.

The idea behind a covered call, also called **Covered Write**, is to hold stock over a long period of time and every month or so sell out-of-the-money call options.

Even though the payoff diagram shows an unlimited loss potential, one must remember that many investors implementing this type of strategy have bought the stock long ago and hence the call option's strike price may be a long way from the purchase price of the stock.



**Maximum Loss:** Unlimited on the downside.

**Maximum Gain:** Limited to the premium received from the sold call option.

For example, a pension fund holds 3000 shares of BHEL, with a current price of Rs.840 per share. Suppose management intends to sell all 3000 shares if the share price hits Rs. 900 and a call expiring in 60 days with an exercise price of Rs. 900 currently sells for Rs.15. By writing 10 BHEL contracts (300 shares each) the fund can pick up Rs.45,000 in extra income. The fund would lose its share of profits from any movement of BHEL stock above Rs. 900 per share, but given that it would have sold its shares at Rs. 900, it would not have realized those profits anyway.

3. **Long Call (Buy Call) :** A long call is simply the purchase of one call option. A long call option is the simplest way to benefit if we believe that the market will make an upward move and is the most common choice among first time investors. Being long a call option means that we will benefit if the stock/future rallies, however, our risk is limited on the downside if the market makes a correction.

Long call is used when the investor expects market to be very bullish and the underlying stock/index/asset to be very volatile. It is advised to buy the lowest strike price call option (in-the-money) and choose sufficient holding period. But in case, the expected business does not take place, the investor must exit the position immediately or create another position to offset the loss.

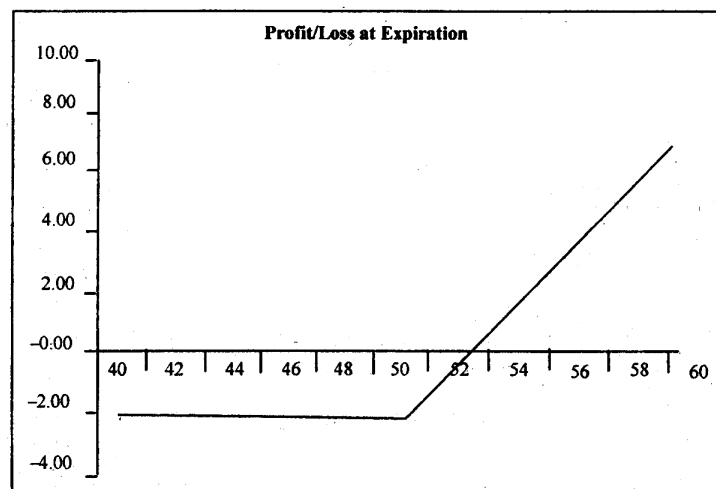


Fig. : Profit/Loss at expiration for long call

**Maximum Loss:** Limited to the premium paid upfront for the option.

**Maximum Gain:** Unlimited as the market rallies.

**When to Use:** When investor are bullish on market direction and also bullish on market volatility.

**Upside Potential:** The price of the option increases as the price of the underlying rises. Investor can book profit by selling the same option at higher price whenever investor think that the underlying price has come to the level he expected. At expiration the break-even underlying price is the strike price plus premium paid for buying the option.

**Downside Risk:** The investor loss is limited to the premium he has paid. The maximum one can lose is the premium, if the underlying price is below the strike price at expiry of the option.

4. **Short Put :** A short put is simply the sale of a put option. Like the short call option, selling naked puts can be a very risky strategy as our losses are unlimited in a falling market. The written put can provide the investor with extra income (premium received on put option) in stable to rising markets. Most investors use this strategy as a method of buying stocks at cheaper rate. Short put is used when the investor expects the share price/index to remain steady or be slightly bullish over the life of the option.

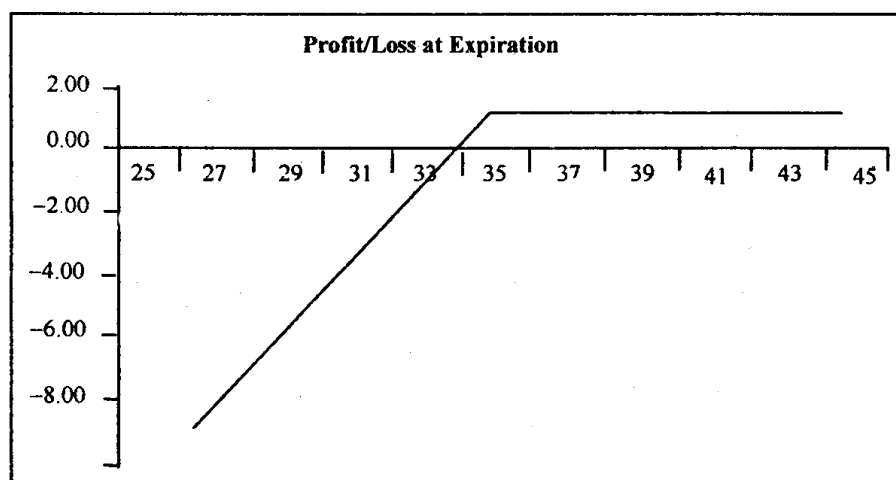


Fig. : Profit / Loss at Expiration for Short Put

**Maximum Loss:** Unlimited in a falling market.

**Maximum Gain:** Limited to the premium received for selling the put option.

**When to Use:** When one is bullish on market direction and bearish on market volatility.

**Upside Potential:** Investor profit is limited to the premium received. At expiration, the break-even is strike price minus premium. Maximum profit is realized if the underlying price is above the strike price.

**Downside Risk:** The price of the option increases as the underlying falls. One can cut the losses by buying the same option if one thinks that the view is going to be wrong. Losses keep on increasing as the underlying falls and are virtually unlimited. Such a position must be monitored closely. The investor must write puts only if he has the financial capacity to buy the underlying shares should they be exercised by the put buyer.

## B) Bearish Strategies

Following are the bearish strategies:

1. **Short Call:** A short call is simply the sale of one call option. A selling option is also known as "writing an option". A short is also known as a naked call. Naked calls are considered very risky positions because the risk is unlimited.

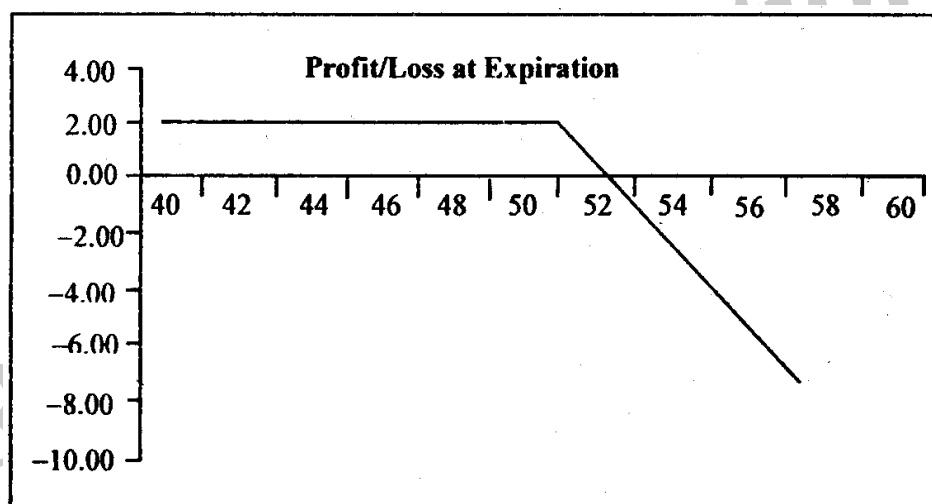


Fig. : Profit / Loss at Expiration for Short Call

**Upside Potential:** The investor's profit is limited to the premium received. At expiration the break-even is strike price plus premium. Maximum profit is realized if the underlying price is below the strike price.

**Downside Risk:** The price of the option increases as the underlying price rises. The investor can cut his losses by buying the same option if he thinks that his view is going wrong. Losses keep on increasing as the underlying rises and are virtually unlimited. Such a position must be monitored closely.

**Maximum Loss :** Unlimited as the market rises.

**Maximum Gain :** Limited to the premium received for selling the option.

**When to Use:** When the investors are bearish on market direction and also bearish on market volatility.

2. **Long Put:** A long put is simply the purchase of one put option. Like the long call, a long put is a nice simple way to take a position on market direction without risking everything. Except with a put option the investor want the market to decrease in value. Buying put options is a fantastic way to profit from a down turning market without shorting stock. Even though both methods will make money if the market sells off, buying put options can do this with limited risk.

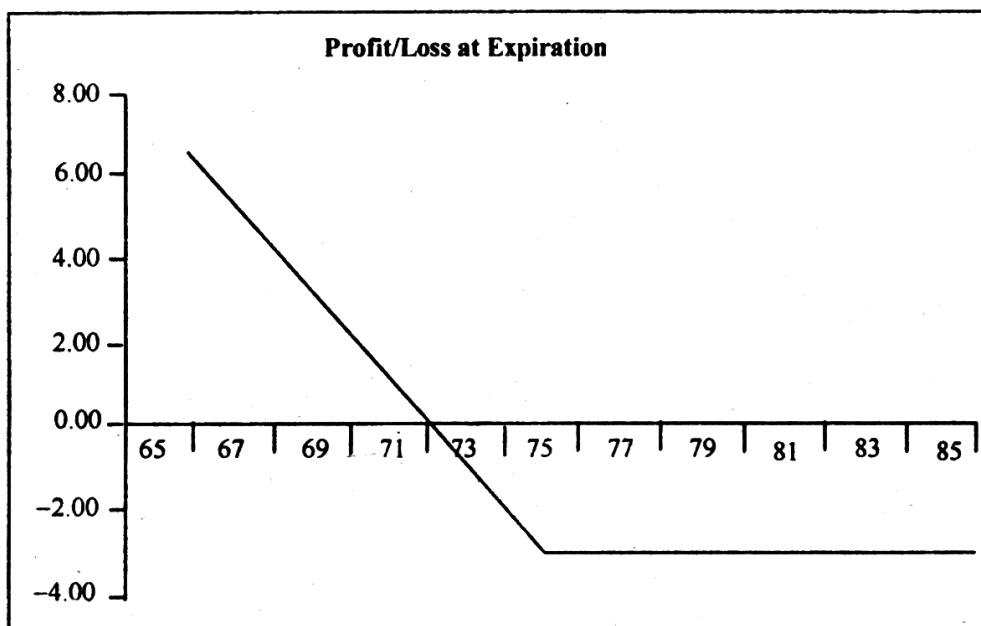


Fig. : Profit / Loss at Expiration for Long Put

**Upside Potential:** The price of the option increases as the price of the underlying price falls. The investor can square up his position by selling the same option at a higher price whenever he think that the underlying price has come to the level he expected. At expiration the break-even underlying price is the strike price minus premium paid for buying the option.

**Downside Risk:** The investor's loss is limited to the premium he has paid. The maximum he can lose is the premium, if the underlying price is above the strike price at expiry of the option.

**Maximum Loss:** Limited to the net premium paid for the option.

**Maximum Gain:** Unlimited as the market sells off.

**When to Use:** When the investors are bearish on market direction and bullish on market volatility.

## 5.5 OPTION VALUATION

**Q8. Discuss the various methods of option valuation.**

**Ans :**

The following two methods are used for valuation of option prices :

1. Black and Scholes option pricing model (BSOPM)
2. Binomial option pricing model (BOPM)

### 1. The Black-scholes Pricing Model (BSOPM)

The black and scholes option pricing model is the most commonly used option pricing model in finance. It was initially developed in 1973 by two academicians fisher Black and Myron scholes and was designed to price European option on non dividend paying stocks after that they developed consultancy org to do many recommendation at corporate sector. Later on some adjustment are made regarding - payment of dividend income. This model is also applicable for American option now days most of the option are made on American style (or) option.

#### Assumptions :

This model is based on the following assumptions.

1. Stock-price behaviour corresponds to the normal log distribution.
2. The risk rate of the stock (s) remains constant in the option contract period.
3. There no taxes (or) transaction cost.
4. All securities are perfectly divisible.
5. No dividend payment on stock during the period of option if the dividend is expected during the period of option that can be adjusted as per unit price.
6. There are no risk less arbitrages opportunities.
7. Stock trading is continuous
8. Investor can borrow or lend at the risk free rate of interest.
9. The slit term risk free interest (r) is constant.

#### Formula's for Determination of Option Price :

The following formulas are used for determination of value of call and put option.

##### Call option

$$C = S \cdot N(d_1) - ke^{-r \cdot T} \cdot N(d_2)$$

### Put Option

$$P = k \cdot e^{-r \cdot T} N(-d_1) - S \cdot N(d_2)$$

where

$d_1$   $d_2$  values are cal as below

$$D_1 = \frac{\ln \cdot \left( \frac{S}{K} \right) + r \cdot T}{\sigma \sqrt{T}} + \sigma \sqrt{T}$$

$$d_2 = d_1 - \sigma \sqrt{T}$$

where

S = Call option price

S = Stock market price

k = Strike price

$N(d_1)$  = The value of normal distribution for  $d_1$ .

e = Exponential value

r = Risk free rate return

T = Option contract time period

$N(d_2)$  = The value of normal distribution for  $d_2$

P = Put option value

ln = Natural log value for the ratio of market price and strike price of the stock.

$\sigma$  = Std deviation (or) Variability ratio

### 2. Binomial Option Pricing Model

The Binomial Option Pricing Model is an options valuation method developed by Cox in 1979. It is a very simple model that uses an iterative procedure to price options, allowing for the specification of nodes, or points in time, during the time span between the valuation date and the option's expiration date. When compared to the Black Scholes model and other complex models, the binomial option pricing model is mathematically simple and easy to use.

The model lowers the possibilities of price changes and is based on the concept of no arbitrage, it assumes a perfectly efficient market, and shortens the duration of the option. Under these simplifications, it is able to provide a mathematical valuation of the option at each node specified.

Binomial Option pricing model is an important topic for the FRM Part 1 exam. There are both conceptual and numerical questions in the exam to test this topic. Here, we will discuss various concepts related to binomial option pricing model.

### Assumptions in Binomial Option Pricing Model

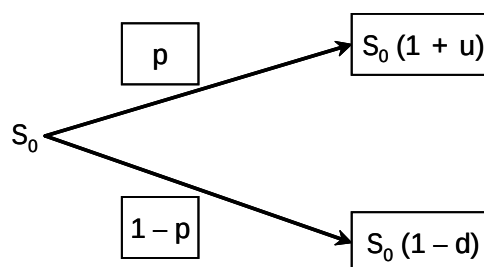
One simplifying assumption that the Binomial Option Pricing Model makes is that over a certain time period, the underlying can only do one of two things: go up, or go down.

In detail, the assumptions in binomial option pricing models are as follows:

1. There are only two possible prices for the underlying asset on the next day. From this assumption, this model has got its name as Binomial option pricing model (Bi means two)
2. The two possible prices are the up-price and down-price
3. The underlying asset does not pay any dividends
4. The rate of interest ( $r$ ) is constant throughout the life of the option
5. Markets are frictionless i.e. there are no taxes and no transaction cost
6. Investors are risk neutral i.e. investors are indifferent towards risk

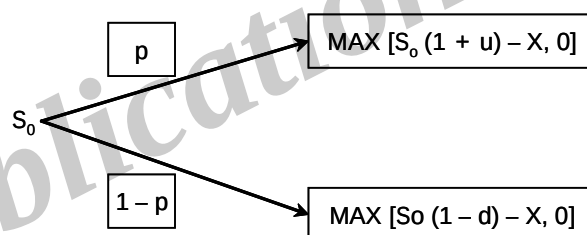
### Binomial option model building process

Let us consider that we have a share of a company whose current value is  $S_0$ . Now in the next month, the price of this share is going to increase by  $u\%$  (up state) or it is going to go down by  $d\%$  (down state). No other outcome of price is possible for this stock in next month. Let  $p$  be the probability of up state. Therefore the probability of down state is  $1-p$ .



Now let us assume that call option exists for this stock which matures at the end of the month. Let the strike price of the call option be  $X$ . Now in case, the option holder decides to exercise the call option at the end of month, what will be the payoffs?

The payoffs are given in the diagram below



Now, the expected payoff using the probabilities of up state and down state. From the above diagram, the expected value of payoff is

$$p + \text{MAX} [S_0(1+u) - X, 0] + (1-p) + \text{MAX} [S_0(1-d) - X, 0]$$

Once the expected value of the payoff is calculated, this expected value of payoff has to be discounted by risk free rate to get the arbitrage free price of call option. Use continuous discounting for discounting the expected value of the payoff. FRM Part 1 uses continuous compounding and discounting for all numerical problems on derivatives.

In some questions, the probability of up state is not given. In such a case, probability of up state can be calculated with the formula

$$p = \frac{e^{rt} - D}{U - D}$$

Where;

$p$  = up state probability

$r$  = risk free rate

$d$  = Down state factor

$u$  = Up state factor

Using the above the model building process, similar model can be build for multi period options and also for put options.

### Binomial Option Pricing Model Advantages

1. Binomial option pricing models are mathematically simple to use.
2. Binomial option pricing model is useful for valuing American options in which the option owner has the right to exercise the option any time up till expiration.
3. Binomial option model is also useful for pricing Bermudian options which can be exercised at various points during the life of the option.

### Binomial Option Pricing Model Limitations

One major limitation of the binomial option pricing model is it is slow speed and complex. Complexity of computation is increased twofold in multi -period binomial option pricing model.

### PROBLEMS ON OPTION VALUATION

1. From the following details calculate the price of call option Black-Shoes models market price of share is Rs. 92 and strike price of share Rs. 95 and time period 50 days option expires on Dec. 21<sup>st</sup> 2002 option contract is made on 11<sup>th</sup> Nov. 2002 and risk free rate of interest is 7.12% p.a. S.D is 35%.

Sol :

$$C = S.D(d_1) - k.e^{-r.T} . N(d_2)$$

$$d_1 = \frac{\ln \left( \frac{S}{K} \right) + r.T}{\sigma \sqrt{T}} + 0.5 \sigma \sqrt{T}$$

Strike price of share = 95

Spot and market price of share = 92

Time price = 50

$$d_1 = \frac{\ln \left( \frac{92}{95} \right) + 0.0712 \times \frac{50}{365}}{0.35 \times \sqrt{\frac{50}{365}}}$$

$$+ 0.5 \times .35 \times \sqrt{\frac{50}{365}}$$

$$d_1 = \frac{-0.03208 + 0.0712 \times 0.13699}{0.35 \times 0.01937} + 0.5 \times 0.35 \times 0.01937$$

$$d_1 = \frac{-0.03208 + 0.00975}{0.1295} + 0.06475$$

$$d_1 = \frac{-0.02233}{0.1295} + 0.06475$$

$$d_1 = -0.17263 + 0.06475 = -0.10788$$

Normal  $d_1 = 0.4562$

$$d_2 = d_1 - \sigma \sqrt{T}$$

$$d_2 = 0.4562 - 0.35 \sqrt{\frac{50}{365}}$$

$$= -0.10788 - 0.35 \times 0.3701$$

$$= -0.10788 - 0.1295$$

$$= -0.2375$$

$Nd_2 = 0.4052$

$$C = S.N(d_1) - k.e^{-r.T} . N(d_2)$$

$$C = (92 \times 0.4562) - 95 e^{-0.0712 \times \frac{50}{365}} \times 0.4052$$

$$C = 41.9704 - 95 e^{-0.00975} \times 0.4052$$

$$C = 41.9704 - 95 \times 0.9902 \times 0.4052$$

$$C = 41.9704 - 94.078 \times 0.4052$$

$$C = 41.9704 - 38.1203$$

$$C = 3.85.$$

2. Mr. Shaker wants to earn by writing call option on RIL's stock the current price of stock is Rs. 28 and shaker wants to write a four month call option with the strike price of Rs. 30/- Mr. shaker wants to determine the appropriate premium to charge for call option. The stock S.D is 30% the risk less rate of interest is 10% p.a. determine the premium value of call option.

Sol :

Market price = 28

S.Price = 30

S.D = 0.30

r = 10%

T = 4 months

$$C = S.N(d_1) - ke^{-r.T} \cdot N(d_2)$$

$$d_1 = \frac{\ln\left(\frac{S}{K}\right) + r.T}{\sigma\sqrt{T}} + 0.5\sigma\sqrt{T}$$

$$d_1 = \frac{\ln\left(\frac{28}{30}\right) + 0.10 \times \frac{4}{2}}{0.30\sqrt{0.334}} + 0.5 \times 0.3 \times \sqrt{0.33}$$

$$d_1 = \frac{-0.06899 + 0.10 \times 0.33}{0.172} \times 0.0866$$

$$d_1 = \frac{-0.0359}{0.1732} \times 0.0866$$

$$d_1 = -0.20779 \times 0.0866$$

$$d_1 = -0.1206$$

→ Normal table ⇒ 1 under 2

$$Nd_1 = 0.4522$$

$$\begin{aligned} d_2 &= d_1 - \sigma\sqrt{T} \\ &= -0.1206 - 0.30\sqrt{0.334} \\ &= -0.1206 - 0.1732 \\ &= -0.2927 \end{aligned}$$

$$Nd_2 = 0.3859$$

$$C = (28 \times 0.4522) - 30e^{-0.1 \times 0.334} \times 0.3859$$

$$C = 12.6612 - 30e^{-0.0334} \times 0.3859$$

$$C = 12.6616 - 29.0145 \times 0.3859$$

$$C = 12.6616 - 11.1967$$

$$C = 1.4649/-$$

3. Consider the following data stock price Rs. 50. Months to expiration is three month risk free rate of int 10 p.a S.D of stock 40% excise price Rs. 55. Calculate the value of call option.

Sol :

$$C = S.N(d_1) - k.e^{-r.T} - N(d_2)$$

$$d_1 = \frac{\ln\left(\frac{S}{K}\right) + r.T}{\sigma\sqrt{T}} + 0.5\sigma\sqrt{T}$$

$$d_1 = \frac{\ln\left(\frac{50}{55}\right) + 0.10 \cdot \left(\frac{3}{12}\right)}{0.40\sqrt{\frac{3}{12}}} + 0.5 + 0.4 \times \sqrt{\frac{3}{12}}$$

$$d_1 = \frac{-0.0953 + (0.01 \times 0.25)}{(0.40)(0.5)} + (0.5)(0.4 \times 0.5)$$

$$d_1 = \frac{-0.0953 + 0.025}{0.2} + 0.1$$

$$d_1 = \frac{-0.0703}{0.2} + 0.1$$

$$d_1 = -0.3515 + 0.1$$

$$d_1 = -0.2515 = 0.4013$$

$$Nd_2 = d_1 - \sigma\sqrt{T}$$

$$Nd_2 = -0.2515 - 0.40\sqrt{\frac{3}{12}}$$

$$Nd_2 = -0.2515 - (0.40 \times 0.5)$$

$$Nd_2 = -0.2515 - 0.2$$

$$Nd_2 = -0.4515$$

$$Nd_2 = 0.3264$$

$$C = S.N(d_1) - k.e^{-r.T} . N(d_2)$$

$$C = 50 . (0.4013) - 55 . e^{-0.10 \times \frac{3}{12}} . (0.3264)$$

$$C = 20.065 - 55 e^{-0.10 \times 0.25} . (0.3264)$$

$$C = 20.065 - 55 e^{-0.025} (0.3264)$$

$$C = 20.065 - 55 (0.975) (0.3264)$$

$$C = 20.065 - 55 (0.3184)$$

$$C = 20.065 - 17.50876$$

$$C = 2.56$$

$$Nd_1 = 2 \text{ under } 5$$

$$\text{is } 0.4013$$

$$Nd_2 = 4 \text{ under } 5$$

$$\text{is } 0.3264.$$

#### 4. Consider the following data

| Particulars         | Stock X  | Stock Y  |
|---------------------|----------|----------|
| Stock Price (S)     | Rs. 80   | Rs. 80   |
| Excise Price (K)    | Rs. 70   | Rs. 80   |
| Time to expiration  | 3 M      | 3 M      |
| Risk free rate int. | 12% p.a. | 12% p.a. |

|         |                      |                      |
|---------|----------------------|----------------------|
| S.D (σ) | $\frac{60\%}{16.12}$ | $\frac{60\%}{10.62}$ |
|---------|----------------------|----------------------|

Calculate the value of call option for X & Y

**Sol :**

**Stock X :**

$$C = S.N(d_1) - k.e^{-r.t} . N(d_2)$$

$$Nd_1 = \frac{\ln\left(\frac{S}{K}\right) + r.T}{\sigma\sqrt{T}} + 0.5 \sigma \sqrt{T}$$

$$Nd_1 = \frac{\ln\left(\frac{80}{70}\right) + 0.12 \times \frac{3}{12}}{0.60 \sqrt{\frac{3}{12}}} + 0.5 (0.60) \left(\sqrt{\frac{3}{12}}\right)$$

$$Nd_1 = \frac{0.13353 + (0.12 \times 0.25)}{(0.60) (0.25)} + 0.5 (0.60) \times (0.5)$$

$$Nd_1 = \frac{0.13353 + 0.03}{0.3} + 0.15$$

$$Nd_1 = \frac{0.16353}{0.3} + 0.15$$

$$Nd_1 = 0.5451 + 0.15 = 0.6951$$

$$\text{Table value } Nd_1 = 0.754911$$

$$Nd_2 = d_1 - \sigma \sqrt{T}$$

$$= 0.6951 - 0.60 \sqrt{\frac{3}{12}}$$

$$= 0.6951 - (0.60 \times 0.5)$$

$$= 0.6951 - 0.3$$

$$= 0.3951$$

**Table Value :**

$$Nd_2 = 0.3483$$

$$C = S.N(d_1) - k.e^{-r.T} N(d_2)$$

$$C = 80(0.7549) - 70 \times e^{-0.12 \times 0.25} (0.3483)$$

$$C = 60.392 - 67.93 (0.3483)$$

$$= 60.392 - 23.66$$

$$C = 36.732$$

**Stock Y :**

$$C = S.N(d_1) - k.e^{-r.T} . N(d_2)$$

$$Nd_1 = \frac{\ln\left(\frac{S}{K}\right) + r.T}{\sigma\sqrt{T}} + 0.5 \sigma \sqrt{T}$$

$$Nd_1 = \frac{\ln\left(\frac{80}{80}\right) + 0.12 \times \frac{3}{12}}{0.60 \times \sqrt{\frac{3}{12}}} + 0.5 \times 0.60 \times \sqrt{\frac{3}{12}}$$

$$Nd_1 = \frac{0 + 0.12 \times 0.25}{0.60 \times 0.5} + 0.5 \times 0.60 \times 0.5$$

$$Nd_1 = \frac{0.03}{0.3} + 0.15$$

$$Nd_1 = 0.25$$

$$Nd_1 = 0.5987$$

$$Nd_2 = Nd_1 - \sigma \sqrt{T}$$

$$Nd_2 = 0.25 - 0.60 \sqrt{\frac{3}{12}}$$

$$Nd_2 = 0.25 - 0.30$$

$$Nd_2 = -0.05$$

$$Nd_2 = 0.4801$$

$$C = S \cdot N(d_1) - K \cdot e^{-rT} \cdot N(d_2)$$

$$C = 80 \cdot (0.5987) - (80) e^{-0.12 \times 0.25} \cdot 0.4801$$

$$C = 47.896 - 77.6356 \times 0.4801$$

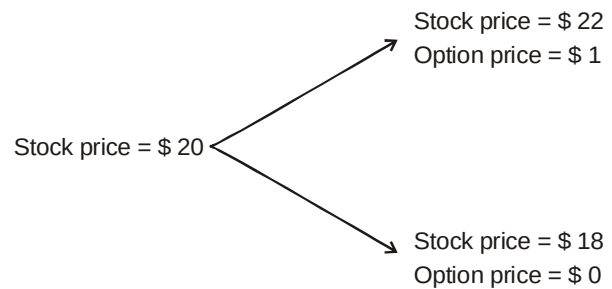
$$C = 47.896 - 37.272851$$

$$C = 10.62.$$

5. A stock price is currently \$ 20 and will more either upto \$ 22 or down to \$ 18 at the end of 3 months. This option considered is a European call option with a strike price of \$ 21, and an expiration date in 3 months. The risk free interest rate is 12% per annum. Calculate the value of call option ?

