1. MEANING OF INVESTMENT

Investment means allocation of monetary resources to assets that are expected to yield some gain or positive return over a given period of time. In other words, anything saved for future by putting a limit on current consumption can be considered as investment. In this sense investment is a "postponed consumption". When we postpone our present consumption, a sacrifice takes place now and it is certain. The benefits that arise in future is uncertain. Hence investments entail a sizeable chance of losing the money (risk) than the savings.

The investors can be either individual investors or institutional investors. Individual/ retail investors are those who are investing on their own. Institutional investors are entities such as investment companies, commercial banks, insurance companies, pension funds and other financial institutions. The perception of

investment differs from investors to investors. In this text, the term investment is used in financial sense and emphasizes investments by individual investors.

The two important elements of an investment are time and risk. In certain risk free investments like government bonds, only time element is important. In certain other investment types, say for example derivatives, the risk element is the dominant aspect. In yet other investments (like equity shares), both time and risk are important. But over a long time frame the risk gets neutralised and that works in favour of the risk-return trade off of these investments.

2. DEFINITION OF INVESTMENT

Investment may be defined as "sacrifice of certain present value for some uncertain future value" – **Sharpe/ Alexander.**

According to Fisher, investment is "a commitment of funds made in the expectation of some positive rate of return".

"Purchase of a financial asset that produces a yield that is proportional to the risk assumed over some future investment period" – **F.Amling.**

4. INVESTMENT OBJECTIVES

People make investment for a variety of purpose and hence the objectives of investment differ from investor to investor. For instance when a pensioner makes investment, his primary motive is regular return where as a multi billionaire expects a reasonable appreciation in the value of investment after a definite period. However, the general objective of every investor is to minimise the risk involved in investment and maximise the return from the investment.

The specific objectives of investments are:

(i) **Yield–** The elementary objective of every investment is earning regular income. This reward may be referred as yield. In case of shares the yield is called dividend where as it is interest for debentures/ bonds. Yield is computed by dividing the actual interest/ dividend received with the cost of investment. It is often used as a parameter for evaluating the performance of a security.

(ii) **Capital Appreciation-** Increase in value of asset is referred to as a capital appreciation. This gain can be realised only when the asset is sold for a price that is higher than the purchased price. Growth of capital is closely associated with the equity shares, real estate and precious metals like gold and silver. Generally growth securities offer low yields[1]. It is also to be noted that capital gains offer potential tax advantages by virtue of their lower tax rate.

(iii) **Safety -** The certainty of return of capital without loss of money or time is

1. The yield on a security is the returns to the owners of the security, in the form of interest or dividends received from it and it does not include the price variations.

referred as safety in the context of investment. The investment should be capable of redemption as and when due and it should be free from default risk. Such safety is higher for T bills, bank and Post office deposits. The safer is the instrument the lesser will be the rate of return.

(iv) **Liquidity-** The security which is high marketable without loss of money and time is said to possess liquidity. An instrument is marketable only if there are large number of buyers and sellers who are ready to deal in it every time. Hence T bill, shares of blue chip companies and open ended mutual funds etc are highly liquid. Some investments like company deposits, National Savings Certificates etc. are highly illiquid in the sense that they are redeemable only on due date. Fixed deposits of Commercial banks can be withdrawn pre- maturely and hence they are liquid to a certain extent since the maturity value is returned only after charging penal interest.

(v) **Hedge against inflation** – Inflation erodes the value of money; hence the investment provides a protection against inflation. The return from investment should be higher than the rate of inflation. For instance if the rate of inflation is 8% and the rate of return from investment is only 7%, it is called a negative return. Investing in equities which are represented in the Sensex or Nifty over a long period is one of the best ways to keep away from inflation. Because the average return of these indices over a period of ten years are always higher than the rate of inflation. Investment in Inflation-Indexed bonds is another option to beat inflation.

(vi) **Tax Planning-** An investor can select certain tax saving schemes to reduce his tax liability. An assesse is eligible for a deduction upto ₹ 150000 from his gross total income as per the provisions of sections 80C under the Income Tax Act 1961. Detailed explanation about various tax saving schemes are given in chapter 3.

6. INVESTMENT PROCESS

All investors would like to beat the markets by constructing an efficient investment portfolio. Many factors like timing of buying and selling of investments, defining and managing risk parameters, asset allocation, performance evaluation and more are important in investment process.

The investment process which consists of series of activities leading to the purchase of securities or other investment alternatives are described below:

1. Framing Investment Policy

An investor should clearly spell his/ her investment policy before making investment. The following aspects are to be considered while framing an investment policy.

(i) **Determination of investible funds or the amount to be invested-** The entire investment procedure revolves around the availability of investible funds.

(ii) **Deciding the investment objectives-** The motives that guides an investor in choosing a particular investment alternative is called investment objectives. Similarly, the investment objectives once set does not remain constant, but it should be adjusted according to the change in personal and family circumstances of the investor.

(iii) **Identification of potential investment assets-** Based on both risk tolerance and return preference, the investor should identify the investible assets. For instance, if he wishes a regular return, debt securities may be selected. Money market instruments are advisable for investors who need short term liquidity whereas equity shares of blue chip companies are better option for capital appreciation. [1]

2. Investment Analysis

Investment analysis involves the use of relevant tools and techniques to decide how to allocate funds in various investment vehicles. The investor should make a comparative analysis of the type of industry and kind of security. The economic and regulatory factors influencing the industry in which the investor is interested is to be reviewed at this stage.

3. Security Analysis

At this phase, the risk-return characteristics of individual securities are

1. Beat the market means earning a better return than the market average. The market average can be calculated in many ways, but usually a benchmark - such as the S&P 500 or the Dow Jones Industrial Average index - is a good representation of the market average. If your returns exceed the percentage return of the chosen benchmark, you have beaten the market.

identified. The aim is to know whether it is worthwhile to acquire these securities for the portfolio[1]. At this stage, the real worth (intrinsic value) of the security is to be assessed. Fundamental analysis can be used to check whether the security is over-priced or under- priced. Technical analysis helps in forecasting the future share price based on the past trends of prices.

4. Construction of Portfolio

This consists of identifying the specific securities in which investment is to be made and determining proportion of investment. An efficient portfolio which provides the highest return of a given level of risk is to be constructed. The selection of a particular security should be based on micro level forecasts of expected cash flows from specific shares /debentures of different companies. Then he must decide the timing of investments for which he has to observe the forecasted price movements of securities at the macro level. Finally he has to minimize his risk for a given expected level of average return of his portfolio. The resultant portfolio is called a diversified portfolio.

5. Portfolio Evaluation

Assessing the performance of the portfolio over a selected period of time in terms of risk and return is called portfolio evaluation. Risk tolerance and return preference of the investors as decided in the investment policy should be taken as a yardsticks or norms for comparison.

6. Portfolio Revision

Economy and financial markets are dynamic and changes take place continuously. As time passes, securities which were once attractive may cease to be so. In view of such developments, it would be necessary for the investor to review the portfolio. He should sell off low yielding securities and buy high yielding new securities. The transaction costs incurred in the buy-sell activities relating to the new portfolio is an important consideration in the revision of the given portfolio. The investors should strike a balance between the cost of moving to the new portfolio and the benefit of the revision. Portfolio evaluation and revision are continuous process.

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1. Group of securities where investment is made is called portfolio.

9. INVESTMENT AVENUES

Different investment options in which an investor can place his surplus funds are called investment avenues. There exists a plethora of investment avenues and the investor can choose the right investment vehicle from the available opportunities. Each investment has its own characteristic feature and the investor has to align his objectives with them. This section tries to bring out the various investment avenues that are available to the investors.

On the basis of return and method of investments, the avenues of investment can be grouped as:

- Fixed and Variable Investments
- Security and Non –Security Investments
- Direct and Indirect Investments

We shall have a detailed discussion about each investment avenues.

9.1 Fixed Income Investments.

In case of fixed income investment, the principal amount and the terminal value are known with certainty. The borrower or issuer is obliged to make payments of a fixed amount on a fixed schedule. For example, the borrower may have to pay interest at a fixed rate once a year, and to repay the principal amount on maturity.

A detailed discussion about fixed income investments are appended below.

(i) Debentures

Corporate debentures are an option available to the investors who prefer a fixed

yield. Since debenture holders are the creditors of the company, they are not entitled to caste vote in the company's general meetings. But they can demand to convene a separate meetings in case the company makes a change in their existing rights. Debentures may be redeemable, convertible, secured, fixed and floating[1].Retails lots of debentures upto ₹10 lakhs can be traded in the equity market segments of BSE and NSE and lots above the specified value is traded in the debt segments of stock exchange.

(ii) Bonds

Bonds are issued by both public and private sector undertakings and a coupon rate is attached to the bond. The coupon rate indicates the annual yield payable to the bond holder which cannot be changed during the tenure of the instrument. Hence the investors are not affected by change in market interest rates. However, the market value of bond will appreciate when the market interest rate is lowered and the market value of bond will decline in tune with the appreciation in market interest rate.

Even though bonds are safer in terms of fixed interest and repayment of principals, they are also subject to various other risks such as call and prepayment risk, credit risk, reinvestment risk, liquidity risk, event risk, exchange rate risk, volatility risk, inflation risk, sovereign risk, and yield curve risk.

(iii) Government Securities (G-Sec)

The securities issued by the Central, State Government and Quasi Government agencies are known as Government securities or gilt edged securities. These securities carry a minimum amount of default risk as it is guaranteed by the RBI on behalf of Central Government. T-bills, Cash Management Bills, Dated Government securities and State Development Loans are different types of G-Sec.

(iv) Money Market Securities –

They have very short term maturity say less than a year. Common money market instruments are:

- **Treasury Bills(T-bills)**

A treasury bill is basically an instrument of short term borrowing by the

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1. Floating rate of interest is based on some benchmark rate say LIBOR (London Inter Bank Offered Rate), PLR (Prime Lending Rate), MIBOR (Mumbai Interbank Offered Rate)

Government of India. Presently in India, T-bills are issued in three tenors- 91 day, 182 day and 364 day. They are issued at a discount and redeemed at the face value at maturity. For instance, a 91 day Treasury bill having a face value of ₹100/ may be issued at ₹ 98.25, that is, at a discount of say, ₹1.75 and would be redeemed at the face value of ₹100. The bills are issued through an auction bidding process by RBI, which occurs in regular intervals. An investor can purchase T-bills through a dealer or online.

❖ **Commercial Paper (CP)**

Commercial paper is an unsecured money market instrument with a fixed maturity period. Corporates whose tangible net worth is not less than ₹4 crores, primary dealers (PDs) and the All-India Financial Institutions (FIs) are eligible to issue CP. The issuer should obtain a credit rating of at least A-2 either from CRISIL, ICRA, CARE, FITCH or any other credit rating agency specified by RBI for this purpose. CP can be issued in denominations of ₹5 lakh or multiples thereof and its maturities varies between 7 days to one year.

❖ **Certificate of Deposit(CD)**

The certificate of deposit is an unsecured instrument issued by commercial banks at a specified rate of interest. They are bearer documents and readily negotiable. The denominations of the CD and the interest rate on them are high. It is mainly preferred by institutional investors and companies rather than the individuals. The minimum size of the certificate is 10 lakh. The additional amount is issued in multiples of ₹ 5 lakh.

❖ **Repos**

Repo is a short form of repurchase agreement which involves the sale of a security with an agreement to repurchase the same security back at a higher price at a later date. Those who deal in government securities use repos as a form of overnight borrowing. A dealer or other holder of government securities (usually T-bills) sells the securities to a lender and agrees to repurchase them at an agreed future date at an agreed price. They are usually very short-term, from overnight to 30 days or more. The sale of the securities is not truly a sale, but rather a loan secured by the underlying security.

The reverse repo is the opposite of a repo. In this case, a dealer buys government securities from an investor and then sells them back at a later date for a higher price

(v) Bank Deposits

Savings deposit, Recurring deposits and Fixed deposit account of commercial banks carry fixed interest. Even though the savings account is more liquid and convenient to handle, the rate of savings deposit is lower. The Reserve Bank of India announced deregulation of the interest rate on savings bank deposits with effect from April 1, 2010.Now the bank can fix the on a daily product basis. The rate of interest varies from banks to banks. However, on an average the rate of interest on SB deposit is 4 per cent.

You can also deposit the money to a Fixed deposit account, the rate of return of which is higher compared to SB account. Rate of interest of FD varies from banker to banker, but on an average most of the bankers grant 6.5-7.5% interest per annum. The investor can receive the interest either at maturity date along with the principal amount or he can choose monthly interest to his SB account. Banker will revise the interest rate from time to time based on the monetary policy of RBI. However, once you have invested money to your FD account, you will get the promised interest irrespective of change in market interest rate. Though the investor parks his fund for a fixed period, he can withdraw the money before the tenure called pre mature withdrawal. But in that case, banker will reduce a fixed percentage as penalty and you will get a lower rate than the promised.

(vi) Post Office Deposits

Post Offices offer many schemes to small investors which can be opened and operated through wide network of post office in rural areas (out of 1.54 lakh post offices in India, 89% are in rural areas). National Savings Certificate with 7.6% interest, Five Year Time Deposit with 7.4% interest, Kisan Vikas Patra with 7.7% interest and Sukanya Samriddhi Account Scheme with 8.1% interest are the popular schemes of Post office.

(vii) Insurance Schemes

In a broad sense, life insurance may be viewed as an investment. There are many insurance policies which can pay an assured return after a fixed period or during post retirement period. For example LIC Pension plan- Jeevan Akshay.

The important types of insurance policies in India are:

(i) Endowment assurance policy- a lump sum amount is received after a specific term (maturity) or on death whichever occurs earlier.

(ii) Money back policy -maturity benefits are paid in instalments by way of survival benefits in every 5 years

(iii) Whole life policy-In addition to providing a death benefit, whole life policy also contains a savings component where cash value may accumulate.

9.2. Variable Income Investments

The term variable-income security refers to investments that offers volatile rate of return which is directly linked with the market forces. Though variable-income securities can give higher return in comparison to fixed income investments, it is having greater risks because the yield and maturity value is not known with certainty. It is even possible for these returns to be negative. Various investments under variable income investment options are:

(i) Equity Shares

The holders of equity shares are not guaranteed a fixed dividend. But over a long run, equity shares are more rewarding and can outperform every other assets class. Investing in the ownership capital of good companies, the investor can participate in the growth opportunities. But selection of right company at right time(entry and exit strategy) is important since performance of equity shares are more market driven.

Based on the nature of income and growth, equity shares can be classified as:

(i) Growth Shares having higher rate of growth than the industrial growth rate in profitability.

(ii) Income Shares belong to companies that have comparatively stable operations like FMCG companies.

(iii) Defensive Shares are relatively unaffected by the market movements.

(iv) Cyclical Shares affected by the upward and downward movements of the business cycle.

Hybrid Instruments

Hybrid instruments possess the characteristics of both debt and equity. The most common type of hybrid securities is convertible preference shares, convertible debentures and structured note.

(i) **Preference shares-** The characteristics of preference shares resembles to fixed income security because the rate of dividend is specified in the

instrument and they are given priority in the repayment of capital over equity holders. Similarly like debenture holders preference shareholders do not possess voting right and hence there is no dilution of control (cannot participate in the management).But due to insufficiency of profit, company can decide not to distribute dividend to preference holders, that makes preference shares unlike a fixed income security like bond or debenture. There are different types of preference shares such as cumulative, redeemable, participating and convertible

(ii) **Partially convertible debentures-** those debentures a part of which is redeemed after fixed period of time and a part is converted into equity or preference shares. The coupon rate is fixed; hence they possess the characteristics of fixed income security. In most of the cases, these instruments are unsecured and hence in the event of liquidation, the holders will get back their money along with the unsecured creditors. This feature makes the instrument in par with equity shares.

(iii) **Structured Note :** It consists of several financial products which are structured together to meet the requirements of investors and the return of which is based on equity indexes. Its portfolio consists of two components- a bond component and a derivative component. The bond portion of the note takes up most of the investment and provides principal protection. The rest of the investment not allocated to the bond is used to purchase a derivative product and provides upside potential to investors.

Table 2 : Different Financial Instruments- A Comparison

Type of Asset	Rate of Return	Risk in Repayment of principal amount	Value Appreciation	Liquidity	Redeemable option
Preference Shares	Fixed provided company makes profit	Low/ Moderate*	No	High**/ Low	Any trading day through stock exchange
Debentures/ Bonds	Fixed	Low/ Moderate*	No	High**/ Low	On maturity
Money Market Instruments	Fixed	Low	No	Low	On maturity

Bank Deposits	Fixed	Low	No	High	Premarture withdrawal possible at a lower rate
Post office Deposits	Fixed	Low	No	Low	On maturity
Insurance	Fixed	Low	No	Moderate	Surrender option is there, but at a loss
Equity shares	Unpredictable	High	Positive or negative	High	Any trading day at market rate

Note:

* - If company goes into liquidation, there is a possibility of losing either part or full amount invested.

**- Highly liquid preference shares are non-convertible redeemable preference shares and privately-placed redeemable preference shares. Partly Convertible debentures, Fully Convertible debentures and non-convertible debentures are traded in stock exchange and are highly liquid.

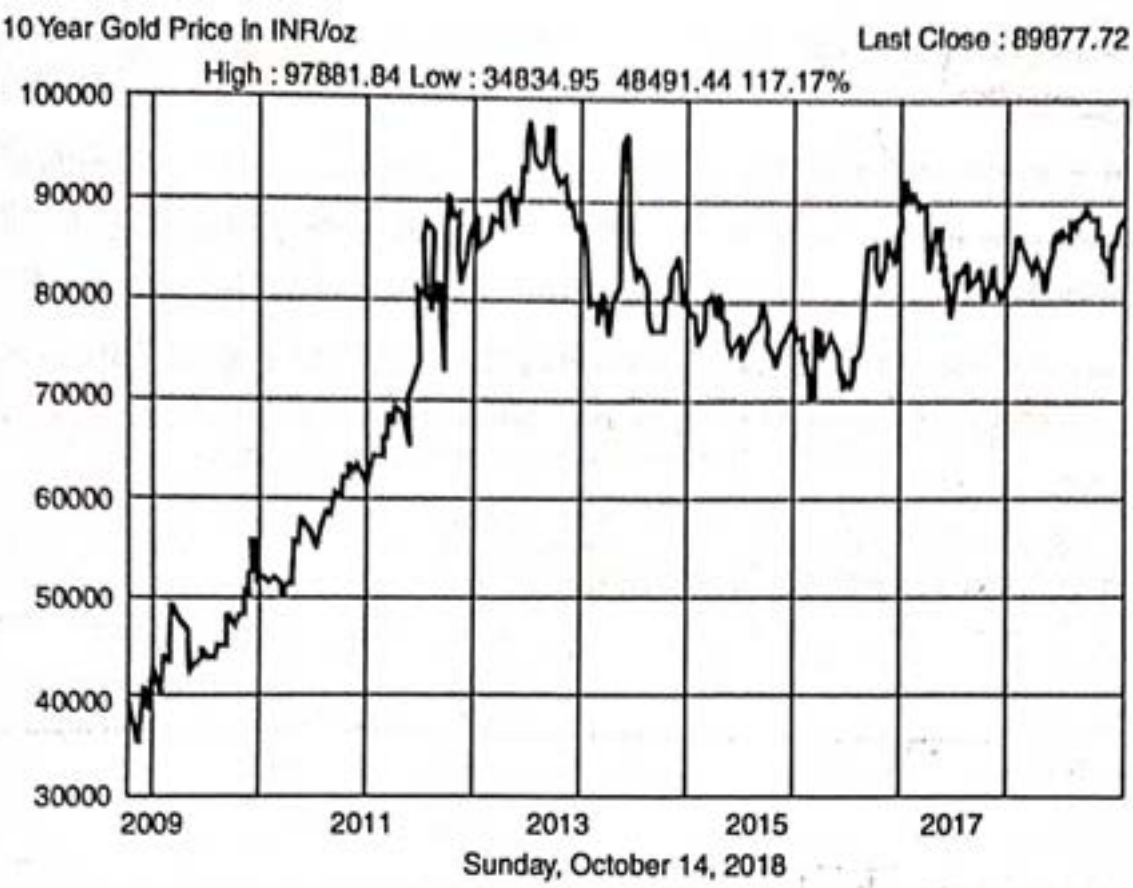
Gold

From time immemorial, gold is considered as the best investment avenue to protect the investor especially during stock market declines and inflation. This is a favourite form of investment amongst the rural and semi-urban population. However, the price of gold also has its highs and lows. But on an average, the performance of gold shows an increasing trend. Look at the figure 1 to see how gold price moves over the last 10 years.

