# Security Analysis and Portfolio Management


Sikkim Manipal University

Directorate of Distance Education

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# Sikkim Manipal University

## Directorate of Distance Education

### Department of Management Studies




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# MF 0010
# Security Analysis and Portfolio Management

## Course Description

Investing is committing one's funds to one or more assets that will be held over some future time period with a view to make financial gain. In this SLM we take up the subject of financial investment, one of the most prolific avenues for investment of surplus funds. We study the role of security analysis in optimising financial investment.

Financial investment is investment in stocks, bonds, mutual funds, etc. Like all investments, financial investment has to be balanced between risk and return. The manner in which this is done, the evaluation of financial securities and selection of the right ones to invest in, and the role of portfolios in combating the risk factor in financial investment, are the subject matter of this SLM.

A financial investor looks for two types of returns: dividends and price appreciation. The factors that underlie movement of stock prices and the systematic study of security pricing are dealt with in the course of the SLM. Security pricing is studied in theory and methods of analysing security prices are described. Since no amount of number-crunching can explain some weird stock price changes, we also look at the psychological aspects, i.e., behavioural finance.

Debt securities are also dealt with, as these typify a definite avenue for investment for a risk-averse investor.

## Course Objectives

The objective of this course is to introduce Financial investment i.e., investment in stocks, bonds, mutual funds, etc.

After studying this course, you should be able to:

- explain various characteristics of investments
- distinguish between 'primary markets' and 'secondary markets'
- describe how risks are measured

- explain the steps in fundamental analysis
- explain the tools of technical analysis
- state the implications of EMH to fundamental and technical analysis
- explain how behavioural factors cause market inefficiencies
- describe basic valuation models
- explain the concept of portfolio management
- explain efficient frontier set
- state the assumptions of CAPM
- measure return on an individual stock
- explain Arbitrage Pricing Theory
- explain the advantages of international diversification
- explain the meaning and benefits of a mutual fund

The Self Learning Material (SLM) for this course is divided into 15 units. A brief description of all the 15 units is given below:

**Unit 1: Financial Investment – A Conceptual Framework**

The unit describes the investment process with respect to return and risk as the two conflicting aspects, and the common mistakes made in investment management.

**Unit 2: Investment Environment**

This deals with the features and composition of money market and capital market and explains financial instruments and financial derivatives traded in these markets.

**Unit 3: Risk and Return**

In this unit the concepts of risk and return, how risk is measured in terms of standard deviation and variance, and the relationship between risk and return are discussed.

**Unit 4: Fundamental Analysis**

This unit deals with the pros and cons of analysing economy, industry and company factors as the backup for investment decisions.

**Unit 5: Technical Analysis**

In this unit the tools of technical analysis, an alternative approach to evaluation of investment decisions, is studied. Important chart formations or price patterns and technical indicators are covered.

**Unit 6: Efficient Market Hypothesis**

This unit deals with the concept of 'Efficient Market' and its implications for security analysis and portfolio management.

**Unit 7: Behavioural Finance**

This unit deals with behavioural finance i.e., when, how and why psychology influences investment decisions

**Unit 8: Valuation of bonds and shares**

In this unit, the elements of investment in bonds are brought out. It discusses in detail bond features and prices, call provisions on corporate bonds, convertible bonds and valuation of bonds.

**Unit 9: Portfolio Management – Risks and Returns**

This unit introduces the concept of investment portfolios and portfolio management, with specific reference to containment of investment risks.

**Unit 10: Markowitz Portfolio Selection Model**

The unit discusses Markowitz Model and Efficient Frontier under the topic of portfolio analysis and diversification of risk.

**Unit 11: Capital Asset Pricing Model (CAPM)**

This unit deals with the assumptions of CAPM, the inputs required for applying CAPM and the limitations of this Model.

**Unit 12: Sharpe: The Single Index Model**

In this unit we study measurement of return on an individual stock, measurement of portfolio return and measurement of individual stock risk.

**Unit 13: Factor Models and Arbitrage Pricing Theory**

The unit discusses Arbitrage Pricing Theory and its principles and compares it with the Capital Asset Pricing Model.

**Unit 14: International Portfolio Investments**

This unit explores investment avenues for foreign portfolio investors and the risks and returns associated with such investment.

**Unit 15: Mutual Fund Operations**

The unit discusses mutual funds, a classic form of portfolio investment, from an investor's standpoint. It analyses the pros and cons of investment in mutual funds and the varieties of portfolios sported by most MFs.

# Unit 1 Financial Investment – A Conceptual Framework

**Structure:**



## 1.1 Introduction

Financial investment is a process of paying out money now for the prospect of getting back a bigger amount in the future. It means converting money into an asset or a claim for a good financial return.

Investment can be made in the form of securities, and this type of investment is the theme of our subject, 'Security Analysis and Portfolio Management' (SAPM). Investment can also be in non-security form.

SAPM deals with investment avenues in financial securities, evaluating a security, ways to carry out fundamental and technical analysis of the

security, efficient market hypothesis, and role of mutual funds. Behavioural aspects of an investor are also covered, as it is a crucial aspect of SAPM.

In the first unit, you will learn meanings of key terms relating to investment, modes of investment and their characteristics, and the difference between investment speculation and gambling. You will learn the steps in the investment process, common errors in investment management and qualities of a successful investor.

**Objectives:**

After going through this unit, you should be able to

- explain the meaning of real asset and financial asset
- define investment, security, security analysis and portfolio management
- explain different modes of investment
- explain various characteristics of investments
- differentiate between investment, speculation and gambling
- list the steps in the investment process
- analyse common errors in Investment management
- identify the qualities of a smart investor

## 1.2 Real Assets vs. Financial Assets

Material wealth of a society is dependent on the productive capacity of the economy. The productive capacity is a function of the real assets of the economy in the form of land, buildings, technology, machines, even human capital, which are used to produce goods and services.

On the other hand, a financial asset is an intangible investment made in a real asset. To the business person who actually creates the real asset you give money as either equity or debt, and obtain a share or a bond. This share or bond is a financial asset.

Real assets do not directly contribute to the productive capacity of the economy but indirectly facilitate in the wealth creation because they help transfer funds from millions of individuals to a few business persons seeking funds.

The value of financial assets will always derive from and depend on the value of the real assets, which they represent.

### 1.2.1 Difference between Real Assets and Financial Assets

| Real Assets | Financial Assets |
|---|---|
| Appear only on the asset side of the balance sheet. | Appear on both the assets and liabilities sides of the balance sheet. |
| Are destroyed only by accident or wearing out over time. | Created together with matching liabilities, so net effect is zero. |

**Self Assessment Questions:**

1. _____ do not directly contribute to the productive capacity of the economy.
2. The value of the financial asset derives from and depends on the value of the _____.
3. State true or false: Real asset is created together with matching liabilities, so net effect is zero.

## 1.3 Terms used in Financial Investment

Financial investment is committing your funds to one or more assets for future redemption with the expectation that its value will increase and make you wealthier.

In other words, you sacrifice current cash holding for future receipt of more cash. The two key factors that affect investment decisions are return and risk.

### 1.3.1 Financial securities

Section 2(h) of Securities Contracts Regulation Act 1956 defines securities to mean and include:

- shares, stocks, bonds, debentures, debenture stock or other marketable securities in any company or other body corporate
- derivatives
- units or any other instrument issued by any collective investment scheme to the investors in such schemes
- security receipt in a scheme of securitisation or reconstruction of financial assets
- units or any other such instrument issued to the investors under any mutual fund scheme
- government securities
- rights or interest in any of the foregoing securities

### 1.3.2 Portfolio

Portfolio is the combination of different classes of financial assets held by an investor. A combination may include equity, debentures, warrants, money market instruments etc.

An investor with a view to maximise return and minimise the risk builds a portfolio of varied financial securities with different risk-return characteristics. Portfolio analysis is an analysis of the risk-return characteristics of individual securities in the portfolio, and the portfolio as a whole.

### 1.3.3 Security analysis

Security analysis involves the projection of future earnings, forecast of the share price and estimate of the intrinsic value of a security. Intrinsic value is derived from the forecast of future cash flows by way of dividend/interest and terminal value (redemption value) of the security.

Security analysis at a fundamental level studies the strengths and weaknesses of the asset, which backs the security, and evaluates the risk/return ratio.

### 1.3.4 Portfolio management

Investopedia defines portfolio management as “the art and science of making decisions about investment mix and policy, matching investments to objectives, asset allocation for individuals and institutions, and balancing risk against performance. Portfolio management is all about strengths, weaknesses, opportunities and threats in the choice of debt vs. equity, domestic vs. international, growth vs. safety, and many other tradeoffs encountered in the attempt to maximise return at a given appetite for risk.”

Traditional portfolio theory aims at having a portfolio that matches the asset preference of the investor. Modern portfolio theory focuses on maximisation of return with minimum risk. It is the weighted average of return of individual stocks. The risk appetite of the investor is definitely taken into account, but continuous risk-return analysis is done to aim at optimising returns.

Portfolio analysis comprises of portfolio construction, selection of securities, revision, evaluation and regular monitoring of the performance of the portfolio.

**Self Assessment Questions**

4. The factors that determine investment decisions are _____ and _____.
5. The return on the portfolio is the _____ of return of individual stocks.
6. _____ are combinations of assets held by the investors.
7. A portfolio is a combination of financial securities with different _____

## 1.4 Modes of Investment

Different securities confer different sets of rights on the investors, with different conditions under which these rights can be exercised. Avenues for investment ranging from riskless to high-risk investment opportunities consist of both security and non-security forms of investment.


**Fig. 1.1: Security Form of Investment (Marketable)**

### 1.4.1 Marketable / Security form of investments

The term 'security' is generally used for a document evidencing liability of the issuer. When you make a fixed deposit in a bank, you are issued a document called Fixed Deposit Receipt (FDR). This is a liability of the bank. Bank has to pay interest on the deposit and return it to you on maturity. The FDR also lists your rights and sets conditions under which you can exercise your rights.

Security forms of investment are transferable and traded in any organised financial market.

**Equity shares**

Equity shares represent ownership capital. An equity shareholder enjoys both ownership stake and residual interest in income and wealth. The issue of equity shares could be in the form of initial public offer, rights issue, bonus issue, preferential allotment and private placement.

Investors have a choice to select equity shares from a broad array of the following types of equity instruments: blue chip company shares, growth shares, income shares, cyclical shares and speculative shares.

**Bonds/Debentures**

Bonds represent long-term debt instruments. The issuer of a bond promises to pay a stipulated amount (interest and principal) to the bondholder. Bond/ debenture is a contract between the issuer and the bondholder that specifies details of the issue including par value of the bond, its coupon rate, maturity period, maturity date, call/put options etc.

Internationally, a secured corporate debt instrument is called a corporate bond while an unsecured corporate debt instrument is called a corporate debenture. In India, corporate debt instrument is a debenture and it is secured.

Central and State Governments issue government bonds. These bonds are called gilt-edged securities. There are different types of bond – straight bonds, zero coupon bonds, floating rate bonds, bonds with embedded options, commodity linked bonds etc. These are dealt in detail in the later units.

**Money market instruments**

Debt instruments, which have a maturity of less than one year at the time of issue, are called money market instruments. Important money market instruments are:

- Treasury bills.
- Commercial paper.
- Certificate of deposits.
- Repurchase agreements – Repos and Reverse Repos.

**Mutual funds**

Mutual funds are also known as indirect investments. It is an alternative route of buying equity shares or fixed income securities through various schemes floated by mutual funds companies. Three broad types of mutual fund schemes are:

- Equity schemes.
- Debt schemes.
- Balance schemes.

### 1.4.2 Non-security form of financial Investment

Non-security form of investments are neither transferable nor traded in any organised financial market.

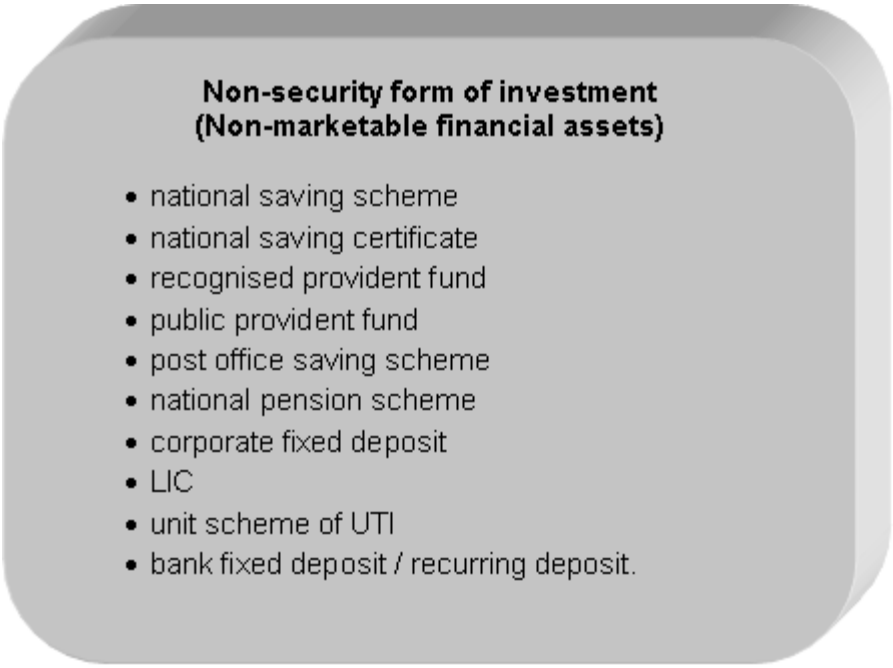


**Fig. 1.2: Non-Security Form of Investment**

**Life insurance policies**

Life insurance is an investment, which covers protection and saving needs of an investor. Policies that provide protection benefits are designed to protect the policyholders from the financial consequences of unwelcome events such as death/long-term sickness/ accidents/disability etc.

Policies designed as savings contracts allow the policyholders to build up funds to meet specific investment objectives such as income for a particular event, retirement planning or repayment of a loan.

Major types of insurance policies in India are endowment assurance policy, money-back policy, term assurance policy, unit linked plan, deferred annuity and whole life policy.

**Bank deposits**

Bank deposits are the simplest and the most common form of investment. Some varieties are current account, savings account and fixed deposit account. The deposit made in current account does not earn any interest while deposit made in savings account and fixed deposit accounts do. The interest rate depends upon the tenure. Bank deposits enjoy high liquidity. They can be withdrawn, and loans can be raised against fixed deposits. Deposit Insurance Corporation provides guarantee to all deposits in schedule bank up to ` 100, 000 per depositor of a bank.

**Post office accounts**

There are various types of accounts namely post office savings account, post office time deposit account, monthly income scheme, Kisan Vikas Patra and National Savings Certificate. Some are pure savings schemes, while others are tax savings schemes.

**Corporate fixed deposits**

Certain large and small corporates raise funds through fixed deposits from the public. Fixed deposits of manufacturing companies are regulated under Companies Act, and fixed deposits of finance companies by Reserve bank of India. A manufacturing firm can mobilise up to 25% of its net worth in fixed deposits and an additional 10% from its shareholders. The interest rates on company deposits are higher when compared to bank fixed deposits.

**Employee provident fund scheme**

Employee Provident Fund (PF) is an important component of savings for a salaried person. Each employee has a separate PF account in which both the employer and employee are required to contribute a certain sum of money every month. While the contribution made by the employer is fully tax exempt, the contribution made by the employee is eligible for tax deduction.

The PF contribution earns compound interest, which is exempt from taxes. The balance PF account is fully exempt from wealth tax and it is not subject to attachment under any order or decree of a court.

**Public provident fund scheme (PPF)**

This scheme of post office is another attractive investment option for individuals and HUFs. Deposits in a PPF account for 15 years and more are eligible for tax concession under Sec 80C.The deposit earns a compounded interest rate, which is also exempt from tax.

**Activity:**

Compare and contrast the market participants in the Securities market for the years from 2010 -2012.

Hint: Prepare the list of market participants like stock exchanges with equities trading, stock exchanges with debt market segment, stock exchanges with Derivative trading, primary dealers, merchant bankers, brokers, portfolio managers, mutual funds, underwriters etc

**Self Assessment Questions:**

8. _____ represent long-term debt instruments.
9. Fixed deposits mobilised by manufacturing companies are regulated by _____.
10. The investment period of PPF scheme is _____.

## 1.5 Characteristics of Investment

While choosing an investment, an investor should know the features to look for. The prominent features are:

**Rate of return**

When we invest, we defer current consumption in order to accumulate our wealth. Return on investment is the change in the wealth either resulting from an investment, due to cash inflow (annual income in the form of dividends / interest) or caused by a change in the price of the asset (capital appreciation / depreciation).

**Risk**

Risk is the likelihood that your investment may fail and you lose the money. It is the degree of uncertainty about the return you expect from the investment, and about the final return of that investment. No investment,

(domestic or international) is risk-free. That is a fact you should not ignore. Even money lying securely in a savings account is at risk from inflation.

**Marketability**

Marketability of an investment is measured on various parameters such as:

- How quickly the instrument can be transacted i.e., can be bought or sold.
- The transaction cost of buying and selling it
- The price change between two successive transactions.

**Tax shelter**

Tax planning is essential for those investors who are in high tax brackets. Tax benefits are of three forms – initial tax benefit, continuing tax benefit and terminal tax benefit.

- An initial tax benefit refers to the tax relief enjoyed at the time of making the investment.
- Continuing tax benefit refers to the tax shield associated with periodic returns from the investment
- Terminal tax benefit refers to relief from taxation when an investment is realised on maturity or when it is sold.

**Convenience**

It is the ease of buying or selling an investment in the market. You can buy or sell blue chip stocks very quickly due to high liquidity while 'Z' category stocks will take much longer to sell.

**Self Assessment Questions:**

11. How quickly the instrument can be transacted relates to _____ feature of investment.
12. _____ refers to relief from taxation when an investment is realised on maturity or when it is sold.
13. _____ is the likelihood that your investment may fail and you lose the money.

## 1.6 Investment and Speculation

Benjamin Graham in his book 'Security Analysis' makes a distinction between speculation and investing. "An investment operation is one which,

upon thorough analysis, promises safety of principal and an adequate return. Operations not meeting these requirements are speculative."

Speculation occurs when an asset is purchased with the hope that price will rise rapidly, leading to quick profit. In speculation, significant risks are taken for obtaining quick gains. For example, you buy an IPO of a stock on the first day of issue with the intention of selling it after receiving a higher price.

Do not consider speculation as a form of gambling. Gambling is based on random outcomes while speculation is not. Gambling is taking risk purely for the enjoyment of risk itself. Speculation is undertaking the risk because of a favourable risk-return trade-off. Speculators make informed decisions before taking on risk. However, speculation cannot be categorised as a traditional investment, because the risk level is higher than average.

**Investment and gambling**

Both investing and gambling require money and require you to calculate the odds on a given 'bet' and you are taking risk. The risks of investments can be managed so that the odds are in your favour, and you are betting on the continued growth and success of the economy. If you stay invested long enough in the stock market, you are reasonably sure of profits in the end. However, a gambler’s chances of losing money increase when he stays longer.

Investing is ***not*** gambling. Gambling is putting money at risk by betting on an uncertain outcome, with the hope that you might win money. The outcome is not based on an economic endeavour, but random outcomes. Gambling creates risk without attempting to quantify the benefit.

**Self Assessment Questions**

14. _____ occurs when an asset is purchased with the hope that price will rise rapidly, leading to quick profit.
15. _____ is putting money at risk by betting on an uncertain outcome, with the hope that you might win money.

## 1.7 The Investment Process

It is rare to find investors investing their entire savings in a single security. Instead, they tend to invest in a group of securities. Such a group of securities is called a **portfolio**. Financial experts stress that in order to

minimise risk an investor should hold a well-balanced investment portfolio. The investment process describes how an investor should decide the securities to invest in while constructing a portfolio, how he should spread the investments, and when he should sell them. This is a procedure involving the following five steps:

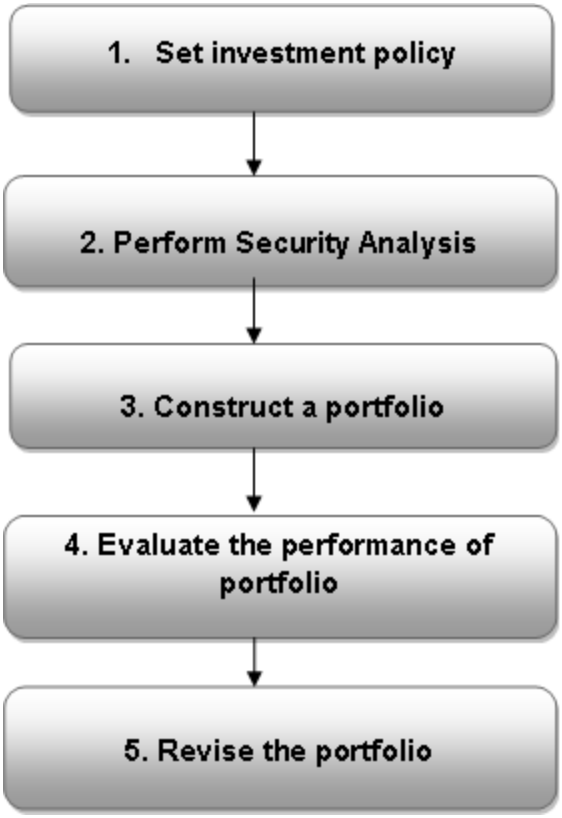


**Figure 1.4: Steps of the Investment Process**

**1. Setting investment policy**

This initial step determines the investor's objectives and the investible amount. Since there is a definite relationship between risk and return, the objectives should be stated in terms of both risk and return.

This step concludes with the **asset allocation** decision, which is identification of the potential categories of financial assets for consideration in the portfolio that the investor is going to construct. Asset allocation

involves dividing an investment portfolio among different asset categories, such as stocks, bonds and cash.

The asset allocation that works best for an investor at any given point in his life depends largely on his time horizon and his appetite for risk.

**Time horizon** – The time horizon is the expected number of months, years, or decades for which the money will be invested. An investor with a longer time horizon may feel more comfortable with a riskier or more volatile investment because he can ride out the economic cycles and the inevitable difficulties of the markets. But an investor, saving for his teenage daughter's college education would be less likely to take a large risk because he has a shorter time horizon.

**Risk appetite** – Risk appetite is an investor's ability and willingness to lose some or all of his original investment in exchange for greater potential returns. An aggressive investor with greater risk tolerance is more likely to risk losing money in order to get better results. A conservative investor will favour investment that protects his original investment. Conservative investors keep a "bird in the hand", while aggressive investors seek "two in the bush."

While setting the investment policy, the investor also selects the **portfolio management style** (active vs. passive management).

**Active management** is the process of managing investment portfolios by attempting to time the market and/or select undervalued stocks to buy and overvalued stocks to sell, based upon research, investigation and analysis.

**Passive management** is the process of managing investment portfolios by trying to match the performance of an index (such as a stock market index) or asset class of securities as closely as possible, by holding all or a representative sample of the securities in the index or asset class. This portfolio management style does not use market timing or stock selection strategies.

**2. Performing security analysis**

The second step is **security selection.** Security analysis involves examining a number of individual securities and identifying those securities that currently appear to be mispriced. Security analysis is done using

fundamental or technical analysis or both (both have been discussed in subsequent units).

**Fundamental analysis** is a method used to evaluate the worth of a security by studying the financial data of the issuer. It scrutinises the issuer's income and expenses, assets and liabilities, management, and position in its industry. In other words, it focuses on the 'basics' of the business.

**Technical analysis** is a method used to evaluate the worth of a security by studying market statistics. Unlike fundamental analysis, technical analysis disregards an issuer's financial statements. Instead, it relies upon market performance of the scrip to ascertain investor sentiment.

**3. Portfolio construction**

The third step identifies the specific assets in which to invest, and determines the amounts to put into each asset. Here **selectivity**, **timing** and **diversification** issues are addressed. **Selectivity** refers to security analysis and focuses on price movements of individual securities. **Timing** involves forecasting of price movement of stocks relative to price movements of fixed income securities (such as bonds). **Diversification** aims at constructing a portfolio that minimises the investor's risk.

The following table summarises how the portfolio is constructed for an active and a passive investor.

| | **Asset Allocation** | **Security Selection** |
|---|---|---|
| Active investor | Market timing | Stock picking |
| Passive investor | Maintain pre-determined selections | Try to track a well-known market index like Nifty, Sensex |

**4. Portfolio revision**

This step is the periodic revision of the portfolio using the three previous steps. A portfolio might not be the optimal one forever and needs constant modifications.

**5. Portfolio performance evaluation**

This step involves determining periodically how the portfolio has performed over the review period (returns earned compared to targeted returns).

**Self Assessment Questions**

16. _____ is a method used to evaluate the worth of a security by studying the financial data of the issuer.
17. _____ refers to security analysis and focuses on price movements of individual securities.
18. _____step involves determining periodically how the portfolio has performed over the review period (returns earned compared to targeted returns).

## 1.8 Common Errors in Investment Management

When investment mistakes happen, money is lost. Mistakes can occur for a variety of reasons, but they generally happen because of the clouding of the investor's judgment by the influence of emotions, not applying basic investment principles, or misconceptions about how securities react to varying economic, political, and fear-driven circumstances. The investor should always keep a rational head and avoid these common investment mistakes:

- **Not having a clearly defined investment plan**
  A well-planned investment strategy does not need frequent adjustments, and there is no place in it for speculations and "hot picks". Investing is a goal-oriented activity that should consider time, risk appetite and future incomes.
- **Becoming complacent and abandoning the plan**
  Changing direction frequently and making drastic rather than measured adjustments is a serious mistake. Always regard investing as a long-term activity.
- **Emotional attachment to securities that rise and not booking profits**
  Profits that are not realised are just book profits and may disappear when the market goes down. While one should not be in a hurry to realise profits, it is equally erroneous to be blind to the beauty of *unrealized* gain and forget basics of prudent investing. Some investors may have "unwilling-to-pay-the-taxes" problem, little realising that the investment may ultimately end up as a realised loss on the tax return.

- **Overdose of market information**
  Investors sometimes suffer from "paralysis by analysis" and become confused and indecisive. Aggravating this problem for the investor is his inability to distinguish between genuine research and sales pitch of the sale side analyst. A narrow focus on information, which has a bearing on the investment, is far more productive and useful.
- **Looking for the proverbial 'quick buck'**
  Investors who want instant success with minimum effort buy every new instrument that catches their fancy. Their portfolios become a motley mixture of many types of securities that are simply strung together without a plan.

## 1.9 Qualities of a Smart Investor

**Smart Investors plan their investments**

An investor may be tempted to buy stocks reported "hot" in the press. However, smart investors make money to meet their financial goals within a certain timeframe. Hence, they first gather information on the market performance. Then they chart their financial destiny. For example, an investor who is 40 years old has a goal to save enough money for retirement. Hence, the investor plans for twenty-year investment based on the expected returns of different assets and suitability to needs. They may also buy securities based on their research and recommendation from people they trust.

**Invest consistently**

Smart investors make their money grow by investing periodically. The two ways in which they do this are:

- By using a part of their savings to buy assets that shows a growth potential such as mutual funds and stocks.
- By distributing other part of their savings among their existing pool of investments.

**Patience**

Smart investors do not react to the daily up and down movement of their investments in the market. They are not upset with the effect of daily gains or losses on their financial goal. They understand that their investments need time to grow and they look at long-term gains patiently. Smart

investors do not buy and sell assets day in and day out in order to beat the market.

**Rational approach towards investment choices**

Smart investors unaffected by the daily, market fluctuations know the right conditions under which they must dispose-off the investments. When the investment is constantly making a loss, the investor sells it to avoid further losses. Similarly, when the investments make unbelievable gains over a period they know the trend cannot hold on forever. Therefore, they “cash-in” by selling the asset. Such a rational approach enables successful investors to safeguard their investments.

## 1.10 Summary

- Financial investment is committing your funds to one or more assets that you will hold over a future time period.
- An investment operation is one, which, upon thorough analysis, promises safety of principal and an adequate return. Operations not meeting these requirements are speculative.
- Investment differs from gambling and speculation.
- Investment involves risks. In order to minimise risk, an investor should hold a well-balanced investment portfolio.
- The investment procedure involves the following five steps:
    - Set investment policy
    - Perform security analysis
    - Construct a portfolio
    - Revise the portfolio
    - Evaluate the performance of portfolio
- Smart investors have a plan for investing and they stick to it. They invest consistently and wait patiently for gains. They are not emotionally tied to their investment positions.

## 1.11 Glossary

***Fundamental analysis:*** A method used to evaluate the worth of a security by studying the financial data of the issuer.

***Money market instruments:*** Debt instruments, that have a maturity of less than one year at the time of issue, are called money market instruments.

***Portfolio:*** The combination of different classes of financial assets held by an investor.

***Technical analysis:*** A method used to evaluate the worth of a security by studying market statistics.

## 1.12 Terminal Questions

1. Explain the meaning of investment, security, and security analysis and portfolio management.
2. Explain the modes of investment.
3. Explain the characteristics of investment.
4. Differentiate between investment and speculation and between investment and gambling.
5. Describe the investment process.
6. What are the common mistakes made in investment management?
7. Explain the qualities of a smart investor.

## 1.13 Answers

### Self Assessment Questions

1. Financial assets
2. Underlying real asset
3. False
4. Risk and return
5. Weighted average
6. Portfolio
7. Risk-return characteristics
8. Bonds
9. Company Law Board
10. 15 years
11. Marketability
12. Terminal tax benefit
13. Risk
14. Speculation
15. Gambling

16. Fundamental analysis
17. Selectivity
18. Portfolio Performance Evaluation

**Terminal Questions:**

1. Financial investment is committing your funds to one or more assets that you will hold over a future time period with the expectation that its value will appreciate and make you wealthier. For more details, refer section 1.3.
2. Avenues for investment ranging from riskless to high-risk investment opportunities consist of both security and non-security forms of investment. For more details, refer section 1.4.
3. While choosing an investment, an investor should know the features to look for. For more details, refer section 1.5.
4. Speculation occurs when an asset is purchased with the hope that price will rise rapidly, leading to quick profit. For more details, refer section 1.6.1.
5. Investment process describes how an investor should decide the securities to invest in while constructing a portfolio. For more details, refer section 1.7
6. The investor should always keep a rational head and avoid the common investment mistakes. For more details, refer section 1.8
7. Smart investors make money by preparing the goals, timeframe and knowledge of the markets to chart a plan that suits their needs. For more details, refer section 1.9

## 1.14 Case Study

**The Anandnagar Electricity Company**

The Anandnagar Electricity Board (AEB) has been operating under the ownership and control of the state of Anandnagar since the creation of the State in 1961. The company was privatised in 2006 and sold to a local business house with interests in energy, pharmaceuticals and financial services, after which it became Anandnagar Electricity Company (AEC).

The State electricity Board regulates prices and activities of private power companies. Demand for electricity has grown @ 4% in Anandnagar.

Privatisation was intended to pave the way for improved performance and raising much-needed finance for growth. Demand for electricity always exceeds supply and power generation required huge capital. The management of AEC stated that their objective would be maximising return to shareholders.

At the time of privatisation, a large private sector financial agency valued AEC at Rs. 4,000 million. A public issue of ordinary shares of Rs. 10 plus a premium of Rs. 20 per share was made, to raise Rs. 4,000 million. The issue was oversubscribed and on the first day of trading the market price of the share was Rs. 35.

AEC has been in operation for 3 years and select financial and operating data is presented in the table below for the years 2006-09.

**Table 1: Anandnagar Electricity Company: Key data for years ending 31 Mar**

(Rs million)

| | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|
| Revenues | 13,500 | 14,250 | 17,500 | 19,500 |
| Operating profit | 810 | 1,100 | 1,790 | 2,730 |
| Taxes | 160 | 200 | 300 | 400 |
| Profit before depreciation & tax | 900 | 960 | 1,030 | 1,190 |
| Profit after tax | 650 | 900 | 1,490 | 2,330 |
| Dividends | 200 | 320 | 600 | 900 |
| Wages and salaries | 3,000 | 3,000 | 2,700 | 2,600 |
| Total assets | 3,000 | 3,600 | 4,500 | 5,750 |
| Capital expenditure | 500 | 900 | 1,750 | 2,250 |
| Debtors | 6,000 | 3,200 | 3,000 | 3,600 |
| Creditors | 4,500 | 2,400 | 2,300 | 2,400 |
| Directors' emoluments | 30 | 70 | 80 | 100 |
| Number of employees | 32,000 | 31,400 | 30,500 | 30,100 |
| P/E Rat\o | - | 10.5 | 12.0 | 11.5 |
| Consumer price index | 100 | 102.7 | 105.8 | 107.4 |

## Questions

1. What changes would you expect in the company's objectives after it became private?
2. Has the company met its stated objectives? What other information do you need to answer this question?

**Hints:**

1. Look at how AEC (a) has downsized its employee strength and outgo on salaries (b) reduced balances of its debtors and creditors and improved working capital management.
2. Calculate the market price and capitalisation using the P/E and see how the shareholders have been benefited.

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# Unit 2 Investment Environment

**Structure:**



## 2.1 Introduction

In the previous unit you learnt about the meanings of real asset and financial asset. Also, you learnt about the different modes of investment, characteristics of investment and the steps in the investment process.

In order to finance expansion and diversification, business firms need capital well beyond their retained earnings, and so raise money from public. Similarly, governments borrow to fund large infrastructure projects and social welfare schemes. Funding is done in three ways:

- From banks or other financial institutions (financial intermediaries).
- By issue of investment instruments in financial markets.
- Through private placements.

The financial intermediaries (banks etc.) are intermediate between the providers and users of financial capital. They take deposits (borrow) from the investors and lend to the users. Financial markets (capital markets, money markets) bring the providers and users in direct contact, without any

intermediary. Private placements do away with both the financial intermediaries and financial markets.

We will be dealing mostly with financial markets in this unit.

Financial markets permit the businesses and governments to raise the funds needed by sale of securities. Securities are issued to investors with excess funds who invest in these securities and earn a return.

The economy requires a sound financial market for its proper functioning. The capital is the most scarce resource for organisations. On the other hand, there are investors who save to invest Thus the financial market in their intermediary role allocates the household savings to serve the financial needs of organisations. Investors earn an interest on their savings in return for giving up consumption of savings.

As you are aware financial markets are the intermediaries that connect buyers to sellers and provide a platform for trading. Through price discovery process, markets enable competition to decide the best price for securities and provide liquidity. As the economy evolves, the markets become more efficient and effective.

In this unit you will learn about the financial markets and the instruments that are traded in it. You will also learn about the roles of intermediaries especially banks which transfer capital from providers to users.

**Objectives:**

After studying this unit, you will be able to:

- discuss the constituents of financial markets
- understand the difference between ‘capital market’ and ‘money market’
- discuss the role played by different stock exchanges
- analyse stock market indices
- differentiate Money Market Instruments and Capital Market Instruments
- describe important money market instruments
- explain the role of financial intermediaries.

## 2.2 Financial Markets

A financial market is a market for creation and exchange of financial assets (securities). *Securities* are stocks (also called shares), bonds or money market instruments that represent an obligation of the issuer to provide the

purchaser an expected return (e.g. dividend) or a stated return (e.g. interest) on the investment.

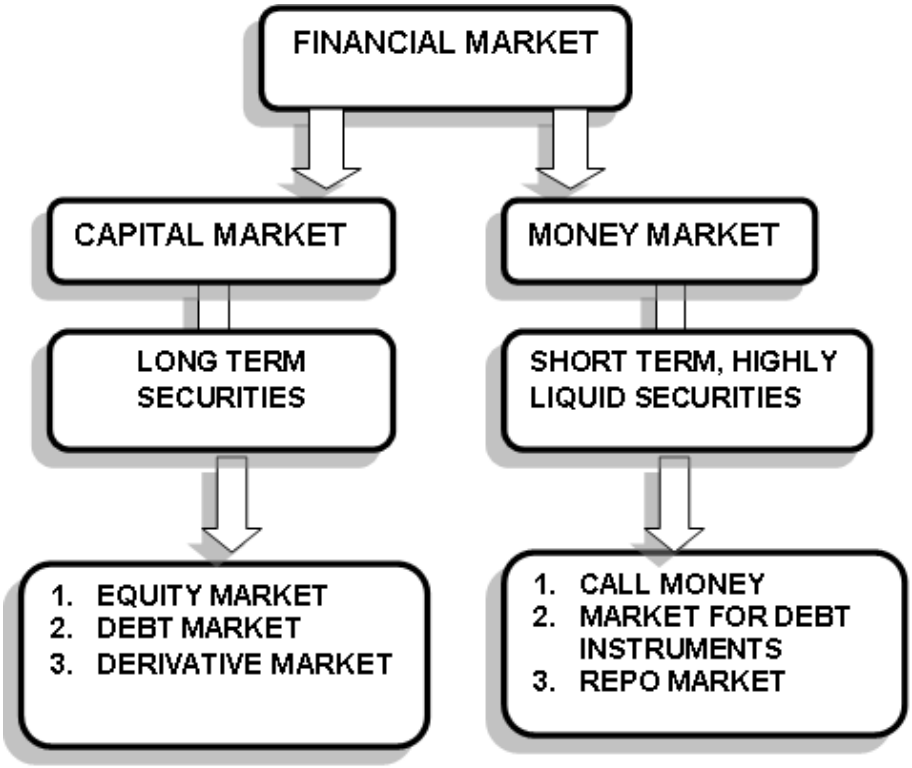


**Fig. 2.1: Structure of Financial Market**

From figure 2.1 you can see that the two key financial markets are the **money market** and the **capital market**. These are markets for short-term and high quality debt securities. Because of the short maturities, these carry little or no default risk and have very little price risk. The capital market is the market for long-term securities. Because of the longer maturities, long-term maturities are subject to considerable price risk, default risk, purchasing power risk etc.

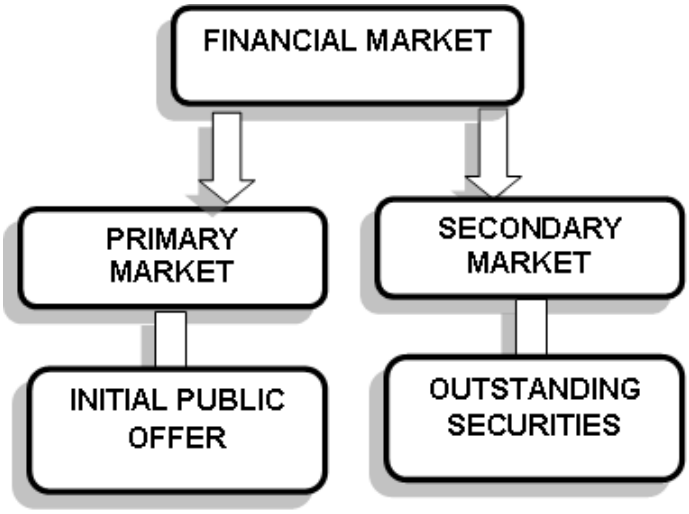


**Fig. 2.2: Financial Market Offerings**

Financial markets are divided into **primary market** and **secondary market**. In primary market, a borrower offers new securities in exchange for cash from the investor (buyer). Sales of bonds, treasury bills or stocks take place in primary markets. The issuers of these securities – corporates, the government – receive cash from people who buy these securities. These buyers receive financial claims that previously did not exist. Corporate or the government directly receives the proceeds from the business transaction only in primary market. If the securities being sold for the first time, these are called as **Initial Public Offers** (**IPOs**). When some amount of securities is outstanding before new sales, they are called **seasoned new issues**. Figure 2.2 depicts this.

**Secondary market** is the place where original purchases of securities trade those securities. These securities may trade repeatedly in the secondary market, but the original issuers will be unaffected. This means that they would not receive any additional cash from those transactions. Cash is received by the person who sells the security and not the issuer.

Functioning of primary markets depends on how efficient secondary markets work. Efficient working of secondary markets assures people who buy primary securities that they can sell them off if needed. Secondary market is where investors come together for trading.

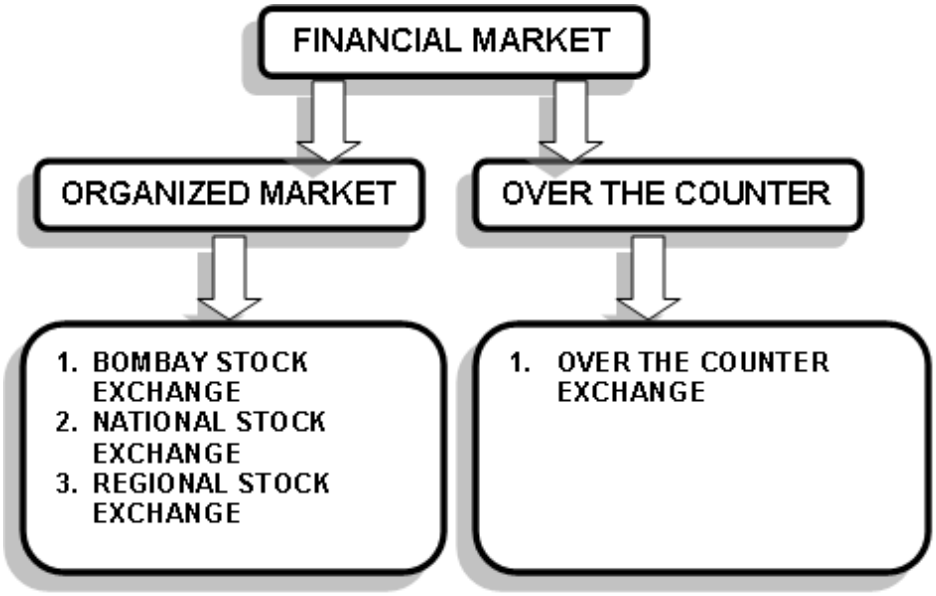


**Fig. 2.3: Financial Markets Division by Location**

Financial markets can also be divided into **organised** and **Over the Counter** (**OTC)** markets. Organised markets have a specific physical location where trading takes place. For example, Regional Stock Exchanges like BSE (Bombay Stock Exchange) are organised markets. OTC markets do not have physical locations. Instead, they are categorised by networks of dealers connected by telephone or computer networks. The 'Over The Counter Exchange of India' (OTCEI) is an example of an OTC market.

**Self Assessment Questions**

1. New sales of treasury bills stocks or bonds all take place in the _____ markets.
2. Bombay Stock Exchange is an example of _____ markets.
3. Capital market is the market for _____.

## 2.3 Money Market – Features and Composition

The money market facilitates interaction between supply and demand of short-term funds, with maturity of a year or less. Most money market transactions are made in marketable securities which are short-term debt instruments such as T-bills and commercial paper.

## THE TERM "MONEY MARKET" IS A MISNOMER.

Money (currency) is not actually traded in the money markets. The securities traded in the money market are short-term with high liquidity and low-risk. They are called 'money equivalents'.

Money market provides investors a place for parking surplus funds for short periods of time. It also provides low-cost source of temporary funds to borrowers like firms, government and financial intermediaries. Money markets are associated with the issuance and trading of short-term (less than 1 year) debt obligations of large corporations, financial institutions (FIs) and governments. Every issue is huge and so only high-quality entities can borrow in the money markets. Money markets are characterised by low default risk and large value instruments.

Money market transactions can be executed directly or through an intermediary. Investors in money market instruments include corporations and FIs who have idle cash but are restricted to a short-term investment horizon. Money markets essentially serve to allocate the nation's supply of liquid funds among major short-term lenders and borrowers. The characteristics of money market instruments are:

- **Short-term debt instruments (maturity of less than 1 year)**
- **Serves immediate cash needs**
  - Borrowers need short-term "working capital".
  - Lenders need an interest-earning "parking space" for excess funds.
- **Instruments are traded in an active secondary market.**
  - Liquid market provides easy entry and exit for participants.
  - Speed and efficiency of transactions allows cash to be "active" even for very short periods of time (overnight).
- **Large denominations**
  - Transactions costs are low in relative terms.
  - Individual investors do not usually participate.
- **Low default risk**
  - Only high quality borrowers participate.
  - Short maturities reduce the risk of "changes" in borrower quality.

- **Insensitive to interest rate changes**
    - **They mature in one year or less from their issue date.** Maturity of less than 1 year is too short for securities to be adversely affected, in general, by changes in rates.

In theory, the banking industry should handle the needs for short-term loans and accept short-term deposits and therefore there should not be any need for money markets to exist. Banks have an information advantage on the creditworthiness of participants - they are better able to deal with the asymmetric information between savers and borrowers. However banks have certain disadvantages.

**BANKS ARE HEAVILY REGULATED.**

Regulation creates a distinct cost advantage for money markets over banks. Banks also have to deal with reserve requirements. These create additional expense for banks that money markets do not have. Also money markets deal with creditworthy entities - governments, large corporates and banks. Therefore the problem of asymmetric information is not severe for money markets.

**Self Assessment Questions**

4. _____ is characterised by low default risk and large denomination of instruments.
5. The securities traded in the money market are short-term with _____ and _____.
6. The maturity period of money market instruments is _____.

## 2.4 Capital Market – Features and Composition

Capital markets are the markets in equity (shares) and long-term debt (bonds); in other words, the markets for long-term capital. Financial instruments in both equity and debt are issued and traded in these markets.

Capital market can be divided into **primary** and **secondary** markets.

- Primary market is a market where securities are offered to public for subscription for the purpose of raising capital. Primary market is the first-sale market.

- Secondary market is a market where already existing (pre-issued) securities are traded amongst investors.

On the equity side, the primary market includes initial public offerings and rights issues. On the fixed income side, it consists of treasury auctions (i.e. auctions of treasury bonds) and original issues of company bonds. The term “placement” refers to a transaction on the primary market - the issuer is “placing” its securities with investors.

The secondary market, on the other hand, is the re-sale market, where securities that have been put out among the public are traded.

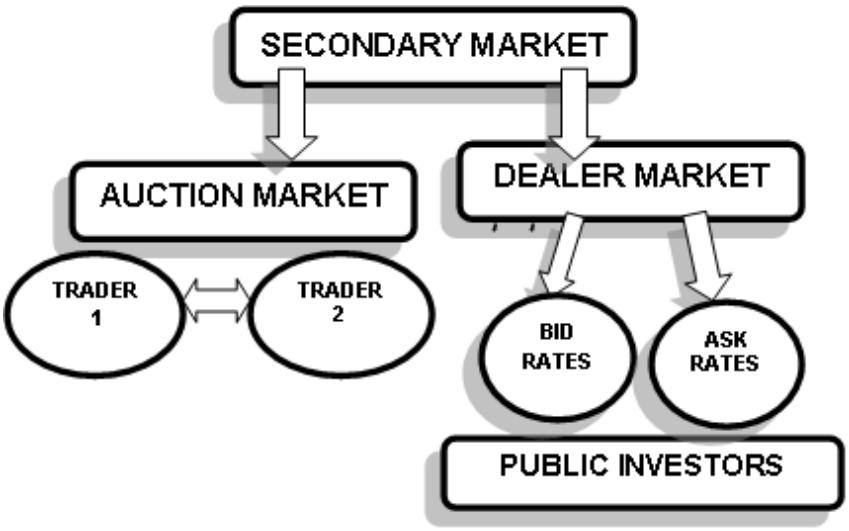


**Fig. 2.4: Structure of the Secondary Market**

Secondary markets could be either auction or dealer markets. An **auction** market is one in which investors (usually represented by a broker) trade directly with each other. A **dealer** market is one where dealers post bid rates (buy rates) and offer rates (sale rates) at which public investors can trade. While Stock Exchange is the part of an auction market, Over-the-Counter (OTC) is a part of the dealer market.

Managers of organisations monitor the secondary market even though they do not directly benefit from it. The close monitor enables them to find the pulse of the market to raise funds from the primary market. The share price aids the organisation in pricing its shares (IPO) on the primary market apart from other factors like goodwill and financial performance.

Secondly the share price affects the financial gains of the organisation's shareholder. When the share price shows an increasing trend shareholders gain financial value. This increases their faith in the organisation's management, whereas, a falling trend in share price may decrease this faith. This might lead to shareholders voting for a change in the top management. Some shareholders may even sell their shares which could further decrease share prices.

Finally managers themselves receive stock options. Hence they are personally motivated to increase the share price of the organisation in the secondary market.

**Self Assessment Questions**

7. _____ is a market where already existing (pre-issued) securities are traded amongst investors.
8. An _____ market is one in which investors (usually represented by a broker) trade directly with each other.
9. A _____ market is one where dealers post bid rates (buy rates) and offer rates (sale rates) at which public investors can trade.
10. The primary market is the _____ market.

## 2.5 Stock Exchanges: NSE, BSE and OTC

A stock exchange is a regulated marketplace that allows securities like bonds, shares, options and futures to be bought and sold. The securities are to be listed on the stock exchange for trading. Stock exchanges perform the role of secondary markets to allow the change of ownership of the securities. As a primary market it allows the organisation to issue new securities and raise funds for business activities.

Brokers and dealers are regulated professionals who specialise in trading securities on the stock exchange. A broker helps the security holder to buy and sell securities and receives commissions for the services rendered. Whereas dealers trade securities in own portfolio and earn money by capitalising on the difference of sell and buy price. Also, the dealers can act as brokers and vice versa.

In India, the two main exchanges are National Stock Exchange (NSE) and Bombay Stock Exchange (BSE) limited. These exchanges are de-

mutualised exchanges - that is, the ownership, management and trading are in separate hands.


**Bombay stock exchange, National stock exchange**

Bombay-Stock Exchange Limited (BSE) was started in the year 1875 and is the oldest stock exchange in Asia. Today more than 6,000 stocks are listed and traded on this exchange.

The National Stock Exchange (NSE) of India the leading stock exchange in India was incorporated in the year November 1992. On this stock exchange all types of securities can be traded through a screen based trading system. In addition to these exchanges the Over the Counter Exchange of India (OTCEI) was set up in 1990 to help small and medium enterprises raise capital for business expansion. It was the first exchange to provide screen based trading. All the stock exchanges are regulated by Securities and Exchange Board of India (SEBI) from Mumbai..

BSE dominated the equity market in India for a long time, with its open outcry, manual operated and undesignated market makers. On the grounds of market efficiency, liquidity and of transparency, market was graded of inferior quality. The consequence of 1992 Harshad Mehta scam, forced the regulators, the finance ministry and SEBI to reform the existing equity market. The screen based trading system in the BSE as well as the NSE formation made the equity market more efficient. Screen based trading refers to a fully computerised trading system that ensures transparency, liquidity and market efficiency for trading.

**Self Assessment Questions**

11. The two main stock exchanges are _____ and _____.
12. The stock exchanges are regulated by _____.
13. OCTEI exchange deals with trading of _____.

## 2.6 Stock Market Indices

An index is defined as a statistical indicator, which provides a representation of the value of the securities constituted. Indices often serve as barometers for a particular market/industry. These are benchmarks based on which economic or financial performance is measured. A stock index reflects the price movement of shares while a bond index captures the manner in which bond prices go up and down.

For more than a hundred years, people have tracked the market's daily ups and downs using various indices of overall market performance. There are currently thousands of indices calculated by various information providers. Internationally, the best known indices are provided by Dow Jones & Co, S & P, Morgan Stanley Capital Markets (MSCI), Lehman Brothers (bond indices). Dow Jones alone currently publishes more than 3,000 indices. Some of the well-known indices are Dow Jones Industrial Average (DJIA), Standard & Poor's 500 Index (S&P 500), Nasdaq Composite, Nasdaq 100, Financial Times-Stock Exchange 100 (FTSE 100), Nikkei 225 Stock Average, Hang Seng Index, Deutscher Aktienindex (DAX). In India the best known indices are Sensex and Nifty.

**SENSEX:** Sensex is the stock market index for BSE. It was first compiled in 1986. It is made of 30 stocks representing a sample of large, liquid and representative companies. The base year of SENSEX is 1978-79 and the base value is 100.

Sensex till August 31, 2003 was constructed on the basis of full market capitalisation. A need was felt to switch over to free float wherein non-promoter and non-strategic shareholdings are eliminated and only those outstanding shares that are available for trading are included. Sensex since 30$^{th}$ September 2003 is being constructed on free float market capitalisation.

**NIFTY:** Nifty is the stock market index for NSE. S&P CNX Nifty is a 50-stock index accounting for 23 sectors of the economy. The base period selected for Nifty is the close of prices on November 3, 1995, which marked the completion of one-year of operations of NSE's capital market segment. The base value of index was set at 1000.

The other indices are BSE 500, BSE 200, BSE TECK, BSE FMCG, BSE IT, BSE Pharma, BSE CD, BSE Metal, BSE small cap, BSE PSU, BSE – Mid cap, BSE auto, BSE realty, Nifty Jr, BSE MCK.

**Self Assessment Questions:**

14. The base year of SENSEX is _____.
15. S&P CNX Nifty caters ___ sectors of the economy.
16. The base value of NIFTY was set at _____.

## 2.7 Money Market Instruments

Important money market instruments are:

**Treasury bills:** These are short-term obligations issued by the government. At present, the Government of India (GOI) issues 4 types of T-Bills i.e., 14-day, 91-day, 182-day and 364-day. They are issued for a minimum amount of $25,000 and in multiples of $25,000. T-Bills are issued at a discount and redeemed at par.

**Call money:** These are short-term funds transferred between financial institutions usually for no more than one day. This is a part of the money market where everyday surplus funds (mostly of banks) are traded. The maturity period of call loans vary from 1 to 14 days. The money that is lent for one day in call money market is also known as 'overnight money'. In India, call money is lent mainly to even out the short-term mismatches of assets and liabilities and to meet CRR requirement of banks.

**Repurchase Agreements:** Repurchase agreements involve sale of a security with an undertaking to buy it back at a pre-determined price on a future date.

When a party trades treasury securities, but decides to buy them back later (usually 3–14 days later) for a certain amount, it is called repo from the point of the seller of the security. The same is viewed as reverse repo from the standpoint of the buyer of the security. Thus, repo agreement is essentially a short-term collateralised loan.

**Negotiable Certificates of Deposit (CD):** These are bank-issued time deposits that specify an interest rate and maturity date, and are negotiable (saleable in a secondary market). CDs are issued at a discount. The discount rate is freely determined by the issuing bank considering the

prevailing call money rates, treasury bill rate, maturity of the CD and its relation with the customer, etc. The minimum size for the issue of CDs is $5 lakh (face value) and thereafter in multiples of $1 lakh.

**Commercial Paper (CP):** In order to raise short-term cash, a company issues short-term unsecured promissory notes. These are called CPs. They mature in no more than 270 days. Only large and creditworthy companies issue commercial papers. CPs, as a source of short-term finance, are used by companies as an alternative to bank finance for working capital. Generally, companies prefer this route when the interest rate charged by banks is higher than the rate at which funds can be raised through CP.

**Bankers' Acceptances:** These are time drafts payable to a trader of goods, with payment assured by a bank. Bankers' acceptance is a post-dated cheque, which guarantees the payment. International trade transactions are financed usually by these.