Sol :

Stock price movement



Let  $P$  as the probability of an upward movement in the stock price in a risk neutral world. The expected return on a stock in a risk-neutral world must be the risk free rate of 12%.

Then  $p$  must satisfy

$$22p + 18(1 - p) = 20 \cdot e^{0.12 \times 3/12}$$

$$22p + 18 - 18p = 20 \cdot e^{0.12 \times 3/12}$$

$$4p + 18 = 20 \cdot e^{0.1 \times 3}$$

$$4p = 20 \cdot e^{0.3} - 18$$

$$4p = (20 \times 1.03045) - 18$$

$$4p = 20.609 - 18$$

$$4p = 2.609$$

$$p = \frac{2.609}{4} = 0.6523$$

$$p = 0.6523$$

At the end of 3 months, the call option has a 0.6523 probability of being worth 1 and a 0.3477 probability of being worth zero.

Its expected value is therefore,

$$0.6523 \times 1 + 0.3477 \times 0 = 0.6523$$

In a risk neutral world this should be discounted at the risk free rate.

The value of option today is

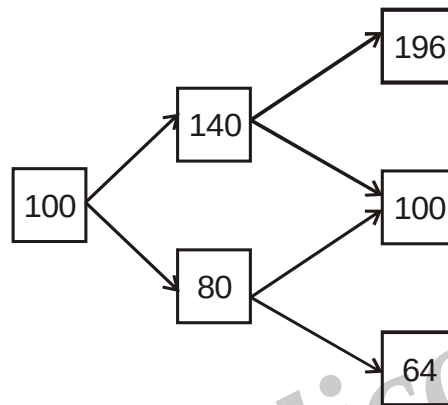
$$= 0.6523 \times e^{-0.12 \times 3/12}$$

$$= \$ 0.633.$$

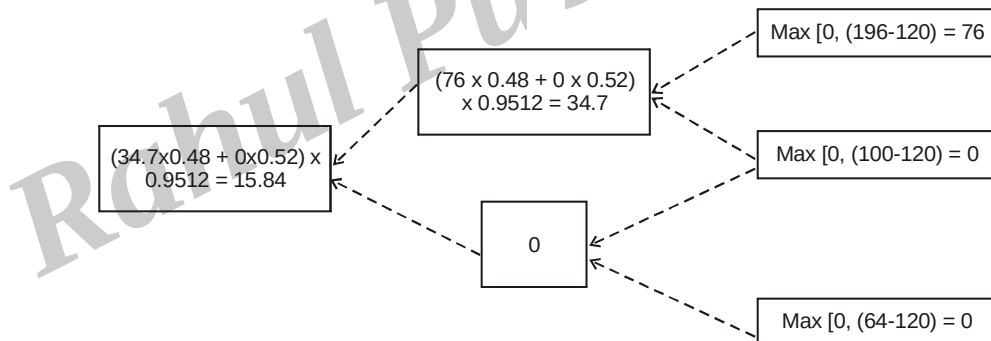
6. Draw Binomial trees from the following data, show the stock prices and calculate the call option and put option value taking risk neutral probability.

$P = 0.48$ , Risk free interest = 10% p.a.

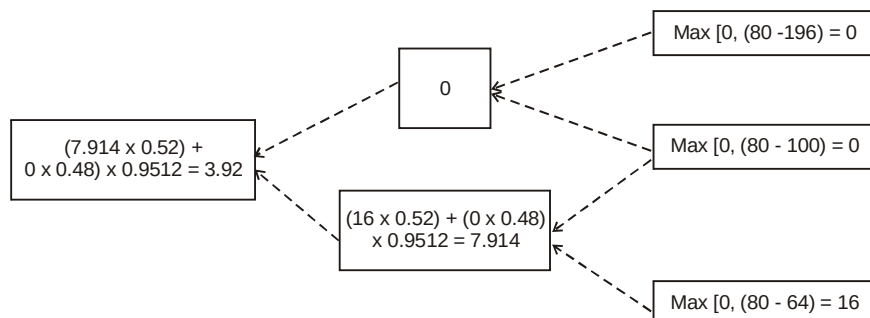
|              | Call option | Put Option |
|--------------|-------------|------------|
| Stock price  | – 100 Rs.   | 100 Rs.    |
| Strike price | – 120 Rs.   | 80 Rs.     |
| Maturity     | – 1 Year    | 1 year     |
| U factor     | 1.4         | 1.4        |
| d factor     | 0.8         | 0.8        |



i) Calculation of European Call Option :



ii) Calculation of Put Option :



## 5.6 FORWARD & FUTURE MARKETS

**Q9. Define forward market ? Explain the features of forward market.**

**Ans :**

Forwards are the oldest of all derivatives. It is an agreement between two parties to buy or sell an asset at a certain date in future at a predetermined price. The promised asset may be currency, commodity, instrument like shares / debentures etc.

Forward contracts are normally traded outside stock exchanges. They are popular on the over the counter market. In a forward contract, the party who promises to buy the specified asset at an agreed price at a future date is said to be in the 'long position' and party who promises to sell is said to be in 'short position'. Thus, long position and short position takes the form of buy and sell in a forward contract.

For Eg :- On October 4, 2010, Mr. Naitik agrees to buy a certain asset on February 4, 2011 for Rs. 1 lakh from Mr. Aniket. This is a forward contract where Mr. Naitik has to pay Rs.1 lakh to Mr. Aniket on February 4 and Mr. Aniket has to supply the asset.

### Features of Forward Contract

#### 1. Bilateral Contract

Forward contract is a bilateral contract between a buyer and a seller hence it is subject to counter-party risk.

#### 2. Over The Counter Trading (OTC)

Forward contracts are private contracts hence traded over the counter and not in exchanges. The contract can be modified as per the requirements of parties.

#### 3. Custom Designed

Forward contract is a custom designed contract between two parties. It contains features in terms of size of contract, date of expiry, type and quality of asset etc.

#### 4. Physical delivery

There is no physical delivery of assets at the time of entering the contract. Physical delivery takes place only on expiry date.

#### 5. Settlement At Maturity

Money is exchanged only on the maturity as stated in the contract. The asset must be delivered on maturity date on receipt of payment.

#### 6. Need For Intermediary

Mostly parties enter into a forward contract with the help of some intermediary. It can be a bank or financial institution or any other party.

**Q10. Explain the classifications of Forward Contracts.**

**Ans :**

Forwards contracts in India are broadly governed by the Forward Contracts (regulation) Act, 1952. According to this act, forward contracts are of the following three major categories:

#### 1. Fixed Term and Optional Term Forward Contract

Both buying and selling forward exchange contracts may be either fixed or optional term contracts.

**i) Fixed Term Contracts:** Fixed Term Contracts allow the customer to specify the date when the delivery of the overseas currency will occur. Earlier delivery is usually an option however a marginal adjustment to the Forward Contract Rate may be required.

**ii) Optional Term Contracts:** Optional Term Contracts allow the customer to enter in to an agreement for a specific period, where the customer declares a certain period within which they would like the delivery to be made (this normally occurs for periods shorter than one month), e.g., a customer may enter a contract for a six month period while having the option of receiving a delivery anytime during the final week.

In both cases, there is a contract that affects delivery for both parties: the customer and the bank. An optional delivery contract does not exempt the customer from his obligation to deliver the forward exchange contract. The

optional delivery contract exclusively effects the period which the delivery will occur, making it optional. Forward rates are applicable for transactions in which settlement is expected to occur two or more business days following the transaction date. Forward contract rates are made-up of the Spot rate for the currency being traded which is slightly adjusted due to the relative Forward Margin.

## 2. Hedge Contracts

These are freely transferable contracts which do not require specification of a particular lot size, quality or delivery standards for the underlying assets. Most of these are necessary to be settled through delivery of underlying assets.

## 3. Transferable Specific Delivery Forward Contracts

Apart from being freely transferable between parties concerned, these forward contracts refer to a specific and predetermined lot size and variety of the underlying asset. It is compulsory for delivery of the underlying assets to take place at expiration of contract.

## 4. Non-Transferable Specific Delivery Forward Contracts

These contracts are normally exempted from the provision of regulation under Forward Contract Act, 1952 but the Central Government reserves the right to bring them back under the Act when it feels necessary. These are contracts which cannot be transferred to another party. The contracts, the consignment lot size and quality of underlying asset are required to be settled at expiration through delivery of the assets.

## 5. Other Forward Contracts

### i) Forward Rate Agreements (FRA):

Forward contracts are commonly arranged on domestic interest-rate bearing instruments as well as on foreign currencies. In forward rate agreement, no actual lending or borrowing is affected. Only it fixes the rate of interest for a futures transaction.

ii) **Range Forwards:** These instruments are very much popular in foreign exchange markets. Under this instrument, instead of quoting a single forward rate, a quotation is given in terms of a range, i.e., a range may be quoted for Indian rupee against US dollar at ` 47 to ` 49. It means there is no single forward rate rather a series of rate ranging from ` 47 to ` 49 has been quoted. This is also known as flexible forward contracts.

## Q11. Define Future Contracts. Explain the features.

Ans :

A future contract is an agreement between two parties to buy or sell an asset at a certain time in future, at a certain price. Future contracts are traded in standardised stock exchanges. A future contract may be offset prior to maturity by entering into an equal and opposite transaction.

### Features of Future Contract

#### 1. Exchange Traded

Future Contracts are generally traded on an exchange. The exchanges provide a mechanism of guarantee to honour the contract. So there is secondary market for futures.

#### 2. Standardised

Future contracts are highly standardised and legally enforceable. There is lack of flexibility.

#### 3. Types Of Future :

Future contracts can be classified into two:-

- Commodity future in which underlying asset is a commodity
- Financial future in which the underlying asset is a security or bond.

#### 4. Transparency

The contracts enjoy a fair degree of transparency. The terms and conditions are published by exchanges.

**5. Down Payment**

In future contracts, the contracting parties have to deposit a certain percentage of contract price called as Margin Money with the exchange. It acts as a collateral to support the contract.

**6. Delivery Of Asset**

In future contract the parties only exchange the difference between the future price and the spot price prevailing on the date of maturity.

**7. Settlement**

A future contract is always settled daily, irrespective of maturity date. It is marked to market on a daily basis. The difference between future price and spot price on a day constitutes either profit or loss.

**Q12. Explain the types of financial future contracts.**

Ans :

Financial futures contracts can be categorised into following types:

- 1. Interest rate futures:** In this type the futures securities traded are interest bearing instruments like T-bills, bonds, debentures, euro dollar deposits and municipal bonds, notional gilt-contracts, short term deposit futures and treasury note futures.
- 2. Stock index futures:** Here in this type contracts are based on stock market indices. For example in US, Dow Jones Industrial Average, Standard and poor's 500 New York Stock Exchange Index. Other futures of this type include Japanese Nikkei index, TOPIX etc.
- 3. Foreign currency futures:** These future contracts trade in foreign currency generating used by exporters, importers, bankers, FIs and large companies.
- 4. Bond index futures:** These contracts are based on particular bond indices i.e. indices of bond prices. Municipal Bond Index futures based on Municipal Bonds are traded on CBOT (Chicago Board of Trade).

- 5. Cost of living index future:** These are based on inflation measured by CPI and WPI etc. These can be used to hedge against unanticipated inflationary pressure.

**Q13. Explain the Functions of futures markets.**

Ans :

Futures markets refer to the relationship among participants and mechanism of trading in futures. The futures may be of commodity or any other underlying assets. Futures contracts are standardised contracts, where only price is negotiated, while in forward contracts all elements are negotiated and they are customised contracts. Since futures market have become an important ingredient of economic activity and the prices of future depend upon so many factors, that is why there is a need to understand the mechanism of futures market and the pricing aspects of the same.

Initially futures were devised as instruments to fight against the risk of future price movements and volatility. Apart from the various features of different futures contracts and trading, futures markets play a significant role in managing the financial risk of the corporate business world. The important functions of futures market are described as follows:

**1. Hedging function**

The primary function of the futures market is the hedging function which is also known as price insurance, risk shifting or risk transference function. Futures markets provide a vehicle through which the traders or participants can hedge their risks or protect themselves from the adverse price movements in the underlying assets in which they deal. For example, a farmer bears the risk at the planting time associated with the uncertain harvest price his crop will command. He may use the futures market to hedge this risk by selling a futures contract.

**2. Price discovery function**

Another important function of futures market is the price discovery which reveals information about futures cash market prices through the futures market. Further, price

discovery function of the futures market also leads to the inter temporal inventory allocation function.

### 3. **Financing function**

Another function of a futures market is to raise finance against the stock of assets or commodities. Since futures contracts are standardized contracts, so, it is easier for the lenders to ensure quantity, quality and liquidity of the underlying asset.

### 4. **Liquidity function**

It is obvious that the main function of the futures market deals with such transactions which are matured on a future date. They are operated on the basis of margins. Under this the buyer and the seller have to deposit only a fraction of the contract value, say 5 percent or 10 percent, known as margins. This practice ensures honouring of the future deals and hence maintain liquidity. When there is a futures contract between two parties, future exchanges required some money to be deposited by these parties called margins. Each futures exchange is responsible for setting minimum initial margin requirements for all futures contracts. The trader has to deposit and maintain this initial margin into an account as trading account.

### 5. **Price stabilization function**

Another function of a futures market is to keep a stabilizing influence on spot prices by reducing the amplitude of short term of fluctuations. In other words, futures market reduces both the heights of the peaks and the depth of the troughs. There is less default risk in case of future contract because the change in the value of a future contract results in a cash flow every day. The daily change in the value of a futures contract must be exchanged, so that if one party (the losing party) defaults, the maximum loss that will be realized is just one day's change in value. Thus the incentive for default in futures is greater than in forwards.

### 6. **Disseminating information**

Aside from the above mentioned functions of the futures markets like risk-transference (hedging), price discovery, price stabilization, liquidity, and financing, this market is very much useful to the economy too. Since in futures market, futures traders' positions are marked to market on daily basis, which is known as daily resettlements. It means that every day the trader's account is added to if (profit occurs) and deducted in case the losses occur. All the profits that increase the margin account balance above the initial balance margin can be withdrawn and vice-versa. If the future price fall, trader account equity rises and vice-versa. Futures markets disseminate information quickly, effectively and inexpensively, and, as a result, reducing the monopolistic tendency in the market. Thus investors are aware of their latest position of equity in transparent and efficient manner.

#### **Q14. Explain the participants of futures markets.**

Ans :

Usually financial derivatives attract three types of traders which are discussed here as under:

#### **1. Hedgers**

Generally there is a tendency to transfer the risk from one party to another in investment decisions. Put differently, a hedge is a position taken in futures or other markets for the purpose of reducing exposure to one or more types of risk. A person who undertakes such position is called as 'hedger'. In other words, a hedger uses futures markets to reduce risk caused by the movements in prices of securities, commodities, exchange rates, interest rates, indices, etc. As such, a hedger will take a position in futures market that is opposite a risk to which he or she is exposed. By taking an opposite position to a perceived risk is called 'hedging strategy in futures markets'. The essence of hedging strategy is the adoption of a futures position that, on average, generates profits when the market value of the commitment is higher than the expected value.

**2. Speculators**

A speculator is a person who is willing to take a risk by taking futures position with the expectation to earn profits. Speculator aims to profit from price fluctuations. The speculator forecasts the future economic conditions and decides which position (long or short) to be taken that will yield a profit if the forecast is realized.

**3. Speculators are of two types**

Day traders and position traders. (1) Position speculator uses fundamental analysis of economic conditions of the market and is known as fundamental analyst, (2) Whereas the one who predicts futures prices on the basis of past movements in the prices of the asset is known as technical analyst.

**4. Arbitrageurs**

Arbitrageurs are another important group of participants in futures markets. They take advantage of price differential of two markets. An arbitrageur is a trader who attempts to make profits by locking in a riskless trading by simultaneously entering into transactions in two or more markets. In other words, an arbitrageur tries to earn riskless profits from discrepancies between futures and spot prices and among different futures prices.

**Recent development in futures market**

One more committee on Forwards market, the Kabra Committee was appointed in 1993, which recommended futures trading in wide range of commodities and also upgradation of futures market. The Kabra Committee recommended the following:

- Strengthening of FMC and Forward Contracts (Regulation) Act, 1952
- Networking of future exchange for better and efficient functioning.
- Stringent vigilance and surveying norms.
- FMC to act as watch dog to monitor the activities of commodity exchanges.

**Q15. Explain the Advantages of Forward and Future Contracts.**

Ans :

**1. Protection Against Price Fluctuations**

Parties to contract can protect themselves against the risk of heavy fluctuations in price of underlying assets.

**2. Flexibility**

Parties to forward contract can modify the agreement as per their convenience.

**3. Facilitates Planning**

These contracts facilitates planning to buy / sell assets at the time when they are most required.

**4. Bulk Transactions**

The forward / future contracts facilitates bulk purchase or sale of assets at short notice in advance of delivery.

**5. Portfolio Management**

Portfolio managers can advice their clients for future contracts to avoid heavy fluctuations in prices.

**6. Development Of Financial Market**

Future and forward contracts facilitates the growth and development of financial markets - Capital Markets as well as Money Markets.

**7. Cash Management**

In forward contract payment is done at maturity on delivery of asset. In future contract only margin money is to be paid. So these contracts do not require payment of purchase price at the time of contract.

**Q16. Distinction between Futures and Forwards Contracts.**

Ans :

Forward contracts are often confused with futures contracts. The confusion is primarily because both serve essentially the same economic functions of allocating risk in the presence of future price uncertainty. However futures are a significant improvement over the forward contracts as they eliminate counterparty risk and offer more liquidity. Table 1.1 lists the distinction between the two.

**A Comparison of Futures and Forward Markets :**

| <b>Futures Market</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Forward Markets</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>1. Trading is conducted in a competitive arena by "open outcry" of bids, offers, and amounts.</li> <li>2. Contract terms are standardized with all buyers and sellers negotiating only with respect to price.</li> <li>3. Non-member participants deal through brokers (exchange members who represent them on the exchange floor).</li> <li>4. Participants include banks, corporations financial institutions, individual investors, and speculators.</li> <li>5. The clearing house of the exchange becomes the opposite side to each cleared transactions; therefore, the credit risk for a futures market participant is always the same and there is no need to analyze the credit of other market participants.</li> <li>6. Margins deposits are to be required of all participants.</li> <li>7. Settlements are made daily through the exchange clearing house. Gains on open positions may be withdrawn and losses are collected daily.</li> <li>8. Long and short positions are usually liquidated easily.</li> <li>9. Settlements are normally made in cash, with only a small percent age of all contracts resulting actual delivery.</li> <li>10. A single, round trip (in and out of the market) commission is charged. It is negotiated between broker and customer and is relatively small in relation to the value of the contract.</li> <li>11. Trading is regulated.</li> <li>12. The delivery price is the spot price.</li> </ol> | <ol style="list-style-type: none"> <li>1. Trading is done by telex or telephone, with participants generally dealing directly with broker-dealers.</li> <li>2. All contract terms are negotiated privately by the parties.</li> <li>3. Participants deal typically on a principal-to-principal basis.</li> <li>4. Participants are primarily institutions dealing with one other and other interested parties dealing through one or more dealers.</li> <li>5. A participant must examine the credit risk and establish credit limits for each opposite party.</li> <li>6. Typically, no money changes hands until-delivery, although a small margin deposit might be required of nondealer customers on certain occasions.</li> <li>7. Settlement occurs on date agreed upon between the parties to each transaction.</li> <li>8. Forward positions are not as easily offset or transferred to other participants.</li> <li>9. Most transactions result in delivery.</li> <li>10. No commission is typically charged if the transaction is made directly with another dealer. A commission is charged to both buyer and seller, however, if transacted through a broker.</li> <li>11. Trading is mostly unregulated.</li> <li>12. The delivery price is the forward price.</li> </ol> |

**Q17. Explain the Structure of Forward and Future Markets.****Ans :**

Most financial futures contracts in the United States are traded on the Chicago Board of Trade (CBOT) or the Chicago Mercantile Exchange (CME). The trading floor for most futures contracts is open from 8:30 A.M. to 3:15 P.M. Only the members of a futures exchange (or persons to whom members have leased their privileges) can engage in futures transactions on the exchange floor. A person becomes a member by purchasing a seat on the exchange. The price of a seat on any exchange fluctuates over time, in accordance with the demand for seats and supply of seats for sale. The structure of futures and forward market includes:

1. Over-the-Counter Trading
2. Electronic Trading
3. Contract specifications
4. Futures Traders
5. Mechanics of Future and Forward Market

**1. Over-the-Counter Trading**

Many types of futures contracts and other derivative contracts are now being sold over the counter, whereby a financial intermediary (such as a commercial bank or an investment bank) finds a counterpart or serves as the counter party. These over-the-counter arrangements are more personalized and can be tailored to the specific preferences of the parties involved. Such tailoring is not possible for the more standardized futures contracts sold on the exchanges,

**2. Electronic Trading**

Some futures contracts are now traded electronically. The Chicago Mercantile Exchange has an electronic trading platform called GLOBEX that complements its floor trading. Some futures contracts are traded both on the trading floor and on GLOBEX, while others are traded only "on GLOBEX. Transactions can occur on GLOBEX virtually around the clock (closed one hour per day for maintenance) and on

weekends. In 2004, the Chicago Board of Options Exchange (CBOE) opened a fully electronic futures exchange.

The CME specialized in futures contracts on money market securities, stock indexes, and currencies. The CBOT specialized in futures contracts on Treasury bonds and agricultural products, and also traded stock options. The CME went public in 2002, while the CBOT went public in 2005. In October 2006, the CME proposed merging with the CBOT. At that time, the combined market value of the two exchanges was \$25 billion. The combined exchanges have an average trading volume of about 9 million contracts, with an underlying value of \$4.2 trillion. By allowing for one trading platform and the elimination of some overlapping staff positions, the combination is expected to improve efficiency and achieve cost savings of more than \$100 million per year. While this merger was awaiting approval from regulators and shareholders, the CBOT received a competing bid from the Intercontinental Exchange (ICE), which facilitates the trading of global futures contracts. However, it agreed to the bid by the CME in June, 2007.