There are various alternatives available for investment in gold through options like jewellery, coins, bullions, ETF and Sovereign Gold Bond.

Some prefer to buy jewels that they can use in their life. In this way, their money is safe with them and they are also bringing it in use. But from investment point of view, purchasing jewellery is not advisable due to the following reasons:

(i) **High making charges** – At the time of purchase, You have to pay very high making charges which cannot be recovered while liquidating the jewellery. The making charges vary according to design, but on an average, it will be around ₹ 200 per gram.



Source: www.goldprice.org

(ii) **Less resale value :** Most jewellers are ready to exchange the gold sold by them at market rate and very few are willing to pay in cash. Most of them deduct 5-10% of the value if you want hard cash.

(iii) **No regular income:** Gold investment does not provide any current income like dividend or rental.

(iv) **Problems in Physical storage-** Storing Gold in large quantities relatively risky and expensive.

(v) **No Tax Advantage-** Investing in gold is not going to provide you with any type of tax advantage in contrast to other tax saving instruments available in market.

Inspite of the limitations in holding jewellery, some people prefer to invest in physical gold. For them gold coins or gold bricks are advisable since it is the pure form of gold. You can buy it from Post offices, Commercial banks and even from e-commerce websites such as Amazon and Flipkart. Compared to jewellery, gold coins have the following advantages:

(i) **Purity-** If you are purchasing for investment purpose, you can buy 24/ 22 Karat pure gold. Proper packaging and certificate ensure the purity of gold.

(ii) **Denomination-** Based on the amount available for investment, an investor can choose a a lower denominations as 5gm and also available in 10g, 50g,

100g even up to 1 kg . Gold coins can be easily traded owing to their smaller size.

(iii) **No making charges-** On purchase, the investor need not pay only a notional amount as making charges say ₹100 per coin. It helps the investor to acquire the real

Note that all the limitations of jewellery like lack of regular income and tax advantage, problem of physical storage etc. are applicable to the investment in gold coins/bars also.

1. Gold ETF or Gold Exchange Traded Fund

Gold Exchange Traded Funds or Gold ETFs are open-ended mutual fund schemes that will invest the money collected from investors in standard gold bullion of 99.5 per cent purity. ETFs are traded on the cash market of the NSE and can be bought and sold at market prices like any other financial instrument. One Gold ETF unit is equal to 1 gram gold. So, it gives you dual benefit of stock trading as well as gold investments. Gold EFTs suit conservative investors who wish to diversify their portfolio with some exposure to gold. As the price of gold rises, the value of Gold ETFs too increases and vice versa. Any person having a demat account can buy Gold ETF. However, a nominal amount will be deducted for brokerage during the transaction.

Gold ETFs are supported by physical gold as security at the back-end. For instance, when you buy a Gold ETF, the person or the entity at the back-end is actually purchasing gold. They give guarantee to the investors about the purity of gold too. For instance, Gold BeES are registered on NSE. They strictly follow the latest market cost of gold called spot prices. NSE allots an 'Authorized Participant or Member' to handle the purchase and sale of gold to generate ETFs. They are generally large companies. Hence, constant trading and control by 'Authorized Members' ensures that cost of the gold and ETFs remains the same.

The features of Gold ETFs are given below:

- Flexibility and liquidity-You can purchase the gold ETFs online and keep it in your Demat account. The investor can sell it during a trading session at the current price.
- Transparency- Gold ETF investors can use the National Stock Exchange platform to keep transactions and trade transparent. Therefore, it is absolutely safe.

- Collateral security-The investor can also use it as a security for secured loans.
- Cost-effective -Golf ETFs do not have designing or making charges like gold (ornaments or bars).
- Risk factors- Like any equity fund, the Net Asset Value of a Gold ETF can go up or down as per the market trends.

Table 3 : Physical Gold versus Gold ETFs

Points of Difference	Physical Gold	Gold ETFs
Liquidity	Idle wealth	It is an investment
Safety	Must store away safely	No need to store and no risk
Cost	Expense in connection with buying and selling is higher	Fund management expense is lower
Pricing	It varies from jeweller to jeweller.	Priced as per international standards and are always transparent.
Demat Account	Demat account is not required.	compulsorily needs a Demat account
Making charges	Making charges applicable on gold ornaments	No making charges

Real Estate Investments

The real estate market offers a high return to the investors. The word real estate means land and buildings. The population growth and the exodus of people towards the urban cities have made the prices to increase manifold. Real estate investing is the purchase, lease, or sale of land and any structures on it for the purpose of

earning money. Real estate investments can be classified into three categories: residential, commercial, and industrial.

Real estate continues to be an attractive investment option because of the following reasons:

(i) High capital appreciation compared to gold or silver particularly in the urban area.

(ii) Loans for the construction of houses are readily available since 3 percent of the loans of commercial banks are earmarked for this purpose.

(iii) Both interest and principal repayment of housing loans are eligible for deduction under Income Tax Act which in turn reduces the tax liability of investor.

There are a multitude of ways to invest in real estate with any amount of money, time commitment, and investment horizon. There are two strategies for real estate investment - active and passive investments.

Active real estate investing requires a great deal of knowledge. The following are the investment options:

(i) **House-Flipping-** Here an investor purchases a home, makes changes and renovations to improve its value on the market, and then sells it a higher price. Another property-flipping option is wholesaling. Wholesaling is when an investor signs a contract to buy a property that they believe is under-priced and then sells it quickly to another investor at a higher price for a profit.

(ii) **Rental Properties-** Property owners earn regular cash flow usually on a monthly basis in the form of rental payment from tenants. The responsibility for rent collection, property maintenance, repairs, evictions, record-keeping for the properties can be done by the investor himself or entrust the task to a property management company for a fixed or percentage fee.

Despite its advantages, real estate investments are not free from the following limitations:

(i) **Higher transaction cost-** stamp duty (on an average it is 7% in India, though variation in rate differ between state to state), registration free @1% for registering the property and brokerage are the major cost associated with purchase of real estate.

(ii) **Low liquidity** – Real estate investments cannot be quickly sold and hence may be treated as illiquid investment.

(iii) **Management and maintenance-** For maintaining the property, taxes to local authorities like property tax and land tax, maintenance cost of property, salary to managers, insurance charges etc. have to be incurred.

(iv) **Market inefficiencies-** Investment in real estate is based on minimal information regarding property value and strength of market which are subject to fluctuations. Likewise, fluctuating demographics and economic conditions may cause volatility in rental income.

(v) **Huge amount-** Investment in real estate involves huge amount of money which may create a great deal of financial and legal liabilities.

9.3. Security and Non-Security Investments

A Security Investment is freely transferable and saleable. It also includes the risk of loss in value. Security investments includes all money market instruments like Treasury Bills, Commercial papers, certificate of deposit and capital market instruments like equity shares, preference shares and debentures.

Under non-security Investments, the document issued as evidence of the investment cannot be transferred from one party to another party. The payment of these can be claimed only the original holder or in the event of death of the original holder, his legal successors can claim the payment. Non-security investments include life insurance, bank deposits, post office deposits, mutual fund schemes and schemes of NBF etc. Unlike Security investments, Non-Security investments do not need the backing of a bank or of an underwriter. It involves much less documentation and paper-work when compared to Security investments

9.4. Direct and Indirect Investment

Under direct investing, investors buy and sell financial assets and manage individual investment portfolio themselves. Consequently, investors take all the risk and their successful investing depends on their understanding of financial markets, its fluctuations and on their abilities to analyse and to evaluate the investments and to manage their investment portfolio.

If investors are buying or selling financial instruments through financial intermediaries it is known as indirect investing. Eg. Mutual funds, Pension fund, Provident fund, Insurance etc. The individual investors have no control over the amount invested. Indirect investing relieves investors from making decisions about their portfolio. The risk for investor using indirect investing depends on the credibility of chosen institution and the professionalism of portfolio managers.

Securities market is a component of the wider financial market where securities can be bought and sold between parties, on the basis of demand and supply. Securities markets encompasses equity markets, bond markets and derivatives markets where prices can be determined and participants both professional and non-professionals can meet. Securities markets can

be split into two levels. Primary markets, where new securities are issued and secondary markets where existing securities can be bought and sold. Secondary markets can further be split into organised exchanges, such as stock exchanges and over-the-counter where individual parties come together and buy or sell securities directly. Another classification of securities market is on the basis of the tenure of the securities. Such a classification has two markets- Capital market and Money market. Capital market is the market for long term securities or funds while money market is the market for short term funds or securities. Although Stock market is a part of Capital Market, in practice the terms capital market, securities market and stock market are used interchangeably.

2.1.2 Market Segments

The Securities Market has two inter-dependent and inseparable segments, the new issues (primary) market and the stock (secondary) market. The primary market provides the channel for creation and sale of new securities, while the secondary market deals in securities previously issued.

a. Primary Market

The issuer of securities sells the securities in the primary market to raise funds for investment and/or to discharge some obligation. In other words, the market wherein resources are mobilised by public limited companies or government agencies through issue of new securities is called the primary market. It enables the corporate entities, public sector institutions and the government to raise resources through issuance of debt and equity based instruments. These resources may be required for new projects as well as for existing projects with a view to expansion, modernisation, diversification and upgradation. These resources are mobilized through either of the following two routes:

i. *Public issue* where anyone and everyone from the public is eligible to subscribe for the issue. IPO is the most common way for companies to raise capital in the primary market.

ii. *Private placement* where only a selected group of people can subscribe to the issue.

In addition, the primary market also provides an exit opportunity to private equity and venture capitalists by allowing them to offload their stake to the public.

The Primary Market holds great significance to the economy of a country. It is through this market that funds flow for productive

purposes from investors to entrepreneurs. The latter use the funds for creating new products and rendering services to customers. The primary market creates and offers the merchandise for the secondary market.

TABLE 2.2 CAPITAL RAISED FROM THE PRIMARY MARKET THROUGH PUBLIC AND RIGHTS ISSUE

Year	2014-15		2015-16		2016-17		2017-18		Apr-Aug 2018	
	No. of Issues	Amount (Rs. Crore)	No. of Issues	Amount (Rs. Crore)	No. of Issues	Amount (Rs. Crore)	No. of Issues	Amount (Rs. Crore)	No. of Issues	Amount (Rs. Crore)
Category Wise										
Public issue	70	12,453	95	48,928	121	58,433	207	88,740	72	31,953
Rights issue	18	6,750	13	9,239	12	3,415	21	21,400	4	1,127
Total	88	19,202	108	58,167	133	61,848	228	1,10,140	76	33,080
Issue Type										
Listed	42	15,892	34	43,351	28	32,753	29	26,366	11	22,176
IPO	46	3,311	74	14,815	105	29,095	199	83,774	65	10,904
Total	88	19,202	108	58,167	133	61,848	228	1,10,140	76	33,080

Source : SEBI

b. Secondary Market

The secondary market is the market for sale or purchase of already issued securities. A well functioning secondary market is a prerequisite for the growth of primary market. An efficient secondary market provides the much needed liquidity and marketability in financial system. The secondary market enables those who hold securities to adjust their holdings in response to changes in their assessment of risk and return. Investors also sell securities for cash to meet their liquidity needs. The price signals, which subsume all information about the issuer and his business including, associated risk, generated in the secondary market, help the primary market in allocation of funds.

Secondary market essentially operates through two mediums:

i. **Over the counter (OTC) market** - This market is informal and trades are negotiated here. Most of the trades in government securities take place in this market. Further, all the spot trades where securities are traded for immediate delivery and payment occur in OTC market.

ii. **Exchange traded market** - Stock exchanges provide platform for purchase and sale of securities by investors. The stock market

ensures free marketability, negotiability and price discharge. All the trades taking place over a trading cycle (day=T) are settled after a certain time T+ 1 Days). The trades executed are cleared and settled by a clearing corporation.

A variant of the secondary market is the Derivatives Market where the securities are traded for future delivery and payment.

As discussed in chapter 1, security analysis is the process of analyzing available securities in terms of return, risk and other salient characteristics. It also covers the aspect of security valuation wherein we calculate the theoretical or fair price or intrinsic value of a security. Equity analysis is the analysis of equity shares in terms of return and risk.

5.1 APPROACHES TO SECURITY ANALYSIS

Behaviour of stock prices is an important area of research in finance. A plethora of research studies have shown share price movements for developed as well as developing countries since the decade of 1960's. The stock market provides the market price of a share or "What the price is". It is the price at which a share can be bought or sold. However a prospective investor as well as an existing shareholder is interested more in knowing "What the price should be" or "What is the real worth of a share", so that a 'buy' or 'sell' decision can be made. In a bid to answer this question and

predict share price, the following three approaches to security valuation have evolved over the years.

1. **Fundamental Analysis :** It is based on the premise that in the long run true or fair value of an equity share is equal to its intrinsic value. The intrinsic value of a share is the present value of all future expected cash inflows from the share. If the intrinsic value is greater than current price of the share, the share is underpriced and hence a good buy. On the other hand, if intrinsic value is less than current price of the share, it is over priced and hence a good 'sell'. The future expected cash inflows from a share depends upon a wide array of factors including company's performance and future prospects. Fundamental analysis is used primarily to identify securities that are mispriced i.e. that are undervalued or overvalued. However fundamental analyst needs to be equipped with certain financial and statistical skills in order to perform it. Fundamental analysis is dealt in detail later in this chapter.

2. **Technical Analysis :** Technical analysis is based on the premise that 'history repeats itself'. Hence future price movements can be well predicted on the basis of past price and volume data. Technical analysts are therefore called "chartists" because they study various charts and patterns to predict "What the price should be". Technical analysis is done on the basis of trend analysis of past prices. Technical analysis is used primarily to time the market i.e. in identifying the right time to buy or sell. It must be noted that technical analysis predicts future prices over a short period of time and hence may not be useful for a long term investor who just want to buy and hold the securities. Technical analysis is dealt in detail in Chapter 6.

3. **Efficient Market Hypothesis (EMH) :** The proponents of EMH, led by Eugene Fama in 1970, believe that share prices at any time reflect their true intrinsic value and hence all available information is already reflected in market price of a share. It is the flow of new information which changes share price. However the extent to which information is reflected in security prices and the speed of adjustment determines what is called the level of market efficiency. Fama (1970) has suggested three levels of market efficiency depending upon the extent to which information is reflected in share prices.

   (i) Weak form
   (ii) Semi-strong form
   (iii) Strong form

Details about Efficient Market Hypothesis are provided in Chapter 7.

5.2 FUNDAMENTAL ANALYSIS

Fundamental analysis is based on the premise that in the long run true or fair value of an equity share is equal to its intrinsic value. The intrinsic value of an asset is the present value of all expected future cash inflows (or earnings) from that asset. In case of an equity share it will be equal to the present value all expected future earnings (in the form of dividend, capital gain etc.) from that share because equity shares have infinite life. The expected earnings from an equity share depend upon a variety of economy wide, industry wide and company specific factors. Therefore fundamental analysis involves in-depth analysis of all possible factors having a bearing on company's profitability and future prospects and hence on share price (theoretical or fair price).

Fundamental analysts forecast, among other things, future level of the economy's GDP, future sales and earnings of a large number of industries and earnings of a large number of companies. Eventually such forecasts are converged to estimate the expected cash inflows from the shares of these companies. There can be two approaches to fundamental analysis - Top down approach and Bottom up approach.

Top down approach : With this approach the financial analysts are first involved in making forecasts for the economy, then for the industries and finally for the companies. The industry forecasts are based on the forecasts of the economy. Further a company's forecasts are based on the forecasts of the economy as well as the concerned industry.

Bottom up approach: In case of bottom up approach, fundamental analysts forecast the prospects of the companies first, then for the industries and in the last forecast for the economy. Such bottom up forecasting may unknowingly involve inconsistent assumptions. Forecasts of the economy is of no use if it is done after company forecasts because ultimately it is the expected cash inflows from the company's share that will be used in finding out the intrinsic value of a share.

Hence in practice, Top down approach is widely used to perform Fundamental analysis.

The various factors of interest in fundamental analysis can be broadly classified into three categories – economy wide factors, Industry wide factors and Company wide factors. Hence we have

1. Economic Analysis
2. Industry Analysis
3. Company Analysis

This top-down approach of fundamental analysis is also referred to as E-I-C- framework, where E implies economy, I implies industry and C implies company level analysis.

Investment Decision Making using Fundamental Analysis

Once we have forecasts about the profitability of a company and make an estimate of the futures cash inflows from a security or share, we calculate intrinsic value of the security or share and compare it with the market price. If the intrinsic value is more than current market price of share then the share is underpriced and hence an investor should buy it. On the other hand if intrinsic value is less than current price, the share is over priced and hence, the holder of the share should sell it and a prospective investor should not buy it.

5.3 EIC FRAMEWORK

As explained above EIC framework is the Top down approach of Fundamental analysis wherein an analyst makes a forecast about the economy wide factors first and then performs Industry analysis and finally Company level analysis. This three level analysis covers a wide range of various economy wide, industry wide and company- wide factors as discussed below:

5.3.1 Economic Analysis

Before performing industry level analysis and firm level analysis and forecasting its dividends and earnings it is important to analyze the broad economic environment in which it operates.

Economic analysis is the study of various economy wide factors influencing stock market viz. Gross Domestic Product (GDP) growth rate, inflation rate, interest rate, exchange rate, balance of payment, fiscal deficit and budgetary provisions, infrastructure etc. An important aspect of economic analysis now a days is the political environment especially in an emerging market like India. Political stability is a necessary requirement for stable and growing financial market of that country. Further, issues such as corruption, law and order, economic policies etc. are of pertinent use for economic analysis.

Economic analysis is a useful tool to understand the general direction of the economy and deciding about the right time to invest. This is particularly done by large and institutional investors whose portfolio comprises of securities from across a number of countries. Conducive macroeconomic environment leads to bullish and/or stable stock market while negative economic outlook affects stock prices adversely. Various economy wide factors analysed in economic analysis are explained below :

(i) **GDP Growth Rate :** Gross domestic product (GDP) is the total value of goods and services produced in an economy during a given period. Growth rate in GDP is an important indicator of the overall state of the economy. Therefore fund managers and institutional investors carefully examine GDP growth rates before deciding about the countries where investment is intended. As per National Bureau of Economic Research (NBER) of USA, two successive quarter decline in GDP growth rate signals a recession in the economy. On the other hand improvement in GDP growth rates indicates improving economic conditions. Index of Industrial Production (IIP) is another important source of manufacturing activity in an economy. Fundamental analysts are interested in understanding whether the overall business and economic condition in the economy will be in terms of boom or recession. If there is optimism and boom as shown by GDP growth rate and IIP then that presents a right time to invest in growing companies.