**Self Assessment Questions**

17. _____ are short-term funds transferred between financial institutions usually for no more than one day.
18. _____ is an agreement for trade of a security with a declaration to buy it back at a pre-determined price on a future date.
19. _____ are time drafts payable to a trader of goods, with payment assured by a bank.

## 2.8 Capital Market Instruments

Capital market instruments are stocks (shares) and bonds.

**Stocks:** A share of common stock gives an investor a portion of ownership of a company. The company initially sells shares of stock to the public, and investors can then trade shares in the secondary markets (on stock exchanges or on the over-the-counter market). Stock is usually owned for growth potential. This potential growth is obtained through changes in the price of the stock.

Investor makes money while selling the stock, if its value increases. However, investor can lose money when he sells the stocks when the price is down. Stocks offer no guarantees to investors, but over long periods of time they have performed better than any other type of investment. Over the

long-term, stocks are the best vehicle for overcoming inflation and building wealth.

**Bonds:** Unlike stocks, bonds do not offer an ownership stake in an organisation. A bond is a loan from an investor to a corporation or a government. In this transaction, the investor, in return of the cash paid, receives interest and a return on the initial amount paid when the bond is matured.

Interest on different types of bonds differs and is dependent on the factors like inflation, interest rate, risk taken by the borrower and the attributes like call option or converted. Interest on bonds is expressed as the percent of the price of the bond, which is known as bond yield.

One of the most appealing factors of bonds is the fixed interest. Bonds fulfil the need of steady income for the investors. Some of the positive aspects of bonds are that they are less volatile than stocks, offer more protection. But inflation could affect bonds.

**Self Assessment Questions**

20. The potential growth of the shares is obtained through _____ of a share of stock.
21. Bonds do not offer protection from _____.

## 2.9 Financial Derivatives

Derivatives are financial instruments that have no intrinsic value, but derive their value from something else. They hedge the risk of owning things that are subject to unexpected price fluctuations, for example foreign currencies, commodities (like wheat), stocks and bonds. The term ‘derivative’ indicates that it has no independent value, i.e. its value is entirely ‘derived’ from the value of the cash asset. For example, price of a stock option depends on the underlying stock price and the price of currency future depends on the price of the underlying currency.

A derivative contract or product, or simply ‘derivative’, is to be distinguished from the underlying cash asset, i.e. the asset bought/sold in the cash market on normal delivery terms. The price of the cash instrument is referred to as the ‘underlying’ price. Examples of cash instruments include actual shares in

a company, commodities (crude oil, wheat), foreign exchange, etc. Types of derivative securities, mostly appealing to investors are *futures and options*.

Future contract is an agreement entered between two parties to buy or sell an asset at a future date for an agreed price. The party agreeing to buy the asset is said to have a *long position.* Party agreeing to trade the asset is said to have a *short position.*

An option is the right of the holder but not the obligation to buy or sell underlying asset by a certain date at a certain price. The option represent a special kind of financial contract under which the option holder enjoys the right (or which he pays a price), but without the obligation, to do something. There are two basic types of options:

- call options
- put options.

A call option gives the option holder the right to buy a fixed number of shares of a certain stock, at a given exercise price on or before the expiration date. To enjoy this option, the option buyer (holder) pays a premium to the option writer (seller) which is non-refundable. The writer (seller) of the call option is obliged to sell the shares at a specified price, if the buyer chooses to exercise his option.

A put option gives the option holder the right to sell a fixed number of shares of a certain stock at a given exercise price on or before the expiration date. To enjoy this right, the option buyer (holder) pays a non-refundable premium to the option seller (writer). The writer of the put option is obliged to buy the shares at a specified price, if the option holder chooses to exercise the option.

Options and futures contracts are important to investors because they provide a way for investors to manage portfolio risk. Investors incur the risk of adverse currency price movements if they invest in foreign securities, or they incur the risk that interest rates will adversely affect their fixed-income securities (like bonds).

Options and futures contracts can be used to limit some, or all, of these risks, thereby providing risk-control (**hedging**) possibilities. For example, if you are holding Reliance shares, you can hedge against falling share price by purchasing a **put option** on the Reliance shares.

Derivatives could be used to check the how future stock prices, exchange rates, interest rates, and commodity prices are performing. Right guesses result in great profits at the same time wrong guesses makes you lose money. Here, derivatives are risky.

**Self Assessment Questions**

22. A put option gives the option holder the right to _____.
23. Options and futures contract provide _____ opportunities.

**Activity:**

Find a recent IPO (initial public offer) from the newspapers or from the internet and download the prospectus. Read it and answer the following questions:

- Who were the existing shareholders?
- Was the company raising more capital or were existing shareholders selling?
- How was the underwriting done, what was its cost? Was there a green shoe option?
- What is the performance of the share after issue?

**Hint**

- Reading a prospectus gives you fair insight into the nature of the share issue and its objectives. Analysis of the subsequent performance helps in evaluating the issue with respect to market conditions.

## 2.10 Financial Intermediaries

Financial intermediaries channel the savings of individuals, businesses, and governments into loans or investments. This means individuals are net suppliers of funds, whereas governments and organisations are net users of funds. The major intermediaries are commercial banks, mutual funds, life insurance companies, and finance companies.

Financial intermediaries facilitate interface between providers and users of capital. They build funds by accepting deposits and/or issuing securities (and, in the process, they incur liabilities). These funds are used for acquiring financial assets by making loans and/or buying securities. This set of activity is known as financial intermediation. Financial intermediaries are

indispensable to help both providers and users of funds cope with market imperfections, in particular, imperfect information.

The major financial intermediaries are banks and insurance companies. Banks collect savings from investors in the form of deposits and provide advances to individuals and business. Insurance companies pool the premium collected from investors. They invest in various securities or advance it to businesses or government undertakings. Thus the intermediary role achieves both efficient payment system as well as risk management.

The main role of financial intermediaries is to invest the savings collected from various investors to buy securities of companies. Using the services of the intermediary saves time and cost for the company in terms of search collecting and screening investors. For the investor it avoids the situation of asymmetric information.

- Financial intermediaries allow individual small savers to access large investment projects through the mechanism of fund pooling. Individual investors are usually too small to benefit individually from large projects. Pooling done by financial intermediaries allow the small investors to do so.
- An household investor has constraints for investing in large investment projects. Through fund pooling the intermediaries permit household investors to invest in these projects.
- Financial intermediaries reduce the risk of poor returns by spreading the savings across various securities or investments. Mutual funds are one such example.

  Small investors are interested in short term investments, whereas most of the projects undertaken are long term in nature. In order to bridge the gap, financial intermediaries use liquidity management strategies which enables the investors to invest in long term projects.

**Self Assessment Questions**

24. _____ are short-term unsecured promissory notes issued by a company to raise short-term cash.
25. A _____ is a contract that gives the owner the right, but not obligation to buy the underlying asset by a specified date at a

specified price while a _____ is a contract that gives the owner the right, but not obligation to sell the underlying asset by a specified date at a specified price.

## 2.11 Summary

- A financial market is a market for creation and exchange of financial assets.
- The two key financial markets are the **money market** and the **capital market**.
- Financial markets can be divided into **primary market** and **secondary market**.
- Primary markets cannot exist if there are no active, efficient secondary markets.
- **Stock exchanges** are organised markets for buying and selling securities which include stocks, bonds, options and futures.
- In India, the two main exchanges are **National Stock Exchange** (NSE) and **Mumbai (Bombay) Stock Exchange** (BSE).
- **Sensex** is the stock market index for BSE. Nifty is the stock market index for NSE**.**
- **Derivatives** are financial instruments that have no intrinsic value, but derive their value from something else.
- **Future** contract is an agreement entered between two parties to buy or sell an asset at a future date for an agreed price.
- A **call option** is a contract that gives the owner the right but not the obligation to buy the underlying asset by a specified date at a specified price while a **put option** is a contract that gives the owner the right but not obligation to sell the underlying asset by a specified date at a specified price.

## 2.12 Glossary

***Primary market:*** A borrower issues new securities in exchange for cash from an investor.

***Secondary markets:*** When the original purchasers of securities sell their securities, they trade in **secondary markets**.

***Money market:*** It provides investors a place for parking surplus funds for short periods of time.

***Capital markets:*** These are markets in equity (shares) and long-term debt (bonds).

***Auction market:*** A market is one in which investors (usually represented by a broker) trade directly with each other.

***Dealer market:*** A market is one in which where dealers post bid rates (buy rates) and offer rates (sale rates) at which public investors can trade.

## 2.13 Terminal Questions

1. What are primary markets? What are secondary markets?
2. What is the difference between capital market and money market?
3. Name the important money market instruments.
4. What are derivatives? How are they used to hedge risk?
5. Explain the role of financial intermediaries.

## 2.14 Answers

### Self Assessment Questions

1. Primary
2. Organised
3. Long term securities
4. Money market
5. High liquid, low risk
6. Less than one year
7. Secondary market
8. Auction
9. Dealer
10. First sale
11. BSE and NSE
12. Securities Exchange Board of India’
13. Small and medium sized companies
14. 1978-79
15. 23

16. 100
17. Call money
18. Repurchase agreement
19. Bankers' acceptance
20. Changes in the price
21. Inflation
22. Sell
23. Hedging
24. Commercial paper
25. Call option, put option

**Terminal Questions**

1. Financial markets can be divided into **primary market** and **secondary market**. For more details, refer section 2.2
2. The money market facilitates interaction between supply and demand of short-term funds, with maturity of a year or less. For more details, refer section 2.3 and 2.4
3. The most important money market instruments are call money, Treasury bills, repos etc. For more details, refer section 2.7.
4. Derivatives are financial instruments that have no intrinsic value, but derive their value from something else. They hedge the risk of owning things that are subject to unexpected price fluctuations. For more details, refer section 2.9
5. Financial intermediaries channel the savings of individuals, businesses, and governments into loans or investments. For more details, refer section 2.10

## 2.15 Case Study:

**FINANCIAL SAVING OF THE HOUSEHOLD SECTOR**

**percent to gross financial savings**

| | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | 2010-11 | 2011-12 |
|---|---|---|---|---|---|---|---|
| **Financial Assets** Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| a) Currency | 8.7 | 8.6 | 10.9 | 12.7 | 9.8 | 13.8 | 11.3 |
| b) Deposits | 47.4 | 55.7 | 56.5 | 60.7 | 41.9 | 45.6 | 52.8 |
| c) other securities | 1.2 | 1.5 | 2.8 | 1.0 | 1.7 | 0.2 | -0.7 |
| d) Mutual Funds (including UTI) | 3.6 | 5.2 | 7.7 | -1.7 | 3.3 | -1.2 | -1.1 |
| e) Investment in Government securities | 2.4 | 0.2 | -2.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| f) Investment in Small Savings, etc. | 12.3 | 5.1 | -1.7 | -3.8 | 4.3 | 4.0 | -2.3 |
| g) Life Funds of LIC and private insurance companies/ provident /pension funds | 24.2 | 24.2 | 25.7 | 31.1 | 39.3 | 36.3 | 38.7 |

**(Source: www.rbi.org.in)-**

### Discussion Question:

Discuss the shifts in the saving pattern of household sector from 2005-2012.

Hint: There was a major shift in the saving pattern of household sector from physical assets to financial assets and within financial assets, from bank deposits to securities etc.

**References:**


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- Preeti Singh; "*Security Analysis and Portfolio Management*," 2011, Himalaya Publishing House.
- Puneethavathi & Pandian, "*Security Analysis and Portfolio Management",* Vikas Publishing House, Ninth edition.
- Prasanna Chandra," *Managing Investments"*, 2003. Tata mcgraw-Hill Publishing Co. Ltd. New Delhi.
- S. Kevin, "*Security Analysis And Portfolio Management"* –PHI Learning P. Ltd.
- Fisher & Jordan: "*Security Analysis & Portfolio Management*", Pearson Education, New Delhi.

## Annexure 1: NIFTY as on 8th June 2010

Comp, Close, (Prev) Open, High, Low, Wt, Qty — BSE.Cl — PE — YH — YL

Qty. in 1000s, Wt = Weighted avg price

**NIFTY**

| | | | | |
|---|---|---|---|---|
| ABB [2] **858.75** (858.55) 846, 867.70, 846, **859.36**,137.7 | 857.90 | 64 | 881 | 642 |
| ACC **851.70** (841.90) 821.50, 898.70, 810.10, **8438**,410.9 | 849.75 | 10 | 1020 | 680 |
| Ambuja Cements [2] **115.50** (112.50) 109.10, 115.95, 109.10, **113.83**,1260.3 | 114.70 | 13 | 125 | 81 |
| Axis Bank **1214.80** (1245.45) 1218.60, 1225, 1196, **1209.27**,1424.6 | 1215.55 | 20 | 1320 | 862 |
| Bharat Petro **563.50** (579.80) 575, 588.60, 557.20, **5697**,1327.8 | 563.45 | 13 | 657 | 408 |
| Bharti Airtel [5] **268.40** (276.30) 266, 273.30, 266, **269.18**,4170.9 | 267.90 | 11 | 870 | 252 |
| BHEL **2270.55** (2331.80) 2309, 2309, 2247.05, **2269.60**,769.1 | 2275.90 | 26 | 2585 | 1922 |
| Cairn India **291.30** (300.20) 294.80, 296.45, 285.65, **289.49**,2436.7 | 291.20 | - | 321 | 200 |
| Cipla [2] **322.05** (325.10) 321, 323.50, 318.25, **321.21**,1507.9 | 321.40 | 26 | 363 | 229 |
| DII [2] **263.90** (261.75) 272, 273.90, 262.10, **265.54**,9507.3 | 264.25 | 58 | 519 | 254 |
| G A I L **452.90** (460.75) 457, 463.90, 447.20, **453.77**,1543.4 | 453.65 | 18 | 470 | 272 |
| Hcl Tech [2] **373.70** (386.90) 382, 382, 370.10, **373.67**,317.3 | 374.65 | 25 | 410 | 162 |
| HDFC **2671** (2748.90) 2700, 2710.60, 2660.10, **2672.81**,401.6 | 2677.45 | 27 | 2881 | 1949 |
| Hdfc Bank **1876.65** (1885.70) 1867, 1894.85, 1868.35, **1873.32**,961.9 | 1880.20 | 30 | 2010 | 1333 |
| Hero Hon [2] **1977.85** (1956.25) 1970, 1996, 1951, **1975.94**,576.8 | 1977.50 | 18 | 2094 | 1311 |
| Hindalco Industries [1] **140.65** (147.60) 142, 144.90, 135, **140.40**,12602.5 | 140.35 | 14 | 193 | 68 |
| Hindustan Unilever. [1] **251.05** (251.70) 234, 253.40, 234, **250.47**,1864.1 | 250.85 | 26 | 306 | 218 |
| Icici Bank **841.95** (865.85) 712, 850, 712, **839.89**,3471.5 | 842.20 | 23 | 1009 | 606 |
| Idea Cellular **54.40** (55.95) 54.05, 55.35, 53.10, **54.35**,9107.2 | 54.60 | 17 | 91 | 47 |
| Infosys [5] **2671.65** (2728.95) 2710, 2710, 2650, **2666.96**,972.7 | 2672.25 | 28 | 2870 | 1665 |
| Infra. Dev. Fin. Co. **162.15** (163.10) 154.15, 163, 153, **159.65**,3291.7 | 162.10 | 22 | 179 | 114 |
| ITC [1] **287.70** (290.85) 285, 289.10, 285, **2871**,2198.8 | 287.45 | 27 | 291 | 180 |
| Jaiprakash Associates [2] **120.15** (122.55) 119.8, 120.60, 116.50, **119.24**,7560.9 | 120.20 | 26 | 269 | 106 |
| Jindal Steel & Power [1] **614.55** (629.65) 629.60, 629.60, 605, **612.43**,1219.3 | 614.10 | 39 | 3622 | 500 |
| Kotak Mahindra Bank **754.40** (752.15) 730, 758, 728.10, **748.47**,397 | 753.40 | 47 | 879 | 529 |
| L & T [2] **1640.20** (1672) 1640, 1655, 1623.80, **1636.34**,547.1 | 1639.20 | 29 | 1729 | 1305 |
| M & M [5] **580.25** (585.20) 572.95, 586.90, 561, **576.82**,1647.7 | 578.40 | 17 | 1199 | 476 |
| Maruti Udyog [5] **1315.45** (1330.05) 1282.10, 1319.80, 1280.80, **1307.17**,464.4 | 1314.20 | 15 | 1737 | 991 |
| Nitpc **199.95** (202.20) 202, 202, 197, **199.11**,1107.6 | 199.05 | 19 | 241 | 182 |
| O N G C **1179.20** (1189.70) 1180, 1207.80, 1166.60, **1183.80**,1345.4 | 1181.25 | 15 | 1277 | 934 |
| Power Grid Corp.. **104.45** (105.75) 104.40, 104.95, 102, **103.70**,624.5 | 104.10 | 21 | 127 | 95 |
| Punjab Nat.bank **1003** (1015.85) 981.35, 1008.85, 981.35, **998.11**,177.8 | 1002.60 | 8 | 1145 | 583 |
| Ranbaxy [5] **422.70** (430.50) 424.90, 425.90, 416, **422.71**,402.8 | 422.65 | 11 | 538 | 236 |
| Reliance **1007.75** (1031.20) 1015, 1015, 1000, **1007.31**,3086.6 | 1009.35 | 21 | 2379 | 959 |
| Reliance Cap **666.35** (678.95) 662.10, 673.50, 652.50, **663.98**,1217.4 | 666.10 | 48 | 1029 | 611 |
| Reliance Communications L [5] **176.60** (168.55) 165, 178.7, 162, **173.96**,31843.5 | 175.90 | 74 | 362 | 131 |
| Reliance Infrastructu **1082.90** (1110.65) 1071, 1089.50, 1066.35, **1077.83**,881 | 1083.85 | 23 | 1404 | 950 |
| Reliance Power. **156.80** (160.15) 157, 157.90, 154.10, **156.17**,1754.9 | 156.60 | 138 | 210 | 133 |
| S A I L **193.35** (201.35) 196.50, 198.20, 191.85, **193.63**,3760.7 | 193.60 | 12 | 267 | 139 |
| SBI **2286.75** (2340.75) 2251.20, 2320, 2232.85, **2286.47**,1492.5 | 2287.05 | 16 | 2500 | 1510 |
| Siemens [2] **683.85** (695.80) 685.10, 694, 681, **686.41**,156 | 683 | 30 | 765 | 376 |
| Sterlite Inds (ind) [2] **621.15** (648.45) 627, 629.90, 617.30, **622.10**,2649 | 621.20 | 56 | 928 | 532 |
| Sun Pharma [5] **1694.35** (1704.80) 1682, 1703, 1662.90, **1686.17**,60.1 | 1695.30 | 39 | 1853 | 1050 |
| Suzlon Energy [2] **54.60** (55.80) 55, 55, 53.10, **54.32**,14031.6 | 54.60 | | | |

# Unit 3 Risk and Return

**Structure:**



## 3.1 Introduction

In the previous unit you learnt about financial markets and the instruments traded in them. You also learnt about the role of financial intermediaries like banks, financial institutions etc.

In this unit you will learn the concepts of risk and return, how risk is measured, and the relationship between risk and return.

Risk comprises two components – unique risk and market risk. Unique risk arises from organisation-specific aspects like usage of out-dated technology, new product development, new competitors, labour problems and large orders. This type of risk can be eliminated by spreading your investments in securities of other firms. Capital allocation is about choosing the set of best combinations from the available lot of risk-return combination.

**Objectives:**

After studying this unit, you should be able to:

- explain the meaning of risk
- describe how risks are measured
- explain the factors that affect risk

- evaluate meaning and measurement of Return
- explain the risk preference through the concept of normal distribution and importance of standard deviation
- evaluate beta coefficient
- explain capital allocation line

## 3.2 Meaning of Risk

Risk is the likelihood that your investment will either earn money or lose money. It is the degree of uncertainty regarding your expected returns from your investments, including the possibility of losing some or all of your investment. Risk includes not only adverse outcomes (lower returns than expected) but good outcomes (higher returns). Both downside and upside risks are considered while measuring risk.

### 3.2.1 Measurement of risk

The thumb rule for all investments is smaller the risk smaller the return; and higher the risk, higher the return. Higher returns compensate for the percent of risk taken. The risk is dependent largely on your risk appetite, which in turn changes with your age, personality and environment. The daily fluctuations of the market tend to smoothen out your long term investment (Historically the stock market has always shown a gradually increasing trend irrespective of short-term declines). But when you are old or close to your monetary goal, you cannot afford to make losses.

Investing in equity because they could give the highest returns automatically increases the risk coefficient. You may gain substantially when the markets are buoyant, but run the risk of losing your entire capital if market tumbles. If you put all your savings in 'safe and familiar' investments you may only earn fewer returns in the long run. For example a 7% assured rate of return which looks attractive today may not be profitable due to rising inflation or taxes. An investor always likes to yield higher returns. For that you must be prepared to take the risk of trying out various investment options.

Risk is commonly measured using variance, standard deviation and beta. Variance is the mean of the square of deviations of individual returns around their average value. Standard deviation is the square root of variance. Beta reflects the volatility of the returns in relation to market movements.

**Self Assessment Questions**

1. The higher the risk, the higher is the _____.
2. Risk is commonly measured using _____, _____ and _____.
3. Standard deviation is the square root of _____.

## 3.3 Factors that affect Risk

The common risk factors are:

- **Business risk:** As a security holder you get dividends, interest or principal (on maturity in case of securities like bonds) from the firm. But there is a possibility that the firm may not be able to pay you due to poor financial performance. This possibility is termed as business risk. The poor financial performance could be due to economic slowdown, poor demand for the firm's goods and services and large operating expenses. Such a performance affects the equity and the debt holder. The equity holder may not get dividends and residual claim on the income and wealth of the firm. Similarly a debt holder may not get interest and principal payments.
- **Inflation risk:** It is the possibility that the money you invested will have less purchasing power when your financial goal is met. This means, the rupee you get when you sell your asset buys lesser than the rupee you originally invested in the asset.

  **Interest rate risk:** The variability in a security's return resulting from changes in the level of interest rates is referred to as interest rate risk. For example the value of a bond may reduce due to rising interest rates. When the interest rate rises, the market price of existing fixed income securities fall, and vice versa. This happens because the buyer of a fixed income security would not buy it at its par value or face value if its fixed interest rate is lower than the prevailing interest rate on a similar security. This occurs due to interest fixed rate lower being lower than the present rate on a similar security. Hence as a buyer you would pay less than the face or par value for such a security. The changes in interest also have an indirect effect on effect equity prices. That means the prices are affected by changes in the relative yields of debentures.

- **Market risk:** Market risk is the changes in returns from a security resulting from ups and downs in the aggregate market (like stock market). This type of risk arises when unit price or value of investment decreases due to market decline. The market tends have a cyclic pattern. John Train says "You need to get deeply into your bones the sense that any market, and certainly the stock market, moves in cycles, so that you will infallibly get wonderful bargains every few years, and have a chance to sell again at ridiculously high prices a few years later".

  The market risk represents a part of the total risk of a security that can be attributed to economic factors like government spending, GDP growth rate money supply, inflation and interest rate structure. Market risk is unavoidable as the economic factors have an effect on all firms to some degree. Market risk is therefore known as systematic risk or non-diversifiable risk.

**Self Assessment Questions**

4. _____ is the probability that the purchasing power of rupees invested will decline.
5. _____ is the changes in returns from a security resulting from ups and downs in the aggregate market.

## 3.4 Meaning and Measurement of Return

Return represents the reward for making an investment. The return on investment consists of two elements:

- Current return.
- Capital return.

**Current return**: It is measured as periodic cash flow (income) from the investment.

**Capital return:** This is reflected in the price change (appreciation or depreciation) in relation to beginning price of the asset.
Thus, the total return for any security is defined as

Total return = Current return + Capital return

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

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

**Example 1:**

Mr. A has purchased 100 shares of `10 each of TVS Motors in 2005 at ` 78 per share. The company has declared a dividend @ 40% for the year 2006-07. The market price of a share as on 1.4.2006 was ` 104 and on 31.3.2007 was `128. Calculate the annual return on the investment for the year 2006-07.

**Solution:**

Dividend received for 2006-07 = **10 x .40 = Rs 4** (annual income)
Beginning Price **($P_0$)** = **Rs 104**
Ending Price **($P_1$)** = **Rs 128**

**Calculation of annual ROR for the year 2006-07**

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

$$= \frac{4 + (128 - 104)}{104} = .2692 \text{ or } \boxed{\textbf{26.92\%}}$$

**Relative Return:** Relative return is defined as

$$\text{Relative Return} = \frac{C + P_e}{P_b}$$

Put differently

Relative Return = 1 + Total return in decimals

In our example the relative return is: 1 + .26292 = **1.26 %**

**Holding Period Return**

Holding period is a period during which an investor holds the investment.

**HPR = Ending Price of an Investment**
**Beginning Price of an Investment**

**Example 2:**

Mr B has purchased 100 shares of ` 10 each of Hero Honda Motors in 2005 at ` 78 per share. The market price of a share as on 31.3.2007 was ` 128. Calculate the holding period yield on the investment.

**Solution:**

**HPR = $\frac{128}{78}$ x 100 =** **1.64 %**

Holding period return can be zero, greater than one but it cannot be negative. If the HPR value is zero, it denotes that investor lost all his money. If HPR value is greater than zero, it denotes there is a positive return

Holding Period return if it is evaluated in percentage terms on an annual basis it is termed as

Holding Period Yield (HPY).

**HPY = HPR -1**

**For the above example, the holding period yield is:**

**HPY = 1.64 – 1 = .64 or** **64%**

**Real Returns:** The real return is the adjustment made for inflation factor.

$$\text{Real return} = \frac{1 + \text{Nominal return}}{1 + \text{Inflation rate}} - 1$$

**Example 3:** The total return for an equity stock during a year was 18.5 per cent. The rate of inflation during that year was 8.5 percent. Thus the real (inflation adjusted) total return was:

(1+.185)/(1+.085) – 1 = 9.22%

**Expected Rate of Return**

Probability is the percentage of the likelihood of an outcome. The expected rate of return [E(R)] is the sum of the products of each outcome (return) and its associated probability. In other words it is the weighted average of the possible returns multiplied by their respective probabilities.

**$E(R) = \sum R_i p_i$**

Where E (R) is the expected return from the stock, $\mathbf{R_i}$ is the return from stock under state ***i,*** $\mathbf{p_i}$ is the probability that states ***i*** occurs and n is the number of possible states.

**Example 4:** The following is the probability distribution of the rate of return on Kisan Foods Stocks.

**Solution:**

| State of the Economy | Rate of Return (%) | Probability | Expected ROR |
|---|---|---|---|
| Growth | 18.5 | 0.25 | 4.63 |
| Expansion | 10.5 | 0.25 | 2.62 |
| Stagnation | 1.0 | 0.25 | 0.25 |
| Decline | -6.0 | 0.25 | -1.50 |
| **Total** | | 1.00 | **6.00** |

**E(R) = 6%**

**Example 5:** The expected rate of return of individual assets can be calculated using the following equation:

$$E(R_x) = (R_1 \times P_1) + (R_2 \times P)_2 + (R_3 \times P_3) + ..... + (R_n \times P_n)$$

$$E(R_x) = \sum_{i=1}^{n} R_i P_i$$

Note that $E(R_x)$ is the expected return on asset X, $R_i$ is $i^{th}$ return and $P_i$ is the probability of $i^{th}$ return. Consider an example.

| State of Economy | Probability | Return (%) |
|---|---|---|
| A | 0.10 | -8 |
| B | 0.20 | 10 |
| C | 0.40 | 8 |
| D | 0.20 | 5 |
| E | 0.10 | -4 |

**Solution**

The expected rate of return of *X* is the sum of the product of outcomes and their respective probability. That is:

$$E(R_x) = (-8 \times 0.1) + (10 \times 0.2) + (8 \times 0.4) + (5 \times 0.2) + (-4 \times 0.1) = 5\%$$

**Variance and Standard Deviation**

The most commonly used measure of risk is variance or its square root, the standard deviation. The formulae for calculating variance and standard deviation of historical rates of return of a share are:

$$\sigma^2 = \frac{1}{n-1}\sum_{t=1}^{n}\left(R_t - \overline{R}\right)^2$$

$$\sigma = \sqrt{\sigma^2} = \sqrt{\frac{1}{n-1}\sum_{t=1}^{n}\left(R_t - \overline{R}\right)^2}$$

where $\sigma^2$ is the variance of the return, $\sigma$ is the standard deviation of return, **R** is the return from the stock in period i (i= 1,….n), $\overline{R}$ is the arithmetic return, and **n** is the number of periods.

**Example 6:** Consider the returns from a stock over a 6-year period:

$R_1$ = 15%, $R_2$= 12%, $R_3$= 20%, $R_4$= -10%, $R_5$ = 14% and $R_6$ = 9% Find the standard deviation and the variance for the stock

**Solution**

| Period | Return $R_1$ | Deviation $(R_1-\overline{R})$ | Square of deviation $(R_1-\overline{R})^2$ |
|---|---|---|---|
| 1 | 15 | 5 | 25 |
| 2 | 12 | 2 | 4 |
| 3 | 20 | 10 | 100 |
| 4 | -10 | -20 | 400 |
| 5 | 14 | 4 | 16 |
| 6 | 9 | -1 | 1 |
| | **$\sum R_1$ = 60**<br>$\overline{R}$ = 10 | | **$\sum(R_1-\overline{R})^2$ = 546** |

The variance and standard deviation of returns are calculated below:

$$\sigma^2 = \frac{1}{n-1}\sum_{t=1}^{n}\left(R_t - \overline{R}\right)^2$$

**$\sigma^2$ = 546/(6-1) = 546/5 = 109.2**

**$\sigma = \sqrt{\sigma^2}$**

**= 10.45%**

**Example 7:**

The share of Hypothetical Company Limited has the following anticipated returns with associated probabilities:

| **Return (%)** | –20 | –10 | 10 | 15 | 20 | 25 |
|---|---|---|---|---|---|---|
| **Probability** | 0.05 | 0.10 | 0.20 | 0.25 | 0.20 | 0.15 |

**Solution**

The risk, measured in terms of variance and standard deviation, is:

$$\sigma^2 = (-20-13)^2 \times 0.05 + (-10-13)^2 \times 0.10 + (10-13)^2 \times 0.20 + (15-13)^2 \times 0.25$$
$$+ (20-13)^2 \times 0.20 + (25-13)^2 \times 0.15 + (30-13)^2 \times 0.05 = 156$$
$$\sigma = \sqrt{156} = 12.49\%$$

The expected rate of return is:

$$E(R) = -20 \times 0.05 + -10 \times 0.10 + -10 \times 0.20 + 15 \times 0.25 + 20 \times 0.20 + 25 \times 0.15 + 30 \times 0.05 = 13\%$$

**Example 8**

Mr. Raj invests in equity shares of Wipro. Its anticipated returns and associated probabilities are given below.

| **Return** | -15 | -10 | 5 | 10 | 15 | 20 | 30 |
|---|---|---|---|---|---|---|---|
| **Probability** | 0.05 | 0.10 | 0.15 | 0.25 | 0.30 | 0.10 | 0.05 |

You are required to calculate the expected ROR and risk in terms of standard deviation

**Solution**

| **Return** | **Probability** | **R x P** | **$R - \overline{R}$** | **$(R - \overline{R})^2$** | **$(R - \overline{R})^2$ x P** |
|---|---|---|---|---|---|
| -15 | 0.05 | -0.75 | -24.50 | 600.25 | 30.0125 |
| -10 | 0.10 | -1.00 | -19.50 | 380.25 | 38.025 |
| 5 | 0.15 | 0.75 | -4.50 | 20.25 | 3.0375 |
| 10 | 0.25 | 2.50 | 0.50 | 0.25 | 0.625 |
| 15 | 0.30 | 4.50 | 5.50 | 30.25 | 9.0750 |
| 20 | 0.10 | 2.00 | 10.50 | 110.25 | 11.0250 |

| | | | | | |
|---|---|---|---|---|---|
| 30 | 0.05 | 1.50 | 20.50 | 420.25 | 21.0125 |
| 55 | | $\bar{R}$ = 9.50 | | | 112.8125 |

$\sigma^2 = \Sigma P(R - \bar{R})^2$

$\sigma = \sqrt{\sigma^2}$

SD = $\sqrt{}$ 112.8125 = 10.62 %

**Self Assessment Questions**

6. Return represents the _____ for undertaking an investment.
7. The return on investment consists of 2 elements _____ and _____.
8. Holding Period return if it is evaluated in percentage terms on an annual basis it is termed as _____.

## 3.5 Risk Preference

An investor with a certain risk tolerance and information on the expected return and standard deviation decides on various investments. Usually investors want to invest in securities which give higher returns at lower standard deviations. According to diminishing marginal utility, as a person gets additional wealth his utility for it increases at a declining rate.

**A risk-averse investor** will choose Investments with the least standard deviation from a bunch with equal rates of return, or investments with the highest return from a bunch with equal standard deviations.

**A risk-seeking investor** likes investment with higher risk irrespective of the rate of return. In reality, most investors are risk-averse.

**Risk Premium** =***f*** (Business risk, Financial Risk, Liquidity risk, Exchange risk, Country risk)

(or)

**Risk Premium =*f* (Systematic Market Risk*)***

**Risk Preference**

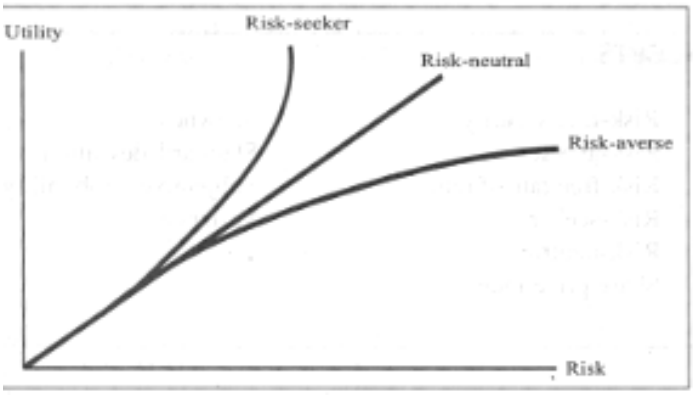


**Fig. 3.1: Risk preference**

**Normal Distribution and Standard Deviation**

The normal distribution is a bell shaped curve that is smooth, symmetric and continuous without skewness. The spread of the normal distribution is characterised by the standard deviation. What is the probability of obtaining a return exceeding or lower than the expected (mean) return? In case of normally distributed returns, it depends only on the standard deviation. It is useful to notice certain properties of a normal distribution.

**Normal Distribution**

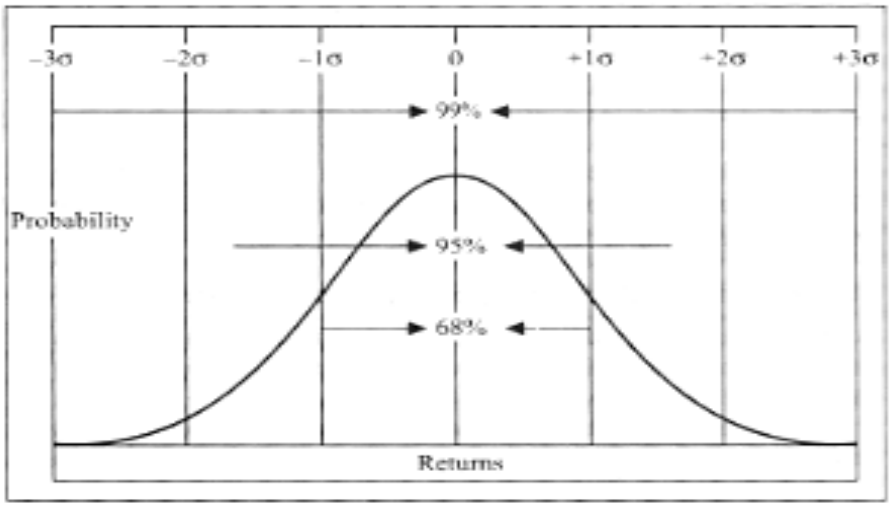


**Fig. 3.2: Normal Distribution of Returns**

- The area under the curve sums to 1.

- The curve reaches its maximum at the expected value (mean) of the distribution and one-half of the area lies on the either side of the mean.
- Approximately 50 percent of the area lies within $\pm 0.67$ standard deviations of the expected value; about 68 percent of the area lies within $\pm 1.0$ standard deviations of the expected value; 95 percent of the area lies within $\pm$ 1.96 standard deviation of the expected value and 99 percent of the area lies within $\pm$ 3.0 standard deviation of the expected value.

The normal probability table can be used to determine the area under the normal curve for various standard deviations. The probability of occurrence can be read from the normal probability table. This table is the 'right tail' of the distribution; that is probabilities of the unknown quantity being greater than X standard deviations from the expected value (mean) are given in the table. The distribution tabulated is a normal distribution with mean zero and standard deviation of 1. Such a distribution is known as standard normal distribution. However, any normal distribution can be standardised and hence the table of normal probabilities will serve for any normal distribution. The formula to standardise is:

$$S = \frac{R - E(R)}{\sigma}$$

R is the outcome (return) in which we are interested, E (R) is mean or expected return and S is the number of standard deviations from the expected return.

**Activity:**
A stock is at Rs 1000 on day1. The total risk 'σ' of the stock is 3% per day. Estimate the range of prices that can be observed on next day with 99% probability.
Hint: At 99% probability, the value can be anywhere between + 3 3. 'σ' from the mean.
Price can vary between 1000-(3*3%*1000)= 1000-90=910
1000+3*3%*1000=1000+90=1090
Thus the price may varies between Rs 910 to Rs 1090 on the next day.

**Self Assessment Questions**

9. A _____ does not consider risk and he would always prefer investments with higher returns.
10. _____ of the area lies within + 1.96 standard deviation of the expected value
11. The curve reaches its maximum at the _____ of the distribution and one-half of the area lies on the either side of the mean.

## 3.6 BETA

Beta reflects the systematic risk, which cannot be reduced. Investors can reduce unsystematic risk when they invest their wealth in a well-diversified market portfolio. A beta of 1.0 indicates average level of risk while and a higher beta shows that the security's return fluctuates more than that of the market portfolio. A zero beta means no risk.

Beta is a ratio of the covariance of returns of a security, j, and the market portfolio, m, to the variance of return of the market portfolio:

$$\beta_j = \frac{Cov_{jm}}{Var_m} = \frac{\sigma_j \sigma_m Cor_{jm}}{\sigma_m^2} = \frac{\sigma_j Cor_{jm}}{\sigma_m}$$

Where $\beta j$ is beta of the security, $\sigma j$ the standard deviation of return of security, $\sigma m$ the standard deviation of returns of the market portfolio, $\sigma 2m$ the variance of returns of the market portfolio m and Corjm the correlation coefficient between the returns of the security j and the market portfolio m.
The expected return on a security is given by the following equation:

$$E(R_j) = R_f + (R_m - R_f)\beta_j$$

where Rf is the risk-free rate, Rm the market return and βj the measure of the security's systematic risk.

**Example:**

This distribution of returns for share P and the market portfolio M is given below

| | **Returns (%)** | |
|---|---|---|
| **Probability** | **P** | **Q** |
| 0.30 | 30 | -10 |
| 0.40 | 20 | 20 |
| 0.30 | 0 | 30 |

You are required to calculate the expected return of security P and the market portfolio, the covariance between the market portfolio and security P and beta for the security.

**Solution**

**Security P**

| Probability (p) | Returns (Rp )(%) | Expected return (Rp) x (P) | Deviation (Rp – Erp) | Deviation Square $(Rp – Erp)^2$ | $(Rp – Erp)^2$ x(P) |
|---|---|---|---|---|---|
| 0.3 | 30 | 9.00 | 13.00 | 169 | 50.7 |
| 0.4 | 20 | 8.00 | 3.00 | 9 | 3.6 |
| 0.3 | 0 | 0.00 | -17.00 | 289 | 86.7 |
| | | ERp = 17.00 | | | Var = 141.0 |
| | | | | | S.D = √141<br>σP = 11.87 |

**Market Portfolio M**

| Prob (P) | $R(_M)$ | Expected Return $(R_M)$ x (P) | Deviation $(R_M - ER_M)$ | $(R_M - ER_M)^2$ | $(R_M - ER_M)^2$ x (P) |
|---|---|---|---|---|---|
| 0.3 | -10 | -3.00 | -24.00 | 576 | 172.8 |
| 0.4 | 20 | 8.00 | 6.00 | 36 | 14.4 |
| 0.3 | 30 | 9.00 | 16.00 | 256 | 76.8 |
| | | $ER_M$ = 14.00 | | | $Var_M$= 264.0<br>$\sigma_M$ = 16.25 |

| $(Rp – Erp) (R_M - ER_M)$ | $(Rp – Erp) (R_M - ER_M)$ x (P) |
|---|---|
| 13x - 24 = -312 | - 312 x .3 = - 93.6 |
| 3 x 6 = 18 | 18 x .4 = 7.2 |
| -17 x 16 = - 272 | - 272 x .3 = - 81.6 |
| | Covariance $_{PM}$= - 168.0 |

| | P | M | |
|---|---|---|---|
| Std deviation | 11.87 | 16.25 | |
| Covariance | | | -168.0 |
| Correlation | = Covariance / σMσP<br>= -168 /(16.25)(11.87) | | -0.871 |
| Beta | = Covariance / | = -168/264 | -0.636 |

| | | | |
|---|---|---|---|
| | variance (M) | | |

**Self Assessment Questions**

12. Investors can reduce _____ when they invest their wealth in a well-diversified market portfolio
13. Beta is a ratio of the _____of a security, j, and the _____, m, to the variance of return of the market portfolio

## 3.7 Capital Allocation Line

The capital allocation decision is the choice of the proportion of the overall portfolio in three broad ways:

1. Safe but low return money market securities or
2. Risky but high return securities.
3. Particular securities to hold within each asset class

Long-term bonds are riskier investment than treasury bonds and the investment in stocks are riskier still. But, riskier investments offer more than the average rate of returns. Investors under these circumstances construct their portfolios of investments using securities from a number of asset classes.

Capital allocation decision deals with the specific individual choice of the best risk –return combination from the set of feasible combinations.

Consider an investor investing a portion of his investment budget ***'y***' in risky portfolio 'M' and the remaining portion ***(1-y)*** in the risk free asset 'F'. The risky rate of return is denoted by ***rp*** and its expected rate of return by ***E(rp)*** and its standard deviation by ***σp***

- The rate of return on ***R***f is 7%
- Expected return on the portfolio ***E(rp)*** is 15%
- Standard deviation ***σp*** is 22%

The risk free asset (Rf) appears on the vertical axis because its standard deviation is zero. The risky asset M is plotted with a standard deviation σp= 22% and the expected return E(rp) is 15%
The risk premium on the risky asset is

**E(rp) – R(f) = 15% - 7% = 8%**

The rate of return on the complete portfolio is
**Rc = y E(rp) + (1-y) rf**

**= y E(rp) + rf – yrf**
**= rf + y [E(rp) –rf]**
**= 7% + y (15-7)**
**= 7% + 8y**

The total rate of return for the portfolio includes the risk free rate and the risk premium. The risk premium is determined by the risk premium of the risky asset. As investors are risk averse they invest in those assets that have a positive risk premium.

The standard deviation for the portfolio containing risky asset and a risk-free asset is given by the standard deviation of the risky asset multiplied by the weight of the risky asset. Here the standard deviation of risky portfolio is 22%, **,σ c = y σp = 22y**

**Investment Opportunity set**

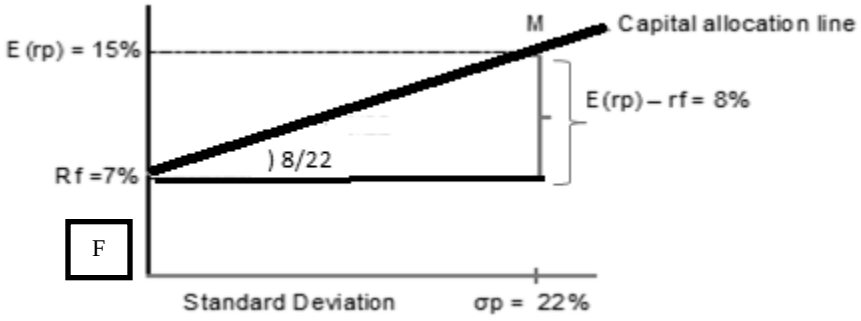


**Fig. 3.3: Investment Opportunity Set**

From the figure 3.3 you can see that the risk free asset **'F'** is plotted on the vertical axis as the standard deviation is zero. Whereas 'M' the risky asset **'M'** is plotted with a standard deviation **σp= 22%** and the expected return of 15%. Assume the investor invests only in the risk asset then complete portfolio is M and y=1.0 Similarly if the investor invests in the risk free portfolio F , **y=0**, then **1-y=1**.0**.**

If the portfolio lies in the midrange between y =0 and y= 1; the portfolio graph will be a straight line connecting points F and M. The slope of the line is **y [E(rp) – rf]/σp = 8/22.**

**Increasing the fraction of the overall portfolio invested in the risky asset increases the expected return at the rate of 8%. The extra return per extra risk is thus 8/22 = .36**

Thus the expected return of the complete portfolio as a function of its standard deviation is a straight line with intercept $r_f$ and the slope:

$$S = \frac{E(rp) - rf}{\sigma p} = \frac{8}{22} = 0.36$$

The investment opportunity set, is the set of feasible expected return and standard deviation pairs of all portfolios resulting from different values of y. From the figure you can see that the starting at rf and ending at called the **capital allocation line (**CAL). This line represents all the risk return combinations available to the investors. The slope of the CAL denoted by S is called the reward-to-variability ratio. It equals the increase in the expected return of the complete portfolio per unit of additional standard deviation (incremental return per incremental risk). The slope is also called the reward-to-variability ratio.

**Self Assessment Questions**

14. The capital allocation decision is the choice of the _____ of the overall portfolio.
15. Capital Allocation decision deals with the specific individual choice of the best risk –return combination from the set of _____

## 3.8 Summary

- Risk is the likelihood that your investment will either earn money or lose money. It is the degree of uncertainty about your expected return from an investment, including the possibility that some or all of your investment may be lost.
- Risk is commonly measured using variance, standard deviation and beta. Variance is the mean of the square of deviations of individual returns around their average value. Standard deviation is the square root of variance. Beta reflects the volatility of the returns in relation to market movements.

- Return represents the reward for undertaking an investment. The return on investment consists of 2 elements - Current return and Capital return.
- Current return is measured as periodic cash flow (income) in relation to beginning price of the investment.
- Capital return is a component of return is reflected in the price change (appreciation/depreciation) in relation to beginning price of the asset.
- The normal distribution is a smooth, symmetric, continuous, bell shaped curve. The distribution is neither skewed nor peaked. The spread of the normal distribution is characterised by the standard deviation.
- Capital allocation decision deals with the specific individual choice of the best risk –return combination from the set of feasible combination

## 3.9 Glossary

***Probability:*** The percentage of the likelihood of an outcome.

***Return:*** represents the reward for undertaking an investment.

***Risk:*** The likelihood that your investment will either earn money or lose money.

## 3.10 Terminal Questions

1. Explain the meaning of risk and how it is measured
2. Describe the factors that affect risk.
3. Explain the term relative return and holding period return.
4. What is expected rate of return and how is it computed?
5. What is Beta and how is it computed?
6. Explain capital allocation line.

## 3.11 Answers

### Self Assessment Questions

1. Potential reward
2. Variance, standard deviation, beta
3. Variance
4. Inflation risk
5. Market risk
6. Reward
7. Capital return and current return

8. Holding period yield
9. Risk-neutral investor
10. 95 percent
11. Expected value (mean)
12. Unsystematic risk
13. Covariance of return, market portfolio
14. Portfolio
15. Feasible combination

**Terminal Questions**

1. Risk refers to the likelihood that your investment will either earn money or lose money. For more details, refer section 3.2.
2. The factors like business, inflation, market and interest rate risk are the factors that affect risk. For more details, refer section 3.3
3. Holding period is a period during which an investor holds the investment. For more details, refer section 3.4
4. The expected rate of return [E(R)] is the sum of the products of each outcome (return) and its associated probability. For more details, refer section 3.4
5. Beta reflects the systematic risk, which cannot be reduced. For more details, refer section 3.6
6. The capital allocation decision is the choice of the proportion of the overall portfolio. For more details, refer section 3.7

## 3.12 Case Study

Here are some historical data on the risk characteristics of Wipro and Tata Motors:

| | Wipro | Tata |
|---|---|---|
| Beta | 1.25 | 1.33 |
| Yearly standard deviation of return (%) | 41.88% | 40.57% |

The correlation coefficient between Wipro's and Tata Motors' returns is 0.72.

**Discussion Questions**

a. What is the standard deviation of a portfolio invested half in Wipro and half in Tata Motors?

b. What is the standard deviation of a portfolio invested one-third in Wipro, one-third in Tata Motors and one-third in government T-bills?
c. What is the approx standard deviation of a portfolio comprised of 100 stocks with betas of 1.25 (like Wipro)?

**Hint**

The calculations should not need anything more than simple arithmetic and knowledge of the formulas. It is much more important to study the numbers after solving the problem and comment on the portfolio risks.

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# Unit 4 Fundamental Analysis

**Structure:**



## 4.1 Introduction

There are two types of data analysis techniques that are available to assist investors in their choice of investments – **fundamental analysis** and **technical analysis**.

Fundamental analysis is a technique to evaluate a security by studying the financial data of the issuer of the security. It studies the issuer's financial results, assets and liabilities, management, and position in the industry. It focuses on the basics of the business, its fundamental strengths.

Technical analysis (We will study in the next unit) analyses statistics that are generated by market activity, such as historical prices and trade volume. This unit deals with fundamental analysis.

**Objectives:**

After studying this unit, you will be able to:

- demonstrate a basic understanding of fundamental analysis
- explain the steps in fundamental analysis
- explain how the economy, industry and company analyses are carried out.
- explain intrinsic value of Securities
- discuss issues with Fundamental Analysis

## 4.2 Steps in Fundamental Analysis

Fundamental analysis focuses on economic, industry, and company information. Economic analysis helps to decide how to allocate investment funds among countries, and within countries among bonds, shares and cash. Industry analysis helps determine which industries to invest in and which to disinvest. Company analysis helps identify companies in the selected industries whose shares may be undervalued and so worth buying.

Thus, if you wish to invest in a company's securities, a rigorous and thorough approach would be needed. We need to analyse the economy and the industry to which the company belongs, before analysing company-specific factors.

The economy is studied to determine if the overall conditions are good for the financial markets. Is inflation a concern? Are interest rates likely to rise or fall? Are consumers spending? Is the trade balance favourable? Is the money supply expanding or contracting? These are some of the questions that a fundamental analyst might ask.

The industry to which the company belongs to influences company's outlook. Even the best of companies can post mediocre returns if the industry is struggling. It is often said that a weak stock in a strong industry is better than a strong stock in a weak industry.

After determining the economic and industry conditions, the company itself is analysed by studying its financial statements.

This three-step approach helps us to estimate the intrinsic value of a security, using a valuation model. Several valuation models are available, including dividend models which focus on the present value of expected dividends, earnings models which focus on the present value of expected earnings, and asset models which focus on the value of the company's assets. (These models have been covered in detail in other units).

Comparing the estimated intrinsic value of the security to its current market price helps determine whether it is overvalued, undervalued or correctly valued.

There are, broadly two fundamental analysis approaches – top-down and bottom-up.

The top-down approach, also known as the E-I-C (Economy-Industry-Company) analysis shown in figure 4.1, involves beginning with a broad overview and working down to a specific stock pick.

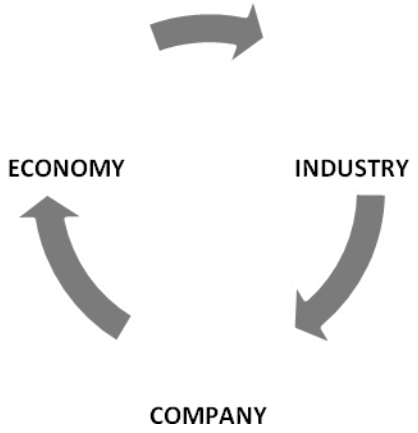


**Fig. 4.1: E-I-C Analysis**

The bottom-up approach, also known as the C-I-E (Company-Industry-Economy) analysis, starts with the analysis process of selecting companies that present attractive investment opportunities and analysing them thoroughly.

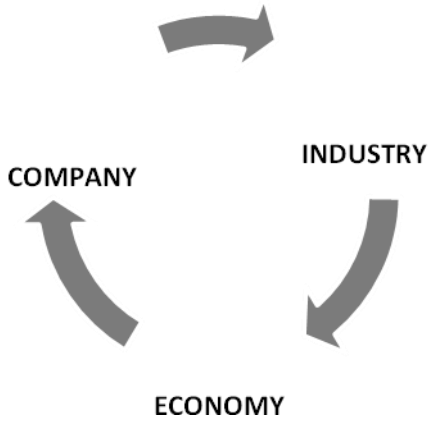


**Fig. 4.2: C-I-E Analysis**

Remember both the approaches achieve the same goal which is to aid in the selection of a potential profitable investment.

Analysts prefer the top-down approach because it is most logical approach among the two. In this approach the analyst first assesses the economic climate for investment, and then chooses the best performing industry in the current economy. Finally the search is narrowed down to the best individual firms within that industry.

The bottom-up approach is the opposite of the top-down approach. Analysts who use the bottom-up investment analysis are termed as 'stock pickers'. This is because they first select the security of a firm to invest in. Then they investigate the industry in which the firm lies and finally assess whether the current economic conditions are favouring the industry.

Generally when the economy grows, majority of industries and companies also grow and vice versa. Hence an economic analysis must be performed to understand whether an investment must be made under the current economic conditions.

For example in a growing economy certain industries like technology or biotech may benefit more from the boom than others. If the stock of such companies is picked, investors may opt for an aggressive growth strategy. This assures them of high returns on investment at relatively low risk.

When the economy slows down the investors may adopt a conservative strategy. So they buy stocks of stable companies like consumer staples, utilities and energy.

- To analyse companies, investors first identify leaders and innovators. They do this by identifying the company's current business, competitive environment and future trends. They also find rankings of companies by market share, product position and competitive advantage. They find out who the current industry leader is.
- They check how the balance of power is affected by changes within the sector.
- Information about barriers to entry is also collected.

The comparative analysis is useful in finding companies which are better than others - be it in marketing, technology, market share or innovation. From this final shortlist of companies, investor selects companies that have the most sensible business plan, sound management and strong financials.

**Self Assessment Questions**

1. The top-down approach, also known as the _____ analysis shown involves beginning with a broad overview and working down to a specific stock pick.
2. The bottom-up approach, also known as the _____ analysis, starts with the analysis process of selecting companies that present attractive investment opportunities and analysing them thoroughly.

## 4.3 Economy Analysis

Economic analysis is done for two reasons:

- A company's growth prospects are dependent on the economy in which it operates.
- Most companies' shares and stocks generally perform well when the economy is in boom.