**3. Specification of Futures-Contracts**

The derivatives exchange has to specify the exact characteristics of every futures contract. These are the underlying asset, the contract size and where and when delivery has to be made. In some cases (especially with commodity futures) alternatives are specified and the trader with the short position can choose the alternative. Commodity futures have many alternative grades in respect of their underlying asset. The derivatives exchange therefore specifies a certain range of acceptable grades. The derivatives' price is sometimes adjusted, depending on the grade delivered. With financial futures that issue is less important. In respect of fixed income futures like the Bond futures, different bonds can be delivered and the exchange has formulas for adjusting the price, which depends on the specific bonds coupon and maturity. Some financial futures, especially on share indices, are settled in cash because it is impossible to deliver the underlying.

i) **Contract Size:** The contract size is solely specified by the derivatives exchange without any variations of the size..

ii) **Place of Delivery:** The place of delivery is very important because commodity futures' underlying can involve huge transportation costs. At times, the price again depends on the delivery location.

iii) **Delivery Months:** Several delivery months are always traded on the same underlying and the delivery month also determines the contract. The derivatives exchange therefore specifies the exact time or period during the delivery month when the delivery has to be made. The trading calendar publishes all the delivery dates per month. Different months are required because the exchange tries to meet traders' different preferences regarding futures' maturity.

iv) **Price Movement Limits**

There are also other general regulations for every futures listed by the derivatives exchange. Often there are daily price movement limits and trading is stopped for the day if these limits are exceeded. By introducing these price limits, the derivatives exchange tries to prevent excessive speculation. Position limits are also often introduced to limit the maximum number of contracts a speculator may hold. This measure reduces the chances of a single speculator influencing the market through his sheer trading volume.

4. **Futures Traders**

A) **Participants on general basis can be in the form of;**

i) **Individual:** Individual participants are sole trader or companies which are 90% owned or controlled by a sole-trader. Individual participants may only trade for themselves and may not do give ups.

ii) **Broker:** An individual or firm acting as an intermediary by conveying customers' trade instructions. Other types of brokers are as follows:

a) **Market Maker:** A market maker is a trader who trades for his or her own account.

b) **Account Executive:** An account executive for a brokerage firm is often called customer's broker. The account executive could be located in any town or city and the account executive deals with his or her customers, conveying their orders to the exchange.

e) **Floor Broker:** Floor Broker is a person with exchange trading privileges, who, in any pit, ring, post, or other place provided by an exchange for the meeting of persons similarly engaged, executes for another person any orders for the purchase or sale of any commodity for future delivery.

d) **Floor Trader:** Floor traders are exchange members who trade futures contracts in the futures pit. A floor trader who trades solely for his own accounts is called a local. Locals provide liquidity for the market, usually by operating as scalpers. A scalper is a very short term trader.

B) **Participants on Trading Strategy Basis can be in the form of;**

i) **Speculators:** While hedgers buy or sell futures contracts to protect themselves against the risk of price changes, speculators buy or sell futures contracts in an attempt to earn a profit. Speculators do not have a prior position that they want to hedge against price fluctuation. Rather they are willing to assume the risk of price fluctuation in the hope of profiting from them.

Speculators play a very important role in the proper functioning of the futures market. They absorb the excess demand (or supply) generated by hedgers, and assume the risk of price fluctuations that hedgers want to avoid. Speculators impart liquidity to the market and their actions, in general, dampen the variability in prices over time.

**ii) Hedgers:** Hedgers are parties who are exposed to risk because they have a prior position in the commodity or the financial instrument specified in the futures contract. For example, a farmer may be expecting a produce of tones of wheat from his farm two months hence, or an investor may currently own a broadly diversified portfolio of equity stocks worth ₹ P million now. By taking an opposite position in the futures market, parties who are at risk with an asset can hedge their position. For example, the farmer may sell wheat futures and the investor may sell stock index futures. By doing so, they can shield themselves against the risk of unexpected price changes.

**iii) Arbitrageurs:** An arbitrageur uses futures contracts to exploit price differences between different markets. The term is mainly applied to trading in financial instruments, such as bonds, stocks, derivatives, commodities and currencies.

Opportunities to arbitrage take place throughout the world markets and derivatives are sometimes used to exploit these. Individuals and “institutions may also look for arbitrage opportunities, as when the current buying price of an asset falls below the price specified in a futures contract to sell the asset.

**iv) Spreaders:** A spreader is a trader or investor who takes out whatever differential might exist between two different markets and capitalizes on that disparity. Some people trade an intermarket spread, which is one

market's calendar month against another calendar month, and others spread intramarket, which is one contract against a completely different market. An example of an intramarket spreader is a trader who makes a market in pork bellies versus live cattle or S&P versus NASDAQ. An example of an intermarket spread is; trading the August live cattle versus October or trading the S&P December contract against the S&P March contract.

Trading the intermarket spread enables one to take advantage of the seasonal adjustments of the contract as opposed to the differential and price disparity between the two completely different market.

## 5. Mechanics of Future and Forward Market

Future trading refers to entering into contracts to buy or sell financial assets or commodities for futures delivery as settlement on standardized terms. The mechanics of future market means how the future market works. It involves the following steps:

1. Registered on Recognized Stock Exchange
2. Placing an Order
3. Role of Clearing House
4. Margin Requirement
5. Delivery and Settlement
6. Price Quotation
7. Regulation of Future Market.

### PROBLEMS ON FUTURES

#### Determination of Future Prices

- 1) For Stock Index Future and Stocks
  - (a) For stock index future and stocks

$$F = Se^{rT} \quad \begin{array}{l} F = \text{future price} \\ S = \text{spot rate} \end{array}$$

$r$  = risk free rate

$T$  = time period

- (b) When yield on underlying is estimated during the future period.

$$F = Se^{(r-q)T} \quad q = \% \text{ of yield}$$

2. For commodities

- (a) When storage or holding cost is not estimated

$$F = Se^{r \cdot T}$$

- (b) When storage or holding cost is estimated

$$F = (S + U)e^{r \cdot T}$$

$U$  = Holding cost (or) Carrying cost

$U$  : It must be converted into present value  
present value of holding cost =  $Ue^{-rT}$

7. Consider a 3 month future contract on the S&P 500 market suppose that the stocks underlying the index provides dividend yield of 1% p.a that the current value of the index is 800 and the continuously compounding risk free interest rate is 6% /p.a determine the future price for the stock index.

**Sol :**

The future contract is relating to stock index and dividend yield rate is given so, the following formula is applied.

$$F = Se^{(r-q)T}$$

$$S = 800; r = 6\% \quad q = 1\%$$

$$T = 3/12$$

$$F = 800 \times e^{(0.06-0.01) \times 3/12}$$

$$F = 810.063$$

When stock index is raising it is implied that the share price may also be increased.

8. Consider the 3 months future contracts on S&P 500 suppose that the stock underlying the index provides a dividend yield of 1% p.a. the current value of index is 400 and risk free rate of interest is 6% p.a. calculate future price.

**Sol :**

The future contract is relating to stock index and dividend yield given so, the following formula is used.

$$F = Se^{(r-q)t}$$

$$= 400.e^{(0.06-0.01)3/12}$$

$$= 405.031$$

9. Calculate the future price from following assume on Nov. 1<sup>st</sup> 05 BSE sensitive under 3200 the future contract is expires on 31<sup>st</sup> Dec. 2005. The risk free rate of interest at continuous compound is 10% and expected dividend yield is 4%.

**Sol :**

$$S = 3200$$

$$r = 10\%$$

$$q = 4\%$$

$$t = 2 \text{ months}$$

$$F = s.e^{(r-q)t} = 3200 \times e^{(0.06)^{2/12}}$$

$$= 3200 \times e^{0.01}$$

$$= 3200 \times e^{(0.10-0.04)^{2/12}}$$

$$= 3232.161$$

10. A stock index currently stand at 350. The risk free interest rate 8% p.a. with continuous compounds and dividend yield on index is 4% p.a. What should be the future price for a 4 months future contract.

**Sol :**

$$S = 350$$

$$r = 8\%$$

$$q = 0.04$$

$$F = s.e^{(r-q)t}$$

$$F = 350 \times e^{(0.08-0.04)^{4/12}}$$

$$F = 354.6979$$

11. A one year no dividend paying stock having the current price of 1500. The risk free rate of interest is 10 p.a. with continuous compounding.

(a) What is the future price.

(b) After 6 months the price of the stock is Rs. 1600 and the risk free interest rate is same as 10% what is the future price ?

Sol :

$$F = S \cdot e^{r \cdot T}$$

(a) Dividend is not expected, So above formula is used

$$S = 1500$$

$$r = 10\%$$

$$T = 1 \text{ year}$$

$$F = S \cdot e^{r \cdot T}$$

$$= 1500 \times e^{0.10}$$

$$= 1650$$

(b) After 6 months

$$S = 1600$$

$$r = 10\%$$

$$t = 6/12$$

$$F = 1600 \times e^{0.10 \times 6/12}$$

$$F = 1680$$

---

### 5.6.1 Mechanics of Trading

**Q18. Explain in detail about mechanics of trading future market ?**

Ans :

- (i) **Clearing House** : In every deal the exchange (or) clearing house is necessarily involved as a third party. After a transaction is recorded, the clearing house substitute itself for the other party, that it becomes the seller to every buyer and buyer for every seller.
- (ii) **Margin Requirement** : Trading in currency futures is subjected to specific margin and maintenance requirement. In order to cover the risk, they are required to deposit.
- (iii) **Marking to market** : In forward contract, the deals is settled on the maturity but in case of currency futures the rates are matched every day with the movements in got rates on this basis gains and losses are settled every day.

**5.7 MUTUAL FUNDS****Q19. What is Mutual Funds ?**

**Ans :**

A mutual fund is just the connecting bridge or a financial intermediary that allows a group of investors to pool their money together with a predetermined investment objective. The mutual fund will have a fund manager who is responsible for investing the gathered money into specific securities (stocks or bonds). When you invest in a mutual fund, you are buying units or portions of the mutual fund and thus on investing becomes a shareholder or unit holder of the fund.

Mutual funds are considered as one of the best available investments as compare to others they are very cost efficient and also easy to invest in, thus by pooling money together in a mutual fund, investors can purchase stocks or bonds with much lower trading costs than if they tried to do it on their own. But the biggest advantage to mutual funds is diversification, by minimizing risk & maximizing returns.

Thus a Mutual Fund is the most suitable investment for the common man as it offers an opportunity to invest in a diversified, professionally managed basket of securities at a relatively low cost. The flow chart below describes broadly the working of a mutual fund.

Unit Trust of India is the first Mutual Fund set up under a separate act, UTI Act in 1963, and started its operations in 1964 with the issue of units under the scheme US-64.

**Q20. What are the features of mutual funds ?**

**Ans :**

- **Variety :** There are four basic types of mutual funds: equity (also called stock), bond, hybrid, and money market. Equity funds concentrate their investments in stocks. Similarly, bond funds primarily invest in bonds. Hybrid funds typically invest in a combination of stocks, bonds, and other securities. Equity, bond, and hybrid funds are called long-term funds. Money market funds

are referred to as short-term funds because they invest in securities that generally mature in about one year or less.

- **Liquidity :** Since mutual funds are required by law to redeem shares on a daily basis, fund shares are a very liquid investment. Most mutual funds also continually offer new shares to investors, and many fund companies allow shareholders to transfer money—or make “exchanges”—from one fund to another within the same fund family. Mutual funds process sales, redemptions, and exchanges as a normal part of daily business activity.
- **Accessibility :** Mutual fund shares are available through a variety of sources. Investors outside retirement plans may purchase fund shares either with the help of an investment professional, such as a broker, financial planner, bank representative, or insurance agent, or directly from the fund itself, based on the investor’s own research and knowledge.
- **Affordability :** Mutual funds offer their many benefits and services at an affordable price. Furthermore, competition within the fund industry helps keep funds affordable, as the results of studies by the SEC and the General Accounting Office show.

**Q21. What are the functions of mutual funds?**

**Ans :**

- The basic function of mutual fund companies is buying and selling securities on behalf of its unit holders,
- It enables small investors to hold a share in a large and diversified portfolio of assets, which reduces the risks of investment.
- The savings so mobilized are pooled in a large, diversified and sound portfolio of equity, bonds, securities etc.
- Investors in the mutual funds are given the share in its total funds, which is evidenced by the unit certificates.

- Mutual funds assure professional management, which helps in earning higher rate of return.
- It helps the small investors who do not have adequate time and knowledge, expertise, experience and resources for directly accessing profitable avenues in capital and money markets.

**Q22. State the advantages and disadvantages of investing in Mutual Funds.**

**Ans :**

**Advantages of Investing Mutual Funds**

- **Professional Management** - The basic advantage of funds is that, they are professional managed, by well qualified professional. Investors purchase funds because they do not have the time or the expertise to manage their own portfolio. A mutual fund is considered to be relatively less expensive way to make and monitor their investments.
- **Diversification** - Purchasing units in a mutual fund instead of buying individual stocks or bonds, the investors risk is spread out and minimized up to certain extent. The idea behind diversification is to invest in a large number of assets so that a loss in any particular investment is minimized by gains in others.
- **Economies of Scale** - Mutual fund buy and sell large amounts of securities at a time, thus help to reducing transaction costs, and help to bring down the average cost of the unit for their investors.
- **Liquidity** - Just like an individual stock, mutual fund also allows investors to liquidate their holdings as and when they want.
- **Simplicity** - Investments in mutual fund is considered to be easy, compare to other available instruments in the market, and the minimum investment is small. Most AMC also have automatic purchase plans whereby as little as Rs. 2000, where SIP start with just Rs.50 per month basis.

**Disadvantages of Investing Mutual Funds**

- **Professional Management**- Some funds doesn't perform in neither the market, as their management is not dynamic enough to explore the available opportunity in the market, thus many investors debate over whether or not the so-called professionals are any better than mutual fund or investor himself, for picking up stocks.
- **Costs** – The biggest source of AMC income, is generally from the entry & exit load which they charge from an investors, at the time of purchase. The mutual fund industries are thus charging extra cost under layers of jargon.
- **Dilution** - Because funds have small holdings across different companies, high returns from a few investments often don't make much difference on the overall return. Dilution is also the result of a successful fund getting too big. When money pours into funds that have had strong success, the manager often has trouble finding a good investment for all the new money.
- **Taxes** - when making decisions about your money, fund managers don't consider your personal tax situation. For example, when a fund manager sells a security, a capital-gain tax is triggered, which affects how profitable the individual is from the sale. It might have been more advantageous for the individual to defer the capital gains liability.

**5.7.1 Types of Mutual Funds Scheme**

**Q23. Explain about the various schemes that exist in mutual funds.**

**Ans :**

**Types of Mutual Funds Scheme**

Wide variety of Mutual Fund Schemes exists to cater to the needs such as financial position, risk tolerance and return expectations etc.

**By Structure**

- (a) **Open Ended Schemes** : An open-end fund is one that is available for subscription all through the year. These do not have a fixed maturity. Investors can conveniently buy and sell units at Net Asset Value ("NAV") related prices. The key feature of open-end schemes is liquidity.

(b) **Close Ended Schemes** : A closed-end fund has a stipulated maturity period which generally ranging from 3 to 15 years. The fund is open for subscription only during a specified period. Investors can invest in the scheme at the time of the initial public issue and thereafter they can buy or sell the units of the scheme on the stock exchanges where they are listed. In order to provide an exit route to the investors, some close-ended funds give an option of selling back the units to the Mutual Fund through periodic repurchase at NAV related prices. SEBI Regulations stipulate that at least one of the two exit routes is provided to the investor.

(c) **Interval Schemes** : Interval Schemes are that scheme, which combines the features of open-ended and close-ended schemes. The units may be traded on the stock exchange or may be open for sale or redemption during pre-determined intervals at NAV related prices.

#### By Nature

(a) **Equity fund** : These funds invest a maximum part of their corpus into equities holdings. The structure of the fund may vary different for different schemes and the fund manager's outlook on different stocks. The Equity Funds are sub-classified depending upon their investment objective, as follows :

- Diversified Equity Funds
- Mid-Cap Funds
- Sector Specific Funds
- Tax Savings Funds (ELSS)

Equity investments are meant for a longer time horizon, thus Equity funds rank high on the risk-return matrix.

(b) **Debt funds** : The objective of these Funds is to invest in debt papers. Government authorities, private companies, banks and financial institutions are some of the major issuers of debt papers. By investing in debt instruments, these funds ensure low risk and provide stable income to the investors. Debt funds are further classified as :

➤ **Gilt Funds**: Invest their corpus in securities issued by Government, popularly known as Government of India debt papers. These Funds carry zero Default risk but are associated with Interest Rate risk. These schemes are safer as they invest in papers backed by Government.

➤ **Income Funds**: Invest a major portion into various debt instruments such as bonds, corporate debentures and Government securities.

➤ **MIPs**: Invests maximum of their total corpus in debt instruments while they take minimum exposure in equities. It gets benefit of both equity and debt market. These scheme ranks slightly high on the risk-return matrix when compared with other debt schemes.

➤ **Short Term Plans (STPs)**: Meant for investment horizon for three to six months. These funds primarily invest in short term papers like Certificate of Deposits (CDs) and Commercial Papers (CPs). Some portion of the corpus is also invested in corporate debentures.

➤ **Liquid Funds**: Also known as Money Market Schemes, These funds provides easy liquidity and preservation of capital. These schemes invest in short-term instruments like Treasury Bills, inter-bank call money market, CPs and CDs. These funds are meant for short-term cash management of corporate houses and are meant for an investment horizon of 1 day to 3 months. These schemes rank low on risk-return matrix and are considered to be the safest amongst all categories of mutual funds.

(c) **Balanced funds**: They are a mix of both equity and debt funds. They invest in both equities and fixed income securities, which are in line with pre-defined investment objective of the scheme. These schemes aim to provide investors with the best of both the worlds. Equity part provides growth and the debt part provides stability in returns.

Further the mutual funds can be broadly classified on the basis of investment parameter viz, Each category of funds is backed by an investment philosophy, which is pre-defined in the objectives of the fund. The investor can align his own investment needs with the funds objective and invest accordingly.

### By Investment Objective

- (a) **Growth Schemes:** Growth Schemes are also known as equity schemes. The aim of these schemes is to provide capital appreciation over medium to long term. These schemes normally invest a major part of their fund in equities and are willing to bear short-term decline in value for possible future appreciation.
- (b) **Income Schemes:** Income Schemes are also known as debt schemes. The aim of these schemes is to provide regular and steady income to investors. These schemes generally invest in fixed income securities such as bonds and corporate debentures. Capital appreciation in such schemes may be limited.
- (c) **Balanced Schemes:** Balanced Schemes aim to provide both growth and income by periodically distributing a part of the income and capital gains they earn. These schemes invest in both shares and fixed income securities, in the proportion indicated in their offer documents (normally 50:50).
- (d) **Money Market Schemes:** Money Market Schemes aim to provide easy liquidity, preservation of capital and moderate income. These schemes generally invest in safer, short-term instruments, such as treasury bills, certificates of deposit, commercial paper and inter-bank call money.

### Other Schemes

- (a) **Tax Saving Schemes:** Tax-saving schemes offer tax rebates to the investors under tax laws prescribed from time to time. Under Sec.88 of the Income Tax Act, contributions made to any Equity Linked Savings Scheme (ELSS) are eligible for rebate.
- (b) **Index Schemes:** Index schemes attempt to replicate the performance of a particular index such as the BSE Sensex or the NSE 50. The portfolio of these schemes will consist of only those stocks that constitute the index. The percentage of each stock to the total holding will be identical to the stocks index weightage. And hence, the returns from such schemes would be more or less equivalent to those of the Index.
- (c) **Sector Specific Schemes:** These are the funds/schemes which invest in the securities of only those sectors or industries as specified in the offer documents. e.g. Pharmaceuticals, Software, Fast Moving Consumer Goods (FMCG), Petroleum stocks, etc. The returns in these funds are dependent on the performance of the respective sectors/industries. While these funds may give higher returns, they are more risky compared to diversified funds. Investors need to keep a watch on the performance of those sectors/industries and must exit at an appropriate time.

### Q24. Differences between Closed-ended and Open-ended Schemes.

Ans :

| Open-ended Schemes                                                                                                         | Closed-ended Schemes                                                                                               |
|----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| 1. Open-ended schemes accept funds from investors and sell shares to the investors on a regular basis.                     | 1. Closed-ended schemes offer subscriptions only for a limited period.                                             |
| 2. Open-ended schemes provide the facility of withdrawing funds to the investors by following the re-purchase arrangement. | 2. Closed-ended schemes do not provide the facility of withdrawing funds to the investors as per their preference. |
| 3. Open-ended schemes are not listed on secondary market.                                                                  | 3. Closed-ended schemes are listed on stock exchange/secondary market.                                             |
| 4. In open-ended schemes of mutual fund duration is not specified for redemption.                                          | 4. In closed-ended schemes of mutual fund duration is specified for redemption.                                    |
| 5. The main feature of open-ended scheme is the liquidity.                                                                 | 5. The main feature of closed-ended schemes are market forces of demand and supply.                                |

**5.7.2 Structure of Mutual Funds****Q25. Explain the Structure of Mutual Funds.**

**Ans :**

The SEBI Regulation Act of 1996 has defined a mutual fund as one, which is constituted in the form of a Trust under the Indian Trust Act 1882. The structure of a mutual fund consists of the following :

- 1. Asset Management Company:** It manages the funds of a mutual fund by diversifying the investments of a company in different type of securities. The company has to be registered with SEBI and is set up as a trust. It works under the guidelines of SEBI.
- 2. Sponsor:** is a person or a body corporate which establishes a mutual fund. It also appoints a Board of Trustees to manage the Trust according to the provisions provided by SEBI.
- 3. Board of Trustees:** This is a position of trust and confidence mainly for the benefit of the unit holders. The trustees select stock according to the price, quantity of stock and their investment policy. They operate upon the fact that the investors have limited knowledge of the environment as well as of the quality of the investments. Its management is superior to the investment in funds by a single naive investor. They are able to draw upon the special dividend as well as capital appreciation factors of a particular security. Their specialized knowledge helps them to diversify in those stocks which give the ideal combination of securities.
- 4. Custodian, Bankers, Registrar and Transfer Agents** are appointed by Trustees to provide financial services to the mutual funds.

These factors can be summarized in the following manner. The professional consultants have the following superiority) in managing the portfolios:

- (a) Management
- (b) Liquidity
- (c) Diversification
- (d) Analysis and selection of securities
- (e) Specialized knowledge due to expertise and training in evaluating investments

**5.7.3 Trends in Indian Mutual Funds****Q26. Explain in detail about mutual funds trends in India.**

**Ans :**

The most important trend in the mutual fund industry is the aggressive expansion of the foreign owned mutual fund companies and the decline of the companies floated by nationalized banks and smaller private sector players.

Many nationalized banks got into the mutual fund business in the early nineties and got off to a good start due to the stock market boom prevailing then. These banks did not really understand the mutual fund business and they just viewed it as another kind of banking activity. Few hired specialized staff and generally chose to transfer staff from the parent organizations. The performance of most of the schemes floated by these funds was not good. Some schemes had offered guaranteed returns and their parent organizations had to bail out these AMCs by paying large amounts of money as the difference between the guaranteed and actual returns. The service levels were also very bad. Most of these AMCs have not been able to retain staff, float new schemes etc. and it is doubtful whether, barring a few exceptions, they have serious plans of continuing the activity in a major way.

The experience of some of the AMCs floated by private sector Indian companies was also very similar. They quickly realized that the AMC business is a business, which makes money in the long term and requires deep-pocketed support in the intermediate years. Some have sold out to foreign owned companies, some have merged with others and there is general restructuring going on.

The foreign owned companies have deep pockets and have come in here with the expectation of a long haul. They can be credited with introducing many new practices such as new product innovation, sharp improvement in service standards and disclosure, usage of technology, broker education and support etc. In fact, they have forced the industry to upgrade itself and service levels of organizations like UTI have improved dramatically in the last few years in response to the competition provided by these.

### Market Trends

Alone UTI with just one scheme in 1964 now competes with as many as 400 odd products and 34 players in the market. In spite of the stiff competition and losing market share, UTI still remains a formidable force to reckon with.

Last six years have been the most turbulent as well as exiting ones for the industry. New players have come in, while others have decided to close shop by either selling off or merging with others. Product innovation is now passes with the game shifting to performance delivery in fund management as well as service. Those directly associated with the fund management industry like distributors, registrars and transfer agents, and even the regulators have become more mature and responsible.

The industry is also having a profound impact on financial markets. While UTI has always been a dominant player on the bourses as well as the debt markets, the new generation of private funds which have gained substantial mass are now seen flexing their muscles. Fund managers, by their selection criteria for stocks have forced corporate governance on the industry. By rewarding honest and transparent management with higher valuations, a system of risk-reward has been created where the corporate sector is more transparent than before. Funds have shifted their focus to the recession free sectors like pharmaceuticals, FMCG and technology sector. Funds performances are improving.

Funds collection, which averaged at less than Rs100bn per annum over five-year period spanning 1993-98 doubled to Rs210bn in 1998-99. In the current year mobilization till now have exceeded Rs300bn. Total collection for the current financial year ending March 2000 is expected to reach Rs450bn.

What is particularly noteworthy is that bulk of the mobilization has been by the private sector mutual funds rather than public sector mutual funds. Indeed private MFs saw a net inflow of Rs. 7819.34 crore during the first nine months of the year as against a net inflow of Rs. 604.40 crore in the case of public sector funds.

Mutual funds are now also competing with commercial banks in the race for retail investor's savings and corporate float money. The power shift towards mutual funds has become obvious. The coming few years will show that the traditional saving avenues are losing out in the current scenario. Many investors are realizing that investments in savings accounts are as good as locking up their deposits in a closet. The fund mobilization trend by mutual funds in the current year indicates that money is going to mutual funds in a big way. The collection in the first half of the financial year 1999-2000 matches the whole of 1998-99.

India is at the first stage of a revolution that has already peaked in the U.S. The U.S. boasts of an Asset base that is much higher than its bank deposits. In India, mutual fund assets are not even 10% of the bank deposits, but this trend is beginning to change. Recent figures indicate that in the first quarter of the current fiscal year mutual fund assets went up by 115% whereas bank deposits rose by only 17%. This is forcing a large number of banks to adopt the concept of narrow banking wherein the deposits are kept in Gilts and some other assets which improves liquidity and reduces risk. The basic fact lies that banks cannot be ignored and they will not close down completely. Their role as intermediaries cannot be ignored. It is just that Mutual Funds are going to change the way banks do business in the future.