(ii) **Inflation :** Inflation erodes purchasing power of money and therefore in times of inflation nominal return does not reflect true or real earnings from an asset. Mounting inflation in some of the developing countries, including India, is one of the reasons for low level of investment. Increase in inflation rates also adversely affects product demand and hence corporate profitability declines in general.

(iii) **Interest Rates :** Term structure of interest rate in an economy affects capital investment and hence income level. Higher interest rate is a symbol of tight monetary policy and increases cost of borrowing which in turn lowers investment and business expansion. Thus interest rates are negatively related with stock performance in an economy.

(iv) **External Sector :** Foreign trade sector or external sector of an economy is an important factor to analyse in this era of globalization. External sector of an economy can be examined with the help of balance of payment (BOP) account which is a statement of receipts and payments of a given country for the transactions entered into with the rest of the world. These transactions are further classified into current account (for merchandise and services or invisibles) and capital account. A widening current account deficit creates pressure on exchange rate and leads to further deteriorating economic condition.

(v) **Infrastructure :** An economy with sound infrastructure facilities such as power, telecommunication, roads & transport etc. is always preferred by institutional investors. Good infrastructure is necessary for continuous and growing production level.

(vi) **Budgetary Provisions & Fiscal Deficit :** Fiscal health of an economy is an indicator of how well the government manages its receipts and expenditures. An increasingly high fiscal deficit is a cause of concern in India and has adversely affected productive investment by the government. Besides fiscal deficit, a number of budgetary provisions such as tax structure, spending on infrastructure and education and other social welfare schemes also affect stock market. A budget which is conducive to industry (e.g. reduced taxes and tax holidays etc.) is always welcome by the stock market in India.

(vii) **Composition of GDP :** It is not only GDP growth rate but also composition of GDP which is of interest to economic analysts. Here we examine the contribution of agriculture, manufacturing and services sector in overall GDP of the country. India is primarily an agrarian economy but about 50-60% of its total GDP comes from services sector. An year of bad monsoon adversely affects agricultural production, reduces income level especially in rural areas which in turn reduces demand for manufactured goods and services. This adversely affects corporate profitability and depresses stock prices.

(viii) **Employment :** The unemployment rate is the percentage to total labour force which is yet to find jobs. The unemployment rate measures the extent to which an economy is operating at full capacity. High unemployment rate is a sign of contracting economy and hence adversely affects stock performance.

(ix) **Government's Economic Policies :** In order to understand the future direction of economic activity, it is necessary to analyse government's economic policies such as fiscal policy, monetary policy, foreign trade policy, etc. which directly affects an industry's and hence a company's performance. Fiscal policy, especially, tax policy of the government has a direct relationship with personal disposable income and corporate profitability. Monetary policy especially changes in interest rates can influence investment and savings especially in short term. An increase in interest rate, increases cost of production and hence may become counter-productive in an already contracting economy.

Besides above a number of other economic indicators help analyse the state of an economy such as foreign exchange reserves, money supply, bond yields, purchasing manager's index (PMI) etc. Business cycles (Boom and recession) also play an important role in economic analysis.

Economic Forecasting

Analysis of various economy wide factors can be performed using the simple statistical techniques such as trend analysis or sophisticated econometric

modelling. Therefore **economic forecasting can be done using the following three approaches**

i. **Trend analysis** of the basic economic indicators such as GDP growth rate, inflation, interest rate, exchange rate etc.

ii. **Probabilistic forecasting :** Using probability distribution approach the analyst may forecast several economic scenarios along with their respective probability of occurrence.

iii. **Econometric modelling :** An econometric modelling is a statistical model used to forecast the level of certain variables known as endogenous variables. In order to make these forecasts the model uses a number of exogenous or explanatory variables. For example the level of next year's GDP growth rate may be related to the rate of investment and inflation rate.

5.3.2 Industry Analysis

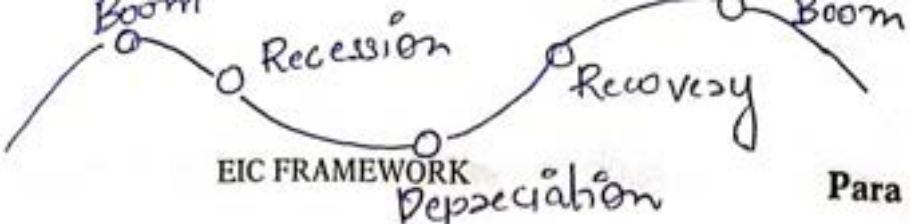
The second stage in equity analysis using EIC framework is industry analysis, which implies study of peculiar features and performance of various industries in an economy. Before deciding about the specific company in which investment is to be done, an investor must get familiar with the nature, performance and prospects of the industry to which that company belongs. Industry analysis is performed on the basis of the analysis for the entire economy. If the economy in general is expected to boom then the overall scenario for all the industries is positive. However the performance of all industries may not be same. Some industries may perform very well and others may not catch up with expected boom in the economy. Different industries have different return and risk profile.

Industry performance is an important determinant of expected earnings and dividends of a company. Industry analysis covers a wide range of factors such as the type of industry, nature of industry product, Industry life cycle, Industry growth rate, govt. policy towards industry and so on. These factors are discussed below:

i. **Nature and Type of Industry :**

Depending upon an industry's response to business cycles, it can be classified as a cyclical industry or defensive industry as explained below :

1. **Cyclical Industries** Industries which are more responsive or sensitive to business cycles are termed as cyclical industries. The performance of cyclical industries varies according to business cycles. During expansion or boom period these industries outperform other industries. Examples of cyclical industries are



consumer durables, automobiles, capital goods, construction etc. Because purchases of these goods can be deferred during a recession, sales are particularly sensitive to economic conditions. Therefore sales of these industries decline faster than other industries and thus they bear the brunt of a slow down.

ii) **Defensive Industries** : In contrast to cyclical industries, defensive industries growth rates are less sensitive to business cycle. These are the industries producing goods and services, sales of which are least sensitive to the state of the economy. Examples of defensive industries include pharmaceutical, food products, education, public utilities etc. These industries outperform other industries when recession starts in an economy.

eg :-

Whether the industry is cyclical or defensive, it is important to analyse certain features of the industry. These features are crucial for proper assessment and forecasts related to earnings and dividends at the company level.

2) **Industry Life Cycle** : Industries can also be classified on the basis of their stage in industry life cycle viz. start up stage, growth stage, maturity stage and declining growth stage.

(i) **Start up Stage** : This stage is usually characterized by the introduction of a new product or technology such as smartphones. At this stage it is difficult to predict which firm will emerge as the market leader because every firm tries to capture largest market share. At the firm level profit margins are relatively low and demand is uncertain. However at the industry level, This phase witnesses rapid and increasing growth because of growing demand for new product. In India the market for smartphones is growing more rapidly than that of T.V. or refrigerator. Industries in start up stage although promise higher return but are also very risky in nature.

P(↓)

Demand (uncertain)

(ii) **Growth Stage** : This is also referred to as consolidation stage due to stable growth in the industry. Due to stable growth companies may enjoy higher profits and therefore companies in growth stage industries promise higher return to the investors. At the end of growth stage, the product becomes very much commonly used and the growth rate starts declining although positive. Industries in growth stage are lucrative investment options. With consistently growing returns at relatively low level of risk.

H(↑)

Returns (↑)

(iii) **Maturity Stage** : During maturity stage also the product demand grows but at a decreasing rate. At the end of this stage the industry reaches a saturation point when the demand for the product reaches its maximum and stops growing. This stage is also characterized by stable returns but investors prefer to exit once an industry reaches to the maturity stage.

(iv) **Declining Stage** Industries during this stage face decline in product sales and hence negative growth rate. The profitability of all companies, in general, decline once the industry reaches this stage. Examples of industries in declining stage in India at present include – conventional cell phones, color T.Vs, two-wheelers etc. These products have been replaced by their substitutes such as smart phones, LCD & LED TVs and low cost cars.

3. Nature of Product of the Industry

The nature of the product of the industry has a bearing on its growth and profitability. If the product is seasonal and agricultural e.g. sugar, its growth rate will depend on monsoon in a particular year. Similarly if the product is not an end-product rather used as material or input in other industries then the growth rate of such an industry depends upon the growth in industry where such a product is used. For example growth and profitability of spare parts industry depends upon automobile industry.

4. Nature of Competition

It is important to understand the nature of competition in an industry, whether perfect competition, monopolistic, oligopoly or monopoly. Companies in an industry with perfect competition have least profitability as compared to a company in monopoly industry. For example IT industry in India has monopolistic competition.

5. Industrial Policy of the Government

Government's policy towards a particular industry also affects its growth prospects and hence performance. Since 1991, Government of India has followed liberalization and privatization policy allowing private and foreign companies in a number of industries dominated by public sectors such as banking, insurance and retail industries. This led to stiff competition as well as improvement in efficiency of good companies in these industries. Further, there are a few industries which enjoy tax exemptions and/or special subsidies such as biotechnology, oil and gas etc. Government also protects small and

cottage industries by procuring their products and providing subsidies. This leads to growth of micro and small enterprises in India.

6. Labour Conditions and Trade Union

In case of labour intensive industries such as agriculture, mining and construction it is important to analyse labour conditions, availability of cheap labour, and how strong is the trade union, if any. Industries with organized labour or trade unions may face difficult times during worker-management conflict. Especially in India trade unions are very strong in banking and automobile industries, which at times lead to disruption in production/operation when a nation-wide strike is announced. For example Maruti Ltd. has to lock out its Manesar plant following stiff protest by the trade union in year 2012.

7. Traditional vs. New Economy Industries

Industries may also be classified as being traditional (such as FMCG, Construction, Capital goods etc.) and new economy industries (such as IT, telecommunication, financial services etc.). Return from companies in traditional industries is low but consistent while from new economy industries return is relatively high but volatile.

In order to analyse risk-return aspects of various industries in India, an investor may examine the performance of following sectoral indices of BSE or NSE.

(*i*) Bankex – Banking Index

(*ii*) Petro index

(*iii*) Pharma-index

(*iv*) IT-index

5.3.3 Company Analysis

At the bottom of EIC framework analysis is company level analysis. Company analysis is the study of various characteristics of a company regarding its operating and financial performance and future prospects. Once an investor decides to invest in a particular industry on the basis of economic and industry analysis, it is important to select the company or companies in which investment is to be made. For example, if an investor decides to invest in IT industry, the next step is to decide in which company Infosys, Wipro, HCL, TCS etc.

In fact the estimation of future dividends and earnings from a company depends upon its past performance and managerial competence. Such an estimate is made within the broad framework of economy wide and industry analysis. The outcome of the Company analysis is expected future

cash inflow from the share of that company which is used in determination of the intrinsic value of the share of that company. The intrinsic value of the share is then compared with the prevailing market price to find out whether the share is undervalued or overvalued. If the share of a company is available in the market at a price less than its true intrinsic value then it is said that the share is undervalued. Hence a prospective investor should purchase it. On the other hand if the share of a company is available in the market at a price more than its true intrinsic value then it is said that the share is overvalued. Hence a prospective investor should not purchase it. Rather, if an investor already holds such a share, it should be sold.

The intrinsic value of a company depends upon the amount of dividends and growth rate, which in turn depends upon the amount of earnings. Hence analysis of earnings of the company is of utmost importance in case of company analysis.

There are various sources for collecting necessary data for company analysis. The company level data is primarily collected from the annual financial statements of the company such as

- Balance sheet
- Income statement
- Cash flow statement
- Notes to financial statements
- Auditor's report
- Social and sustainability reports, if any
- Corporate governance reports

(1) Financial Ratio Analysis
(2) Mngt & Corp Governance
(3) Product diff & Innovations

Company analysis covers the following parameters of study: financial ratio analysis especially earnings analysis, analysis of company management and corporate governance, analysis of product differentiation and innovations.

(1) Financial Ratio Analysis

Financial ratio or accounting ratio is based on the historical performance of the company. These ratios can be calculated using balance sheet and income statement data. It covers analysis of profitability, liquidity, solvency and efficiency level of a company.

(i) Earnings analysis or Profitability

Past profitability of a company is a good indicator of its future prospects. Earnings analysis is an important component of company analysis because future cash inflows from an equity share depends to a great extent on the earnings of the company. A company's overall profitability may be analysed

using operating profit margin, return on capital employment (ROCE), Return on Asset (ROA), Return on Investment (ROI), net profit margin etc. In Indian companies announce quarterly financial results and announcement regarding earnings or net profits is the most sought after news in stock market. Some of the important earnings measures are explained below:

a. **Return on Equity (ROE) :** Return on equity is that part of total earnings of the company which belongs to equity shareholders. It is calculated by dividing profit after tax and preference dividend by the amount of equity shareholders' funds or net worth.

$$\text{Return on Equity} = \frac{\textit{PAT–Preference dividend}}{\textit{Equity Shareholders funds}} \times 100$$

$$\text{Return on equity} = \frac{\textit{PAT–Preference dividend}}{\textit{Net worth}} \times 100$$

Return on equity indicates whether equity shareholders are getting adequate return on their funds or not. Return on equity is higher than return on investment if the company is profitable and uses debt. Equity shareholders are more interested in analyzing return on equity rather than the overall profitability of the company because that is what matters to them.

b. **Earnings per share (EPS) :** Earnings per share is calculated by dividing the amount of profit after tax and preference dividends by the total number of outstanding equity shares of the company. Hence it shows how much amount is earned per equity share of the company. It is easy to understand than any other ratio and is widely reported in news and media. An increasing EPS shows the relative strength of the company.

$$\text{Earning per share} = \frac{\textit{PAT–Preference dividend}}{\textit{Number of equity shares}}$$

On the basis of the past trend analysis of EPS a fundamental analyst may very well forecast its future or expected EPS which can be used in the valuation of equity shares. The earnings multiplier approach of equity valuation determines the fair price of an equity share as the multiplication of Price earnings ratio and expected EPS of the company.

Price Earnings Ratio (P/E) Analysis of price earnings ratio or P/E ratio, as we popularly call it, is an important ingredient of company analysis. P/E ratio is calculated by dividing market price per share by the EPS.

$$\text{Price Earnings Ratio} = \frac{\textit{Market price per share}}{\textit{EPS}}$$

P/E ratio indicates the relative valuation of the share of a company in stock market. A high P/E ratio implies that the market is optimistic about the growth of the company and hence is paying a premium or high price to buy the share. However a very high P/E ratio of a company's share may also mean that the shares are overpriced in the market. On the other hand low P/E ratio implies that the market is pessimistic about the earnings potential of the company and hence the shares of the company are being traded at relatively low price. It may also mean that the stocks are underpriced in the market. Hence some investor prefer to buy stocks with low P/E ratio as they believe that they are undervalued.

Book Equity to Market Equity Ratio (BE/ME): A related valuation ratio is Book equity to Market Equity ratio. It is calculated by dividing the Book Value of Equity share by the Market price.

$$\text{BE/ME Ratio} = \frac{\textit{Book value per share}}{\textit{Market price per share}}$$

It must be noted that book value per share is Net asset value per share. BE/ME ratio indicates the relative valuation of the share of a company in stock market. A high BE/ME ratio implies that the market is pessimistic about the growth rates of the company and hence its shares are being traded at a low price in the market. However a very high P/E ratio of a company's share may also mean that the shares are underpriced in the market. Stocks with high BE/ME ratio are considered as Value stocks. On the other hand low BE/ME ratio implies that the market is optimistic about the earnings potential and growth of the company and hence the shares of the company are being traded at relatively high price in the market. It may also mean that the stocks are overpriced in the market. Low BE/ME ratio stocks are called Glamour Stocks or Growth stocks. Hence some investor prefer to

buy stocks with high BE/ME ratio as they believe that they are undervalued. Fama French (1992) have shown that high BE/ME ratio stocks outperform low BE/ME ratio stocks in the market.

Growth rate in Earnings Another important aspect of company analysis is to forecast growth rate of the company. Growth rates can be calculated for assets, sales, turnover as well as earnings. For equity valuation and analysis, growth rate in earnings is of prime importance. A forecast about the future growth rate of earnings of a company can be made on the basis of trend analysis of historical or past EPS or by using some regression analysis. For example if the earnings per share of a company have grown from Rs. 10 to Rs. 20.11 over the period of five years then it implies that the compound growth rate in the earnings of the company is 15% p.a.

Dividend Policy of the company Generally, the total amount of earnings are not distributed as dividends. A part of the earnings is distributed as dividends and a part is retained in the company for further investment. Once the earnings have been analysed it is important to analyse the dividend policy of the company so as to arrive at a fair valuation of equity shares. Dividend policy of a company may also vary over time. Dividend policy comprises of the following three important and related measures-

i. Dividend per share
ii. Dividend payout ratio
iii. Growth rate in dividends

Dividend per share (DPS) is calculated by dividing total amount of dividend by the number of equity shares.

$$DPS = \frac{Total\ profits\ distributed}{Number\ of\ equity\ shares}$$

The amount of dividend per share shows the actual cash inflows from the equity shares. Hence it is an important input in calculating intrinsic value of a share.

Dividend payout ratio is the ratio which shows how much proportion (or %) of the total earnings is distributed as dividends. It is calculated by dividing the Dividend per

share by Earnings per share. It can also be calculate by dividing total amount of dividends by the total Earnings.

$$\text{Dividend Payout Ratio} = \frac{\textit{Dividend per share}}{\textit{Earnings per shares}}$$

Some companies have high payout ratio while others have low payout ratio.

Growth rate in dividends is the rate at which dividends have been growing or are expected to grow in future. Growth rate is used to determine the amount of expected future dividends from the share. If dividend payout ratio is same then growth rate in earnings and growth rate in dividends will be same.

(ii) Liquidity

An important factor affecting the payment of dividends is liquidity of a company. Sufficient liquidity is a pre-condition for dividend payment and hence liquidity analysis is important in company analysis. Liquidity can be assessed using current ratio or quick ratio (acid test ratio) of a company. Current ratio is calculated by dividing the amount of current assets by the amount of current liabilities. Ideal current ratio in a manufacturing company is 2. For the calculation of quick ratio we divide quick assets by current liabilities. Quick assets are cash, marketable securities and accounts receivables. Ideal quick ratio in a company is 1. At times companies are forced to declare bankruptcy due to lack of liquidity.

$$\text{Current ratio} = \frac{\textit{Current Assets}}{\textit{Current Liabilities}}$$

2 : 1

$$\text{Quick ratio} = \frac{\textit{Cash} + \textit{Marketable securities} + \textit{Accounts Receivables}}{\textit{Current Liabilities}}$$

(iii) Long Term Solvency

Besides liquidity analysis, it is important to assess long term solvency of a company. It can be done with the help of Debt-equity ratio or capital gearing ratio. A high level of debt-equity ratio over the past years, makes a company more vulnerable and increases the probability of financial distress. On the other hand a very low level of debt equity ratio implies that the company is not using its debt capacity so as to increase return on equity. Degree of Financial leverage indicates the extent of financial risk in a company.

(iv) Operating Efficiency

The operating efficiency of a company can be assessed with the help of various turnover ratios such as – Stock turnover ratio, debtors turnover ratio, working capital turnover etc. An increase in turnover ratios over the years is a sign of improved operating efficiency in a company.