### 4.3.1 Factors to be considered in economy analysis

The economic variables that are considered include:

- gross domestic product (GDP) growth rate
- exchange rates
- balance of payments (BOP)

- current account deficit
- government policy (fiscal and monetary policy)
- domestic legislation (laws and regulations)
- unemployment rates
- public attitude (consumer confidence)
- inflation
- interest rates
- productivity (output per worker)
- capacity utilisation (output by the firm).

GDP is the total income earned by a country and GDP growth rate is comparison of GDP year-on-year.

Inflation is important for investors, as excessive inflation undermines consumer spending power (prices increase) and so can cause economic stagnation. However, deflation (negative inflation) can also hurt the economy, as it encourages consumers to postpone spending (as they wait for cheaper prices).

Exchange rate changes affect exports and imports. If exchange rate strengthens, exports are hit. If the exchange rate weakens, imports are affected. BOP influences exchange rate movements, through supply and demand for foreign currency.

BOP reflects a country's international monetary transactions for a specific time period. It consists of current account and capital account. The current account is an account of the trade in goods and services. The capital account is an account of the cross-border transactions in financial assets.

When a country's imports exceed its exports we say there is a current account deficit. A capital account deficit occurs when the investments made in the country by foreigners is less than the investment in foreign countries made by local players. The currency of a country appreciates when there is more foreign currency coming into the country than leaving it. Therefore, a surplus in the current or capital account causes the currency to strengthen and a deficit causes the currency to weaken.

The levels of interest rates (the cost of borrowing money) in the economy and the money supply (amount of money circulating in the economy) also have a bearing on the performance of businesses. Other things being equal,

an increase in money supply causes interest rates to fall; a decrease causes the interest rates to rise.

If interest rates are low, the cost of borrowing goes down, and companies find it easier to finance their expansion through borrowing. On the other hand, when the interest rates go up, borrowing may become too costly and plans for expansion get postponed. Interest rates also have a significant effect on the share markets. In very broad terms, share prices improve when interest rates fall and vice versa. This is because (1) profitability improves with reduced interest costs and (2) the discount rate for present value calculation (which is at least partly linked to interest rate) will be lower.

### 4.3.2 Business cycle and leading coincidental and lagging indicators

All economies experience recurrent periods of expansion and contraction. This recurring pattern of recession and recovery is called business cycle. The business cycle consists of expansionary and recessionary periods. When business activity reaches a high point, it peaks. A low point on the cycle is called trough. Troughs represent the end of a recession and the beginning of an expansion. Peaks represent the end of an expansion and the beginning of a recession.

In the expansion phase, business activity grows, production and demand increases, and employment expands. Businesses and consumers borrow more for investment and consumption purposes. As the cycle moves into the peak, demand for goods overtakes supply and prices rise. This creates inflation. During inflationary times, there is too much money chasing a limited amount of goods.

Therefore, businesses charge more and cause prices to rise and purchasing power to fall. As a result demand slackens and economic activity declines. The cycle then enters the recessionary phase. As business activity contracts, employers lay off workers (unemployment increases) and demand further slackens. Usually, this causes prices to fall. The cycle enters a trough. Eventually, lower prices stimulate demand and the economy starts moving up.

The performance of an investment is patently influenced by the business cycle. To some extent business cycles can be predicted using their cyclical nature and the economic indicators. Economic indicators are quantitative

announcements (released as data), released as per a predetermined schedule, reflecting the financial, economic and social atmosphere of the economy. They are published by various agencies of the government and also private sector.

Economists use three types of indicators that provide data on the movement of the economy as the business cycle enters different phases. These are leading, coincident, and lagging indicators.

Leading indicators precede the upward and downward movements of the business cycle and can be used to predict the near term activity of the economy. Thus rising corporate profits may mean possible stock market price increases. Examples of leading indicators are average weekly hours of production workers, money supply etc.

Coincident indicators usually mirror the movements of the business cycle. They tend to change directly with the economy. Example includes industrial production, manufacturing and trade sales etc.

Lagging indicators are economic indicators that change after the economy has already gone into a particular phase. Lagging indicators tend to follow (lag) economic performance. Examples are ratio of trade inventories to sales, ratio of consumer instalment credit outstanding to personal income etc.

**Self Assessment Questions**

3. Distinguish between top-down and bottom-up approach to fundamental analysis. Which is better?

4. What are the factors to be considered in economy analysis?

5. What are leading, lagging and coincident indicators?

_____
_____
_____
_____
_____
_____

## 4.4 Industry Analysis

Many times it is more important to be in the right industry than in the right stock. Industries tend to react differently towards different economic cycles. Other factors being equal, companies from similar industries tend to respond alike towards certain economic conditions; when the share prices move, they usually move as groups.

Industry-specific news such as new product launches, enactment of economic legislation related to the industry or new rules framed by the concerned regulatory body are some of the factors that the industry analyst considers, to assess the changing potential of an industry

Key industry data include the industry structure, overall growth rate and market size, importance to the economy, competition, product quality, cost elements, supply-demand relationships, government regulation and business cycle exposure.

### 4.4.1 Factors affecting industry performance

The factors affecting industry performance are given below.

**Sensitivity to the business cycle**

Industries are affected in a different ways to recessions and expansions. For example, heavy industries like steel manufacturers are harshly affected during recession. On the other hand, consumer goods like food and beverage firms are less affected. In an inflation spiral, regulated industries such as utilities are severely affected as they are powerless to pass price increase to customers.

In a booming economy some industries show a better performance when compared to others. This is because the demand trends of different industries vary.

For example, during recession people do not stop taking medicines therefore pharmaceuticals may outperform the rest of the market. Hence an investor may put their savings in industry outperformers stock. Similarly in economic upturn, investors prefer to invest in growth stocks, like technology. Investors consider specific industry cycles that could differ from the economic cycle.

Most industries can either be categorised as defensive or cyclical. Defensive industries are those that sell goods that people consume irrespective of the state of the economy, such as food or pharmaceuticals. Their performance tends to be relatively steady in bad times, but earnings will not increase proportionately with an upswing in the economic cycle. In general, people do not eat more or buy more medicines when they have more disposable income – they may buy more luxury items when their income improves.

Cyclical industries are those whose fortunes change with the rise and fall of the economy. The profitability of cyclical industries is closely tied to a particular economic cycle, for example consumer durables.

**Industry life cycle**

Most industries go through fairly well-defined life cycle stages that affect the growth of companies in that industry, competition climate, the types of profit margins, and overall stability of the market. The industry life cycle has a major effect on the earnings per share and rates of return offered by the industry. As a result, the ability to recognise the industry life cycle stage is a valuable asset for any investor.

Generally industries evolve through three stages–the pioneering stage, the expansion stage, and the stabilisation stage. This concept of an **industry life cycle** applies to industries or product lines within an industry.

- **Pioneering stage:** During this stage, there is a rapid growth in demand for the company. Many companies fail at this stage as a result of strong competitive pressures while others achieve rapid growth in sales and earnings. The investors of such companies have a good chance of earning more than the expected returns. At the same time the risk of the firm failing is also high.
- **Expansion stage:** In this stage the pioneer firms that have survived continue to grow and prosper at a moderate growth rate. In this phase,

firms focus on improving their products and at times lower prices. As firms have stabilised in financial performance the companies they attract investment capital. This is because investors prefer to invest in these firms with proven track record and low risk of failure. Also the dividends pay-outs are good that make it more attractive for the investor to buy stock of these firms to investors.

- **Stabilisation stage (maturity stage):** This is a stage of moderate growth for firms. Sales increase, but at a slower rate. Products are standardised and less innovative while competition is stiff, and costs are stable. Such firms continue to operate without significant growth, and are usually headed for stagnation.

The three-part classification of industry life cycle described above aids the investors in narrowing down their investment target.

**Industry structure and performance**

You may have read Michael Porter's work on competitive strategy. Here he talks about how the competitive rivalry in an industry governs its ability to sustain above-average returns. According to Porter, competition has the following five dimensions.

- **Threat of new entrants:** New entrants put pressure on price and profits. Therefore barriers to entry can be a key determinant of an industry's profitability. The most attractive segment has high entry barriers and low exit barriers. Although any firm should be able to enter and exit a market, each industry often presents varying levels of difficulty, commonly driven by economies. Manufacturing-based industries are more difficult to enter than many service-based industries. **Barriers to entry** protect profitable areas for firms and inhibit additional rivals from entering the market.
- **Bargaining power of buyers:** The bargaining power of buyers describes the impact customers have on an industry.
- **Rivalry between existing competitors:** Firms make efforts to establish a competitive advantage over their rivals. The intensity of rivalry varies within each industry. Industries that are "concentrated," versus "fragmented," often display the highest level of rivalry.

- **Threat of substitute products or services:** Substitute products are those that are available in other industries that meet an identical or similar need for the end user. As more substitutes become available and affordable, the demand becomes more elastic since customers have more alternatives. Substitute products may limit the ability of firms within an industry to raise prices and improve margins.
- **Bargaining power of suppliers:** An industry that produces goods requires raw materials. This leads to buyer-supplier relationships between the industry and firms that provide raw materials. Depending on where the power lies, suppliers may be able to exert an influence on the producing industry.

The strength of these five factors varies across industries and can change over time. Fundamental analysts analyse the industry structure to find the strength of the five forces, which in turn determine industry profitability.

**Self Assessment Questions**

6. _____ industries are those whose fortunes change with the rise and fall of the economy.
7. According to Porter, competition has _____ dimensions.

**Activity:**
Does the market prices of similar companies in the same industry exhibits the same relationship with respect to Book value and EPS.

## 4.5 Company Analysis

Once the economic forecast and industry analysis are done, the fundamental analyst focuses on choosing the best positioned company in the chosen industry. Selecting a company involves an analysis of the company's management, its financial statements and the key drivers of its future growth. The analyst looks for companies with professional management, strong financials, and great prospects, which are undervalued by the market. The future is in focus here, and the past is relevant only to the extent it reflects the management's track record.

The areas of focus in company analysis are given below.

### 4.5.1 Business and financial risk

Investors look for a return that is relative to the perceived risk associated with the company. The risk can be measured as variability of the company's after-tax cash flows. A company's overall risk has two components – business risk and financial risk.

**Business risk** is uncertainty about future operating income or earnings before interest and tax (EBIT). This is the risk attributable to the composition of the company's assets. Factors affecting business risk are:

a) sensitivity of company sales to general economic conditions
b) industry conditions including competition, growth prospects, and the company' ability to affect its selling and input prices
c) company characteristics including size of the company, management, and **operating leverage**.

**Operating leverage** is the use of fixed operating costs as opposed to variable operating costs. A company with relatively high fixed operating costs will experience more variable operating income if sales change. If most costs are fixed and hence do not decline when demand falls, the company has high operating leverage.

**Financial risk** is the variability or uncertainty of a company's earnings per share (EPS). Financial leverage is the use of fixed-cost sources of financing (debt, preferred stock) rather than variable-cost sources (common stock). Financial risk is the additional risk concentrated on common stockholders as a result of financial leverage.

### 4.5.2 Financial statement analysis

Analysing a company's financial statements and ratios provide analysts with useful leads. From it they estimate the magnitude of future cash flows (earnings and dividends) and the risk inherent in these estimates. These estimates are then used in evaluating a company.

The analysts rely on three statements – income statement, balance sheet and the statement of cash flows. The major tools for analysis are ratio analysis and growth rates.

The income statement provides information on the company's net income for the period of a year, half-year or quarter. The key variables to watch are revenues, gross profit margin, operating profit margin, net profit margin and

earnings per share (EPS). Special attention is needed on the "quality of earnings".

Under generally accepted accounting principles, companies are allowed fairly wide latitude on how they recognise revenues and handle extraordinary income and expenses. Many companies 'manage' or 'smooth' earnings, believing that it adds to the stability of the stock price over time. The analysts need to watch for such manipulations, as it may signal problems. Analysts also look for where the earnings are coming from – from increased sales, or decreased expenses. Costs can only be cut up to a limit and so profit increases via cost reduction can at best be temporary.

The balance sheet is a presentation of a company's assets, liabilities and shareholders' equity at a point in time. The key variables to watch on the balance sheet are cash, accounts receivable, inventories, and long-term debt. An interesting quote to remember while analysing balance sheet comes from Benjamin Graham in his book *Security Analysis:* "liabilities are real but assets are of questionable value."

The cash flow statement shows how the company has performed in managing inflows and outflows of cash and how it has funded its operations and growth. The statement of cash flows is far more difficult to manipulate than the income statement, and can help to gauge the quality of earnings.

Financial ratios are commonly used to analyse a company's financial performance. Analysts examine ratios at two levels: (1) a company's ratios for a period compared to previous periods (time series analysis or trend analysis) and (2) a company's ratios compared to those of comparable companies (cross-section analysis).

Financial ratios measure four crucial criteria of financial performance as given below.

- **Profitability:** Arguably the most important yardstick of financial performance, profitability is measured in terms of sales and in terms of investment and pinpoints the factors impacting the result for the period. Return on net worth, return on total assets, and operating ratios to sales are key ratios in this genre.

- **Liquidity:** Liquidity portrays the company's ability to meet its short-term financial obligations and strength in working capital management. Current ratio and quick ratios are major indicators of liquidity.
- **Efficiency:** Efficiency means competence in using the firm's assets to generate sales and profits. A host of turnover ratios are used to measure efficiency, like receivables turnover ratio and inventory turnover.
- **Solvency:** Solvency is the long-term sustainability or the capability of a business to survive troughs in the business cycle. This can also be called the assessment of riskiness of the business, since a business that plays safe has greater chances of survival than a business that takes many risks.

Two kinds of ratios – leverage ratios and coverage ratios–help measure the solvency of a business. Examples of leverage ratios are 'debt ratio' and 'debt to equity ratio'. Examples of coverage ratios include the 'times interest earned ratio' and the 'fixed charge coverage ratio'. A popular ratio with bankers, which they use to assess this parameter, is DSCR (debt services coverage ratio).

The growth rates are a variant of trend analysis of ratios. The growth of key variables to a business, including revenues, operating profits, and free cash flow, is tracked and the growth path of the company is charted.

### 4.5.3 Business plan indicators

The business plan outline and strategic thinking of the management are usually spelt out in the prospectus of a new company and in the annual financial report of an existing company. For a new business, the questions raised are:

- Does the business make sense?
- Is it viable?
- Will there a market for its goods and services?
- What profits can be made?

For an established business, the questions may are:

- Is the company on the right track?
- Is it a market leader?
- Can it maintain the leadership position?

### 4.5.4 Management

The success of a business plan lies mainly in its execution. Great execution requires top-quality management. Investors therefore need to assess the capability of the company's board and executive management. Some of the questions that should be addressed are:

- How sound is the management team?
- Do they have a proven track record?
- How long have they worked together?

**Self Assessment Questions**

8. _____ portrays the company's ability to meet its short-term financial obligations and strength in working capital management.
9. _____ means competence in using the firm's assets to generate sales and profits
10. _____ is the long-term sustainability or the capability of a business to survive troughs in the business cycle.

## 4.6 Intrinsic value of securities

After studying the conditions and the outlook for economy, industry, and company, the fundamental analyst determines the intrinsic value of a security and compares it to the current market price of the security. The comparison reveals whether the company is overvalued or undervalued. If the company is overvalued it means that it priced in the market above its fair value. If it is undervalued it means that it is priced in the market below its fair value. When the share is undervalued it is bought and held until other investors' realise its value. This pushes its value towards its fair share price due to the increasing demand. On the other hand, when a share is over-priced it may be a signal to sell the shares.

This exercise capitalises on the observed discrepancy in market price and intrinsic value of company shares. In other words, the valuation gap exposed by the fundamental analysis is used by the investors to reap capital gains till price corrections take place in the market.

When the market is in equilibrium, the current market price reflects the average intrinsic value evaluations made by all investors. If this value differs for an investor, it effectively means differing from the market consensus on

the expected return or risk or both. Such investors may profit by acting before the market consensus reflects the correct information.

**Self Assessment Questions**

11. When the market is in _____, the current market price reflects the average intrinsic value evaluations made by all investors.

## 4.7 Issues with Fundamental Analysis

**Time constraints:** Fundamental analysis offer excellent insights, but it is time-consuming. With passage of time valuations could be contradictory to the current stock price.

**Difficulty in being Industry/company specific:** The type of analysis technique to be used depends on the industry and the facts of each company. For example, you may use a subscription-based model for an Internet Service Provider (ISP). The same is not the best method to value an oil company. Refining the analysis to requirements becomes a key problem.

**Subjectivity of assumptions:** Projections are based on assumptions that might be subjective in nature. This may lead to errors in numbers which significantly impact the valuation.

**Analyst bias:** As maximum data is used for fundamental analysis originates the company, the presence of bias cannot be ruled out. Another concern is, many analysts work for big brokers whose business is underwriting and investment banking for the companies. Though precautions are taken to prevent conflict of interest, the on-going relationship between the brokers and the company may influence the sell-side analyst. Buy-side analysts who work for mutual funds and money managers tend to look beyond the company statistics.

**Definition of fair value:** When market evaluations vary considerably, there is pressure to change growth and multiplier assumptions to reduce the gap. If the stock is valued at 50 times the earnings in the market and the present assumption is 30 times the analyst may change the assumption. Just as stock prices fluctuate, growth and multiplier assumptions also change. Who should we trust the market with its stock price, or the analyst with assumptions?

**Self Assessment Questions**

12. What is 'financial statement analysis?

_____
_____
_____
_____
_____

13. What is industry life cycle?

_____
_____
_____
_____
_____
_____

## 4.8 Summary

- Fundamental analysis is a security valuation method that uses financial and economic analysis to evaluate businesses to predict the movement of security prices.
- The objective of fundamental analysis is to determine the fair or 'intrinsic' value of securities, through the examination of the three variables and the understanding of their interactions.
- Fundamental analysis is based on the assumption that in the short run, the market price of a security can differ from its intrinsic value.
- The end goal of performing fundamental analysis is to produce a fair value for a security that an investor can compare with the security's current market price.
- After determining the intrinsic value of a share, and comparing it with its market price, fundamental analysts assess whether the company is overvalued or undervalued, and make use of the valuation gap between the intrinsic and market value of stocks, and reap capital gains when price corrections take place in the market over a period of time.

## 4.9 Glossary

***BOP:*** Reflects a country's international monetary transactions for a specific time period.

***Balance sheet:*** Presentation of a company's assets, liabilities and shareholders' equity at a point in time

***Cash flow statement:*** statement of managing inflows and outflows of cash.

## 4.10 Terminal Questions

1. Explain the process of fundamental analysis.
2. Briefly explain the variables that are analysed in economy analysis.
3. How is company analysis useful in determining the intrinsic value of a security?
4. Discuss the factors affect industry analysis.
5. Analyse the issues in Fundamental analysis.

## 4.11 Answers to SAQs and TQs

### Self Assessment Questions

1. E-I-C (Economy-Industry- Company)
2. C-I-E (Company-Industry-Economy)
3. For more details, refer section 4.2.
4. For more details, refer section 4.3.1.
5. For more details, refer section 4.3.1.
6. Cyclical
7. Five
8. Liquidity
9. Efficiency
10. Solvency
11. equilibrium
12. For more details, refer section Refer to 4.5.2.
13. For more details, refer section Refer to 4.4.1

### Terminal Questions

1. Fundamental analysis focuses on economic, industry, and company information. For more details, refer 4.2.

2. Economic analysis is done for two reasons – firstly, a company's growth prospects are dependent on the economy in which it operates. Secondly, most companies' shares and stocks generally perform well when the economy is in a boom. For more details, refer section 4.3.
3. Once the economic forecast and industry analysis are done, the fundamental analyst focuses on choosing the best positioned company in the chosen industry. For more details, refer section 4.5.
4. Industries tend to react differently towards different economic cycles. For more details, refer 4.4.
5. For more details, refer 4.7.

## 4.12 Case: ABC Corp

The following profit and loss account of ABC Corp (Table 1) has been reclassified in Table 2 and presented with two comments about ABC Corp's performance in 1999.

**Table 1**

| **Profit and Loss account of ABC Corp** | | |
|---|---|---|
| | **`Million** | |
| | **Yr ended 31/3/99** | **Yr ended 31/3/98** |
| **Revenues** | | |
| Gross sales and other income | 41,638 | 43,902 |
| Less: sales tax | 1,414 | 1,454 |
| Sales and other income | 40,224 | 42,448 |
| Expenditure | | |
| Material cost | 9,194 | 8,128 |
| Customs duty on imports | 2,643 | 1,637 |
| Personnel cost | 7,004 | 6,112 |
| Other manufacturing costs | 5,498 | 6,054 |
| Operating expenses | 2,738 | 2,453 |
| Selling expenses | 1,490 | 1,294 |
| Excise duty | 4,504 | 4,771 |
| Add/(less) stock variation | (2,886) | 179 |
| Depreciation | 1,746 | 1,520 |

| | | |
|---|---|---|
| Interest | 1,488 | 1,354 |
| Total expenditure | 33,419 | 33,502 |
| | | |
| Profit before tax | 6,805 | 8,946 |
| Provision for taxation | 1,940 | 2,200 |
| Profit after tax | 4,865 | 6,746 |
| Proposed dividend | 550 | 550 |
| Tax on dividend | 55 | 66 |
| Retained earnings for the year | 4,260 | 6,130 |

**Table 2**

| **Analysis of the above profit and loss account** | | | | |
|---|---|---|---|---|
| | **Yr ended 31.3.99** | | **Yr ended 31.3.98** | |
| | **` mil** | **%** | **` mil** | **%** |
| | | | | |
| Sales and Other Income | 41,638 | 100.0 | 43,902 | 100.0 |
| | | | | |
| Material cost (less duties) | 9,194 | 22.1 | 8,128 | 18.5 |
| Personnel cost | 7,004 | 16.8 | 6,112 | 13.9 |
| Other expenses | 6,840 | 16.4 | 9,980 | 22.7 |
| Depreciation | 1,746 | 4.2 | 1,520 | 3.4 |
| Interest | 1,488 | 3.6 | 1,354 | 3.1 |
| Taxes (to Government) | 10,556 | 25.4 | 10,128 | 23.1 |
| Dividend | 550 | 1.3 | 550 | 1.3 |
| Retained Profit | 4,260 | 10.2 | 6,130 | 14.0 |
| | | | | |

**Explanatory memorandum**

- In a year when the sales were down, the profits have naturally been affected. The fall is even more as Government levies have gone up substantially, over which the company has no control. Employee costs have also increased.
- But the company has done well to contain other expenses not only as a percent of sales, but even in absolute terms, and brought it down by

over ` 30 crore.

**Discussion Questions**

1. Is this analysis correct or is there a deliberate misstatement of facts?
2. What is the purpose achieved by such a misstatement, if it is there?

**Hint**

The 'other expenses' has been clubbed with increase/decrease in stock, and the percentage thus calculated gives the picture of an excellent performance in cutting down other expenses.

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# Unit 5 Technical Analysis

**Structure:**



## 5.1 Introduction

Technical analysis is a method used to evaluate the worth of a security by analysing statistics pertaining to its market activity, such as prices and volumes. Technical analysts do not attempt to measure a security's intrinsic value, as is done by the fundamental analyst, but instead use charts and other tools to identify patterns that can suggest future activity.

Technical analysts' exclusive use of historical price and volume data, termed as empirical analysis, forms the subject matter of this unit.

**Objectives:**

After studying this unit, you should be able to:

- discuss the meaning and basic tenets
- explain the tools of technical analysis
- discuss Charting as a Technical Tool
- state the assumptions of the Dow Theory
- discuss important Chart Formations or Price Patterns
- discuss Technical Indicators
- differentiate between fundamental analysis and technical analysis.

## 5.2 Meaning and Basic Tenets

Unlike fundamental analysts, technical analysts do not worry about whether a stock is undervalued or not. They are more concerned about a security's trading data and the information this data can provide about the direction of security price. Technical analysis disregards the financial statements of the company that has issued the security. Instead it relies on market trends to ascertain investor sentiments that can be used to predict how a security performs.

Technicians, chartists or market strategists (as they are variously known), believe that there are systematic statistical dependencies in asset returns. They make price predictions on the basis of price and volume data, looking for patterns and possible correlations, and applying rules of thumb to charts to assess 'trends', 'support' and 'resistance levels'. From these, they develop ‘buy and sell’ signals.

Technical analysis is based on three assumptions:

1. **The market discounts everything:** Technical analysis assumes that at any given point in time a security's price incorporates all the factors that can impact the price including fundamental factors. Technical analysts believe that the company's fundamentals, along with broader economic factors and market psychology are all built into the security price and therefore there is no need to study these factors separately. They therefore confine themselves to analysis of price movements. Technical analysis considers only supply and demand to determine the market value of a security.
2. **Price moves in trends:** Technical analysts believe that the security prices tend to move in trends that persist for long periods. This means that establishing a trend, the future price movement is more likely to be in the same direction. Any shifts in supply and demand cause reversals in trends. These shifts can be detected in charts/graphs.
3. **History tends to repeat itself:** Price movements/chart patterns mostly repeat the same patterns. Market psychology is considered to be the reason behind the repetitive nature of price movements. Market participants react in a consistent manner to similar market stimuli over a period of time.

The key assumption in technical analysis is that markets are driven more by psychological factors than fundamental values. Its proponents believe that asset prices reflect not only the underlying 'value' of the assets but also the hopes and fears of those in the market. They assume that in a certain set of circumstances, investors will react in a similar manner as in the past and that the resultant price moves are likely to be the same. Technical analysts use chart patterns to analyse market movements and to predict security prices. Although many of these charts have been used for more than 100 years, technical analysts believe them to be relevant even now, as they illustrate repetitive patterns.

Technical analysis can be applied to any security which has historical trading data. This includes stocks, bonds, futures, foreign exchange etc. In this unit, we will deal with examples of stocks.

**Self Assessment Question:**

1. The key assumption in technical analysis is that markets are driven more by _____ than fundamental values.

## 5.3 Tools of Technical Analysis

There are many different types of technical traders; some rely on chart patterns, others use technical indicators and oscillators, and most use a combination of the two.

**Charting:** Technical analysts are sometimes called *chartists,* because they study records or charts of past stock prices and trading volume, hoping to find patterns they can exploit.

**Technical indicators:** Technical analysts also use technical indicators besides charts to assess prospects for market declines/advances. A technical indicator is a series of data points that are derived by applying a formula to the price data of a security. Price data includes any combination of the open, high, low or close prices over a period of time.

Technical indicators can be classified in many ways. They can be classified into three types:

- Sentiment indicators.
- Flow of funds indicators.
- Market structure indicators.

**Sentiment indicators** are intended to measure the expectations of various groups of investors, for example, mutual fund investors and corporate insiders.

**Flow of funds indicators** are intended to measure the potential for various investor groups to buy or sell stocks, in order to predict the price pressure from those actions.

**Market structure indicators** monitor price trends and cycles.

**Self Assessment Questions:**

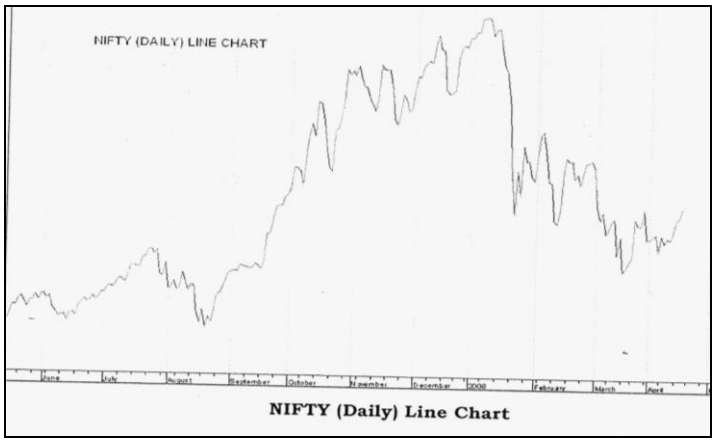
2. What are the basic assumptions of technical analysis?
3. _____ are intended to measure the expectations of various groups of investors.
4. _____ monitor price trends and cycles.

## 5.4 Charting as a Technical Tool

A chart is a graphical representation of a series of points over a period. For example, a chart may show a stock's price movement over one year period, where each point on the graph represents the closing price for each day of the year that the stock was traded. There are three main types of charts:

- Line.
- Bar.
- Candlestick.

**Line charts** are the most basic, with a line joining the closing price of one period to the closing price of another period.

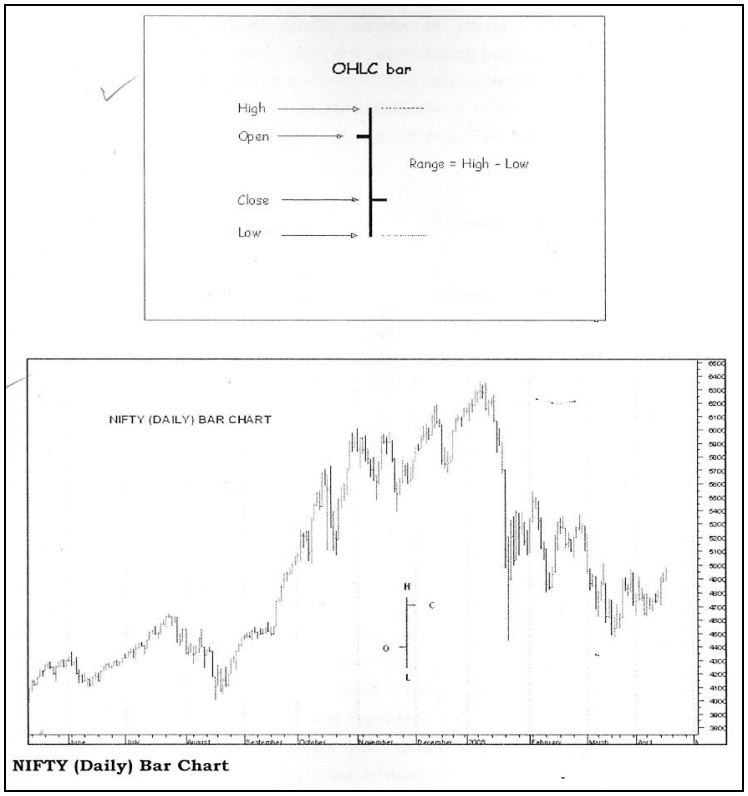



NIFTY (Daily) Line Chart

"Line charts" are formed by connecting the closing prices of a specific stock or market over a given period of time. Line chart is particularly useful for providing a clear visual illustration of the trend of a stock's price or a market's movement. It is a valuable analytical tool used extensively by traders.

**Bar charts** depict price action in a stock over a given period of time. Such visual representation of price activity helps in spotting trends and patterns.

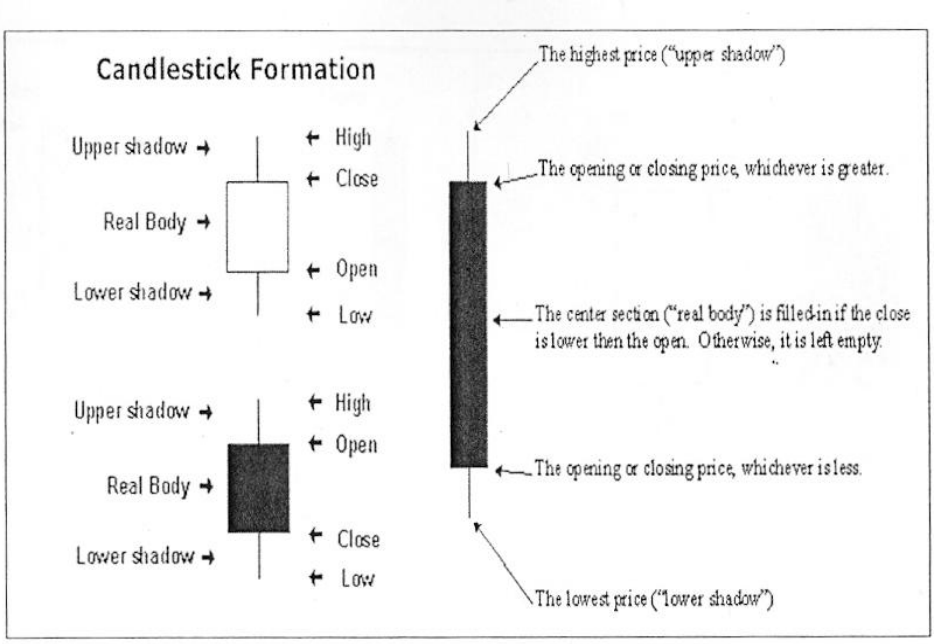
Although daily bar charts are best known, these can be created for any time period (For example, weekly or monthly). A bar shows the high price for the period (at the top) and the lowest price (at the bottom) of the bar. Small lines on either side of the vertical bar serve to mark the opening and closing prices. The opening price is marked by a small tick to the left of the bar and the closing price by a similar tick to the right. Many investors work with bar charts created in a matter of minutes during a day's trading.




**NIFTY (Daily) Bar Chart**

**Candlestick charts** display the open, high, low and closing prices in a format similar to a modern-day bar chart, but in a manner that extenuates the relationship between the opening and closing prices. Candlesticks do not involve any calculations. Each candlestick represents one period (Example a day) of data. The figure given below displays the elements of a candle.

A candlestick chart can be created using the data of high, low, open and closing prices for each time period that you want to display. The hollow or filled portion of the candlestick is called “the body” (also “the real body”). The long thin lines above and below the body represented the high/low range and are called “shadows” (also “wicks and tails”). The high is marked by the top of the upper shadow and the low by the bottom of the lower shadow. **If the stock closes higher than its opening price,** a hollow candlestick is drawn with the bottom of the body, representing the opening price and the top of the body representing the closing price. **If the stock closes lower than its opening price**, a filled candlestick is drawn with the top of the body representing the opening price and the bottom of the body representing the closing price.

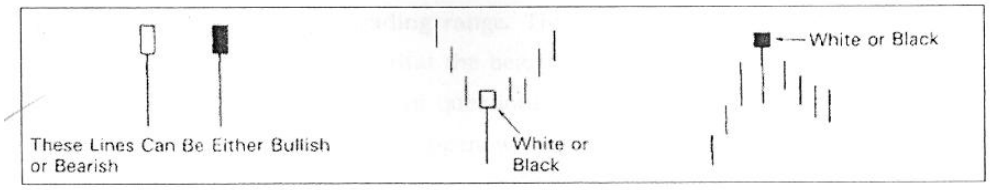


**Candlestick analysis**

The overall market psychology can be tracked through candlestick analysis. It shows the interaction between buyers and sellers. A white candlestick indicates closing price of the session being above the closing price and a black candlestick shows closing price of the session being below the closing price. The shadow at top and bottom indicates the high and low for the session.

**One candle patterns**

One candle patterns are known as “umbrella lines”. There are two types of umbrella lines – the hanging man and the hammer. They have long lower shadows and small real bodies that are at the top of the trading range for the session.




Hammer and Hanging Man Hammer Hanging Man Candlesticks

**Hammer**

Hammer is a one-candle pattern that occurs in a downtrend when bulls make a start to step into the rally. It is so named because it hammers out the bottom. Although the colour of the body is not of much significance but a while candle shows slightly more bullish implications than the black body.

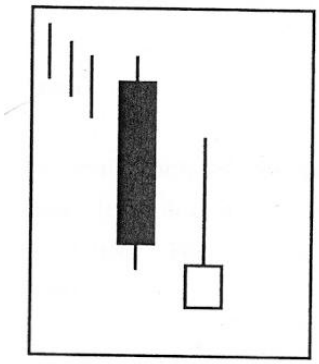
**Hanging man**

The hanging man appears during an uptrend, and its real body can be either black or white. While it signifies a potential top reversal, it requires confirmation during the next trading session. The hanging man usually has little or no upper shadow.

**Shooting start and inverted hammer**

Other candles similar to the hanging man and hammer are the “shooting star” and the “inverted hammer”. Both have small real bodies and can be either black or while but they both have long upper shadow and have very little or no lower shadows.

**Inverted hammer**



Technical analysts study charts for analysing trends and support and resistance levels.

**Trend**

A trend is the general direction in which a security or market is headed. Prices do not tend to move in a straight line in any direction, but rather in a series of highs and lows. In technical analysis, a trend is the movement of the highs (peaks) and lows (troughs).

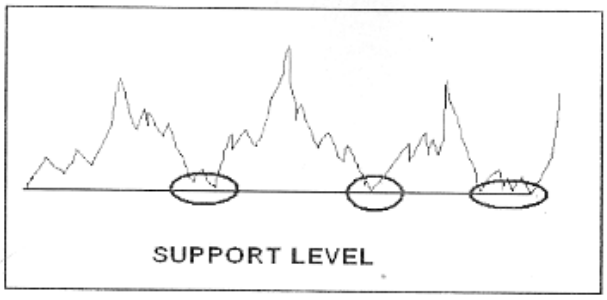
Trends can be classified in terms of direction into uptrend, downtrend and horizontal trend. An **uptrend** is a series of higher highs and higher lows, while a **downtrend** is one of lower lows and lower highs. When there is little movement up or down in the peaks and troughs, it is a **sideways** or **horizontal** trend.

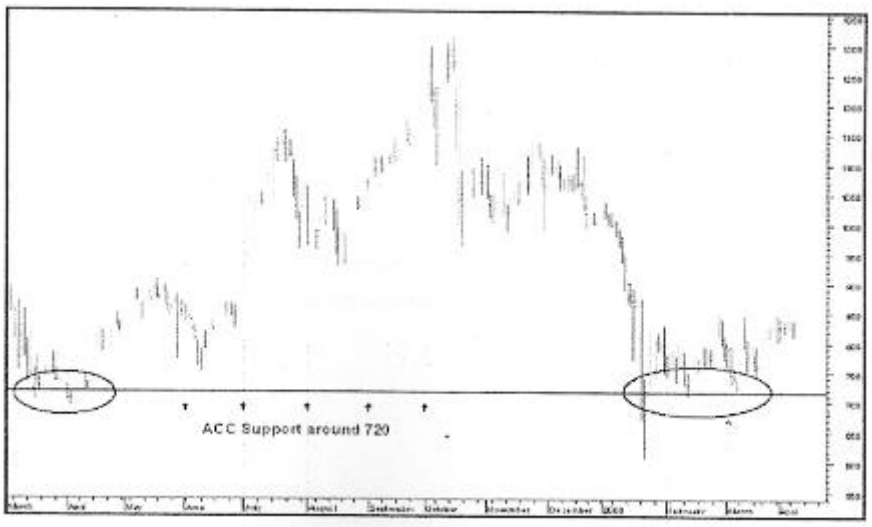
Trends can be classified on the basis of length into primary, intermediate and short-term trends. In terms of the stock market, a **primary** trend is generally categorised as one lasting longer than a year. An **intermediate** trend is considered to last between one and three months and a short-term trend lasts less than a month.

A long-term trend comprises of several intermediate trends, which often move against the direction of the major trend. If the major trend is upward and there is a downward correction in price movement followed by a continuation of the uptrend, the correction is considered to be an intermediate trend. Short-term trends are part of both major and intermediate trends.

**Support and resistance**

"Support" is where a falling price can be expected to halt, temporarily, due to a concentration of demand. A **support** level is a value below which the stock price is not expected to drop, as demand of security is expected to increase at this level and prevent the price from falling any further.



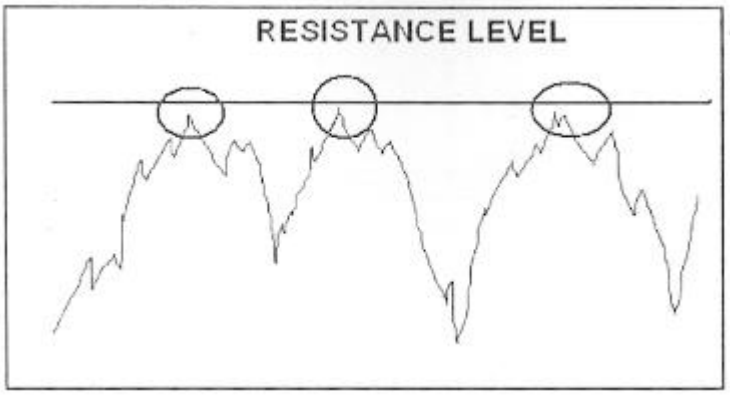




ACC chart showing the support level at 720

Support does not always hold true. A break below support signals that the bulls have lost to the bears. A fall below support level indicates more willingness to sell and a lack of willingness to buy. Once a support is broken, another support level will have to be established at a lower level.

A resistance is a horizontal ceiling where the pressure to sell is greater than the pressure to buy. "Resistance" is where a rising price can be expected to halt temporarily due to a concentration of supply. A **resistance** level is a

level above which stock price is not expected to go as supply of security is expected to increase and depress the prices.




Resistance does not always hold true. A break above resistance signals that the bears have lost to the bulls. A break in the resistance levels shows more willingness to buy or lack of incentive to sell. Once resistance is broken, another resistance level will have to be established at a higher level. Support and resistance levels are determined by prices in the recent past.

**Why do support and resistance lines occur?**

A stock's price is determined by supply and demand. Bulls buy when the stock prices are low and bears sell when the price reaches its maximum. Bulls increase the prices by increasing the demand and bears decrease it by increasing the supply. The market reaches a balance when bulls and bears agree on a price.

When prices are increasing, there is a point at which the bears become more aggressive and the bulls begin to pull back; the market balances along the resistance level.

When prices are falling, the market balances along the support line. As prices starts to decline toward the support line, buyers become more inclined to buy and sellers start holding on to their stocks.

According to experts, previous support and resistance levels can be used as "targets" or "limit" prices where market have traded away from them.

**Activity:**
Prepare the list of data on major markets like BSE and NSE that are published daily by the Economic Times.

**Hint:** Major prices indices of ET, BSE price indices, NSE price indices, Turnover on BSE and NSE, etc.

**Self Assessment Question:**

5. What are support and resistance levels?

## 5.5 Dow Theory

The Dow Theory was originated by Charles Dow, the founder of the Dow Jones Company and editor of the *Wall Street Journal.* The Dow Theory presumes that the market moves in persistent bull and bear trends. Dow Theory was originally used for market as a whole, but it is now used for individual securities as well.

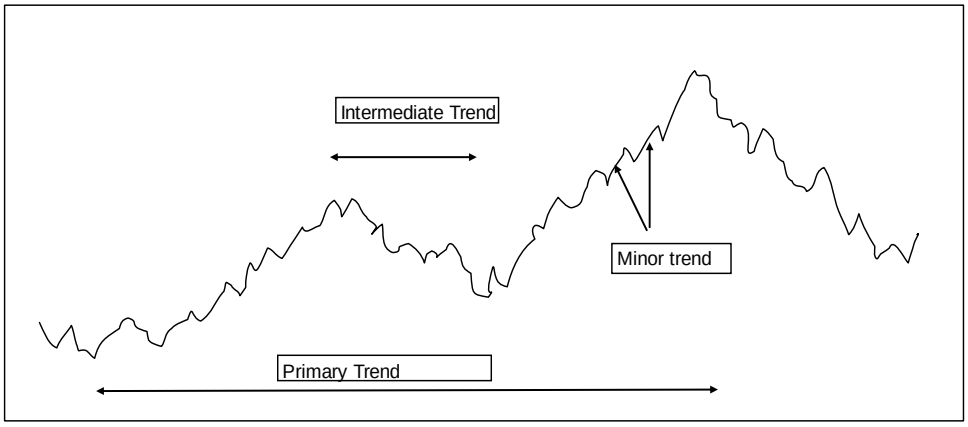
Dow Theory recognises that it is the actions of traders in the marketplace responding to news that cause prices to change rather than the news itself, and that, once established, a market trend tends to continue. The theory had originally focused on using general stock market trends as a barometer for general business conditions. It was originally not used to forecast stock prices. However, subsequent work has focused almost exclusively on use of theory.

The Dow Theory comprises the following assumptions:

1. **The averages discount everything:** An individual stock's price reflects everything that is known about the security. As new information arrives, market participants quickly disseminate the information and the price adjusts accordingly. Likewise, the market averages discount and reflect everything known by all stock market participants.

2. **The market is comprised of three trends:** At any given time in the stock market, three forces are in effect – the primary trend, secondary trends, and minor trends. The primary trend can either be a bullish (rising) market or a bearish (falling) market. Primary trend usually lasts for over a year and may continue for several years. If the market is making successive higher-highs and higher-lows the primary trend is up. If the market is making successive lower-highs and lower-lows, the primary trend is down.

   Secondary trends are intermediate, corrective reactions to the primary trend. These reactions typically last from one to three months. Minor trends are short-term movements lasting from one day to three weeks. Secondary trends are typically comprised of a number of minor trends. The Dow Theory holds that since stock prices over the short-term are subject to some degree of manipulation while primary and secondary trends are not, minor trends are unimportant and can be misleading.




3. **Primary trends have three phases:** The Dow Theory says that:
   - The first phase is a slump made up of aggressive buying by informed investors in anticipation of economic recovery and long-term growth. The general feeling among most investors during this phase is one of "gloom and doom" and "disgust." The informed investors, realising that a turnaround is inevitable, aggressively buy from these distressed sellers.
   - The second phase is characterised by increasing corporate earnings and improved economic conditions. Investors will begin to accumulate stock as conditions improve.

- The third phase is characterised by record corporate earnings and peak economic conditions. The general public (having had enough time to forget about their last "scathing") now feels comfortable participating in the stock market, fully convinced that it is headed for the moon. They now buy heavily, even creating a buying frenzy. It is during this phase that investors who did aggressive buying during the first phase begin to liquidate their holdings in anticipation of a downturn.

4. **The volume confirms the trend:** The Dow Theory focuses primarily on price action. Volume is only used to confirm uncertain situations. Volume should expand in the direction of the primary trend. If the primary trend is down, volume should decrease during market declines. If the primary trend is up, volume should increase during market advances.
5. **A trend remains intact until it gives a definite reversal signal:** An uptrend is defined by a series of higher-highs and higher-lows. In order for an uptrend to reverse, prices must have at least one lower high and one lower low (the reverse is true of a downtrend).

**Self Assessment Questions:**

6. What is a trend? What are the different kinds of trends in terms of direction?

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_____
_____
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_____
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## 5.6 Important Chart Formations or Price Patterns

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. The theory behind chart patterns is based on the assumption that market trend repeats itself. The idea is that certain patterns are seen many times, and that these patterns signal a certain high probability of a movement in stock price. A technical analyst, using the historic trend of a chart pattern,

which is assumed to set in motion a certain price movement, identifies trading opportunities. While every chart pattern contains indications, none will tell you with 100% certainty where a security is headed.

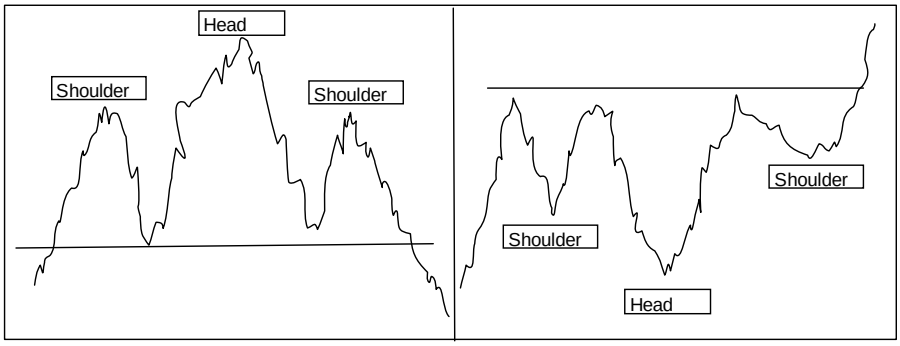
There are two types of chart patterns – **reversal** and **continuation**.

A reversal pattern signals that a prior trend will reverse upon completion of the pattern. A continuation pattern, on the other hand, signals that a trend will continue once the pattern is complete.

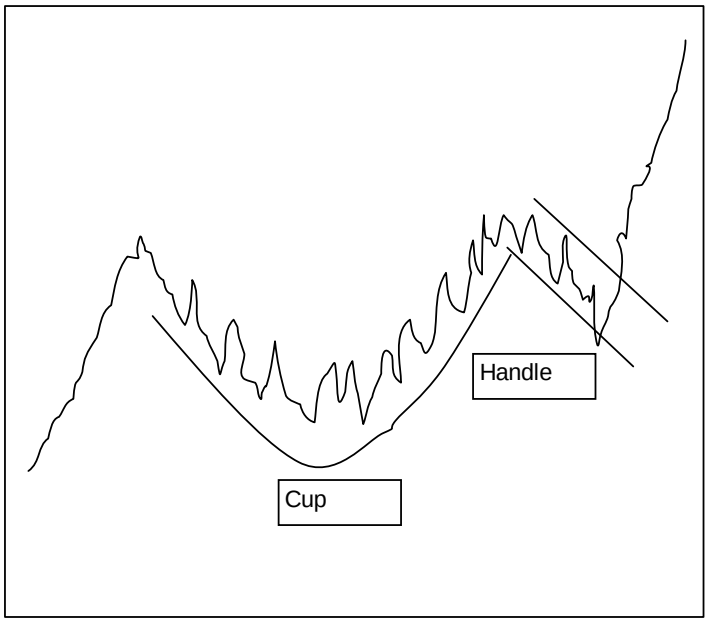
Some of the popular chart patterns are given below:

**Head and shoulders:** This is one of the most popular chart patterns in technical analysis. Head and shoulders is a reversal chart pattern that, when formed, signals that the security is likely to move against the previous trend. So if the previous trend was an uptrend, there would be a downtrend and vice versa.

There are two versions of the head and shoulders chart pattern. Head and shoulders top (shown on the left) is a pattern that is formed at the high of an upward movement, and indicates that the upward trend is about to end. Head and shoulders bottom (also inverse head and shoulders pattern) (shown on the right) signals the reversal of a downtrend.




**Cup and handle:** A cup and handle chart is a bullish continuation pattern in which the upward trend has paused, but will continue in an upward direction once the pattern is confirmed. This price pattern forms what looks like a cup, which is preceded by an upward trend. The handle follows the cup formation and is formed by a generally downward/sideways movement in the security's price. Once the price movement pushes above the resistance lines formed in the handle, the upward trend can continue.




**Self Assessment Questions:**

7. A _____ is a bullish continuation pattern in which the upward trend has paused, but will continue in an upward direction once the pattern is confirmed.

## 5.7 Technical Indicators

A technical indicator is a series of data points that are derived by applying a formula to the price and/or volume data of a security. Price data can be any combination of the open, high, low or closing price over a period of time. Some indicators may use only the closing prices, while others incorporate volume and open interest into their formulae. The price data is entered into the formula and a data point is produced.

For example, say the closing prices of a stock for 3 days are ` 41, ` 43 and ` 43. If a technical indicator is constructed using the average of the closing prices, the average of the 3 closing prices is one data point ((41+43+43)/3 = 42.33). However, one data point does not offer much information. A series of data points over a period of time is required to enable analysis. Thus we can have a 3-period moving average as a technical indicator, where we drop the earliest closing price and use the next closing price for calculations.

By creating a time series of data points, a comparison can be made between present and past levels. Technical indicators are usually shown in a graphical form above or below a security's price chart for facilitating analysis. Once shown in graphical form, an indicator can be compared with the corresponding price chart of the security. Sometimes indicators are plotted on top of the price plot for a more direct comparison.

Technical indicators measure money flow, volatility, momentum etc. They are used for two main purposes – **to confirm price movement and the quality of chart patterns**, and **to form buy and sell signals**. A technical indicator offers a different perspective from which to analyse the price action. Some, like **moving averages**, are derived from simple formulae and relatively easy to understand. Others like **stochastics** have complex formulae and require more effort to understand. Technical indicators can provide unique perspective on the strength and direction of the underlying price action.

Indicators filter price action with formulae. Therefore they are derivative measures and not direct reflections of the price action. This should be remembered when analysing indicators. Any analysis of an indicator should be taken with the price action in mind.

There are two main types of indicators – **leading** and **lagging**. A leading indicator precedes price movements and is used for prediction. A lagging indicator follows price movement and is used for confirmation.

The main benefit of leading indicators is that they provide early signals for entry and exit, fore-warning a potential strength or weakness. Leading indicators are useful in **trending** markets. In a market that is trending up, it helps identify oversold conditions for buying opportunities. In a market that is trending down, it helps identify overbought situations for selling opportunities. Some of the more popular leading indicators include Relative Strength Index (RSI) and Stochastic Oscillator.

Lagging indicators follow the price action and are commonly referred to as **trend-following** indicators. Lagging indicators work best when the markets or securities develop strong trends. They are designed to get traders in and keep them in as long as the trend is intact. As such, these indicators are not effective in trading or sideways markets. Some popular trend-following

indicators include moving averages and Moving Average Convergence Divergence (MACD).

Technical indicators are constructed in two ways – those falling in a bounded range and those that do not. Technical indicators bound within a range are called **oscillators**. Oscillators are used as an overbought/oversold indicator. A market is said to be '**overbought**' when prices have been trending higher in a relatively steep fashion for some time, to the extent that the number of market participants 'long' of the market significantly outweighs those on the side lines or holding 'short' positions. This means that there are fewer participants to jump onto the back of the trend. The '**oversold'** condition is just the opposite. The market has been trending lower for some time and is running out of 'fuel' for further price declines.

Oscillators move within a range, say between zero and 100, and signal periods where the security is overbought (near 100) or oversold (near zero). Oscillators are the most common type of technical indicators. Technical indicators that are not bound within a range also form 'buy and sell' signals and display strength or weakness in the market, but they can vary in the way they do this.

The two main ways that technical indicators are used to form buy and sell signals is through **crossovers** and **divergence**. Crossovers occur when either the price moves through the moving average, or when two different moving averages cross over each other. Divergence happens when the direction of the price trend and the direction of the indicator trend are moving in the opposite direction. This indicates that the direction of the price trend is weakening.

Technical indicators help identify momentum, trends, volatility and various other aspects in a security to aid technical analysis. While some traders use a single indicator for buy and sell signals, others use two or more indicators with price movement and chart patterns.

Some popular technical indicators are discussed below to illustrate the concept:

**Moving average**

The moving average is a lagging indicator which is easy to construct and is one of the most widely used. As the name suggests it represents an average of a specified time series. The most common way to calculate the moving average is to work from the last 10 days of closing prices. Each day, the most recent close (day 11) is added to the total and the oldest close (day 1) is subtracted. The new total is then divided by the total number of days (10) and the resultant average computed. The purpose of the moving average is to track the progress of a price trend. The moving average is a levelling device. By averaging the data, a smoother line is produced, making it much easier to view the underlying trend. A moving average filters out random noise and offers a smoother perspective of the price action.

**Moving Average Convergence Divergence (MACD)**

MACD is a momentum indicator and it is made up of two exponential moving averages. The MACD plots the difference between a 26-day exponential moving average and a 12-day exponential moving average. A 9-day moving average is generally used as a trigger line. When the MACD crosses this trigger and goes down, it is a bearish signal and when it crosses it to go above it, it is a bullish signal. This indicator measures short-term momentum as compared to longer term momentum and signals the current direction of momentum. Traders use the MACD for indicating trend reversals.