### 5.7.4 Net Asset Value

#### Q27. Explain in detail about Net Asset Value.

And :

The question, however, is whether the performance of open-end mutual fund companies of managed funds in terms of performance is better than the performance of investments made by an individual because portfolios are equally important whether they are invested by a managed trust or by an individual. Mutual funds invest the money collected from the investors in securities markets. Market value of securities changes every day. This is the reason that NAV also varies from day to day. The NAV per unit is the market value of securities of a scheme divided by the total number of units of the scheme on any particular day. NAV can be calculated in the following way:

$$\text{NAV} = \frac{\text{Value of Securities} - \text{Liabilities}}{\text{No. of Outstanding Units}}$$

### Costs in Mutual Fund Investments

Mutual funds have different kinds of expenses in order to run the business enterprise. These costs are called Operating Costs. These costs are administrative expenses, consultation fees given to trustees and expenses on brokerage. These are calculated as shown in the example below. They are also called Expense Ratio. The operating costs are deducted from the closing NAV assets. This cost is spread out on the unit holders as they receive a reduced NAV to cover the costs of the mutual funds.

$$\text{Expense Ratio} = \frac{\text{Total Annual Operating Expense}}{\text{Average Assets under Management}}$$

### Return from Mutual Fund

A mutual funds investment provides a return in a form of annual dividends and distribution of capital gains. Returns are calculated by taking into consideration dividends, capital gains, NAV in the beginning of the period and NAV in the end of the period. This is shown in the example.

$$\text{Return} = \frac{\text{Div} + \text{CG} + (\text{NAV}_1 - \text{NAV}_0)}{\text{NAV}_0}$$

Div = Dividends.

CG = Capital gain.

NAV<sub>0</sub> = NAV in the beginning.

NAV = NAV at the end of the year.

NAV = NAV<sub>0</sub> shows change over the period.

### PROBLEMS ON NAV

- 12. A mutual fund collected Rs. 75,00,000 by issuing Rs. 7,50,000 units of Rs. 10 each. The amount has been invested in different securities. The market value of these securities is Rs. 1,00,00,000 and the mutual fund has a liability of 6,00,000. Calculate Net Asset Value of the fund.**

**Sol :**

$$\begin{aligned} \text{NAV} &= \frac{1,00,00,000 - 6,00,000}{7,50,000} \\ &= \frac{94,00,000}{7,50,000} \end{aligned}$$

- 13. A mutual fund has an annual expense of 25 lakhs. Assets in the beginning of the year were Rs. 1,50,00,000**

**Sol :**

$$\text{The expense ratio} = \frac{25,00,000}{1,50,000 + 5,00,00,000} \times 100$$

14. A mutual fund has an NAV of Rs. 10.60 in the beginning and Rs. 10.90 at the end of the period. Calculate the return of the mutual fund.

When dividend of Rs. 1.50, is distributed.

If there is a capital gain also distribute of 0.50 Paise.

Sol :

$$i) \quad \text{Return} = \frac{1.50 + (10.90 - 10.60)}{10.60} \times 100$$

$$= \frac{1.80}{10.60} \times 100 = 16.4\%$$

- ii) When capital gain is distributed

$$= \frac{1.50 + 0.50(10.90 - 10.60)}{10.60} \times 100 = 29.59\%.$$

15. The Baltic Growth Fund has a total amount of assets equal to Rs. 60.1 lakhs. Its liabilities are Rs. 0.10 lac and the number of outstanding shares are equal to Rs. 7 lacks. What is Baltic' NAV.

Sol :

$$\text{NAV} = \frac{\text{Assets} - \text{Liabilities}}{\text{No. of shares}} = \frac{60.1 - 0.10}{7 \text{ lacs}} = \frac{60}{7} = \text{Rs. } 8.57$$

16. The information for Growth fund A and Growth Fund B is given below:

| End of year | Ending NAV | Capital gains distribution | Cash dividend distribution |
|-------------|------------|----------------------------|----------------------------|
| 19 × 3      | 45         | 1.25                       | 25                         |
| 19 × 2      | 40         | 1.50                       | 0.15                       |
| 19 × 1      | 38         | 1.10                       | 0.10                       |

**Growth Fund B**

| End of year | Ending NAV | Capital gains distribution | Cash dividend distribution |
|-------------|------------|----------------------------|----------------------------|
| 19 × 3      | 50         | 3.00                       | 0.45                       |
| 19 × 2      | 42         | 2.50                       | 0.40                       |
| 19 × 1      | 40         | 1.75                       | 0.35                       |

- (a) Which fund had the higher rate of return in year 19 × 3.  
 (b) What after - tax return would an investor in 9 tax - bracket of 33% earn on growth fund B in 19 × 3.

Sol :

a) For Growth Fund A

$$r_t = \frac{c_t + d_t + (NAV_t - NAV_{t-1})}{NAV_{t-1}}$$

$$r_{19 \times 3} = \frac{1 - 25 + 0.35 + -(45 - 40)}{40} = \frac{1.50 + 5}{40} = \frac{6.50}{40} = 16.25\%$$

For growth Fund B,

$$\begin{aligned} r_{19 \times 3} &= \frac{3 + 0.45 + (50 - 42)}{42} \\ &= \frac{3.45 + 8}{42} = \frac{11.45}{42} = 27.26\% \end{aligned}$$

**Conclusion**

Growth fund B had the higher return,

b) For Fund B,

$$\text{After tax capital gain} = C_{19 \times 3}(1 - T) = 3(1 - 0.30) = \text{Rs. } 2.10$$

$$\text{After tax dividend} = C_{19 \times 3}(1 - T) = 0.45(1 - 0.33) = \text{Rs. } 0.30$$

$$\begin{aligned} \therefore r_1 &= \frac{c_t + d_t + (NAV_t - NAV_{t-1})(1 - T)}{NAV_{t-1}} \\ r_{19 \times 3} &= \frac{2.40 + 5.60}{42} = \frac{8.00}{42} = 19.5\% \end{aligned}$$

17. A mutual fund has an NAV of Rs. 10.90 in the beginning of the month there is no change in the end of the month and the unit holders benefited by receiving a return of Rs. 0.05 and capital gains of Rs. 0.50. What is the monthly rate of return?

Sol :

$$\begin{aligned} \text{Return} &= \frac{0.05 + 0.05}{10.90} \\ &= \frac{0.1}{10.90} \times 100 = 0.9\% \end{aligned}$$

18. Calculate Net Asset Value of a mutual fund when the following information is provided.

|                                        |           |
|----------------------------------------|-----------|
| Cash balance                           | 4,00,000  |
| Bank balance                           | 2,00,000  |
| Bonds (Realizable Value Equity Shares) | 10,00,000 |
| Equity Shares (Realizable Value)       | 10,00,000 |
| Expenses                               | 1,00,000  |
| No. of Units Outstanding               | 2,00,000  |

**Sol :**

|                                    |                    |
|------------------------------------|--------------------|
| Cash Balance                       | = 4,00,000         |
| Bank Balance                       | = 2,00,000         |
| Equities                           | = <u>10,00,000</u> |
| Bonds                              | = 10,00,000        |
| Total Realizable Value             | = 26,00,000        |
| Less expenses increased            | = <u>1,00,000</u>  |
|                                    | = 25,00,000        |
| Divided by No. of Unit Outstanding | = <u>25,00,000</u> |
|                                    | 2,00,000           |
| NAV per unit                       | Rs. 12.50          |

- 19. A mutual fund has an NAV of Rs. 30 in the beginning of the year and Rs. 35 at the end of the period. It increased an expenditure of Rs. 0.50 per unit, find its expense ratio.**

**Sol :**

$$\begin{aligned}
 \text{Expense ratio} &= \frac{\text{Expenses}}{\text{Average Assets}} \times 100 \\
 &= \frac{0.50}{(30 + 35) / 2} \times 100 \\
 &= \frac{0.50}{32.50} \times 100 \\
 &= 1.54 \%
 \end{aligned}$$

- 20. A mutual fund has new scheme each unit is of Rs. 100 whereby investors are looking for a return of 15%. How much should the mutual fund earn if its initial expenses are 5% and annual recurring expenses are 2% to cover its costs and expectation of investors ?**

**Sol :**

$$\text{Minimum Return} = \frac{\text{Return of Investors} + \text{Recurring Expenses}}{(1 - \text{Initial Expenses})}$$

$$\text{Return of investors} = \text{Rs. 15.00}$$

$$\text{Recurring Expenses} = 2\% \times (100 - 5\%)$$

$$2 \times 95 = 1.90$$

$$\text{Total Return Required} = 16.90$$

$$\text{Funds available } (100 - 5\%) = 17.79\%$$

$$\text{Return } (16.90 \div 95) = 17.79\%$$

It can also be calculated in the following way,

$$\frac{15 + 1.90}{100 - 5} \times 100 = 17.19\%.$$

- 21. An investor earns a return of 15% in equity shares. A mutual fund has floated a scheme which will give a return of 17% but it has an issue expense of 5%. How much should be the mutual fund expenses to be equal to the return in equities?**

**Sol :**

An investor invests Rs. 100, and gets a return of Rs. 15. The mutual fund invests Rs. 95 after expenses of Rs. 5 @ 17%.

$$\begin{aligned}\text{Income of mutual fund (17\%} \times 95) &= 16.15 \\ \text{Less return to investor} &= 15.00 \\ \text{Amount available for expenses} &= 1.15 \div 95 \\ &= 1.21\%\end{aligned}$$

Expenses should be 1.21%.

### 5.7.5 Risk and Return in Mutual Funds

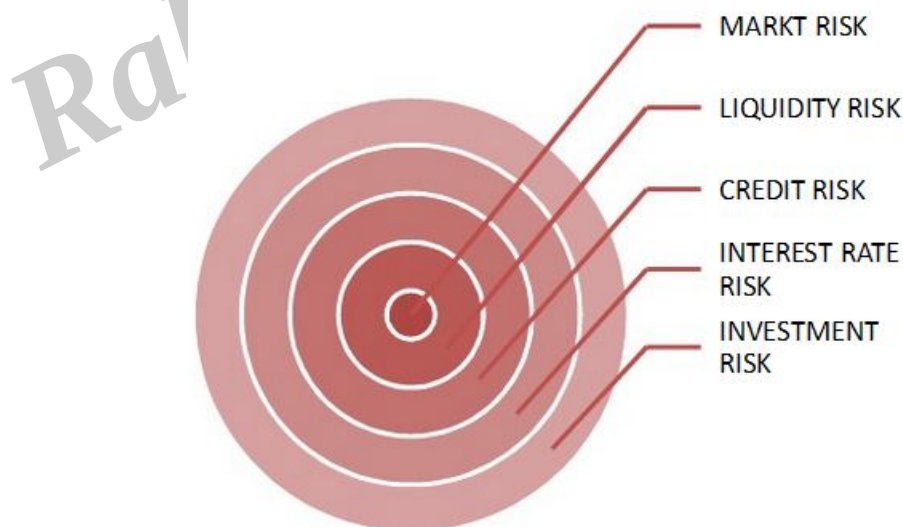
**Q28. Discuss briefly about risk and return involved in mutual funds.**

**Ans :**

#### **A) RISK INVOLVED IN MUTUAL FUNDS**

Risk is an inherent aspect of every form of investment. For mutual fund investments, risks would include variability, or period-by-period fluctuations in total return. The value of the scheme's investments may be affected by factors affecting capital markets such as price and volume volatility in the stock markets, interest rates, currency exchange rates, foreign investment, changes in government policy, political, economic or other developments.

#### **Type of Risk**



#### **1. Market Risk**

At times the prices or yields of all the securities in a particular market rise or fall due to broad outside influences. When this happens, the stock prices of both an outstanding, highly profitable company and a fledgling corporation may be affected. This change in price is due to "market risk."

## 2. Liquidity Risk

Thinly traded securities carry the danger of not being easily saleable at or near their real values.

The fund manager may therefore be unable to quickly sell an illiquid bond and this might affect the price of the fund unfavorably. Liquidity risk is characteristic of the Indian fixed income market.

## 3. Credit Risk

In short, how stable is the company or entity to which you lend your money when you invest? How certain are you that it will be able to pay the interest you are promised, or repay your principal when the investment matures?

## 4. Interest Rate Risk

Changing interest rates affect both equities and bonds in many ways. Bond prices are influenced by movements in the interest rates in the financial system. Generally, when interest rates rise, prices of the securities fall and when interest rates drop, the prices increase. Interest rate movements in the Indian debt markets can be volatile leading to the possibility of large price movements up or down in debt and money market securities and thereby to possibly large movements in the NAV.

## 5. Investment Risks

In the sectorial fund schemes, investments will be predominantly in equities of select companies in the particular sectors. Accordingly, the NAV of the schemes are linked to the equity performance of such companies and may be more volatile than a more diversified portfolio of equities.

## B) Returns in Mutual Funds

The return on any investment, measured over a given period of time, is simply the sum of its capital appreciation and any income generated divided by the original amount of the investment, which is expressed as a percentage. The term applied to this composite calculation is total return.

However, there is a difference in this simple concept as applied to stocks and mutual funds. Unfortunately, a great many mutual fund investors do not seem to have a clear understanding of a fund's total return. The relationships between a fund's net asset value (NAV), yield (income) and capital gains distributions can be confusing. For stock investors, calculating and understanding their total return is relatively easy. By comparing how total return is derived for both stocks and mutual funds, you'll be able to better understand how this measure works for mutual funds.

### 1. Stock Total Return

We begin our illustration with a share of XYZ Company that is bought for \$30 at the beginning of the year. During the year, its price fluctuates, but it closes the year at \$33, which represents a nice percentage return on the investment of 10% ( $\$3/\$30$ ).

But, things get even better because XYZ paid an annual dividend of \$1 per share. This dividend equals an additional 3.3% return ( $\$1/\$30$ ). Adding together the capital appreciation (price increase) of 10% and the income return (dividend) of 3.3% gives us a one-year total return for XYZ Company stock of 13.3%. However, remember that unless you sell XYZ stock, the price appreciation gain remains in the stock price, or is unrealized. (For more on this concept, see What are unrealized gains and losses?)

### 2. Fund Total Return

With mutual funds, explaining total return is a bit more complicated. We begin with a share of the ABC Fund, which is purchased at its net asset value (price) of \$16 per share. A fund's NAV is derived by dividing the value of its portfolio securities (the fund's assets), less any accrued fees and expenses (the fund's liabilities), by the number of fund shares outstanding.

Here's an illustration of the computation of net asset value for the ABC Fund:

The fund's cash and cash equivalents = \$200,000

The fund's stock holdings at market prices:

- 10,000 shares of Company X @ \$50 = \$500,000
- 20,000 shares of Company Y @ \$30 = \$600,000
- 50,000 shares of Company Z @ \$8 = \$400,000

Total market value of stock holdings = \$1,500,000

The fund's total assets = \$1,700,000

Less the fund's liabilities = \$100,000

The fund's total net assets = \$1,600,000

The fund's total shares outstanding: 100,000

The fund's NAV: \$16 (\$1,600,000/100,000)

Remember that mutual funds are priced once a day, at the end of the day. Unlike stocks, where prices are moved by the supply and demand forces of the marketplace, fund prices are determined by the value of the underlying securities in the fund.

### 5.8 PERFORMANCE EVALUATION MODELS

**Q29. State the methods of portfolio performance evaluation.**

Ans :

Initially the performance evaluation of portfolio was done entirely by managers who were aware of the risk associated with the return, but they did not know how to quantify risk, so they could not consider it explicitly. Portfolio evaluation has evolved dramatically since the early 1960s. the various methods used for portfolio performance evaluation are :

- Sharpe's Reward to Variability Model
- Treynor's Reward to Volatility Model
- Jensen's Differential Return Model

#### 5.8.1 Sharpe's Reward to Variability Model

**Q30. Explain about Sharpe's Reward to Variability Model.**

Ans :

Sharpe's Model follows closely from the author's earlier work on the CAPM. The model yields

a single value that can be used for investment performance rankings. It assigns highest rank to portfolio that has the best risk adjusted rate of return; His measure make a measurement of the risk premium of portfolios.

The difference between a portfolio's expected rate of return and the risk less rate is called the risk premium. Then each portfolio's risk premium is divided by its standard deviation of annual returns, a measure of the portfolio's total risk or variability, estimated over the evaluation period. The resulting number is the rate of reward per unit of variability. Sharpe's index is explained in the following equation :

$$S_t = \frac{R_t - R}{\sigma_t} = \frac{\text{Reward}}{\text{Total risk}}$$

$$= \frac{\text{Risk Premium}}{\text{Standard Deviation}}$$

Whereas  $S_t$  = Sharpe's Index

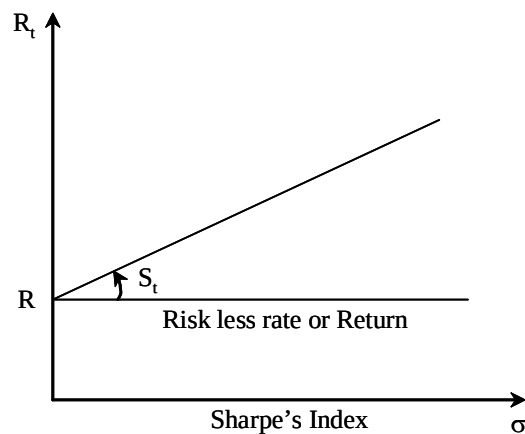
$R_t$  = Expected average return from the portfolio

$R$  = Risk less rate of return

$\sigma_t$  = Total risk of the portfolio

This index gives a measure of portfolios total risk and variability of returns in relation to the risk premium. This method ranks all portfolios on the basis of  $S_t$ . If one portfolio has higher  $S_t$  than another, the first one is the better performer.

The following figure gives a graphic representation of Sharpe's index. Larger the value of  $S_t$ , the better the performance of the portfolio.  $S_t$  measure the slope of the line emanating from the risk less rate outward to the portfolio in question.



### 5.8.2 Treynor's Reward to Volatility Model

#### Q31. Explain about Treynor's Reward to Volatility Model.

Ans :

Jack L. Treynor based his model on the concept of characteristic line. This line is the least squares regression line relating the return to the risk and Beta is the slope of the line. The slope of the line measures volatility. A steep slope means that the actual rate of return for the portfolio in question is relatively sensitive to fluctuations in the general stock market whereas a gentle slope indicates that the portfolio in question is relatively insensitive to market fluctuations. Treynor also pointed out that investment risk in a diversified portfolio is the sum of responses to General Market fluctuations and fluctuations peculiar to the particular securities held in the portfolio.

Treynor's measure is the measure of portfolio's excess return per unit of portfolio's beta coefficients ( $b$ ). The Sharpe measure relates a portfolio's excess return to total risk while the Treynor measure relates the excess return to non-diversifiable or systematic risk as measured by the portfolio's volatility. However, if diversified portfolios are compared the rankings will be similar irrespective of which method is used. Treynor's reward to volatility ratio is shown in the following equation :

$$T_t = \frac{R_t - R}{b_t}$$

Whereas

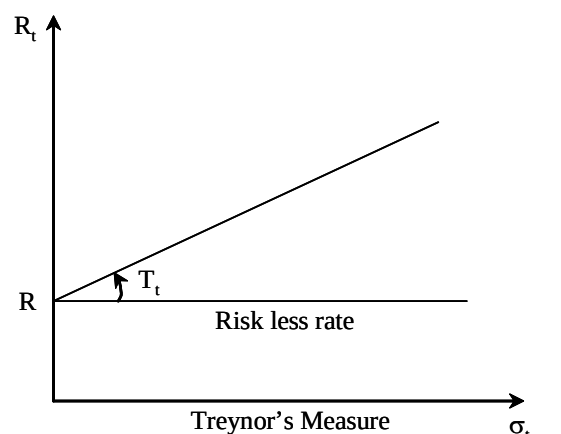
$T_t$  = Treynor's measure of portfolio's performance

$R_t$  = Return of the portfolio

$R$  = Risk less rate of return

$b_t$  = Beta coefficient or volatility of the portfolio

Graphically Treynor's measure is depicted as



### 5.8.3 Jensen's Differential Return Model

#### Q32. Explain about Jensen's Differential Return Model.

Ans :

Jensen's model is different from the Sharpe's and Treynor's model in the sense that the earlier models provided a measure of ranking the relative performance of various portfolios on a risk adjusted basis while Jensen's model gives a measure of absolute performance on a risk adjusted basis.

Jensen's Model is based on CAPM. Jensen attempts to construct a measure of absolute performance on a risk adjusted basis that is a definite standard against which performance of various funds can be measured. This standard measures the portfolio manager's predictive ability to achieve higher return than expected for the given risk ness. Jensen's model is given in the following equation :

$$R_t - R = a + b (R_m - R)$$

Whereas  $R_t$  = Portfolio Return

$R$  = Risk less return

$a$  = Intercept the graph that measure the forecasting ability of the portfolio

$b$  = Beta coefficient, a measure of systematic risk

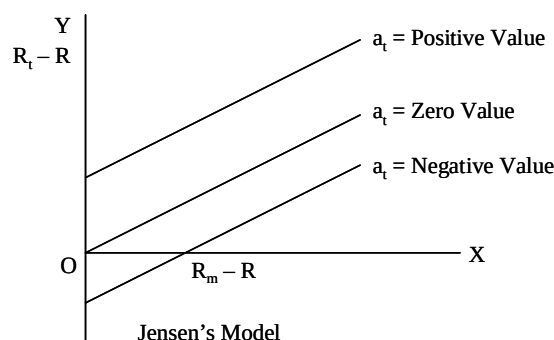
$R_m$  = Return of the market portfolio

Thus, Jensen's equation involves two steps :

- (i) First the calculates what the return of a given portfolio should be on the basis of  $b$ ,  $R_m$  and  $R$ .

- (ii) He compares the actual realized return of the portfolio with the calculated or predicted return. Greater the excess of realized return over the calculated return, better is the performance of the portfolio.

Graphic representation of Jensen's model is as given in the following figure :



#### 5.8.4 Fama's Model

##### Q33. Explain Fama's Decomposition of Returns Model.

Ans :

The Eugene Fama model is an extension of Jensen model. This model compares the performance, measured in terms of returns, of a fund with the required return commensurate with the total risk associated with it. The difference between these two is taken as a measure of the performance of the fund and is called net selectivity.

The net selectivity represents the stock selection skill of the fund manager, as it is the excess return over and above the return required to compensate for the total risk taken by the fund manager. Higher value of which indicates that fund manager has earned returns well above the return commensurate with the level of risk taken by him.

Required return can be calculated as:

$$R_i = R_f + S_i/S_m \cdot (R_m - R_f)$$

Where,  $S_m$  is standard deviation of market returns. The net selectivity is then calculated by subtracting this required return from the actual return of the fund.

##### Q34. Analyse the various portfolio performance evaluation methods.

Ans :

Among the above performance measures, two models namely, Treynor measure and Jensen model use systematic risk based on the premise that the unsystematic risk is diversifiable. These models are suitable for large investors like institutional investors with high risk taking capacities as they do not face paucity of funds and can invest in a number of options to dilute some risks. For them, a portfolio can be spread across a number of stocks and sectors. However, Sharpe measure and Fama model that consider the entire risk associated with fund are suitable for small investors, as the ordinary investor lacks the necessary skill and resources to diversify.

Moreover, the selection of the fund on the basis of superior stock selection ability of the fund manager will also help in safeguarding the money invested to a great extent. The investment in funds that have generated big returns at higher levels of risks leaves the money all the more prone to risks of all kinds that may exceed the individual investors' risk appetite.

## SOLVED PROBLEMS

### PROBLEMS ON EVALUATION MODELS

22. Nithya firm is trying to decide two out of the four investment funds. From the past performance, they were able to calculate the following average returns and standard deviations of these funds. The current risk free rate of interest is 9 percent.

| Particulars        | Alpha Fund | Vinu Fund | Meenu Fund | Arvind Fund |
|--------------------|------------|-----------|------------|-------------|
| Average return     | 17         | 18        | 16         | 14          |
| Standard deviation | 19         | 20        | 13         | 12          |

**Sol :**

Using Sharpe Index :  $\frac{\text{Risk Premium}}{\text{S.D}}$

$$S_i = \frac{R_p - R_f}{\sigma_p}$$

$$\text{Alpha Fund} = \frac{17 - 9}{19} = .421$$

$$S_i \text{ for Vinu fund} = \frac{18 - 9}{20} = .45$$

$$S_i \text{ for Meenu fund} = \frac{16 - 9}{13} = .538$$

$$S_i \text{ for Arvind fund} = \frac{14 - 9}{12} = .417$$

**Conclusion :**

Nithya firm is advised to choose the Meenu fund and the Vinu fund because their performances are better than the other two.

### 23. Calculate Sharpe's Index and Discuss.

**Portfolio A :** Expected return  $R_p = 10\%$ ,  $\sigma_p = 4\%$

**Portfolio B :** Expected return  $R_p = 18\%$ ,  $\sigma_p = 6\%$

Riskless rate of return i.e.,  $R_f = 6\%$

$$S_A = \frac{R_p - R_f}{\sigma_p} = \frac{10\% - 6\%}{4} = 1$$

$$S_B = \frac{18\% - 6\%}{6} = 2$$

**Conclusion :**

B is better portfolio because index is higher.