I. Assets Turnover Ratio = Net sales/Average Assets

II. Working Capital Turnover Ratio = Net sales/Average Working Capital → How effectively company uses available fund to streamline production of G&S.

(v) Operating and Financial Leverage (Business risk and Financial Risk) (cost) (Debt)

Before investing in a company it is important to analyse its operating and financial leverage which results in operating and financial risks respectively. Operating leverage arises due to the presence of fixed operating costs (e.g. rent, depreciation etc.) in the cost structure of a company. Higher amount of operating costs increases the chance of not meeting fixed cost obligations in bad times or when the sales decline. The degree of operating leverage can be calculated as below :

$$\text{Degree of operating leverage} = \frac{\text{\% Change in EBIT}}{\text{\% Change in Sales}}$$ (↑) → O. Risk (↑)

The higher degree of operating leverage, the greater is the operating risk of the company.

Financial leverage, on the other hand, measures the level of financial risk in a company. It arises due to the presence of fixed financial costs in costs structure of a company i.e. the use of debt-capital. The degree of financial leverage can be calculated as given below :

$$\text{Degree of Financial leverage} = \frac{\text{\% Change in EPS}}{\text{\% Change in EBIT}}.$$ (↑) → F.R (↑)

The higher degree of financial leverage, the greater will be financial risk of the company. At times, when operating profits of the company are declining, it leads to adverse impact on earnings per share and hence shareholder's return.

(2) Management and Corporate Governance

It is important to examine the managerial competence and corporate governance in a company. A highly profitable company may not be a good company to invest if its management is not competent and corporate governance standards are not adequate. For example the

share price of Satyam Ltd., which was one of the most profitable IT companies in India till the year 2008, declined significantly after the report of management fraud and bad corporate governance in January 2009. Investors must ensure that the companies in which they are investing have competent, efficiency and professional management which follow all corporate governance norms.

(3) Product Differentiation and Innovations

USP (unique selling point)

Two companies may sell same product (such as detergent) but the company which differentiates its product from other products available in the market and engages itself in product innovations is a good investment option. Further, creation of brand also helps a company in reaping higher profits.

Besides above it is necessary to analyse production and marketing strategies of a company and its future plans regarding expansion, mergers and acquisitions etc. All these help in estimating company's earnings and hence dividends to the shareholders.

8.2.1 Discounted Cash Flow Models/Dividend Discount Models

As the name suggests, these models calculate the value of an equity share as the total present value of all future expected cash inflows. The present value is calculated using some appropriate discount rate or required rate of return on equity (Ke). This is the minimum required rate of return from the viewpoint of the prospective investor. The intrinsic value of the share is also termed as its theoretical value of fair price. It must be noted that the intrinsic value of the equity share implies "What the price should be" and NOT "What the price actually is". The actual market price may be different from intrinsic value of the share giving rise to investible opportunities. If market price is lower than the intrinsic value of a share then the share is undervalued or underpriced in the market. Such a share is a good buy. Hence an investor should invest in a share for which intrinsic value > market price.

MP < IV
↓
undervalued
(Buy / Invest)

On the other hand if market price is higher than the intrinsic value of a share then the share is overvalued or overpriced in the market. Such a share is a not a good buy. Hence an investor should not invest in a share for which intrinsic value < market price. Rather if an investor already holds such a share, it should be immediately sold.

MP > IV
↳ overvalued
(Sell).

There can be two cases under DCF technique for valuation of an equity share:

(a) **When holding period is pre decided or finite**

An investor may decide to hold the share for a specified period of time and hence would be selling it at some price at the end of his investment period. For the sake of simplicity here we can assume that the expected dividends every year and selling price at the end of holding period can be estimated in advance.

(i) **One year holding period**

When an investor wants to hold the share only for one year and tries to determine its fair price, he needs to make an estimate of the year-end dividend and selling price. Given these two, the fair value can be calculated by using discounting rate (i.e. required rate of return from equity shares).

The formula for equity valuation when we know the year end dividend and selling price is :

$$P_0 = \frac{D_1 + P_1}{1 + K_e} \quad \text{.....(8.1)}$$

where P_0 = Present value of share (fair price)

D_1 = Expected year end dividend

P_1 = Expected year end selling price

K_e = The required rate of return from equity investment

$$P_0 = \frac{D_1}{(1+K)^1} + \frac{D_2}{(1+K)^2} + \cdots \frac{D_n}{(1+K)^n} + \frac{S_n}{(1+K)^n}$$

Therefore the fair price of this equity share is Rs.111. The investor should buy it at the current price of Rs.100.

(ii) Multiple Years Holding Period

Where; D = Dividend
S = S.P
K = Expected Rate of return

The above formula given in (8.1) can be extended to the case of multiple years holding period. In such a case we need to calculate the total of present value of all expected future dividends and at the end of the holding period expected selling price. The formula is:

$$P_0 = \sum_{t=1}^{n} \frac{D_t}{(1+K_3)^t} + \frac{P_n}{(1+K_e)^n} \quad \text{.....(8.2)}$$

where P_0 = Present value of share

D_t = Expected dividend in year t

K_e = The required rate of return from equity investment

P_n = Expected selling price at the end of year n.

n = holding-period in years

If dividends are constant we can use present value annuity factor. In such a case Equation (8.2) can be written as:

$$Po = D(PVFA_{Ken}) + Pn(PVF_{Ken}) \quad \text{.....(8.2A)}$$

(b) Dividend Capitalisation Model [also referred to as Dividend Discount Model (DDM)]

In real life there is no definite holding period of common stocks (or shares) and given the 'going concern' concept of a perpetual company we may assume that the life of equity shares is also infinite or perpetual. Since holding period is not defined we do not make an estimate of the expected selling price. Rather in such a case the shares are valued on the basis of expected dividends throughout the life of the company/equity shares. This makes the series of expected dividends infinite. Hence **the future cash inflows from equity shares is nothing but an infinite stream of dividends**. We need to calculate their total present value to arrive at the intrinsic value or fair price of the share. However dividends may or may not be same throughout, due to various reasons such as, growth of company, market conditions, investment requirements or change in dividend policy. It may be expected that the dividends are constant as the company follows a constant rupee dividend policy or they are growing at a constant rate or they are fluctuating or having multiple growth rates.

Depending upon growth forecasts we may have four such cases:

(i) No growth in dividends (Constant Rupee Dividends)

When the company is expected to provide same amount of rupee dividend year after year, it is said to have been following a constant dividend policy. In such a case the investor will receive same amount of dividend every year for an infinite period. Hence this becomes a perpetuity. Therefore the present value of dividends for such an infinite period will be calculated as below :

$$P_0 = \frac{D_1}{(1+K_e)^1} + \frac{D_2}{(1+K_e)^2} + \frac{D_3}{(1+K_e)^3} - - - \infty$$

Since $D_1 = D_2 = D_3 = D$ & so on

$$P_0 = \frac{D_1}{1+K_e} + \frac{D_1}{(1+K_e)^2} + \frac{D_1}{(1+K_e)^3} - - - \infty$$

$$P_0 = \frac{D_1 / 1+K_e}{1 - \frac{1}{1+K_e}} = \frac{D_1}{K_e}$$

$\therefore$ Intrinsic Value is $P_0 = \frac{D_1}{K_e}$ .....(8.3)

(ii) Constant growth rate in dividends

It is hard to assume in reality that the company will follow constant rupee dividend policy throughout its life. In reality, majority of the companies provide for growing dividends. If we assume that dividends would grow at a constant rate (g) forever, we would have the following stream of dividend

Year	Dividend
1	D_1
2	$D_1(1+g)$
3	$D_1(1+g)^2$
4	$D_1(1+g)^3$
:	:
:	:
α	α

This series will continue upto infinity. Now in order to calculate intrinsic value, we need to calculate present values of all these dividends. Therefore

$$P_0 = \frac{D_1}{1+K_e} + \frac{D_1(1+g)}{(1+K_e)^2} + \frac{D_1(1+g)}{(1+K_e)^3} - - - \infty$$

$$P_0 = \frac{D_1 / 1+K_e}{1-(1+g)/1+K_e}$$

$D_0(1+g)$

OR

Hence Intrinsic value is $P_0 = \frac{D_1}{K_e - g}$ .....(8.4)

$P_0 = \frac{D_0(1+g)}{k-g}$

where P_0 = Intrinsic value or fair price or theoretical price

D_1 = expected dividend at the end of year 1

g = Constant growth rate in dividend

K_e = Required rate of return on equity

(iii) Multi period growth rate model

A more realistic assumption about growth in dividends is that dividends grow at a higher rate during a few years before assuming a normal growth rate for the rest of its life. We may have two-stage growth model wherein dividends grow at a higher rate (g_1) for first few years before growing at the normal rate (g) beyond that period. In such a case the intrinsic value will be calculated as below :

$$P_0 = \left[\frac{D_1}{1+K_e} + \frac{D_2}{(1+K_e)^2} - - - \frac{D_n}{(1+K_e)^n}\right] + \frac{D_n(1+g)}{(1+K_e)^{n+1}} + \frac{D_n(1+g)^2}{(1+K_e)^{n+2}} \quad \text{.....}\alpha(8.5)$$

$$P_0 = \left[\frac{D_1}{1+K_e} + \frac{D_2}{(1+K_e)^2} + - - \frac{D_n}{(1+K_e)^n}\right] + \frac{D_n(1+g)}{K_e - g} \times \frac{1}{(1+K_e)^n} \quad \text{.....(8.5A)}$$

Here $D_1 = D_0(1+g_1)$, $D_2 = D_0(1+g_1)^2$ & so on

where P_0 = Intrinsic value of share

D_t = Dividend in year t

n = Number of years of abnormal growth rate

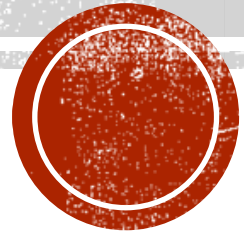
g_1 = Growth rate for first few years

g = Normal growth rate i.e. constant forever beyond first few years

K_e = Required rate of return

Similarly we can have 3-stage or 4-stage models depending upon the number of growth rate forecasts.

MODULE 2 – TECHNICAL ANALYSIS



SIMPLE MOVING AVERAGE ANALYSIS

- It can be used to analysis the movement of entire market as well as individual stock prices.
- 200 days or 53 weeks moving average is the most popular in analysis of market trend.
- A 200 days moving average is calculated as follows:

Step 1 – Add all stock prices for first 200 days and then divide it by 200 to calculate simple average of 200 stock prices.

Step 2 – This average shall be kept in the middle i.e., 100.5^{th} day.

Step 3 – Drop the first stock price and take one more stock price from below and calculate the average stock price of these 200 observations.

Step 4 – The average is placed at the center i.e., 101.5^{th} day.

Step 5 – This process is continued.

BUY OR SELL SIGNAL USING SMA

- The moving average is compared with the index line (stock price line) to buy or sell signals. Two basic rules are –
  - When the market price line cuts the moving average line from below it is a **BUY SIGNAL.**
  - When the market price line cuts the moving average line from above, it implies bearish trend will soon set in. Hence, it is regarded as a **SELL SIGNAL.**

Q. FOLLOWING ARE THE DAILY CLOSING INDEX VALUES OF CNX NIFTY OVER THE PAST 30 DAYS. CALCULATE 7 DAYS AND 4 DAYS MOVING AVERAGE :

Day	Index Value	Day	Index Value
1	7000	16	8150
2	7200	17	8000
3	6900	18	7960
4	7100	19	7865
5	7400	20	7764
6	7500	21	7653
7	7700	22	7539
8	6900	23	7500
9	7300	24	7498
10	7600	25	7640
11	7700	26	7780
12	7800	27	7642
13	8000	28	7534
14	8120	29	7432
15	8200	30	7325

7 DAYS MA

Day	Index Value	7-day SMA	Day	Index Value	7-day SMA
1	7000		16	8150	7817.143
2	7200		17	8000	7938.571
3	6900		18	7960	7995.714
4	7100		19	7865	8032.857
5	7400		20	7764	8042.143
6	7500		21	7653	8008.429
7	7700		22	7539	7941.714
8	6900	7257.143	23	7500	7847.286
9	7300	7242.857	24	7498	7754.429
10	7600	7257.143	25	7640	7682.714
11	7700	7357.143	26	7780	7637
12	7800	7442.857	27	7642	7624.857
13	8000	7500	28	7534	7607.429
14	8120	7571.429	29	7432	7590.429
15	8200	7631.429	30 31	7325	7575.143 7550.143

EXPONENTIAL MOVING AVERAGE (EMA)

- Exponential Moving Average (EMA) is like Simple Moving Average (SMA), measuring trend direction over a period.
- However, SMA simply calculates an average of price data, EMA applies more weight to data that is more current.
- Because of its unique calculation, EMA will follow prices more closely than a corresponding SMA.
- When EMA rises ---- you may want to **consider buying** when prices dip near or just below the EMA (cut from below).
- When EMA falls ---- you may **consider selling** when prices rally towards or just above the EMA (cut from above)

CALCULATION OF EMA

- EMA uses the previous EMA value in its calculation.

$$\mathbf{EMA = Price\ (t) * k + EMA\ (y) * (1 - k)}$$

Where;

t = today

y = yesterday

$k = 2 \div (N + 1)$

N = number of days in EMA

Q: CALCULATE THE EMA USING THE FOLLOWING INFORMATION:

Day	Price	Day	Price
1	60.33	11	57.15
2	59.44	12	57.32
3	59.38	13	57.65
4	59.38	14	56.14
5	59.22	15	55.31
6	59.88	16	55.86
7	59.55	17	54.92
8	59.50	18	53.74
9	58.66	19	54.80
10	59.05	20	54.86

Day	Price	Previous EMA	10-day EMA	Day	Price	Previous EMA	10-day EMA
1	60.33			11	57.15	59.439	59.023
2	59.44			12	57.32	59.023	58.713
3	59.38			13	57.65	58.713	58.520
4	59.38			14	56.14	58.520	58.087
5	59.22			15	55.31	58.087	57.582
6	59.88			16	55.86	57.582	57.269
7	59.55			17	54.92	57.269	56.842
8	59.50			18	53.74	56.842	56.278
9	58.66			19	54.80	56.278	56.009
10	59.05		59.439	20	54.86	56.009	55.800

EMA = Price (t) * k + EMA (y) * (1 – k)

N = 10

k = 2 ÷ (N + 1) = 2 ÷ (10 + 1) = 0.181

EMA (11th day):

Price (t) = Price on 11th day = 57.15

EMA (y) = 59.439 (first EMA shall be SMA)

So, EMA (11th day) = 57.15 * 0.181 + 59.439 (1 – 0.181) = 10.343 + 48.680 = **59.023**

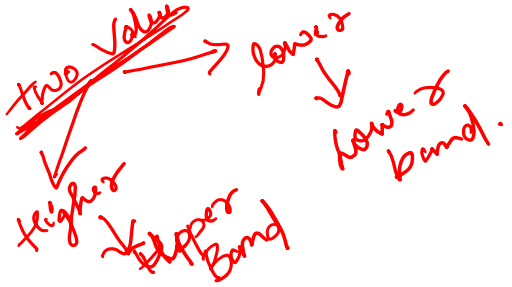
EMA (12th day):

Price (t) = price on 12th day = 57.32

EMA (y) = 59.023

So, EMA (12th day) = 57.32 * 0.181 + 59.023 (1 – 0.181) = 10.374 + 48.339 = **58.713**

OSCILLATORS



- Oscillators are momentum indicators use in technical analysis whose fluctuations are **bounded by some upper and lower band.**
- When oscillators value approach these bands, they give overbought or oversold signals to traders.
- Oscillators are usually combined with moving average indicators to signal trends.
- **Most used oscillators** are ***stochastic oscillators, relative strength index (RSI), rate of change (ROC) and money flow (MFI).***
- When investors use oscillators, two values are picked – one shall be higher value and the other being lower value.
- When **oscillators oscillates towards the higher value** – it indicates **overbought** situation. It means the buying volume has been diminishing for several trading days, which means traders may **start to sell their shares**.
- When **oscillators oscillates toward the lower value** – it indicates **oversold situation**. It means has been sold for an extended period and traders may be enticed **to buy it**.
- A technician will rely on oscillators when the charts are not showing a definite trend in either direction.

I. RATE OF CHANGE INDICATORS (ROC)

- The Rate-of-Change (ROC) indicator, which is also referred to as simply Momentum, is a pure **momentum oscillator** that measures the **percent change in price from one period to the next.**
- The ROC calculation compares the current price with the price "n" periods ago.
- When plotted it forms an oscillator that fluctuates above and below the zero line as the Rate-of-Change moves from positive to negative.
- ROC is used in technical analysis set against a zero-level midpoint.
- A **rising ROC above zero** typically **confirms an uptrend** while **falling ROC below zero** indicates a **downtrend**.
- When **price is consolidating**, the ROC will **hover near zero**.

$$\text{ROC} = \frac{\text{Closing Price p} - \text{Closing Price p-n}}{\text{Closing Price p-n}} * 100$$

Where;

Closing Price p = Closing price of most recent period

Closing price p-n = Closing price n periods before most recent period

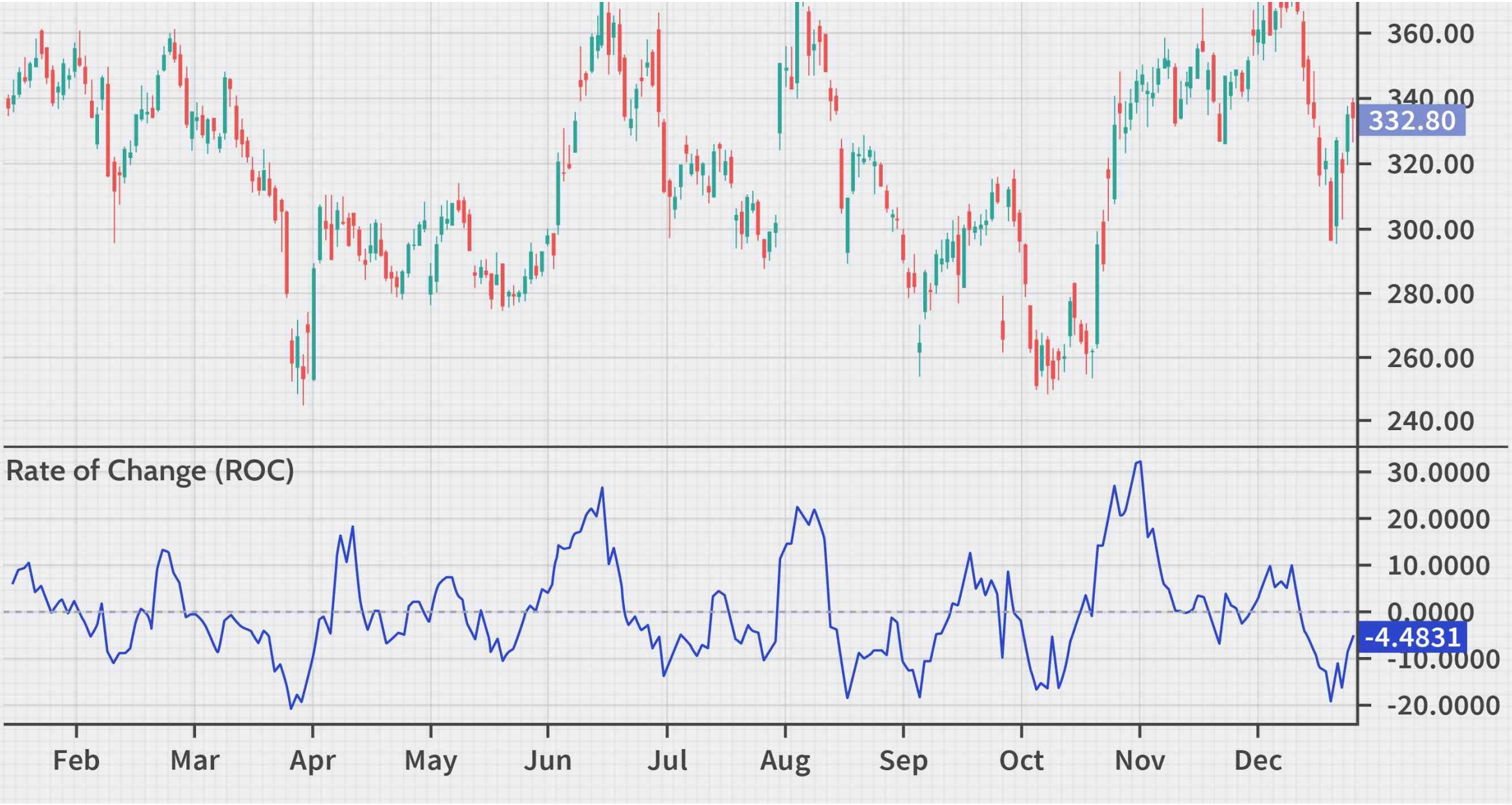
Q: A STOCK'S PRICE AT CLOSE OF TRADING TODAY IS RS 10 AND CLOSING PRICE FIVE TRADING DAYS PRIOR WAS RS. 7, THEN CALCULATE ROC?