**Relative Strength Index (RSI)**

RSI is another well-known momentum indicator. Momentum measures the rate of change of prices by continually taking price differences for a fixed time interval. RSI helps to signal overbought and oversold conditions in a security. RSI is plotted in a range of 0-100. A reading above 70 suggests that a security is overbought, while a reading below 30 suggests that it is oversold. This indicator helps traders to identify whether a security's price has been unreasonably pushed to its current levels and whether a reversal may be on the way.

**Stochastic oscillator**

The stochastic oscillator is one of the most recognised momentum indicators. This indicator provides information about the location of a current closing price in relation to the period high and low prices. The closer the

closing price is to the period high, the higher is the buying pressure, and the closer it is to the period's low, the more is the selling pressure. The idea behind this indicator is that in an uptrend, the price should be closing near the highs of the trading range, signalling upward momentum in the security. In downtrends, the price should be closing near the lows of the trading range, signalling downward momentum. The stochastic oscillator is plotted in a range of 0-100 and signals overbought conditions above 80 and oversold conditions below 20.

**Self Assessment Questions:**

8. A _____ is a series of data points that are derived by applying a formula to the price and/or volume data of a security.

## 5.8 Fundamental and Technical Analysis – A Comparison

Technical analysis looks at the price movement of a security and uses this data to predict its future price movements. Fundamental analysis analyses fundamental performance and economic factors to find undervalued securities.

**Differences between fundamental and technical analysis:**

1. **Charts vs. financial statements:** A technical analyst approaches a security via the charts, while a fundamental analyst studies the financial statements. Technical analysis is the study of price action and *trend*, while fundamental analysis focuses the company's performance in the backdrop of industry and economy conditions.

   By looking at the financial statements (income statement, balance sheet and cash flow statement) a fundamental analyst determines a company's value. The technical analyst sees no reason for analysing the company's fundamentals as he believes that they are already accounted for in the stock's price. All the information that a technical analyst desires is there in the price of the securities that can be found in the charts.

2. **Time horizon:** Fundamental analysts take a longer term view of the market when compared to the technical analysts. Technical analysis has a timeframe of weeks or even days whereas fundamental analysis often looks at data over a number of years. The difference in the timeframes is because of the different investing styles of fundamental and technical

analysis. It can take a long time for an undervalued stock, uncovered by fundamental analysis, to reach its "correct" value. Fundamental analysis assumes that if the short-term market is wrong (in valuing a stock at less than its intrinsic value) the price of the stock will correct itself over a longer period.

Also, the data analysed in fundamental analysis covers long periods, at least a quarter and usually a year. In contrast the price and volume data that the technical analysts use are generated continually, all the time.

3. **Trading vs. investing:** The goals of technical and fundamental analysis are often different. Generally fundamental analysis is oriented to investment decisions, while technical analysis is more relevant for trading decisions. Investors buy assets that they believe can increase in value and yield returns over longer periods. Traders buy assets that they believe they can sell quickly at a higher price.
4. **Cause vs. effect:** While both approaches have the same objective of predicting the direction of prices, the fundamental analyst studies the ***causes*** of market movements, while the technical analyst studies the ***effect*** of market movements. The fundamental analyst needs to know ***why*** the prices have changed. The technical analyst, on the other hand, attempts to find ***where*** the prices can be expected to change.

   Although technical analysis and fundamental analysis may seem to be poles apart, many market participants have achieved success by combining both. Thus a fundamental analyst may use technical analysis to figure out the best time to enter into an undervalued security. Often this opportunity is present when the security is severely oversold. By timing entry into a security, the gains on the investment can be greatly improved. Similarly, some technical traders might look at fundamentals to add strength to a technical signal. For example, if a sell signal is obtained after technical analysis, a technical trader might look at fundamental data before going ahead with the decision.

**Self Assessment Questions:**

9. Explain important chart patterns.

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10. Distinguish between fundamental analysis and technical analysis.

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11. What are leading and lagging indicators?

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## 5.9 Summary

- Technical analysts identify non-random price patterns and trends in financial markets and attempt to exploit those patterns.
- Technical analysis evaluates securities by analysing the statistics generated by market activity. It is based on three assumptions:
  - the market discounts everything
  - price moves in trends
  - history tends to repeat itself.
- While technicians use various methods and tools, the study of price charts is primary. Technical analysts believe that all the information that they need about a stock can be found in its charts.
- They take a short-term approach to analysing the market. **Charts** are studied to identify the trend.
- A **trend** is the direction in which a security is headed. There are three types of trends–uptrend, downtrend, and sideways/horizontal trend.
- Another concept is that of **support and resistance**. A support is the price level below which a stock or a market is not likely to fall. A resistance level is the price level above which a stock or a market is unlikely to rise.
- A **chart pattern** is a distinct formation on a stock chart that creates a trading signal, or a sign of future price movements.
- There are two types of chart patterns–**reversal** and **continuation**.

- A **head and shoulder pattern** is a reversal pattern that signals that a security is likely to move against its previous trend.
- A **cup and handle** is a bullish continuation pattern in which the upward trend has paused but will continue in an upward direction once the pattern is confirmed.
- A **technical indicator** is a series of data points that are derived by applying a formula to the price and/or volume data of a security. They measure such things as money flow, trends, volatility and momentum.
- Technical analysis is frequently contrasted with fundamental analysis, which is a study of the economic factors that some analysts believe can influence security prices.

## 5.10 Glossary

***Trend:*** The direction in which a security is headed.

***Charts:*** Charts are studied to identify the trend.

***Technical indicator:*** Technical indicator is a series of data points that are derived by applying a formula to the price and/or volume data of a security.

## 5.11 Terminal Questions

1. Discuss the tools of Technical Analysis
2. Explain Charting as a Technical Tool
3. Briefly explain the Dow Theory.
4. Explain the important Chart Formations or Price Patterns
5. What are technical indicators? How are they used?
6. Compare and contrast the Fundamental and Technical Analysis

## 5.12 Answers

### Self Assessment Questions

1. Supply and demand.
2. Technicians, chartists or market strategists (as they are variously known), believe that there are systematic statistical dependencies in asset returns.
3. Sentiment indicators
4. Market structure indicators

5. A stock’s price is determined by supply and demand. Bulls buy when the stock prices are low and bears sell when the price reaches its maximum. Bulls increase the prices by increasing the demand and bears decrease it by increasing the supply. The market reaches a balance when bulls and bears agree on a price.
6. A trend is a general direction in which a security or market is headed.
7. Cup and handle chart
8. technical indicator
9. Refer to 5.6
10. Refer to 5.8
11. Refer to 5.7

**Terminal Questions**

1. There are many different types of technical traders; some rely on chart patterns, others use technical indicators and oscillators, and most use a combination of the two. For more details, refer section 5.3.
2. A chart is a graphical representation of a series of points over a period. For example, a chart may show a stock's price movement over one year period, where each point on the graph represents the closing price for each day of the year that the stock was traded. For more details, refer section 5.4.
3. The Dow Theory was originated by Charles Dow, the founder of the Dow Jones Company and editor of the *Wall Street Journal.* For more details refer section 5.5.
4. A chart pattern is a distinct formation on a stock chart that creates a trading signal, or a sign of future price movements. For more details, refer section 5.6.
5. A technical indicator is a series of data points that are derived by applying a formula to the price and/or volume data of a security. For more details, refer section 5.7.
6. Technical analysis looks at the price movement of a security and uses this data to predict its future price movements. Fundamental analysis analyses fundamental performance and economic factors to find undervalued securities. For more details, refer section 5.8.

## 5.13 Case Study

**Downfall of Amaranth Advisors**

Amaranth Advisors, traders in energy stocks made a fortune in 2005 by placing bullish bets on natural gas market, which was bolstered by the effect of Hurricane Katrina on natural gas production and delivery.

The company predicted a similar trend in 2007-2008 and ended up losing $6 billion in less than a month as contract prices in the energy market fell drastically. This again proves that market analysts deliver inconsistently.

The year 2007 also saw the beginning of the biggest global financial meltdown since the great depression, as US and UK economy were hit by credit crunch, resulting from risky trading by Banks and Credit Card companies. Investigations into the meltdown have revealed how industry analysts not only failed to predict this crash, some of the market analysis and speculations were even responsible for magnifying the meltdown.

To sum up we can say that while market analysis can be correct sometimes, it has been wrong quite often and with disastrous results. Therefore, trading based on stock market technical analysis can be considered as safe as trading without such input.

**Questions:**

- In the light of the examples quoted above, is technical analysis still worthwhile or just a waste of time?
- What can the analyst do to make technical analysis useful despite the shortcomings?

**Hint**

For every case that disputes the validity of using technical analysis for investment decisions, there is one or more confirming the validity. The trick is to use technical analysis in an array of decision-making tools instead of using it as a sole basis for investment decisions.

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- www.prabhatmittal.com

# Unit 6 Efficient Market Hypothesis

**Structure:**



## 6.1 Introduction

**Efficient Market Hypothesis (EMH)** asserts that financial markets are 'efficient', meaning the prices of traded assets (Example stocks and bonds) reflect all known information. The prices of assets reflect the collective beliefs of all investors about future prospects. EMH implies that it is not possible to consistently outperform the market, appropriately adjusted for risk, by using any information that the market already knows, except through luck. Only new information affects price of assets.

Information or *news* in the EMH is defined as anything that may affect asset prices. Prices react to information. Flow of information is random. Therefore price changes are random. In the early 1900s, Louis Bachelier is credited with developing the idea that the stock prices are governed by a random

walk. The random walk theory asserts that price movements will not follow any patterns or trends and that past price movements cannot be used to predict future price movements.

Eugene Fama was the first to formally propose EMH. He stated that **all relevant information is fully and immediately reflected in a security's market price**. Fama made the argument that in an active market which has many well-informed and intelligent investors, securities will be appropriately priced and reflect all available information.

He argued that in an efficient market, competition among the market participants leads to a situation where, at any point in time, actual prices of securities reflect the events that have happened and the events that the market expects to take place. (Fama defined an 'efficient' market as a market where large numbers of rational, profit-maximisers actively compete with each other and try to predict future market values of individual securities, and where important current information is almost freely available to all participants.)

The implication of EMH is that in an efficient market the actual price of a security will always be a good estimate of its intrinsic value. If this hypothesis is correct, no investor will be able to earn anything more than an equilibrium rate of return on investments (or it is not possible to “beat” the market).

Most people who buy and sell securities do so under the assumption that securities bought are worth more than the price paid, while securities sold are worth less than the selling price. However, if EMH is correct and security prices fully reflect all available information, it would not be worth an investor’s time and effort to find undervalued securities. Buying and selling securities in an attempt to outperform the market will effectively be a game of chance rather than skill. However, if EMH is not correct and prices **do not** fully reflect all available information, investors can find and use that information and perhaps make a killing in the market.

EMH has been the subject of intense debate among academics and financial professionals. Whether markets are efficient has been extensively researched and remains controversial. This unit deals with this concept in detail.

**Objectives:**

After studying this unit, you will be able to:

- explain the concept and value of 'efficient market'
- explain 'Random Walk Theory'
- explain Random Walk and Efficient Market Hypothesis (EMH)
- discuss forms of Market Efficiency
- discuss misconceptions about EMH
- state the implications of EMH to fundamental and technical analysis
- discuss implications of EMH for Security Analysis and Portfolio Management
- discuss the Critique of EMH

## 6.2 Concept of 'Efficient Market'

The performance of a financial market depends on how efficiently capital is allocated by the market. Three related types of market efficiency are used to describe the performance of financial markets, which are allocation efficiency, operational efficiency, and informational efficiency.

**Allocation efficiency:** A financial system exhibits allocation efficiency if it allocates capital to its best (most productive) use. For example, stock market investors shun security offers from firms in declining industries, but welcome offerings from firms in more promising industries.

**Operational efficiency:** Operational efficiency refers to the impact of transaction costs and market frictions on the operation of a market.

**Informational efficiency:** Informational efficiency refers to whether prices reflect 'true value'. In a market exhibiting informational efficiency, asset prices incorporate all relevant information fully and instantaneously. For example, when company A receives a takeover bid from company B that seems certain to succeed, the stock price of A increases immediately to reflect the per share bid premium.

**Efficient market hypothesis** (EMH) deals with informational efficiency.

**Market efficiency** refers to a condition in which current prices reflect all the publicly available information about a security. The basic idea underlying market efficiency is that competition will drive all information into the price quickly. In the financial market, the maximum price that investors are willing

to pay for a financial asset is actually the present value of future cash inflows discounted at a rate to compensate for the uncertainty in the cash flow projections. Therefore the investors are actually trading information about future cash flows and their degree of certainty as a "commodity" in financial markets.

**Efficient market** emerges when new information is quickly incorporated into the price so that it reflects up-to-date information. Under these conditions, the current market price in any financial market could be the best unbiased estimate of the value of the investment.

In an efficient market therefore prices react to new information quickly and precisely. There is no free lunch in an efficient market. The only way you can get higher returns is by taking on more risk. But no information is available to construct strategies that can earn higher returns on a consistent basis.

**Self Assessment Questions:**

1. _____ (EMH) deals with informational efficiency.

## 6.3 The Value of an Efficient Market

It is important that financial markets are efficient for at least three reasons.

- **To encourage share buying:** Accurate pricing is required if individuals are to be encouraged to invest in companies. If shares are incorrectly priced, many savers will refuse to invest because of fear that when they sell their shares the price may not represent the fundamentals of the firm. This will seriously reduce the availability of funds to companies and retard economic growth. Investors need the assurance that they are paying a fair price for acquiring shares and that they will be able to sell their holdings at a fair price – that the market is efficient.
- **To give correct signals to company managers:** Maximisation of shareholder wealth is the goal of managers of a company. Managers will be motivated to take the decisions that maximise the share price and hence the shareholder wealth, only when they know that their wealth maximising decisions are accurately signalled to the market and get incorporated in the share price. This is possible only when the market is efficient.

- **To help allocate resources:** If a badly run company in a declining industry has shares that are highly valued because the stock market is not pricing them correctly, it will be able to issue new capital by issuing shares. This will attract more of economy's savings for its use. This would be bad for the economy as these funds would be better utilised elsewhere.

**Self Assessment Questions:**

2. Financial markets are _____ for at least three reasons.

## 6.4 Random Walk Theory

EMH is associated with the idea of a "random walk". Random walk is a term used to characterise a price series where all subsequent price changes represent random deviations from previous prices. The logic of the random walk idea is that if the flow of information is not hindered and if information is immediately incorporated and reflected in the stock prices, it follows that tomorrow's security price will incorporate tomorrow's news and security price changes tomorrow will be independent of the price changes today. Since news by definition is unpredictable and random, the resulting price changes must be random too.

The theory asserts that prices have no memory; therefore past and present prices cannot be used to predict future prices (as implied in technical analysis). Prices move at random, since new information is random, and adjust to new information as it becomes available. The adjustment to this new information is so fast that it is impossible to profit from it. Furthermore, news and events are also random and trying to predict these (fundamental analysis) is useless.

The theory implies that the prices fully reflect all known information, and even uninformed investors buying a diversified portfolio at the market prices will obtain a rate of return equal to that achieved by the experts. In his book "A Random Walk Down Wall Street", Burton G Malkiel states that a blindfolded chimpanzee throwing darts at the Wall Street Journal can select a portfolio that would perform as well as the portfolio that is selected by the experts. The advice to the investors is not to ask a chimpanzee to throw darts and select a portfolio for them, but to buy and hold a broad-based index fund.

**Self Assessment Questions:**

3. EMH is associated with the idea of a _____.

## 6.5 Random Walk and EMH

Statistical research has shown that stock prices seem to follow a random walk with no apparent predictable patterns that investors can exploit to their advantage. These findings are now taken to be evidence of market efficiency, i.e. market prices reflect all currently available information. Only new information will move stock prices, and this information is equally likely to be good or bad news. Therefore stock prices movements are random.

Random walk theory usually starts from the assumption that the major security exchanges are good examples of efficient markets where there are large numbers of rational profit-maximisers actively competing with one another, trying to predict future market values of individual securities. In an efficient market important current information is almost always freely available to all participants.

In an efficient market, actual prices of individual securities at any point in time reflect the information based both on past and future events. This is the result of competing actions of many intelligent market participants. In an efficient market the actual price of a security is a good estimate of its **intrinsic value**. In an uncertain world market, participants will disagree on the intrinsic value of the security, leading to discrepancies between actual prices and intrinsic values. But in an efficient market the actions of the many competing participants cause the actual price of a security to wander randomly about its intrinsic value.

If the differences between actual prices and intrinsic values are systematic rather than random in nature, as predicted by theory, then intelligent market participants should be able to predict the path by which the actual prices move towards their intrinsic values. However, when many intelligent traders attempt to take advantage of this knowledge, they would tend to neutralise such systematic behaviour in price series. Although uncertainty concerning intrinsic values will remain, actual prices of securities will wander randomly about their intrinsic values.

The intrinsic values change all the time as a result of new information coming in. The new information is about factors that may affect a company's

prospects, such as the success of a current R&D program, a change in management, a new tax imposed on the industry's products in foreign countries etc. In an efficient market, on an average, competition between market players will cause the full effects of new information on intrinsic value to be reflected "instantaneously" in actual prices. This "instantaneous adjustment" property of an efficient market implies that successive price changes in individual securities will be independent. A market where successive price changes in individual securities are independent is, by definition, a random-walk market.

The random-walk hypothesis may not be an exact description of the behaviour of stock market prices. However, for practical purposes, the model may be accepted. Thus, although successive price changes may not be strictly independent, the actual amount of dependence may be so small as to be unimportant.

**Self Assessment Question:**

4. In an efficient market the actual price of a security is a good estimate of its _____.

## 6.6 Forms of Market Efficiency

Informational efficiency is all about reflecting all available information in the price of a security. Two questions arise here are:

(1) What is **all available information**?

(2) What does **reflection** of available information mean?

Different answers to these questions give rise to different versions of market efficiency.

***Available information*:** This is at three levels of strength. Basic information about the past prices refers to the weak version of EMH. Price information together with all published and publicly available data refers to the semi-strong version. Information about price, public data as well as private data refers to the strong version of EMH.

***"Prices reflect all available information"*** means all financial transactions that are carried out at market prices, using the available information, are zero NPV activities.

The weak form of EMH states that **all past prices, volumes and other market statistics (generally referred to as technical data) cannot provide any information that would prove useful in predicting future stock price movements.** The current prices fully reflect all security market information, including the historical sequence of prices, rates of return, trading volume data, and other market-generated information. This implies that past rates of return and other market data should have no relationship with future rates of return. It would mean that if the weak form of EMH is correct, then technical analysis cannot generate excess returns.

The semi-strong form suggests that **stock prices fully reflect all publicly available information and all expectations about the future**. "Old" information is to be discarded and not to be used to predict stock price fluctuations. The semi-strong form suggests that fundamental analysis is also fruitless knowing what a company generated in terms of earnings and revenues in the past will not help you determine stock price in the future. This implies that decisions made on new information after it is public should not lead to above-average risk-adjusted profits from those transactions.

Lastly, the strong form of EMH suggests that **stock prices reflect all information, whether it be public (say in SEBI filings) or private (in the minds of the CEO and other insiders).** So even with material non-public information, EMH asserts that stock prices cannot be predicted with any accuracy.

**Self Assessment Questions:**

5. What is Efficient Market Hypothesis (EMH)?

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_____

6. What are allocational, operational and informational efficiency?

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7. What is Random Walk Theory?

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## 6.7 Empirical Tests of EMH

The debate about efficient markets has resulted in a plethora of empirical studies attempting to determine whether specific markets are in fact 'efficient' and if so to what degree. Academic studies have attempted to prove or disprove each of these forms of EMH, via testing of correlations (month-to-month and day-to-day returns), relative strengths, stock splits, earnings announcements, book value/market capitalisation correlation studies etc.

To test **weak form efficiency**, profitability of trading is tested to see whether past price or volume contains useful information. Auto correlation tests and filter rule tests are used to test weak form efficiency. An **auto correlation test** investigates whether the returns are statistically dependent on one another, i.e. can past stock return data predict future stock return data. A **filter rule** is a trading rule regarding the actions to be taken when shares rise or fall in value by x%. Filter rules should not work if markets show weak form of efficiency.

**Semi-strong** form efficiency denotes that any new information about the stock is incorporated into the price so quickly that the investor cannot act upon it and gain excess returns. The main line of research in this area is to watch the stock price just before and after a public announcement. These are called **event studies.** Event studies involving phenomena occurring at known points in time, such as a stock split or the announcement of corporate earnings, are frequently used in tests of the semi-strong form of market efficiency, to see whether public information is reflected immediately. To test **strong-form efficiency** performance of professional managers or insiders is assessed to see whether they have superior information unknown to public investors.

A tremendous amount of evidence supports the weak form of efficient market hypothesis. Technical trading rules are not consistently profitable. Serial correlation in daily stock returns is close to zero. The history of share prices cannot be used to predict the future in any abnormally profitable way. Early tests of the EMH focused on technical analysis. It is the technical analysts whose existence is threatened the most by EMH. The vast majority of studies of technical theories have found these strategies to be completely useless in predicting securities prices.

Recently though, there have been some studies which show that in certain circumstances some of the schemes technical analysts use might be of help in reaping excess returns, although the trading costs involved might eat up the higher returns.

**Semi-strong form of EMH** is generally supported by the data. Prices react to news quickly. Studies have looked, among other things, at the reaction of the stock market to the announcement of various events such as earnings, stock splits, capital expenditure, divestitures and takeovers. The usefulness or relevance of the information was judged based on the market activity associated with a particular event. In general, typical results from event studies have showed that security prices adjust to new information within a day of the event announcement, an inference that is consistent with the semi-strong form EMH.

Some evidence for and against the semi-strong form of market efficiency has been discovered in the following:

**Information announcements:** Can trading in shares, immediately following announcement of new information, (for example announcements on dividends or profit figures) produce abnormal returns? Evidence supports the semi-strong form of EMH, as excess returns, are nil. It is seen that most of the information in financial results or dividend announcements are reflected in share prices before the announcement is made.

**Stock splits:** When stock splits are made, no new money is raised by the company and existing shareholders receive more shares for the same value of stock. As the firm does not receive money and the fundamentals have not changed, prices should not react purely to a stock split. However, splits tend to occur when companies are doing well, and are seen as confirmation that

the company anticipates continued growth in profits and dividends. Researches have shown that share prices rise steeply before the split, but not following it. So investors would not be able to profit by purchasing stock on the split date. This evidence is consistent with the semi-strong form of EMH.

**Manipulation of earnings:** Release of financials is an important source of information about a company. Most companies present a truthful account of their business, but some do creative accounting (which obeys the letter of the law and accounting rules but involves the manipulation of the accounts to show the most favourable figures). Market efficiency tests have shown that investors certainly ingest accounting information in their decision, but doubts have been raised about market efficiency to large-scale creative accounting.

Evidence does not support **strong form EMH**. Insiders can make a profit on their knowledge, and people go to jail, get fined, or get suspended from trading for doing so. One does not even have to look at the studies done in this area. All the news stories of people making excess returns by participating in insider trading, (e.g. Ken Lay and Jeff Skilling, former Enron executives who allegedly participated in insider trading), contradict the strong form of the EMH. It is well-known that people can and do make abnormal gains using information that is not in the public domain. In this respect stock markets are not strong form efficient. Those who do not have the private information feel cheated by insider trading. To avoid a loss of confidence in the market, most stock exchanges attempt to curb insider trading and it is a criminal offence in most exchanges.

There is also negative evidence for EMH as given below:

**1. Stock market crash of 1987:** There was no apparent exogenous news that could cause the crash which resulted in an enormous and discontinuous price drop. On October 19, 1987, the Dow Jones Industrial Average fell by 22 percent. The effect was felt worldwide and there was no immediate bouncing back from the crash. There was heavy institutional selling (one institution sold $1.7 billion). The suspects for the crash were index arbitrage and portfolio insurance whose collective mass selling caused the market to fall.

**2. Smooth dividends but volatile prices (research conducted by Shiller):** The volatility of share prices relative to variables that affect share prices can be studied to test market efficiency. Shiller's study of share price volatility revealed significant volatility in the stock market. Shiller inferred that the fluctuations in actual prices which were greater than those implied by changes in the fundamental variables were the result of fads or waves of optimistic or pessimistic market psychology.

**Self Assessment Question:**

8. An _____ investigates whether the returns are statistically dependent on one another,

## 6.8 Misconceptions about EMH

There are three classic misconceptions:

**Any share portfolio will perform as well as or better than a special trading rule designed to outperform the market:** Market efficiency does not mean that it does not make a difference how you invest. The risk-return trade-off applies at all times, and it is important that the portfolio is broad-based and diversified. EMH only cautions you not to expect to consistently "beat the market" on a risk-adjusted basis, using costless trading strategies.

**There should be fewer price fluctuations:** Again, EMH does not mean stability of stock prices. In fact constant fluctuation of market prices is really an indication that markets *are* efficient. New information impacting security prices arrives constantly and causes continuous adjustment of prices.

**EMH presumes that all investors have to be informed, skilled, and able to constantly analyse the flow of new information. Still, the majority of common investors are not trained financial experts. Therefore market efficiency cannot be achieved:** This too is wrong. Not all investors have to be informed. In fact, market efficiency can be achieved even if only a relatively small core of informed and skilled investors trade in the market. It only needs a few trades by informed investors using all the publicly available information to drive the share price to its semi-strong-form efficient price.

**Self Assessment Question:**

9. EMH does not mean _____ of stock prices.

## 6.9 EMH, Technical Analysis and Fundamental Analysis

**Technical analysis** is a general term for a number of investing techniques that attempt to forecast securities prices by studying past prices and related statistics. **Fundamental analysis** focuses on the determinants of the underlying value of the stock or security, such as a firm's profitability and growth prospects. As both types of analysis are based on public information, neither should generate excess profits if markets are operating efficiently.

**Weak-form EMH** states that the current prices fully reflect all security-market information, including the historical sequence of prices, rates of return, trading volume data, and other market-generated information. This implies that past rates of return and other market data should have no relationship with future rates of return.

Technical analysis searches for profitable trading strategies based on recurring patterns in stock prices. Many people do price charting to predict share prices. However, examining recent trends in price and other market data in order to predict prices would be a waste of time if the market is weak-form efficient. Investors cannot devise an investment strategy to yield abnormal profits on the basis of an analysis of past price patterns.

**Under the weak form of EMH, technical analysis is useless**. Technical analysis relies on sluggish response of stock prices to fundamental supply and demand factors. This possibility is diametrically opposed to the notion of an efficient market. Stock prices follow random walks, and past returns are entirely useless for predicting future returns.

Empirical studies of technical analysis do not generally support the hypothesis that these can generate trading profits. Only very short-term filters seem to offer any hope for profits, yet these are extremely expensive in terms of trading costs. These costs exceed potential profits even in the case of floor traders. The majority of researchers that have tested technical trading systems (and the weak-form EMH) have found that prices adjust rapidly to stock market information and that technical analysis is unlikely to provide any advantage to investors who use them.

However, others argue that all this does not negate technical analysis.

**Semi-strong form EMH** states that the current security prices reflect all public information, including market and non-market information. This

implies that decisions made on new information after it becomes public should not lead to above-average risk-adjusted profits from those transactions.

**Implications of semi-strong form EMH:** The semi-strong form tests focus on the question of whether it is worthwhile to acquire and analyse publicly available information. If semi-strong efficiency is true, it undermines the work of fundamental analysts whose trading rules cannot be applied to produce abnormal returns because all publicly available information is already reflected in the share price. An analysis of balance sheets, income statements, product line, announcements of dividend changes or stock splits, or any other public information about a company will not yield abnormal profits if the market is semi-strong form efficient.

Several anomalies (discussed in this unit) regarding semi-strong form of EMH have been uncovered. These include the P/E effect, the small-firm effect, the neglected-firm effect, and the market-to-book effect. The anomalies seem to contradict the semi-strong version of EMH.

**Strong-form EMH** states that stock prices fully reflect all information from public and private sources. This would require perfect markets in which all information is cost-free and available to everyone at the same time (which is clearly not the case). Implication of strong-form EMH is that **not even "insiders" would be able to "beat the market" on a consistent basis.**

**Self Assessment Questions:**

10. _____ states that the current prices fully reflect all security-market information, including the historical sequence of prices, rates of return, trading volume data, and other market-generated information.
11. _____ states that stock prices fully reflect all information from public and private sources.

## 6.10 Implications of EMH for Security Analysis and Portfolio Management

### 6.10.1 Implications for active and passive investment

Proponents of EMH often advocate passive as opposed to active investment strategies. Active management is the art of stock-picking and market-timing.

The policy of passive investors is to buy and hold a broad-based market index. Passive investors spend neither on market research, on frequent purchase nor on sale of shares.

The efficient market debate plays an important role in the decision between active and passive investing. Active managers argue that less efficient markets provide the opportunity for skilful managers to outperform the market. However, it is important to realise that a majority of active managers in a given market will underperform the appropriate benchmark in the long run whether or not the markets are efficient. This is because active management is a zero-sum game in which the only way a participant can profit is for another less fortunate active participant to lose. However, when costs are added, even marginally successful active managers may underperform the market. By and large, performance record of professionally managed funds does not support the claim that active managers can consistently beat the market. The empirical evidence is that investing in passively managed funds such as index fund has outperformed actively managed funds for the last several decades.

If markets are efficient, what is the role for investment professionals? Those who accept EMH generally reason that the primary role of a portfolio manager consists of analysing and investing appropriately based on an investor's tax considerations and risk profile. Optimal portfolios will vary according to factors such as age, tax bracket, risk aversion, and employment. **The role of the portfolio manager in an efficient market is to tailor a portfolio to those needs, rather than to beat the market.**

### 6.10.2 Implications for investors and companies

EMH has a number of implications for both investors and companies.

**For investors:** Much of the existing evidence indicates that the stock market is highly efficient, and therefore, investors have little to gain from active management strategies. Attempts to beat the market are not only useless but can reduce returns due to the costs incurred in active management (management fees, transaction costs, taxes, etc.). Investors should therefore follow a passive investment strategy, which makes no attempt to beat the market.

This does not mean that there is no role for portfolio management. Returns can be optimised through diversification and asset allocation, and by minimisation of investment costs and taxes. In addition, the portfolio should be geared to the time horizon and risk profile of the investor.

Public information cannot be used to earn abnormal returns. Therefore, the implication is that fundamental analysis is a waste of time and money and as long as market efficiency is maintained, the average investor should buy and hold a suitably diversified portfolio.

Investors, however, will have to make efforts to obtain timely information. Semi-strong form of market efficiency depends on the quality and quantity of publicly available information. Therefore, companies should be encouraged by investor pressure, accounting bodies, government rulings and stock market regulation to provide as much information as feasible, subject to the need for secrecy.

The perception of a fair and efficient market can be improved by more constraints and deterrents placed on insider trading.

**For companies:** EMH also has implications for companies.

- **Companies should focus on substance, not on window-dressing accounting data:** Some managers believe that they can fool shareholders through creative accounting but investors are able to see through the manipulation and interpret the real position, and consequently security prices do not rise.
- **The timing of security issues does not have to be fine-tuned:** A company need not delay a share issue thinking that its shares are currently under-priced because the market is low and hoping that the market will rise to a more 'normal level' later. This thinking defies the logic of the EMH – if the market is efficient the shares are already correctly priced and it is just as likely that the next move in prices will be down as up.

**Self Assessment Questions:**

12. The _____debate plays an important role in the decision between active and passive investing.

**Activity:**
Analyse the reasons for EMH in its strong form is not realistic in actual markets.
**Hint:** Explain how market prices are manipulated.

## 6.11 Critique of EMH

EMH is based on the premise that stock prices reflect information and do not change unless there is new information. But this is not always the case. The paradox of efficient markets is that they depend on market participants who believe the market is inefficient and trade securities in an attempt to outperform the market.

In other words, if market prices reflect all information, we only need to look at prices. But if everyone looks only at the prices and nothing else, how can prices reflect information? If it is true that the prices reflect all available information, then who has the incentive to collect costly information?

EMH has also been challenged by certain anomalies in the capital markets.

### 6.11.1 Market anomalies

The reality about market traders and operators is that people believe markets are inefficient and they look for anomalies and take advantage of them, thereby eliminating opportunities that they bring. This contributes to making the markets more efficient.

Researchers have uncovered numerous stock market anomalies that seem to contradict EMH. The search for anomalies is effectively the search for systems or patterns that can be used to outperform passive and/or buy-and-hold strategies. Theoretically though, once an anomaly is discovered, investors attempting to profit by exploiting the inefficiency should result in its disappearance. In fact, numerous anomalies that have been documented via back-testing have subsequently disappeared.
Some major anomalies are:

**The low PE effect:** Some evidence indicates that low PE stocks outperform higher PE stocks of similar risk. Studies show that stocks of companies with low P/E ratios earned a premium for investors. An investor who held the low P/E ratio portfolio earned higher returns than an investor who held the entire sample of stocks. These results also contradict EMH.

**Low-priced stocks:** Many people believe that the price of every stock has an optimum trading range.

**Small-firm effect:** Small-firm effect is also known as the 'size-effect'. Studies have revealed that excess returns would have been earned by holding stocks of low capitalisation companies. If the market was efficient, one would expect the prices of stocks of these companies to go up to a level where the risk adjusted returns to future investors would be normal. But this did not happen.

**The neglected firm effect:** Neglected firms seem to offer superior returns with surprising regularity.

**Over/under reaction of stock prices to earnings announcements:** There is substantial documented evidence on both over and under-reaction to earnings announcements. Studies present evidence that is consistent with stock prices over-reacting to current changes in earnings. They report positive (negative) estimated abnormal stock returns for portfolios that previously generated inferior (superior) stock price and earning performance. This could be construed as the prior period stock price over-reaction to earnings developments. Thus, the evidence suggests that information is not impounded in prices instantaneously as EMH suggests.

**The January effect:** Studies have documented evidence of higher mean returns in January as compared to other months.

**The weekend effect (or Monday effect):** Studies have found that there is a tendency for returns to be negative on Mondays whereas they are positive on the other days of the week, with Friday being the best of all.

**Other seasonal effects:** Holiday and turn of the month effects have been well-documented over time and across countries. Studies show that US stock returns are significantly higher at the turn of the month, defined as the last and first three trading days of the month.

**The persistence of technical analysis:** If EMH is true, technical analysis should be useless. Each year, however, an immense amount of literature is printed on the subject.

**Standard & Poor's (S&P) Index effect:** Studies find a surprising increase in share prices (up to 3 percent) on the announcement of a stock's inclusion into the S&P 500 index. Since in an efficient market only information should

change prices, the positive stock price reaction appears to be contrary to EMH.

**The weather:** Sunshine puts people in a good mood in temperate climates. People in good moods make more optimistic choices and judgments. Studies show that the New York Stock Exchange index tends to be negative when it is cloudy. Recent studies that have analysed data for 26 countries from 1982-1997 found that stock market returns are positively correlated with sunshine in almost all of the countries studied. Interestingly, they find that snow and rain have no predictive power!

These phenomena have been rightly referred to as anomalies because they cannot be explained within the existing paradigm of EMH. It clearly suggests that information alone is not moving stock prices. These anomalies have led researchers to question EMH and to investigate alternate modes of theorising market behaviour.

**Self Assessment Questions:**

13. How are weak and semi-strong forms of market efficiency tested?

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14. What are the misconceptions about EMH?

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## 6.12 Summary

- EMH is an investment theory that states that it is impossible to beat the market because stock market efficiency causes existing share prices to always incorporate and reflect all relevant information.
- The crux of EMH is that to outperform the market the only way is to purchase riskier investments.

- EMH implies that if new information is revealed about a firm, it will be incorporated into the share price rapidly and rationally, with respect to the direction of the share price movement and the size of that movement.
- Stock market efficiency does not mean that investors have perfect powers of prediction; all it means is that the current price of the security is an unbiased estimate of its true economic value based on the information revealed.
- In the major stock markets of the world, stock prices are set by forces of supply and demand.
- Market participants distinguish among three forms of the efficient market hypothesis. The weak form asserts that all information to be derived from past stock prices is already reflected in stock prices. The semi-strong form claims that all publicly available information is already reflected in the stock price and the strong form asserts that all information, including private, is reflected in security prices.
- Although the cornerstone of SAPM theory, EMH is controversial and often disputed.

## 6.13 Glossary

***Market efficiency:*** Refers to a condition in which current prices reflect all the publicly available information about a security.

***Random walk:*** A term used to characterise a price series where all subsequent price changes represent random deviations from previous prices.

## 6.14 Terminal Questions

1. Discuss Random Walk Theory
2. Discuss random Walk and Efficient Market Hypothesis (EMH)
3. Discuss the forms of Market efficiency
4. Discuss the Empirical Tests of EMH
5. Explain the misconceptions about EMH
6. What are the implications of EMH to fundamental and technical analysis?
7. Discuss the implications of EMH for Security Analysis and Portfolio Management

## 6.15 Answers

### Self Assessment Questions

1. Efficient market hypothesis
2. efficient
3. random walk
4. intrinsic value.
5. Refer to 6.1
6. Refer to 6.2
7. Refer to 6.4
8. auto correlation test
9. stability
10. Weak-form EMH
11. strong-form EMH
12. efficient market
13. Refer to 6.7
14. Refer to 6.8

### Terminal Questions

1. EMH is associated with the idea of a “random walk”. Random walk is a term used to characterise a price series where all subsequent price changes represent random deviations from previous prices. For more details, refer section 6.4.
2. Random walk theory usually starts from the assumption that the major security exchanges are good examples of efficient markets where there are large numbers of rational profit-maximisers actively competing with one another, trying to predict future market values of individual securities. In an efficient market important current information is almost always freely available to all participants. For more details, refer section 6.5.
3. Informational efficiency is all about reflecting all available information in the price of a security. For more details, refer section 6.6.
4. The debate about efficient markets has resulted in a plethora of empirical studies attempting to determine whether specific markets are in fact ‘efficient’ and if so to what degree. For more details, refer section 6.7.
5. There are three classic misconceptions. For more details, refer section 6.8.

6. Implication of strong-form EMH is that not even “insiders” would be able to “beat the market” on a consistent basis. For more details, refer section 6.9.
7. The efficient market debate plays an important role in the decision between active and passive investing. For more details, refer section 6.10.

## 6.16 News Item

**“Hewlett Packard proposes merger with Compaq”**

Sep. 3, 2001: Two companies, Hewlett Packard (HP) and Compaq, revealed plans to merge. Announcing the proposal, Carly Fiorina the CEO of HP stated: “the combinations vaults us into a leadership role” and creates “substantial owner value through cost structure improvements and growth opportunities”. But investors and technical analysts gave the proposal a big thumbs-down, and over the next 2 days HP underperformed the market by 21% and Compaq underperformed by 16%. Investors apparently believed that the merger would have a negative NPV of $13 billion.

When on Nov 6 the Hewlett family announced that they would vote against the proposal the market revived and HP shares net day gained 16%.

We are not saying investors were right, and management may have had valid reasons to believe that the merger would be a great success. Our point is simply that the price reaction of the 2 stocks provided a potentially valuable summary of investor opinion about the effect of the merger on firm value.

**Discussion Questions**

1. Study the behaviour of the two stocks during the period Sep’01 to Jan’02 and comment on the efficiency of market impounding of firm information.
2. Review subsequent history of the merger and comment on EMH with respect to the HP-Compaq merger.

**Hint**

EMH implies that if new information is revealed about a firm, it will be incorporated into the share price rapidly and rationally, with respect to the direction of the share price movement and the size of that movement.

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# Unit 7 Behavioural Finance

**Structure:**



## 7.1 Introduction

In the previous unit we have learnt about efficient market hypothesis (EMH). EMH implies that it is not possible to consistently outperform the market,

appropriately adjusted for risk, by using any information that the market already knows, except through luck.

In this unit we will learn about behavioural finance, which deals with when, how and why psychology influences investment decisions.

The domain of finance is dominated by the premise that people are rational. Recently psychologists have challenged this assumption. They argue that people often suffer from cognitive and emotional biases and act in an irrational manner. With increasing evidence of the influence of psychology and emotions on decisions, behavioural finance has received greater acceptance. This unit discusses heuristic biases, frame dependence, emotional and social influence and market inefficiencies

**Objectives:**

After studying this unit you should be able to:

- explain important heuristic biases and cognitive errors that impair judgment
- identify cognitive and emotional factors of frame dependence
- explain how behavioural factors cause market inefficiencies
- list challenges faced by behavioural finance experts
- discuss strategies for overcoming psychological biases.

## 7.2 Meaning of Behavioural Finance

The study of behavioural finance recognises that people employ imperfect rules of thumb to process data, which induces biases in their beliefs and predisposes them to commit errors.

Behavioural finance postulates that perceptions of risk and return are significantly influenced by how problems are framed, and by emotions and herd instinct.

## 7.3 Heuristic Biases

**'Heuristics'** refers to experience-based techniques for problem solving, learning, and discovery. Where an exhaustive search is impractical, heuristics are used to speed up the process of finding a satisfactory solution. Examples of this method include using a rule of thumb, an educated guess, an intuitive judgment, or common sense.

In more precise terms, heuristics are strategies using readily accessible, though loosely applicable, information to control problem-solving in human beings and machines.

Decisions based on heuristics sometimes yield reasonable judgments, but may also lead to serious and systematic errors. Important heuristic biases and cognitive errors that impair judgment are representativeness, overconfidence, anchoring, aversion to ambiguity and innumeracy.

### 7.3.1 Representativeness

This is the tendency to form judgments based on stereotypes. For example, you may form an opinion on a prospective employee based on the perception held by you on how he had performed in his previous employment. Though such representativeness is a good rule of thumb, it could also be wrong.

In the investing domain representativeness reflects in the following ways:

- Being too quick to detect patterns in data that are in fact random.
- Belief that a healthy growth of earnings in the past may be representative of high growth rate in the future.
- Being drawn to mutual funds with a good track record because such funds are performing, though in fact unskilled/inefficient fund managers may be earning high returns by chance.
- Being overly optimistic about past winners and overly pessimistic about past losers.
- Assumption that good companies are valued stocks, although the opposite holds true most of the time.

### 7.3.2 Overconfidence

Overconfidence is the illusion of control. People tend to believe that they have influence over future outcomes in an uncertain environment. Such an illusion may be fostered by factors like active involvement and positive early outcomes. Active involvement in a task like online investing gives investors a sense of control. Positive early outcomes, although they may be purely by chance, create an illusion of control.

### 7.3.3 Anchoring

People are often unwilling to change the opinion once formed even if they receive new and relevant information. Suppose investors have formed an

opinion that Firm X has above average long-term earnings prospect and in one quarter the firm reports much lower earnings, the investors continue to hold their view and will not react to the news because of 'anchoring'.

### 7.3.4 Familiarity

People are comfortable with things that are familiar to them and this applies to investments too. People therefore invest more in the stocks of their employer company, local companies and domestic companies.

### 7.3.5 Aversion to ambiguity

This is the other side of the concept of familiarity. Just as people look for familiar names to invest, they consciously avoid little-known stocks – the ambiguity could be in the nature of industry, the promoters or even the project being handled.

### 7.3.6 Innumeracy

People have difficulty with numbers. In the words of John Paulos, innumeracy is "an inability to deal comfortably with the fundamental notions of number and chance". The trouble people have with numbers is reflected in the following:

- Not being conscious of the difference between nominal and real changes in purchasing power, interest rate etc.
- Not understanding 'odds' and so not figuring out the "true" probabilities.
- Paying more attention to big numbers and less to small figures.
- Predicting events subjectively – based on how vivid the example was and not objectively – based on how frequently the event occurred.
- Ignoring the 'base rate' which represents the normal experience and going by the 'case' rate which reflects the most recent experience.

**Self Assessment Questions**

1. Investors may be too quick to detect patterns in data that are in the fact random. This refers to _____.
2. _____ stems partly from illusion of knowledge and partly from illusion of control.
3. _____ refers to forming an opinion and taking decision based on it even though new information is relevant
4. People predict an event on the basis of how vivid the past example was and not on the basis of how frequently the event has actually occurred. (True/False)

## 7.4 Frame Dependence

Frame dependence denotes the tendency to evaluate current decisions within the framework they have been presented in and based on perceptions of risk/return rather than pure risk and return.

The usual example is categorisation of where money comes from and what it is "assigned" to instead of recognising its fundability. The alternative is to speak of frame independence, wherein behaviour is not influenced by how the decision is framed. Examples are loss aversion, hedonic editing, loss of self-control, regret, and money illusion.

### 7.4.1 Prospects Theory

The prospect theory was propounded by Kahneman and Tversky. It describes how people frame and value a decision involving uncertainty. According to this theory, people look at choices in terms of potential gains or losses in relation to a specific reference point, which is often the purchase price. The decision attempts to maximise utility, keeping in mind the following features of the utility function.

1. The utility function is concave for gains. This means that people feel good when they gain, but twice the gain does not make them feel twice as good.
2. It is convex for losses. This means that people experience pain when they lose, but twice the loss does not mean twice the pain.
3. The utility function is steeper for losses than for gains. This means that people feel stronger about the pain from a loss than the pleasure from an equal gain-about two and half times as stronger and this phenomenon is referred as loss aversion.

People value gains/losses based on **S-shaped** utility function.

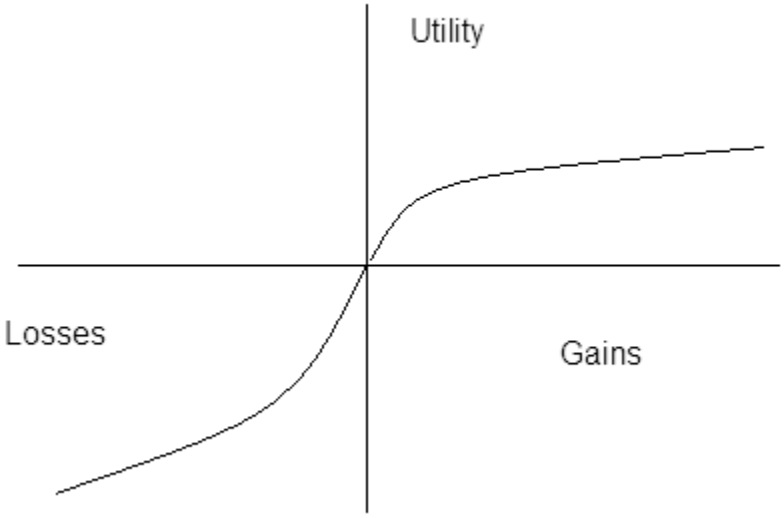



**Fig. 7.1: S-shaped utility**

### 7.4.2 Mental accounting

Traditional finance holds that wealth (money in particular) must be regarded as “fungible” and every financial decision should be based on a rational calculation of its effects on overall wealth position.

In reality, people do not have the computational skills and willpower to evaluate decisions in terms of their impact on overall wealth. It is intellectually difficult and emotionally burdensome to figure out how every short-term decision will effect on wealth position in the long run.

Mental accounting manifests itself in various ways:

- Investors have a tendency to ride losers as they are reluctant to realise losses. Mentally they treat unrealised paper loss and realised loss differently although from a rational economic point of view they are the same.
- Investors often integrate the sale of losers so that the feeling of regret is confined to one time period.
- Investors tend to stagger the sale of winners over time to prolong favourable experience.
- People are more venturesome with money received as bonus but very conservative with money set aside, say for children’s education.

- Investors often have an irrational preference for stocks paying high dividends because they do not mind spending the dividend income but are not inclined to sell a few shares and “dip into the capital”.

### 7.4.3 Narrow framing

Investors should ideally pay attention to changes in their total wealth over their investment horizon. However they engage in narrow framing by focusing on changes in wealth that are narrowly defined both in a cross-sectional as well as temporal sense.

Narrow framing in a cross-sectional sense means that investors tend to look at each investment separately rather than the portfolio in its totality. They are more focused on price changes in individual stocks and do not see the behaviour of the overall portfolio.

Narrow framing in a temporal sense means that investors pay undue attention to short-term gains and losses even when their investment horizon is long (like saving for retirement which may be many years away).

### 7.4.4 Behavioural portfolios

While investors understand the principles of diversification they do not form portfolios in the manner suggested by portfolio theories. According to Hersh Shefrin and Meir Statman, the psychological tendencies of investors prod them to build their portfolios as a pyramid of assets.

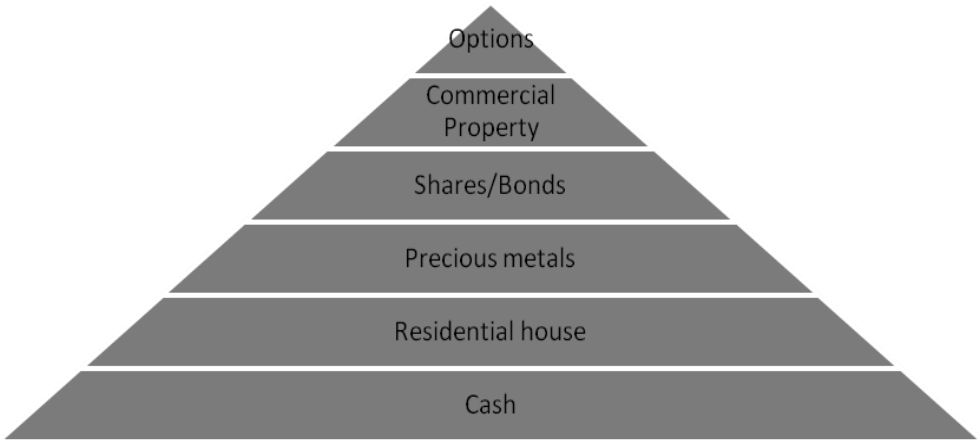



**Fig. 7.2: Pyramid of Behavioural Portfolio**

The salient features of the pyramid of behavioural portfolio are:

- Investors have several goals such as safety, income, and growth (often in that sequence).
- Each layer in the pyramid represents assets meant to meet a particular goal.
- Investors have mental accounts for each investment goal and they are willing to assume different levels of risk for each goal.
- The asset allocation of an investor's portfolio is determined by the amount of money assigned to each asset class by the mental accounts.
- Investors end up with a variety of mini-portfolios as they overlook interactions among mental accounts and investment assets.
- Diversification stems from investor goal diversification, not from purposeful asset diversification as recommended by Markowitz's portfolio theory. This means that most investors do not have efficient portfolios. Put differently, they can earn higher expected returns for the level of risk they are taking.

### 7.4.5 The shadow of the past

People are willing to take more risk after earning gains (For example, winning a bet) and less risk after incurring losses (For example, losing a bet). Experimental studies suggest a house-money effect, a snakebite effect and a trying–to-break-even effect.

**House-money effect:** Amateur gamblers somehow do not fully consider a win as their own and are hence tempted to risk it in further gambling.

**Snakebite effect:** After incurring a loss, people are less inclined to take risk. A loss is akin to a snakebite that makes a person more cautious.

**Trying–to-break-even effect:** Losers however do not always shun risk. People often jump at the chance to recover their losses. This effect may be stronger than the snakebite effect.

**Self Assessment Questions**

5. Frame dependence stems from a mix of _____ and _____ factors.
6. Investors often have an irrational preference for stocks paying high dividends because they do not mind spending the dividend income but are not inclined to sell a few shares and _____ _____.

7. Losers, however, do not always shun risk. People often jump at the chance to recover their losses. _____ effect may be stronger than the snakebite effect.

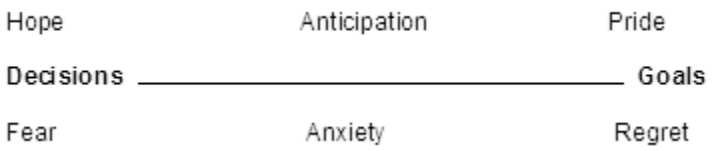
## 7.5 Emotions and Social Influences

Emotions and herd instinct are an important part of the decision-making process, particularly when decisions involve a high degree of uncertainty.

### 7.5.1 Emotional timeline

Emotions have a bearing on risk tolerance, which in turn influences portfolio selection. Investors experience a variety of emotions as they consider alternatives, decide how much risk to take, watch their decisions play out, assess whether the initial strategy needs modification and finally learn how far they have succeeded in achieving their financial goals.

**Emotional timeline**




Investment decisions lie at the left end of the timeline and investment goals at the right end. According to psychologist Lola Lopes, investors experience a variety of emotions, positive and negative. Positive emotions are shown above the time line and negative emotions below the time line.

On the positive side, hope becomes anticipation which finally converts into pride. On the negative side, fear turns into anxiety which finally transforms into regret. Hope and fear have a bearing on how investors evaluate alternatives.

Fear induces investors to look at the downside of things, whereas hope causes them to look at the upside. The downside perspective emphasises security; the upside perspective focuses on potential gains. According to Lopes, these two perspectives reside in everyone, as polar opposites. However, they are often not equally matched, as one pole tends to dominate the other. The relative importance of these conflicting emotions determines the risk tolerance.

### 7.5.2 Herd instinct and overreaction

There is a natural desire on the part of a human being to be part of a group and to decide on the feel of the herd rather than by rigorous independent analysis. This tendency is accentuated in the case of decisions involving high uncertainty. Large trends and fads begin when individuals ignore their private information but take cues from the actions of others. Imagine that in a traffic jam you find the driver ahead of you suddenly takes a little used exit. Even if you are not sure it will save you time, you are likely to follow him. A few more follow you and this becomes a trend.

**Self Assessment Questions**

8. Emotions have a bearing on risk tolerance, which in turn influences _____.
9. _____ induces investors to look at the downside of things, whereas _____ causes them to look at the upside.
10. _____ tendency is accentuated in the case of decisions involving high uncertainty.

## 7.6 Market Inefficiency

There are discrepancies between market price and intrinsic value often due to behavioural influence of the investors. The two assumptions are:

1. Some investors are not rational as their demand for risky assets is influenced by beliefs or sentiments that are not fully supported by fundamentals. These types of investors are termed as noise traders.
2. Arbitrage operations by rational investors tend to be limited as there are risks associated with it.

**Noise trading**

Many investors trade on pseudo-signals or noise and not on fundamentals. As long as these investors trade randomly, their trade cancels out and are likely to have no perceptible impact on demand. Noise traders tend to:

- be overconfident and hence assume more risk
- extrapolate past time series and hence chase trends
- put lesser weight on base rates and more weights on new information and hence overreact to news
- follow market gurus and forecasts and act in a similar fashion.

**Limits to arbitrage**

One can expect the irrationality of 'noise traders' to be countered by the rationality of 'arbitrageurs' as the latter are supposed to be guided by fundamentals and are immune to sentiments. However, arbitrage in the real world is limited to two types of risk. The first is fundamental. Buying 'undervalued' securities tends to be risky because the market may fall further and inflict losses. The fear of such a loss may restrain arbitrageurs from taking large enough long positions that will push price to fully conform to fundamentals. The second risk is resale price risk and it arises mainly from the fact that arbitrageurs have finite horizon.