24. Assume that Portfolio A has an average return of 18 percent with a standard deviation of 3 percent, and Portfolio B has an expected average return of 33 percent with a standard deviation of 6 percent. Further assume that riskfree rate of return,  $R = 9$  percent. Then the Sharpe index equals:

$$S_A = \frac{18\% - 9\%}{3} = \frac{9}{3} = 3$$

and for B :  $S_B = \frac{33 - 9}{6} = \frac{24}{6} = 4$

**Conclusion :**

Thus, 3 is ranked as the better portfolio because its index is higher ( $4 > 3$ ).

25. Calculate Treynor's Performance Index and Discuss.

| Portfolio | Return | $\beta$ | $R_i$ |
|-----------|--------|---------|-------|
| A         | 20     | 0.5     | 10    |
| B         | 24     | 1.0     | 10    |

**Sol :**

$$\text{Treynor's Index} = \frac{\text{Risk Premium}}{\text{Beta Portfolio}}$$

$$T_A = \frac{R_p - R_f}{\beta_p} = \frac{20 - 10}{0.5} = 20$$

$$T_B = \frac{24 - 10}{1} = 14$$

**Conclusion :**

Portfolio A performs better.

26. Assume that portfolio A has average return of 15 percent with volatility of 3 percent, and that the portfolio B has an average return of 18 percent with volatility of 5 percent. Further, assume that riskless rate,  $R = 9$  percent. Then the Treynor's value of for portfolio A equals :

**Sol :**

$$T_A = \frac{15 - 9}{3} = 2.0$$

and for Portfolio B :

$$T_B = \frac{18 - 9}{5} = 1.8$$

**Conclusion :**

Therefore, Treynor's index has ranked portfolio A as the better portfolio because its value is higher ( $2.0 > 1.8$ ) despite the fact that portfolio B had a higher return ( $18\% > 15\%$ ). It is due to difference in volatility ( $\sigma$ ) of two portfolio.

27.

| Portfolio | Average Annual Return | Standard Deviation | Correlation Co-efficient |
|-----------|-----------------------|--------------------|--------------------------|
| A         | 18                    | 27                 | 0.8                      |
| B         | 14                    | 18                 | 0.6                      |
| C         | 15                    | 8                  | 0.9                      |
| Market    | 13                    | 12                 | –                        |

Risk free rate of interest is 9.

- (a) Rank these portfolio using Sharpe's and Treynor's methods.  
 (b) Compare both the indices.

Sol :

**(a) Sharpe Index**

$$S_i = \frac{R_p - R_f}{\sigma_p}$$

$$A = \frac{18 - 9}{27} = .333$$

$$B = \frac{14 - 9}{18} = .277$$

$$C = \frac{15 - 9}{8} = .75$$

**Conclusion :**

Ranking order is C, A, P

**Treynor Index**

$$T_n = \frac{R_p - R_f}{\beta_p}$$

Beta values are not given. Beta values can be estimated by using the formula

$$\beta = r \frac{\sigma_p}{\sigma_m}$$

$$A = 0.8 \times \frac{27}{12} = 1.8$$

$$B = 0.6 \times \frac{18}{12} = .6$$

$$C = 0.9 \times \frac{8}{12} = .6$$

$$T_n \text{ for A} = \frac{18 - 9}{1.8} = 5$$

$$T_n \text{ for B} = \frac{14 - 9}{.9} = 5.56$$

$$T_n \text{ for C} = \frac{15 - 9}{.6} = 10.$$

**Conclusion :**

The ranking is C, B, A.

- (b) The order of B and A get reversed in the Treynor's index. This may be due to their relationship with the market i.e., the systematic risk factor.

**28. Mr. Anand is having units in a mutual fund for the past three years. He wants to evaluate its performance by comparing it to the market.**

|                    | Fund  | Market |
|--------------------|-------|--------|
| Return             | 70.60 | 41.40  |
| Standard deviation | 41.31 | 19.44  |
| Risk Free Rate     | 2%    | 2      |
| $\beta$            | 1.12  | —      |

Find out Sharpe and Treynor indices. Comment

**Sol :**

- (a) Sharpe Index

$$S_t = \frac{R_p - R_f}{\sigma_p}$$

$$= \frac{70.60 - 12}{41.31} = 1.419$$

$$S_t \text{ for market} = \frac{R_p - R_f}{\sigma_m} = \frac{41.40 - 12}{19.44} = 1.512$$

**Conclusion :**

Sharpe index for the fund is lower than the market and it indicates that the fund has not performed well.

- (b) Treynor's Index

$$T_n = \frac{R_p - R_f}{\beta_p} = \frac{70.60 - 12}{1.12} = 52.3\%$$

$$\text{Market index} = \frac{41.40 - 12}{1} = 29.4$$

**Conclusion :**

(Market index by definition would have a beta value equal to 1) According to Treynor index, the portfolio has performed better than the market. The two measures give different opinions. Reason is that the Sharpe's measure uses the total risk and the Treynor's measure uses only the systematic risk. In a well-diversified portfolio, the unsystematic risk would become zero and both the measures would give the same result. But, here the portfolio seems to be poorly diversified and so, the results differ.

**29. Six portfolios experienced the following results during a seven year period :**

| Portfolio                | Average Annual Return (%) | Standard Deviation (%) | Correlation with Market |
|--------------------------|---------------------------|------------------------|-------------------------|
| A                        | 18.6                      | 27.0                   | 0.81                    |
| B                        | 14.8                      | 18.0                   | 0.65                    |
| C                        | 15.1                      | 8.0                    | 0.98                    |
| D                        | 22.0                      | 21.2                   | 0.75                    |
| E                        | - 9.0                     | 4.0                    | 0.45                    |
| F                        | 26.5                      | 19.3                   | 0.63                    |
| Market (m)               | 13.0                      | 12.0                   | -                       |
| Risk Free Rate ( $R_f$ ) | 9.0                       | --                     |                         |

Rank these portfolios using Sharpe's and Treynor's methods.

Sol :

| Portfolio                | Average Annual return (%) | Std. Deviation | Correlation with Market |
|--------------------------|---------------------------|----------------|-------------------------|
| A                        | 18.6                      | 27             | 0.81                    |
| B                        | 14.8                      | 18             | 0.65                    |
| C                        | 15.1                      | 8              | 0.98                    |
| D                        | 22.0                      | 21.2           | 0.75                    |
| E                        | -9                        | 4              | 0.45                    |
| F                        | 26.5                      | 19.3           | 0.63                    |
| Market (m)               | 13                        | 12             | -                       |
| Risk free rate ( $R_f$ ) | 9                         | -              | -                       |

**Sharpe measure :**

$$S_p = \frac{R_p - R_f}{\sigma_p}$$

$$S_A = \frac{18.6 - 9}{27} = 0.36$$

$$S_B = \frac{14.8 - 9}{18} = 0.32$$

$$S_C = \frac{15.1 - 9}{8} = 0.76$$

$$S_D = \frac{22 - 9}{21.2} = 0.61$$

$$S_E = \frac{-9 - 9}{4} = -4.5$$

$$S_F = \frac{26.5 - 9}{19.3} = 0.91$$

**Treynor measure :**

$$T_p = \frac{R_p - R_f}{\beta_p}$$

In the given problem 'β' values are not given, β can be calculated by using the formula :

$$\beta_p = \rho = \frac{\sigma_p}{\sigma_m}$$

$$\beta_A = 0.81 \times \frac{27}{12} = 1.82$$

$$\beta_B = 0.65 \times \frac{18}{12} = 0.975$$

$$\beta_C = 0.98 \times \frac{8}{12} = 0.653$$

$$\beta_D = 0.75 \times \frac{21.2}{12} = 1.325$$

$$\beta_E = 0.45 \times \frac{4}{12} = 0.15$$

$$\beta_E = 0.63 \times \frac{19.3}{12} = 1.013$$

$$T_A = \frac{18.6 - 9}{1.82} = 5.275$$

$$T_B = \frac{14.8 - 9}{0.975} = 5.95$$

$$T_C = \frac{15.1 - 9}{0.653} = 9.34$$

$$T_D = \frac{22 - 9}{1.325} = 9.81$$

$$T_E = \frac{-9 - 9}{0.15} = -120$$

$$T_F = \frac{26.5 - 9}{1.013} = 17.273$$

**Conclusion :**

Ranking the funds using sharpe and Treynor measures :

| Fund | Sharpe | Rank | Treynor measure | Rank |
|------|--------|------|-----------------|------|
| A    | 0.36   | 4    | 5.275           | 5    |
| B    | 0.32   | 5    | 5.95            | 4    |
| C    | 0.76   | 2    | 9.34            | 3    |
| D    | 0.61   | 3    | 9.81            | 2    |
| E    | -4.5   | 6    | -120            | 6    |
| F    | 0.91   | 1    | 17.275          | 1    |

30. The following information is provided regarding the performance of the funds namely Birla Advantage, Sundaram Growth and Sun F & C Value for a period of six months ending August 1999. The risk free rate of interest is assumed to be 9. Rank them with the help of Sharpe Index and Treynor Index and Discuss.

|                 | $R_p$ | $\sigma_p$ | $\beta$ |
|-----------------|-------|------------|---------|
| Birla Advantage | 25.38 | 4          | .23     |
| Sundaram Growth | 25.11 | 9.01       | .56     |
| Sun F & C Value | 25.01 | 3.55       | .59     |

**Sol :**

$$\text{Sharpe Index} = \frac{R_p - R_f}{\sigma_p}$$

$$\text{Birla Advantage} = \frac{25.38 - 9}{4} = 4.095 \rightarrow \text{I}$$

$$\text{Sundaram Growth} = \frac{25.11 - 9}{9.01} = 1.788 \rightarrow \text{III}$$

$$\text{Sun F \& C Value} = \frac{25.01 - 9}{3.55} = 4.509 \rightarrow \text{II}$$

The Birla Advantage fund ranks top among the three funds because of the higher return and low volatility in return. The Sundaram Growth Fund's return is high compared to Sun's but the high volatility in return has made it to be ranked third.

$$\text{Treynor Index} = \frac{R_p - R_f}{\beta}$$

$$\text{Birla Advantage} = \frac{25.38 - 9}{.23} = 71.21 \rightarrow \text{I}$$

$$\text{Sundaram Growth} = \frac{25.11 - 9}{.56} = 28.77 \rightarrow \text{II}$$

$$\text{Sun F \& C Value} = \frac{25.01 - 9}{.59} = 27.14 \rightarrow \text{III}$$

Birla Advantage Fund's high value is due to the high risk premium i.e., 16.38 and the low market related risk .23 whereas in the Sun Fund, the premium is low and the market related risk is high.

**31. Pearl and Diamond are the two funds, Pearl has a mean success of 0.15 and Diamond has (0.22). The Diamond has double the beta of Pearl fund's 1.5. The standard deviations of Pearl and Diamond funds 15% and 21.43%. The mean return of market index is 12% and its standard deviations is 7. The risk-free rate is 8%.**

**(a) Compute the Jensen Index for each fund.**

**(b) Compute the Treynor and Sharpe indices for the funds. Interpret the results.**

**Sol :**

**Jensen Index**

$$R_p = \alpha_p + \beta(R_m - R_f)$$

Jensen's Index for Pearl Fund

$$\begin{aligned} &= 8 + 1.5 (12 - 8) \\ &= 14 \end{aligned}$$

$$\begin{aligned} \text{For Diamond fund,} &= 8 + 3 (12 - 8) \\ &= 20 \end{aligned}$$

The difference between the actual and estimated returns.

$$\text{Pearl fund} = 15 - 4 = 1$$

$$\text{Diamond fund} = 22 - 20 = 2$$

**Treynor Index**

$$T_n = \frac{R_p - R_f}{\beta_p}$$

$$\text{Pearl fund} = \frac{15 - 8}{1.5} = 0.47$$

$$\text{Diamond fund} = \frac{22 - 8}{3} = 4.67$$

According to Treynor Index, both the funds have same value.

**Sharpe Index**

$$S_t = \frac{R_p - R_f}{\sigma_p}$$

$$\text{Pearl fund} = \frac{15 - 8}{15} = 0.46$$

$$\text{Diamond fund} = \frac{22 - 8}{21.43} = 0.65$$

$$\text{Market performance} = \frac{12 - 8}{7} = 0.57$$

Treynor index and the Sharpe index results differ. Sharpe index considers the total risk but the Treynor index considers only the market risk.

**32. Six portfolios experienced the following results during a seven year period :**

| Portfolio      | Average Annual Return (%) | Standard Deviation (%) | Correlation with Market |
|----------------|---------------------------|------------------------|-------------------------|
| A              | 18.6                      | 27.0                   | 0.81                    |
| B              | 14.8                      | 18.0                   | 0.65                    |
| C              | 15.1                      | 8.0                    | 0.98                    |
| D              | 22.0                      | 21.2                   | 0.75                    |
| E              | -9.0                      | 4.0                    | 0.45                    |
| F              | 26.5                      | 19.3                   | 0.63                    |
| Market         | 13.0                      | 12.0                   | -                       |
| Risk Free Rate | 9.0                       | -                      | -                       |

**Sol :**

| Portfolio      | Average Annual return (%) | Std. deviation | Correlation with Market |
|----------------|---------------------------|----------------|-------------------------|
| A              | 18.6                      | 27             | 0.81                    |
| B              | 14.8                      | 18             | 0.65                    |
| C              | 15.1                      | 8              | 0.98                    |
| D              | 22.0                      | 21.2           | 0.75                    |
| E              | -9                        | 4              | 0.45                    |
| F              | 26.5                      | 19.3           | 0.63                    |
| Market         | 13                        | 12             | -                       |
| Risk free rate | 9                         | -              | -                       |

**Sharpe measure :**

$$S_p = \frac{R_p - R_f}{\sigma_p}$$

$$S_A = \frac{18.6 - 9}{27} = 0.36$$

$$S_B = \frac{14.8 - 9}{18} = 0.32$$

$$S_C = \frac{15.1 - 9}{8} = 0.76$$

$$S_D = \frac{22 - 9}{21.2} = 0.61$$

$$S_E = \frac{-9 - 9}{4} = -4.5$$

$$S_F = \frac{26.5 - 9}{19.3} = 0.91$$

**Treynor measure :**

$$T_p = \frac{R_p - R_f}{\beta_p}$$

In the given problem 'β' values are not given, β can be calculated by using the formula :

$$\beta = P \times \frac{\sigma_p}{\sigma_m}$$

$$\beta_A = 0.81 \times \frac{27}{12} = 1.82$$

$$\beta_B = 0.65 \times \frac{18}{12} = 0.975$$

$$\beta_C = 0.98 \times \frac{8}{12} = 0.653$$

$$\beta_D = 0.75 \times \frac{21.2}{12} = 1.325$$

$$\beta_E = 0.45 \times \frac{4}{12} = 0.15$$

$$\beta_F = 0.63 \times \frac{19.3}{12} = 1.013$$

$$T_A = \frac{18.6 - 9}{1.82} = 5.275$$

$$T_B = \frac{14.8 - 9}{0.975} = 5.95$$

$$T_C = \frac{15.1 - 9}{0.653} = 9.34$$

$$T_D = \frac{22 - 9}{1.325} = 9.81$$

$$T_E = \frac{-9 - 9}{0.15} = -120$$

$$T_F = \frac{26.5 - 9}{1.013} = 17.273$$

Ranking the funds using sharpe and Treynor measures :

| Fund | Sharpe | Rank | Treynor measure | Rank |
|------|--------|------|-----------------|------|
| A    | 0.36   | 4    | 5.275           | 5    |
| B    | 0.32   | 5    | 5.95            | 4    |
| C    | 0.76   | 2    | 9.34            | 3    |
| D    | 0.61   | 3    | 9.81            | 2    |
| E    | -4.5   | 6    | -120            | 6    |
| F    | 0.91   | 1    | 17.275          | 1    |

33. Rani Limited to decide two out of the four investments funds. From the past performance; it was able to calculate the following average returns and standard deviations of these funds. The market rate of interest is 9 percent.

| Particulars        | Alpha Fund | Vinu Fund | Meenu Fund | Arvind Fund |
|--------------------|------------|-----------|------------|-------------|
| Average return     | 17         | 18        | 16         | 14          |
| Standard deviation | 19         | 20        | 13         | 12          |

Sol :

Sharpe Index

$$S_p = \frac{R_p - R_f}{\sigma_p}$$

$$\text{Alpha Fund} = \frac{17 - 9}{19} = 0.421$$

$$\text{Vinu Fund} = \frac{18 - 9}{20} = 0.45$$

$$\text{Meenu Fund} = \frac{16 - 9}{13} = 0.538$$

$$\text{Arvind Fund} = \frac{14 - 9}{12} = 0.417$$

Rani Limited is advised to choose the Meenu fund and Vinu Fund because their performance are better than the other two.

34. Mr. Shahrukh is having units in a mutual fund from the past three years. He wants to evaluate its performance by comparing it to the market.

| Particulars        | Fund  | Market |
|--------------------|-------|--------|
| Return             | 70.60 | 41.40  |
| Standard deviation | 41.31 | 19.44  |
| Risk free rate     | 25.00 | 2.00   |
| $\beta$            | 1.12  | –      |

Find out Sharpe and Treynor indices. Comment

**Sol :**

**(a) Sharpe Index**

$$S_t = \frac{R_p - R_f}{\sigma_p}$$

$$= \frac{70.60 - 12}{41.31} = 1.419$$

$$S_t \text{ for market} = \frac{R_p - R_f}{\sigma_p} = \frac{41.40 - 12}{19.44} = 1.512$$

Sharpe index for the fund is lower than the market and it indicates that the fund has not performed well.

**(b) Treynor's Index**

$$T_n = \frac{R_p - R_f}{\beta_p}$$

$$= \frac{70.62 - 12}{1.12} = 52.3\%$$

$$\text{Market index} = \frac{41.40 - 12}{1} = 29.4$$

(Market index by definition would have a beta value equal to 1) According to Treynor index, units performed better than the market. The two measures give different opinions. Reason is that the Sharpe measure uses the total risk and the Treynor's measure uses only the systematic risk. In a well diversified portfolio, the unsystematic risk would become zero and both the measures would give the same result.

35. Alpha and beta co-efficients for five stocks are given below :

| Stocks         | Alpha | Beta |
|----------------|-------|------|
| United Limited | 1.0   | 0.8  |
| Dreams Limited | 1.35  | 1.15 |
| Yash Limited   | 1.18  | 1.25 |
| Johr Limited   | 1.25  | 0.95 |
| Devgan Limited | 1.5   | 1.4  |

Rank the five stocks using Jensen's performance measure.

**Sol :**

$$\text{Jensen's performance measure} = \frac{\text{Co-efficient of } \alpha}{\text{Co-efficient of } \beta}$$

Each stock's alpha should be divided by its beta as below :

$$\text{United's value} = \frac{1.0}{0.8} = 1.25 \rightarrow \text{II}$$

$$\text{Dream's value} = \frac{1.35}{1.15} = 1.17 \rightarrow \text{III}$$

$$\text{Vash's value} = \frac{1.18}{1.25} = 0.94 \rightarrow \text{V}$$

$$\text{Johr's value} = \frac{1.25}{0.95} = 1.32 \rightarrow \text{I}$$

$$\text{Devgan's value} = \frac{1.5}{1.4} = 1.07 \rightarrow \text{IV}$$

36. Reliance Mutual Fund (RMF), Treasury Bills (T-Bills) and Sensex have had the following returns over the past five years:

| Year | RMF    | T-Bills | Sense |
|------|--------|---------|-------|
| 2006 | 8.4%   | 6.0%    | 6.0%  |
| 2007 | - 6.0% | 10.8%   | -4.80 |
| 2008 | 15.6%  | 8.4%    | 12.0% |
| 2009 | 13.2%  | 7.2%    | 10.8% |
| 2010 | 18.0%  | 9.6%    | 14.4% |

Evaluate the performance of RMF using Jensen's differential index and comment on the result.

**Sol :**

Alpha value can be determined as follows:

$$(R_p - R_f) = \alpha + \beta (R_m - R_f)$$

$$\text{Let } (R_p - R_f) = y, (R_m - R_f) = X$$

$$\alpha = \bar{y} - \beta \bar{X}$$

$$\beta = \frac{N \sum XY - \sum X \cdot \sum Y}{N [\sum X^2] - [\sum X]^2}$$

| Year | RMF<br>return<br>(%) ( $R_p$ ) | Sensex<br>returns<br>(%) ( $R_m$ ) | Rf   | Y<br>( $R_p - R_f$ ) | X<br>( $R_m - R_f$ ) | $X^2$  | $Y^2$  | XY     |
|------|--------------------------------|------------------------------------|------|----------------------|----------------------|--------|--------|--------|
| (1)  | (2)                            | (3)                                | (4)  | (5)                  | (6)                  | (7)    | (8)    | (9)    |
| 1    | 8.4                            | 6                                  | 6    | 2.4                  | 0                    | 0      | 5.76   | 0      |
| 2    | -6                             | -4.8                               | 10.8 | -16.8                | -15.6                | 243.36 | 282.24 | 262.08 |
| 3    | 15.6                           | 12                                 | 8.4  | 7.2                  | 3.6                  | 12.96  | 51.84  | 25.92  |
| 4    | 13.2                           | 10.8                               | 7.2  | 6                    | 3.6                  | 12.96  | 36     | 21.6   |
| 5    | 18                             | 14.4                               | 9.6  | 8.4                  | 4.8                  | 23.04  | 70.56  | 40.32  |
|      |                                |                                    |      | 7.2                  | -3.6                 | 292.32 | 446.4  | 349.92 |

$$\beta = \frac{5(349.92) - [(7.2)(-3.6)]}{5(292.32) - (-3.6)^2}$$

$$= \frac{1749.6 + 25.92}{1461.6 - 12.96}$$

$$\beta = \frac{1774.92}{1448.64}$$

$$\beta = 1.23$$

$$\alpha = \bar{Y} - \beta \bar{X}$$

$$\bar{X} = \frac{\sum X_i}{n} = \frac{-3.6}{5} = -0.72$$

$$\bar{Y} = \frac{\sum Y}{n} = \frac{7.2}{5} = 1.44$$

$$\alpha = \bar{Y} - \beta \bar{X}$$

$$\alpha = 1.44 - 1.23 (-0.72)$$

$$= 1.44 + 0.886$$

$$\alpha = 2.326$$

37. Pearl and Diamond are the two mutual funds. Pearl has a mean success of .15 and Diamond has .22. The Diamond has double the beta of Pearl fund's 1.5. The standard deviations of Pearl and Diamond funds are 15% and 21.43%. The mean return of market index is 12% and its standard deviation is 7. The risk free rate is 8%.

(a) Compute the Jensen Index for each fund.

(b) Compute the Treynor and Sharpe indices for the funds. Interpret the results.

Sol :

(a) Jensen Index

$$R_p = \alpha_p + \beta (R_m - R_f)$$

Jensen's Index for Pearl fund

$$= 8 + 1.5 (12 - 8)$$

$$= 14$$

For Diamond fund =  $8 + 3 (12 - 8)$

$$= 20$$

The difference between the actual and estimated returns.

$$\text{Pearl fund} = 15 - 14 = 1$$

$$\text{Diamond fund} = 22 - 20 = 2$$

(b) Treynor Index

$$T_n = \frac{R_p - R_f}{\beta_p}$$

$$\text{Pearl fund} = \frac{15 - 8}{1.5} = 4.67$$

$$\text{Diamond fund} = \frac{22 - 8}{3} = 4.67$$

According to Treynor Index, both the funds have same value.

**Sharpe Index**

$$S_t = \frac{R_p - R_f}{\sigma_p}$$

$$\text{Pearl fund} = \frac{15 - 8}{15} = 0.46$$

$$\text{Diamond fund} = \frac{22 - 8}{21.43} = 0.65$$

$$\text{Market performance} = \frac{12 - 8}{7} = 0.57$$

**Conclusion :**

Treynor index and the Sharpe index results differ. Sharpe index considers the total risk but the Treynors index considers only the market risk.

38. Wisdom fund, T bills and BSE Sensex have had the following returns over the past 5 years.

| Period | Wisdom fund<br>Return % | T. Bills<br>Return % | BSE-Sensex<br>Return % |
|--------|-------------------------|----------------------|------------------------|
| 19 × 1 | 9                       | 6                    | 6                      |
| 19 × 2 | -6                      | 10                   | -5                     |
| 19 × 3 | 14                      | 8                    | 11                     |
| 19 × 4 | 12                      | 7                    | 10                     |
| 19 × 5 | 16                      | 9                    | 13                     |

What is the predictive ability of the fund ?