$$\text{ROC} = \frac{\text{Closing Price p} - \text{Closing Price p-n}}{\text{Closing Price p-n}} * 100$$

- Closing Price p = 10
- Closing price p-n = 7

$$\text{ROC} = \frac{10 - 7}{7} * 100$$

$$= 3/7 * 100 = \mathbf{42.857}$$


360.00
340.00
332.80
320.00
300.00
280.00
260.00
240.00
Rate of Change (ROC)
30.0000
20.0000
10.0000
0.0000
-4.4831
-10.0000
-20.0000
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

II. RELATIVE STRENGTH INDEX (RSI)

- The Relative Strength Index (RSI), developed by **J. Welles Wilder**, is a momentum oscillator that measures the speed and change of price movements.
- The relative strength index (RSI) is also a **momentum indicator** used in technical analysis that **measures the magnitude of recent price changes** to evaluate overbought or oversold conditions in the price of a stock or other asset.
- The RSI is displayed as an **oscillator** (a line graph that moves between two extremes) and can have a **reading from 0 to 100.**
- The RSI provides technical traders with signals about bullish and bearish price momentum, and it is **often plotted beneath the graph of an asset's price**.
- An asset is usually considered **overbought when the RSI is above 70%** and **oversold when it is below 30%.**

CALCULATING RSI

$$RSI_{(Step1)} = 100 - \left[\frac{100}{1 + \frac{Avg.\ gain}{Avg.\ loss}}\right]$$

- The RSI is computed with a two-part calculation that starts with the following formula:

RSI (step one) = 100 – [100 ÷ (1+Average gain/Average loss)]

The average gain or loss used in the calculation is the average percentage gain or loss during a look-back period. The standard is to use 14 periods to calculate the initial RSI value.

For example, imagine the market closed higher seven out of the past 14 days with an average gain of 1%. The remaining seven days all closed lower with an average loss of –0.8%. The calculation for the first part of the RSI would look like the following expanded calculation:

RSI (step one) = 100 – [100 ÷ 1 + (1%/14)/(0.8%/14)] = 55.55

- Once there are 14 periods of data available, the second part of the RSI formula can be calculated. The second step of the calculation smooths the results.

RSI (step two) = 100 – [100 ÷ 1 + (Previous average gain * 13) + Current gain/ (Previous average loss * 13) + Current loss)]

Using the formulas above, the RSI can be calculated, where the RSI line can then be plotted beneath an asset's price chart.

The RSI will rise as the number and size of positive closes increase, and it will fall as the number and size of losses increase.

$$RSI_{(Step\ two)} = 100 - \left[1 + \frac{100}{\frac{(Previous\ Avg.\ Gain \times 13) + Current\ Gain}{(Previous\ Avg.\ Loss \times 13) + Current\ Loss}} \right]$$


150.00
145.00
140.00
135.00
130.00
125.00
120.00
115.00
80.0000
60.0000
40.0000
20.0000
Overbought > 70%
Oversold < 30%
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov

ON BALANCE VOLUME (OBV)

- On-balance volume (OBV) is a technical trading momentum indicator that uses **volume flow to predict changes in stock price.**
- Joseph Granville first developed the OBV metric, and that volume was the key force behind markets and designed OBV to **project when major moves in the markets would occur based on volume changes.**
- The OBV is a cumulative total of volume (positive and negative). There are three rules implemented when calculating the OBV. They are:

➢ If today's closing price > than yesterday's closing price, then:

Current OBV = Previous OBV + today's volume

➢ If today's closing price < than yesterday's closing price, then:

Current OBV = Previous OBV - today's volume

➢ If today's closing price = yesterday's closing price, then:

Current OBV = Previous OBV

- Granville went on to explain his theory by stating that when volume increased or decreased dramatically without any significant change in the issue's price, then at **some point the price would "spring" upward or downward**.
- Many traders simply use the on-balance volume indicator as a confirming technical indicator of a stock's price trend. For example, when a stock is steadily rising in price, traders monitoring the on-balance volume indicator will expect to see it rising as well.
- For example, if a stock's price continues to rise, but the on-balance volume indicator begins to decline, that may be interpreted that the previous buying momentum in the stock is beginning to wane (decrease). The **stock price may soon peak** and **turn to the downside**.

QUESTION: BELOW IS A LIST OF 10 DAYS' WORTH OF A HYPOTHETICAL STOCK'S CLOSING PRICE AND VOLUME. USING THESE INFORMATION CALCULATE THE OBV:

Day	Closing Price	Volume
1	10	25,200
2	10.15	30,000
3	10.17	25,600
4	10.13	32,000
5	10.11	23,000
6	10.15	40,000
7	10.20	36,000
8	10.20	20,500
9	10.22	23,000
10	10.21	27,500

Day	Closing Price	Volume	Calculations	OBV
1	10	25,200		25,200
2	10.15	30,000	25,200 + 30,000	55,200
3	10.17	25,600	55,200 + 25,600	80,800
4	10.13	32,000	80,800 – 32,000	48,800
5	10.11	23,000	48,800 – 23,000	25,800
6	10.15	40,000	25,800 + 40,000	65,800
7	10.20	36,000	65,800 + 36,000	1,01,800
8	10.20	20,500	Current OBC = Previous OBC	1,01,800
9	10.22	23,000	1,01,800 + 23,000	1,24,800
10	10.21	27,500	1,24,800 – 27,500	97,300

AVERAGE DIRECTIONAL INDEX

- The average directional index (ADX) is a technical analysis indicator **used to determine the strength of a trend.**
- The trend can be either up or down, and this is shown by two accompanying indicators, the **negative directional indicator (-DI)** and the **positive directional indicator (+DI).**
- It was developed by **Welles Wilder.**
- ADX fluctuates from 0 to 100. The **trend has strength when ADX is above 25**; the **trend is weak or the price is trendless when ADX is below 20**, according to Wilder.
- If the +DI line crosses above the -DI line and the ADX is above 20, or ideally above 25, then that is a **potential signal to buy**.
- On the other hand, if the -DI crosses above the +DI, and the ADX is above 20 or 25, then that is an opportunity to enter a **potential short trade** (a trading technique in which an investor sells a security with plans to buy it later anticipating the price of a security will fall in the short term).
- If +DI is higher than -DI, the pressure in price is more upward, indicating a buying signal, and if -DI is higher, the pressure in price is more downward, indicating a selling signal.
- ADX does NOT determine whether the trend is bullish or bearish. Rather, it **merely measures the strength of the current trend.**

ADX VALUES AND IT'S INDICATION

ADX Value	Indication
Rising	Strengthening trend
Falling	Weakening trend
Below 20	Weak trend
Between 20 and 40	Strong trend
Above 40	Extreme trend


Data
EURCHF, Daily - Euro vs Swiss Franc
stuck in a range
strong downtrend!
INDEX
1.5200
1.5100
1.5000
1.4900
1.4800
1.4700
1.4600
ADMI/ADX
ADX < 20
ADX > 50
100.0000
75.0000
50.0000
41.5894
32.2281
7.6203
0.0000
Sep 28
Oct 5
12
19
26
Nov 2
9
16
23
30
Dec 7
14
21
28
Jan 4
11
18
25
Feb 1
8


Data
EURCHF, Daily - Euro vs Swiss Franc
INDEX
1.6300
1.6200
1.6100
1.6000
1.5900
1.5800
ho hum, ranging...
Why, hello there, uptrend!
ADMI/ADX
ADX < 20
ADX > 50
100.0000
75.0000
50.0000
41.5894
32.2281
7.6203
0.0000
Oct 9
16
23
30
Nov 6
13
20
27
Dec 4
11
18
25
Jan 1
8
15
22
29
Feb 5
12
19

Module 3 – Efficient Market Hypothesis

Random Walk Theory

- Random walk theory (hypothesis) is based on the **premise** that **stock prices follow a random walk** i.e., successive changes of prices are random and unpredictable.
- It implies that the successive price changes are unrelated or independent of each other.
- One **cannot predict tomorrows' price** on the basis of **todays or yesterdays' price or past prices.**
- It does not mean that market is irrational. If prices are determined rationally then only the new information will cause them to change.
- So, Random walk would always be **natural result of prices that always reflect full current information.**
- If stock prices are predictable that shows market inefficiency and investors irrationality.

- The random walk model can be given below as:

$$\mathbf{Pt = Pt\text{-}1 + Et}$$

Where;

Pt = Price in period t

Pt-1 = Price in period t-1

Et = A random term which is unpredictable

Efficient Market Hypothesis

- Efficient Market Hypothesis implies that a **security prices reflect all available information** and **adjust rapidly** to the inflow of new information.
- So, a **security prices changes** only in case of **inflow of "new' information.**
- Since inflow of **new information is unpredictable**, security price changes cannot be predicted.
- If new information happens to be good – then security prices will adjust **upward** immediately.
- If new information happens to be bad – then the security prices will adjust **downward** instantly.

- Hence, market efficiency is also concerned with **speed of adjustment** of security prices to new information.
- The notion that the stock prices **fully reflect all available information** is referred to as Efficient Market Hypothesis.
- So, Efficient Market is one which – (a) Stock prices already reflect all available information and (b) Stock prices rapidly (instantly) adjust to all new information.
- **Basic idea of EMH** is that **investors are rational** and demand and supply prevailing in the capital market are such that the prevailing **market price happens to be true worth** or intrinsic value or fair price of the security.
- Market efficiency **requires free flow of information to all** market participants **at the same point of time**. If the information is asymmetry, then security prices will not adjust rapidly in case of new information.

Forms of Market Efficiency

I. Weak Form of Market Efficiency

- In a weak form of market efficiency, **security prices fully reflect all past prices and volume information**.
- This version of market hypothesis states that the trend analysis is useless – one cannot predict tomorrow's price based on previous prices.
- Hence, it assumes that "**Stock prices have no memory**".
- **Successive price** changes are **statistically independent** and hence stock prices follow a random walk and are non-stationary.

Implications of Weak form of Market Efficiency

1) If the market is efficient in weak form – then **technical analysis becomes a useless** exercise. It is not possible to predict future price movements on basis of past price and volume data.

2) Investors may still outperform the market and analyze stocks **using fundamental analysis**. Therefore, publicly available information such as financial statements, company reports, and announcements of important events can be used to earn profit in stock market.

3) Stock **prices behave in random way** i.e., prices follow a random walk.

II. Semi Strong Form

- This is a **second level** or form of market efficiency. In semi strong form, security **prices reflect not only past prices and volume information but also all publicly available information** i.e., all financial and operating information.
- Since security prices are already adjusted for all publicly available information, one cannot outperform the market using such information.
- It implies that besides technical analysis, **even fundamental analysis becomes a fruitless** exercise in semi-strong market.

Implications of Semi-strong Form of Market Efficiency

1) If the market is efficient in semi-strong form, then besides technical analysis, **fundamental analysis also become useless**. The market price of a security is always equal to its intrinsic value as can be calculated using past prices as well as publicly available information.

2) Only those investors or traders **can outperform the market** and earn superior returns who have **access to inside or private information**.

3) Any news, good or bad, **once made public will have an immediate effect on stock prices**. Hence such a news cannot be used to earn to superior returns.

III. Strong Form of Market Efficiency

- This is the highest level of market efficiency. In strong form of market efficiency, security **prices reflect all information be it public or private** (i.e., inside information).
- It means that no one, not even insiders can consistently beat the market or earn superior returns.
- All information about the security is already discounted and reflected in its price.
- It is only the **inflow of "new information"** that can change the security prices.

Implications of EMH

- **No one can outperform** the market on consistent basis over long-term.
- Since there is a **random walk in stock prices**, technical analysis as well as well as fundamental analysis become useless.
- One **cannot yield superior returns** based on trend analysis (technical analysis) or fundamental analysis (EIC analysis).
- Security **prices fully reflect all available information**, therefore, **anytime is a good time to buy or sell.**
- The best investment strategy in an efficient market is "**Passive Investment Strategy**" rather than 'Active Management'.

Passive management implies investment in market portfolio or index funds which does not require analysis of individual securities for selection in portfolio. Active management means analyzing individual securities for stock selection, building up optional portfolio and portfolio rebalancing does not yield any superior gains in an efficient market.

Tests of market Efficiency

The test of market efficiency depends upon which level or form of market efficiency one want to test for. Therefore, these tests have been presented in different heads as per weak form, semi-strong form and strong form of market efficiency.

1. Tests of weak form of market efficiency

- Several statistical tests and techniques are being used by the researchers to test whether the market is weak form efficiency or not.
- The basic idea here is to check whether the stock price follow a random walk i.e., whether successive price changes are unrelated and independent.
- The tests that could be used for same are as follows:
  - Serial Correlation Test (Autocorrelation Test)
  - Filter Rules
  - Runs Test

(1) Serial Correlation Test (Autocorrelation Test) –

- The test checks the presence of serial correlation or autocorrelation in the stock return series.
- Serial correlation measures the degree of association between returns in each period with those in previous period.
- Positive serial correlation means that positive returns tend to follow positive returns and negative returns tend to follow negative returns.
- The presence of serial correlation or auto-correlation in return series implies that the market is weak form inefficient.

(2) **Filter Rules** –

- Weak form of market efficiency requires that the investment strategies based on past price or volume data (i.e., technical analysis) cannot generate above normal returns over a long term.
- Therefore, filter rules test can be performed to check whether market is weak form efficient or not.
- A filter rule is a **filter, usually a percentage** which is used by the trader to initiate a buy or sell decision.
- Normally prices of stocks move within a given range i.e., **support and resistance level**. Based on this **range the filter** is decided.
- Example: If a stock price moves in a range of Rs. 20 to Rs. 40, then a 10% filter may be applied. It means that if the price remains within +/- 10% of the lower and upper price level, no action would be initiated. But when the prices goes beyond this +/- 10%, an action to buy or sell the stock is initiated.
- This way **several 'Buy' and 'Sell' signals are generated using filter rules**. If these filters provide the investors with above normal returns, then it implies that the market is not weak form efficient.

(3) **Runs test** –

- Runs test can be used to **check whether successive price changes are random or predictable.**
- Run is an **uninterrupted sequence of price movements** in the same direction.
- Example: The price series 20,22,23,25 has only one run because prices are moving only in the upward direction. On other hand price series 20,22,23,21,20 has two runs – one up to 23 and then decline to 20.
- Similarly, one can determine the actual number of runs (R) in each series of a stock.
- Then the actual number of runs can be compared with mean or expected number of runs ($\bar{R}$) to check whether the two are significantly different or not.

II. Tests of Semi-strong form of Market Efficiency

- There are two major tests under this which are as follows:

(1) **Event Study Methodology** –

❑ This can be used to **check the announcement effects** of earnings, dividends, mergers, bonus issue, stock splits, etc. on stock prices and returns.

❑ The **date of such announcement** is regarded as the "**Event Day**" and returns are examined prior to and after the event day.

❑ Normally, a test window of +/- 30 days is applied.

❑If **significant abnormal returns are generated** over the period surrounding the event date, then the **market is semi strong form efficient**.

(2) Test for Market Anomalies –

- Many researchers have reported the **presence of various CAPM anomalies** such as size effect, P/E effect, value effect, neglected firm effect, etc.
- Besides above, many other anomalies such as seasonality effect, turn of the year effect, turn of the month effect, holiday effect, day of the week effect, etc. have been documented for developed as well as developing market.
- The presence of these effects or **market anomalies casts doubts on semi-strong form of market efficiency** in these markets because **investors can exploit these effects to earn superior returns.**
- It has been widely accepted that **once an anomaly is detected it gets disappeared over a period** as arbitrage opportunities arise and everybody in the market wants to take advantage of the anomaly. This behavior restores equilibrium and wipes out the anomaly.

III. Test of Strong Form of Market Efficiency

- Although the presence of **strong form of market efficiency** is a **rare phenomenon** even in mature and developed markets, the researchers do test for it.
- One way to test whether the market is strong form efficiency or not is to **examine the return patterns** and **trading behaviors** of corporate management, insiders, stock market specialists and mutual funds or large institutional investors.
- **All the investors are expected** to have **access to superior amount of information and analysis skills** which is not generally available in public domain.
- If these sets of **people can generate significantly higher returns** than the market or general investors, one can conclude that the market is **not strong form efficient.**

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* Portfolio Revision

The act of changing the mix of securities in a portfolio is called 'PORTFOLIO REVISION'.

The process of adding more assets into an existing portfolio (OR) changing the ratio of funds invested → is called 'PORTFOLIO REVISION'.

It involve sale and purchase of assets in an existing portfoli over certain period of time to maximize returns & minimize risk.

* Need for Portfolio Revision

① When individual has some additional money to invest and fel the need to invest more.

② Change in investment / financial goal led to need for portfolio revision.

③ Financial market is subject to risk & uncertainty which might make investor buy or sell off his assets due to fluctuations.

Portfolio Revision Strategies

Active Revision Strategy

→ Involve frequent changes in existing portfolio over a period for max. return and min. risks.

→ It allows to sell & purchase securities on regular basis

Passive Revision Strategy

→ Involve rare change in portfolio only under certain pre-determined rules.
↳ FORMULA PLANS

→ So can bring changes in portfolio as per formula plans only.

* FORMULA PLANS

They are predefined rules & regulations deciding WHEN and HOW MUCH assets an individual can purchase or sell for portfolio revision.