**Price behaviour**

Arbitrageurs contribute to price volatility as they try to take advantage of the mood swings of noise traders. The effect of arbitrage is to stimulate the interest of other investors and to contribute to the movement of prices away from fundamentals. Although eventually arbitrageurs sell out and help prices return to fundamentals, in the short run they feed the bubble rather than help it to dissolve.

C. Rangarajan puts it this way: "Share price in India tends to be considerably influenced by short-term technical considerations and speculations. The fundamentals affect the share price after a considerable time lag. This disparity of perception leads to volatility and overheating of the stock market."

Edgar E Peters says that "The efficient market hypothesis assumes that investors are rational, orderly and tidy. It is a model of investment behaviour that reduces mathematics to simple linear differential equations. However the markets are not orderly or simple. They are messy and complex. This is evident from the following:

- In Mexico, stock prices increased by over 7 times and then declined by 73% from the peak during the period 1978-81
- Taiwan's stock rose nearly 10 times and then sharply declined by 80% during the period 1986-90
- Sensex index rose by more than 100% in a period of 2-3 months and then lost over 45% in a short time in 1992.

**Self Assessment Questions**

11. _____ try to extrapolate past time series and hence chase trends.
12. Share price in India tends to be considerably influenced by short term technical considerations and _____.
13. The fear of buying an undervalued stock may result in loss that may restrain arbitrageurs from taking large enough _____ that will push price to fully conform to fundamentals.
14. _____ rose by more than 100% in a period of 2-3 months and then lost over 45% in a short time in 1992.

## 7.7 Critique of Behavioural Finance

Excerpts from an article by John Maurice Clark in the Journal of Political Economy (1918):

**"**Efficient market advocates find the evidence on stock market inefficiency puzzling, for it suggests that there are profitable investment strategies that border on being 'free lunches'. So their first reaction was to contend that observed evidence does not suggest that investors make mistakes, but simply reflects risk. For example, they argued that the stocks on the 'loser' portfolio are fundamentally riskier than those on the 'winner' portfolio. The efficient market advocates that 'data-mining' is bound to throw some anomalies and inefficiencies.

It appears that the risk story and data mining critique have not been able to demolish the inefficiency market point of view. Behavioural scientists talk about things like 'representation heuristics and conservatism'. But a substantial portion of academic finance community regards them as sceptics.

Behavioural finance is an attempt to borrow some good psychology rather than invent more bad psychology."

The author recommends that we look for concrete reasons for investor action rather than attribute the action to psychological factors and irrational biases.

## 7.8 Strategies for overcoming Psychological Biases

**Understand the biases**

- Pogo, the folk philosopher created by the cartoonist Walt Kelly, provided an insight that is particularly relevant for investors, “We have met the enemy- and it’s us”. So, understand your biases (the enemy within) as this is an important step in avoiding them.

**Focus on the big picture**

- Develop an investment policy and put it down on paper. Doing so will make you react less impulsively to the gyration of market.

**Follow a set of quantitative investment criteria**

- Quantitative investment criteria like price-earnings ratio not more than 15, the price to book ratio not more than 4, growth rate of earnings at least 12% and so on are helpful. They tend to mitigate the influence of emotion, hearsay, rumour and psychological biases.

**Diversify**

- If you own a fairly diversified portfolio of say 12 to 15 stocks from different industries, you are less prone to do something drastic when you incur losses in one or two stocks because these losses are likely to be offset by gains elsewhere.

**Control your investment environment**

- If you want to discipline your investment activity, you should regulate your investment environment and free it from temptations.
  Here are a few ways to do so:
- Check your stocks only once every month.
- Trade only once a month and preferably on the same day every month.
- Review your portfolio once or twice a year.

**Strive to earn market returns**

- Seek to earn returns in line with what the market offers. If you strive to outperform the market, you are likely to succumb to psychological biases.

**Review your biases periodically**

- Once in a year review your psychological biases. This will throw up useful pointers to contain such biases in future.

**Activity:**
If you are a investor, analyse how frequently you change your psychological basis for investment in the stock market in a year.

## 7.9 Summary

- Behavioural finance postulates that perceptions of risk and return are significantly influenced by how decision-making problems are framed, recognises that emotions and herd instinct play an important role in influencing decisions.
- The important heuristic biases and cognitive errors that impair judgment are representativeness, overconfidence, anchoring aversion to ambiguity and innumeracy.
- Overconfidence is the illusion of control. People tend to believe that they have influence over future outcomes in an uncertain environment. Such an illusion may be fostered by factors like active involvement and positive early outcomes.
- Active involvement in a task like online investing gives investors a sense of control. Positive early outcomes, although they may be purely by chance, create an illusion of control.
- Emotions and herd instinct are an important part of the decision making process particularly when decisions involve a high degree of uncertainty.
- Herd instinct is the natural desire of a human being to be part of a group and decide on the feel of the herd rather than rigorous independent analysis. This tendency is accentuated in the case of decisions involving high uncertainty.

## 7.10 Glossary

***'Heuristics':*** Refers to experience-based techniques for problem solving, learning, and discovery.

***Behavioural finance:*** Recognises that people employ imperfect rules of thumb to process data which induces biases in their beliefs and predisposes them to commit errors.

***Frame dependence:*** Denotes the tendency to evaluate current decisions within the framework in which they have been presented and making decisions based on perceptions of risk-return rather than pure risk and return.

## 7.11 Terminal questions

1. Explain important heuristic biases and cognitive errors that impair judgment.
2. Identify cognitive and emotional factors of frame dependence.
3. How do emotions and herd instinct become a part of the decision-making process?
4. Explain how behavioural factors influence market inefficiencies.
5. Explain the strategies for overcoming psychological biases.

## 7.12 Answers

### Self Assessment Questions

1. Representativeness
2. Overconfidence
3. Anchoring
4. True
5. Cognitive and emotional
6. “Dip into the capital”
7. Trying to break even
8. Portfolio selection
9. Fear, hope
10. Herd Instinct
11. Noise traders
12. Speculations
13. Long position
14. Sensex

### Terminal Questions

1. **‘Heuristics’** refers to experience-based techniques for problem solving, learning, and discovery. For more details, refer section 7.3.
2. Frame dependence denotes the tendency to evaluate current decisions within the framework in which they have been presented and making decisions based on perceptions of risk-return rather than pure risk and return. For more details, refer section 7.4.
3. Emotions and herd instinct are an important part of the decision-making process particularly when decisions involve a high degree of uncertainty. For more details, refer section 7.5.

4. There are discrepancies between market price and intrinsic value often due to behavioural influence of the investors. For more details, refer section 7.6.
5. There are different strategies for overcoming psychological biases. For more details, refer section 7.8.

## 7.13 Case Study

**Royal Dutch Petroleum and Shell Transport & Trading**

The Dutch company Royal Dutch Petroleum (RDP) and the British company Shell Transport & Trading (STT), before they were merged into one corporate entity, shared alike in the profits of the oil giant. RDP was entitled to 60% of the cash flow and STT to 40%. So you would expect that the market value of RDD would be 1.5 times that of STT. But in practice the values of the two shares traded far away from this parity line for long periods. This was studied over a 30-year period.

This would suggest to an investor an opportunity for easy money – buy the stock that is selling cheaper and sell the other. But the parity curve of the two stocks gives us a totally different picture. For instance if an investor had sold STT to buy RDP in Dec'78 when RDP was 15% below par, he would have had to wait for very long before he made any profits, since the undervalued share continued to be undervalued for over 2 years – in fact it moved to (-) 35% in Jun'79 and would have rung alarm bells if the investor was doing it on behalf of his client.

**Discussion Questions**

a. Does the case throw any light on under and over-reaction of investors to company events and announcements? Comment.
b. In particular, comment upon a market phenomenon, prolonged underperformance of new issues, which is seen often.

**Hint**

A thorough review of RDP and SST parity during the period would indicate that no easy profits can be made by studying behavioural finance. At best it could explain some of the right and wrong decisions, but as a predictor of stock prices it has a long way to go.

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# Unit 8 Valuation of Bonds and Shares

**Structure:**



## 8.1 Introduction

Investment in capital market refers to a commitment of funds to one or more assets that will be held over a future time period. Two popular asset types are shares and bonds. Shares are assets that have indefinite life. Bonds have limited life.

Investors are classified as owners (who invest in equities or stocks) and loaners (who invest in debt or bonds). Owning equity in a company is the most common and widely available means by which investors meet their financial objectives. Individual investors become owners of a publicly-traded company by purchasing stock in that company. By investing in shares, they can participate in the company's growth over time.

Investors may also choose to loan money to companies, governments or municipalities by purchasing bonds in return for regular interest payments and the return of principal on the scheduled date. This unit discusses different aspects of investment in shares and bonds.

**Objectives:**

After studying this unit, you will be able to:

Analyse the elements of capital market

- describe basic valuation models
- discuss bond features and Prices
- explain 'call' provisions on corporate bonds
- discuss Convertible Bonds
- explain valuation of Bonds
- discuss price-Yield Relationship
- explain the risks in debt securities
- discuss duration of Bonds
- discuss Duration and Immunisation
- analyse Bond Portfolio Management
- explain Valuation of Preference Shares
- explain Equity Valuation
- analyse Equity Portfolio Management

## 8.2 Elements of Investment in Capital Market

Stocks are a way for individuals to own parts of businesses. A share of common stock gives an investor a portion of ownership in a company. As the value of the company changes, the value of the share in that company rises and falls. Investors purchasing shares of stock:

(a) expect to receive a portion of the company's profits in dividends

(b) expect the price of the stock to go up.

Investors are taking a risk by owning stock. If the company or the market weakens the investor risks losing all or a portion of his investment.

Stock is generally owned for its growth potential. This potential growth is obtained through changes in the price of a share of stock. If the stock increases in value, the investor makes money from its sale. However he loses money if stock price decreases while selling. Stocks offer no

guarantees to investors, but over long periods of time they have performed better than any other type of investment. Stocks are the best vehicle as a long-term investment for overcoming inflation and building wealth.

Bonds do not give investors an ownership stake in a company, like stocks do. The investor loans the corporation or government, cash and in exchange receives interest payments and a return of the initial loan (principal) at the end of the life of the bond (maturity date). The amount of interest that different bonds pay (bond yield) varies depending on a variety of factors. These include other interest rates, inflation, the risk that the borrower will default on the loan, and attributes of the bond such as whether or not the bond can be called or converted. Paying a set amount of interest is one of the major advantages of bonds. Many investors need a steady stream of income from their investments, and bonds can be a great income-generating vehicle. Bonds also tend to be less volatile than stocks, offering greater protection from stock market downturns. Apart from the risk of non-payment of principal, inflation risk and interest rate risk are the risk factors in buying bonds.

**Self Assessment Questions:**

1. Stock is generally owned for its _____

## 8.3 Basic Valuation Models – Fundamental Approach

The value of a capital market investment is based on the present value of cash flows, the asset is expected to produce during its life. We measure the value of an asset (intrinsic value) by discounting expected cash flows at a rate that reflects their risks.

$$\text{Value of asset} = \sum_{t=1}^{N} \frac{(\text{Expected Cash Flow})_t}{(1+r)^t}$$

## 8.4 Bond Features and Prices

Bonds are debt securities – the bondholder is a creditor of the entity issuing the bond. The bondholder makes a loan of the face value to the issuer. The issuer (borrower) promises to repay to the lender (investor) the principal on maturity date plus coupon interest over its life.

**Bond terms**

Par value (face value): Face amount paid at maturity.

Coupon rate: Percentage of the par value that will be paid out annually in the form of interest.

Annual interest payment on bond = coupon rate × par value
Maturity: The duration of time until the par value must be repaid.

**Example**

A bond with par value of $1,000 and coupon rate of 8% might be sold to a buyer for ` 1,000. The bondholder is then entitled to a payment of ` 80 (= 8% × ` 1,000) per year, for the stated life of the bond, say 30 years. The ` 80 payment typically comes in two semi-annual instalments of ` 40 each. At the end of the 30-year life of the bond, the issuer also pays the ` 1,000 par value to the bondholder.

**Self Assessment Questions**

2. Bonds are _____.
3. _____ is the amount paid at maturity.

## 8.5 Call Provisions on Corporate Bonds

The call provision allows the issuer to repurchase the bond at a specified call price before the maturity date. If a company issues a bond with a high coupon rate, when market interest rates are high, and interest rates later fall, the firm might like to retire the high-coupon debt and issue new bonds at a lower coupon rate to reduce interest payments. This is called **refunding**. The call price of a bond is commonly set at an initial level near par value plus one annual coupon payment. The call price falls as time passes, gradually approaching par value.

Callable bonds typically come with a period of call protection, an initial time during which the bonds are not callable. Such bonds are referred to as **deferred callable bonds**. The option to call the bond is valuable to the firm, allowing it to buy back the bonds and refinance at lower interest rates when market interest rates fall. From the bondholder's perspective, the proceeds then will have to be reinvested in a lower interest rate. To compensate

investors for this risk, callable bonds are issued with higher coupon rates and promised yields than non-callable bonds.

**Self Assessment Questions**

4. What are call provisions on bonds?

_____

_____

_____

_____

_____

## 8.6 Convertible Bonds

Convertible bonds give the bondholders an option to exchange each bond for a specified number of shares of common stocks of the firm. The **conversion ratio** gives the number of shares for which each bond may be exchanged. Suppose a convertible bond that is issued at par value of $1,000 is convertible into 40 shares of a firm's stock. The current stock price is $20 per share, so the option to convert is not profitable now. However, should the stock price later rise to $30, each bond may be converted profitably into $1,200 worth of stock.

The **market conversion value** is the current value of the shares for which the bonds may be exchanged. At the $20 stock price, the bond's conversion value is $800. The **conversion premium** is the excess of the bond value over its conversion value. If the bond is selling currently at $950, its premium will be $150.

## 8.7 Valuation of Bonds

To value a security, we discount its expected cash flows by the appropriate discount rate. The cash flows from a bond consist of coupon payments until the maturity date plus the final payment of par value.

$$\text{Bond value} = \sum_{t=1}^{T} \frac{coupon}{(1+r)^t} + \frac{par\ value}{(1+r)^T}$$

Where *r is* the interest rate that is appropriate for discounting cash flows and *T is* the maturity date.

The present value (PV) of a ` 1 annuity that lasts for *T* periods when the interest rate equals *r is:*

$$\sum_{t=1}^{T} \frac{1}{(1+r)^t} = \frac{1}{(1+r)} + \frac{1}{(1+r)^2} + \ldots + \frac{1}{(1+r)^T} = \frac{1}{r}\left[1 - \frac{1}{1+r)^T}\right]$$

We call this expression T-period **PVIFA** (Present Value Interest factor for an Annuity) for an interest rate r.

The present value (PV) of a single payment of `1 to be received in *T* periods is:

$$\frac{1}{(1+r)^T}$$

We call this expression the **PVIF** (Present Value Interest Factor).

Bond value is:

$$= coupon\ x \sum_{t=1}^{T} \frac{1}{(1+r)^t} + par\ value\ x \frac{1}{(1+r)^T}$$

$$= coupon\ x \frac{1}{r}\left[1 - \frac{1}{(1+r)^T}\right] + par\ value\ x \frac{1}{(1+r)^T}$$

Thus bond value = coupon × PVIFA (*r*, *T*) + par value × PVIF (*r*, *T*)

PVIF and PVIFA values can be calculated using the equations or read from tables.

**Example**

Calculate the value of a bond with an 8% coupon, 30-year maturity bond with par value of ` 1,000 paying 60 semi-annual coupon payments of `40 each. The interest rate is 8% annually or *r* = 4% per six-month period.
The value of the bond is:

$$\text{Price} = \text{`}\ 40\ x \sum_{t=1}^{60} \frac{1}{(1+4\%)^t} + \text{`}\ 1{,}000\ x \frac{1}{(1+4\%)^{60}}$$

$$= \text{`}\ 40\ x \frac{1}{4\%}\left[1 - \frac{1}{(1+4\%)^{60}}\right] + \text{`}\ 1{,}000\ x \frac{1}{(1+4\%)^{60}}$$

= ` 40 x PVIFA (4%, 60) + ` 1000 x PVIF (4%, 60)

= ` 40 x 22.6235 + ` 1000 x 0.09506

= ` 904.94 + ` 95.06 = ` 1000

If the interest rate were to rise to 10% (5% per 6 months), the bond's price would become:

$$\text{Price} = ` 40 \text{ x} \sum_{t=1}^{60} \frac{1}{(1+5\%)^t} + ` 1{,}000 \text{ x} \frac{1}{(1+5\%)^{60}}$$

$$= ` 40 \text{ x} \frac{1}{5\%}[1 - \frac{1}{(1+5\%)^{60}}] + ` 1{,}000 \text{ x} \frac{1}{(1+5\%)^{60}}$$

= ` 40 x PVIFA (5%, 60) + ` 1000 x PVIF (5%, 60)

= ` 40 x 18.9292 + ` 1000 x 0.05353

= ` 757.17 + ` 53.53 = ` 810.70

At a higher interest rate, the present value of the payments to be received by the bondholder is lower. The bond price will fall as market interest rates rise.

**Self Assessment Question**

5. What is the price of a 10% coupon, 20-year maturity bond with par value of ` 1,000 paying semi-annual coupon payments, if the interest rate is 8% annually?

_____

_____

_____

_____

_____

## 8.8 Price-Yield Relationship

**Nominal yield:** This is simply the yield stated on the bond's coupon. If the coupon is paying 5%, the bondholder receives 5%.

**Current yield:** Current yield = Annual interest/Current price. This calculation takes into consideration the bond market price fluctuations and represents the present yield that a bond buyer would receive upon purchasing a bond

at a given price. As mentioned above, bond market prices move up and down with interest rate changes. If the bond is selling for a discount, then the current yield will be greater than the coupon rate. For instance, an 8% bond selling at par has a current yield that is equivalent to its nominal yield, or 8%.

Current Yield = Annual interest/Current price = (8% x ` 1000) / ` 1000 = 8%.

However, a bond that is selling for *less* than par, or at a discount, has a current yield that is *higher* than the nominal yield. Thus if you buy a bond with a par value of ` 1000, coupon rate of 8% and the current price of ` 950, the Current Yield= Annual interest/Current price

= (8 % x ` 1000) / ` 950

= ` 80 / ` 950 **= 8.42 %**

**Solved problems**

1. What is the current yield of a 10-year 12% coupon bond at par value of ` 1000 and setting for ` 950?

   **Answer**

   Current yield = 120/950 = .1263 or **12.63%**

2. What will be the price of a 5-year discount bond that pays ` 1000 at maturity if the interest rate rises to 11%?

   **Answer**

   $$\text{Price} = \frac{1000}{(1.11)^5} = \mathbf{593.45}$$

3. What will be the price of a 5-year discount bond that pays ` 1000 at maturity if the going interest rate is 9%?

   **Answer**

   $$\text{Price} = \frac{1000}{(1.09)^5} = \mathbf{649.93}$$

4. A bond with six years to maturity has a coupon rate of 9% and a par value of ` 1000. How much would an investor pay for the bond if he requires the following annual rate of return?

a. 7%
b. 10%
c. 12%

**Answer**

a. Price = 90 x PVIFA (7%, 6 years )+ 1000 x PVIF (7%, 6 years)
   = 90 x 4.766 + 1000 x .666
   = **1094.94**
b. Price = 90 x PVIFA (10%, 6 years) + 1000 x PVIF( 10%, 6 years)
   = 90 x 4.355 + 1000 x .564
   = 391.95 +564
   = **955.95**
c. Price = 90 x PVIFA (12% 6years) + 1000 x PVIF (12% 6years)
   = 90 x 4.111 + 1000 x .507
   = 369.99 + 507
   = **876.99**

**Value of a zero coupon bond**

1. IDBI issued deep discount bonds in 1996 which have a face value of `2,00,000 and a maturity period of 25 years. The bond was issued at `5,300. What is the realised yield of this zero coupon bond?

   **Answer**

   $5300 = \frac{200000}{(1+r)^{25}}$

   $(1+r)^{25} = 37.7358$

   $1+r = (37.7358)^{1/25} = 1.1563$

   **r = 15.63%**

2. If a zero coupon bond is issued for ` 2,500 with a maturity value of `1,00,000 at the end of 20 years, then what is the realised yield?

   **Answer**

   $2500 = \frac{1,00,000}{(1+r)^{20}}$

   $(1+r)^{20} = 1,00,000 / 2500 = 40$

$(1+r) = [40]^{1/20} = 1.2025$ or

r = 20.25%

3. Consider a 5-year discount bond with a face value of ` 1000 that yields 10% compounded annually. What is its price?

**Answer**

$$\text{Price} = \frac{1000}{(1+.10)^5} = 620.92$$

**Yield-to-maturity (YTM):** This measures the investor's total return if the bond is held to its maturity date. This includes the annual interest payments plus the difference between what the investor paid for the bond and the amount of principal received at maturity.

YTM is the annual rate of return that a bondholder will earn under the assumption that the bond is held to maturity and the interest payments are reinvested at the YTM. YTM is the same as the bond's internal rate of return (IRR). YTM or simply the yield is the discount rate that equates the current market price of the bond with the sum of the present value of all cash flows expected from this investment.

$$\text{Market Price} = \sum_{t=1}^{T} \frac{\text{coupon}}{(1+\text{YTM})^t} + \frac{\text{par value}}{(1+\text{YTM})^T}$$

Previously, we had calculated the price of bond value when the discount rate (r) was given. This discount rate was the YTM. In YTM calculations, the market price of the bond is given, and we have to calculate the discount rate that equates the present values of all the coupon payments and the principal repayment to the market price.

We do this by using trial and error or an approximation formula.

$$yield = \frac{Coupon + \frac{(Face\ value - Price)}{Maturity}}{\frac{(Price + Face\,value)}{2}}$$

**Example**

Suppose a company can issue 9% annual coupon, 20-year bond with a face value of ` 1,000 for ` 980. What is the yield-to-maturity on this bond?

Coupon = 9% x ` 1000 = ` 90

Face Value = ` 1000

Price = ` 980

Maturity = 20 years

Yield = $\frac{90 + (1000-980)/20}{(1000+980)/2}$

= 91/990 = .0919 or **9.19%**

**Example**

Calculate YTM of bond with 4.5% coupon and 10 years remaining to maturity, selling at a price of $900. The par value is $1000. Use approximation method.

**Answer**

YTM = $\frac{\text{Annual coupon interest + [Discount / number of years to maturity]}}{\text{[Current price + par value]/2}}$

= $\frac{45 + [100/10]}{[900+1000]/2}$

= 55/950 = 0.579 or 5.79%

If the same bond were selling at $1100

YTM = $\frac{\text{Annual coupon interest - [Premium / number of years to maturity]}}{\text{[Current price + par value]/2}}$

= $\frac{45 - [100/10]}{[1100+1000]/2}$

= 35/1050 = 0.0333 or **3.33%**

**Example**

A bond pays interest annually and sells for ` 835. It has 6 years to maturity and a par value of ` 1000. What is its coupon if its promised yield to maturity is 12%?

**Answer**

835 = 1000 x (X) [PVIFA 12% 6years] + 1000 [PVIF 12% 6 years]
100
835 = 10(X) [4.111] + 1000 X .507
328 = 41.11 (X)
**7.98% = (X) (coupon rate)**

**Example**

A bond with a coupon rate of 15% is currently selling at par. Find its YTM.

**Answer**

If the bond is selling at par its coupon rate is equal to its YTM i.e. 15%

**Yield-to-Call:** When a bond is callable, the market also looks to the yield-to-call (YTC). Normally if a bond is called, the bondholder is paid a premium over the face value (known as the call premium). YTC calculation assumes that the bond will be called, so the time for which the cash flows (coupon and principal) occur is shortened. YTC is calculated exactly like YTM, except that the call premium is added to the face value for calculating the redemption value, and the first call date is used instead of the maturity date.

**Self Assessment Questions**

6. Suppose a company can issue 10% annual coupon, 15-year bond with a face value of ` 1,000 for ` 950. What is the yield-to-maturity on this bond? You can use approximation formula.

## 8.9 Risks in Debt Securities

**Interest rate risk:** The cash flows from a bond (coupon payments and principal repayment) remain fixed though interest rate keeps changing. As a result, the value of a bond fluctuates. Thus interest rate risk arises because the changes in the market interest rates affect the value of the bond. The return on a bond comes from coupons payments, the interest earned from re-investing coupons (interest on interest), and capital gains. Since coupon

payments are fixed, a change in the interest rates affects interest on interest and capital gains or losses. An increase in interest rates decreases the price of a bond (capital loss) but increases the interest received on reinvested coupon payments (interest on interest). A decrease in interest rates increases the price of a bond (capital gain) but decreases the interest received on reinvested coupon payments.

Thus there are two components of Interest rate risk.

**Reinvestment rate risk** is the uncertainty about future or target date portfolio value that results from the need to reinvest bond coupons at yields that are not known in advance.

Interest rate increases tend to decrease bond prices (price risk) but increase the future value of reinvested coupons (reinvestment rate risk), and vice versa.

**Default risk or credit risk** refers to the possibility of having the issuer defaulting on the payments of the bond. It is the risk that the borrower will not honour, in full or in part, its promise to repay the interest and principal. The realised return on a bond will deviate from the expected return if the issuer fails to meet the obligations to make interest and principal payments.

Most investors do not directly assess a bond's default risk, but instead use the credit ratings provided by credit rating agencies such as CRISIL, ICRA, Moody's and S&P to evaluate the degree of risk. Credit ratings are the most common benchmark used when assessing corporate bond default risk. These securities are backed by the issuing companies, rather than by government/agency guarantees or insurance. Credit ratings provide an indication of an issuer's ability to make timely interest and principal payments on a bond.

The two most recognised rating agencies, known worldwide, that assign credit ratings to corporate bond issuers are Moody's Investors Service (Moody's) and Standard & Poor's Corporation (S&P). In India, the credit rating agencies are ICRA and CRISIL among others.

**Call risk:** If a company issues a bond with a high coupon rate when market interest rates are high, and interest rates later fall, the firm might like to retire the high-coupon debt and issue new bonds at a lower coupon rate to reduce interest payments. If a bond has a call provision, then the company can

repurchase the bond at a specified *call price* before the maturity date. From the bondholder's perspective it is a disadvantage, as the proceeds will then have to be reinvested at a lower interest rate. This is the call risk faced by the bondholder.

**Liquidity risk:** Bonds have varying degrees of liquidity. There is an enormous number of bond issues most of which do not trade on a regular basis. As a result, if a bondholder wants to sell quickly, he will probably not get a good price for his bond. This is the liquidity risk.

**Self Assessment Question:**

7. Explain interest rate risk.

_____

_____

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## 8.10 Duration of Bonds

**Bond duration** is a measure of bond price volatility, which captures both price and reinvestment risk and which is used to indicate how a bond will react in different interest rate environments.

The duration of a bond is the weighted average maturity of cash flow stream, where the weights are proportional to the present value of cash flows. It is defined as:

Duration = D = {PV ($C_1$) x 1 + PV ($C_2$) x 2+ ----- PV ($C_n$) x n} / Current price of the bond

Where PV (Ci) is the present values of cash flow at time i.

**Steps in calculating duration:**

Step 1: Find present value of each coupon or principal payment.

Step 2: Multiply this present value by the year in which the cash flow is to be received.

Step 3: Repeat steps 1 and 2 for each year in the life of the bond.

Step 4: Add the values obtained in step 2 and divide by the price of the bond to get the value of duration.

**Example**

Calculate the duration of an 8% annual coupon 5-year bond that is priced to yield 10% (i.e. YTM = 10%). The face value of the bond is ` 1000.

Annual coupon payment = 8% x ` 1000 = ` 80

At the end of 5 years, the principal of $1000 will be returned to the investor.

Therefore cash flows in year 1 – 4 = ` 80.

Cash flow in year 5= Principal + Interest = ` 1000 + ` 80 = ` 1080

| Year (t) | Annual cash flow | PVIF @10% | Present value of annual cash flow PV(Ct) | Explanation | Time x PV of cash flow | Explanation |
|---|---|---|---|---|---|---|
| 1 | 80 | 0.90909 | 72.73 | = 80 x 0.90909 | 72.73 | = 1 x 72.73 |
| 2 | 80 | 0.82645 | 66.12 | = 80 x 0.82645 | 132.24 | = 2 x 66.12 |
| 3 | 80 | 0.75131 | 60.10 | = 80 x 0.75131 | 180.3 | = 3 x 60.1 |
| 4 | 80 | 0.68301 | 54.64 | = 80 x 0.68301 | 218.56 | = 4 x 54.64 |
| 5 | 1080 | 0.62092 | 670.59 | = 1080 x 0.62092 | 3352.95 | = 5 x 670.59 |
| | | Total | **924.18** | | **3956.78** | |

Price of the bond = ` 924.18

The proportional change in the price of a bond:

$(\Delta P/P) = - \{D/ (1+ YTM)\} \times \Delta y$

Where $\Delta y$ = change in Yield, and YTM is the yield-to-maturity.

The term D / (1+YTM) is also known as **modified duration.**

The modified duration for the bond in the example above = 4.28 / (1+10%) = **3.89** years.

This implies that the price of the bond will decrease by 3.89 x 1% = 3.89% for a 1% increase in the interest rates.

**Example**

A bond having ` 1000 face value and 8% coupon bond with 4 years to maturity is priced to provide YTM of 10%. Find the duration of the bond.

**Answer**

$P_0$ = 80 x PVIFA 10%, 4 years + 1000 x PVIF 10%, 4 years

= 80 x 3.170 + 1000 x .683 = 937

$r_c$ = 80/937 = 0.857 (current yield)

$r_d$ = YTM

n = 4 years

$$\text{Duration} = \frac{r_c}{r_d} \times \text{PVIFA}(r_d, n)(1+r_d) + \left[1-\frac{r_c}{r_d}\right] n$$

$$= \frac{.0854}{0.10} \times 3.170\,(1.10) + \left[\frac{1-0.854}{0.10}\right]^4$$

= 2.977 + .584 = 3.561 years

Generally speaking, bond duration possesses the following properties:

- bonds with higher coupon rates have shorter durations
- bonds with longer maturities have longer durations
- bonds with higher YTM lead to shorter durations
- duration of a bond with coupons is always less than its term to maturity because duration gives weight to the interim payments. **A zero-coupon bond's duration is equal to its maturity.**

**Self Assessment Question:**

8. What is 'duration' of bonds?

## 8.11 Duration and Immunisation

If the interest rate goes up, the price of the bond falls but return on re-investment of interest income increases. If the interest rate goes down, the price of the bond rises but return on re-investment of interest income decreases. Thus the interest rate change has two effects (price risk and reinvestment risk) in opposite directions.

Can an investor ensure that these two effects are equal so that he is immunised against interest rate risk? Yes, it is possible, if the investor chooses a bond whose duration is equal to his investment horizon. For

example, if an investor's investment horizon is 5 years, he must choose a bond whose duration is equal to 5 years if he wants to insulate himself against interest rate risk. If he does so, whenever there is a change in interest rate, losses (or gains) in price is exactly offset by gains (or losses) in re-investment.

**Activity:**

An investor wants to purchase a bond with maturity of 3 years, coupon 11%and par value ` 100.

a) If the investor requiring YTM 15% of equivalent risk and maturity, what is the price he has should pay.

b) If the bond is selling at a price of ` 100. What is its YTM?

c) What is the duration of the bond, if the YTM is 12% and expected return is 10.06%.

## 8.12 Bond Portfolio Management

The volatility of a bond is determined by its coupon and maturity. The lower the coupon and the higher the maturity, the more volatile are the bond prices. If market rates are expected to decline, bond prices will rise. Therefore, you would want bonds with maximum price volatility. Maximum price increase (capital gain) results from holding long-term, low coupon bonds. (This is the same as saying hold bonds with long durations).

If market rates are expected to rise, bond prices will fall. Therefore, you would want bonds with minimum price volatility. Therefore, invest in short term, high coupon bonds to minimise price volatility and capital loss. (This is the same as saying 'hold bonds with short durations').

## 8.13 Valuation of Preference Share

Preference shares usually have a priority of claims superior to that of common shares, and usually have a fixed or stated dividend per share. For example, if the par value of a preference share were $100 with a 6 percent annual dividend rate, the annual dividend would be $6 on that share.

Preference shares are also called **hybrid** securities as they share the characteristics of bonds (fixed income in the form of fixed dividend like the

interest on bonds) and common shares (dividends on preference shares are not a legal obligation).

The management of a company will do everything it can to pay preference dividends annually since they usually carry a cumulative feature and common shareholders cannot be paid their dividends unless the preference shareholders have been paid their cumulative dues. Unless the stock is retired or converted, preference shares continue paying dividends forever.

Since dividends are to be paid in perpetuity, price of preference shares, Pp is given by:

$$P_p = \frac{D_p}{R}$$

Where Dp = dividend on preference shares and R is the discount rate.

## 8.14 Equity Valuation

Shareholders together own the assets of the company and the cash flows generated. As the company acquires more assets and the stream of cash gets larger, the value of the business increases and with that the value of the shareholders' stock in that business also goes up.

The **dividend discount model** (DDM) is a widely used approach to value common stocks. Financial theory states that the value of any securities is equal to all future cash flows that the owner will receive, discounted at an appropriate risk-adjusted rate. A common stock can be thought of as a right to receive future dividends. A stock's intrinsic value can therefore be defined as the value of all future dividends discounted at the appropriate discount rate.

$$\text{Value of Equity } (P_{O)} = \sum_{t=1}^{\infty} \frac{\text{Expected Dividends})_t}{(1+R)^t}$$

We can compute the share value assuming (a) zero growth of dividends and b) constant growth of dividends.

**Zero growth of dividends:** If the dividends do not grow, we have the same dividend amount in perpetuity. The share price $P_0$ would be:

$$P_O = \frac{D}{R}$$

Where D is the constant dividend and R is the discount rate.

**Example**

ABC's common stock currently pays ` 2 as dividend, which is expected to remain constant. If the required return on this stock is 5%, what should the stock sell for today?

**Answer**

` 2/.05 = ` 40 (Note: $P_0 = P_t$ for all t)

**Constant growth model:** Suppose the rate of growth in dividend from one period to the next, *g* is constant, the share price $P_0$ is calculated as follows.

$$P_0 = \frac{D_0(1+g)}{(1+R)} + \frac{D_0(1+g)^2}{(1+R)^2} + \frac{D_0(1+g)^3}{(1+R)^3} + \ldots$$

$$= \frac{D_0(1+g)}{R-g} = \frac{D_1}{R-g}$$

Where $D_0$ is the dividend paid at time 0, $D_1$ is the next year's dividend, R is the discount rate and g is the rate at which dividends grow.

This is called "Gordon Growth Model" after Myron Gordon.

At any point in time: $P_1 = \frac{D_{t+1}}{R-g}$

Price also grows at rate g.

**Example**

Assume that XYZ pays ` 1 dividend at t = 1 and that the discount rate is 10% and expected to increase by 5% annually. What should the stock sell for today?

$P_0$ = ` 1 / (10% - 5%) = ` 20

What if the discount rate is 12%?

$P_0$ = ` 1 / (12% - 5%) = ` 14.29; Higher discount rate results in lower value.

What if the growth rate is only 2%?

$P_0$ = ` 1 / (10% - 2%) = ` 12.50; Lower growth rate results in lower value.

**Solved problems**

1. **An** investor is considering the purchase of a share of ABC Ltd. If his required rate of return is 10%, the year-end expected dividend is ` 4 and year-end price is expected to be ` 26, compute the value of the share.

   $\frac{D_1}{(1+r)} + \frac{P}{(1+r)}$

   r = 0.10, $D_1$ = 4 and $P_1$ = 26

   $= \frac{4}{1.10} + \frac{26}{1.10}$

   = 3.64 + 23.64

   = 27.28

2. ABC Ltd paid a dividend of ` 4 per share at the end of the year. The dividend is expected to grow 8% each year for the next 4 years. The market price of the share is expected to be ` 60 at the end of 4 years. Assuming 12% required rate of return of investor, at what price should he buy the share of ABC?

   $D_0$ = 4 **r= .12 n = 4**

   $D_1$ = 4(1.08) = **4.32**

   $D_2$ = $4(1.08)^2$ = **4.67**

   $D_3$ = $4(1.08)^3$ = **5.04**

   $D_4$ = $4(1.08)^4$ = **5.44**

   $\mathbf{P_0}= \frac{4.32}{(1.12)} + \frac{4.67}{(1.12)^2} + \frac{5.04}{(1.12)^3} + \frac{5.44 + 60}{(1.12)^4}$

   = 3.86 +3.72 + 3.59 + 3.09 + 34.02

   = **48.28**

   **The share of ABC should sell for ` 48.28**

3. An investor has invested in the share of ABC Ltd which expects no (zero growth) in dividends. ABC has paid a dividend of ` 3 per share. If the required rate of return is 14% what would be the value of the share?

   **$P_0$ = D/r = 3/(.14) = 21.43**

4. The required rate of return of investor is 14%. Assume the $D_1$ is 2.50 compute the price at which the share will sell if the investor expects the earnings/dividend to grow at (1) 12% (2) 14% and (3) 16%

   **When g =12%**
   P0 = D1 /(k-g)
   = 2.5/(.14-.12)
   = 2.5 /.02
   = 12.5 (K>g)

   **When g =14%**
   P0 = D1 /(k-g)
   = 2.5/(.14-.14)
   = 2.5 /0
   = invalid formula (k=g)

   **When g =16%**
   P0 = D1 /(k-g)
   = 2.5/(.14-.16)
   = undefined. (k<g)

5. The following facts are available:
   Risk-free rate = 9%; Expected market return = 18%; Beta coefficient of share ABC is 1.5; Expected dividend during the next year is ` 3, growth rate in dividend is 8%. Compute the price at which the share of ABC should sell.
   Computation of 'r'
   r = rf +β (Rm-Rf)
   = .09 + 1.5 (.18-.09)
   = .09 + .135
   r = .225
   P0 = D1/(r-g) = 3 / (.225 -.08) = 3/.145
   = 20.7

6. XYZ's current stock price is ` 36 and its last dividend was ` 2.40. In view of company's strong financial position required rate of return is only 12%. Its dividend is expected to grow at a constant rate of 5%, and if $K_e$ is expected to remain at 12%, what is XYZ's expected stock price 5 years from now?

**Answer**

P0 = 36; D0 = 2.40 r= .12 g =?

P0 = D1 / (r-g) Where D1 = D0 (1+g)

$$36 = \frac{2.40(1+g)}{0.12-g}$$

| End of the year | Div [D0 (1+g) = D1] | PV @ 12% | PV of dividends |
|---|---|---|---|
| 1 | 2.40 (1.05) = 2.52 | .893 | 2.25 |
| 2 | 2.52 (1.05) = 2.65 | .797 | 2.11 |
| 3 | 2.65 (1.05) = 2.78 | .712 | 1.98 |
| 4 | 2.78(1.05) = 2.92 | .636 | 1.86 |
| 5 | 2.92 (1.05) = 3.07 | .567 | 1.74 |
| | | | 9.94 |

The value of stock at the end of the 5th year is

D6 = D5 (1+g)

= 3.07(1.05) = **3.22**

P0 = D6 /(k-g)

= 3.22 / (.12-.05) = **46**

Present value of Rs.46 @ 12% discount rate

**46 x .567 = 26.08**

The value of the share is the sum of PV of future dividend and the Present value of expected price at the end of 5th year

**= 26.08 + 9.94 = 36.02**

**Self Assessment Question:**

9. What is Dividend Discount Model? How is it used to value equity?

_____

_____

_____

_____

## 8.15 Equity Portfolio Management

There are two equity portfolio management strategies

**Passive equity portfolio management:** This is the process of managing investment portfolios by trying to match the performance of an index (such as Sensex or Nifty) as closely as possible by holding all or a representative sample of the securities in the index. This strategy is designed to match market performance. This is a long-term buy-and-hold strategy. It does not use market timing or stock selection strategies. The fund manager is judged on how well he tracks the target index.

**Active equity portfolio management:** It is the process of managing investment portfolios by attempting to time the market and/or select undervalued stocks to buy and overvalued stocks to sell based upon company research, investigation and analysis. It attempts to outperform a passive benchmark portfolio on a risk-adjusted basis. The goal of the fund is to earn a portfolio return that exceeds the return of a passive benchmark portfolio, net of transaction costs, on a risk-adjusted basis. The transactions costs of active management must be offset by superior performance vis-à-vis the benchmark.

**Self Assessment Questions**

10. _____is the process of managing investment portfolios by trying to match the performance of an index (such as Sensex or Nifty) as closely as possible by holding all or a representative sample of the securities in the index.
11. The goal of the fund is to earn a _____ that exceeds the return of a passive benchmark portfolio, net of transaction costs, on a risk-adjusted basis.

## 8.16 Summary

- Stock (shares) is ownership in a company, with each share of stock representing a tiny piece of ownership.
- There are two primary classes of stock—**common shares** and **preference shares**.
- **Preference share** typically pays regular dividends and is favoured by investors who want income foremost from their stocks.

- **Common share** represents ownership of a company and may offer more rights and privileges than preferred stock. Investors may purchase stock on the primary or secondary market.
- The value of a share can be determined using the dividend discount model.
- **Bonds** are also known as 'fixed-income securities' because the amount of income the bond generates each year is fixed, or set, when the bond is sold.
- The yields on a bond that are of importance to an investor are **current yield**, **yield to maturity** and **yield to call**.
- The risks that a bondholder faces when investing in bonds are **interest rate risks, default risk, liquidity risk** and the risk that the bond would be called if the market interest rates go down.
- To immunise a bond portfolio against interest rate risk the investor invests in a bond portfolio whose **duration** is equal to his investment horizon.

## 8.17 Glossary

***Yield-to-maturity (YTM):*** This measures the investor's total return if the bond is held to its maturity date.

***Nominal yield:*** This is simply the yield stated on the bond's coupon. ***Current yield:*** Current yield = Annual interest/Current price.

***Par value (face value):*** Face amount paid at maturity.

***Coupon rate:*** Percentage of the par value that will be paid out annually in the form of interest.

**Annual interest payment on bond** = coupon rate × par value

***Maturity:*** The length of time until the par value must be repaid.

## 8.18 Terminal Questions

1. How is investing in bonds different from investing in shares?
2. Discuss bond Features and Prices.
3. Discuss Call Provisions on Corporate Bonds.

4. Explain Convertible Bonds.
5. Explain Valuation of Bonds.
6. Discuss Price-Yield Relationship.
7. What are the risks of investing in debt securities?
8. Explain Duration of Bonds.
9. Explain Bond Portfolio Management.
10. Discuss valuation of Preference Shares.
11. Explain equity valuation.
12. Discuss Equity Portfolio Management.

## 8.19 Answers

### Self Assessment Questions

1. growth potential
2. debt securities
3. par value
4. The call provision allows the issuer to repurchase the bond at a specified call price before the maturity date.
5. Price = ` 50 x PVIFA (4%, 40) + ` 1000 x PVIFA (4%, 40)

   = ` 50 x 19.7928 + ` 1000 x 0.2083 = ` 1197.94
6. Yield to maturity =

$$yield = \frac{100 + \frac{(1000 - 950)}{15}}{\frac{(950 + 1000)}{2}} = 10.60\%$$

7. Interest rate risk arises because the changes in the market interest rates affect the value of the bond.
8. **Bond duration** is a measure of bond price volatility, which captures both price and reinvestment risk and which is used to indicate how a bond will react in different interest rate environments.
9. The **dividend discount model** (DDM) is a widely used approach to value common stocks.
10. Passive equity portfolio management
11. portfolio return

**Terminal Questions**

1. Bonds do not give investors an ownership stake in a company, like stocks do. For more details refer section 8.2.
2. Bonds are debt securities – the bondholder is a creditor of the entity issuing the bond. For more details refer section 8.4.
3. The call provision allows the issuer to repurchase the bond at a specified call price before the maturity date. For more details refer section 8.5.
4. Convertible bonds give the bondholders an option to exchange each bond for a specified number of shares of common stocks of the firm. For more details refer section 8.6.
5. To value a security, we discount its expected cash flows by the appropriate discount rate. For more details refer section 8.7.
6. Bond market prices move up and down with interest rate changes. For more details refer section 8.8.
7. The risks in investing in debt securities are interest rate, Credit risk, liquidity risk etc. For more details refer section 8.9.
8. Bond duration is a measure of bond price volatility, which captures both price and reinvestment risk and which is used to indicate how a bond will react in different interest rate environments. For more details refer section 8.10.
9. The volatility of a bond is determined by its coupon and maturity. The lower the coupon and the higher the maturity, the more volatile are the bond prices. For more details refer section 8.12.
10. Preference shares usually have a priority of claims superior to that of common shares, and usually have a fixed or stated dividend per share. For example, if the par value of a preference share were $100 with a 6 percent annual dividend rate, the annual dividend would be $6 on that share. For more details refer section 8.13.
11. The dividend discount model (DDM) is a widely used approach to value common stocks. For more details refer section 8.14.
12. There are two equity portfolio management strategies. For more details refer section 8.15.

## 8.20 Case Study

**Reeby Sports – valuation of shares**

George Reeby and his children own a company founded 10 years ago, which sells sports equipment. The 2 million shares in the company owned by the family has a book value of $26.34 million now, or the book value of each share is $13.17. George wants to take the company public and has to decide what his company's value and his share worth are. He knows book value may not be a good guide to a share's market value. He asks Jenny, his daughter and an investment banker, to help out. He collects the following facts, which he thinks will be useful to Jenny.

a. Earnings per share, dividend per share and book value of Reeby Sports are given in table A below.
b. The cost of capital is estimated at 10%.
c. George is confident the company will grow steadily for the next 6-8 yrs, but it might become difficult to find investment opportunities thereafter.
d. Molly Sports is Reeby's biggest competitor and has a P/E ratio of 13.1.
e. Molly has announced plans to expand and may become a stronger rival in the days to come.

**Table A**

| Year | **EPS $** | **Dividend $** | **Bk value $** | **ROE %** |
|---|---|---|---|---|
| 1996 | -2.10 | 0 | 9.80 | -27.0 |
| 1997 | -0.70 | 0 | 7.70 | -7.1 |
| 1998 | 0.23 | 0 | 7.00 | 3.0 |
| 1999 | 0.81 | 0.20 | 7.61 | 11.6 |
| 2000 | 1.10 | 0.20 | 8.51 | 14.5 |
| 2001 | 1.30 | 0.30 | 9.51 | 15.3 |
| 2002 | 1.52 | 0.30 | 10.73 | 16.0 |
| 2003 | 1.64 | 0.60 | 11.77 | 15.3 |
| 2004 | 2.00 | 0.60 | 13.17 | 17.0 |
| 2005 | 2.03 | 0.80 | 14.40 | 15.4 |

**Discussion Questions**

1. Help Jenny forecast dividend payments for Reeby Sports and estimate the value of the stock. Consider the fact that there may be no growth after 6 or 8 yrs.

2. How much of your estimated value of Reeby's stock come from PVGO or the present value of growth opportunities?

**Hint**

Molly has a P/E of 13.1. If you calculate Reeby's P/E based on book value it is 6.6, which is way too low. Correct value starts only around the figure based on the P/E multiple. Apply the formula for valuation based on dividend growth.

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# Unit 9 Portfolio Management – Risk and Return

**Structure:**



## 9.1 Introduction

Investors constantly seek the best returns on their investments at the lowest risk. An individual asset may not help them to achieve this objective instead a portfolio is required. Therefore, investors hold a portfolio or a combination of assets.

The goal of portfolio management is to optimally allocate the invested amount into different assets in such a manner that the overall return continues to be good, but the overall risk is reduced by inclusion of contrasting assets in the portfolio. This unit deals with the construction and management of investment portfolios.

**Objectives:**

After studying this unit, you will be able to:

- explain the concept of portfolio and portfolio management
- explain the concept of risk and its types
- explain the meaning of ‘risk diversification
- measuring the portfolio return
- measuring the portfolio risk
- constructing the optimal portfolio.

## 9.2 The Concept of Portfolio and Portfolio Management

Modern portfolio theory assumes that investors are risk-averse. This means that given a choice between two assets with equal expected rates of return, investors will select the asset with the lower level of risk, and would demand a higher return if the risk level increases. It follows that an investor who wants higher returns must accept more risk.

The exact trade-off between risk and reward is different for various investors and is based on individual risk appetites. The implication of risk aversion is that a rational investor will not invest in a portfolio if an alternative portfolio exists which has a more favourable risk-return profile i.e. better expected returns for the same level of risk.

Portfolio theory further assumes that only two things matter to the investor—average return and standard deviation. Other characteristics of the distribution of returns such as its skewness do not bother him.

Portfolio management deals with finding an efficient portfolio that maximises the rate of return for a given level of risk. The return is the weighted return of the securities held in the portfolio. The risk of the portfolio is represented by the standard deviation of return from the portfolio.

**Self Assessment Question:**

1. Modern portfolio theory assumes that investors are _____.

## 9.3 The Concept of Risk and its Types

Risk is the uncertainty that you may not earn your expected return on your investment. Major types of risk include:

- **Investment risk:** Investment risk is the possibility that your investment value will fall. Standard deviation is commonly used to measure investment risk. It shows a stock or bond's volatility, or the tendency of its price to move up and down from its average. As standard deviation increases, investment risk also increases.
- **Market risk:** Market risk is the chance that the market where your investment trades will slump.
- **Interest rate risk:** Interest rate risk is the possibility that the interest rates will change while you are holding a debt investment.

- **Inflation risk:** Bonds are especially vulnerable to inflation risk. Bonds are fixed income securities. Bond's coupon payment and principal repayment are usually fixed. Inflation naturally erodes the purchasing power of the fixed amounts received.
- **Industry risk:** Industry risk is the possibility that a set of factors that are particular to an industry group drags down the industry's overall performance. For example, local industry may be hit by foreign competition or protective government subsidies may be removed or reduced.
- **Credit risk:** Credit risk is the possibility that a company that issues bonds is unable to make coupon payments and/or principal repayments.
- **Liquidity risk:** Liquidity risk is the possibility that your investment in a security (stock or bond) does not have ready buyers in the market. Such a security is called a 'thinly traded security'. As a result you may have to sell your investment at a price below its fair value.
- **Pre-payment risk:** Pre-payment risk is the possibility that borrowers repay debt ahead of schedule. As a result, investors are repaid sooner than expected and have to reinvest these pre-payments at a rate which is lower than what they have been earning. Borrowers pre-pay and refinance their debt when interest rates decline.

**Self Assessment Question:**

2. _____ is the possibility that a company that issues bonds is unable to make coupon payments and/or principal repayments.

## 9.4 Risk Diversification

An important way to reduce the risk of investing is to diversify your investments. Diversification can be understood as "not putting all your eggs in one basket." For example, if your portfolio consists of only technology or banking stocks, it is likely to face a substantial loss in value if a major event adversely affects the banking or technology industry.

Diversification requires you to invest in securities in which returns do not move together i.e., their returns have low correlation. Correlation coefficient is used to measure the degree to which returns of two securities are related. Stocks whose returns move exactly together have a coefficient of +1.0. Two stocks whose returns move in exactly opposite directions have a correlation

of -1.0. To effectively diversify, you should aim to find investments that have a low or negative correlation. Stocks of companies in the same industry, for instance, may have high positive correlation.

As you increase the number of securities in your portfolio, you reach a point where you have diversified as much as is reasonably possible. When you have about 30 securities in your portfolio you have diversified most of the risk.

**Self Assessment Questions**

3. What is Liquidity Risk?

4. Explain risk aversion.

5. Explain risk diversification.

## 9.5 Measurement of Portfolio Return

The expected return of a portfolio is given by the weighted average of the expected returns obtained from the individual securities held in the portfolio.

$$\text{Expected } (R_P) = \sum_{i=1}^{i=n} w_i \text{ Expected } (R_i)$$

Where $w_i$ is the weight that each security has in the portfolio, with the total weight being equal to 1 (or in percentage terms, 100%).

$$\sum_{i=1}^{i=n} w_i = 1$$

Thus for a 2-security portfolio

Expected ($R_P$) = $w_1$ Expected ($R_1$) + (1–$w_1$) Expected ($R_2$)

**Example**

You decide to invest 60% of your portfolio in ABC Ltd. and 40% in XYZ Ltd. The return on ABC Ltd. is 15% and the return on XYZ is 21%. What is the portfolio's expected return?

Expected (R) = (0.60 x 15%) + (0.40 x 21%) = 17.40%

## 9.6 Measurement of Portfolio Risk– Measurement of Covariance, Variance, Standard Deviation and Correlation Coefficient

Variance (or the standard deviation which is the square root of variance) is a measure of risk of the portfolio. The total variance of a portfolio is almost always lower than the weighted average of individual variances because, negative deviations in some assets may be offset or at least mitigated by positive deviations in other assets.

If the number of assets comprising the portfolio is large enough, the portfolio variance arises more from the covariances than from variances of individual assets. The variance of an n-security portfolio is:

$$\sigma_P^2 = \sum_{i=1}^{n} \sum_{j=1}^{n} x_i x_j \rho_{ij} \sigma_i \sigma_j$$

Where $x_i$ = Proportion of total investment in Security i

$\rho_{ij}$ = Correlation coefficient between Security i and Security j

The variance of a two-security portfolio is:

$$\sigma_P^2 = x_A^2 \sigma_A^2 + x_B^2 \sigma_B^2 + 2 x_A x_B \rho_{AB} \sigma_A \sigma_B$$

Total Risk  Risk from A  Risk from B  Interactive Risk

Return variance is a security's ***total risk***. It comprises risk from individual securities plus interactive risk.

The range of values for correlation coefficient, $\rho_{1,2}$ is $-1.0 \leq \rho_{1,2} \leq 1.0$. If $\rho = 1.0$, the securities would be perfectly positively correlated. If $\rho = -1.0$, the securities would be perfectly negatively correlated.

Most investors want portfolio variance to be as low as possible without having to give up any return.

- If two securities have low correlation, the interactive risk will be small.
- If two securities are uncorrelated, the interactive risk drops out.
- If two securities are negatively correlated, interactive risk would be negative and would reduce total risk.

In order to calculate the variance of a portfolio we need to know the standard deviation of the assets and the correlation of the assets in the portfolio.