**Sol :**

The alpha value can be determined as follows

$$(R_p - R_f) = \alpha + \beta (R_m - R_f)$$

$$(R_p - R_f) = y ; (R_m - R_f) = x.$$

$$\beta = \frac{N \sum xy - \sum x \sum y}{N \sum x^2 - (\sum x)^2}$$

$$\alpha = \bar{y} - \beta \bar{x}$$

| Period | Fund<br>Return ( $R_p$ ) | Sensex<br>Return ( $R_m$ ) | $R_f$<br>T.Bills | $y = R_p - R_f$ | $x = R_m - R_f$ | $x^2$ | $xy$ |
|--------|--------------------------|----------------------------|------------------|-----------------|-----------------|-------|------|
| 19 × 1 | 9                        | 6                          | 6                | 3               | 0               | 0     | 0    |
| 19 × 2 | -6                       | -5                         | 10               | -16             | -15             | 225   | 240  |
| 19 × 3 | 14                       | 11                         | 8                | 6               | 3               | 9     | 18   |
| 19 × 4 | 12                       | 10                         | 7                | 5               | 3               | 9     | 15   |
| 19 × 5 | 16                       | 13                         | 9                | 7               | 4               | 16    | 28   |
|        |                          |                            |                  | 5               | -5              | 259   | 301  |

$$\beta = \frac{N \sum xy - \sum x \sum y}{N \sum x^2 - (\sum x)^2}$$

$$= \frac{5 \times 301 - (-5 \times 5)}{5 \times 259 - (-5)^2}$$

$$= \frac{1530}{1270} = 1.2047$$

$$\alpha = \bar{y} - \beta \bar{x}$$

$$= 1 - (1.2047 \times -1)$$

$$\alpha = 2.2047$$

39. The following results were obtained from a study for a period of six months in 1999.

|                 | $R_p$ | $\sigma_p$ | $\beta$ |
|-----------------|-------|------------|---------|
| Birla Advantage | 25.38 | 4.0        | 0.23    |
| PI CI CI GP     | 36.28 | 6.86       | 0.52    |
| Alliance Equity | 45.56 | 4.31       | 0.63    |
| S & P CNX 500   | 36.74 | 3.69       | 1.00    |
| $R_f$           | 9.00  | —          | —       |

Using the inputs, rank the funds according to the predictive ability of the fund's management.

**Sol :**

### Jensen Index

$$R_p - R_f = \alpha_p + \beta (R_m - R_f)$$

The  $\alpha_p$  indicates the managerial skills. To properly adjust the Jensen measure for ranking purpose, each assets alpha should be divided by its beta.

### Birla Advantage

$$25.38 - 9 = \alpha_p + .23 (36.74 - 9)$$

$$16.38 = \alpha_p + 6.38$$

$$\alpha_p = 10$$

$$\frac{\alpha_p}{\beta} = \frac{10}{.23} = 43.48 \rightarrow \text{I}$$

### PI CI CI GP

$$36.28 - 9 = \alpha_p + .52 (36.74 - 9)$$

$$27.28 = \alpha_p + 14.42$$

$$\alpha_p = 12.86$$

$$\frac{\alpha_p}{\beta} = \frac{12.86}{.52} = 24.73 \rightarrow \text{II}$$

### Alliance Equity

$$45.56 - 9 = \alpha_p + .63 (36.74 - 9)$$

$$36.56 = \alpha_p + 17.48$$

$$\alpha_p = 19.08$$

$$\frac{\alpha_p}{\beta} = \frac{19.08}{.63} = 30.29 \rightarrow \text{III}$$

**5.8.5 Fama's Decomposition of Returns****Q35. Describe Fama's decomposition approach.****Ans :**

The performance measures assess the overall performance of a portfolio or fund. Eugene Fama has provided an analytical framework that allows a detailed breakdown of a funds performance into the source or components performance. This is known as the Fama decomposition of total return.

The total return on a portfolio can be firstly divided into two components namely, risk free return and the excess return. Thus,

Total return = Risk free return + Excess return

The excess return arises from different factors or sources such as risk bearing and stock selection.

Hence, the excess return, in turn, may be decomposed into two components, namely, risk premium or reward for bearing risk and return from stock selection known as return from stock selectively. Thus,

Excess return = Risk premium + Return from stock selection

The risk of a security is of two types, systematic risk and unsystematic risk or diversifiable risk. When a portfolio of securities is created most of the unsystematic risk or diversifiable risk would disappear. But in practice, there is no portfolio systematic risk and a small amount of diversifiable risk.

Hence, the risk premium can be decomposed into two components namely, return from bearing systematic risk (market risk) and return for bearing diversifiable risk. Thus,

Risk premium = Return for bearing systematic risk + Return for bearing diversifiable risk

Thus, the total return on a portfolio can be decomposed into four components.

Return on portfolio = Riskless rate + Return from market risk + Return from diversifiable risk + Return from pure selectivity

This may be represented as,

$$R_p = R_f + R_1 + R_2 + R_3$$

Each components can be calculated as follows.

i) The risk-free rate of return ( $R_f$ ) is the return available on a riskless asset such as the government security.

ii) The return from market risk ( $R_1$ ) is calculated as,

$$R_1 = \beta_p (R_m - R_f)$$

Where,

$R_m$  = The return on the market index

iii) The return from diversifiable risk ( $R_2$ ) is calculated as,

$$R_2 = \left[ \left( \frac{\sigma_p}{\sigma_m} \right) - \beta_p \right] (r_m - r_f)$$

Where,

$\sigma_p$  = The portfolio standard deviation

$\sigma_m$  = The standard deviation of the market index.

iv) The return from pure selectivity ( $R_3$ ) can be obtained as the difference between the actual return and the sum of the other three components as,

$$R_3 = R_p - (R_f + R_1 + R_2)$$

The return from pure selectivity is really the additional return obtained by a portfolio manager for his superior stock selection ability. It is the return earned over and above the return mandated by the total risk of the portfolio as measured by standard deviation.

Mathematically, this can be calculated as the difference between the actual return on a portfolio and the return mandated by its total risk.

This is also known as Fama's net selectivity measure. The following formula may be used for calculating the measure.

Fama's net selectivity

$$= \left[ \frac{41.31}{19.44} - 1.121 \right]$$

Where,

$R_p$  = Actual return on portfolio

$R_f$  = Risk free rate

$R_m$  = Return on market index

$\sigma_p$  = Standard deviation of portfolio return

$\sigma_m$  = Standard deviation of market index return.

The return from net selectivity may be negative. This occurs when the actual return realized on a portfolio is less than that mandated by the total risk of the portfolio. This indicates that, due to poor stock selection, the portfolio has not earned the return expected from it commensurate with its total risk.

The decomposition of total return is useful in identifying the different skills involved in active portfolio management. A portfolio manager who attempts to earn a higher return than the market return assumes higher risk and depends on his superior stock selection ability to achieve the higher return. If he is successful the return due to pure selectivity would be positive.

Portfolio evaluation completes the cycle of activities comprising portfolio management. It provides a mechanism for identifying weaknesses in the investment process and for improving the deficient areas. Thus portfolio evaluation would serve as a feedback mechanism for improving the portfolio management process.

### PROBLEMS

- 40. Consider the following data on a portfolio,**

$R_p = 21\%$ ,  $\sigma_p = 15\%$ ,  $R_m = 16\%$ ,

$\sigma_m = 12\%$ ,  $r_f = 10\%$ ,  $\beta_p = 0.85$

**Compute the Fama's net selectivity.**

**Sol :**

Fama's decomposition may be stated as,

$$R_p = R_f + R_1 + R_2 + R_3$$

Here,

$R_f = 10\%$

$R_1$  = Return from market

$R_2$  = Return from diversifiable risk

$R_3$  = Return from pure selectivity

We have,

$$\begin{aligned} R_1 &= \beta_p(R_m - R_f) \\ &= 0.85(16 - 10) = 5.1\% \end{aligned}$$

$$\begin{aligned} R_2 &= \left[ \left( \frac{\sigma_p}{\sigma_m} \right) - \beta_p \right] (R_m - R_f) \\ &= \left[ \left( \frac{15}{12} \right) - 0.85 \right] (16 - 10) \\ &= (1.25 - 0.85)(6) = 2.4\% \end{aligned}$$

$$\begin{aligned} R_3 &= R_p - (R_f + R_1 + R_2) \\ &= 21 - (10 + 5.1 + 2.4) \\ &= 3.5\% \end{aligned}$$

Thus

$$R_p = 10 + 5.1 + 2.4 + 3.5 = 21\%$$

Alternatively, Fama's net selectivity can be directly calculated as follows.

Fama's net selectivity

$$\begin{aligned} &= R_p - \left[ R_f \left( \frac{\sigma_p}{\sigma_m} \right) (R_m - R_f) \right] \\ &= 21 - \left[ 10 + \left( \frac{15}{12} \right) (16 - 10) \right] \\ &= 21 - (10 + 7.5) \\ &= 21 - 17.5 = 3.5\% \end{aligned}$$

- 41. Mr. Ajay has been managing the portfolio of a large mutual fund for the last two years. He found that his portfolio had earned a return of 70.6%, the standard deviation of returns was 41.31% and had a beta of 1.121. During the same period, the return on the market as a whole was 41.4% and had the standard deviation of 19.44%. Assume that the risk-free rate was 12%. Compute the Fama's measure of net selectivity for Ajay's performance and show the breakup of its observed return in terms of its various components.**

**Solution :**

Given that,

$$R_p = 70.60\%, \quad R = 41.40\%$$

$$\sigma_p = 41.31\%, \quad \sigma_m = 19.44\%$$

Fama's net selectivity

$$\begin{aligned} &= R_p - \left[ R_f + \left( \frac{\sigma_p}{\sigma_m} \right) (R_m - R_f) \right] \\ &= 70.60 - \left[ 12 + \left( \frac{41.31}{19.44} \right) (41.4 - 12) \right] \\ &= 70.60 - [12 + (2.125 \times 29.4)] \\ &= 70.60 - [12 + 62.475] \\ &= 70.60 - 74.475 = -3.875\% \end{aligned}$$

Breakup of observed return in terms of its various components is given below,

1. Risk free return,  $R_f = 12.00\%$
2. Compensation for systematic risk,  
 $R_1 = (R_m - R_f) = 1.121 (41.4 - 12) = 32.96\%$
3. Compensation for diversifiable risk,

$$\begin{aligned} R_2 &= \left[ \left( \frac{\sigma_p}{\sigma_m} \right) - \beta_p \right] (R_m - R_f) \\ &= \left[ \frac{41.31}{19.44} - 1.121 \right] (41.4 - 12) \\ &= (2.125 - 1.121) (29.4) \\ &= 1.004 \times 29.4 = 29.52\% \end{aligned}$$

4. Net selectivity,  $R_3 = -3.88\%$

Total actual return,

$$\begin{aligned} R_p &= R_f + R_1 + R_2 + R_3 \\ &= 12 + 32.96 + 29.52 - 3.88 \\ &= 70.60\%. \end{aligned}$$

### Exercise Problems

1. Nithya firm is trying to decide two out of the four investment funds. From the past performance, they were able to calculate the following average returns and standard deviations of these funds. The current risk free rate of interest is 9 percent

|                    | Alpha | Veenu fund<br>fund | Meenu<br>fund | Arvind<br>fund |
|--------------------|-------|--------------------|---------------|----------------|
| Average return     | 17    | 18                 | 16            | 14             |
| Standard deviation | 19    | 20                 | 13            | 12             |

**Sol :**

[Sharp's Index,  $S_{\text{Alpha}} = 0.421$ ,  $S_{\text{veenu}} = 0.45$ ,  $S_{\text{Meenu}} = 0.538$ ,  $S_{\text{Arvind}} = 0.417$ ]

2. An investor holds units in 3 mutual funds (X, Y and Z). The risk free rate of return is 9%. Find the missing figures in the table

| Fund | Sharpe's Measure | Standard Deviation | Return on Fund |
|------|------------------|--------------------|----------------|
| X    | ?                | 41.30              | 71             |
| Y    | 0.43             | ?                  | 17             |
| Z    | 0.54             | 13                 | ?              |

**Sol :**

$$S_X = 1.5 \text{ (III)}$$

$$\sigma_Y = 18.60 \text{ (I)}$$

$$r_Z = 16.02 \text{ (II)}$$

3. The rate of return and risk for three growth - oriented firms are as follows

| Growth Firms | Return | Risk(s) |
|--------------|--------|---------|
| A            | 15 %   | 16%     |
| B            | 13 %   | 18%     |
| C            | 12 %   | 11%     |

Rank each firm by Sharpe's index of portfolio performance if the risk free rate is 7 percent

**Sol :**

Sharpe Index = [ $S_A = 0.5$ ,  $S_B = 0.33$ ,  $S_C = 0.43$ ]

4. Mr. Anand is having units in a mutual fund for the past three years. He wants to evaluate its performance by comparing it to the market.

|                    | Fund  | Market |
|--------------------|-------|--------|
| Return             | 70.60 | 41.40  |
| Standard deviation | 41.31 | 19.44  |
| Risk free rate     | 2%    | 2      |
| $\beta$            | 1.12  | —      |

Rank each form by Sharpe's Treynor's index of portfolio performance if the risk free rate is 7 percent

**Sol :**

$$[S_t = 2.03\%, \text{Trevnor's } T_n = 61.23]$$

5. Consider the following information for three mutual funds P, Q and R and the market.

|                 | Mean<br>return | Standard<br>Deviation | Beta |
|-----------------|----------------|-----------------------|------|
| P               | 15%            | 20%                   | 0.90 |
| Q               | 17%            | 24%                   | 1.10 |
| R               | 19%            | 27%                   | 1.20 |
| Market<br>Index | 16%            | 20%                   | 1.00 |

The mean risk-free rate was 10 percent. Calculate the Treynor measure, Sharpe measure and a Jensen measure for the three mutual funds and the market index.

**Sol :**

$$[S_p = 0.25, 0.292, 0.33 ; T_p = 5.56, 6.36, 7.5]$$

$$\text{Sharpe's Index} - S_p = 0.25, S_Q = 0.292, S_R = 0.33$$

$$\text{Treynor's Index} \rightarrow T_p = 5.56, T_Q = 6.36, T_R = 7.5$$

10. Consider the following information for three mutual funds P, Q and R and the market.

Mean Standard Beta return deviation

|                 |     |     |      |
|-----------------|-----|-----|------|
| P               | 15% | 20% | 0.90 |
| Q               | 17% | 24% | 1.10 |
| R               | 19% | 27% | 1.20 |
| Market<br>Index | 16% | 20% | 1.00 |

The mean risk-free rate was 10 percent. Calculate the Treynor measure, Sharpe measure and Jensen measure for the three mutual funds and the market index.

**Sol :**

$$\text{Treynor's measure } (t_n) \Rightarrow 5.56, 6.36, 7.5$$

$$\text{Market Index} \Rightarrow 6.00$$

$$\text{Sharpe Measure } (S_p) = 0.25, 0.292, 0.333$$

$$\text{Market Index} = 0.3$$

$$\text{Jensen Measure} = 0.4, 6.4, 1.8$$

$$\text{Market Index} = 0$$

11. Consider the following information for three mutual funds and the market.

|              | Mean return | Standard deviation | Beta |
|--------------|-------------|--------------------|------|
| SBIMF        | 15 percent  | 20 percent         | .9   |
| BOIMF        | 17 percent  | 24 percent         | 1.10 |
| TATAMF       | 19 percent  | 27 percent         | 1.20 |
| Market Index | 16 percent  | 20 percent         |      |

The mean risk-free rate was 10 percent. Calculate the Jensen measure and Treynor measure for the three mutual funds.

**Sol. :**

Jensen Measure  $\rightarrow$  - 0.44 (III), 0.36(II), 1.5(I)

Treynor Measure  $\rightarrow$  5.56 (III), 6.36 (II), 7.5(I)

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## Short Question and Answers

### 1. Derivatives

**Ans :**

A derivative is a financial instrument whose value depends on underlying assets. The underlying assets could be prices of traded securities of gold, copper, aluminum and may even cover prices of fruits and flowers.

Derivatives have become important in India since 1995, with the amendment of the Securities Contract Regulation Act of 1956. Derivatives such as options and futures are traded actively on many exchanges. Forward contracts, swap and different types of options are regularly traded outside exchanges by financial institutions, banks and corporate client in over-the-counter markets. There is no single market place or an organized exchange.

Organized exchanges began trading in options on securities in 1973, whereas exchange traded debt options started trading in 1982. On the other hand, fixed income futures began trading in 1975, but equity related futures started trading in 1982. The reasons for debt options being stronger than futures are that stock exchanges tend to introduce those instruments that they think will be successful in trading.

In the equity market, a relatively large proportion of the total risk of a security is unsystematic. At the same time many securities display a high degree of liquidity that can be expected to be maintained for long periods of time. These to be successful, the underlying instruments have to be traded in large quantities and with some price continuity so that the option related transactions need not create more than a minor disturbance in the market.

### 2. Features of Options

**Ans :**

The following features are common in all types of options.

- **Contract:** Option is an agreement to buy or sell an asset obligatory on the parties.

- **Premium:** In case of option a premium in cash is to be paid by one party (buyer) to the other party (seller).
- **Pay off:** From an option in case of buyer is the loss in option price and the maximum profit a seller can have in the options price.
- **Holder and writer** Holder of an option is the buyer while the writer is known as seller of the option. The writer grants the holder a right to buy or sell a particular underlying asset in exchange for a certain money for the obligation taken by him in the option contract.
- **Exercise price** There is call strike price or exercise price at which the option holder buys (call) or sells (put) an underlying asset.
- **Variety of underlying asset** The underlying asset traded as option may be variety of instruments such as commodities, metals, stocks, stock indices, currencies etc.
- **Tool for risk management** Options is a versatile and flexible risk management tools which can mitigate the risk arising from interest rate, hedging of commodity price risk. Hence options provide custom-tailored strategies to fight against risks.

### 3. Types of options.

**Ans :**

There are various types of options depending upon the time, nature and exchange of trading. The following is a brief description of different types of options:

#### (a) Put and call option

- (i) **Put option** is an option which confers the buyer the right to sell an underlying asset against another underlying at a specified time on or before a

predetermined date. The writer of a put must take delivery if this option is exercised. In other words put is an option contract where the buyer has the right to sell the underlying to the writer of the option at a specified time on or before the option's maturity date.

- (ii) **Call option** is an option which grants the buyer (holder) the right to buy an underlying asset at a specific date from the writer (seller) a particular quantity of underlying asset on a specified price within a specified expiration/maturity date. The call option holder pays premium to the writer for the right taken in the option.

**(b) American and European option**

**American option** provides the holder or writer to buy or sell an underlying asset, which can be exercised at any time before or on the date of expiry of the option. On the other hand a European option can be exercised only on the date of expiry or maturity.

This is clear that American options are more popular because there is timing flexibility to exercise the same. But in India, European options are prevalent and permitted.

**(c) Exchange traded and OTC options.**

**Exchange traded** options can be traded on recognized exchanges like the futures contracts. Over the counter options are custom tailored agreement traded directly by the dealer without the involvement of any organized exchange. Generally large commercial bankers and investment banks trade in OTC options.

Exchange traded options have specific expiration date, quantity of underlying asset but in OTC traded option trading there is no such specification and terms are subjective and mutually agreed upon by the parties. Hence OTC traded options are not bound by strict expiration date, specific limited strike price and uniform underlying asset.

Since exchange traded options are guaranteed by the exchanges, hence they have less risk of default because the deals are cleared by clearing houses. On the other side OTC options have higher risk element of default due to noninvolvement of any third party like clearing houses. Offsetting the position by buyer or seller.

**4. The Black-scholes Pricing Model (BSOPM)**

**Ans :**

The black and scholes option pricing model is the most commonly used option pricing model in finance. It was initially developed in 1973 by two academicians fisher Black and Myron scholes and was designed to price European option on non dividend paying stocks after that they developed consultancy org to do many recommendation at corporate sector. Later on some adjustment are made regarding - payment of dividend income. This model is also applicable for American option now days most of the option are made on American style (or) option.

**Assumptions :**

This model is based on the following assumptions.

1. Stock-price behaviour corresponds to the normal log distribution.
2. The risk rate of the stock (s) remains constant in the option contract period.
3. There no taxes (or) transaction cost.
4. All securities are perfectly divisible.
5. No dividend payment on stock during the period of option if the dividend is expected during the period of option that can be adjusted as per unit price.
6. There are no risk less arbitrages opportunities.
7. Stock trading is continuous
8. Investor can borrow or lend at the risk free rate of interest.
9. The slit term risk free interest (r) is constant.

**5. Features of Forward Contract**

Ans :

**(i) Bilateral Contract**

Forward contract is a bilateral contract between a buyer and a seller hence it is subject to counter-party risk.

**(ii) Over The Counter Trading (OTC)**

Forward contracts are private contracts hence traded over the counter and not in exchanges. The contract can be modified as per the requirements of parties.

**(iii) Custom Designed**

Forward contract is a custom designed contract between two parties. It contains features in terms of size of contract, date of expiry, type and quality of asset etc.

**(iv) Physical delivery**

There is no physical delivery of assets at the time of entering the contract. Physical delivery takes place only on expiry date.

**6. Participants of futures markets.**

Ans :

Usually financial derivatives attract three types of traders which are discussed here as under:

**(i) Hedgers**

Generally there is a tendency to transfer the risk from one party to another in investment decisions. Put differently, a hedge is a position taken in futures or other markets for the purpose of reducing exposure to one or more types of risk. A person who undertakes such position is called as 'hedger'. In other words, a hedger uses futures markets to reduce risk caused by the movements in prices of securities, commodities, exchange rates, interest rates, indices, etc. As such, a hedger will take a position in futures market that is opposite a risk to which he or she is exposed. By taking an opposite position to a perceived risk is called 'hedging strategy in futures markets'. The essence of hedging strategy is

the adoption of a futures position that, on average, generates profits when the market value of the commitment is higher than the expected value.

**(ii) Speculators**

A speculator is a person who is willing to take a risk by taking futures position with the expectation to earn profits. Speculator aims to profit from price fluctuations. The speculator forecasts the future economic conditions and decides which position (long or short) to be taken that will yield a profit if the forecast is realized.

**(iii) Speculators are of two types**

Day traders and position traders. (1) Position speculator uses fundamental analysis of economic conditions of the market and is known as fundamental analyst, (2) Whereas the one who predicts futures prices on the basis of past movements in the prices of the asset is known as technical analyst.

**(iv) Arbitrageurs**

Arbitrageurs are another important group of participants in futures markets. They take advantage of price differential of two markets. An arbitrageur is a trader who attempts to make profits by locking in a riskless trading by simultaneously entering into transactions in two or more markets. In other words, an arbitrageur tries to earn riskless profits from discrepancies between futures and spot prices and among different futures prices.

**7. Mutual Funds**

Ans :

A mutual fund is just the connecting bridge or a financial intermediary that allows a group of investors to pool their money together with a predetermined investment objective. The mutual fund will have a fund manager who is responsible for investing the gathered money into specific securities (stocks or bonds). When you invest in a mutual fund, you are buying units or portions of the mutual fund and thus on investing becomes a shareholder or unit holder of the fund.

Mutual funds are considered as one of the best available investments as compare to others they are very cost efficient and also easy to invest in, thus by pooling money together in a mutual fund, investors can purchase stocks or bonds with much lower trading costs than if they tried to do it on their own. But the biggest advantage to mutual funds is diversification, by minimizing risk & maximizing returns.

Thus a Mutual Fund is the most suitable investment for the common man as it offers an opportunity to invest in a diversified, professionally managed basket of securities at a relatively low cost. The flow chart below describes broadly the working of a mutual fund.

## 8. Functions of mutual funds

Ans :

- The basic function of mutual fund companies is buying and selling securities on behalf of its unit holders,
- It enables small investors to hold a share in a large and diversified portfolio of assets, which reduces the risks of investment.
- The savings so mobilized are pooled in a large, diversified and sound portfolio of equity, bonds, securities etc.
- Investors in the mutual funds are given the share in its total funds, which is evidenced by the unit certificates.
- Mutual funds assure professional management, which helps in earning higher rate of return.
- It helps the small investors who do not have adequate time and knowledge, expertise, experience and resources for directly accessing profitable avenues in capital and money markets.

## 9. Closed-ended and Open-ended Schemes

Ans :

| Open-ended Schemes                                                                                                         | Closed-ended Schemes                                                                                               |
|----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| 1. Open-ended schemes accept funds from investors and sell shares to the investors on a regular basis.                     | 1. Closed-ended schemes offer subscriptions only for a limited period.                                             |
| 2. Open-ended schemes provide the facility of withdrawing funds to the investors by following the re-purchase arrangement. | 2. Closed-ended schemes do not provide the facility of withdrawing funds to the investors as per their preference. |
| 3. Open-ended schemes are not listed on secondary market.                                                                  | 3. Closed-ended schemes are listed on stock exchange/secondary market.                                             |
| 4. In open-ended schemes of mutual fund duration is not specified for redemption.                                          | 4. In closed-ended schemes of mutual fund duration is specified for redemption.                                    |
| 5. The main feature of open-ended scheme is the liquidity.                                                                 | 5. The main feature of closed-ended schemes are market forces of demand and supply.                                |

## 10. Net Asset Value

And :

The question, however, is whether the performance of open-end mutual fund companies of managed funds in terms of performance is better than the performance of investments made by an individual because portfolios are equally important whether they are invested by a managed trust or by an individual. Mutual funds invest the money collected from the investors in securities markets. Market value of securities changes every day. This is the reason that NAV also varies from day to day. The NAV per unit is the market value of securities of a scheme divided by the total number of units of the scheme on any particular day. NAV can be calculated in the following way:

$$\text{NAV} = \frac{\text{Value of Securities} - \text{Liabilities}}{\text{No. of Outstanding Units}}$$

**11. Sharpe's Reward to Variability Model****Ans :**

Sharpe's Model follows closely from the author's earlier work on the CAPM. The model yields a single value that can be used for investment performance rankings. It assigns highest rank to portfolio that has the best risk adjusted rate of return; His measure make a measurement of the risk premium of portfolios.