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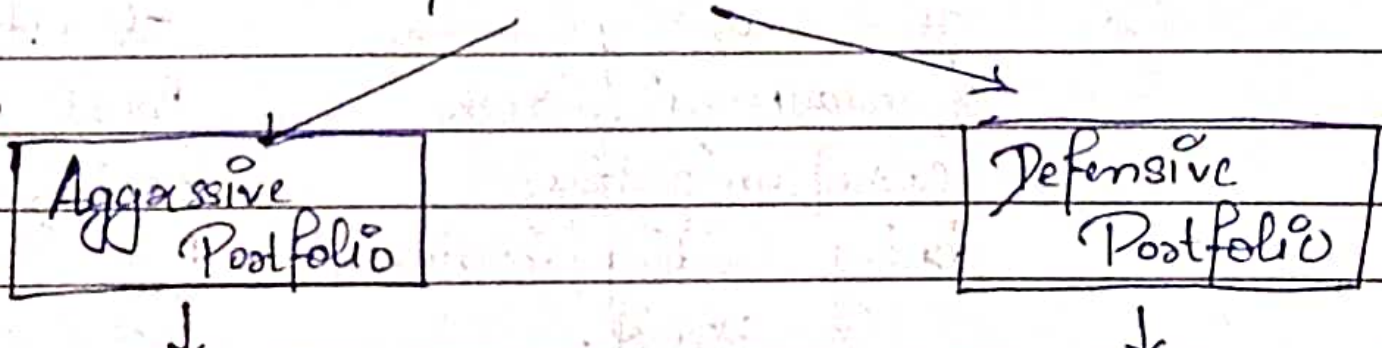
Securities can be purchased or sold only when there are changes / fluctuations in the financial market.

It help investor to make the best possible use of fluctuation in F.M.

↓

One can purchase when prices are less
and
Sell off when prices are higher.

With help of Formula plans Investor can divide his funds and transfer funds from one portfolio to other



↓

It consists of fund that appreciate quickly & guarantee max. return to investor

↓

It consist of securities that do not fluctuate much & remain constant over a period of time

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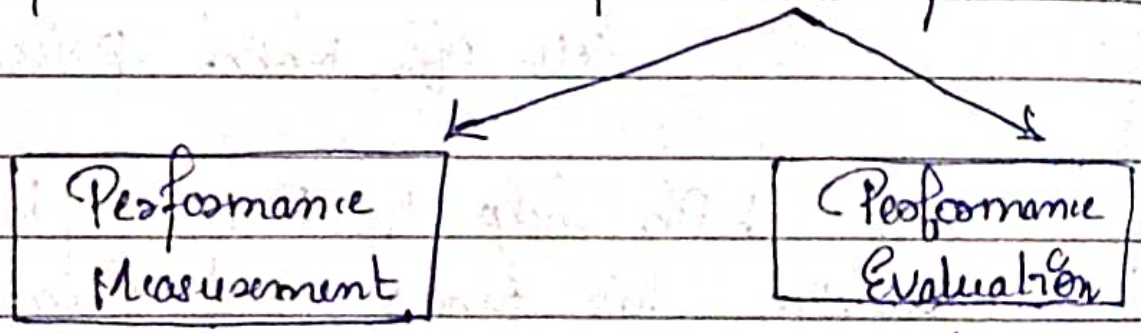
* Portfolio Evaluation

It refers to evaluation of performance of investment portfolio.

It involves comparing the return earned on a portfolio with return earned on one or more other portfolio (OR) benchmark portfolio.

Portfolio Evaluation comprise two functions



↓

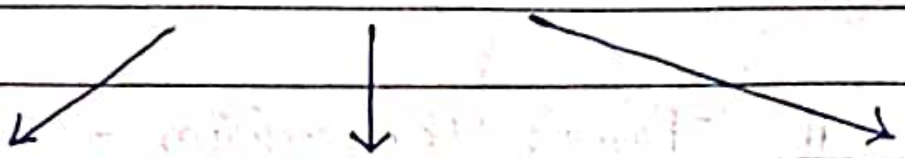
It is accounting function of measuring return earned on portfolio during holding / investment period.

↕

It address issues as whether the performance was superior (or) inferior, whether performance was due to skill / luck etc.

* Fama's Decomposition.

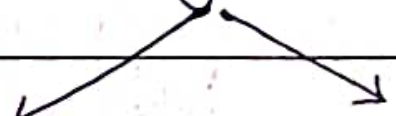
It is a measure that shows how to arrange the fund's realized returns into three components :



① Excess Returns
↓
The return the investor should earn for the risk he/she chose.

② Compensation for Systematic Risk
↓
The additional return for the risk chosen by the manager

③ Return from Selectivity
↓
Return from managers' ability in selecting good securities.



① Diversification
↓
Additional return that compensates portfolio manager for bearing diversifiable risk

② Net Selectivity
↓
Residual performance after accounting diversification.

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I Fama's Decomposition – Risk

↓

Portion / proportion of excess return explained by portfolio beta (β) and market risk premium.

II Fama's Decomposition – Investors' risk

↓

If investor specify a target level of risk, the risk premium can be decomposed

Investor's Risk ← → Manager's Risk

↓

Risk premium earned if portfolio beta (Pβ) exactly equal to target beta.

III Fama's Decomposition – Manager's risk

↓

If manager take different level of risk than target level → Risk premium

↓

due to extra risk that manager took.

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IV Fama's Decomposition - Selectivity

↓

That portio of excess return that is not explained by portfolio beta & market risk premium.

↓

Since it is not explainable by risk - it is due to SUPERIOR SECURITY SELECTION.

V Fama's Decomposition - Diversification

↓

Difference b/w return that should have been earned according to CML and return been earned according to SML

↓

If perfectly diversified - This will be ZERO

VI Fama's Decomposition - Net Selectivity

↓

Residual performance on selectivity after accounting diversification.

↓

Risk premium from → Ability to Select Stock — Substracting Diversification

10.1 PORTFOLIO PERFORMANCE EVALUATION

Once an investor selects a portfolio it is necessary that he evaluates its portfolio periodically so as to achieve his financial goals. If there is no performance evaluation, then it is not necessary that the portfolio is performing as expected. This may be due to various reasons such as changes in the investment environment or unexpected performance of the companies whose securities are held etc. An investor may hold more than one portfolios of assets such as equity portfolio comprising only shares and bond portfolio comprising only bonds. The overall portfolio of an investor is the combination of all these portfolios. Hence it is necessary for every investor to evaluate the performance of various portfolios that he holds. In case of performance evaluation it is necessary to have a benchmark portfolio against which the performance of the portfolio will be evaluated. A benchmark is the standard portfolio which provides minimum performance standards. If the given portfolio performs better than the benchmark portfolio, then the given portfolio is outperformer. On the other hand if the given portfolio performs less than the benchmark portfolio, then the given portfolio is underperformer. There are many methods or techniques for evaluating the performance of portfolios. They are categorised as - Absolute return measure and Risk Adjusted Measures or Methods.

i. **Absolute return measure** In absolute return measure we compare the absolute returns of various portfolios as well as benchmark portfolio. There is no consideration of risk in case of performance evaluation using this measure. Portfolio having highest return is the top performer while the one giving least return is the poorest performer. For example if the returns on two portfolios P and Q are 24% and 17% respectively then portfolio P is a better performer than portfolio Q as per Absolute Return Measure. However the

serious limitation of this measure is that it does not consider risk at all. It compares returns regardless of the underlying risks. If is not acceptable as different portfolios may have differing degrees of risk. For example if the risk of portfolio P is very high say 30% while the risk of Portfolio Q is very low say 5%, then the two portfolios cannot be compared just on the basis of returns. Hence we need some risk adjusted measures to evaluate the performance of portfolios.

ii. **Risk Adjusted Measures** – Risk adjusted measures adjust the return from a portfolio for the underlying risk. These measures are Sharpe ratio (or index), Treynor's Ratio (or index) and Jensen's Alpha. They are discussed below:

10.2 RISK ADJUSTED MEASURES OR TECHNIQUES FOR EVALUATING PERFORMANCE OF PORTFOLIOS

1. Sharpe's measure: (or Sharpe Ratio or Sharpe Index)

William Sharpe developed a composite measure to evaluate the performance of mutual funds. It expresses risk premium (or excess return) of the portfolio in terms of per unit of total risk. The excess return or risk premium is the excess of actual return over the risk free return. Total risk is measured by the standard deviation of the returns from the portfolio. It is also termed as Reward to Volatility ratio. It is calculated as under:

$$SP = \frac{\text{Return of portfolio-Return of risk free investment}}{\text{Standard deviation of Portfolio}} \quad \text{(MRP)} \quad \text{.....(10.1)}$$

$$SP = \frac{Rp-Rf}{\sigma p} \quad \text{.....(10.1A)}$$

Thus Sharpe ratio converts risk premium into risk premium per unit of risk. The higher the Sharpe's ratio, the better it is.

Ranking of portfolios:

When we have to rank the portfolios we give first rank to the one having highest Sharpe ratio and the last rank to the one having lowest Sharpe ratio. Hence ranking of portfolios can be done in the descending order of Sharpe Ratio.

Whether outperformed or Underperformed:

In order to find out whether the portfolio has outperformed or underperformed we need some benchmark portfolio say the market portfolio. If the Sharpe ratio of the given portfolio is higher than the Sharpe ratio of Market portfolio (or any other benchmark portfolio)

$SR_p > SR_{MP}$ → portfolio outperformed

$SR_p < SR_{MP}$ → portfolio underperformed

then, we say that the given portfolio has outperformed the market or is an outperformer. On the other hand if the Sharpe ratio of the given portfolio is lower than the Sharpe ratio of Market portfolio (or any other benchmark portfolio) then, we say that the given portfolio has underperformed the market or is an underperformer.

2. Treynor's measure (or Treynor's ratio)

Another risk adjusted measure is Treynor's ratio. Treynor's measure of portfolio performance, like Sharpe, measures portfolio's risk premium return per unit of risk, but it uses systematic risk as indicated by beta factor. Treynor's ratio (Tp) is calculated as under:

$$Tp = \frac{\text{Return of portfolio-Return of risk free investment}}{\text{Beta of Portfolio}} \quad \text{.....(10.2)}$$

$$Tp = \frac{Rp-Rf}{\beta p} \quad \text{.....(10.2A)}$$

A portfolio with higher Treynor's ratio is considered as a better performer than a portfolio with lesser Treynor's ratio. Hence the higher the Treynor's ratio the better it is.

Ranking of portfolios:

When we have to rank the portfolios we give first rank to the one having highest Treynor's ratio and the last rank to the one having lowest Treynor's ratio. Hence ranking of portfolios can be done in the descending order of Treynor's Ratio.

Whether outperformed or Underperformed:

In order to find out whether the portfolio has outperformed or underperformed we need some benchmark portfolio say the market portfolio. If the Treynor's ratio of the given portfolio is higher than the Treynor's ratio of Market portfolio (or any other benchmark portfolio) then, we say that the given portfolio has outperformed the market or is an outperformer. On the other hand if the Treynor's ratio of the given portfolio is lower than the Treynor's of Market portfolio (or any other benchmark portfolio) then, we say that the given portfolio has underperformed the market or is an underperformer.

It must be noted that the Treynor's ratio of Market portfolio is always equal to its risk premium or excess return. This is because the beta factor of the market portfolio is always one. Hence in the denominator of the formula of Treynor's ratio we have 1.

Can Sharpe Ratio and Treynor's Ratio Give Contradictory Results?

$Tp > T_{MP}$ → outperformed.

$Tp < T_{MP}$ → underperformed.

It must be noted that Sharpe ratio uses total risk while Treynor's ratio uses Systematic risk in the denominator. Total risk comprises of systematic as well as unsystematic risk. If there is no unsystematic risk, especially in case of well and perfectly diversified portfolio, then the total risk and systematic risk will be same and hence Sharpe ratio and Treynor ratio will provide similar results.

However, it is quite possible that the total risk of a portfolio is not equal to its systematic risk only. It may also comprise of unsystematic risk. Especially in case of not so diversified portfolios we find that there is presence of significant amount of unsystematic risk. In such case Sharpe ratio and Treynor ratio may provide contradictory results. This is explained in Illustration 10.1.

3. Jensen's measure (or Jensen's alpha)

Michael Jensen's measure, denoted by α, is also a risk adjusted measure. It is the actual return on the portfolio over and above the CAPM predicted return. It is measured as follows:

α_j = Actual return - Expected Return under CAPM.....(10.3)

It must be noted that the expected return from CAPM is calculated as under

$E(Rp) = Rf + [R_M - Rf]\beta p$.....(10.3A)

It can be observed that Jensen's alpha measures "abnormal return" of a portfolio. The higher the alpha, the better it is. The value of alpha may be positive, zero or negative. When the portfolio provides a return higher than the expected return as per CAPM, the value of Jensen's alpha is positive. When the portfolio provides a return exactly same as expected under CAPM, the value of Jensen's alpha is zero. On the other hand, when the portfolio provides a return lower than the expected return as per CAPM, the value of Jensen's alpha will be negative.

It must be noted that the Jensen's alpha of the market portfolio is always zero. This is because the beta factor of the market portfolio is always 1. Therefore if we put beta of the portfolio as 1 in the equation of CAPM above we get the market return only. Hence actual market return is always same as expected market return and therefore Jensen's alpha of the market portfolio is always zero.

Ranking of portfolios:

When we have to rank the portfolios we give first rank to the one having highest Jensen's alpha and the last rank to the one having

lowest Jensen's alpha. Hence ranking of portfolios can be done in the descending order of Jensen's alpha.

Whether outperformed or Underperformed:

(1) Using Jensen's alpha a portfolio outperforms if Jensen's alpha is positive.

On the other hand if Jensen's alpha is negative the portfolio is said

(2) to be an underperformer.

(3) If Jensen's alpha is zero, then the portfolio is performing as expected

9.1 PORTFOLIO MANAGEMENT PROCESS

A **Portfolio** is basically a collection of assets or securities which are so collected together to reduce the risk. The basic idea behind a portfolio is diversification.

Portfolio management *is the process of construction, revision and evaluation of a portfolio.* The objective of portfolio management is to build a portfolio which gives a return commensurate with the risk profile of the investor. Process of Portfolio Management can be understood with the help of flow chart depicted in Exhibit 9.1 It begins with the analysis of risk and return of individual securities which will form part of the portfolio and hence it is termed as *Security analysis.* Here we analyse all available securities in terms of their return and risk features. Then we build up all possible portfolios comprising these securities and calculate these portfolios' risk and returns. This is termed as *Portfolio analysis.* At the end of this step we have a number of feasible and efficient portfolios to choose from. Next, from these feasible and efficient portfolios we select the optimal portfolio depending upon the risk profile of the individual investor. This step is termed as *Portfolio selection.* Once the optimal portfolio is constructed we need to revise this portfolio due to changes in investment environment or changes in investment objectives. Hence *Portfolio revision* is the next step. Finally, selection and revision of the portfolio is not the ultimate aim. We also need to constantly monitor this portfolio in terms of its valuation and evaluate the portfolio's performance vis a vis some benchmark or other similar portfolios. Hence portfolio management process ends at *Portfolio performance evaluation.* If the portfolio is not performing well then the investor needs to further revise his portfolio or construct a new optimal portfolio to suit his risk return preferences. The portfolio management process is explained below :

Step 1 : Security Analysis: An investor has a large number of available securities which may be used in an infinite number of ways to construct portfolios. These securities vary in terms of their features as well as risk and return characteristics. Traditionally the available securities have been categorised as Fixed income securities such as bonds and debentures and Variable income securities, primarily equity shares. However, now a days a number of innovations in financial markets are giving rise to new and innovative financial instruments. For example now we have ADRs, GDRs, Floating rate

bonds, Asset Linked Bonds, Financial derivatives etc. In security analysis we analyse all available securities in terms of their risk return and related features. There are three approaches to security analysis- Fundamental analysis, Technical analysis and Efficient Market Hypothesis. These three approaches have been dealt with in detail in Chapters 5, 6 and 7. As per *Fundamental Analysis* the value of a security in long term will be equal to its intrinsic value. Intrinsic value of a security is the present value of all future expected cash inflows from the security. Hence we calculate intrinsic value of a security using Economy, Industry and Company wide factors. Once the intrinsic value is calculated, we compare it with the actual market price to find out whether the security is underpriced, overpriced or fairly priced in the market. Securities which are underpriced in the market are a good investment option for a prospective investor. Fundamental analysis makes use of EIC (Economy Industry and Company analysis) Framework to arrive at a reasonable estimate of future cash inflows from a security. Fundamental analysis helps in selecting the right securities. *Technical Analysis* on the other hand is based on the premise that future prices can be predicted on the basis of past trends in prices and volume data. It assumes that History repeats itself. Hence a number of technical indicators and charts are used to predict future direction of prices. Technical analysis helps in timing the market. *Efficient Market Hypothesis* (EMH) implies that the current price of the securities fully reflect all available information. Hence at any time in the market, securities are fairly priced. Security prices change only in case of inflow of new information and new information is completely random. As per EMH, the given market price is the best price to buy or sell. Hence anytime an investor can buy or sell.

Step 2 : Portfolio Analysis and Selection After security analysis, the next step is to analyse possible portfolios of various securities in terms of portfolio returns and risks. It must be noted that a large number of securities virtually give rise to an infinite number of feasible or possible portfolios. However all portfolios may not be efficient. An efficient portfolio is one which provides maximum return for a given level of risk or which has lowest risk for a given level of return. We need to identify such efficient portfolios.

Step 3 : Portfolio Selection : After the identification of efficient portfolios, an investor selects the optimal portfolio which optimises his utility given his risk return preferences. This is known as **portfolio selection**. In order to identify the optimal portfolio, the investor needs to consider his utility scores (in terms of indifference curves) besides the return and risks of efficient portfolios and select that portfolio as optimal portfolio which maximises his utility. Markowitz Model and Capital Market Theory are the building blocks of portfolio selection by a rational investor.

Step 4 : Portfolio Revision It must be noted that portfolio management is not a one time job, it's a continuous process. This is due to the fact that the financial environment in which investment decisions are made is not static but dynamic or ever changing. Changes in investment environment may render an optimal portfolio redundant or inefficient. Hence there is a need to revise the optimal portfolio in the light of changes in capital market, economic and industry wide factors. Further, it is quite possible that with time, the investment objectives of the investor also change. This requires for revision of his existing portfolio to accomplish new investment goals or objectives. Hence portfolio revision is an integral part of portfolio management process.

Step 5 : Portfolio Performance Evaluation It is necessary to evaluate the portfolio in order to ascertain whether it has performed as expected. The evaluation of a portfolio is concerned with assessing the actual return and risk of a portfolio over a specified period. This is important because if portfolios are not evaluated periodically then the investor may not be able to reap the expected returns at desired level of risk. There are a number of methods which can be used to evaluate the performance of portfolios. Popular risk adjusted measures of portfolio performance evaluation are - Sharpe Ratio, Treynor' s ratio, Jensen's alpha, Fama's decomposition ratio etc. These are discussed in detail in Chapter 10. In order to assess the performance of a portfolio it is necessary to evaluate a portfolio's performance by comparing it with some benchmark (or market portfolio). Portfolios which out-perform the benchmark or market portfolio are held. While those which under-perform are either revised or sold by the investor.