**Example**

A security analyst has prepared the following probability distribution of the possible returns on the shares of two companies: Stock C and Stock D.

| Probability | Return on C | Return on D |
|---|---|---|
| 0.3 | 10% | 40% |
| 0.5 | 14% | 16% |
| 0.2 | 20% | 20% |

**Expected (Mean) Return of stocks**

The mean return for stock C is 14%.

| Probability | Return on C | Probability x return |
|---|---|---|
| 0.3 | 10% | 3% |
| 0.5 | 14% | 7% |
| 0.2 | 20% | 4% |
| | Total | **14%** |

The mean return for stock D is 24%.

| Probability | Return on D | Probability x return |
|---|---|---|
| 0.3 | 40% | 12% |
| 0.5 | 16% | 8% |
| 0.2 | 20% | 4% |
| | Total | **24%** |

**Variance and standard deviation of stocks**

The variance of return for stock C is 0.0012 and standard deviation is 3.46%.

| Expected return= | | **14%** | | |
|---|---|---|---|---|
| Probability | Return on C | Difference from mean, i.e.14% | Difference$^2$ | Probability x Difference $^2$ |
| 0.3 | 10% | -4% | 0.0016 | 0.00048 |
| | | =0.1-0.14 | =-0.04^2 | =0.3x0.0016 |
| 0.5 | 14% | 0% | 0.0000 | 0.00000 |
| 0.2 | 20% | 6% | 0.0036 | 0.00072 |
| **1.00** | | | Total= | **0.00120** |
| variance = | 0.00120 | | | |
| Standard deviation=√ 0.0012 = 0.0346= 3.46% | | | | |

The variance of return for stock D is 0.01120 and standard deviation is 10.58%.

| Expected return | | **24%** | | |
|---|---|---|---|---|
| Probability | Return on D | Difference from mean, i.e.24% | Difference $^2$ | Prob x Difference $^2$ |
| 0.3 | 40% | 16% | 0.0256 | 0.00768 |
| | | =0.4-0.24 | =0.16^2 | =0.3x0.0256 |
| 0.5 | 16% | -8% | 0.0064 | 0.00320 |
| 0.2 | 20% | -4% | 0.0016 | 0.00032 |
| **1.00** | | | Total= | **0.01120** |
| Variance= | 0.01120 | | | |
| Standard deviation=√ 0.0112 = 0.1058= 10.58% | | | | |

**Covariance of stocks**

Covariance $(r_1,r_2) = \rho_{1,2}\ \sigma_1\sigma_2$
Where
$\rho_{1,2}$ = Correlation coefficient of returns = Covariance$(r_1,r_2)$ / $[\sigma_1\sigma_2]$
$\sigma_1$= Standard deviation of returns for Security 1
$\sigma_2$ = Standard deviation of returns for Security 2

Covariance of returns on Stock C and Stock D is -0.0024 and Correlation Coefficient is -0.6556

| Expected return | **14%** | **24%** | | | |
|---|---|---|---|---|---|
| Probability (p) | Return on C (x) | Return on D (y) | (x-μc)= Difference from mean for C, i.e.14% | (y-μD)= Difference from mean for D, i.e.24% | p x (x -μC) x (y-μD) |
| 0.3 | 10% | 40% | -4% | 16% | -0.0019 |
| 0.5 | 14% | 16% | 0% | -8% | 0.0000 |
| 0.2 | 20% | 20% | 6% | -4% | -0.0005 |
| **1.00** | | | | Total= | **-0.00240** |
| Covariance= | | | -0.00240 | | |
| Standard deviation for C= | | | 0.0346 | Or | 3.46% |
| Standard deviation for D= | | | 0.1058 | Or | 10.58% |
| Correlation coefficient $\rho_{CD}$= | | | -0.6556 | =-0.0024/ (0.0346x0.1058) | |

**Variance of portfolio comprising stocks C and D**

Let us make a portfolio of the two stocks C and D with the proportion (weight) of C as 25% and the proportion of D as 75%.

The variance of the portfolio is 0.0054712 and standard deviation is √0.0054712= 0.0740 or 7.40%.

$$\sigma_p^2 = x_c^2\sigma^2 + x_D{}^2\sigma^2 + 2x_C x_D \rho_{CD}\sigma_C\sigma_D$$

= $(.25)^2$ $(0.0346)^2$ + $(0.75)^2$ $(0.1058)^2$ + 2(0.25) (0.75) (–.6556) (.0346) (.1058)
= 0.0000748 + 0.0062964 – 0.0008999 = 0.0054713:

**Self Assessment Question**

6. _____ or the standard deviation which is the square root of variance) is a measure of risk of the portfolio.

## 9.7 Optimal Portfolio

Various portfolio combinations may result in a given return. The investor wants to choose the portfolio combination that provides the least amount of variance. Let us understand this with the help of an example.

Assume the following statistics for Stocks A, B, and C:

| | **Stock A** | **Stock B** | **Stock C** |
|---|---|---|---|
| Expected return | 0.20 | 0.14 | 0.10 |
| Standard deviation | 0.232 | 0.136 | 0.195 |

Correlation coefficients between the three stocks are:

| | **Stock A** | **Stock B** | **Stock C** |
|---|---|---|---|
| ***Stock A*** | 1 | | |
| ***Stock B*** | 0.286 | 1 | |
| ***Stock C*** | 0.132 | -0.605 | 1 |

An investor seeks a portfolio return of 12%. Which combinations of the three stocks accomplish this objective? Which of those combinations involves the least amount of risk?

Two combinations achieve a 12% return:
1) 50% in B, 50% in C: (.5) (14%) + (.5) (10%) = 12%
2) 20% in A, 80% in C: (.2) (20%) + (.8) (10%) = 12%

The variance of the stock B–stock C combination is:

$$\sigma_p^2 = x_B{}^2\sigma^2 + x_C{}^2\sigma^2 + 2x_B x_C \rho_{BC}\sigma_B\sigma_C$$

= $(.50)^2$ $(0.136)^2$ + $(0.5)^2$ $(0.195)^2$ + 2(0.5) (0.5) (–.605) (.136) (.195)
= 0.0046 + 0.0095 – 0.0080 = 0.0061

The variance of the stock A–stock C combination is:

$$\sigma_p^2 = x_A^2\sigma^2 + x_C{}^2\sigma^2 + 2x_A x_C \rho_{AC}\sigma_A\sigma_C$$

$= (.20)^2 (0.232)^2 + (0.8)^2 (0.195)^2 + 2(0.2) (0.8) (.132) (.232) (.195)$

$= 0.0022 + 0.0243 + 0.0019 = 0.0284$

Investing 50% in Stock B and 50% in Stock C achieves an expected return of 12% with the lower portfolio variance. Thus, the investor will likely prefer this combination to the alternative of investing 20% in Stock A and 80% in Stock C.

**Self Assessment Questions**

7. You decide to invest 30% of your portfolio in Stock C and 70% in Stock D. The return on Stock C is 18% and the return on Stock D is 24%. What is your portfolio's expected return?

   _____
   _____
   _____
   _____

8. What is the standard deviation of a portfolio which is invested 40% in Stock A and 60% in Stock B? The standard deviation of returns of stock A and B are 5% and 7.5% respectively and the correlation coefficient of returns of the two stocks is 0.45.

   _____
   _____
   _____
   _____

9. How does correlation between returns of stocks comprising the portfolio affect the variance of the portfolio?

   _____
   _____
   _____
   _____

**Activity:**

Table A shows standard deviations and correlation coefficients of seven stocks.

**Table A**

| | Alcan | BP | DBk | KLM | LVMH | Nestle | Sony |
|---|---|---|---|---|---|---|---|
| **Correlation coefficients** | | | | | | | |
| **Alcan** | 1.0 | | | | | | |
| **BP** | 0.39 | 1.0 | | | | | |
| **DBk** | 0.55 | 0.23 | 1.0 | | | | |
| **KLM** | 0.54 | 0.29 | 0.36 | 1.0 | | | |
| **LVMH** | 0.61 | 0.22 | 0.48 | 0.49 | 1.0 | | |
| **Nestle** | 0.26 | 0.30 | 0.16 | 0.32 | 0.02 | 1.0 | |
| **Sony** | 0.36 | 0.14 | 0.39 | 0.19 | 0.50 | 0.10 | 1.0 |
| **Standard deviations (%)** | | | | | | | |
| | 30.2 | 23.9 | 38.1 | 54.5 | 42.0 | 15.5 | 47.5 |

**Question**

Calculate the variance of a portfolio with equal investments in each stock.

## 9.8 Summary

- Risk is associated with the uncertainty of an investment's performance and assessing whether the expected return will be achieved.
- The measurement of risk emphasises the extent of variability and volatility.
- Superior returns can be obtained by investing in a diversified portfolio of assets rather than in individual assets.

## 9.9 Glossary

***Variance* (or the standard deviation which is the square root of variance):** A measure of risk of the portfolio.

***Optimal portfolio:*** Portfolio combination that provides the least amount of variance.

## 9.10 Terminal Questions

1. Why do investors invest in portfolio of securities and not in individual securities?
2. List the major types of investment risks.
3. Explain the meaning of 'risk diversification
4. Discuss the measurement of the portfolio return
5. Discuss the measurement of the portfolio risk
6. Construct the optimal portfolio.

## 9.11 Answers

### Self Assessment Questions

1. risk-averse
2. Credit risk
3. Refer to 9.3
4. Refer to 9.2
5. Refer to 9.4
6. Variance
7. 0.3 x 18% + 0.7 x 24 % = 22.2 %
   Variance = (0.4 x 5 %) 2 + (0.6 x 7.5 %) 2 + 2 x (0.4x 5%) x (0.6 x 7.5%) x 0.45 = 0.003235
8. Standard deviation = √0.003235 = 0.0569 or 5.69%
9. Refer to 9.6.

### Terminal Questions

1. The exact trade-off between risk and reward is different for various investors and is based on individual risk appetites. For more details, refer section 9.2.
2. The different types of risks are market risk, interest rate risk, liquidity risk credit risk etc. For more details, refer section 9.3.
3. Diversification requires you to invest in securities in which returns do not move together i.e., their returns have low correlation. For more details refer section 9.4.
4. The expected return of a portfolio is given by the weighted average of the expected returns obtained from the individual securities held in the portfolio. For more details, refer section 9.5.

5. Variance (or the standard deviation which is the square root of variance) is a measure of risk of the portfolio. For more details, refer section 9.6.
6. Various portfolio combinations may result in a given return. The investor wants to choose the portfolio combination that provides the least amount of variance. For more details, refer section 9.7.

## 9.12 Case Study

An investment company manages an equity fund consisting of five stock, with the following market values and betas.

| Stock | Market value | Betas |
|---|---|---|
| A | Rs 10,00,000 | 1.10 |
| B | Rs 2,50,000 | 1.2 |
| C | Rs 5,00,000 | 0.75 |
| D | Rs 12,50,000 | 0.6 |
| E | Rs 16,50,000 | 1.3 |
| | Total-4650000 | |

If Rf = 7%, E(Rm)= 14%, calculate the portfolio 's expected return.
Hint: calculate beta and expected return of the portfolio.

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# Unit 10 Markowitz Portfolio Selection Model

**Structure:**



## 10.1 Introduction

The investment decision is not only about which securities to own, but how to divide the investor's wealth amongst securities. In the last unit, we focused on how investors should focus on selecting portfolios based on the overall risk-reward characteristics and not just buy securities that have attractive risk-reward characteristics individually. Investors should select portfolios and not individual securities.

This unit studies the Markowitz model of portfolio selection, regarded as a path-breaking theory.

**Objectives:**

After studying this unit, you will be able to:

- explain the concept of portfolio analysis and diversification of risk
- state the assumptions of Markowitz Model
- explain efficient frontier set
- discuss the modification to Efficient Frontier (Leveraged Portfolio)
- analyse the criticism of Markowitz Model.

## 10.2 The Concept of Portfolio Analysis and Diversification of Risk

Harry Markowitz in the 1950s developed a theory of portfolio choice that dealt with the households' and firms' investment in financial assets under uncertainty.

A basic tenet of Economics is that due to the scarcity of resources all economic decisions involve trade-offs. Markowitz identified the trade-off facing the investor as the one between risk and expected return. (Markowitz took standard deviation of returns, also known as volatility, as a measure of risk).

Markowitz's theory analyses how wealth can be optimally invested in portfolios which are made up of assets with different expected returns and risks. At the heart of Markowitz's analysis is the insight that while the return on a portfolio composed of risky assets is the value-weighted average of each risky asset's return, the risk of the portfolio is not a linear, weighted average value. The risk of a portfolio depends not only on individual variances of the different assets comprising the portfolio but on the pair-wise covariances between them.

The lower the covariances between assets (i.e. the lesser the correlation between their returns) the lower is the risk of the portfolio composed of these assets. This makes it possible to reduce the risk of a portfolio by diversification. Markowitz showed that diversification can reduce the risk of a portfolio by including in assets whose returns have low correlation with each other.

Markowitz's work compels investors to consider the relationship between individual securities' returns.

Stocks influenced by similar industry-wide conditions will all move together in step. While in good times they all will perform well, during bad times they all will perform badly and adversely affect the portfolio's value and return. Markowitz was the first to formally prove this intuitive finding. He showed that imperfect correlation between securities in the portfolio is the key reason why diversification reduces portfolio risk.

Accordingly he proposed that investors should focus on selecting portfolios based on their overall risk-reward characteristics rather than merely

compiling portfolios from securities that individually had attractive risk-reward characteristics. In a nutshell, inventors should select portfolios and not individual securities.

## 10.3 Assumptions of Markowitz Model

Markowitz's model identifies the trade-off facing the investor as one between expected return (mean) and risk (variance). It makes the following assumptions concerning the investment market and investors' behaviour in those markets.

- All investors have the same expected single period investment horizon. At the beginning of the period, the investor allocates his wealth among various assets, assigning a non-negative weight to each asset. During the period, each asset generates a random rate of return so that at the end of the period, his wealth has been changed by the weighted average of the returns.
- Investors are rational and behave in a manner so as to maximise their utility. They seek to maximise the expected return of total wealth.
- Investors base decisions on expected returns and risk (variance or standard deviation of these returns from the mean). They are risk-averse and try to minimise the risk and maximise return. They prefer higher returns to lower returns for a given level of risk.
- Investors have free access to fair and correct information on the returns and risk. All markets are perfectly efficient.
- There are no taxes and no transaction costs.

**Self Assessment Questions:**

1. What are the assumptions of Markowitz model?

_____

_____

_____

## 10.4 Efficient Frontier or Efficient Set

**Efficient frontier** represents the trade-off between risk and expected return faced by an investor when forming his portfolio. Efficient frontier was first defined by Harry Markowitz as part of his portfolio theory. The theory

considers a universe of risky investments and explores what might be an optimal portfolio based upon investments in these risky securities.

Assume a one-year holding period for investment in these securities. Today's values for all the risky investments are known. The returns on these investments (reflecting price changes, coupon payments, dividends, stock splits, etc.) till the end of the holding period are random. So we can calculate expected returns and variances of returns for these securities.

Correlation of returns between individual pairs of securities must then be calculated. Using these inputs, we then calculate the expected return and variance of the portfolio as a whole. (The calculation of expected returns and standard deviation for a portfolio has been illustrated in unit 7).

The notion of 'optimal portfolio' can be defined in one of two ways:

1. For any level of volatility consider all the portfolios which have that volatility (standard deviation). From among them all, select the one which has the highest expected return.
2. For any expected return, consider all the portfolios which have that expected return. From among them all, select the one which has the lowest volatility.

Each definition produces a set of optimal portfolios. Definition (1) produces an optimal portfolio for different levels of risk. Definition (2) produces an optimal portfolio for different levels of expected return. The set of optimal portfolios obtained using either definition is exactly the same and is called the efficient frontier.

In the following diagram, numerous portfolio combinations of all the available assets have been plotted. This is the **attainable set** of portfolios. The y-axis represents the expected return and the x-axis represents the total risk as measured by standard deviation,$\sigma$). From this attainable set of all possible portfolios, we locate the subset known as the **efficient set** which is composed of portfolios that offer the lowest risk for given level of return (or alternatively, the highest return for a given level of risk). This is the curved line EF shown in the diagram. All other portfolios in the attainable set are dominated by the efficient set. Thus the Markowitz portfolio selection model generates a frontier of efficient portfolios which are equally good. An

investor selects the single portfolio from this 'efficient' set that meets his needs.

The Markowitz efficient frontier is usually composed only of portfolios as only portfolios benefit from diversification. Individual assets contain both diversifiable and non-diversifiable risk and are generally not efficient investments. However, the most efficient portfolio may sometimes consist of a single security if it is the only way the investor can obtain the desired return with a given amount of risk.

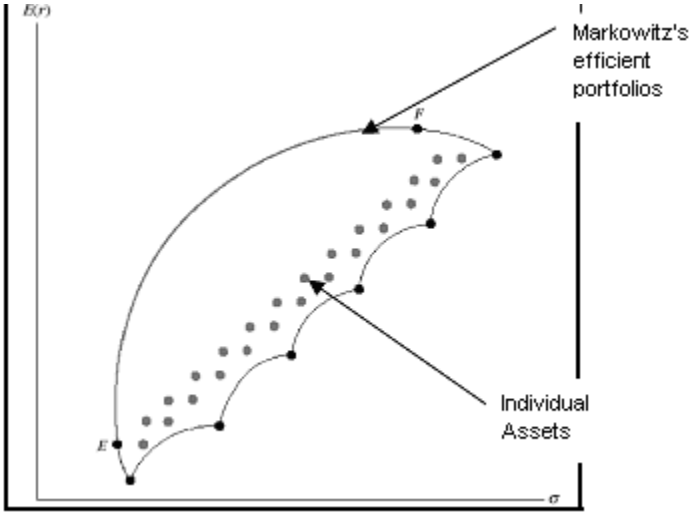


**Figure 10.1: The Efficient Frontier**

**Self Assessment Questions:**

2. What is an optimal portfolio?

## 10.5 Modification to Efficient Frontier (Leveraged Portfolio)

Markowitz's work established that a mean-variance efficient frontier exists for any collection of risky assets and rational investors would select portfolios only on this frontier at a position that reflected their personal risk preferences and tolerances. The introduction of a risk-free (zero variance of

returns) asset added a new dimension to this analytical framework, giving investors an additional investment option. They could now select their optimal portfolio of risky assets along the efficient frontier and mix this portfolio in various proportions or weights with an investment in a risk-free asset.

It was James Tobin who added the notion of leverage to portfolio theory by incorporating an asset which pays a risk-free rate. By combining a risk-free asset with a portfolio on the efficient frontier, it is possible to construct portfolios whose risk-return characteristics are superior to those of the portfolios that lie on the efficient frontier.

If we add borrowing and lending at the risk-free rate, the investment opportunities can be extended. We expand the Markowitz approach by considering investing not just in risky assets but also in a risk-free asset. The investor invests $x_1$ in risk free asset and $x_2$ in the risky asset. The risk-free asset has a certain payoff, $R_f$. There is no uncertainty about the terminal value of this type of asset. Therefore, the standard deviation of risk free asset's return, $\sigma_f = 0$. The correlation $\rho_{2f}$ between the risk-free asset and any risky asset is zero.

The expected return of the portfolio $E(R_p)$ is

$$E(R_P) = x_1R_1 + x_2E(R_2)$$

The variance and standard deviation of the portfolio are:

$$\sigma_p^2 = x_1^2\sigma_1^2 + x_2^2\sigma_2^2 + 2x_1x_2\rho_{12}\sigma_1\sigma_2$$
$$= 0 + x_2^2\sigma_2^2 + 0 = x_2^2\sigma_2^2$$
$$and$$
$$\sigma_p = x_2\sigma_2$$

The characteristics of portfolios – expected return and standard deviation – that combine investing in a risk-free asset with investing in a risky asset plot on a straight line connecting the risky and risk-free points:

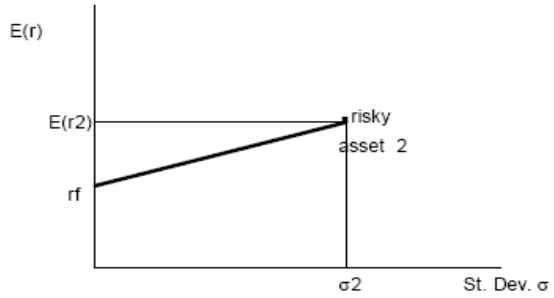


**Fig. 10.2: Correlation $P_{2f}$ Between the Risk-Free Asset and Risky Asset**

Now, let us combine the risk-free asset with a risky asset on the efficient frontier. (Refer to the diagram below). Being on this line means that the investor is investing part of his money in the risk-free asset and the remaining money in the risky asset. The risk-free asset can be combined with any portfolio (say X or T) on the efficient frontier (EF). But all these combinations would not be optimal. Why would a rational investor choose *any* risky asset portfolio *except* the single one that lies at the point of tangency between the efficient frontier and the straight line extending from the risk-free asset? Only the tangency portfolio (portfolio T) would be optimal for the investor. The tangent line ($r_f$-L), – which we will see in fig 10.3 is called the **capital market line (**drawn to the efficient frontier passing through the risk-free rate dominates all portfolios below it, including the efficient frontier). Thus portfolio T is the optimal risky portfolio that is held by all investors regardless of their degree of risk aversion. Tobin called the portfolio T as the **super-efficient portfolio**. We will see that this super-efficient portfolio is actually the **market portfolio**.

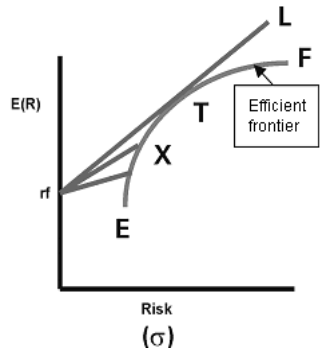


**Figure 10.3: Super-Efficient Portfolio**

Using the risk-free asset, investors who hold the super-efficient portfolio may either leverage their position by borrowing at the risk-free rate and investing the proceeds in the super-efficient portfolio, or de-leverage their position by selling some of their holdings in the super-efficient portfolio and investing the proceeds in the risk-free asset. The resulting portfolios have risk-reward profiles, all of which fall on the line passing through the risk free rate and tangent to the efficient frontier (the capital market line). Accordingly, portfolios which combine the risk-free asset with the super-efficient portfolio are superior from a risk-reward standpoint to portfolios that lie on the efficient frontier.

Tobin concluded that portfolio construction should be a two-step process. First, the investors should determine the super-efficient portfolio. This is the risky portion of their portfolio. Next, they should leverage or de-leverage the super-efficient portfolio to achieve the level of risk that they desire.

Significantly, the composition of the super-efficient portfolio is independent of the investor's risk appetite. It lies on the line drawn through the risk free rate and tangent to the efficient frontier. The two decisions that the investors have to make are:

- choosing the composition of the risky portion of the investor’s portfolio (Portfolio T)
- deciding on the amount of leverage to use, are entirely independent of each other.

This is called Tobin's **separation theorem**.

**Self Assessment Question:**

3. How does the introduction of a risk-free asset give the investors an additional investment option?

**Activity:**

Calculate the expected risk of the portfolio.

| Security | Expected return | proportion % invested | SD |
|---|---|---|---|
| A | 10 | 20 | 0.2 |
| B | 15 | 20 | 0.3 |
| C | 20 | 60 | 0.5 |

**Hint:** Calculate risk of the portfolio.

## 10.6 Criticism of Markowitz Model

The Markowitz model was a brilliant innovation in the field of portfolio selection. Markowitz showed us that all the information that was needed to choose the best portfolio for any given level of risk is contained in three simple statistics, which are mean of securities' returns, standard deviations of returns and correlation between securities' returns.

The model requires no information about dividend policy, earnings, market share, strategy, and quality of management. In short, Harry Markowitz fundamentally altered the thinking on investment decisions. Today almost every portfolio manager uses the basic framework of the risk-return trade-offs even if they do not adopt the Markowitz model entirely.

Why does not then everyone use the Markowitz model to solve their investment problems? The answer lies in the statistics that are required as inputs for the model. The historical mean return of securities may be a poor estimate of their future mean return. As we increase the number of securities, we increase the number of correlations that we must estimate and they must be estimated *correctly* to obtain the right answer.

In fact, with more than thousands of stocks listed on the BSE and NSE, it is almost certain that we will find correlations that are widely inaccurate for the purpose of estimating future correlations. Unfortunately, the Markowitz model does not deal well with incorrect inputs. That is why the model is best applied to allocation decisions across asset classes (such as between stocks and bonds). For these the number of correlations is low, and the statistics (mean, standard deviation and correlation) are well-estimated.

## 10.7 Summary

- Creating optimal portfolios of risky assets depends not just on the risk-return characteristics of each security but on the risk-return relationships as *between* individual securities in the portfolio.
- While portfolio return can be expressed as a simple weighted average of the returns from each asset, portfolio risk is impacted also by the covariance of returns between assets.
- The expected return and volatility of a portfolio is calculated using the expected returns, variances and covariances of securities comprising the portfolio.
- Out of the entire universe of possible portfolios that can be constructed using different securities, only some will optimally balance risk and reward. These constitute what Markowitz calls an **efficient frontier** of portfolios.
- An investor should select a portfolio that lies on the efficient frontier.
- James Tobin expanded on Markowitz's work by adding a risk-free asset to the analysis. The risk free asset made it possible to leverage or de-leverage portfolios on the efficient frontier.

## 10.8 Glossary

***Efficient frontier:*** Represents the trade-off between risk and expected return faced by an investor when forming his portfolio.

## 10.9 Terminal Questions

1. What is an ‘efficient frontier’?
2. Discuss the limitations of Markowitz model.

## 10.10 Answers

**Self Assessment Questions**

1. Refer to 10.3
2. Refer to 10.4
3. Refer to 10.5

**Terminal Questions**

1. Efficient frontier represents the trade-off between risk and expected return faced by an investor when forming his portfolio. For more details, refer section 10.4.
2. The model does not discuss the information about dividend policy, earnings, market share, strategy, and quality of management. For more details, refer section 10.6

## 10.11 Case Study

**Percival Hygiene**

Percival Hygiene has $10 million invested in long-term corporate bonds yielding 9% per annum with a standard deviation of 9%. They are looking at the possibility of investing in an index fund with an annual return of 14% and SD 16%.

**Discussion Questions**

1. Can a combination of the index fund and T-bills (yield 6%) improve the return without increasing risk?
2. Can Percival do even better by investing equally in the index fund and the present bond portfolio?

**Hint:** The correlation between the two funds is +.1.

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# Unit 11 Capital Asset Pricing Model (CAPM)

**Structure:**



## 11.1 Introduction

Capital asset pricing means defining an appropriate risk-adjusted rate of return for a given asset. Capital Asset Pricing Model (CAPM) is a model that helps in this exercise.

William Sharpe, Treynor and Lintner contributed to the development of this model. An important consequence of the modern portfolio theory as introduced by Markowitz was that the only meaningful aspect of total risk to consider for any individual asset is its contribution to the total risk of a portfolio. CAPM extended Harry Markowitz's portfolio theory to introduce the notions of systematic and unsystematic (or unique) risk.

With the introduction of risk-free lending and borrowing, the efficient frontier of Markowitz was expanded and it was shown that only one risky portfolio (the tangency portfolio) mattered in evaluating the portfolio risk contribution characteristics of any asset. CAPM demonstrated that the tangency portfolio

was nothing but the **market portfolio** consisting of all risky assets in proportion to their market capitalisation.

Since the market portfolio includes all the risky assets in their relative proportions, it is a fully diversified portfolio. The inherent risk of each asset that can be eliminated by belonging to the portfolio has already been eliminated. Only the market risk (also called systematic risk) will remain. This has been discussed in detail in the last unit.

The CAPM is a model for risky asset pricing. Using a statistical technique called linear regression, the total risk of each risky asset is separated into two components:

- variability in its returns (i.e., risk) that is related with the variability of returns in the market portfolio (its contribution to systematic risk)
- variability in its returns that is unrelated with the variability of returns in the market portfolio (called unsystematic risk).

Systematic risk of a risky asset exists in the market portfolio and cannot be eliminated by portfolio diversification. Investors who want to hold the market portfolio must be and are rewarded. Unsystematic risk for any risky asset cannot be eliminated by holding the market portfolio (which includes the risky asset in question).

Thus the major conclusion of CAPM is that expected return on an asset is related to its systematic and not to its total risk or standard deviation. Its systematic risk is given by its beta coefficient (β). An asset's beta is a measure of its co-movement with the market index.
This unit discusses CAPM model in detail.

**Objectives:**

After studying this unit, you will be able to:

- state the assumptions of CAPM
- explain 'Separation Theorem'
- explain the Capital Market Line (CML)
- explain the Security Market Line (SML)
- differentiate the CML and SML
- discuss the inputs required for applying CAPM
- discuss the issues in Beta Estimation

- explain the Systematic (Market) and Unsystematic (Unique) Risk
- explain the limitations of CAPM.

## 11.2 Assumptions of CAPM

- All investors are assumed to follow the mean-variance approach, i.e. the risk-averse investor will ascribe to the methodology of reducing portfolio risk by combining assets with counterbalancing correlations.
- Assets are infinitely divisible.
- There is a risk-free rate at which an investor may lend or borrow. This risk-free rate is the same for all investors.
- Taxes and transactions costs are irrelevant.
- All investors have same holding period.
- Information is freely and instantly available to all investors.
- Investors have homogeneous expectations i.e. all investors have the same expectations with respect to the inputs that are used to derive the Markowitz efficient portfolios (asset returns, variances and correlations).
- Markets are assumed to be perfectly competitive i.e. the number of buyers and sellers is sufficiently large, and all investors are small enough relative to the market, so that no individual investor can influence an asset's price.

Consequently all investors are price takers. Market price is determined by matching supply and demand.

Investors are considered to be a homogeneous group. They have the same expectations, same one-period horizon, same risk-free rate and information is freely and instantly available to all investors. This is an extreme case, but it allows the focus to change from how an individual should invest to what would happen to security prices if everyone invested in a similar manner.

Some of these assumptions of CAPM are clearly unrealistic. But relaxing many of these assumptions would have only minor influence on the model and would not change its main implications or conclusions. The primary way to judge a theory is to see how well it explains and helps predict behaviour. While CAPM does not completely explain the variation in stock returns, it remains the most widely used method for calculating the cost of capital.

**Self Assessment Question:**

1. Assets are infinitely _____.

## 11.3 Separation Theorem

In unit 8, we studied that if investors can borrow and lend, then everybody holds a combination of two portfolios – i) a portfolio of risky assets (tangency portfolio) that lies on the efficient frontier and ii) the risk-free asset. The risk-free asset and the tangency portfolio is the same for all investors if they live in a world of homogenous expectations, have same one-period horizon, and same risk-free rate and if information is freely and instantly available to all.

Thus investors differ from each other (depending on their relative risk preferences) only by the proportions of the risk-free asset and tangency portfolio they choose to hold in their portfolio.

Thus portfolio construction is a two-step process. First, determine the risky portion of their portfolio – the tangency portfolio on the efficient frontier that an investor would hold. The next step is to leverage (borrow at the risk-free rate and invest further in the tangency portfolio) or de-leverage (sell part of the tangency portfolio and lend the proceeds at the risk-free rate) this portfolio to achieve whatever level of risk that they desire.

We have seen that the composition of the tangency portfolio on the efficient frontier is the same for all investors and is independent of the investor's risk appetite as it lies on the line drawn through the risk-free rate and tangent to the efficient frontier.

Therefore, the two decisions that the investors have to make are:
(i) choosing the composition of the risky portion of the investor’s portfolio
(ii) deciding on the amount of leverage to use.

These are entirely independent of each other. This is called Tobin's **separation theorem**. It states that that "the optimal combination of risky assets for an investor can be determined without any knowledge of the investor's preferences toward risk and return."

**Self Assessment Question**

2. Portfolio construction is a _____ step process.

## 11.4 Market Portfolio

If investors have the same expectations, same one-period horizon, same risk-free rate and if information is freely and instantly available to all investors, it can be shown that the portfolio of risky assets lying on the efficient frontier that the investors hold (the tangency portfolio) is the same for everyone. It is the **market portfolio**.

Market portfolio consists of all assets available to investors, and each asset is held in proportion to its market value relative to the total market value of all assets.

The tangency portfolio should be the market portfolio. Reason being the tangency portfolio is a portfolio that every rational investor would hold. If a risky asset was not included in this portfolio there would be no demand for it and it would not exist.

As far as the proportion of each risky asset in this market portfolio is concerned, market efficiency and equilibrium ensure that the demand for each asset is reflected in its price so that the relative market capitalisation of each asset (as a percentage of the entire market for risky assets) would be the weight or proportion of each asset in the market portfolio.

**Self Assessment Question:**

3. Market portfolio consists of all _____ available to investors, and each asset is held in proportion to its market value relative to the total market value of all assets.

## 11.5 The Capital Market Line (CML)

The CML says that the expected return on a portfolio is equal to the risk-free rate plus a risk premium.

$$\bar{r}_p = r_f + \left(\frac{(\bar{r}_m - r_f)}{\sigma_m}\sigma_p\right.$$

Where, $r_f$ = risk-free rate, $r_m$ = return on market portfolio, $\sigma_m$ = standard deviation of the return on market portfolio, $\sigma_p$ = standard deviation of the return on the portfolio.

Graphically, the CML can be drawn as below:

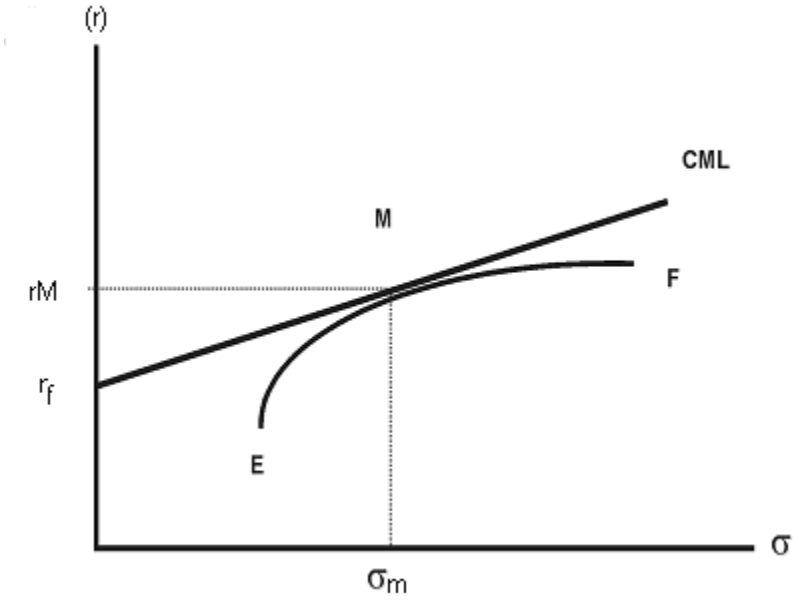


**Figure 11.1: The Capital Market Line (CML)**

EF is the efficient frontier, M is the market portfolio and the line tangent to the efficient frontier and joining the risk-free rate ($r_f$) with the market portfolio (M) and going beyond is the Capital Market Line (CML).

The risk-free rate compensates investors for the time value of money while the risk premium compensates investors for bearing risk. The risk premium is equal to the market price of risk times the quantity of risk for the portfolio (as measured by the standard deviation of the portfolio).

$$\frac{(\bar{r}_m - r_f)}{\sigma_m}\sigma_p$$

The term ($r_m$ – $r_f$) is the expected return of the market beyond the risk-free return. It is a measure of the reward for holding the risky market portfolio rather than the risk-free asset. The term $\sigma_m$ is the risk of the market portfolio. Thus, the slope of the CML measures the reward per unit of market risk. It determines the additional return needed to compensate for a unit change in risk. It is also called the market price of risk.

Capital Market Line (CML) leads all investors to invest in the tangency portfolio (M portfolio) which is the *investment decision*. Individual investors

differ in position on the CML depending on risk preferences (which leads to the *financing decision*). Risk-averse investors will lend part of the portfolio at the risk-free rate ($r_f$) and invest the remainder in the market portfolio (points left of M). Aggressive investors would borrow funds at the risk-free rate and invest everything in the market portfolio (points to the right of M)

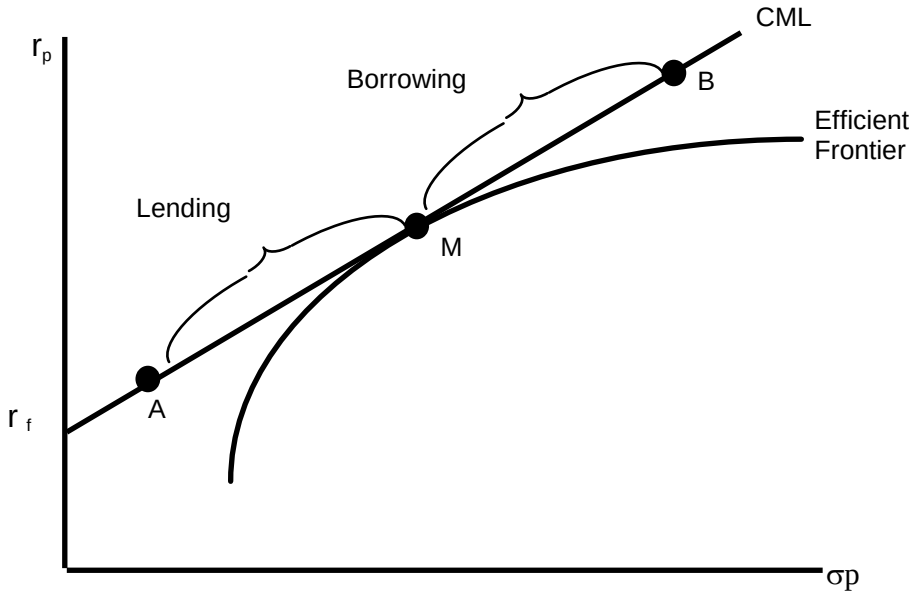


**Figure 11.2: The Capital Market Line- Tangency Portfolio**

**Self Assessment Question**

4. What is Capital Market Line (CML)?

## 11.6 The Security Market Line (SML)

For an individual risky asset, the relevant risk measure is the covariance of its returns with the return on the market portfolio. An extension of covariance called beta coefficient of an asset, $\beta_i$ is defined as:

$$\beta_i = \frac{\sigma_{i,M}}{\sigma_M^2}$$

Where $\sigma_{i,M}$ = covariance of the return on the asset and the return on the market portfolio.

$\sigma^2_M$ = variance of return on the market portfolio.

The CAPM equation, whose graphical representation is the Security Market Line (SML), describes a linear relationship between risk and return for an individual asset. Risk, in this case, is measured by beta (β). Required rate of return for a particular asset in a market depends on its sensitivity to the movement of the market portfolio (i.e. the broader market). This sensitivity is known as the asset beta (β) and reflects systematic risk of the asset. For the market portfolio, beta of the portfolio, $\beta_M = 1$ by definition. More sensitive assets have a higher beta while less sensitive assets have lower beta. Expected return on any security or portfolio is equal to the risk-free rate plus a risk premium.

$$(r_i) = r_f + [(r_M) - r_f] \times \beta_i$$

Thus expected return on a security $(r_i)$ depends on the risk-free rate, $(r_f,)$ which is the pure time value of money, $(r_M - r_f,)$ the reward for bearing systematic risk and $\beta i$, the amount of unsystematic risk.

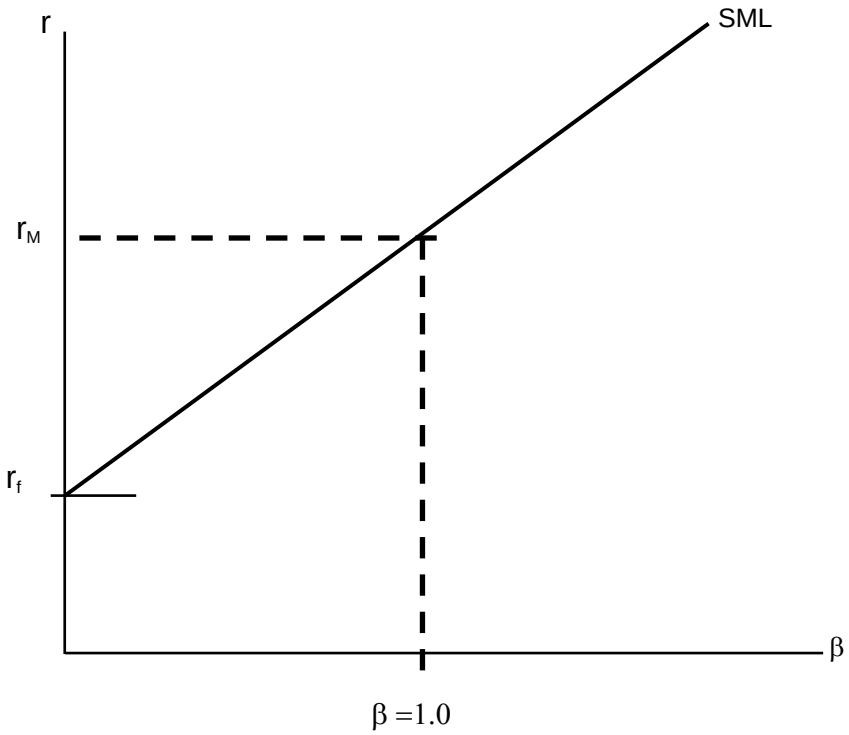


**Figure 11.3: The Security Market Line (SML)**

**Example**

If the expected market risk premium is 8% (0.08) and the risk-free rate is 3% (0.03), calculate the expected return on an asset whose beta is:

(i) $\beta x = 1.25$

(ii) (ii) $\beta y = 0.6$.

**Solution**

Expected market risk premium ($r_m - r_f$) = 0.08 and risk-free rate , $r_f$ = 0.03

i) if $\beta x = 1.25$; $r_x = 0.03 + 1.25(0.08) = 0.13$ or 13%

ii) if $\beta y = 0.6$ ; $r_y = 0.03 + 0.6(0.08) = 0.078$ or 7.8%

**Self Assessment Questions:**

5. What is Separation Theorem?

6. If the expected market risk premium is 10% and the risk-free rate is 5%, calculate the expected return on a stock whose beta is 1.5.

## 11.7 CML and SML

The Security Market Line (SML) and the Capital Market Line (CML) are sometimes confused with each other. CML is a straight line on a plot of absolute returns versus risk that begins at the point of the risk-free asset and extends to its point of tangency with the efficient frontier for risky assets that we call the market portfolio and beyond. Along CML, there are only differing proportions of investing in the market portfolio and borrowing or lending at the risk-free rate to either increase or decrease the exposure to the market portfolio.

SML allows us to represent the risk and return characteristics of every asset in the market portfolio. Instead of dealing with the market portfolio as a whole or as a single entity, SML disaggregates the market portfolio into its individual risky assets and plots return against the only meaningful (or rewarded) aspect of total risk for each asset that is rewarded (its beta).

Thus CML shows the relation between the expected return from a portfolio and its standard deviation and helps investors in their capital allocation problem, while SML shows the relation between expected return and beta and helps investors in security selection and individual asset pricing.

**Self Assessment Question:**

7. How is Capital Market Line (CML) different from Security Market Line (SML)?S

_____
_____
_____
_____
_____
_____

**Activity:**
Given Rf= 6%, E(Rm)= 15%, and expected return and expected betas are as follows:

| Stock | expected return | expected beta |
|---|---|---|
| A | 13% | 1.2 |
| B | 15% | 0.75 |
| C | 20% | 1.60 |

analyse which stock is undervalued or overvalued, relative to expected return
**Hint:** calculate E for each stock.

## 11.8 Inputs required for Applying CAPM

We need estimates of three things for applying CAPM:

- risk-free interest rate $r_f$
- market price of risk ($r_M$ - $r_f$)
- beta for the stock β.

**Risk-free rate** can be estimated by the current yield on risk-free assets such as treasury bills. It is common practice to view treasury bills as the risk-free asset because their short terms make their values insensitive to interest rate fluctuations.

**Market price of risk** can be estimated by looking at the historical difference between the return on market index and the return on treasury bills.

The **beta** of any asset is estimated by regression analysis. To estimate beta, we regress the asset returns for the past several periods (usually 60

months) on the market returns. The slope in this regression is an estimate of beta, β. The regression equation is:

$$r_{i,t} = \alpha_i + \beta_i r_{M,t} + \varepsilon$$

Where,

$r_{i,t}$ = the rate of return for asset i during period t

$r_{M,t}$ = the rate of return for the market portfolio M during t

$\alpha_i$ = constant term

$\beta_i$ = slope of the regression line = Covariance between asset returns and market returns/variance of market portfolio returns

ε = error term

Betas are estimated from actual data. Different agencies estimate beta differently, possibly using different data. For data, the most common choices are three to five years of monthly data, or a single year of weekly data. The calculated betas may be adjusted for various statistical reasons and for the reason that the value of beta changes over time.

This may happen due to changes in a company's capital structure or due to the fact that a company changes its business by manufacturing and selling different products. Blume adjustment, multiplies the beta value obtained through regression by 2/3 and then adds 1/3 to the product, to arrive at the modified value of beta, in the belief that betas tend to revert to one.

$\beta_{adjusted} = (2/3)\ \beta_{calculated} + 1/3$

Another view holds that betas may revert to their industry averages.

**Self Assessment Question:**

8. The _____ of any asset is estimated by regression analysis

## 11.9 Issues in Beta Estimation

When interpreting an estimate of beta, it is important to be aware of some practical problems in estimation. Apart from econometric issues, there will be a difference in the calculated beta depending on the following factors.

1. The length of time over which the return is calculated (e.g. daily, weekly, monthly)
2. The number of observations used

3. The specific time period used
4. The market index selected

- **Impact of time interval:** The number of observations and time interval used in regression varies across agencies that are estimating betas. Some like Value Line Investment Services (VL) use weekly rates of return over five years while others like Merrill Lynch use monthly return over five years. There is no "correct" interval for analysis. However, there is a weak relationship between these betas that are estimated differently due to difference in intervals used. This interval effect impacts smaller firms more.
- **Effect of the market proxy:** The betas are estimated using regression analysis, by drawing the asset's characteristic line with the model (market) portfolio. Thus a measure of the market portfolio is needed. But what should be the market portfolio? Should it be the Nifty or the Sensex or some other index? The market portfolio should theoretically include all types of assets from all around the world. CAPM is often criticised because of the difficulties in selecting a proxy for the market portfolio as a benchmark.

Although linear regression is an easy statistical tool to use to estimate betas, it only provides an estimate and the validity of beta depends upon a number of factors. Regression assumes that betas are fixed over the estimation period. However, betas can vary over a period of time as companies change their business and enter new areas. This is why analysts use a limited time period to calculate beta. Any longer interval may make the assumption of constant beta grossly invalid.

Since beta is a coefficient from a regression, it is only as valid as the data used to calculate it. It may happen that the market index used for regression may not completely capture non-systematic risk exposure.

Suppose a company is exposed to interest rate risk, but has a moderately low beta with respect to the market index Nifty. If interest rate risk demands market compensation by portfolio investors, then one will be underestimating the non-systematic risk of the company if only Nifty is used when calculating the expected return and discount rate through a single-factor model.

**Self Assessment Question:**

9. What are the problems encountered in estimating beta?

_____

_____

_____

_____

_____

## 11.10 Systematic (Market) and Unsystematic (Unique) Risk

The total risk of a portfolio (indeed of a security) consists of two parts:

- market (or systematic) risk
- unique (Unsystematic or firm-specific) risk.

Diversification reduces the unique risk, but the market risk cannot be diversified away. Therefore, the Capital Asset Pricing Model (CAPM) advocates that investors should not expect to be compensated (expect more profit) for taking on unique risk as it can be diversified away, but they can expect to receive higher returns for taking on more market risk.

Market risk is the variability in all risky assets caused by macroeconomic variables. This risk cannot be avoided, regardless of the amount of diversification. Systematic risk factors are macroeconomic variables that affect the valuation of all risky assets such as variability in the growth of the money supply, interest rate volatility, variability in aggregate industrial production, and natural calamities like drought, earth quake, hurricane, etc. For small countries, external problems (capital flows, exchange rates, terms of trade etc.) are also included.

Many of the risks faced by an individual company are specific to its activity, management etc. These are unique risks and can be diversified away. Examples of unique risks are a company winning a large contract, wildcat strikes or litigation hitting a company or the company facing a governmental investigation.

**Self Assessment Question:**

10. What are systematic risk and unique risk?

_____

_____

_____

_____

_____

## 11.11 Limitations of Capital Asset Pricing Model

- CAPM is a single period model.
- It is a single factor linear model. It defines risky asset returns solely as a function of the asset's contribution to the systematic risk of the market portfolio.
- The true market portfolio defined by the theory behind the CAPM is unobservable. Therefore, one has to select and use a market portfolio such as Nifty or Sensex as "proxy."
- If we use historical data to estimate the inputs for the basic CAPM (risk-free rate, beta and market risk premium), we are making the assumption that the past (specifically the period that we select for the historical data) is the best predictor of the future.

Over the years, a lot of research has been done to test the validity of CAPM but there are problems encountered in doing this research. CAPM is a theory about **expected returns** whereas we can only measure **actual returns**. This makes it difficult to test the theory as it is conceived. Another problem in testing CAPM is that the market portfolio should include all assets, not just stocks traded in stock exchanges. In practice, most of the tests use stock market indexes such as the S & P 500 as proxies for the market portfolio.

The results of the research, in general, indicate that the model fails a rigorous test of validity. The results do generally indicate that any asset's returns are, as CAPM asserts, a linear function of its non-diversifiable risk. But these studies, strictly interpreted find a different intercept and a different slope for SML than the one predicted by CAPM—SML seems flatter than that predicted by CAPM.

In spite of its limitations, most observers regard CAPM as the best tool to describe how assets are priced in efficient markets at equilibrium. The model has found its way into the practical tool kit of many security analysts, portfolio designers, financial managers, investors etc. Corporations often use CAPM to help estimate the cost of equity financing, which is in turn an important component of the weighted average cost of capital (WACC).

**Self Assessment Question:**

11. CAPM is a _____ model.

## 11.12 Summary

- **CAPM** extends portfolio theory and seeks to develop a model for pricing of risky assets based on their relevant risks.
- CAPM follows from the Tobin extension to the Markowitz model but requires additional assumptions.
- CAPM decomposes a portfolio's risk into systematic and specific risk.
- **Systematic risk** is the risk of holding the market portfolio.
- **Specific risk** is the risk which is unique to an individual asset. It represents the component of an asset's return which is not correlated with general market moves.
- According to CAPM, marketplace compensates investors for taking systematic risk but not for taking specific risk. This is because specific risk can be diversified away.
- **Non-systematic or specific risk** can be measured using beta. According to CAPM, expected return of a stock equals the risk-free rate plus the portfolio's beta multiplied by the expected excess return of the market portfolio.

## 11.13 Glossary

***Specific risk:*** Risk which is unique to an individual asset.

***Market risk:*** Variability in all risky assets caused by macroeconomic variables.

## 11.14 Terminal Questions

1. List out the assumptions of Capital Asset Pricing Model (CAPM).
2. Discuss Separation Theorem
3. Explain Market Portfolio
4. Analyse the Capital Market Line (CML)
5. Analyse the Security Market Line (SML)
6. Differentiate CML and SML
7. Analyse the inputs required for applying CAPM
8. Discuss the issues in Beta Estimation
9. Explain Systematic (Market) and Unsystematic (Unique) Risk
10. What are the limitations of Capital Asset Pricing Model

## 11.15 Answers

### Self Assessment Questions

1. divisible
2. two
3. assets
4. Refer to 11.5
5. Refer to 11.3
6. 5% + 1.5 x (10%-5%) = 12.5%
7. Refer to 11.7
8. Beta
9. Refer to 11.9
10. Refer to 11.10
11. single period

### Terminal Questions

1. The CAPM is a model for risky asset pricing. For more details, refer section 11.2.
2. Tobin's **separation theorem** states that that "the optimal combination of risky assets for an investor can be determined without any knowledge of the investor's preferences toward risk and return." For more details, refer section 11.3.

3. Market portfolio consists of all assets available to investors, and each asset is held in proportion to its market value relative to the total market value of all assets. For more details, refer section 11.4.
4. The CML says that the expected return on a portfolio is equal to the risk-free rate plus a risk premium. For more details, refer section 11.5.
5. The CAPM equation, whose graphical representation is the Security Market Line (SML), describes a linear relationship between risk and return for an individual asset. For more details, refer section 11.6.
6. Thus CML shows the relation between the expected return from a portfolio and its standard deviation and helps investors in their capital allocation problem, while SML shows the relation between expected return and beta and helps investors in security selection and individual asset pricing. For more details, refer section 11.7.
7. We need estimates of three things for applying CAPM: risk-free interest rate $r_{f,}$ market price of risk $(r_M - r_f)$ and beta for the stock β. For more details, refer section 11.8.
8. When interpreting an estimate of beta, it is important to be aware of some practical problems in estimation. For more details, refer section 11.9.
9. The total risk of a portfolio (indeed of a security) consists of two parts: market (or systematic) risk and unique (Unsystematic or firm-specific) risk. For more details, refer section 11.10.
10. The CAPM is a theory about expected returns whereas we can only measure actual returns. For more details, refer section 11.11.

## 11.16 Case Study

**Beta Management Company**

In early January 1991, Sarah Wolfe was in her office considering new goals and directions for her company forth coming year. Ms. Wolfe was the founder and CEO fo the Beta Management Group, a small investment management company based in a Boston suburb. She dealt with a growing number of high-net-worth individual clients and had $25 million in assets under management. Beta's investment success during the past year had brought in a steady stream of new clients and additional money from

existing clients. At the same time, Ms. Wolfe had inquiries from some small institutions, and was hoping to expand her business in 1991.

Beta Management Company was founded in 1988. A wealthy couple had become fed up with their investment losses stemming from the October 1987 crash and had asked their friend, Ms. Wolfe, to manage a portion of their money. While business was slow at first, she gradually developed a client base through good performance and word of mouth. She considered herself a market strategist, and Beta Management's stated goals were to enhance returns but reduce risks for clients via market timing. Given the small size of her accounts, the easiest way for her to maintain and adjust equity market exposure was to "index". She would keep a majority of Beta's funds in no-load, low-expense index funds (with the remainder in money market instruments), adjusting the level of market exposure between 50% and 99% of Beta's funds in an attempt to "time the market." She had toyed with using a few different index funds at first, but soon settled on exclusive use of Vanguard's Index 500 Trust due to its extremely low expense ratio and its success at closely matching the return on the S&P 500 Index.

While Beta's performance had lagged market returns in 1989, Ms. Wolfe had been quite successful in 1990. She had reduced Beta's equity position to 50% in June, partially missing a large two-month market decline (see Table 1). After nervously waiting out August and September, she began moving money back into the index fund. The report in front of her showed that as of January 4, 1991, Beta Management had 79.2% of its $25 million invested in the Vanguard fund; Beta had also made money for its clients during a down market year.

This success had brought in enough new money to double the size of Beta in under six months, allowing Ms. Wolfe to finally make the move to work full-time managing money. But she had lost some potential new clients who had thought it unusual that Beta Management used only an index mutual fund and picked none of its own stocks. Ms. Wolfe had felt this same resistance in conversations with a few of the potential institutional clients she was courting. As a result, one of her New Year's resolutions had been to begin looking at some individual stocks for possible purchase for Beta's equity portfolio. She would focus on smaller stocks, since she didn't want to compete with Beta's equity portfolio. She would focus on smaller stocks,

since she didn't want to compete with larger, analyst-staffed funds on their own turf, and also because she already had exposure to the S&P 500 stocks through investment in the index fund. She also decided to increase the proportion of Beta's assets in equities, since she felt the market was still a good value and that 1991 would be a good year.