The difference between a portfolio's expected rate of return and the risk less rate is called the risk premium. Then each portfolio's risk premium is divided by its standard deviation of annual returns, a measure of the portfolio's total risk or variability, estimated over the evaluation period. The resulting number is the rate of reward per unit of variability. Sharpe's index is explained in the following equation:

$$S_t = \frac{R_t - R}{\sigma_t} = \frac{\text{Reward}}{\text{Total risk}}$$

$$= \frac{\text{Risk Premium}}{\text{Standard Deviation}}$$

Whereas

 $S_t$  = Sharpe's Index $R_t$  = Expected average return from the portfolio $R$  = Risk less rate of return $\sigma_t$  = Total risk of the portfolio**12. Treynor's Reward to Volatility Model****Ans :**

Jack L. Treynor based his model on the concept of characteristic line. This line is the least squares regression line relating the return to the risk and Beta is the slope of the line. The slope of the line measures volatility. A steep slope means that the actual rate of return for the portfolio in question is relatively sensitive to fluctuations in the general stock market whereas a gentle slope indicates that the portfolio in question is relatively insensitive to market fluctuations. Treynor also pointed out that investment risk in a diversified portfolio is the sum of responses to General Market fluctuations and fluctuations peculiar to the particular securities held in the portfolio.

Treynor's measure is the measure of portfolio's excess return per unit of portfolio's beta coefficients ( $b$ ). The Sharpe measure relates a portfolio's excess return to total risk while the Treynor measure relates the excess return to non-diversifiable or systematic risk as measured by the portfolio's volatility. However, if diversified portfolios are compared the rankings will be similar irrespective of which method is used. Treynor's reward to volatility ratio is shown in the following equation :

$$T_t = \frac{R_t - R}{b_t}$$

Whereas

 $T_t$  = Treynor's measure of portfolio's performance $R_t$  = Return of the portfolio $R$  = Risk less rate of return $b_t$  = Beta coefficient or volatility of the portfolio**13. Jensen's Differential Return Model****Ans :**

Jensen's model is different from the Sharpe's and Treynor's model in the sense that the earlier models provided a measure of ranking the relative performance of various portfolios on a risk adjusted basis while Jensen's model gives a measure of absolute performance on a risk adjusted basis.

Jensen's Model is based on CAPM. Jensen attempts to construct a measure of absolute performance on a risk adjusted basis that is a definite standard against which performance of various funds can be measured. This standard measures the portfolio manager's predictive ability to achieve higher return than expected for the given risk ness. Jensen's model is given in the following equation :

$$R_t - R = a + b (R_m - R)$$

Whereas  $R_t$  = Portfolio Return $R$  = Risk less return $a$  = Intercept the graph that measure the forecasting ability of the portfolio $b$  = Beta coefficient, a measure of systematic risk $R_m$  = Return of the market portfolio

**14. Fama's Decomposition of Returns Model**

*Ans :*

The Eugene Fama model is an extension of Jenson model. This model compares the performance, measured in terms of returns, of a fund with the required return commensurate with the total risk associated with it. The difference between these two is taken as a measure of the performance of the fund and is called net selectivity.

The net selectivity represents the stock selection skill of the fund manager, as it is the excess return over and above the return required to compensate for the total risk taken by the fund manager. Higher value of which indicates that fund manager has earned returns well above the return commensurate with the level of risk taken by him.

Required return can be calculated as:

$$R_i = R_f + S_i/S_m \cdot (R_m - R_f)$$

Where,  $S_m$  is standard deviation of market returns. The net selectivity is then calculated by subtracting this required return from the actual return of the fund.

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## *Internal Assessment (Mid Examinations)*

The pattern of Mid Exams or Continuous Internal Evaluation (CIE) prescribed by the JNTU-H as per the Regulations 2019 (R19) for all the semesters is as follows,

- There would be two Mid Exams or Continuous Internal Evaluation (CIE) for each semester,
  - The **I<sup>st</sup> Mid Term Examinations** would be conducted during the Middle of the Semester.
  - The **II<sup>nd</sup> Mid Term Examinations** during the last week of instructions.
- The Mid Exam I and II would have the same pattern of question paper which would carry **25 Marks** each and the time duration for conducting each Mid exam would be 120 min.
- The pattern of Mid Exam Question Paper would consist of two parts i.e., **Part-A** and **Part-B**.
  - **Part-A** consist of 5 compulsory questions each carries 2 marks (i.e  $5 \times 2 = 10$  marks).
  - **Part-B** consist of 5 questions out of which 3 questions should be answered, each question carries 5 marks (i.e  $5 \times 3 = 15$  marks).
- The average of the two Mid exams will be added with the 75 marks of External end examination which equals to 100 marks (i.e  $25 + 75 = 100$ ).

### **UNIT - I**

#### **Part - A**

- |                             |                        |
|-----------------------------|------------------------|
| 1. Investment               | (Refer Unit-I, SQA-1)  |
| 2. Investment Policy        | (Refer Unit-I, SQA-4)  |
| 3. Margin Trading           | (Refer Unit-I, SQA-8)  |
| 4. Features of Speculation  | (Refer Unit-I, SQA-9)  |
| 5. Investment vs. gambling. | (Refer Unit-I, SQA-10) |

#### **Part - B**

- |                                                             |                          |
|-------------------------------------------------------------|--------------------------|
| 1. Define investment. Explain the objectives of investment. | (Refer Unit-I, Q.No. 1)  |
| 2. Differences between Investment Vs Speculation.           | (Refer Unit-I, Q.No. 5)  |
| 3. Explain the characteristics of investment.               | (Refer Unit-I, Q.No. 7)  |
| 4. Explain about investment process.                        | (Refer Unit-I, Q.No. 9)  |
| 5. Discuss briefly about Investment Environment.            | (Refer Unit-I, Q.No. 10) |

**UNIT - II****Part - A**

1. Capital Market Line (Refer Unit-II, SQA-13)
2. Security Market Line (SML) (Refer Unit-II, SQA-14)
3. Financial Risk (Refer Unit-II, SQA-4)
4. Sharpe's single index model (Refer Unit-II, SQA-10)
5. Capital Asset Pricing Model (Refer Unit-II, SQA-11)

**Part - B**

1. Explain the various Measurements of Risk. (Refer Unit-II, Q.No. 8)
2. Explain the components of return analysis. (Refer Unit-II, Q.No. 9)
3. Explain briefly about Portfolio Selection. Write about feasible set-of portfolio and efficient set-of portfolio? (Refer Unit-II, Q.No. 14)
4. Define Capital Asset Pricing Model. Explain its assumptions. (Refer Unit-II, Q.No. 17)
5. Explain briefly about the Capital Market Line. (Refer Unit-II, Q.No. 19)
6. Explain briefly about the Security Market Line (SML). (Refer Unit-II, Q.No. 20)
7. Explain the concept of Arbitrage Pricing Theory. (Refer Unit-II, Q.No. 22)

**UNIT - III****Part - A**

1. YTM (Refer Unit-III, SQA-2)
2. Deep Discount Bond (Or) Zero Coupon Bond (Refer Unit-III, SQA-5)
3. Macaulay's Duration (MD) Vs Modified Macaulay's Duration (MMD) (Refer Unit-III, SQA-6)
4. Bond Immunisation (Refer Unit-III, SQA-7)
5. Interest Rates. (Refer Unit-III, SQA-10)
6. Bond Convexity (Refer Unit-III, SQA-12)

**Part - B**

1. Define bond ? Explain the features of bond. (Refer Unit-III, Q.No. 1)
2. What are the different types of Fixed Income Securities. (Refer Unit-III, Q.No. 3)
3. Explain the classifications of bonds. (Refer Unit-III, Q.No. 4)
4. Write brief note on interest rates. (Refer Unit-III, Q.No. 5)
5. Explain briefly about various bond theorems. (Refer Unit-III, Q.No. 8)
6. What is Bond Duration ? (Refer Unit-III, Q.No. 9)
7. Discuss various Active and Passive Bond Management Strategies. (Refer Unit-III, Q.No. 11)

**UNIT - IV****Part - A**

1. Equity Valuation. (Refer Unit-IV, SQA-1)
2. Earnings Multiplier Approach (Refer Unit-IV, SQA-3)
3. Features of EVA Approach (Refer Unit-IV, SQA-6)
4. Fundamental Analysis (Refer Unit-IV, SQA-7)
5. Evaluation of Technical Analysis (Refer Unit-IV, SQA-13)
6. Dow Theory. (Refer Unit-IV, SQA-12)

**Part - B**

1. What is equity valuation ? Explain the scope of equity valuation. (Refer Unit-IV, Q.No. 1)
2. Discuss the Equity Valuation Models. (Refer Unit-IV, Q.No. 2)
3. Discuss briefly about P/E Ratio or Earnings Multiplier Approach. (Refer Unit-IV, Q.No. 3)
4. Discuss briefly about Economic Value Added Approach. (Refer Unit-IV, Q.No. 6)
5. What do you mean by Fundamental Analysis ? (Refer Unit-IV, Q.No. 7)
6. What is technical analysis ? Explain the assumptions of technical analysis. (Refer Unit-IV, Q.No. 13)
7. Differentiate Fundamental Analysis Vs. technical analysis. (Refer Unit-IV, Q.No. 18)
8. Explain the concept of EMH. (Refer Unit-IV, Q.No. 19)

**UNIT - V****Part - A**

1. Types of options. (Refer Unit-V, SQA-3)
2. Features of Forward Contract (Refer Unit-V, SQA-5)
3. Mutual Funds (Refer Unit-V, SQA-7)
4. Sharpe's Reward to Variability Model (Refer Unit-V, SQA-11)
5. Jensen's Differential Return Model (Refer Unit-V, SQA-13)

**Part - B**

1. Define derivatives ? Explain the types of derivatives. (Refer Unit-V, Q.No. 1)
2. Explain in detail about overview of derivative markets in India. (Refer Unit-V, Q.No. 2)
3. Differences between Call Option and Put Option. (Refer Unit-V, Q.No. 5)
4. Discuss briefly about various option strategies. (Refer Unit-V, Q.No. 7)
5. Discuss the various methods of option valuation. (Refer Unit-V, Q.No. 8)
6. Distinction between Futures and Forwards Contracts. (Refer Unit-V, Q.No. 16)
7. Explain in detail about Net Asset Value. (Refer Unit-V, Q.No. 27)
8. Discuss briefly about risk and return involved in mutual funds. (Refer Unit-V, Q.No. 28)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.B.A III - Semester Examination

**R17**

October / November - 2020

**SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT**

Time : 2 Hours]

[Max. Marks : 75

Answer any five questions  
All questions carry equal marks

**ANSWERS**

- |                                                                                   |                        |
|-----------------------------------------------------------------------------------|------------------------|
| 1. Discuss in detail the important features of Securities Trading and Settlement. | (Unit-I, Q.No. 12)     |
| 2. Describe the important aspects of Capital Asset pricing model.                 | (Unit-II, Q.No. 17)    |
| 3. Discuss in detail the theory of Arbitrage Pricing.                             | (Unit-II, Q.No. 22)    |
| 4. Explain the term structure of interest rates.                                  | (Unit-III, Q.No. 6)    |
| 5. Describe the importance of Active and Passive bond management.                 | (Unit-III, Q.No. 11)   |
| 6. Discuss in detail the concept of Economic value added approach.                | (Unit-IV, Q.No. 6)     |
| 7. Explain in detail fundamental and technical analysis.                          | (Unit-IV, Q.No. 7, 13) |
| 8. Discuss the trends in Indian Mutual Funds.                                     | (Unit-V, Q.No. 26)     |

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

## M.B.A III - Semester Examination

R17

December - 2019

## SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

Time : 3 Hours]

[Max. Marks : 75

**Note :** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part - A.

Part - B contains of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

PART - A ( $5 \times 5 = 25$  Marks)**ANSWERS**

1. Write a short notes on the following :

(a) Preferential Allotment of shares.

(Unit-I, Q.No. 11(iii-Point)

(b) YTM and YTC

(Unit-III, SQA-2)

**Ans :**

Yield to call (YTC) is a financial term that refers to the return a bondholder receives if the bond is held until the call date, which occurs sometime before it reaches maturity. This number can be mathematically calculated as the compound interest rate at which the present value of a bond's future coupon payments and call price is equal to the current market price of the bond.

Yield to call applies to callable bonds, which are debt instruments that let bond investors redeem the bonds—or the bond issuer to repurchase them—on what is known as the call date, at a price known as the call price. By definition, the call date of a bond chronologically occurs before the maturity date.

(c) Efficient Frontier

(Unit-II, Q.No. 14)

(d) Economic Value added Approach

(Unit-IV, Q.No. 6)

(e) Covered call and straddle

**Ans :**

A covered call refers to a financial transaction in which the investor selling call options owns an equivalent amount of the underlying security. To execute this an investor holding a long position in an asset then writes (sells) call options on that same asset to generate an income stream. The investor's long position in the asset is the "cover" because it means the seller can deliver the shares if the buyer of the call option chooses to exercise. If the investor simultaneously buys stock and writes call options against that stock position, it is known as a "buy-write" transaction

A straddle is a neutral options strategy that involves simultaneously buying both a put option and a call option for the underlying security with the same strike price and the same expiration date.

A trader will profit from a long straddle when the price of the security rises or falls from the strike price by an amount more than the total cost of the premium paid. Profit potential is virtually unlimited, so long as the price of the underlying security moves very sharply.

## PART - B (5 × 10 = 50 Marks)

2. (a) Explain the investment environment in India. (Unit-I, Q.No. 10)  
 (b) Differentiate between Investment and Speculations. (Unit-I, Q.No. 5)

OR

3. (a) Briefly explain the Securities Institutions viz., NSE, SEBI and NSDI., which provide greater scope for Indian Stock Markets. (Unit-I, Q.No. 12)  
 (b) Explain about Margin Trading. (Unit-I, Q.No. 14)
4. (a) What is Beta and how can you measure risk through Beta ? (Unit-II, Q.No. 8)  
 (b) A Bank is managing a Portfolio of stocks with the following Market Value and betas ( $\beta$ ). Find the Beta of the portfolio.

| Stocks              | P <sub>1</sub> | P <sub>2</sub> | P <sub>3</sub> | P <sub>4</sub> | P <sub>5</sub> |
|---------------------|----------------|----------------|----------------|----------------|----------------|
| Market Value (₹)    | 1,00,000       | 2,00,000       | 3,00,000       | 2,50,000       | 1,50,000       |
| Betas ( $\beta_i$ ) | 1.1            | 1.6            | 0.8            | 1.2            | 2.0            |

Sol :

Calculation of weights ( $W_i$ ) of each security in the portfolio,

$$= \frac{\text{Market value of each portfolio}}{\text{Sum of portfolio}}$$

$$\text{Sum of portfolios} = 1,00,000 + 2,00,000 + 3,00,000 + 2,50,000 + 1,50,000 = 10,00,000$$

$$W_{p_1} = \frac{1,00,000}{10,00,000} = 0.10$$

$$W_{p_2} = \frac{2,00,000}{10,00,000} = 0.20$$

$$W_{p_3} = \frac{3,00,000}{10,00,000} = 0.30$$

$$W_{p_4} = \frac{2,50,000}{10,00,000} = 0.25$$

$$W_{p_5} = \frac{1,50,000}{10,00,000} = 0.15$$

$$\begin{aligned} \text{Calculation of beta of the Portfolio, } \beta_p &= W_{p_1} \beta_{p_1} + W_{p_2} \beta_{p_2} + W_{p_3} \beta_{p_3} + W_{p_4} \beta_{p_4} + W_{p_5} \beta_{p_5} \\ &= (0.10 \times 1.1) + (0.20 \times 1.6) + (0.30 \times 0.80) + (0.25 \times 1.2) + (0.15 \times 2.0) \\ &= 0.11 + 0.32 + 0.24 + 0.30 + 0.30 \\ &= 1.27 \\ \therefore \beta_p &= 1.27 \end{aligned}$$

OR

5. (a) Briefly explain the Capital Market Line (CML) Concept, with the diagram and the formulae. (Unit-II, Q.No. 19)
- (b) What are the assumptions of CAPM Model ? (Unit-II, Q.No. 17)
6. (a) What is a Bond? Briefly explain (i) Bond Volatility and (ii) Bond Convexity. (Unit-III, Q.No. 1, 13, 14)
- (b) The face value of a bond is ₹ 1,000 coupon rate of 8% life of bond is 5 years and the market price of bond is ₹ 1,042. Compute YTM of this bond.

**Sol .**

Given that,

Face value of bond,  $P_n = ₹ 1,000$

Market value of bond  $P_0 = ₹ 1,042$

Coupon rate,  $r = 8\%$

Coupon amount,  $C = 8\% \text{ of } ₹ 1,000 = ₹ 80$

$$P_0 = C (PVIFA_{y,n}) + P_n (PVIF_{y,n})$$

Consider the YTM rate as 7%.

$$P_0 = 80(PVIFA_{7\%, 5\text{yrs}}) + 1,000(PVIF_{7\%, 5\text{yrs}})$$

**Note :**

The PVIF value is taken from present value interest factor table)

$$= 80(4.10) + 1,000(0.713)$$

$$= 328 + 713$$

$$= ₹ 1,041$$

Since, the value is less than ₹ 1,042, try with lower rate,

Now, consider YTM rate as 6%

$$P_0 = 80(PVIFA_{6\%, 5\text{yrs}}) + 1,000(PVIF_{6\%, 5\text{yrs}})$$

$$= 80(4.21) + 1,000(0.747)$$

$$= 336.96 + 747$$

$$= ₹ 1083.96 \approx ₹ 1084$$

Above calculation shows that at 7%, value is ₹ 1,041 and at 6% value is ₹ 1,084. But investor should get YTM value to get ₹ 1,042. By using interpolation between 6% and 7 we get exact value.

$$YTM = 6 + \frac{1084 - 1042}{1084 - 1041} \times (7 - 6)$$

$$= 6 + \frac{42}{43} \times 1$$

$$= 6 + 0.98$$

$$YTM = 6.98\%$$

Hence, yield to maturity of the bond is 6.98%

7. (a) Xavier purchased, at par, a Bond with a face value of ₹ 1,000, at 10% Coupon Rate, having 5 years to maturity. The bond was called 3 years later, for a price of ₹ 1,300, after making the second annual interest payment. Xavier then reinvested the proceeding in a Bond selling at its face value of ₹ 1,000, with 3 years to maturity and 8% Coupon Rate. What is Xavier's YTM over the 5 year period ?

Ans :

### Incomplete Wrong Problem

- (b) Explain Bond Duration. (Unit-III, Q.No. 9)
8. (a) What is Equity Valuation ? Briefly explain : (i) Liquidation Value, and (ii) Free Cash Flow Model. (Unit-IV, Q.No. 1, 2)
- (b) Discuss the types of Mutual funds in India. (Unit-IV, Q.No. 23)
- OR
9. (a) Differentiate between fundamental and technical analysis. (Unit-IV, Q.No. 18)
- (b) Write briefly about Efficient Market Hypothesis. (Unit-IV, Q.No. 19)
10. (a) Compare and contrast Futures and Forward contract. (Unit-V, Q.No. 16)
- (b) What are the assumptions of Black and Scholes option pricing model ? (Unit-V, Q.No. 8)
- OR
11. (a) Explain about NAV, Expense ratio, Fund of Funds. (Unit-V, Q.No. 27)

Ans :

### Expense Ratio

The expense ratio (ER), also sometimes known as the management expense ratio (MER), measures how much of a fund's assets are used for administrative and other operating expenses. An expense ratio is determined by dividing a fund's operating expenses by the average dollar value of its assets under management (AUM). Operating expenses reduce the fund's assets, thereby reducing the return to investors.

The Formula for the Expense Ratio is

$$ER = \text{Total Fund Assets} / \text{Total Fund Costs}$$

### Fund of Funds

Fund of funds is a Mutual Fund which utilizes its pool of resources to invest in various other kinds of mutual funds available in the market. Alternatively, investment in hedge funds can also be made via this Mutual Fund.

Fund of funds MFs have portfolios of varying degree of risks, depending upon the main aim of the manager. If the primary target of the portfolio manager is to earn the highest yields possible, then mutual funds having higher NAV will be targeted, even though it is associated with a higher degree of risk. However, if the primary aim is stability, low-risk instruments will be acquired using the pool of financial resources obtained.

These mutual funds can be used to invest in both in domestic as well as international funds, as per the discretion of the asset management company. This increases the diversification of the fund of funds.

The essential characteristic of such Mutual Funds is that they are maintained by highly trained professional portfolio managers. This ensures accurate market predictions to a certain extent, minimizing the chances of incurring a loss.

(b) From the following data, Calculate Sharpe's Index and Interpret the result :

Portfolio X: Expected Return  $R_p = 15\%$ ,  $\sigma_p = 5\%$

Portfolio Y: Expected Return  $R_p = 20\%$ ;  $\sigma_p = 6\%$

Risk-free Rate of Return ( $R_f$ ) = 10%

*Sol :*

**Sharp's Index**

$$S_t = \frac{r_p - r_f}{\sigma_p}$$

Where,

$r_p$  = return on found

$r_f$  = Risk free rate

$\sigma_p$  = Standard deviation

**Portfolio X**

$$S_t = \frac{r_p - r_f}{\sigma_p}$$

Where,

$r_p = 15$

$r_f = 10$

$\sigma_p = 5$

$$= \frac{15 - 10}{5}$$

$S_t = 1$

**Portfolio Y**

$$S_t = \frac{r_p - r_f}{\sigma_p}$$

$r_p = 20$

$r_f = 10$

$\sigma_p = 6$

$$= \frac{20 - 10}{6}$$

$S_t = 1.67$

**Comment**

Portfolio Y stood in first place as it has higher index than Portfolio X.

## SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

Time : 3 Hours ]

[Max. Marks : 75

**Note:** This question paper contain two Parts **A** and **B****Part A** is compulsory which carries 25 marks. Answer all questions in **Part A**.**Part B** consists of 5 Units. Answer any One full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

**ANSWERS****PART - A (5 × 5 = 25 Marks)**  
**(Short Answer Type)**

1. (a) Distinguish between Investment and Speculation. **(Unit - I, Q.No.5)**  
 (b) Explain the features of Indifference Curves.

**Ans :**

- (i) Indifference curve is pictorial representation of utility of an investment.  
 (ii) Portfolios shown on indifference curve represent same level of utility.  
 (iii) Indifference curves cannot intersect because investor consider all portfolios as equally desirable.  
 (iv) Non satiation and risk aversion are the two assumptions which results in convex and positively sloped indifference curve.

- (c) Explain Holding period return and Yield to call **(Unit - III, SQA-3)**  
 (d) Compare and contrast Weak forms and Strong form of market efficiency.

**Ans :**

Following are the differences between weak form and strong form of market efficiency.

| S.No | Weak Form Efficiency                                                    | S.No | Strong Form Efficiency                                                |
|------|-------------------------------------------------------------------------|------|-----------------------------------------------------------------------|
| 1.   | It implies that security prices indicate all trade related information. | 1.   | It implies that security prices indicate complete information.        |
| 2.   | It is also known as random walk theory.                                 | 2.   | It is also known as perfect market theory.                            |
| 3.   | Information includes only about post sequences of returns.              | 3.   | Information includes private or monopolistic information also.        |
| 4.   | Technical traders cannot earn abnormal returns constantly in weak form. | 4.   | All investors cannot earn abnormal returns constantly in strong form. |

- (e) Explain Protective Put and Covered Call.

Ans :

### Protective Put

Protective put is one of the option strategy that is used to hedge in a bear market. Protective put is the strategy which an investor buys both stock and put.

### Covered Call

Covered call is one of the option strategy that is used to hedge the risk through purchasing stock by writing the call options. Under this strategy, one should maintain a suitable hedge ratio and also high number of written calls than stock. Most preferred simple strategy is to buy a stock for writing one call of their own is called covered call. This strategy is less risky when compared to other strategies.

## PART - B (5 × 10 = 50 Marks) (Essay Answer Type)

2. (a) Compare and contrast Capital Market and Money Market.

Ans :

| Basis                                | Capital market                                                                                                                                                                     | Money market                                                                                                                                                   |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Participants</b>                  | Individual investors as well as institutional investors like financial institutions, banks, corporate houses and foreign investors participate in the capital market transactions. | The participants are RBI, Commercial Banks financial institutions, mutual funds and corporate houses. Individual investors do not participate in money-market. |
| <b>Instruments traded</b>            | The instruments of capital market include equity shares, preference shares, bonds, debentures, etc.                                                                                | Some of the main instruments used in money-market are commercial paper, treasury bills, trade bills, certificate of deposit, etc.                              |
| <b>Duration of securities traded</b> | The capital market deals in medium and long-term securities which are for more than one year.                                                                                      | Money-market deals in short-term securities having a maximum tenure of one year.                                                                               |
| <b>Expected return</b>               | Higher returns on investment.                                                                                                                                                      | There is always a trade off between risk and return. Low risk involved leads to lesser returns.                                                                |
| <b>Safety</b>                        | Capital market is more risky.                                                                                                                                                      | The instruments of money-markets are safe, less risky due to short duration and soundness of issuers.                                                          |

- (b) Discuss about securities trading and settlement.

(Unit - I, Q.No.12)

(OR)

3. (a) What is Margin Trading ?

(Unit - I, Q.No.14)

- (b) Explain the various money market instruments.

Ans :

### 1. Call Money Market

Call money market consists of overnight financing and money needed at short notice for periods upto 14 days. It is meant to balance the short-term needs of the banks. Call money markets exist in all developed money markets. In fact, it is the most sensitive part of the financial system. In India,

the call money market is centered in Mumbai. Institutions like IDBI, GIC, NABARD participate in the call money market.

## 2. Treasury Bill Market

Treasury bill market is mainly concerned with the treasury bills. The treasury bills are referred as the short term liability of the central government in India. These bills are offered for settling the temporary deficits faced by the government.

## 3. Commercial Bill Market

Commercial bills are the credit instruments which helps the business organizations and banking organizations. The commercial bill legally aims at repaying the seller in case of late payments by the purchaser. Usually, commercial bills emerge from local transactions.