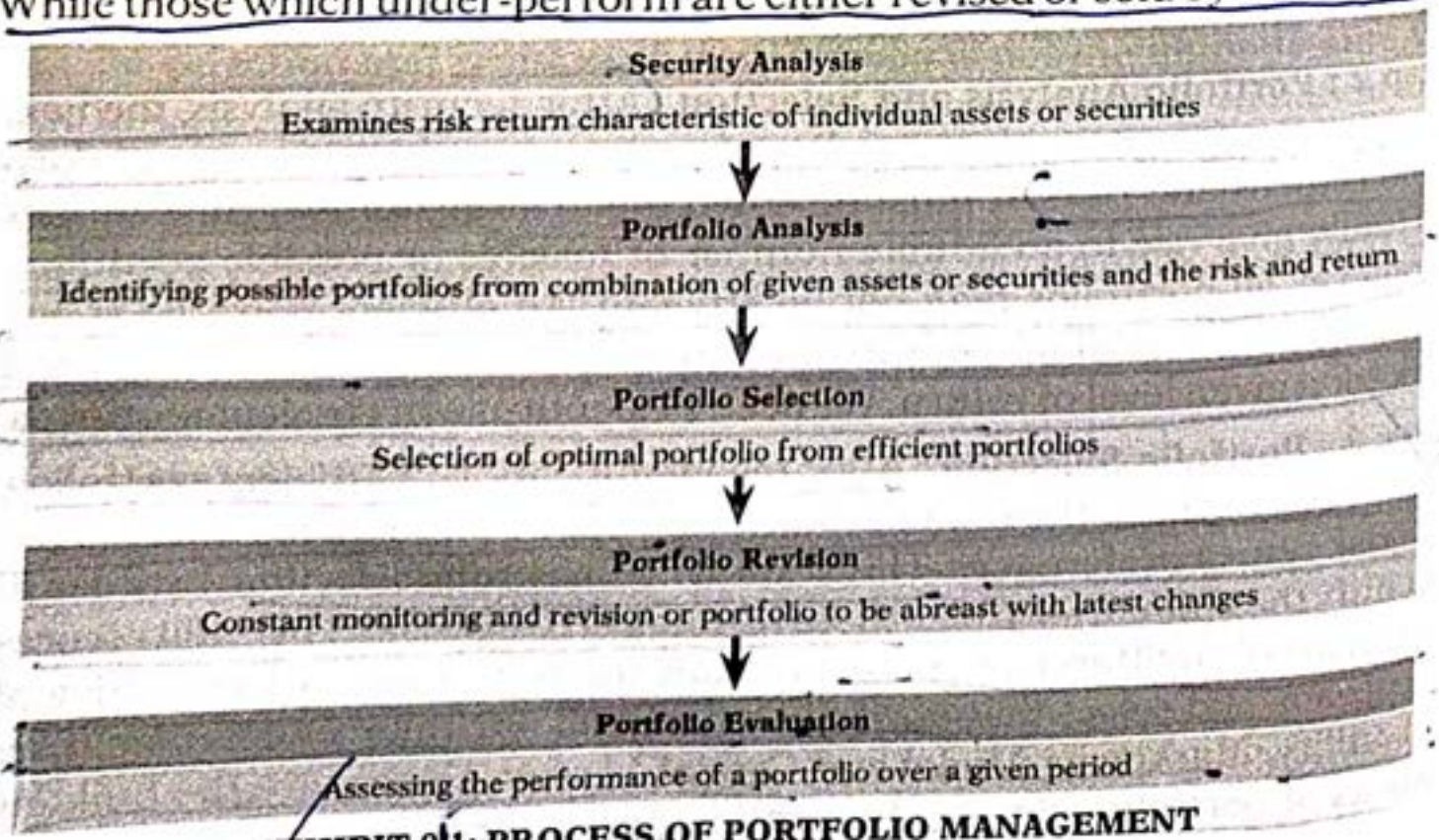


EXHIBIT 9.1: PROCESS OF PORTFOLIO MANAGEMENT

The first step i.e. security analysis is already dealt with in Chapter 4 to Chapter 8, wherein we analysed fixed income securities and equity shares in terms of their valuation aspects (risk and returns). In this chapter we deal with portfolios. Hence the discussion will begin with the analysis of portfolios in terms of portfolio return and portfolio risk. After analysis of portfolios in terms of return and risk we will discuss portfolio selection Models.

9.2 PORTFOLIO ANALYSIS - MARKOWITZ MODEL

Harry Markowitz (1952) provided the foundation for portfolio analysis in terms of return and risk. In fact Markowitz's Portfolio Theory includes portfolio analysis as well as portfolio selection. We will discuss portfolio analysis first and then will resolve the problem of portfolio selection. The underlying assumption in Markowitz model is that investors are risk averse.

9.2.1 Portfolio return

Portfolio return is the weighted average of the returns of the individual assets or securities comprising that portfolio. The weights are the proportion of total funds invested in a particular asset or security. Let us understand the concept with a simple case of two securities portfolio. Suppose an investor can invest his money either in Security A or Security B. The possible returns on these stocks under different market conditions are given below:

Market condition	Probability	Security A (%)	Security B (%)
Good	0.3	22	6
Neutral	0.5	14	10
Bad	0.2	7	11

As you already know the expected rate of return is the sum of the product of possible returns and their respective probabilities. Thus, the expected return on Security A and Security B shall be given by:

$E(R_A) = (0.3 \times 22) + (0.5 \times 14) + (0.2 \times 7) = 15\ \%$

$E(R_B) = (0.3 \times 6) + (0.5 \times 10) + (0.2 \times 11) = 9\ \%$

So, the expected return on an individual security X i.e. $E(R_x)$ can be computed with a generalised formula:

$$E(R_x) = \sum_{i=1}^{n} Ri\ Pi$$

Where,

R_i = return on security X, and

P_i = Probability of ith return.

Now suppose the investor decides to allocate his 50% funds in Security A and 50% in Security B, then what shall be the expected return of portfolio consisting of these two securities? In this case, we need to calculate expected return by using weighted average.

The expected return of portfolio i.e. $E(R_p)$ is the weighted average of the returns of the individual securities comprising that portfolio. It can be calculated as :

$$E(R_p) = \sum_{i=1}^{n} W_i \times E(R_i) \quad \text{.....(9.1)}$$

Where,

$E(R_p)$ = Portfolio return

W_i = Proportion of total funds invested in a particular asset or security i.

R_i = Expected return of asset or security i, and

n = Number of assets or securities in the portfolio.

Let us compute the Portfolio return in our example using equation (9.1)

$E(R_p) = (15 \times 0.5) + (9 \times 0.5) = 12\%$

9.2.2 Portfolio risk

Portfolio risk is the combined risks of the securities comprising that portfolio. It must be noted that every security in the portfolio has a variance (or S.D.) measuring its risk. But we cannot just combine these variances (or individual securities risks) so as to calculate portfolio risk. This is because besides variances, securities in a portfolio also have co-variances i.e. interactive risk. A co-variance between security X and Y captures the tendency of these two securities to move together. Hence portfolio risk is based on not just variances of individual securities but also their covariances.

Portfolio Risk, as measured by standard deviation, is **not** simply the weighted average of the standard deviation of the individual assets or securities. Portfolio risk depends not just on individual risks but also interactive risk (or co-variance). Portfolio risk considers the standard deviation together with the co-variance of returns on these assets or securities. Hence we use variance co-variance matrix to calculate portfolio risk.

Portfolio Risk in a two security case:

For 2-security portfolio, the portfolio risk can be calculated using equation (9.2)

$$\sigma p = \sqrt{W_1^2\sigma_1^2 + W_2^2\sigma_2^2 + 2W_1W_2Cov_{12}} \quad \text{.....(9.2)}$$

Where

W_1 = Proportion of total funds invested security 1

W_2 = Proportion of total funds invested security 2

σ_1 = standard deviation of return of security 1,

σ_2 = standard deviation of return of security 2,

Cov_{12} = co-variance between security 1 and 2

Now we know that co-variance is equal to the product of coefficient of correlation and standard deviation of security 1 and standard deviation of security 2.

$$Cov(12) = \rho_{12}\sigma_1\sigma_2$$

Hence equation (9.2) can be written in terms of Coefficient of correlation as in equation (9.2A)

$$\sigma p = \sqrt{W_1^2\sigma_1^2 + W_2^2\sigma_2^2 + 2W_1W_2\rho_{12}\sigma_1\sigma_2} \quad \text{.....(9.2A)}$$

It must be noted that in case of two securities we have one co-variance. As the number of securities in the portfolio increases, the number of terms on the right-hand side of the equation increases as well, because the number of co-variances also increases. For example in case of three securities we have three co-variances while in case of 5 securities we have 10 co-variances. As the number of securities increases we will have more and more co-variance terms to be used in the calculation of portfolio risk.

Though the portfolio manager has no control over the risk of an individual security, but he does have control over the portfolio components. If he selects two securities such that their returns are totally uncorrelated, then the third term drops out completely and portfolio risk will be lower.

Portfolio risk in case of n securities can be calculated using equation (9.3):

$$\sigma p = \sqrt{\sum_{i=1}^{n}\sum_{j=1}^{n} W_iW_j\rho_{ij}\sigma_i\sigma_j} \quad \text{.....(9.3)}$$

Where,

W_i = Proportion of total funds invested in a particular security i

W_j = Proportion of total funds invested in a particular security j

σ_i = standard deviation of return of security i,

σ_j = standard deviation of return of security j,

ρij = coefficient of correlation between returns of security i and j

n = Number of securities in the portfolio.

The above discussion shows that portfolio risk depends on standard deviation of individual securities as well as on covariances or on coefficient of correlation between the two securities.

The return and risk of a portfolio depends on the following factors :

(i) Proportion of funds to be invested in each security comprising that portfolio.

(ii) The returns of each security

(iii) The risk (or S.D.) of each security

(iv) The covariance between the returns of these securities. Since covariance is equal to the coefficient of correlation multiplied with the product of S.D. of each security, we may say that it depends upon coefficient of correlation.

9.2.3 Limitation of Markowitz Model of Portfolio Analysis

As discussed above portfolio return is based on the returns of individual securities while portfolio risk is based on variances as well as covariances. The number of covariances increases manifold as we increase the number of securities in the portfolio. For analysing 50 securities using Markowitz model of Portfolio Analysis, we need 50 returns, 50 variances and 1225 covariance terms. (it must be noted that the number of covariances will be ${}^{N}C_{2}$). So a total of 1325 bits of data is required to proceed with the analysis or portfolio return and risk.

Therefore the main limitation of Markowitz Model is that it requires substantial amount of input data so as to calculate portfolio return and risk. In case of N securities The data requirement will be as follows: N= Expected returns, N= Variances and N(N-1)/2 Covariances. When we add these we get $(3N+N^2)/2$ items. Total estimate = $2N + N(N-1)/2$

* Relation B/w Covariance and portfolio

Covariance is used in portfolio theory to determine what assets to include in the portfolio.

Covariance → .. Statistical measure of *DIRECTIONAL Relation ship b/w two asset prices.

Modern Portfolio Theory uses it to reduce overall RISK for Portfolio.

POSITIVE COVARIANCE → Assets move in same direction

NEGATIVE COVARIANCE → Assets move in opposite direction

ZERO COVARIANCE → Assets not follow any pattern (OR) no relationship.

CONSTRUCTION OF PORTFOLIO

→ It is important to reduce overall risk

↓

Include assets that have negative COVARIANCE with each other

$$COV_{xy} = \frac{\Sigma(x - \bar{x})(y - \bar{y})}{N}$$

NOTE: 1 If coefficient of correlation given :

$$COV_{xy} = \rho_{xy} \times \sigma_x \times \sigma_y$$

Eg:

Market condition	Prob.	A (%)	B (%)
Good	0.3	22	6
Neutral	0.5	14	10
Bad	0.2	-4	11

$E(R_A) = 15\%$

$E(R_B) = 9\%$

Market condition	Probability (P_1)	Deviations $R_A - E(R_A)$	Deviations $R_B - E(R_B)$	Product
Good	0.3	22 - 15 = (7)	6 - 9 = (-3)	0.3 x 7 x -3 = -6.3
Neutral	0.5	14 - 15 = (-1)	10 - 9 = (1)	-0.5
Bad	0.2	7 - 15 = (-8)	11 - 9 (2)	-3.2
		COVARIANCE		-10

Note: 2 When probabilities of distribution given :→

$$Cov_{xy} = P[(x - \bar{x})(y - \bar{y})]$$

P → Probabilities; $(x - \bar{x})$ → Return of Sec X; $(y - \bar{y})$ → Expected Return of X

* Correlation of coefficient

+ It measure DEGREE and DIRECTION of linear relation b/w 2 variables (securities).

+ It's value range from +1 and -1.

$$\rho_{xy} = \frac{Cov_{xy}}{\sigma_x \sigma_y}$$

Other things being equal, if coefficient of correlation is HIGH → PORTFOLIO RISK (↑)

coefficient of correlation (↓) → PORTFOLIO RISK (↓)

I Coefficient of correlation is +1

↳ Security returns are perfectly positively correlated

↳ (↑)/(↓) in return of one security → exactly some proportionate (↑)/(↓) in another security.

↳ Returns of both security move in tandem.

↳ NO DIVERSIFICATION BENEFIT

↳ There is no interactive risk here

$\therefore \sigma_p = w_1\sigma_1 + w_2\sigma_2$

↳ NAIVE DIVERSIFICATION

II. Coefficient of correlation less than 1 but more than 0

↳ Returns of securities move in same direction but not (↑)/(↓) in same proportion.

↳ Here we can get benefit of diversification.

↓

Diversify UNSYSTEMATIC RISK

↓

CONTROLABLE BY CO.

Eg: Business Risk, Financial Risk

III. Coefficient of correlation = 0

↳ Security returns — unrelated

↳ No relation b/w returns of 2 securities.

↳ It gives HIGER DEGREE OF DIVERSIFICATION

↓

Portfolio risk lower.

IV Coefficient of correlation less than 0 but greater than −1

- Correlation — Negative
- Returns of 2 securities move in OPPOSITE DIRECTION.
- (↑) in return of (A) — (↓) in return of (B)
- Better than all. Such securities — HEDGE ASSET.
- More diversified portfolio & lower portfolio risk than correlation is +ve.

V Coefficient of correlation is −1

- Perfectly negative coeff. of correlation.
- It is possible to completely eliminate risk.
- We have portfolio which has Zero portfolio Risk

Date / /

Zero Risk portfolio

(1) Coefficient of correlation = −1

(2) $w_1 = \frac{\sigma_2}{\sigma_1 + \sigma_2}$

Eg: $r_{AB} = -1$, $\sigma_A = 20\%$ & $\sigma_B = 30\%$
Expected returns = 12% & 18%.

Sol:

$$w_A = \frac{\sigma_B}{\sigma_A + \sigma_B} = \frac{30}{20+30} = 0.60$$

$$w_B = 1 - 0.60 = 0.40.$$

$$COV_{12} = r_{12} \times \sigma_1 \times \sigma_2 = -1 \times 20 \times 30 = -600$$

$$\sigma_p = \sqrt{w_1^2 \sigma_1^2 + w_2 \sigma_2^2 + 2 w_1 w_1 COV_{12}}$$

$$= \sqrt{(0.60)^2 (20)^2 + (0.40)^2 (30)^2 + 2 (0.6)(0.4)(-600)}$$

$$= \sqrt{(0.36 \times 400) + (0.16 \times 900) + 0.48(-600)}$$

$$= \sqrt{144 + 144 + -288}$$

$$= \sqrt{288 - 288}$$

$$= 0$$

RELATIONSHIP BETWEEN COEFFICIENT OF CORRELATION, DIVERSIFICATION AND PORTFOLIO RISK

Coefficient of Correlation	Diversification	Portfolio Risk
+1 i.e. perfectly positive correlation	No Diversification. Only risk averaging	Not reduced. Portfolio risk is weighted average of security risks.
Less than +1 but greater than 0 i.e. positive correlation	Diversification is possible	Portfolio risk will be lower. Hence risk can be reduced
0 i.e. no correlation	Diversification is possible	Portfolio risk will be lower. Hence risk can be reduced
Less than 0 but greater than -1 i.e. negative correlation	Diversification as well as hedging is possible	Portfolio risk will be lower. Hence risk can be reduced
-1 i.e. perfectly negative correlation	Diversification is possible. Perfect hedging is possible	**Portfolio risk will be even lower and can also be Zero. Here portfolio risk can be completely eliminated if $W1 = \sigma 2/(\sigma 1 + \sigma 2)$**

9.3 PORTFOLIO SELECTION

Once we have analysed the portfolios in terms of their risk and returns, the next step in portfolio management process is construction or selection of optimal portfolio. Every investor in the market is risk averse. However investors differ in terms of their attitude towards risk and return i.e. investors have different risk return preferences. Some investors are less risk averse or aggressive. Others are more risk averse or conservative investors. Even in the category of aggressive and conservative investors we may have more aggressive or less aggressive and so on. Depending upon the risk aversion of a particular investor, the same security may provide different utilities or satisfaction to different investors. The main criterion or guiding principle while selecting the optimal portfolio is that it should be a portfolio which provides maximum return for a given level of risk or which has minimum risk for a given level of return. Further, every investor wants to maximise his utility while selecting the optimal portfolio.

The problem of portfolio selection has been dealt in detail by Harry Markowitz (1952) in his Portfolio Theory, which was later extended by Sharpe (1964) in Capital Market Theory. Hence the two theories available to solve the problem of portfolio selection can be studied under the following two headings:

1. Portfolio Theory
2. Capital Market Theory

It must be noted that capital market theory is a major extension of the Portfolio Theory of Markowitz. Portfolio theory is really a description of how rational investors should build efficient portfolios and select the optimal portfolio which maximises their utility.

Capital Market theory simplifies the problem of portfolio selection by introducing a risk free asset in the market. These theories are explained in detail in the following sections.

9.3.1 Portfolio Theory of Harry Markowitz (1952) or Mean Variance Optimisation Model

The seminal work by Harry Markowitz published in a paper titled "Portfolio Selection" in *Journal of Finance* in 1952, sets the foundation for the selection of optimal portfolio by a rational investor. The portfolio theory popularly known as Markowitz Model provides the logical and analytical tool for the selection of an optimal portfolio. This model is based on expected return (i.e. mean) and risk (or variance) and hence it is also termed as Mean Variance Optimisation Model. This model is based on certain assumptions such as

1. Investors are risk averse.
2. Portfolios can be analysed in terms of their risk and return. Portfolio return is the weighted average of the return on individual securities. Portfolio risk is calculated using variance covariance matrix as given in equation 9.3.
3. The decision regarding selection of optimal portfolio by an investor is based only on return and risk.
4. Investors are rational, they attempt to have maximum return for a given risk and minimum risk for a given return.
5. Investors have different risk return preferences i.e. their indifference curves are different.

Using above assumptions the Markowitz Model of portfolio selection can be presented in following three steps.

Step 1: Setting the portfolio opportunity set (or investment opportunity set)

First of all we need to prepare a portfolio opportunity set. Portfolio opportunity set shows the risk and returns of all possible portfolios which can be made from a set of available securities. In case of N securities we can have an infinite number of possible portfolios in which an investor can invest. For example in case of two securities A and B, we can combine these two securities in a number of portfolios by just changing their weights or proportion of funds invested in each. We can have 1% in A and 99% in B, 2% in A and 98% in B and so on. The number of such portfolios will be many. Every portfolio is then analysed in terms of its risk and return. The graphical presentation of these portfolios is termed as Portfolio or Investment Opportunity Set. When the number of securities is three say A, B and C we can have even more possible portfolios because now we can have portfolios of A+ B, B + C, A+ C as well as A+B+C and depending upon their weights these portfolios will be many more in number. In real life we have many securities, hence the portfolio opportunity set comprises of an

infinite number of feasible portfolios which can be constructed using the available securities.

Fig 9.2 shows the Portfolio Opportunity Set in case of N securities. It can be observed that there is a region of portfolio opportunity set in case of N securities. Every point in this region belongs to a particular portfolio. There are many feasible portfolios in which an investor can invest.