As a first step toward both of these goals, Ms. Wolfe was considering immediately increasing her equity exposure to 80% with the purchase of one of two stocks recommended by her newly hired analyst. Both were small NYSE-listed companies whose stock price had eroded over the past two years (see Table 1) to levels that seemed unreasonably low.

California R.E.I.T. was a real estate investment trust that made equity and mortgage investments in income-producing properties (retail building 57%; industrial 17%; offices 15%; apartments 11%) in Arizona (51%), California (30%), and Washington (19%). Its investments and stock price had been badly damaged by the "World Series" earthquake of 1989 and the downturn in California real estate values (see Table 1). Ms. Wolfe viewed it as a good value, but noticed that it was an extremely volatile stock. Its stock price closed at $2 ¼ per share on January 4, 1991.

Brown Group, Inc was one of the largest manufacturers and retailers of branded footwear, and had been undergoing a major restructuring program since 1989. Earnings dropped in 1989 but had stayed positive and steady; the stock price had dropped substantially in late 1989 and late 1990. Ms. Wolfe knew that some of Brown's many brand names – including Jordache, Naturalizer, and Buster Brown – would wear well during the current recession, and she like the steady cash flow and earnings. She noted, though, that Brown's stock price seemed quite variable and somewhat sensitive to movements in the stock market. Still, she felt it was an attractive opportunity at its January 4 price of $24.

Ms. Wolfe felt that now was the right time to begin her program of adding individual stock investments and increasing her equity position. A $200,000 purchase of one of these stocks would increase her total equity exposure to $20 million. Still, she had some doubts. She was quite worried about he variability in individual stocks in general, and these stocks in particular. After all, she had always promised her clients reasonable returns with a focus on keeping their exposure to risk under control. She noticed that these stocks

both seemed to bounce around in price much more than the market (or the index fund), and she wondered if she was doing the right thing exposing her clients to these new risks.

**Table 1: Investment Return Data**

| Month | Vanguard Index 500 Trust | California R.E.I.T. | Brown Group |
|---|---|---|---|
| 1989 – January | 7.32 | -28.26 | 9.16 |
| February | -2.47 | -3.03 | 0.73 |
| March | 2.26 | 8.75 | -0.29 |
| April | 5.18 | -1.47 | 2.21 |
| May | 4.04 | -1.49 | -1.08 |
| June | -0.59 | -9.09 | -0.65 |
| July | 9.01 | 10.67 | 2.22 |
| August | 1.86 | -9.38 | 0 |
| September | -0.4 | 10.34 | 1.88 |
| October | -2.34 | -14.38 | -7.55 |
| November | 2.04 | -14.81 | -12.84 |
| December | 2.38 | -4.35 | -1.7 |
| 1990 – January | -6.72 | -5.45 | -15.21 |
| February | 1.27 | 5 | 7.61 |
| March | 2.61 | 9.52 | 1.11 |
| April | -2.5 | -0.87 | -0.51 |
| May | 9.69 | 0 | 12.71 |
| June | -0.69 | 4.55 | 3.32 |
| July | -0.32 | 3.48 | 3.17 |
| August | -9.03 | 0 | -14.72 |
| September | -4.89 | -13.04 | -1.91 |
| October | -0.41 | 0 | -12.5 |
| November | 6.44 | 1.5 | 17.26 |
| December | 2.72 | -2.56 | -8.53 |

**Discussion Questions:**

1. Compute the standard deviation of the stock returns of California REIT and Brown Group during the past 2 years.

2. Suppose that Beta's position had been 99% of equity funds invested in the index fund, and 1% in the individual stock. Calculated the standard deviation of this portfolio using each stock. How does each stock affect the variability of the equity investment?
3. Based on your answers to questions 1 and 2, which stock is riskiest?"

Source: http://brainmass.com/economics/finance/23762. Retrieved on 1st October, 2012.

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# Unit 12 Sharpe: The Single Index Model

**Structure:**



## 12.1 Introduction

In the last unit, we discussed the CAPM model, which is a single factor linear model as it defines risky asset returns solely as a function of the asset's contribution to the systematic risk of the market portfolio. Markowitz portfolio selection model has two shortcomings. The first is the problem of *computational complexity*. When dealing with large numbers of securities, the statistical inputs required for using the model are many. The correlation or covariance between every pair of securities must be evaluated in order to estimate portfolio risk. There are thousands of shares that trade on stock exchanges. For 1,000 shares, the number of covariances required are n x (n-1) / 2 = 1000 x 999 / 2 = 499,500. For larger number of shares the number of statistical inputs is even greater.

The second problem with the Markowitz model is that it assumes that all the risk and return characteristics can be explained by the covariance of the security's returns with the returns of other securities. Thus, changes in factors such as the growth rate of the economy or the inflation rate are not accounted for directly.

These considerations have led to various simplifications and extensions of the model. One is the single-index model developed by Sharpe. The major assumption of Sharpe's single-index model is that all the covariances of security returns can be explained by a single factor. This factor is called the Index, hence the name "Single Index Model." The Single Index Model relates returns to a single factor, thus eliminating Markowitz's complex method of calculating all covariances of all assets in the portfolio.

One version of the model, called the **Market Model**, uses a market index such as the Sensex as the factor, although in principle, any factor that influences security returns can serve as the index. This model has substantially reduced the number of required inputs when estimating portfolio risk. Instead of estimating the correlation between every pair of securities as required by the Markowitz model, the single index model requires that each security's correlation with an index be evaluated. This means that for *n* securities we require *n* statistical inputs. So instead of 499,500 correlation coefficients required for 1,000 securities, we need just 1,000 values. This unit deals with the Single Index Model.

**Objectives:**

After studying this unit, you will be able to:

- measure return on an individual stock
- measure the portfolio return
- measure individual Stock Risk
- explain how the total risk of a portfolio can be reduced.
- explain Portfolio Risk Diversification
- measure of return on an individual stock using regression equation

### 12.2 Measurement of Return on an Individual Stock

The Single Index Model (Market Model) states that the return on an individual stock over a given time period is related to the return on the same period that is earned on a market index such as Sensex or Nifty. Thus, if the market goes up, the stock goes up and if the market goes down, the stock goes down.

Thus, $r_i = \alpha_i + \beta_i r_M + \varepsilon_i$

Where $r_i$ = return on stock, $r_M$ = return on the market index, $\alpha_i$= intercept term, $\beta_i$ = slope term and $\varepsilon_i$ = random error term. This defines a line with

intercept $\alpha_i$ and slope $\beta_{i,}$ with $\varepsilon_i$ being the deviations from the line for the individual returns. This line is called the *Security Characteristic Line* (*SCL*).

Assuming that the slope is positive, the equation indicates that the higher the return on the market index, the higher is the return on the individual stock likely to be. The expected value of random error term is zero.

**Example**

Consider a stock which has $r_M$ = return on the market index = 12%, $\alpha_i$ = 3% and $\beta_i$ = 1.5. The expected return on the stock is 3% + 1.5 x 12% = 21%. Similarly if the market index's return is –8%, then the return on the security is expected to be 3% + 1.5 x – 8% = - 9%.

### 12.3 Measurement of Portfolio Return

If the proportion of funds invested in stock i is denoted by $X_i$, the return on the portfolio is:

$$r_p = \sum_{i=1}^{N} X_i r_i$$

Substituting the value of $r_i$, this results in the following equation for the portfolio:

$$r_p = \sum_{i=1}^{N} X_i (\alpha_i + \beta_i r_M + \varepsilon_i)$$

Or

$$r_p = \sum_{i=1}^{N} X_i \alpha_i + (\sum_{i=1}^{N} X_i \beta_i) r_M + \sum_{i=1}^{N} X_i \varepsilon_i$$

Or

$$r_p = \alpha_p + \beta_p r_M + \varepsilon_p$$

where,

$$\alpha_p = \sum_{i=1}^{N} X_i \alpha_i$$

$$\beta_p = \sum_{i=1}^{N} X_i \beta_i$$

and

$$\varepsilon_p = \sum_{i=1}^{N} X_i \varepsilon_i$$

## 12.4 Measurement of Individual Stock Risk

In the single index model, total risk of an individual stock, measured by its variance, $\sigma_i^2$, has two components – market risk and unique (stock-specific) risk.

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

where $\sigma_M^2$ denotes the variance of return on the market index. Thus $\beta_i \sigma_M^2$ denotes the market risk of stock and $\sigma_{\varepsilon i}^2$ denotes the unique risk of stock as measured by the variance of return of random error term $\varepsilon_i$ (as appearing in the equation for the return on an individual stock).

## 12.5 Measurement of Portfolio Risk

The total risk of the portfolio, measured by the variance of the portfolio's returns, $\sigma_p^2$, is:

$$\sigma_p^2 = \beta_p^2 \sigma_m^2 + \sigma_{\varepsilon p}^2$$

Where,

$$\beta_p^2 = (\sum_{i=1}^{N} X_i \beta_i)^2$$

Assuming that the random error components of security returns are uncorrelated:

$$\sigma_{\varepsilon p}^2 = \sum_{i=1}^{N} X_i^2 \sigma_{\varepsilon i}^2$$

Thus the total risk of the portfolio can be viewed with two components, similar to the two components of the total risk of an individual stock. These are market risk and unique risk. $\beta_p \sigma_M^2$ denotes the market risk and $\sigma_{\varepsilon p}^2$ denotes the unique risk of the portfolio.

**Self Assessment Question:**

1. What are the components of portfolio risk?

_____
_____
_____
_____
_____
_____

## 12.6 Portfolio Risk Diversification

The total risk of a portfolio can be reduced by diversification. There is a reduction in the size of the portfolio's unique risk while the portfolio's market risk remains approximately the same.

Generally, the more diversified the portfolio (the larger the number of stocks in it), the smaller the proportion of each stock in the portfolio $X_i$. This does not cause any significant change in the portfolio beta $\beta_p$, unless a deliberate attempt is made to include stocks with very high or low betas.

The portfolio beta is an average of the beta of the portfolio stocks. There is no reason why increasing the diversification will cause the portfolio beta and therefore the market risk of the portfolio to either increase or decrease. However an increase in diversification and therefore a reduction in the proportion of each stock $X_i$ lead to a reduction in the unique risk and in turn the total risk of a portfolio.

**Example**

Consider 3 securities A, B and C with the following betas and standard deviation of random error terms:

A: $\beta$= 1.2, $\sigma_\varepsilon$ = 6.06%

B: $\beta$= 0.8, $\sigma_\varepsilon$ = 4.76%

C: $\beta$= 1.0, $\sigma_\varepsilon$ = 5.5%

The standard deviation of market return is 8%.

The variance and the standard deviation of returns of the three stocks, A, B and C are:

| **A** | | | | | |
|---|---|---|---|---|---|
| Market risk = | | $\beta^2\sigma_M^2$ = | 0.0092 | $=1.2^2 \times 0.08^2$ | |
| Unique risk = | | $\sigma_\varepsilon^2$ = | 0.0037 | $=0.0606^2$ | |
| Total risk = | | | 0.0129 | | |
| Standard deviation = | | √0.0129= | 0.1136 | Or | 11.36% |

| **B** | | | | | |
|---|---|---|---|---|---|
| Market risk = | | $\beta^2\sigma_M^2$ = | 0.0041 | $=0.8^2 \times 0.08^2$ | |
| Unique risk = | | $\sigma_\varepsilon^2$ = | 0.0023 | $=0.0476^2$ | |
| Total risk = | | | 0.0064 | | |
| Standard deviation = | | √0.0064= | 0.0800 | Or | 8.00% |

| **C** | | | | | |
|---|---|---|---|---|---|
| Market risk = | | $\beta^2\sigma_M^2$ = | 0.0064 | $=1^2 x 0.08^2$ | |
| Unique risk = | | $\sigma_\varepsilon^2$ = | 0.003 | $=0.055^2$ | |
| Total risk = | | | 0.0094 | | |
| Standard deviation = | | √0.0094= | 0.0970 | Or | 9.70% |

Let us combine the stocks A and B in a portfolio where each has a proportion of 0.5 and C has a proportion of 0 (i.e. C is not present in the portfolio).

The variance and standard deviation of this portfolio are:

| Beta portfolio= | | $\Sigma x_i \beta_i$ = | 1 | =0.5 x 1.2 + 0.5 x 0.8 | |
|---|---|---|---|---|---|
| Market risk portfolio= | | $\beta_p^2\sigma_M^2$ = | 0.0064 | $=1 \times 0.08^2$ | |
| Unique risk= | | $\Sigma x_i^2 \sigma_\varepsilon^2$ = | 0.0015 | $=0.5^2 \times 0.0606^2 + 0.5^2 x 0.0476^2$ | |
| Total risk= | | | 0.0079 | | |
| Standard deviation= | | √0.0079= | 8.89% | | |

Now, let us introduce C in the portfolio. Let each stock have an equal proportion of 0.33 in the portfolio.

The variance and standard deviation of this portfolio are:

| | | | |
|---|---|---|---|
| Beta of portfolio= | $\Sigma x_i \beta_i$ = | 0.99 | =0.33 x 1.2 + 0.33 x 0.8 + 0.33x1 |
| Market risk of portfolio= | $\beta_p^2 \sigma_M^2$ = | 0.0063 | =0.99 x 0.082 |
| Unique risk= | $\Sigma x_i^2 \sigma_\varepsilon^2$ = | 0.001 | = $0.33^2$ x $.0606^2$ +$0.33^2$ x$.0476^2$ +$0.33^2$ x $.055^2$ |
| Total risk= | | 0.0073 | |
| Standard deviation= | √0.0073= | 8.54% | |

Thus we see that the introduction of the third stock reduces the variance (from 0.0079 to 0.0073) and therefore, the total risk of the portfolio.

**Self Assessment Question:**

2. How is the portfolio risk diversified?

_____
_____
_____
_____
_____
_____
_____

## 12.7 Measurement of Return on an Individual Stock using Regression Equation

The single index model equation has the form of a regression equation:

$$r_i = \alpha_i + \beta_i r_M + \varepsilon_i$$

This defines a line with intercept $\alpha_i$ and slope $\beta_i$, with $\varepsilon_i$ being the deviations from the line for the individual returns. It can be estimated using regression techniques. To do so, gather paired historical data on stock price (usually closing price) and the market index.

Construct one-period returns (for a one-month or one-week holding periods) for the stock and the market index. Make a scatter diagram of these returns

with the x-axis representing the return on the market index and the y-axis representing the return on the stock.

Estimate a regression equation with the stock returns as the dependent variable and the market return as the independent variable. The resulting intercept coefficient and the slope coefficient are the estimates for $\alpha_i$ and $\beta_i$ respectively.

**Activity:**
Consider a stock which has r m = return on the market index = 15%, αi = 2% and βi= 0.8. What is the expected return on this stock?
**Hint:** Expected return on the stock is 2% + 0.8 x 15% = 2% + 12% = 14%

## 12.8 Summary

- The **Single Index Model** developed by William Sharpe avoids the Markowitz method of calculating a multitude of covariances of stocks.
- The major assumption of Sharpe's Single-Index Model is that all the covariances of security returns can be explained by a **single factor**. This factor is called the index, hence the name 'Single Index Model'.
- The Single Index Model relates returns to a single factor, thus eliminating Markowitz's complex method of calculating all covariances of all assets in the portfolio.
- One version of the model, called the **market model**, uses a market index such as the Sensex or the Nifty as the factor, although in principle any factor that influences security returns can serve as the index.

## 12.9 Glossary

***Single Index Model:*** All covariance of security returns can be explained by a single factor called the Index.

## 12.10 Terminal Questions

1. What are the shortcomings of the Markowitz Model? How are they addressed by the Single Index Model?
2. Explain the use of regression equation for the measurement of return on an individual stock.

## 12.11 Answers

**Self Assessment Questions**

1. Refer to 12.5
2. Refer to 12.6

**Terminal Questions**

1. Markowitz portfolio selection model has two shortcomings. For more details, refer section 12.1.
2. The single index model equation has the form of a regression equation. For more details, refer section 12.7.

## 12.12 Case study:

If risk free rate (Rf) is 5 %, and market return 14% and beta is 1.5 for the security

a) determine the expected return for the security

b) what happens to expected return if Rm or market return increases to 18%, assuming that other variables do not change.

c) what happens to expected return if the beta falls to 1, assuming that other variables do not change.

Hint: Calculate the expected return for the security using the formula:
Ri= Rf +(Rm-Rf)β

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# Unit 13 Factor Models and Arbitrage Pricing Theory

**Structure:**



## 13.1 Introduction

Modern portfolio theory helps an investor to identify his optimal portfolio from umpteen number of security portfolios that can be constructed. We have seen in earlier units how the risk-return framework (using expected return and standard deviation of return of securities) along with all the covariances between the securities' return is used to derive the curved efficient set of Markowitz. For a given risk-free rate, the investor identifies the tangency portfolio and determines the linear efficient set (Capital Market Line). The investor invests in the tangency portfolio and either borrows or lends at the risk-free rate, the amount of borrowing or lending depends on his risk-return preferences.

With a large numbers of securities, the number of statistical inputs required for using the Markowitz model is tremendous. The correlation or covariance between every pair of securities must be evaluated in order to estimate portfolio risk.

The task of identifying the curved Markowitz efficient set can be greatly simplified by introducing a **return-generating process**. Return generating

process is a statistical method that explains how the return on a security is generated. In unit 12, we have studied one type of return-generating model, i.e. the market model. This is a single-factor model which relates a security's return to a single factor, which is the return on a market index.

However, the return on a security may depend on more than a single factor, necessitating the use of multiple factor models. Multiple factor models relate the return on a security to different factors in the economy, like the expected inflation, GDP growth rate, interest rate, tax rate changes etc.

Factor models or index models assume that the return on a security is sensitive to the movement of multiple factors. To the extent that returns are indeed affected by a variety of factors, the multiple factor models are seen to be more useful than the market model.

A factor model attempts to capture the major economic forces that systematically move the prices of all securities. The assumption is that the returns on securities show common reaction to one or more factors specified in the model.

Arbitrage Pricing Theory (APT) is a factor model that was developed by Stephen Ross. It starts with the assumption that security returns are related to an unknown number of unknown factors. It does not specify what these factors are. Unlike CAPM, APT does not rely on measuring the performance of the market. Instead, it directly relates the price of the security to fundamental factors. What these factors are is not indicated by the theory, and needs to be empirically determined.

**Objectives:**

After studying this unit, you will be able to:

- explain Single Factor Model and Variance
- explain two-factor Models and Variance
- explain Arbitrage Pricing Theory
- explain the role of arbitrage in APT
- analyse extension of Arbitrage to Two-factor Model
- contrast Arbitrage Pricing Theory and the Capital Asset Pricing Model.

## 13.2 Single Factor Model and Variance

The simplest factor model, given below, is a one-factor model:

The return on a security $r_i$ is given by:

$$r_i = a_i + b_i F + \varepsilon_i$$

Where F = the factor

$a_i$ = the expected return on the security i if the factor has a value of zero

$b_i$ = the sensitivity of security i to this factor

$\varepsilon_i$ = the random error term.

The returns on security i are related to two main components. The first of these involves the factor F. Factor F affects all security returns but with different sensitivities. The sensitivity of security i is return to F is $b_i$. Securities that have small values for this parameter will react only slightly as F changes, whereas when $b_i$ is large, variations in F cause large movements in the return on security i.

As a concrete example, think of F as the return on a market index (e.g. the Sensex or the Nifty), the variations in which cause variations in individual security returns. Hence, this term causes movements in individual security returns that are related. If two securities have positive sensitivities to the factor, both will tend to move in the same direction.

The second term in the factor model is a random error term, which is assumed to be uncorrelated across different stocks. We denote this term $\varepsilon_i$ and call it the **idiosyncratic return component** for stock i. An important property of the idiosyncratic component is that it is assumed to be uncorrelated with F, the common factor in stock returns. The expected value of random error term is zero.

According to one factor model, the expected return on security i, $\bar{r}_i$ can be written as:

$$\bar{r}_i = a_i + b_i \bar{F}$$

Where $\bar{F}$ denotes the expected value of the factor. The random error term drops out as the expected value of the random error term is zero.

This equation can be used to estimate the expected return on the security. For example, if the factor F is the GDP growth rate, and the expected GDP growth rate is 5%, $a_i$ = 4% and $b_i$ = 2, then the expected return is equal to 4% + 2 x 5% = 14%.

The **variance** of any security in the single factor model is equal to:

$$\sigma_i^2 = b_i^2 \sigma_F^2 + \sigma_{\varepsilon i}^2$$

Where $\sigma_F^2$ = the variance of the factor F

$\sigma_{\varepsilon i}^2$ = the variance of the random error term $\varepsilon_i$.

Thus if the variance of the factor $\sigma_F^2 = 0.0003$

Variance of the random error term $\sigma_{\varepsilon i}^2 = 0.0015$

$b_i = 2$

Variance of the security = $2^2$ x 0.0003 + 0.0015 = 0.0027
Standard deviation of the security = √variance =√0.0027 = 0.0520 = 5.2 %.
In a single factor model, the covariance between any two securities i and j is equal to:

$$\sigma_{ij} = b_i b_j \sigma_F^2$$

Where $b_i$ and bj = the factor sensitivities of the two securities
$\sigma_F^2$ = the variance of the factor F.

**Example**
If the factor sensitivities of two securities are 2 and 4 respectively, and if the variance of the factor $\sigma_F^2$ is 0.0003, then covariance between the two securities = 2 x 4 x 0.0003 = 0.0024.

## 13.3 Two-factor Models and Variance

The return generating process for a two-factor model has two factors.

$$r_i = a_i + b_{i1} F_1 + b_{i2} F_2 + \varepsilon_i$$

Where $F_1$ and $F_2$ are the two factors

$a_i$ = the expected return on the security i if each of the factor have a value of zero

$b_{i1}$ = the sensitivity of security i to factor F1

$b_{i2}$ = the sensitivity of security i to factor F2

$\varepsilon_i$ = the random error term.

Thus if factor $F_1$ is the GDP and the factor $F_2$ is the inflation rate (INF) the expected return on security i is given by:

$$r_i = a_i + b_{i1} GDP + b_{i2} INF + \varepsilon_i$$

According to two-factor model, the expected return on security i, $\bar{r}_i$ can be written as:

$$\bar{r}_i = a_i + b_{i1}\bar{F}_1 + b_{i2}\bar{F}_2$$

Where $\bar{F}_1$ and $\bar{F}_2$ denote the expected values of the two factors. The random error term drops out as the expected value of the random error term is zero.

**Example**

If GDP grows by 2.9%, inflation is 3%, and factor sensitivities of the security to GDP and inflation rate are 2.2 and -0.7 respectively, and $a_i$ = 5.8%, the security's expected return = 5.8% + 2.2 x 2.9 + (-0.7 x 3%) = 10%.

According to two-factor model, the variance of any security i is:

$$\sigma_i^2 = b_{i1}^2\sigma_{F1}^2 + b_{i2}^2\sigma_{F2}^2 + 2b_{i1}b_{i2}Cov(F_1, F_2) + \sigma_{\varepsilon i}^2$$

**Example**

If the variance of the factors $\sigma_{F1}^2$ and $\sigma_{F2}^2$ are 0.0003 and 0.00029 respectively, the variance of the random error term $\sigma_{\varepsilon i}^2$ is 0.00182 the factor sensitivities $b_{i1}$ and $b_{i2}$ are 2.2 and -0.7 respectively and the covariance between the two factors is 0.000065, then the variance of the security = $2.2^2$ x 0.0003 + $(-0.7)^2$ x 0.00029 +2 x 2. 2 x (-0.7) x 0.000065 + 0.00182 = 0.003214.

Standard deviation of the security = √variance = √0.003214 = 0.0567 = 5.67 %.

According to the two-factor model, the covariance between any two securities i and j can be determined by:

$$\sigma_{ij} = b_{i1}b_{j1}\sigma_{F1}^2 + b_{i2}b_{j2}\sigma_{F2}^2 + (b_{il}b_{j2} + b_{i2}b_{j1})Cov(F_1, F_2)$$

Continuing with the example above, suppose another security has factor sensitivities $b_{j1}$ and $b_{j2}$ are 6 and -5 respectively, then the covariance between the two securities is (2.2 x 6 x 0.0003) + (-0.7 x -5 x 0.00029) + {(2.2 x -5) + (- 0.7 x 6)} x 0.000065 = 0.00399.

**Self Assessment Questions**

1. In a two-factor model, the two factors are GDP growth rate and inflation. The factor sensitivities of a security to GDP and inflation are

2.5 and -1.5 respectively. If GDP grows by 4.5 %, and inflation is 3.5%, and $a_i$ = 6 %, what is the security's expected return?

2. In a single factor model, if the factor sensitivities of two securities are 3 and 5 respectively, and if the variance of the factor σF2 is 0.0005, what is the covariance between the two securities?

**Activity:**

In a two-factor model, if the variance of the factors σF12 and σF22 are 0.0005 and 0.0004 respectively, the variance of the random error term σεi 2 is 0.0020, the factor sensitivities of a security to the two factors, bi1 and bi2 are 3.2 and -1.5 respectively, and the covariance between the two factors is 0.00008. What is the variance and the standard deviation of the security?

**Hint:** The variance of the security = 3.22 x 0.0005 + (-1.5)2 x 0.0004 +2 x 3. 2 x (-1.5) x 0.00008 + 0.0020 = 0.007252

Standard deviation of the security = √variance =√0.007252 = 0.0852 = 8.52 %.

## 13.4 Arbitrage Pricing Theory (APT)

Capital Asset Pricing Model (CAPM), and Arbitrage Pricing Theory (APT) are two of the most commonly used models for pricing risky assets based on their relevant risks.

CAPM calculates the required rate of return for any risky asset based on the security's beta. Beta is a measure of the movement of the security's return with the return on the market portfolio, which includes all available securities

and where the proportion of each security in the portfolio is its market value as a percentage of total market value of all securities.

The problem with CAPM is that such a market portfolio is hypothetical and not observable and we have to use a market index like the S&P 500 or Sensex as a proxy for the market portfolio.

However, indexes are imperfect proxies for overall market as no single index includes all capital assets, including stocks, bonds, real estate, collectibles, etc. Besides, the indexes do not fully capture the relevant risk factors in the economy.

An alternative pricing theory with fewer assumptions, the Arbitrage Pricing Theory (APT), has been developed by Stephen Ross. It can calculate expected return without taking recourse to the market portfolio. It is a multi-factor model for determining the required rate of return which means that it takes into account economy factors as well. APT calculates relations among expected returns that will rule out arbitrage by investors.

APT requires three assumptions:

1) Returns can be described by a factor model.
2) There are no arbitrage opportunities.
3) There are large numbers of securities that permit the formation of portfolios that diversify the firm-specific risk of individual stocks.

APT starts with the assumption that security returns are related to an unknown number of unknown factors. These factors can be GDP (Gross domestic product), market interest rate, the rate of inflation, or any random variable that impacts security prices. For simplicity, let us assume that there is only one factor (such as the GDP growth rate) that impacts the security price. In this one-factor APT model, the security return is:

$$r_i = a_i + b_i F_i + \varepsilon_i$$

Where $F_1$ = Factor

$a_i$ = Expected return on the security i if the factor has a value of zero

$b_i$ = Sensitivity of security i to this factor (also known as factor loading for security i)

$\varepsilon_i$ = Random error term.

Imagine an investor holds 3 stocks and the market value of stock 1 is $250,000, of stock 2 is $250,000 and of stock 3 is $1,000,000. Thus the investor's wealth is equal to $1,500,000. These three stocks have the following returns and sensitivities.

| | $r_i$ | $b_i$ |
|---|---|---|
| Stock 1 | 10% | 1.0 |
| Stock 2 | 18% | 2.5 |
| Stock 3 | 12% | 2.0 |

Do these expected returns and factor sensitivities represent an equilibrium condition? If not, what happens to restore equilibrium?

## 13.5 Principle of Arbitrage or Arbitrage Theory

APT shows that for well-diversified portfolios, if the portfolio's expected return (price) is not equal to the expected return predicted by the portfolio's sensitivities ($b_i$), then there will be an arbitrage opportunity. According to APT, an investor will explore the possibility of forming an arbitrage portfolio to increase the expected return on his current portfolio without increasing risk. An arbitrage opportunity arises if an investor can construct a zero investment portfolio with no risk, but with a positive profit. Since no investment is required, an investor can create large positions to secure large levels of profits.

An arbitrage portfolio does not require any additional commitment of funds. Let Xi represent the change in the investor's holding of security i (as a proportion of total wealth. It is therefore, the proportion of security i in the arbitrage portfolio). Thus the requirement of no new investment can be expressed as:

$$X_1 + X_2 + X_3 = 0$$

An arbitrage portfolio has no sensitivity to any factor. Sensitivity of a portfolio is the weighted average of the sensitivities of the securities in the portfolio to that factor, this requirement can be expressed as $b_1X_1 + b_2X_2 + b_3X_3 = 0$
In the current example,

$$1.0\ X_1 + 2.5\ X_2 + 2.0\ X_3 = 0$$

At this point we have two equations and three unknowns. As there are more unknowns than equations, an infinite number of combinations of $X_1$, $X_2$ and

$X_3$ will satisfy the requirements. As a way of finding one such arbitrage portfolio, arbitrarily assign a value of 0.2 to X1. Thus we have 2 equations and 2 unknowns.

$$0.2 + X_2 + X_3 = 0$$
$$0.2 + 2.5\ X_2 + 2.0\ X_3 = 0$$

Solving these two equations gives a value of $X_2 = 0.4$ and $X_3 = -0.6$
Hence, a possible arbitrage portfolio is one with $X_1 = 0.2$, $X_2 = 0.4$ and $X_3 = -0.6$.

The expected return of an arbitrage portfolio must be greater than 0. Thus to see whether an arbitrage portfolio has actually been identified, its expected return must be determined. If it is positive an arbitrage portfolio has been identified.

Thus the last requirement is:

$$X_1\ r_1 + X_2\ r_2 + X_3\ r_3 > 0$$
$$\text{Or } 10\%\ X_1 + 18\%\ X_2 + 12\%\ X_3$$

Substituting the values:
= 10% x 0.2 + 18% x 0.4 + 12% x (-0.6) = 2%. Since this is positive, an arbitrage portfolio has been identified.

The arbitrage portfolio involves buying 0.2 x $1,500,000 = $300,000 of stock 1, 0.4 x $1,500,000 = $600,000 of stock 2 and selling 0.6 x $1,500,000 = $900,000 of stock 3.

**Return on old portfolio**

| **Old portfolio** | | | | |
|---|---|---|---|---|
| | Amounts | Weight | rate of return | weighted return |
| Stock 1 | 250,000 | 0.1667 | 10% | 1.67% |
| Stock 2 | 250,000 | 0.1667 | 18% | 3.00% |
| Stock 3 | 1,000,000 | 0.6666 | 12% | 8.00% |
| | 1,500,000 | 1.0000 | | 12.67% |

**Return on new portfolio**

Weights of new portfolio

**Stock 1:** 0.1667 + 0.2 = 0.3367

**Stock 2:** 0.1667 + 0.4 = 0.5667

**Stock 3:** 0.6666 – 0.6 = 0.0666

| New portfolio | | | | |
|---|---|---|---|---|
| | Amounts | Weight | Rate of return | weighted return |
| Stock 1 | 550,000 | 0.3667 | 10% | 3.67% |
| Stock 2 | 850,000 | 0.5667 | 18% | 10.20% |
| Stock 3 | 100,000 | 0.0666 | 12% | 0.80% |
| | 1,500,000 | 1.0001 | | 14.67% |

Thus, we see that the new portfolio gives a return which is 14.67% - 12.67% = 2 % more than the old portfolio as the calculations above have indicated.

**Sensitivity of old portfolio:** 0.1667 x 1.0 + 0.1667 x 2.5 + 0.6666 x 2.0 = 1.916

**Sensitivity of new portfolio:** 0.3667 x 1.0 + 0.5667 x 2.5 + 0.0666 x 2.0 = 1.916

Thus, the sensitivity of the old portfolio is the same as that of the new one. The risk would also be approximately the same as the difference in the risk is only due to non-factor risk.

What is the effect of buying stocks 1 and 2 and selling stock 3? As everyone would be doing it to exploit the arbitrage opportunity, the prices of stocks 1 and 2 will rise because of the buying pressure and the price of stock 3 will fall due to the selling pressure. Consequently, the return on stocks 1 and 2 will fall and the return on stock 3 will increase. This buying and selling will continue till all arbitrage possibilities are significantly reduced or eliminated. At this point, there exists a linear relationship between expected returns and sensitivities:

$$\overline{r_i} = \lambda_0 + \lambda_1 b_i$$

Where $\lambda_0$ and $\lambda_1$ are constants

This equation is the asset pricing equation of the APT when returns are generated by a single factor. As an illustration, suppose, $\lambda_0$ = 5 and $\lambda_1$= 4 for the example above,

$$\overline{r_i} = 5 + 4b_i$$

$$\overline{r}_1 = 5 + (4 \times 1) = 9\%$$

$$\overline{r}_2 = 5 + (4 \times 2.5) = 15\%$$

$$\overline{r}_3 = 5 + (4 \times 2.0) = 13\%$$

Thus, the expected returns of stocks 1 and 2 have fallen from 10% and 18% to 9% and 15% respectively, due to buying pressure and the expected return of stock 3 has increased from 12% to 13% because of selling pressure.

Thus, in equilibrium, the expected return on any security is a linear function of the security's sensitivity to the factor, $b_i$.

$\lambda_0$ is the return on an asset that has no sensitivity to the factor ($b_i$ =0). Hence, it is the risk free rate ($r_f$). Thus, we can write the equation for expected return as:

$$\overline{r_i} = r_f + \lambda_1 b_i$$

## 13.6 Extension of Arbitrage to Two Factor Model

In the case of two factors, denoted by F1 and F2, each security will have two sensitivities, $b_{i1}$ and $b_{i2}$. The security returns are generated by the following factor model:

$$r_i = a_i + b_{i1}F_1 + b_{i1}F_2 + \varepsilon_i$$

The linear relationship between expected returns and sensitivities is:

$$\overline{r_i} = \lambda_0 + \lambda_1 b_{i1} + \lambda_2 b_{i2}$$

Where $\lambda_0$ , $\lambda_1$and $\lambda_2$ are constants.

$\lambda_0$ is the return on an asset that has no sensitivity to the factors 1 and 2 ($b_{i1}$ =0, $b_{i2}$ =0). Hence, it is the risk-free rate ($r_f$).

Thus,

$$\overline{r_i} = r_f + \lambda_1 b_{i1} + \lambda_2 b_{i2}$$

## 13.7 Identifying the Factors in the APT

APT does not identify the factors to be used in the theory. Therefore, they need to be empirically determined. In practice, and in theory, one stock might be more sensitive to one factor than another. For example, the price of ONGC shares will be sensitive to the price of crude oil, but not Colgate shares. In fact, APT leaves it up to the investor or the analyst to identify each of the factors for a particular stock. So the real challenge for the investor is to identify three things:

- the factors affecting a particular stock
- the expected returns for each of these factors
- the sensitivity of the stock to each of these factors.

Identifying and quantifying each of these factors is no trivial matter and is one of the reasons why CAPM remains the dominant theory to describe the relationship between a stock's risk and return.

Ross and others have identified the following macro-economic factors as significant in explaining the return on a stock:

- growth rate in industrial production
- rate of inflation
- spread between long-term and short-term interest rates
- spread between low grade and high grade bonds
- growth rate in GNP (Gross national product)
- growth in aggregate sales in the economy
- rate of return on S&P 500
- investor confidence
- shifts in the yield curve.

With that as guidance, the rest of the work is left to the stock analyst to identify specific factors for a particular stock.

## 13.8 Arbitrage Pricing Theory vs. the Capital Asset Pricing Model

APT and CAPM are the two most influential theories on stock and asset pricing today. The APT model is different from the CAPM in case of less restrictiveness in its assumptions. APT allows the individual investor to develop their model that explains the expected return for a particular asset.

Intuitively, the APT hold true because it removes the CAPM restrictions and basically states that the expected return on an asset is a function of many factors and the sensitivity of stock to these factors. As these factors change, so does the expected return on the stock, and therefore its value to the investor. However, the potentially large number of factors means that more factor sensitivities have to be calculated. There is also no guarantee that all the relevant factors have been identified. This added complexity is the reason APT is less widely used than CAPM.

In the CAPM theory, the expected return on a stock can be described by the movement of that stock relative to the rest of the stock market. The CAPM

theory is a simplified version of the APT, where the only factor considered is the risk of a particular stock relative to the rest of the stock market–as described by the stock's beta.

From a practical standpoint, CAPM remains the dominant pricing model used today. When compared to the APT, CAPM is more refined and relatively simpler to calculate.

**Self Assessment Questions**

3. What are the differences between APT and CAPM?

4. What is the role of arbitrage in APT?

5. Explain the relationship between expected return and sensitivity in APT.

## 13.9 Summary

- CAPM is a single factor model where a security's return is estimated based on its sensitivity to excess returns on the market portfolio.
- In contrast, multi-factor models that we studied in this unit extend CAPM to consider that a security's return also depends on other economic measures and not just the market portfolio.

- One multi-factor model is the Arbitrage Pricing Theory Model (APT). APT gives up the notion that there is one right risky portfolio for everyone, and replaces it with an explanatory model of what drives asset returns.
- The world of APT is not one in which all investors are stuck in the same portfolio. It is a world with many possible sources of risk and uncertainty.
- The APT model predicts a security's return based on unexpected changes in economic factors such as inflation, industrial production, bond risk premium, and the term structure of interest rates.
- APT holds that if equilibrium prices of securities offer no arbitrage opportunities, then the expected returns on the securities are linearly related to the factor loadings.

## 13.10 Glossary

***Factor model:*** Model that attempts to capture the major economic forces.

## 13.11 Terminal Questions

1. What are factor models?
2. Discuss the Arbitrage Pricing Theory (APT)
3. How are the factors identified for APT?
4. Explain Arbitrage Pricing Theory (APT) versus the Capital Asset Pricing Model (CAPM)

## 13.12 Answers

### Self Assessment Questions

1. The security's expected return = 6% + 2.5 x 4.5 % + (-1.5 x 3.5%) =12%.
2. The covariance between the two securities = 3 x 5 x 0.0005 = 0.0075.
3. Refer to 13.8
4. Refer to 13.5
5. Refer to 13.5 and 13.6

### Terminal Questions

1. A factor model attempts to capture the major economic forces that systematically move the prices of all securities. For more details, refer section 13.1, 13.2 and 13.3.

2. Capital Asset Pricing Model (CAPM), and Arbitrage Pricing Theory (APT) are two of the most commonly used models for pricing risky assets based on their relevant risks. For more details, refer section 13.4.
3. In fact, APT leaves it up to the investor or the analyst to identify each of the factors for a particular stock. For more details, refer section 13.7.
4. APT and CAPM are the two most influential theories on stock and asset pricing today. The APT model is different from the CAPM in case of less restrictiveness in its assumptions. For more details, refer section 13.8.

## 13.13 News Item

**Failed Wizards Of Wall Street**

“Can you devise surefire ways to beat the markets? The rocket scientists thought they could. Boy, were they ever wrong

Smart people aren't supposed to get into this kind of a mess. With two Nobel prize winners among its partners, Long-Term Capital Management L.P. was considered too clever to get caught in a market downdraft. The Greenwich (Conn.) hedge fund nearly tripled the money of its wealthy investors between its inception in March, 1994, and the end of 1997. Its sophisticated arbitrage strategy was avowedly ''market-neutral''--designed to make money whether prices were rising or falling. Indeed, until last spring its net asset value never fell more than 3% in a single month.

Then came the guns of August. Long-Term Capital's rocket science exploded on the launchpad. Its portfolio's value fell 44%, giving it a year-to-date decline of 52%. That's a loss of almost $2 billion. ''August has been very painful for all of us,'' Chief Executive John W. Meriwether, a legendary bond trader, said in a letter to investors. (Long-Term's executives declined to speak on the record.)

Long-Term Capital and its Nobel laureates in economics, Robert H. Merton and Myron S. Scholes, weren't the only ones who got creamed. Locating the losses is hard because Wall Street and the hedge-fund world don't disclose them. According to Andrew W. Lo, a finance professor at Massachusetts Institute of Technology who advises several so-called quant funds, as much

as 20% of hedge funds, which control some $295 billion, are quantitatively oriented.

**Long-Term Damage.** The losses didn't stop there. Nearly every major investment house and bank in the U.S. and abroad has a group of highly paid rocket scientists in its proprietary trading department trying to beat the market with complex, computer-aided trading strategies. In an announcement on Sept. 2, Salomon Smith Barney Holdings **(NXS)** disclosed that it had realized $300 million in losses from fixed income and global arbitrage--five times its $60 million in Russia-related credit losses. Then, on Sept. 9, Merrill Lynch & Co. **(MER)** announced that it had lost $135 million from trading and said that the losses had hurt its own stock price.

August may go down as a watershed in the history of high-tech investing. That's because the losses suffered weren't just financial: The reputation of quantitative investing itself has been dealt long-term damage. Merton and Scholes, after all, are two of the most esteemed figures in finance--co-inventors with the late Fischer Black of the options-pricing model that underpins much of rocket science. They and their counterparts seemed to have developed a clean, rational way to earn high returns with little risk. Instead of betting which way a market is headed, they typically search for ingenious arbitrage plays--chances to cash in on temporary disparities in the prices of related assets.

Wall Street warmed to rocket science not because it was impressed with PhDs in physics or Nobel prize winners in economics. The Street was impressed by the money these quants were making without having to be a George Soros--placing informed bets on the direction of assets like gold, oil, or the British pound. The beauty of rocket science was that though the gambles were huge, the risks were minimal.

In August, though, many of these delicately constructed bets collapsed like a house of cards. Even if the quants do spring back this autumn, it will be impossible for many of them to claim that they can reliably produce low-volatility profits, because the volatility they've experienced this year is anything but low. Suddenly, many market-neutral funds aren't looking any safer than "directional" funds run by wizards like Soros.

To be sure, the performance of many quantitative hedge funds doesn't tar all of financial rocket science. Some quantitative firms don't use leverage and seek merely to outperform some benchmark such as the Standard & Poor's 500-stock index. By their own lights, many of those firms came through August fine--sinking, to be sure, but not as much as the benchmarks they measure themselves against. ''Our first objective is to control risk,'' says Stephen A. Ross, a professor at MIT and co-head of Roll & Ross Asset Management Corp., whose return is up for the year and for the month of August against its benchmarks.

**''Nauseating.''** That's fine for Roll & Ross, but the dark days of August weren't so kind to the quants that take bigger gambles in pursuit of bigger rewards. Turmoil enveloped almost every market. Real estate magnate Samuel Zell says that the market for commercial mortgage-backed securities, in which traders rely heavily on computer modeling, is in ''meltdown.'' Invictus Partners, an eight-month-old arbitrage hedge fund, began June ranked among the top-performing hedge funds in the country, but then lost all of its gains over the summer--and more. ''What began to happen in June, July, and August was hypnotic, nauseating, and awesome,'' says Gregory van Kipnis, the fund's founder and CEO.

One prominent victim was the High Risk Opportunities Fund, a bond-arbitrage hedge fund. It was put into liquidation in the Cayman Islands on Sept. 1. Its $850 million in Russian investments went bad after Moscow suspended bond and currency trading on Aug. 14. As befits a hedge fund of its type, High Risk Opportunities wasn't betting for or against the Russian economy--it was simply playing the 4% spread between the ruble-denominated Russian Treasury bills, known as GKOs, and the lower cost of borrowing rubles from banks. This seemed a safe bet because it didn't depend on Russia forking over dollars. The fund manager--III Offshore Advisors--was blindsided twice. First, the Russians halted trading in their domestic government debt market. ''Nobody in the history of the world has ever done anything this foolish,'' says Warren B. Mosler, the firm's West Palm Beach (Fla.)-based director of economic analysis. Then, several European banks that had sold currency hedges against the plunging ruble abruptly suspended an estimated $400 million in payments that Mosler contends the hedge fund is owed.

History is what underlies most of the quant models--however, it is not the history of governments, but of markets and prices. Their models are based on identifying historical relationships between the prices of kindred assets, be they bonds, stocks, or currencies. Mountains of data that reflect decades of market behavior are fed into computers. The computer models sift through the data to find the precise relationships between the prices of these assets. Sometimes, the prices move in the same direction. At other times, they diverge. When the assets move out of their normal alignment, the bell rings.

That's a signal to trade on the expectation that prices will revert to historic patterns. The trades can focus on markets throughout the world. It can be two related U.S. stocks, a basket of 15 U.S. biotechnology stocks, two Italian bonds of different maturities, or a basket of foreign currencies. But that's not always where the bet ends. In order to minimize the risk, the computer then spits out what other trades should be made to hedge against any accompanying risks that the arb doesn't want to take on.

Normally, the price discrepancies that the models seek to exploit are tiny--and indeed, have become smaller and smaller as more and more players comb the markets. The result has been bigger and bigger bets. The computer model predicts the exact price points at which to enter the deal and the size of the bet to get the highest returns with an acceptable level of risk. This had led to the use of more and more borrowed money, resulting in many trades leveraged to the hilt. "Hedge funds with mathematically driven strategies may use far higher than average leverage because of the perceived lower level of risk inherent in their using a large number of diversified positions," says George Van of fund-tracker Van Hedge Fund Advisors International.

Why did rocket science backfire? Sure, the models do take into consideration the possibilities of some failures occurring in the market system that upset normal historical relationships. Indeed, that's why these bets usually involve a series of hedges. What occurred, however, was the financial world's equivalent of a "perfect storm"--everything went wrong at once. Interest rates moved the wrong way, stocks and bond prices that were supposed to converge diverged, and liquidity dried up in some crucial markets. As Long-Term's Meriwether told his shareholders in a Sept. 3

letter: "We expected that sooner or later...we as a firm would be tested. I did not anticipate, however, how severe the test would be."

At the heart of the breakdown was a global "flight to quality" that was far more intense than the wizards' computer models predicted. They had been forecasting that differences in the interest rates of safe securities and risky ones, which had widened, would return to their normal range, as they almost always had before. But as Russia unraveled and parts of Asia fell deeper into crisis, investors around the world switched their money into the safest securities they could find, such as U.S. Treasury bonds.

Many of the quant firms were betting on riskier, less liquid securities such as junk bonds, and they got crushed. Instead of narrowing, the spreads between safe and risky securities widened drastically in virtually every market around the world.

The unexpected widening of spreads wreaked havoc on supposedly low-risk portfolios. For example, some quant firms were betting that junk-bond yields in Britain had gotten too high in relation to those of high-grade corporate bonds, and that the spread would narrow. If the yield spread had narrowed, as forecast, the quants would have earned a bundle. But that's not what happened: The yield spreads widened and the quants owed a ton of money.
To work, the quant models need liquid markets on all sides of the trade. But markets in August are thin, as Meriwether noted in his letter to fundholders. Wrote Meriwether: "...volatility and the flight to liquidity were magnified by the time of year when markets were seasonally thin." That's the trouble with liquidity: It's never there when you really need it, as buyers of so-called portfolio insurance discovered in the 1987 stock market crash.

A liquidity drought is basically panic in slow motion. "It wasn't just the big hedge funds," says D. Sykes Wilford, a managing director of New York-based CDC Investment Management Corp. "This summer, it affected lots of people, particularly investment banks, banks, fund managers. They had to reduce their capital exposures. When they do that, other trades that may have looked smart all of a sudden were subjected to this liquidity shock, too, and it fed on itself."

**Worldwide Phenomenon.** The stinger is that liquidity dried up across markets. It was a worldwide phenomenon, so the geographic diversification

employed by so many quant firms did them not a whit of good. Late August was actually worse for some market-neutral arbitragers than the 1987 crash, admit some quants. ''They weren't all bullish and they weren't all bearish, but they were all believers in the liquidity and continuity of markets,'' says James Grant, editor of *Grant's Interest Rate Observer*.

The carnage was widespread because so many people were making the same kinds of bets. ''When Russia announced default, everybody's risk appetite went down dramatically. Every position held on every dealer's books was subject to liquidation. Any concept of long-term or fundamental value disappeared,'' says William T. Winters Jr., head of Europe fixed income at J.P. Morgan & Co. **(JPM)** in London. ''Large investors lost money on positions that became very illiquid and volatile.''

Worst hurt of all were highly leveraged hedge funds. Heavy borrowing amplified their returns on the way up, and it amplified their losses on the way down. When spreads widened in a disorganized, tumbling market, gains on short positions weren't enough to offset losses on long ones. Lenders demanded more collateral, forcing the funds either to abandon the arbitrage plays or to raise money for the margin calls by selling other holdings at fire sale prices.

Long-Term Capital responded to the crisis by shedding marginal deals, such as bets on the direction of interest rates, at losses, while keeping in place its core arbitrage bets. As its moniker suggests, the firm is able to hang tough longer than most hedge firms because its capital base is stable. The first date any investors can withdraw capital is the end of 1998, and even then the potential withdrawal is less than 12% of the fund. Borrowing arrangements are long-term as well--generally for six months or a year.

**Hubris.** If markets quickly return to their old alignments, Long-Term Capital will come out way ahead, and August will be nothing but a scary memory. Indeed, the firm is beefing up its bets by raising more capital from investors. But what if the spreads just keep getting wider? It could happen. Grant, the newsletter editor, likes to quote a play-it-safe Wall Street maxim: ''Never meet a margin call.'' In other words, if the market is going against you, concede defeat quickly and liquidate before you really lose your shirt.

Since the quants came to Wall Street, there has been no shortage of critics. Rocket science can't substitute for common sense, says Wilford, who manages a ''market-neutral'' hedge fund himself. ''I've seen too, too many of these quant geniuses that don't have a clue about how markets behave. When they get a shock like this, they're dumbfounded. They just don't have the intuition of what to do.''

The quants may have placed too much faith in their exquisitely tuned computer models. ''The hubris a bad quant can exhibit is, he thinks he has the best model of all time,'' says van Kipnis. ''Many of these models provide the illusion of certainty,'' says economist Henry Kaufman of Kaufman & Kubarych. "There is a kind of assurance that ultimately can't be satisfied.''

In a certain sense, maybe the problem wasn't too much rocket science, but too little. Extreme, synchronized rises and falls in financial markets occur infrequently--but they do occur. The problem with the models is that they did not assign a high enough chance of occurrence to the scenario in which many things go wrong at the same time--the ''perfect storm'' scenario. Sources say Long-Term Capital's worst-case scenario was only about 60% as bad as the one that actually occurred.

On the other hand, some quant firms made out just fine. Unlike Long-Term Capital, which looked at markets around the world, these firms are niche players, and their models concentrate on specific markets. Roll & Ross, for example, employs a value approach to stocks, using the latest academic research to screen for a combination of low price-earnings and market-to-book-value ratios.

Another example of wizardry that worked is a little-known niche firm based in Radnor, Pa., owned by Banque Nationale de Paris, called BNP/Cooper Neff Inc. The only bet BNP/Cooper Neff makes is arbitrage between stocks that become overvalued or undervalued because of such things as money flows in and out of markets. It is scrupulously neutral on the attractiveness of growth stocks vs. cyclical stocks, or large-capitilization stocks vs. small-cap stocks.

Although the firm's assets under management aren't huge--about $10 billion--it estimates that it accounts for about 4% of the daily trading volume on the New York Stock Exchange and 6% to 10% of the volume on the

principal exchanges of France, Germany, Spain, and Italy. BNP/Cooper Neff--which is so Far not open to outside investors--needs enormous volumes oftrades because its average profit margin per trade is so small. Their research staff includes about a dozen physics PhDs. While it won't release its results, Chairman and co-founder Richard W. Cooper says: "August was the best month in our history. In markets that become irrational, you can find greater mispricing opportunities."

But Cooper's firm is not typical. And, after its summer setback, rocket science, whether quants bounce back or not, will be forced to change. It will have to adjust its models to account for more riskiness in global markets. The search for inefficiencies in markets that can produce profits will continue. But there's one thing to remember about being on the cutting edge: Sometimes, you bleed.

*By Peter Coy and Suzanne Woolley, with Leah Nathans Spiro and William Glasgall in New York and bureau reports"*

*Source:* **www.businessweek.com/1998/38/b3596001.htm**. retrieved on 1st October, 2012

**Discussion Question**

Discussion Question:

1. Evaluate the performance of APT in the above case

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# Unit 14 International Portfolio Investments

**Structure:**



## 14.1 Introduction

There has been an increase in international portfolio investments in recent years. This is because many countries have liberalized and deregulated their capital and foreign exchange markets. International investments have been facilitated by introduction of products like American Depositary Receipts (ADR) and country funds by the commercial and investment banks. Recent advances in computer and telecommunication technologies have led to a major reduction in transaction and information costs associated with international investments. Investors have also become aware of the potential gains from international investments.

This unit deals with international portfolio investments.

**Objectives:**

After studying this unit, you will be able to:

- describe investment avenues available for investors who wish to make foreign portfolio investments.
- explain Country Funds
- explain terms like ADR, GDR, country funds and equity indices.
- explain the advantages of international diversification.
- discuss the risks involved in foreign investment.

## 14.2 Foreign Portfolio Investment

Two of the chief reasons why people invest internationally are: **diversification** - spreading the investment risk among foreign companies and markets that are different from the national economy and **growth** -- taking advantage of the potential for growth in emerging markets abroad.

While it is desirable on the part of an investor to hold a portfolio that includes foreign assets, many still invest exclusively or predominantly in domestic securities as there are significant barriers to investing overseas. These barriers include high transaction costs, high information costs about foreign securities, legal and institutional restrictions, extra taxes, exchange risk and political risk associated with overseas investments.

## 14.3 Investment Avenues for Foreign Portfolio Investors

A foreign company's publicly traded debt or equity are ADRs, GDRs and Euro DRs. They are negotiable securities and these Depository Receipts (DRs) can be traded on US stock exchanges and also on many European Stock Exchanges.

Both individual and institutional investors desire to reduce risk by diversifying their portfolios. But while directly investing in local trading markets several problems are faced. Inefficient trade settlements, uncertain custody services and costly currency conversions are some of these obstacles faced. Many of these operational and custodial problems of international investing can be circumvented with the help of Depositary Services.

The broker who buys the shares in the open market deposits these shares a the depositary bank which issue Depositary Receipt to him. These

certificates enjoy the facility of being freely traded in the over-the-counter market or, upon compliance with regulations, on a national stock exchange. The Depositary Receipt Certificate states the responsibilities of the depositary bank with respect to actions such as payment of dividends, voting at shareholder meetings, and handling of rights offerings.

Investors looking for international investment opportunities also invest in mutual funds. There are both global mutual funds as well as regional and single country funds available to investors interested in investing overseas. Funds which include both foreign and domestic shares of companies are known as global funds, whereas funds that expose investors to companies from one region or country are known as regional or single country funds..