## 4. Certificate of Deposits Market

A certificate of deposit is a type of certificate given by the bank to its depositors for a particular time period. These certificates are same like conventional term deposits but with the only difference that they are to be negotiated and traded in short-term money market.

## 5. Commercial Paper (CP's)

Commercial paper is a short-term instrument of raising funds by corporate. It is a sort of unsecured promissory note sold by the issuer to the investor. The maturity of the CPs is flexible. Highly rated corporate which can obtain funds at a cost lesser than the cost of borrowing from banks are particularly interested in issuing CPs.

4. The estimates of the standing deviation and correlation co-efficient for three stock are given below.

| Stock | Standard deviation | Correlation with Stock |        |      |
|-------|--------------------|------------------------|--------|------|
|       |                    | A                      | B      | C    |
| A     | 32                 | 1.00                   | - 0.80 | 0.40 |
| B     | 26                 | - 0.80                 | 1.00   | 0.65 |
| C     | 18                 | 0.40                   | 0.65   | 1.00 |

If a portfolio is constructed with 15% of stock A, 50% of stock B and 35% of stock C. What is the portfolios standard deviation ?

Ans :

In the given problem, the covariance between securities are not given. However, the covariance between two securities are indicated as the product of correlation between two securities and standard deviation of two securities. i.e.,

$$\sigma_{ij} = r_{ij} \sigma_i \sigma_j$$

The below table shows the variance covariance matrix

| Weight | Security | A (0.15)                               | B (0.50)                           | C (0.35)                           |
|--------|----------|----------------------------------------|------------------------------------|------------------------------------|
| 0.15   | A        | $1.00 \times 32 \times 32 = 1024$      | $- 0.80 \times 26 = - 665.6$       | $0.40 \times 32 \times 18 = 230.4$ |
| 0.50   | B        | $- 0.80 \times 26 \times 32 = - 665.6$ | $1.00 \times 26 \times 26 = 676$   | $0.65 \times 26 \times 18 = 304.2$ |
| 0.35   | C        | $0.40 \times 18 \times 32 = 230.4$     | $0.65 \times 18 \times 26 = 304.2$ | $1.00 \times 18 \times 18 = 324$   |

$$\begin{aligned}\sigma_p^2 &= (0.15 \times 0.15 \times 1024) + (0.15 \times 0.50 \times 0.50 \times -665.6) + (0.15 \times 0.35 \times 230.4) + \\ &\quad (0.50 \times 0.15 \times -665.6) + (0.50 \times 0.50 \times 676.0) + (0.50 \times 0.35 \times 304.2) + \\ &\quad (0.35 \times 0.15 \times 230.4) + (0.35 \times 0.50 \times 304.2) + (0.35 \times 0.35 \times 324.0) \\ &= 23.04 + (-49.92) + 12.10 + (-49.92) + 169 + 53.24 + 12.10 + 53.24 + 39.69\end{aligned}$$

$$\sigma_p^2 = 262.57$$

∴ The portfolio standard deviation is,

$$\sigma_p = \sqrt{262.57}$$

$$\sigma_p = 16.20$$

OR

5. (a) Explain single index model (Unit - II, Q.No.16)  
 (b) What is Efficient Frontier ? Explain risk free lending and borrowing. (Unit - II, Q.No.18)
6. (a) Explain the various types of Bonds. (Unit - III, Q.No.4)  
 (b) A Reliance industries debenture with a face value of ₹ 100 has a coupon of 10% per annum coupon payment being made annually. The maturity date of the instrument is 7<sup>th</sup> May 2018. The traded price of the bond on 7<sup>th</sup> May 2016 is ₹ 110. Compute the yield to maturity of the bond.

Ans :

Given that,

Face value of bond,  $P_n = ₹ 100$

Market value of bond,  $P_o = ₹ 110$

Coupon rate,  $r = 10\%$

Coupon amount,  $c = 10\% \text{ of } ₹ 100 = ₹ 10$

Maturity,  $n = 2 \text{ yrs}$

$$P_o = C(PVIFA_{y,n}) + P_n(PVIF_{y,n})$$

The above equation can be solved by considering trial and error method.

Consider the YTM rate as 5%

$$\begin{aligned}P_o &= 10(PVIFA_{5\%, 2 \text{ yrs}}) + 100(PVIF_{5\%, 2 \text{ yrs}}) \\ &= 10(1.859) + 100(0.907) \\ &= 18.59 + 90.7 = 109.29\end{aligned}$$

Since, the value is less than ₹ 110, try with lower rate,

Now, consider YTM rate as 4%

$$P_o = 10(PVIFA_{4\%, 2 \text{ yrs}}) + 100(PVIF_{4\%, 2 \text{ yrs}})$$

$$\begin{aligned}
 &= 10(1.86) + 100(0.925) \\
 &= 18.66 + 92.5 \\
 &= 111.16
 \end{aligned}$$

Above calculation shows that at 5% value is ` 109.29 and at 4% value is ` 111.16. But investor should get YTM value to get ` 110. By using interpolation between 4% and 5% we get exact value.

$$\begin{aligned}
 \text{YTM} &= 4\% + \frac{111.16 - 110}{111.16 - 109.29} \times (5\% - 4\%) \\
 &= 4\% + \frac{1.16}{1.87} \times 1\% \\
 &= 4\% + 0.62 \\
 \text{YTM} &= 4.62\%
 \end{aligned}$$

Hence, yield to maturity of the bond is 4.62%

OR

7. (a) A ` 100 per value bond bears a coupon rate of 14 percent and matures after five years. Interest is payable semi-annually. Compute the value of the bond if the required rate of return is 16%.

Ans :

In this given case, the number of half-yearly periods is 10.

$$\text{Half-yearly interest}_{(C)} \text{ payment} = ` 100 \times 14\% \times \frac{1}{2}$$

$$C = ` 14 \times \frac{1}{2}$$

$$C = ` 7$$

$$\text{The discount rate} = \frac{16\%}{2} = 8\%$$

Thus, the bond value is,

$$\begin{aligned}
 V &= \sum_{t=1}^{10} \frac{7}{(1+r)^t} + \frac{100}{(1+r)^{10}} \\
 &= \sum_{t=1}^{10} \frac{7}{(1+0.08)^t} + \frac{100}{(1+0.08)^{10}} \\
 &= \sum_{t=1}^{10} \frac{7}{(1.08)^t} + \frac{100}{(1.08)^{10}}
 \end{aligned}$$

$$\begin{aligned}
 P_0 &= C(\text{PVIFA}_{8\%, 10 \text{ years}}) + 100(\text{PVIF}_{8\%, 10 \text{ years}}) \\
 &= 7(6.710) + 100(0.463) \\
 &= 46.97 + 46.3 \\
 &= ` 93.27
 \end{aligned}$$

∴ Value of bond = ` 93.27

(b) What is bond volatility and bond convexity ?

(Unit - III, Q.No.13,14)

8. A company paid dividends amounting to 0.75 per share during the last year. The company is expected to pay ₹ 2 per share during the next year. Investors forecast a dividend of ₹ 3 per share in the year after that. Therefore it is expected that dividends will grow at 10 percent per year into an indefinite future. Would you buy/sell the share if the current prices of the share is ₹ 54 ? Investors required rate of return is 15 percent.

Ans :

Given that,

$$g = 10\%$$

$$D_1 = ₹ 2$$

$$D_2 = ₹ 3$$

$$K = 15\%$$

$$n = 2 \text{ years}$$

The formula for calculating two stage growth model is  $P_0 = V_1 + V_2$  where,

$$V_1 = \sum_{t=1}^n \frac{D_t}{(1+k)^t} \quad V_2 = \frac{D_n(1+g)}{(k-g)(1+k)^n}$$

$$V_1 = \frac{D_1}{(1+k)^1} + \frac{D_2}{(1+k)^2} + \dots + \frac{D_n}{(1+k)^n}$$

$$V_1 = \frac{2}{(1+0.15)^1} + \frac{3}{(1+0.15)^2}$$

$$= 1.74 + 2.27 = 4.01$$

$$V_2 = \frac{3(1+0.10)}{(0.15-0.10)(1+0.15)^2} \quad V_2 = \frac{3.3}{(0.05)(1.3225)}$$

$$= 49.91$$

$$P_0 = 4.01 + 49.91$$

$$\therefore P_0 = 53.92$$

The current price of the share is ₹ 54 which is equal to the intrinsic value of ₹ 53.9. Thus, no trading is recommended because the share is priced fairly.

(OR)

9. (a) Describe the key economic variables that an investor must monitor as part of his fundamental analysis.

(Unit - IV, Q.No.8)

- (b) Explain about chart pattern and Relative Strength Index

*Ans :*

Chart patterns can be viewed when the price bar charts are closely drawn for number of days. Technical analysts use chart patterns in order to determine the changes in trends and estimate the future movement of prices. The following are the different types of chart patterns.

- (i) Reversal Patterns
- (ii) Continuation Pattern
- (iii) Support and resistance

### **Relative Strength Index (RSI)**

Relative Strength Index (RSI) is an important tool which provides indications for upcoming selling and buying opportunities in the market. By using the below formula, the RSI for the share can be determined.

$$RSI = 100 - \left[ \frac{100}{1 + RS} \right]$$

Where,  $RS = \frac{\text{Average profit per day}}{\text{Average lost per day}}$

10. (a) The share of Omega Company which is not expected to pay dividend in the near future is currently selling for ₹ 150. The risk-free rate is 0.8 per a month. A 3-month futures contract is selling for ₹ 152. Develop an arbitrage strategy and show what your profit will be 6.3 months hence.

*Ans :*

The formula for calculating futures contract is,

$$F_o = S_o (1 + r_f)^T$$

Given that

$$S_o = 150$$

$$r_f = 0.8\%$$

$$T = 6.3 \text{ months}$$

Substitute the above values in  $F_o$  formula

$$F_o = 150 (1 + 0.008)^{6.3}$$

$$= 150(1.008)^{6.3}$$

$$= 150 (1.0515)$$

$$F_o = 157.7$$

Since the given future contract value is 152 which is less than the calculated futures contract value  $F_o$  i.e., 157.7 arbitrage strategy is as follows,

| Action                                                                   | Initial Cash Flow | Cash Flow at time T (6.3 months) |
|--------------------------------------------------------------------------|-------------------|----------------------------------|
| Short sell the share and return it after 6.3 months                      | 150               | $-S_T$                           |
| Now lend 150 and get back the loan amount with interest after 3.6 months | - 150             | $150(1.008)^{6.3} = 157.7$       |
| Purchase a future contract ( $F_0 = 152$ )                               | 0                 | $S_T = 152$                      |
|                                                                          | 0                 | 5.7                              |

(b) Distinguish between futures and forwards.

(Unit - V, Q.No.16)

OR

11. (a) Given the following information.

|            | Portfolio A | Portfolio B |
|------------|-------------|-------------|
| Beta       | 0.9         | 1.8         |
| Return (%) | 12.5        | 19          |
| SD (%)     | 20          | 26.5        |

Risk free rate of return 6% Market return = 12%

Calculate (i) Sharpe Ratio (ii) Treynor Ratio

Ans :

**(i) Sharpe Ratio**

The formula for calculating sharpe ratio is,

$$S_F = \frac{r_p - r_f}{\sigma_p}$$

**Portfolio A**

Given values for portfolio A are,

$$r_p = 12.5\%$$

$$r_f = 6\%$$

$$\sigma_p = 20\%$$

Substitute the above values in the sharpe ratio formula.

$$S_p = \frac{12.5 - 6}{20}$$

$$= \frac{6.5}{20}$$

$$= 0.325$$

**Portfolio B**

Given values for portfolio B are

$$r_p = 19\%$$

$$r_f = 6\%$$

$$\sigma_p = 26.5\%$$

Substitute the above values in the Treynor ratio formula

$$\begin{aligned}
 S_p &= \frac{r_p - r_f}{\sigma_p} \\
 &= \frac{19 - 6}{26.5} \\
 &= \frac{13}{26.5} \\
 S_p &= 0.49
 \end{aligned}$$

## (ii) Treynor Ratio

The formula for calculating Treynor ratio is,

$$T_p = \frac{r_p - r_f}{\beta_p}$$

### Portfolio A

Given values for portfolio A are,

$$\begin{aligned}
 r_p &= 12.5\% \\
 r_f &= 6\% \\
 \beta_p &= 0.9
 \end{aligned}$$

Substitute the given values in Treynor ratio formula,

$$\begin{aligned}
 T_p &= \frac{12.5}{0.9} \\
 &= \frac{6.5}{0.9} \\
 T_p &= 7.22
 \end{aligned}$$

### Portfolio B

Given values for portfolio B are,

$$\begin{aligned}
 r_p &= 19\% \\
 r_f &= 6\% \\
 \beta_p &= 1.8\%
 \end{aligned}$$

Substitute the above values in the Treynor ratio formula.

$$\begin{aligned}
 T_p &= \frac{19 - 6}{1.8} \\
 &= \frac{13}{1.8} \\
 T_p &= 7.22
 \end{aligned}$$

(b) Explain the types of mutual funds in India.

**(Unit - V, Q.No.23)**

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.B.A II - Year III - Semester Examination

**R17**

December - 2018

**SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT**

Time : 3 Hours]

[Max. Marks : 75

**Note :** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part - A.

Part - B contains of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

PART - A ( $5 \times 5 = 25$  Marks)

(Short Answer Questions)

**ANSWERS**

1. Write short notes on the following :

(a) Gambling

**Ans :**

Gambling is the wagering of money or something of value (referred to as “the stakes”) on an event with an uncertain outcome, with the primary intent of winning money or material goods. Gambling thus requires three elements be present: consideration, risk (chance), and a prize. The outcome of the wager is often immediate, such as a single roll of dice, a spin of a roulette wheel, or a horse crossing the finish line, but longer time frames are also common, allowing wagers on the outcome of a future sports contest or even an entire sports season.

**Chance-Based Gambling**

In chance-based gambling players have no way to affect or influence the result, which is completely dependent on random events.

**Skill-Based Gambling**

In skill-based gambling players can use betting strategies, and techniques based on related knowledge or other players' decisions and behaviour.

(b) Portfolio Selection

**(Unit-II, Q.No.14)**

(c) Interest Rates

**(Unit-III, SQA - 10)**

(d) Relative Valuation

**Ans :**

A relative valuation model is a business valuation method that compares a company's value to that of its competitors or industry peers to assess the firm's financial worth. Relative valuation models are an alternative to absolute value models, which try to determine a company's intrinsic worth based on its estimated future free cash flows discounted to their present value, without any reference to another company or industry average. Like absolute value models, investors may use relative valuation models when determining whether a company's stock is a good buy.

Relative valuation uses multiples, averages, ratios and benchmarks to determine a firm's value. A benchmark may be selected by finding an industrywide average, and that average is then used to determine relative value.

(e) P/E Ratio

**(Unit-V, SQA - 3)**

**PART - B (5 × 10 = 50 Marks)****(Essay Type Questions)**

- |     |                                                                              |                                       |
|-----|------------------------------------------------------------------------------|---------------------------------------|
| 2.  | Explain in detail the Investment Environment.                                | <b>(Unit-I, Q.No.10)</b>              |
|     | (OR)                                                                         |                                       |
| 3.  | Discuss in detail the various types of orders.                               | <b>(Unit-I, Q.No.13)</b>              |
| 4.  | Explain in detail Arbitrage Pricing Theory and explain its salient features. | <b>(Unit-II, Q.No.22)</b>             |
|     | (OR)                                                                         |                                       |
| 5.  | Discuss in detail Capital Asset Pricing Model and its application.           | <b>(Unit-II, Q.No.17)</b>             |
| 6.  | Explain in detail the various bond pricing theorems.                         | <b>(Unit-III, Q.No.8)</b>             |
|     | (OR)                                                                         |                                       |
| 7.  | Discuss elaborately active and passive bond management strategies.           | <b>(Unit-II, Q.No.11)</b>             |
| 8.  | Explain in detail various techniques of relative valuation.                  | <b>(Unit-IV, Q.No.3,4,5)</b>          |
|     | (OR)                                                                         |                                       |
| 9.  | Discuss in detail about Efficient Market Hypothesis.                         | <b>(Unit-IV, Q.No.19,20)</b>          |
| 10. | Explain in detail various option strategies and option valuation.            | <b>(Unit-V, Q.No.7,8)</b>             |
|     | (OR)                                                                         |                                       |
| 11. | Briefly explain various models of performance evaluation.                    | <b>(Unit-IV, Q.No.29,30,31,32,33)</b> |

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.B.A III - Semester Examination

R19

MODEL PAPER - I

SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

Time : 3 Hours]

[Max. Marks : 75

PART - A (5 × 5 = 25 Marks)

(Short Answer Questions)

ANSWERS

1. (a) Diversification of the Company (Unit-I, SQA-5)
- (b) Objectives of Portfolio Management (Unit-II, SQA-1)
- (c) Interest Ratio (Unit-III, SQA-10)
- (d) Dow Theory (Unit-IV, SQA-12)
- (e) Derivatives (Unit-V, SQA-1)

PART - B (5 × 10 = 50 Marks)

(Essay Type Questions)

2. Define investment. Explain the objectives of investment. (Unit-I, Q.No.1)
- (OR)
3. What are the different types of orders ? (Unit-I, Q.No.13)
4. Following data relates to two securities i and j

| Security | Expected return (%) | Risk in (%) |
|----------|---------------------|-------------|
| i        | 9%                  | 7.56        |
| j        | 8%                  | 3.75        |

If  $\rho(i, j)$  is  $-0.5$  and the proportion of investment 28% and 72% in i and j securities find out

(a) Return on port folio

(b) Risk on port folio

(Unit-II, Problem No.7)

(OR)

5. Define Capital Asset Pricing Model. Explain its assumptions. (Unit-II, Q.No.17)
6. What is Bond Yields ? Explain the various techniques in which the bond is calculated. (Unit-III, Q.No.9)

(OR)

7. Mr. Gupta recently purchased a bond with a Rs. 1000 face value, a 10 percent coupon rate and four years to maturity. The bond makes annual interest payments, the first to be received one year from today. Mr. Gupta paid Rs. 1032.40 for the bond. What is the bonds yield-to-maturity ?

**(Unit-II, Problem No.8)**

8. Discuss the Equity Valuation Models.

**(Unit-IV, Q.No.2)**

(OR)

9. The Almas corporation's cash dividend payout ratio is 60%, its risk adjusted cost of capital is 10%, the current earnings per share are Rs. 4.04 and have been growing at 3% per year. A technological break through is expected to increase Almas growth rate to 60% for the foreseeable future. Almas corporations common stock has been selling at 8 to 9 times its earnings. What do you expect the price-earnings ratio will be after technological development is publicly announced ?

**(Unit-IV, Problem No.22)**

10. Discuss the various methods of option valuation.

**(Unit-V, Q.No.8)**

(OR)

11. The following information is provided regarding the performance of the funds namely Birla Advantage, Sundaram Growth and Sun F & C Value for a period of six months ending August 1999. The risk free rate of interest is assumed to be 9. Rank them with the help of Sharpe Index and Treynor Index and Discuss.

| Particulars     | $R_p$ | $\sigma_p$ | $\beta$ |
|-----------------|-------|------------|---------|
| Birla Advantage | 25.38 | 4          | .23     |
| Sundaram Growth | 25.11 | 9.01       | .56     |
| Sun F & C Value | 25.01 | 3.55       | .59     |

**(Unit-IV, Problem No.30)**

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

## M.B.A III - Semester Examination

R19

## MODEL PAPER - II

## SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

Time : 3 Hours]

[Max. Marks : 75

PART - A ( $5 \times 5 = 25$  Marks)

## (Short Answer Questions)

ANSWERS

1. (a) Investment (Unit-I, SQA-1)
- (b) Feasible Set of Portfolios (Unit-II, SQA-9)
- (c) Bond Immunisation (Unit-III, SQA-7)
- (d) Fundamental Analysis (Unit-IV, SQA-7)
- (e) Features of Option (Unit-V, SQA-2)

PART - B ( $5 \times 10 = 50$  Marks)

## (Essay Type Questions)

2. Explain about investment process. (Unit-I, Q.No.9)
- (OR)
3. What do you mean by Securities Market? Classify Security Market in detail. (Unit-I, Q.No.11)
4. A portfolio consist of 40% of security X and 60% of security Y. It has the following probability distribution of returns. Calculate portfolio return and risk.

| State       | Probability | Return X(%) | Return Y(%) |
|-------------|-------------|-------------|-------------|
| Boom        | 0.1         | 14          | 20          |
| Recession   | 0.2         | -5          | -2          |
| Normal      | 0.4         | 10          | 9           |
| Recovery    | 0.1         | 9           | 14          |
| Slow growth | 0.2         | 12          | 18          |

(Unit-II, Problem No.1)

(OR)

5. Discuss briefly about sharpe's single index model. (Unit-II, Q.No.16)
6. Explain briefly about various bond theorems. (Unit-III, Q.No.8)
- (OR)
7. Prem is considering the purchase of a bond currently selling at Rs.,878.50. The bond has four years to maturity, face value of Rs.1,000 and 8% coupon rate. The next annual interest payment is due after one year from today. The required rate of return is 10%.

- (a) Calculate the intrinsic value (Present value) of the bond. Should Prem buy the bond?
- (b) Calculate the yield to maturity of the bond.

**(Unit-III, Problem No.32)**

8. What is technical analysis ? Explain the assumptions of technical analysis. **(Unit-IV, Q.No.13)**

(OR)

9. (i) Define price to book value ratio.

- (ii) Explain how price to sales ratio is calculated.

**(Unit-IV, Q.No.4,5)**

10. Distinction between Futures and Forwards Contracts.

**(Unit-V, Q.No.16)**

(OR)

11. From the following details calculate the price of call option Black-Shoes models market price of share is Rs. 92 and strike price of share Rs. 95 and time period 50 days option expires on Dec. 21<sup>st</sup> 2002 option contract is made on 11<sup>th</sup> Nov. 2002 and risk free rate of interest is 7.12% p.a. S.D is 35%.

**(Unit-V, Problem No.1)**

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

## M.B.A III - Semester Examination

R19

## MODEL PAPER - III

## SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

Time : 3 Hours]

[Max. Marks : 75

PART - A ( $5 \times 5 = 25$  Marks)

## (Short Answer Questions)

ANSWERS

1. (a) Margin Trading (Unit-I, SQA-8)
- (b) Security Market Line (SML) (Unit-II, SQA-14)
- (c) Macaulay's Duration (MD) Vs Modified Macaulay's Duration (MMD) (Unit-III, SQA-6)
- (d) Equity Valuation (Unit-IV, SQA-1)
- (e) Mutual Funds (Unit-V, SQA-7)

PART - B ( $5 \times 10 = 50$  Marks)

## (Essay Type Questions)

2. Explain the characteristics of investment. (Unit-I, Q.No.4)
- (OR)
3. Examine the recent trends in security market. (Unit-I, Q.No.12)
4. An investor owns a portfolio composed of five securities with the following characteristics:

| Security | Beta | Random error term<br>standard deviation (per cent) | Proportion |
|----------|------|----------------------------------------------------|------------|
| 1        | 1.35 | 5                                                  | 0.10       |
| 2        | 1.05 | 9                                                  | 0.20       |
| 3        | 0.80 | 4                                                  | 0.15       |
| 4        | 1.50 | 12                                                 | 0.30       |
| 5        | 1.12 | 8                                                  | 0.25       |

If the standard deviation of the market index is 20 per cent, what is the total risk of the portfolio?

(Unit-II, Problem No.11)

(OR)

5. B.V. prasad considering several investments the risk free rate of return is 6.75% and the expected return for the market is 12% what should be the required rates of return for each investment using the CAPM.

| Security | A    | B    | C    | D    | E    |
|----------|------|------|------|------|------|
| Beta     | 1.20 | 0.80 | 1.50 | 0.60 | 1.25 |

(Unit-II, Problem No.16)

6. Explain in detail about Bond Immunization.

(Unit-III, Q.No.12)

(OR)

7. Calculate the value and duration for the following bonds assuming a YTM of 8% for both ABC and XYZ.

| Bond | Years of Maturity | Annual Interest | Maturity Value |
|------|-------------------|-----------------|----------------|
| ABC  | 10                | ` 80            | ` 1000         |
| XYZ  | 15                | ` 65            | ` 1000         |

(Unit-III, Problem No.9)

8. Differentiate Fundamental Analysis Vs. technical analysis.

(Unit-IV, Q.No.18)

(OR)

9. Discuss briefly about Economic Value Added Approach.

(Unit-IV, Q.No.6)

10. Explain about the various schemes that exists in mutual funds.

(Unit-V, Q.No.23)

(OR)

11. Six portfolios experienced the following results during a seven year period :

| Portfolio                | Average Annual Return (%) | Standard Deviation (%) | Correlation with Market |
|--------------------------|---------------------------|------------------------|-------------------------|
| A                        | 18.6                      | 27.0                   | 0.81                    |
| B                        | 14.8                      | 18.0                   | 0.65                    |
| C                        | 15.1                      | 8.0                    | 0.98                    |
| D                        | 22.0                      | 21.2                   | 0.75                    |
| E                        | - 9.0                     | 4.0                    | 0.45                    |
| F                        | 26.5                      | 19.3                   | 0.63                    |
| Market (m)               | 13.0                      | 12.0                   | -                       |
| Risk Free Rate ( $R_f$ ) | 9.0                       | —                      |                         |

Rank these portfolios using Sharpes and Treynor's methods.

(Unit-V, Problem No.29)