### 14.3.1 Country Funds

A **single country** fund is a mutual fund that restricts its investment to the assets of one country and is able to allocate its funds only within the range of investment opportunities that are available in the specified country. For example, a single-country fund for Germany will only invest in assets based in that country, such as the stocks of German companies, German government debt and other Germany-based financial instruments.

A **regional fund** is a mutual fund that confines itself to investments in securities from a specified geographical area, such as Latin America, Europe or Asia. A regional mutual fund will generally invest in a diversified portfolio of companies based in and operating out of its specified geographical area. However, some regional funds can also be set up to invest in a specific segment of the region's economy, such as energy or telecommunications.

### 14.3.2 American Depository Receipts (ADR)

US investors are allowed to invest in companies that are not based in the United States through ADRs These company stocks are not traded on US exchanges. A US depositary bank issues the ADR certificate representing shares held by the bank of the foreign company. One ADR may represent a portion of a foreign share, one share or a bundle of shares of a foreign corporation. These shares can be traded in US dollar denominated securities in the US domestic market through the ADR. Typically very large foreign companies issue ADRs.

ADR is a receipt that represents the number of foreign shares that are deposited at a US bank. The ADR represents the ownership of underlying foreign stock that is held in custody by the bank that issues them. In effect, the bank owns the shares and trades claims against those shares. ADR investors are entitled to all the privileges of stock ownership including dividend payments. The bank also serves as a transfer agent for the ADR. ADRs have been used to help US investors to avoid transactions costs and some of the risks of holding or trading securities in an unfamiliar foreign market. They can also be used to overcome regulatory barriers facing US investors from holding shares in non-US firms. The wide range of companies whose shares are indirectly traded in the United States means that US investors can essentially achieve full diversification without moving outside the securities traded within the United States.

ADRs are issued typically by large US banks. An ADR certifies that the depositary bank is holding shares in the non-US firm as a trustee for the holder of the certificate. Normally it is at the request of the non-US firm that the depositary bank launches an ADR program, with the objective of enabling the firm to reach a larger pool of worldwide investors. ADRs can be offered for sale in the United States only in accordance with regulations established by the US Securities and Exchange Commission (SEC), which ensures an adequate degree of disclosure of the foreign firm's accounts. The more the disclosure, the more unrestricted is the trading of the ADR in the US markets.

Owning ADRs has some advantages compared to owning foreign shares directly for an investor in USA. When an investor buys and sells ADRs, he is trading in the US market. The trade will be settled in US dollars. The depositary bank converts any dividends or other cash payments into US dollars before sending them to the investor. The depositary bank may also arrange to vote on behalf of the investor in the shareholder meeting as per the instructions of the investor. All this facilitates stock ownership with the least effort on the part of the investor.

There are disadvantages too. Depositary banks charge fees for their services and will deduct these fees from the dividends and other distributions on the shares. The depositary bank also passes on to the investor expenses for converting foreign currency into US dollars etc.

### 14.3.3 Global Depository Receipts (GDR)

To raise money in more than one market, some corporations use GDRs to sell their stock on markets in countries other than their home country. The GDRs are issued in the currency of the country where the stock is trading. For example, a German company might offer GDRs priced in pounds in London and in yen in Tokyo. Individual investors in the countries where the GDRs are issued buy them to diversify into international markets.

**Self Assessment Questions:**

1. _____is a receipt that represents the number of foreign shares that are deposited at a US bank.
2. The _____are issued in the currency of the country where the stock is trading.

## 14.4 International Equity Indices

A group of stocks representing the entire market or in some cases a particular segment of a market, or in some cases the entire market is an index. An index is an an indicator that provides a representation of the value of the securities that constitute the index. Thus, a specific segment of the US capital markets is represented by the “Standard & Poor's 500 index” “Nikkei” represents large Japanese companies and the “CAC 40” represents large French companies. The components of an index are dynamic as they change over time, old stocks can be dropped and new stocks are added. Indices often serve as For benchmarks against which financial or economic performance is measured, indices are often referred to.

The index which tracks the movement of a market as a whole is a stock market index (such as the FTSE 100, Dow Jones, Nikkei, Hang Seng, etc.). There are other indices that track the performance of different classes of securities and regions. Security prices are the basic data used to calculate an index. The calculation of an index Weighting price changes correctly to reflect company size and the availability of securities to investors is required to calculate an index

The important international equity indices are:

- **Dow Jones:** The most widely used US index
- **S & P 500:** Constituents are the 500 largest US listed companies

- **FTSE 100**: An index that includes the 100 largest UK listed companies which cover about 80% of UK market capitalization
- **CAC-40:** The most widely used index for the Paris stock market
- **DAX:** The most widely used German index.
- **Nikkei:** The main index for the Tokyo stock exchange
- **Hang Seng**: The main index for Hong Kong
- **MSCI**: A family of indices most widely used for emerging markets.

Stocks from several markets make up broader indices, such as the MSCI EAFE. For example, the MSCI EAFE includes a total of 21 developed markets in Europe, Australasia and the Far East (Japan and Hong Kong). 26 emerging markets like Argentina, Brazil, China, Greece, India, Indonesia, Israel, Korea, Malaysia, Mexico, Philippines, Russia, South Africa, Sri Lanka and Taiwan are included in the EMF index. As countries are added or dropped from the index broader market indices, particularly for emerging markets, may change.

**Self Assessment Questions**

3. What are country funds?

4. Name some of the important international equity indices.

## 14.5 Emerging Markets

Investing in emerging markets offers high returns but with equally high risk. These are capital markets in developing countries, typically with low per capita GDP. While developing countries make up over 80% of the world's population, they make up less than 10% of the stock market capitalization. There is low correlation between emerging market returns and returns elsewhere in the world and this aids diversification. However, as impediments to capital market mobility fall, correlations will increase.

Problems of investing in emerging markets include political uncertainty, lack of company information, lack of liquidity, trading and custodial difficulties, confidentiality and insider trading problems, as well as higher transaction costs compared with developed countries.

The following are the common features of an emerging market, however these characteristics differ from country to country:

- Economic growth is high
- Exchange rate risk is high
- Political risk is high
- Weak legal systems and lack of effective regulation
- Minority shareholders are not protected enough
- A single majority shareholder or a group of connected shareholder(e.g. a family) controlling a large numbers of companies The presence of large conglomerates

Field Code Changed

Inflation offsets Exchange rate risks (and therefore profit growth) that tends to follow a depreciation of the currency. The other risks involved with investing in emerging markets are largely diversifiable.

**Activity:**

Name some emerging markets and discuss the advantages of investing in them.

**Hint:** economic growth, labour etc.

## 14.6 International Diversification

International investments are made for the purpose of growth and portfolio diversification. Diversification is a risk management tool. As long as one

class of domestic assets is less than perfectly correlated (correlation coefficient less than +1) with another class of domestic assets, a balanced portfolio that includes both classes of assets is likely to be less risky. International diversification, by increasing the number of markets and assets to invest in, provides an improved risk-return trade-off. International stock and bond diversification can yield higher returns with less risk.

The CAPM (Capital Asset Pricing Model) assumes that the risk of any asset can be attributed to two sources- systematic risk and unsystematic risk. The unsystematic risk is due to risks unique to the company and can be diversified away by holding a sufficiently large portfolio of securities. Systematic risk is due to market influences that affect all assets, such as the state of the economy. Systematic risk cannot be reduced by diversification if investments are made within a country. But the same risk may become diversifiable outside the country since it may not influence the other country. So if investments are made in a number of countries the risk may be reduced. By diversifying across nations whose economic cycles are not perfectly in phase, investors can reduce risk. The economic, political, institutional and even psychological factors affecting security returns tend to be different across countries.

While systematic risk can be reduced by investing in a number of countries, international portfolio investment introduces new problems not encountered in domestic markets - exchange rate risk, restrictions on capital flows across international boundaries, political risk, country-specific regulations and accounting practice differences.

**Self Assessment Question:**

5. Diversification is a _____tool.

## 14.7 Risks and Returns from Foreign Investing

International investing provides superior returns adjusted for risk. Allocating some portion of one's portfolio to foreign assets provides better risk-cover than a portfolio of only domestic assets. International equities also offer access to a broader spectrum of economies and opportunities that can provide for further diversification benefits. Some of the best performing companies in the world like General Electric, Exxon Mobil and Microsoft have shares that are listed on overseas stock markets. If an investor wants

to profit from the growth of large global companies, he would have to invest internationally.

However, there are costs and risks of international investing. In smaller markets, an investor may have to pay a premium to purchase shares of popular companies. In some countries, there may be unexpected taxes, such as withholding taxes on dividends. Transaction costs such as fees, broker's commissions, and taxes can be higher than in domestic markets. Mutual funds that invest abroad often have higher fees and expenses than funds that invest in domestic stocks, in part because of the extra expense of trading in foreign markets.

There are risks involved in international investing. Some of the risks are:

**1) Changes in currency exchange rates**

When the exchange rate between the foreign currency (in which the international investment is denominated) and the home currency (say, Rupee for an Indian) changes, it can increase or decrease the investment return. Foreign securities trade and pay dividends in the currency of their local market. When an investor receives dividends or sells his international investment, he will need to convert the cash that he receives into his home currency.

During a period when the foreign currency is strong compared to the home currency, this strength increases his investment return because his foreign earnings translate into more units of local currency. Thus for an Indian who has made investments in the US, if the dollar appreciates it is good news since the dollar earnings would convert into more Indian rupees.

By the same token if the US dollar depreciates, it reduces his investment return because his earnings translate into fewer rupees. In addition to this exchange rate risk, there is the risk that the country may impose controls that restrict or delay moving money out of the country.

**2) Dramatic changes in market value**

There can be dramatic changes in market value in Foreign markets as well like any other market. By investing for long term and by trying to ride out the short term downturns in the market can help reduce the impact of these price changes. *When i*ndividual investors try to "time" the market in the domestic markets and sometimes in the foreign markets as well, they fail in

their attempt. Two decisions need to be make when one times the market-–deciding when to get out before prices fall and when to get back in before prices rise again.

**3) Political, economic and social events**

Political, economic and social factors that influence foreign markets are difficult to understand by the investors. Although these factors provide diversification, they also contribute to the risk of international investing..

**4) Lack of liquidity**

Foreign markets may have lower trading volumes, fewer listed companies and may be open only for a few hours in a day. In some countries there are restrictions on the amount or type of stocks that foreign investors may purchase. To buy a foreign security an investor may have to pay premium prices and may also have difficulty finding a buyer when he wants to sell the security..

**5) Less information**

In many cases investors don't get the same type of information in the case of foreign companies as in the case of domestic companies. The investors may not be able to find up-to-date information and the investor may not be able to understand the language used by the company.

**6) Reliance on foreign legal remedies**

The investor may not be able to sue the company in his own country's courts and even if he is able to sue successful in a domestic court he may not be able to collect on a home country judgment against a foreign company. The investor will have to rely on legal remedies are available in the company's country.

**7) Different market operations**

The operations in the domestic country's trading markets will be different from that of foreign markets. For example, there may be different periods for clearance and settlement of security transactions. Home markets may report stock trades much faster than foreign markets. Rules providing for the safekeeping of shares held by custodian banks or depositories may not be as well-developed in some foreign markets, with the risk that the investor's shares may not be protected if the custodian has credit problems or fails.

## 14.8 International Listing

In addition to issuing stock locally, companies can also obtain funds by issuing stock in international markets. This will enhance the company's image and recognition, and diversify its shareholder base. A stock offering may also be more easily digested when it is issued in several markets. Also, a company may decide to cross-list its shares.

Cross-listing of shares is listing of its equity by a firm on one or more foreign stock exchanges in addition to its domestic exchange. By cross-listing its shares, a company benefits from the access to foreign investors, increased liquidity and lower cost of capital.

Depending on the company's specific motives and willingness of the host stock market to accept the company the company must choose the stock markets on which to cross-list its shares and sell new equity. Keeping in mind the cash flows needed to cover dividend payments the decision about where to place its stock will be taken. The market characteristics of stock markets are important. Stock markets may differ in trading activity level, size and proportion of individual versus institutional share ownership. Cross-listing attempts to accomplish one or more of many objectives:

- Support liquid secondary market and improve the liquidity of its existing shares for new equity issues in foreign markets.
- Overcome mispricing in a segmented and illiquid home capital and thereby Increase its share price.
- Improve the company's visibility.
- Establish a secondary market for shares used to acquire other firms.
- Create a secondary market for shares that can be used to compensate local management and employees in foreign subsidiaries.

**Self Assessment Questions**

6. List the risks involved in international investing.

7. How does international investing reduce systematic risk?

## 14.9 Summary

- International stock and bond investments can yield higher returns with less risk when compared to investment in a single market. This is because international investment offers a broader range of opportunities than domestic investment and international diversification leads to a reduction in risk.
- The reduction in risk is due to the fact that security returns are found to be less correlated across countries than within a country.
- Adding foreign securities to a domestic portfolio reduces the total risk of the portfolio because of a low correlation between foreign securities and the domestic market.
- One way to invest internationally is through mutual funds (global, regional and country funds). International securities can also be purchased by buying Depository Receipts (ADRs, GDRs).
- The barriers to overseas investment include excessive transaction costs, information costs for foreign securities, legal and institutional restrictions, extra taxes, exchange risk and political risk associated with overseas investments.

## 14.10 Glossary

***Single country fund:*** a mutual fund that restricts its investment to the assets of one country and is able to allocate its funds only within the range of investment opportunities that are available in the specified country.

***Regional fund:*** a mutual fund that confines itself to investments in securities from a specified geographical area

## 14.11 Terminal Questions

1. What are the investment avenues available for investors who wish to make foreign portfolio investments?

2. Discuss International Equity Indices
3. Analyse emerging Markets
4. Discuss International Diversification
5. What are the risks and returns of foreign investment?
6. Analyse International Listing

## 14.12 Answers

### Self Assessment Questions

1. ADR
2. GDR
3. Refer to 14.3.1
4. Refer to 14.3.4
5. Risk Management
6. Refer to 14.7
7. Refer to 14.7

### Terminal Questions

1. Depositary Receipts (DRs), which include ADRs, GDRs and Euro DRs are negotiable securities that generally represent a foreign company's publicly traded equity or debt. For more details, refer section 14.3.
2. A group of stocks representing the entire market or in some cases a particular segment of a market, or in some cases the entire market is an index. For more details, refer section 14.4.
3. Investing in emerging markets offers high returns but with equally high risk. For more details, refer section 14.5.
4. International investments are made for the purpose of growth and portfolio diversification. Diversification is a risk management tool. For more details, refer section 14.6.
5. International investing provides superior returns adjusted for risk. Allocating some portion of one's portfolio to foreign assets provides better risk-cover than a portfolio of only domestic assets. For more details, refer section 14.7.
6. Cross-listing of shares is listing of its equity by a firm on one or more foreign stock exchanges in addition to its domestic exchange. For more details, refer section 14.8.

## 14.13 Case Study

“Global Depository Receipts: The Values and the Challenges

Mr. Tayo Aderinokun, CEO of Guaranty Trust Bank, signing its Eurobond in London

It was Guaranty Trust Bank that opened the floodgate when in July it successfully issued and listed its Global Depository Receipt (GDR) on the London Stock Exchange (LSE). FCMB, Fidelity Bank and now Diamond Bank have followed to further attract foreign direct investment into the Nigerian banking sub-sector through issuance of the local equity-backed global financing instrument. This is an endorsement of Nigeria's indigenous banking brands by international investors at a time the banks are moving to the world stage. Seen in the local market context, the rising number of Nigerian banks issuing Global Depository Receipts is capable of correcting the lop-sidedness that currently characterize primary market activities at the Nigerian Stock Exchange (NSE). The real sector players have remained crowded out of the primary market by the banks as progress is unlikely on the tenuous call for 'market access quota system' by legislation or regulation.

Global Depositary Receipts are instruments like shares or Foreign Currency Convertible Bonds which are issued as depository receipts by overseas depository banks to be traded in designated international (or foreign) markets. The DRs represent certain units of the underlying shares which are traded in the market local to the equities.

The American Depository Receipt (ADR) - a variant of the GDR has been around for eighty years. Indian companies, including those outside the financial services sector, have been issuing depository receipts for international trading since the early 1990s. In 1999, Hyundai Motor Company issued $500 million GDR to international investors. At the listing of Bank Muscat on the LSE on October 5, 2005, the Chairman of the Omani bank, Sheikh Abdul Malik bin Abdullah Al Khalili, disclosed that the bank's $149million GDR was several times oversubscribed.

More remarkable is the official listing on the LSE of Oil and Gas Development Co. Ltd. (OGDCL) on December 8, 2006. OGDCL is a state owned Pakistan?s flagship company in the energy sector. The listing and

trading of OGDCL's global depository shares (GDS) is reported to represent a significant milestone in Islamabad's privatization program.

The transactions mentioned above clearly point to the fact that whereas Nigerian banks only launched into the GDR market in 2007, the instrument has been popularly issued by both private and public sector companies in the mature and not-so-mature emerging markets for more than fifteen years. As reported recently in the local media, the attempt by Dangote Industries to issue Global Depository Receipts hit the rocks as the local conglomerate fell short on some of the vital requirements.

The OGDCL listing is a good case study for the Bureau of Public Enterprises (BPE), in terms of how to attract higher values to the State Owned Enterprises (SOEs) under its portfolio for privatization. While the banks are coming belatedly into the GDR market, it is obvious that our SOEs are far from attaining the level of value delivery and openness required for international listings. In any case, where compliance is enforced, not many of the corporations owned by the Nigerian state will meet listing requirements at the NSE.

Successful issuance of internationally traded Depository Receipts (DRs), especially in the emerging markets, is perceived as progress in regulation and disclosure in the local market. For the issuer, it evidences its sound corporate governance practice. That is the huge barrier to issuing the financing instrument, in spite of the big risk appetite of international investors.

In the last two years, the various regulatory agencies overseeing different operators in the Nigerian markets have been up and doing. They are aware that globalisation is also converging market regulations, although Nigeria is more likely to attain world standard faster when she consolidates her financial markets regulators into one single authority.

In preparing for its GDR issuance, Diamond Bank Plc had put some of the advantages of depository receipts in public domain. For the issuer, there is prestige and greater exposure in the world market. The two-way fungibility of GDR enhances liquidity of the equity concerned, and it encourages an international shareholder base. It enables investor savvy Diaspora communities to invest in the underlining equities of their countries of birth

which is traded in their countries of residence - thereby overcoming the inhibitions of high risk perception of their indigenous markets.

For local investors, buying depository receipts immediately makes their portfolios global. Investors gain the benefits of portfolio diversification, while trading in their own market under familiar settlement and clearance conditions. The DR investors is able to reap the benefits of these usually higher-risk, higher-return equities, without having to go directly into foreign markets perceived to have peculiar and unfamiliar regulatory and disclosure risks.

India's relatively early entry into the international equity market through the GDR and the way it evolved her regulation of the market offer insights to a newly emerging market like Nigeria's. In India, and as would be found elsewhere, proceeds from the GDR are used to finance capital goods imports; capital expenditure including domestic purchase/installation of plant, equipment and buildings and investments in software development; prepayment or scheduled repayment of earlier external borrowings. Proceeds from DRs are not investible by the issuers in stock markets and real estate in India.

These help in channelling the funds appropriately. They also address the concern expressed by the IMF in April on tracking FDI proceeds.

Most certainly the lead which the banks have taken in Nigeria in issuing internationally traded equities has its roots in the visionary banking consolidation programme introduced by the Soludo-led CBN in July 2004. Of note too is the relatively benign risk perception of Nigeria since the exit from the Paris Club debt and the BB- sovereign rating of Nigeria by S&P. It is, however, imperative that the apex banking regulator continues to tune its framework for ensuring that Nigerian banks remain safe, sound and investor friendly.

Some of Nigerian CEOs in the banks have shown that they can respond positively to the right regulatory / market impetus. Although the new era of competition by Nigerian banks in the international arena has further opened up human capital gaps in the financial services system, nevertheless, the banks have the largest pool of skilled manpower in the economy.

A more acutely localised sectoral skill gap is partly the challenge operators in the real sector face. Most of their products are emblematic of this, and the few manufacturers in the economy have found no financing refuge in the capital market.

Finding a workable solution to lift the real sector out of the current situation is daunting. The TABB Group recently affirmed in a study that "global market consolidation will not spell the end for the international depository receipt as a financial instrument." It is therefore expected that more Nigerian banks will continue to embrace DRs in a way that will reduce the amount of capital they would have otherwise raised from the local primary market. This presents a glimmer of hope that the real sector will begin to show more presence in the primary market at the NSE.

But then, are the manufacturers near a position where they can deliver competitive returns to investors? It is also a sure bet that high networth local investors will seize the opportunities for diversification of their portfolio through DRs and earn returns in dollars. That is the thinking behind the massive awareness programme in the local press by Diamond Bank in the run up to on-going GDR issue.

Jide Akintunde

**Source:**

http://www.financialnigeria.com/development/developmentreport_category_item_detail.aspx?categoryid=3&item=83, retrieved on 1 October 2012.

Field Code Changed

Discussion Questions:

1. What are the benefits of depository receipts from the case?

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# Unit 15 Mutual Fund Operations

**Structure:**



## 15.1 Introduction

Mutual fund is a common pool of money into which investors place their contributions that are to be invested in accordance with their stated objective. The ownership of the fund is thus joint or “mutual” – the fund belongs to all investors.

Mutual funds are associations or trusts that make investments in financial instruments for mutual benefit of its members. The fund collects money from these members and invests them in a dynamic portfolio of financial assets with a view to reduce risks and maximise income and capital appreciation for distribution to its members’ pro rata.

Mutual funds serve as a key financial intermediary, playing a crucial role in mobilising savings and investing them in capital markets, opening up a huge source of funds for capital markets. Stock market activities are also significantly influenced by mutual funds.

**Objectives:**

After studying this unit you should be able to:

- explain the meaning and benefits of a mutual fund
- describe the structure of mutual funds in India
- classify different types of mutual funds
- explain different categories of mutual funds
- know the regulations on investments of a mutual fund
- understand key financial terminologies of a mutual fund.

## 15.2 Meaning and benefits of Mutual Fund

A mutual fund is a type of financial intermediary that pools funds of investors with similar investment objectives and invests them in different types of financial claims (equity shares, bonds, money market instruments etc). These pooled funds provide thousands of investors with proportional ownership of diversified portfolios managed by professional investment managers. The term 'mutual' is used in the sense that all its return, minus its expenses, is shared by the fund's unit-holders.

**Benefits**

Mutual funds increase mobilisation of investible funds of the community by pooling the savings of a large number of small savers.

Mutual funds offer a great solution for small investors to diversify their investment. They reduce the unit-holder's risk, by evolving schemes suited to his stated preferences and risk appetite.

Mutual funds use qualified portfolio managers who analyse economic, industry and company trends and factors, and assess their impact on company stock prices. They adjust the composition of their portfolio in response to changing economic conditions. Mutual funds have grown at a rapid pace, thanks to the professionalism of their managers.

Presently there are more than 8,000 different mutual funds with total assets exceeding `10 trillion. There are about 755 mutual fund schemes and assets under management amounted to `94,000 crores in 2006-07. Over the last 25 years mutual fund assets have increased more than 23 times and more than 88 million households own units of one or more mutual funds.

**Self Assessment Questions**

1. A mutual fund is a financial _____.
2. Mutual funds adjust the composition of their portfolio in response to changing _____.
3. Mutual funds provide _____, _____ and _____.

## 15.3 Structure of Mutual Fund Operations

In India, mutual funds are operated by entities like sponsors, mutual funds, trustees, asset management companies, custodians, registrars and transfer agents.

**Sponsor**

The sponsor of a mutual fund is similar to the promoter of a company. The sponsor could be a bank, a financial institution or a financial services company. For example, the sponsor of Reliance Mutual Fund is the Anil Dhirubhai Ambani Group (ADAG).

The sponsor has to obtain a license from SEBI for which it has to fulfil conditions relating to capital, profits, track record, default-free dealings etc. The sponsor is responsible for establishing the mutual fund.

**Mutual fund**

The mutual fund is constituted as a trust under the Indian Trust Act 1881 and registered with SEBI. The beneficiaries of the trust are the investors who invest in various schemes of the mutual fund.

**Trustee**

The trust enters into contracts in the name of the trustees who can be either individuals or a corporate body (a trustee company). The trustee company is incorporated with limited liability under the Companies Act 1956. To ensure that trustees are fair and impartial, SEBI rules mandate that at least two-thirds of the trustees should have no association with the sponsor.

The trustees appoint an Asset Management Company (AMC), secure necessary approvals, periodically monitor how the AMC functions and hold the properties of the various schemes in trust for the benefit of investors. The trustees are accountable for the financial discipline of the mutual fund.

**Asset Management Company (AMC)**

The AMC is a separate company appointed by the trustees to run the mutual fund. It should have a certificate from SEBI to act as portfolio manager under SEBI (Portfolio Managers) Rules and Regulations, 1993. It

handles all operational matters such as designing and launching the schemes, managing investments, and interacting with investors. The fund managers are assisted by a team of analysts who track markets, sectors and companies.

**Structure of Mutual Funds in India**

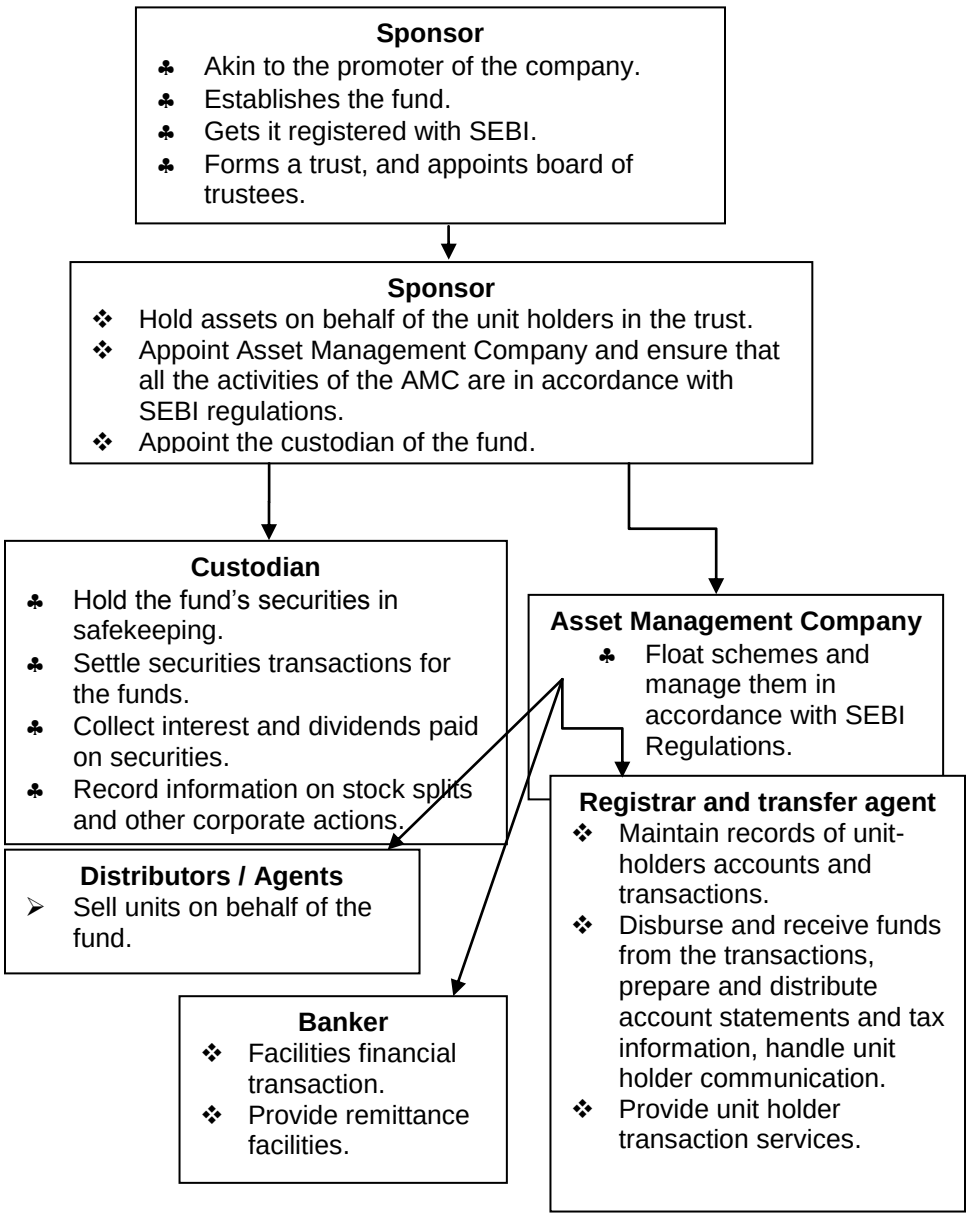


**Fig. 15.1: Structure of Mutual Funds in India**

AMCs charge fees linked to the size of the scheme but with limits. Currently it is 1.25% on the first $100 crore of the weekly average net assets and 1% on the balance of net assets.

**Custodian**

The custodian handles the investment back office operations of a mutual fund including receipt and delivery of securities, collection and distribution of dividends and segregation of assets between schemes.

**Registrar and transfer agents**

The registrar and transfer agents handle investor-related services such as issuing, redeeming and repurchasing units, sending statements of accounts to the investors etc. Some fund-houses handle such functions in-house, while others outsource it to SEBI-approved registrars and transfer agents like Karvy and CAMS.

**Self Assessment Questions**

4. The _____ of a mutual fund is similar to the promoter of an entity.
5. _____ provides transaction services to the investors.
6. _____ settles securities transactions and records information on stock splits and other corporate actions.

## 15.4 Types of Mutual Funds

Funds are classified as open-ended, close-ended, exchange traded and hedge funds.

**Open-ended schemes**

Open-ended funds are open to investment at all times. Investors can purchase and sell (redeem) units from these schemes any time. Thus the number of units of an open-ended fund keeps changing. When the fund receives additional investment, it invests in additional securities.

There are different categories of open-ended mutual funds, allowing investors to invest in a fund that fits their specific investment objective and risk profile.

**Close-ended schemes**

The subscription to a close-ended scheme is kept open only for a limited period (usually one month to three months) with a fixed maturity period. Close-ended funds do not repurchase (redeem) the shares they sell. Instead investors have an option to sell the units on a stock exchange similar to shares of a corporate entity.

**Exchange traded funds**

Exchange traded fund (ETF) is a hybrid of a close-ended index fund and an open-ended index fund. Like a close-ended index fund it is listed on the stock exchange and like an open-ended fund it creates and redeems units in line with the rise and fall in demand.

The management goal of an ETF is to mimic an index so that the share price of the ETF moves in line with that index. For example Standard & Poor's Depository Receipts (called Spider) is a basket of stocks matched to the S&P 500 index.

Cube (trading symbol is QQQQ) is an ETF created by the Bank of New York. It is traded on the Amex and represents the NASDAQ 100 index, which consists of many technology firms. This is ideal for investors who believe that technology stocks will perform well but do not want to select individual stocks.

Key features of an ETF are:

- The open-ended side of an ETF is restricted to a limited set of participants called authorised participants and a certain minimum size is prescribed for the creation/redemption of units.
- The creation/redemption of units happens in kind. Authorised participants who want new ETF units have to pay in the form of a basket of stocks that mirrors the underlying index. Similarly when authorised participants want the ETF units to be redeemed they are paid in the form of a basket of stocks mirroring the underlying index.
- As ETFs are listed on the secondary market, investors can buy and sell ETF units for cash.
- In the secondary market, ETF units tend to trade near their fair value (NAV). If the market price of ETF units exceeds NAV, authorised participants would sell ETF units from their inventory, buy the underlying basket of stocks from the exchange, and deliver the basket of stocks to

the ETF to replenish their inventory of ETF units and make arbitrage profits.

**Advantage of an ETF over an index fund, close-ended and open-ended scheme**

An ETF is better than a close-ended index fund because ETF units trade near their fair value (NAV), whereas the units of a close-ended index fund typically trade at a discount.

An ETF is better than an open-ended index fund in three ways.

1. An ETF requires minimal cash balance, thanks to in-kind creation and redemption of units. This reduces the tracking error which is the difference between the performance of an index scheme and the benchmark index.
2. ETFs have lower expenses ratios. For example the offer document of Benchmark Nifty BeEx (BEFS) caps its expenses ratio at 0.80%, whereas index funds charged on average 1.16 percent in 2006-07.
3. You can buy and sell ETF throughout the day at the prevailing market price, whereas the index fund can be traded only at the closing NAV of the day.

**Hedge funds**

Hedge funds are also vehicles of collective investment. While mutual funds are open to the general investing public, hedge funds are typically open only to wealthy individuals and institutional investors. Mutual funds are heavily regulated entities whereas hedge funds are not. Hedge fund managers can engage in leverage, short sales and heavy use of derivatives across various markets. Mutual funds do not have such flexibility though SEBI recently permitted short-selling with a cap.

Hedge funds buy securities that appear to be relatively under-priced and sell securities that appear to be relatively overpriced. For example, if the yield on corporate bonds seems unusually high compared to the yield on treasury bonds, the hedge funds would buy corporate bonds and short-sell treasury bonds. By being long on corporate bonds and short on treasury bonds, the fund maintains a ‘hedged’ position with respect to interest rate exposure. It expects to earn a profit when the yield spread (corporate bond yield – treasury bond yield) returns to its normal level, irrespective of what happens to the general level of interest rates.

A market-neutral position does not necessarily mean low risk. If valuation difference across the two sectors persists or even accentuates, hedge funds can lose money. Since hedge funds typically take highly leveraged positions, their returns tend to be highly volatile.

**Self Assessment Questions**

7. _____ is a hybrid of a close-ended index fund and an open-ended index fund.
8. _____ is the difference between the performance of an index scheme and the benchmark index.
9. Hedge fund managers can engage in _____, _____ and heavy use of _____ across various markets.

## 15.5 Classification of Mutual Funds

Mutual funds invest in three broad classes of financial assets namely stocks, bonds and money market instruments. Stocks include equity and equity-related instruments, bonds include debt instruments that have a maturity period of more than one year. For example treasury bonds, quasi-government bonds, corporate debentures and asset based securities. Money market instruments are instruments that have a maturity period of less than one year including treasury bills, commercial paper, certificate of deposits, reverse repo (repurchase agreement) and call money.

Mutual fund schemes depending upon the asset mix are classified into three broad categories – equity scheme, hybrid scheme and debt scheme.

**Equity schemes**

Equity schemes invest the bulk of their corpus (85%-95%) in equity shares or equity-linked instruments and the balance in cash. Equity funds would be exposed to the equity price fluctuation risk at the market level, at the industry or sector level and at the company-specific level.

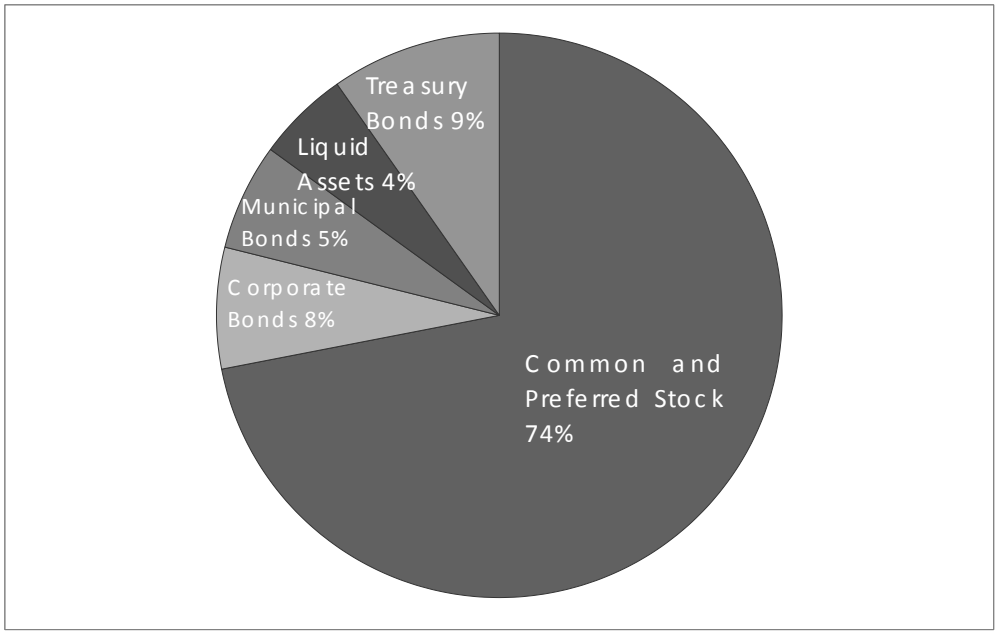


**Fig. 15.2: Classification of Mutual Fund**

Equity funds' net asset values fluctuate with all these price movements. These price movements are caused by a number of political, social and economic factors. The issuers of equity shares offer no guaranteed repayment as in case of debt instruments. Hence equity funds are at the higher end of the risk spectrum.

**Diversified equity schemes**

These schemes invest in a broadly diversified portfolio of 20 to 50 equity shares from a wide range of industries. Examples are HDFC Equity schemes, Reliance Vision Fund etc.

**Index schemes**

An index scheme is an equity scheme that invests its corpus in a basket of equity shares that comprises a given stock market index such as the Standard & Poor, Nifty Index or the SENSEX, with each share being assigned a weight equal to what it has in the index. Indeed an index scheme appreciates or depreciates in tune with the index. Examples of such index schemes are UTI Master Index and Franklin India Index NSE NIFTY.

**Sectoral schemes**

These schemes invest its corpus in the equity shares of a given sector such as banking, information technology, telecommunications, pharmaceuticals, power, realty etc. Examples are UTI Petro, Franklin Infotech and Reliance Pharma Fund.

**Tax planning schemes**

Tax planning or equity linked savings schemes (ELSS) are open to only individuals and HUFs subject to certain conditions and limitations prescribed by Income Tax Act. Subscription to such schemes can be deducted before computing the taxable income. Examples are Franklin India Tax shield and Reliance Tax Saver.

**Hybrid schemes**

These schemes are also known as balanced schemes wherein investment is made in both equity and debt instrument on a certain proportion. In equity-oriented schemes, 60% of the portfolio is invested in equity shares and balance in debt and money market instruments. In debt-oriented schemes, 85-90% of the portfolio investment is made in debt and money market instruments and the equity component would be 10-15%. Examples of such schemes are Birla Monthly Income Plan and Franklin Templeton Monthly Income plan.

**Debt schemes**

Debt schemes invest in debt instruments like bonds and cash. The various types of debt schemes are gilt schemes, mixed debt schemes, floating rate debt schemes, cash schemes and fixed maturity plans.

Gilts are government securities with medium to long-term maturity periods typically of over one year (under-one-year instruments being money market securities). In India, we have now seen the emergence of Government Securities or Gilt Funds that invest in government paper called dated securities (unlike Treasury Bills that mature in less than one year). Since the issuer is the Governments of India / States, these funds have little risk of default and hence offer better protection of principal.

**Offshore fund schemes**

These funds invest in equities in one or more foreign countries thereby achieving greater diversification, but with additional risks. Offshore Equity Funds may invest in a single country or many countries.

**Money market funds schemes**

Money market funds invest generally in securities of less than one-year maturity period which are short-term in nature. Treasury bills issued by the governments, certificates of deposit issued by banks and commercial paper issued by companies are the typical short-term and interest-bearing instruments. Investment in the inter-bank call money market is also done by Money Market Mutual Funds in India.

Liquidity and safety of principal are the major strengths of money market funds.

**Value**

Growth funds are shares of companies with good or improving profit prospects, and aim primarily at capital appreciation. They concentrate on growth prospects, and are willing to pay high price/earnings multiples for companies considered to have good potential. In contrast to the growth investing, other funds follow value investing approach. Value funds try to seek out fundamentally sound companies whose shares are currently under-priced in the market. Value funds will add only those shares to their portfolios that are selling at low price-earnings ratios, low market to book value ratios and are undervalued by other yardsticks.

Value funds have the equity market price fluctuation risks, but stand often at a lower end of the risk spectrum in comparison with growth funds. Value stocks may be from a large number of sectors and therefore diversified. However, value stocks often come from cyclical industries. The example of a value fund in India is Templeton Fund, which has in its portfolio shares of cement/aluminium and other cyclical industries. Prices of such shares may fluctuate more than the overall market in both bull and bear markets, making such value funds riskier than diversified funds in the short-term. However, proponents of value investing recommend it as a long-term approach. In the long term, value funds ought to be less risky than growth funds or even equity diversified funds.

**Self Assessment Questions**

10. Mutual funds invest in three broad classes of financial assets namely _____, _____ and _____.
11. _____ try to seek out fundamentally sound companies whose shares are currently under-priced in the market.

**State true or false**

12. Value funds are riskier than growth funds in the long term.

## 15.6 Regulations on the investment of a Mutual Fund

The investments of a mutual fund are subject to a set of regulations prescribed by SEBI, which are:

- No term loan shall be granted to a mutual fund scheme.
- A mutual fund under all its schemes will not own more than 10% of any company's paid-up capital carrying voting rights.
- Transfer of investment from one scheme to another scheme of a mutual fund is permitted provided it is done at the prevailing market price for quoted instruments. The securities so transferred shall be in conformity with the investment objectives of the scheme.
- A mutual fund may borrow to meet liquidity needs, for the purpose of repurchase, redemption of units or payment of interest or dividend to the unit-holders. Such borrowings shall not exceed 20% of the net asset of the scheme and the duration of the borrowings shall not exceed 6 months.
- A scheme shall not invest more than 15% of its NAV in debt instruments issued by a single issuer, rated not below investment grade by an authorised credit rating agency.
- A mutual fund can enter into derivatives transactions on a recognised stock exchange for the purpose of hedging and portfolio balancing in accordance with SEBI guidelines.
- A scheme shall not make any investment in:
  a) Unlisted security of an associate or group company of the sponsor.
  b) Any security issued by way of private placement by an associate or group companies of the sponsor.
  c) The listed securities of group companies of the sponsor in excess of 25% of the net asset.

- A scheme shall not invest more than 10% of its NAV in the equity shares or equity related instruments of any one company. This limit will not apply to index funds because the exposure to a company's stock would depend on the weight of the stock in the benchmark index.
- A scheme may invest in ADRs/GDRs of Indian companies listed on overseas stock exchanges to the extent and in a manner approved by RBI. The fund will employ necessary measures to manage foreign exchange movements arising out of such investments.
- A scheme shall not invest more than 5% of its NAV in unlisted equity shares or equity related instruments in case of an open-ended scheme and 10% of its NAV in case of a close-ended scheme.
- Mutual funds shall mark all investments to market and carry investments in the balance sheet at market value. However, since the unrealised gain arising out of appreciation in investments cannot be distributed, provision has to be made for the exclusion of this item when arriving at distributable income.

**Self Assessment Questions**

**State true or false**

13. A mutual fund can enter into derivatives transactions on a recognised stock exchange for the purpose of hedging and portfolio balancing in accordance with SEBI guidelines.
14. A scheme shall not make investment in the listed securities of group companies of the sponsor in excess of _____ of the net asset.

## 15.7 Mutual Fund Terminologies

Here are the key financial terms you should be familiar with both as a student and as an investor.

**Asset mix**

The asset mix of a scheme refers to the allocation of the corpus of a scheme across three broad asset categories viz., equity shares, bonds and money market instruments. An asset mix of 60:30:10 denotes that 60% of the corpus is invested in equity shares, 30% in bonds/debentures of corporate entities and 10% in money market instruments.

**Entry load, exit load, and no-load funds**

Marketing of a new mutual fund scheme involves initial expenses. These expenses may be recovered from the investors in different way at different times. Two ways in which a fund's sales expenses are usually recovered from investors are:

**Entry load:** It is recovered at the time of investor's entry into the fund / scheme, by deducting a specific amount from his initial contribution.

**Exit load:** It is recovered at the time of the investor's exit from the fund / scheme, by deducting a specified amount from the redemption proceeds payable to the investor.

**No-load funds:** No charges are recovered from the investors in such type of schemes.

**Market price, repurchase price and reissue price**

A close-ended scheme has to be necessarily listed on a recognised stock exchange to ensure that its participants enjoy liquidity. Generally, the market price of a close-ended scheme tends to be lower than its NAV.

If the market price is lower than the NAV, the scheme is said to be selling at a discount and if it is higher, the scheme is said to be selling at a premium. In addition to listing, the mutual fund may also offer the facility of repurchase. The repurchase price is usually linked to the NAV. In open-ended schemes, the mutual fund has to stand ready to repurchase and issue its units on a continuing basis. The repurchase and the reissue prices are also closely linked to the NAV.

**Estimating Net Asset Value**

An investor can buy or redeem units from the fund itself at a price based on the net asset value (NAV) per unit. NAV per unit is obtained by dividing the amount of the market value of the fund's assets (plus accrued income + receivables + accrued income minus the fund's liabilities – accrued expenses) by the number of units outstanding.

$$NAV = \frac{\text{Market value of the fund's investment (+) Receivables (+) Accrued Income (-) Liabilities (-) Accrued Expenses}}{\text{Number of units outstanding}}$$

The number of units outstanding goes up or down every time the fund issues new units or repurchases existing units. In other words, the 'unit capital' of an open-end mutual fund is not fixed but variable.

**Rate of return**

The periodic (period could be one month, one quarter, one year or more) rate of return on a mutual fund scheme is the total compounded return to the investor from the scheme since the date of purchase/ issue.

**Example**

NAV at the beginning of the period is ` 16 and NAV at the end is ` 17 and the fund paid a dividend of ` 1. The rate of return is:

**ROR = [(17-16) +1] / 16 = 12.5 percent**

It is calculated on NAV basis or price basis. When calculated on NAV basis, it reflects the return generated by the fund manager on NAV. In this calculation the assumption is that the dividend is reinvested at the NAV prevailing on the day it is paid. It reflects the return to investor by way of market or repurchase price on price basis. Here the assumption is that the dividend is reinvested at the prevailing market or reissue price.

**Standard deviation**

The standard deviation of returns is the square root of the mean of the square of deviations around the arithmetic average. Generally, standard deviation, Ex-Mark, and beta are computed taking monthly returns into account for a period of three to five years.

**Beta**

Past price volatility relative to a particular stock market index is the Beta of a fund. It is a measure of risk that provides useful statistical information

particularly when applied to portfolios. It has been found that most mainstream equity funds have betas in the range of 0.85 to 1.05.

**Alpha**

Alpha measures the extra return earned on a scheme on a risk-adjusted beta.

**Gross dividend yield**

Gross dividend yield is an important indicator of the investment characteristics of a mutual fund. Value funds tend to have a higher gross dividend yield and growth-oriented funds a lower gross dividend yield among equity funds. The gross dividend yield is a reliable differentiator of a fund's investment philosophy.

**Expense ratio**

The annual recurring costs as a percentage of the net assets of the scheme are the expense ratio of the scheme.

**Self Assessment Questions**

15. The asset mix of a scheme refers to the allocation of the corpus of a scheme across three broad asset categories viz., _____,_____ and _____
16. The market price of a _____ scheme tends to be lower than its NAV.
17. _____ refers to the annual recurring costs as a percentage of the net assets of the scheme.
18. Alpha measures the extra return earned on a scheme on a _____

## 15.8 Options and Value Added Services

Mutual funds offer various options and value added services to attract and retain customers in a competitive market.

**Options:** The options available to the investors are dividends payout option, dividend reinvestment option and growth options, systematic investment plan, systematic transfer plan and systematic withdrawal plan.

**Dividend payout option:** Under this scheme, the dividend declared by the scheme is paid in cash to the investor.

**Dividend reinvestment option:** Under this scheme, the dividend declared by the scheme is ploughed back into the scheme at the applicable NAV.

**Growth option:** Under this scheme, no dividend is paid and hence the gains of the scheme gets reflected in the NAV of the scheme.

**Systematic Investment Plan (SIP):** Under the systematic investment plan, the investor invests regular sums of money every month to buy units of a mutual fund scheme. Here the investor buys more units when the price is low and fewer units when the price is high as the investment is made regularly. This is known as rupee cost averaging.

**Systematic Transfer Plan:** Under this scheme, an investor invests a lump sum in the liquid scheme and opts for systematic transfer plan (STP) wherein a predetermined amount of money will be transferred from liquid scheme to the equity scheme. The benefit of this is, until it is transferred the investment earns a post-tax rate comparable to a deposit in a bank account.

**Systematic Withdrawal Plan:** This scheme allows the investor to withdraw a fixed amount every month. The mutual fund sends the redemption proceeds to the investor every month automatically. The investor can opt for a fixed sum every month or a certain percentage of the capital appreciation in the NAV of the scheme.

**Value added services**

Mutual funds offer value added services like redemption over phone, triggers and alerts, chequebook facility and new points of purchase. A trigger is an actionable facility that lets the investor pre-specify exit targets for his mutual fund investments. Generally triggers are based on the value of the NAV or after a specified date. When the target is reached, the fund house will automatically redeem the units of the investors.

For the convenience of their investors, fund houses are supplementing traditional channels of distribution with more points-of purchase (POP). For examples HDFC Mutual fund allow investors to buy and sell units through ATMs.

**Activity**

Download the prospectus of the Mutual fund in the document found at http://www.kotak.com/bank/common/pdf/factsheets/KotakLifestyle-OD.pdf. Examine the prospectus and identify key features of the fund, such as offer of returns, statement of risk, management of the fund etc. Prepare a white paper of 2 pages on how you would go about making a similar prospectus

## 15.9 Summary

- Mutual funds are associations or trusts who wish to make investments in the financial instruments for the mutual benefit of its members.
- Mutual funds employ qualified portfolio managers who analyse economic, industry and company trends and forecasts and assess the potential impact of various conditions on companies.
- Open-ended funds are open to investment from investors at all times. Investors can buy or sell (redeem) their shares back to the scheme at any time.
- Money Market Funds invest in securities of a short-term nature, which generally means securities of less than one-year maturity period. Typical short-term, interest-bearing instruments are treasury bills issued by governments, certificates of deposit issued by banks and commercial paper issued by companies.
- An investor can buy or redeem units of the fund itself at a price based on the net asset value (NAV) per unit. NAV per unit is obtained by dividing the amount of the market value of the fund's assets (plus accrued income + receivables + accrued income minus the fund's liabilities – accrued expenses) by the number of units outstanding.
- Mutual funds offer value added services like redemption over phone, triggers and alerts, chequebook facility and new points of purchase.

## 15.10 Glossary

***Mutual Fund:*** Financial intermediary that pools funds of investors.
***Open ended funds:*** Funds are open to investment all times.

## 15.11 Terminal Questions

1. Explain the meaning and benefits of mutual funds.
2. Draw a schematic diagram representing the structure of a mutual fund.
3. Describe with examples different types of mutual funds.
4. Explain different categories of mutual funds.
5. List the regulations over mutual funds.
6. Explain the terms: Net asset value, Exit and Entry loads, Asset Mix.

7. What are the different options and value added services available to the investors?

## 15.12 Answers

### Self Assessment Questions

1. Intermediary.
2. Economic conditions.
3. Diversification, management expertise, liquidity.
4. Sponsor.
5. Registrar and transfer agents.
6. Custodian.
7. Exchange traded funds.
8. Tracking error.
9. Leverage, short sales, derivatives.
10. Stocks, bonds, money market instruments.
11. Value funds.
12. False.
13. True.
14. 25 percent.
15. Stock, bonds, money market instruments.
16. Close ended.
17. Expenses ratio.
18. Risk-adjusted beta

### Terminal Questions

1. A mutual fund is a type of financial intermediary that pools funds of investors with similar investment objectives and invests them in different types of financial claims (equity shares, bonds, money market instruments etc). For more details, refer section 15.2
2. In India, mutual funds are operated by entities like sponsors, mutual funds, trustees, asset management companies, custodians, registrars and transfer agents. For more details, refer section 15.3

3. Funds are classified as open-ended, close-ended, exchange traded and hedge funds. For more details, refer section 15.4
4. Mutual funds invest in three broad classes of financial assets namely stocks, bonds and money market instruments. For more details, refer section 15.5
5. The investments of a mutual fund are subject to a set of regulations prescribed by SEBI. For more details refer section 15.6
6. For explanation refer section 15.7
7. Mutual funds offer various options and value added services to attract and retain customers in a competitive market For more details, refer section 15.8.

## 15.13 Case Study

Mutual funds lose 8,600 equity folios a day

Equity mutual funds are hit hard. Fund houses are losing their equity retail investors at a fast pace. So far in the current financial year, the segment has witnessed an average erosion of 8,600 equity folios (including equity-linked saving schemes) on a daily basis. This rate of closure is almost double that in the previous financial year. In fact, during the April-July period, the fund market saw closure of over a million equity folios, nearly a third of the combined account closures during the preceding two financial years."Investors are now questioning how long is long term," says Deepak Chatterjee, managing director of SBI Mutual Fund. Normally, investors are advised to stay invested at least for three years. But even after this duration, they have not made money. Agrees Saurabh Nanavati, chief executive of Religare Mutual Fund. According to him, investors who started systematic investment plans more than three years ago, too, are sitting on losses. According to the capital markets regulator, Securities and Exchange Board of India (Sebi), in July alone, 327,000 equity accounts were closed - either terminated or cancelled. This brings the overall equity investors base further down to 36.6 million, from 37.6 million in March 2012."This is shocking that despite having taken various measures in the direction of investors' awareness programmes, we (industry) are unable to arrest the decline in (equity) folios," says the chief marketing officer of one of the top 10 fund houses. Interestingly, during the heydays of the sector in 2007-08, when indices were climbing to newer highs, fund houses added as many as

34,000 equity folios aday. However, later, abolition of entry load on equities in August 2009 kept distributors away, leading to a sharp fall. Since the beginning of FY13, the BSE benchmark index, the Sensex, has shed only 168 points, or less than a percentage point, from 17,404 on March 30 to 17,236 on July 31, though with much volatility during this period.“There are all sorts of reasons behind the steep decline,” explains the chief executive officer of a new entrant, which launched its first equity scheme last year. According to him, “There are hardly any renewals of systematic investment plans, profit booking amid volatile stock markets, cancellations of existing folios or, for that matter, no transactions of the scheduled payments leading to closure of folios. On top of it, of course, the persistent weak equity markets.” Executive vice-president of DSP BlackRock, Ajit Menon, told Business Standard fresh investments were lesser than the redemptions in the equity segment, which showed investors were shying away from equities. During April-July, net outflows from the equity category stood at Rs.1,430 crore. Assets under management in the segment were Rs 1.78 lakh crore, making it a fourth of the industry’s overall assets of Rs 7.3 lakh crore as on July 31. The steep pace (over fourfold increase) at which fund houses added investors to their kitty, especially between 2004-05 and 200809 mainly because of misselling by distributors, seems to have started hurting the industry. It appears the adage ‘slow and steady wins the race’, is finding few takers among fund houses. – www.business-standard.com

Source: http://www.taxmann.com/news.aspx?nid=11822#lm

**Discussion :** Discuss the problems of equity mutual funds.

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