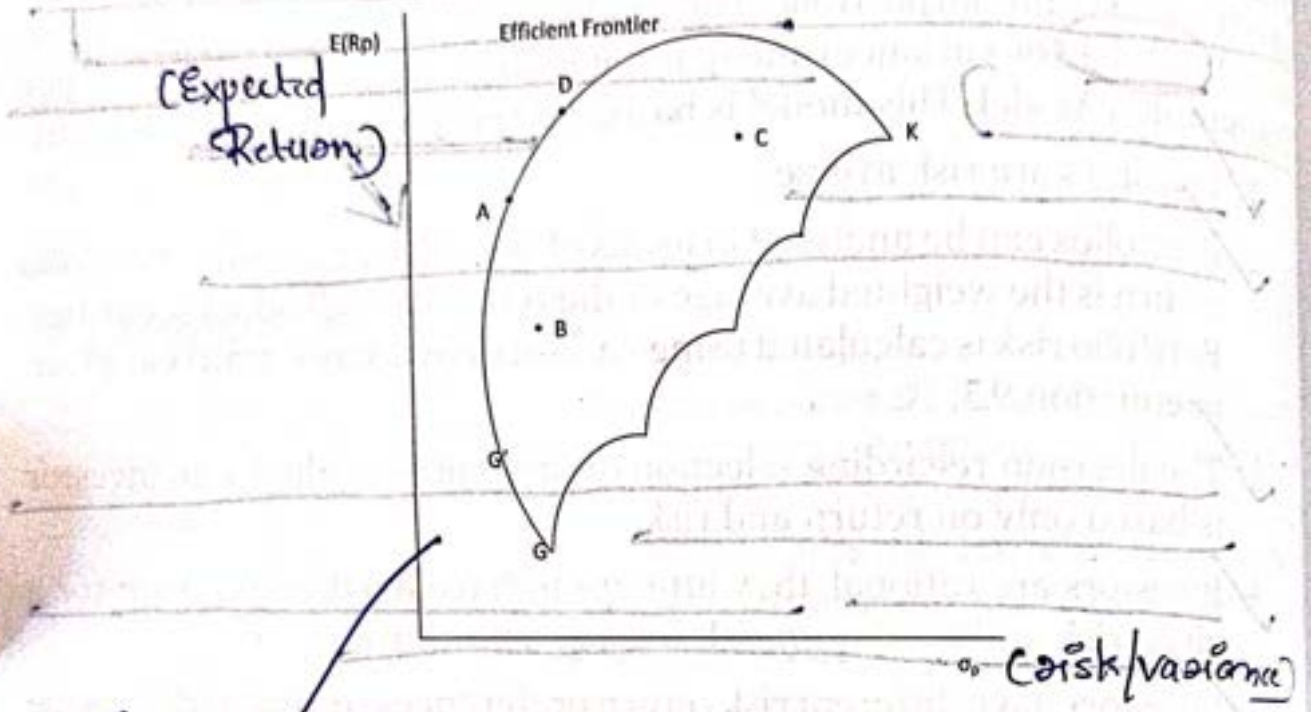


FIG 9.2 : PORTFOLIO OPPORTUNITY SET IN CASE OF N SECURITIES

Step 2 : Determining the Efficient Set of portfolios (i.e. Efficient Frontier):

Once the region of all feasible portfolios has been identified, the next task is to find out those portfolios which are efficient. All feasible portfolios are not efficient. **An efficient portfolio is one (i) which has maximum return for a given level of risk or (ii) which has minimum risk for a given level of return.** As investors are rational they will prefer more return to less return. Further since the investors are risk- averse, they prefer less risk to more risk. Hence given a choice among portfolios having same risk, investors prefer to hold the portfolio with the highest return. On the other hand if the choice is among the portfolios having same return, then the investors will prefer that portfolio which has lowest risk. Here we apply the *Rule of Dominance*. As per the *Rule of Dominance* a portfolio having highest return dominates all other portfolios having same risk. Further a portfolio having lowest risk dominates all other portfolios having same return. As per the rule of dominance we can identify the set of efficient portfolios. In Fig 9.2, it can be seen that portfolio A dominates portfolio B and all other portfolios lying below A. This is because all other portfolios lying below portfolio A provide lower return at the same level of Risk. Hence portfolio A is an efficient portfolio. Similarly portfolio D dominates portfolio C and all other portfolios lying to the right of portfolio D. This is because portfo

lio C and all other portfolios lying to the right of portfolio D, have higher risk than portfolio D but provide same return as provided by portfolio D. Further the portfolios which lie below point G' say in the part G'C are also inefficient because they are dominated by the portfolios in the upper part of G'. We can identify all efficient portfolios in the similar manner. Finally we get the set of efficient portfolios which lie on the curve G'ADK.

This set of efficient portfolios is popularly known as **Efficient Frontier. Thus Efficient frontier is the graphical presentation of all efficient portfolios out of the feasible portfolios**. It must be noted that all efficient portfolios are feasible but all feasible portfolios are not efficient.

Step 3: Constructing Indifference curves of the investor

The Efficient frontier which we derive in step 2 shows all efficient portfolios from which the investor will choose his optimal portfolio. There are many efficient portfolios but optimal portfolio must be one from among these portfolios. As you are aware that investors differ in terms of their risk return preferences. Some investors are more risk averse and some are less risk averse. The more risk averse investor should select an optimal portfolio in the lower region of efficient frontier, while a less risk averse investor should select a portfolio in the upper region of efficient frontier. But efficient frontier alone cannot help an investor to select the optimal portfolio. The basic criterion for the selection of optimal portfolio is that the satisfaction or utility of the investor is maximised. For this we construct Indifference Curves for the investors. As explained in Chapter 3, an indifference curve shows all those combinations of risk and return which generate same utility for an investor. Since all investors are risk averse, the indifference curves of the investor will be upward sloping as shown in Fig 9.3. It must be noted that a less risk averse investor will have rather flatter indifference curves while a more risk averse investor will have steeper indifference curves. But indifference curves for a particular investor cannot intersect. They will be parallel. In Fig 9.3 we constructed three indifference curves for the investor, I_1, I_2 and I_3. The utility on I_3 is highest and on I_1 is lowest. Hence portfolio D provides higher utility than portfolios A,B or C. However on the same indifference curve, the utility derived is same. It implies that the utility of portfolio B is same as that of C. Portfolio B and C provides higher utility that portfolio A.

- More Risk Averse → lower region of efficient Frontier. → IC shall be steeper.
- Less Risk Averse → Upper region of efficient frontier. → IC shall be flatter.

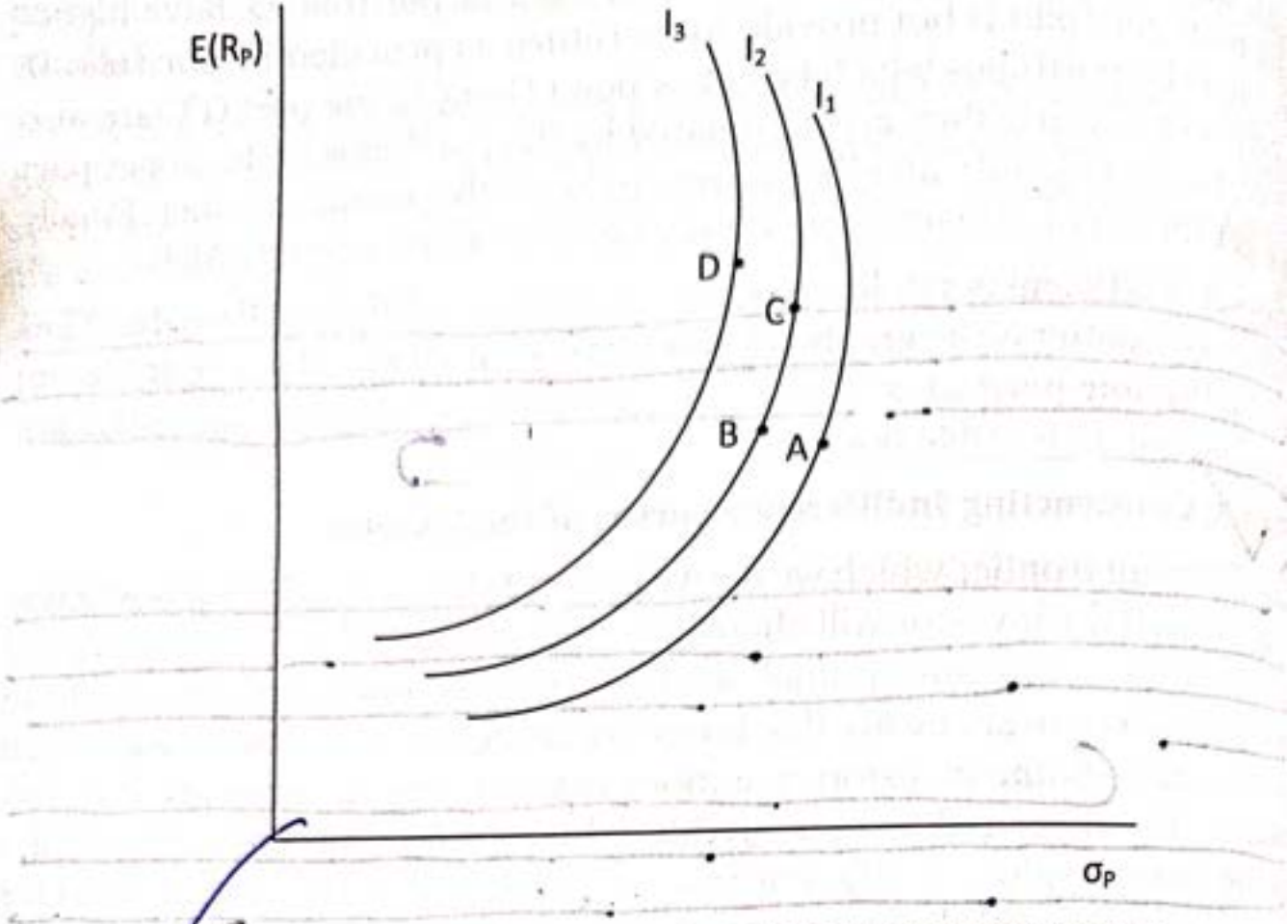


FIG 9.3: INDIFFERENCE CURVES OF A RISK AVERSE INVESTOR

Step 4 : Selecting the optimal portfolio

The last step is the selection of optimal portfolio. Every investor wants to select a portfolio which maximises his utility. Therefore for the selection of optimal portfolio we superimpose Indifference Curves of the investor on the Efficient Frontier. The indifference curves show the utility that an investor derives using different combinations of risk and returns. The higher the indifference curve the greater is the utility. On the same indifference curve utility is same. Efficient frontier shows all efficient portfolios from which the investor has to choose his Best or Optimal Portfolio. Hence selection of the optimal or best portfolio must meet the following two conditions

i. The portfolio is efficient i.e. it must lie on efficient frontier and

ii. The utility of the investor is maximised i.e. it should lie on the highest possible indifference curve.

Fig 9.4 shows this selection process. Here we have superimposed indifference curves I_1, I_2 and I_3, derived in step 3, on the efficient frontier which we derived in step 2. The optimal portfolio is given by point E. i.e. the point of tangency between the efficient frontier and the highest possible indifference curve i.e. I_2. It must be noted that only portfolio E meets the conditions described above. No other portfolio is better than portfolio E. Portfolio P1 and P2 are also efficient but they are on a lower indifference

curve and hence the utility derived from P1 and P2 will be lower than that derived from E. Hence the investor will not select it as the best portfolio. On the other hand portfolio P3 is desired by the investor as it provides higher utility, but it is not attainable as it does not lie on Efficient frontier. Hence the only optimal or Best portfolio is portfolio E. We can now generalise that *the optimal portfolio for an investor under Markowitz model is the point of tangency between the efficient frontier and the highest possible indifference curve.* This also referred to as the point of equilibrium.

It must be noted here that since the indifference curves for different investors will be different, depending upon their degree of risk aversion, we will have as many optimal portfolios of the risky securities as there are number of investors. A more risk averse investor will have steeper indifference curves and hence his optimal portfolio (*i.e.* point of tangency) will be in the lower region of efficient frontier. A less risk averse investor will have more flat indifference curves and hence his optimal portfolio (point of tangency) will lie on the upper region of the efficient frontier.

In Fig 9.4A, the indifference curves for a more risk averse investor (Say Mr. X) are I_1, I_2 and I_3 while for a less risk averse investor (say Mr. Y) the indifference curves are I_5, I_6 and I_7. You can notice that the indifference curves I_1, I_2 and I_3 are steeper than the indifference curves I_4, I_5 and I_6. The optimal portfolio for Mr. X will be E1 and for Mr. Y it will be E2. Similarly every investor will have a unique optimal portfolio which is defined by the point of tangency between his highest possible indifference curve and efficient frontier. There will be as many optimal portfolios as there are number of investors in the market. This is the main limitation of Markowitz Model of portfolio selection.

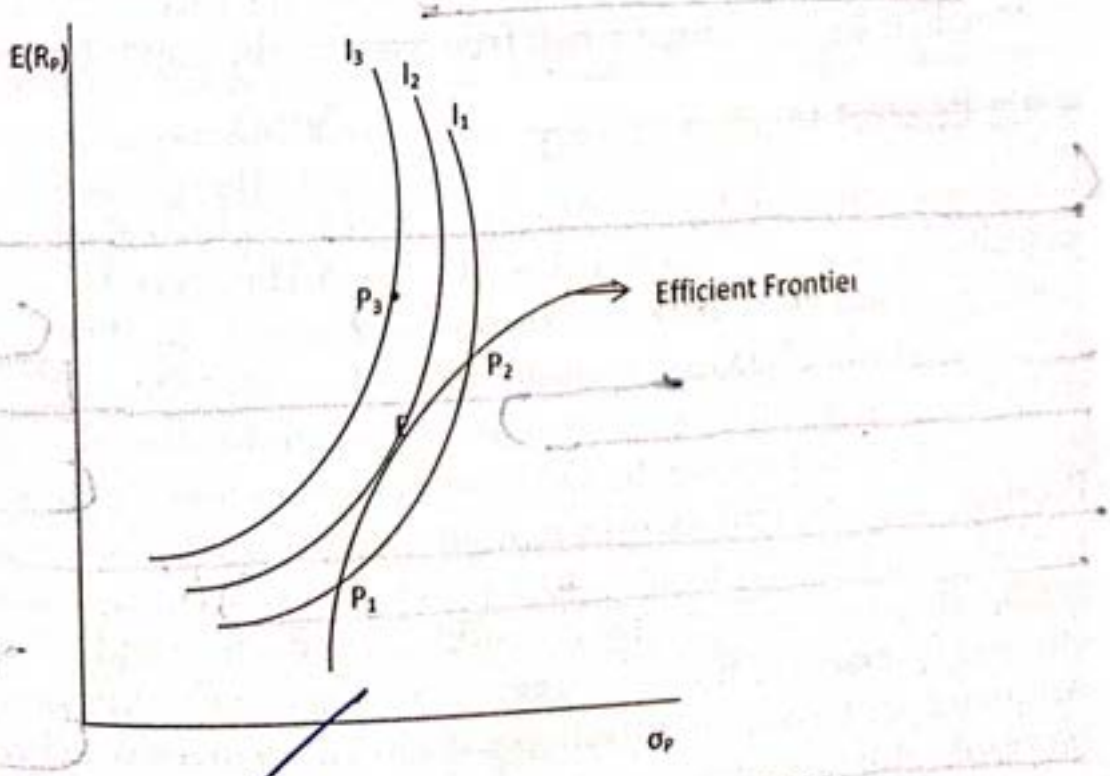


FIG : 9.4 : SELECTING THE OPTIMAL PORTFOLIO

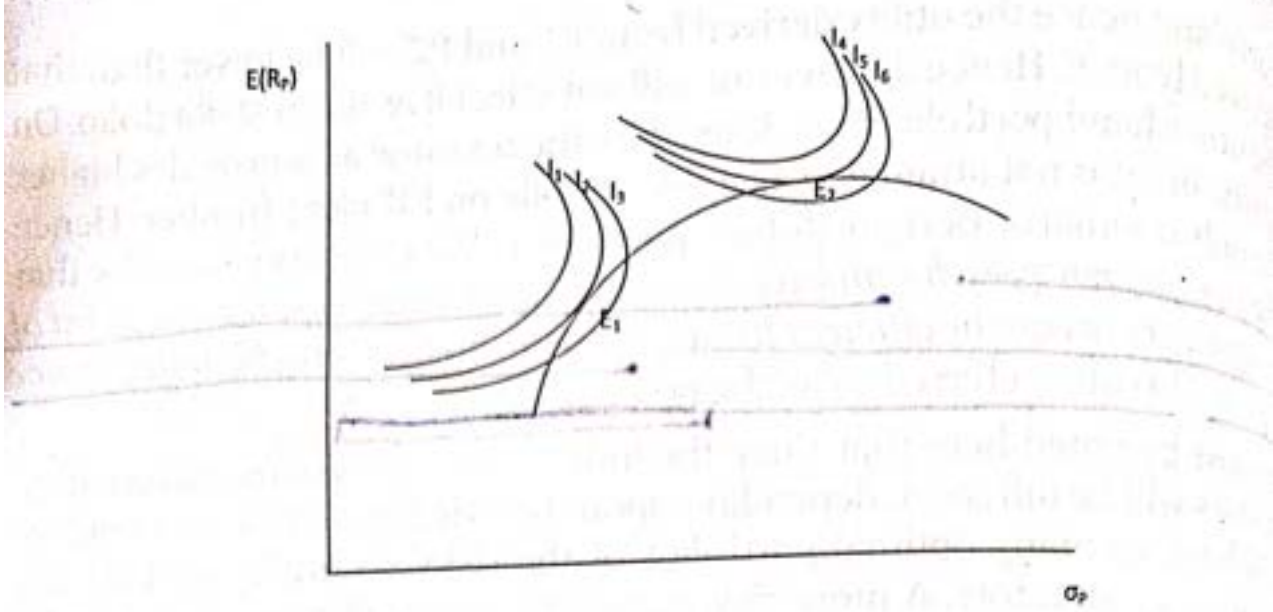


FIG : 9.4A : SELECTING THE OPTIMAL PORTFOLIO

Limitations of Markowitz Model

Markowitz model explains in a logical way as to how the efficient portfolio can be identified and finally how the optimal portfolio is selected. Howeve Harry Markowitz model suffers from the following limitations

1. Markowitz model is quite demanding in terms of data requirements In order to analyse N securities we need $(3n+N^2)/2$ data inputs. becomes very cumbersome and complex to handle such a large data set. For example in order to analyse 100 securities we need 10 returns, 100 variances and 4950 co variances i.e. a total of 5150 data inputs. This is substantial.
2. As per Markowitz Model there are as many optimal portfolios a there are number of investors. However this limitation is removed when we introduce a risk free asset in the capital market.

9.3.2 Capital Market Theory

The development of Capital Market Theory can be traced to Sharpe when he published a paper " Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk" in *Journal of Finance* in 1964. Capital market theory extends Markowitz model to a situation when a risk free asset is introduced in the capital market. It must be noted that the optimal portfolio of risky securities will be different for every investor under Markowitz Portfolio Theory. There will be as many optimal portfolios of risky securities as there are number of investors in the market. This is because every investor will have a different set of indifference curve and given the shape of efficient frontier (a concave curve), we will have different points of tangency defining optimal or equilibrium portfolio for an investor. This problem can be resolved if we introduce a risk free asset in the market which allows

the investors to lend or borrow at risk free rate. Capital Market Theory extends Markowitz's Portfolio Theory by including risk free lending and borrowings. It also assumes that all the investors are rational and mean variance optimizers as assumed by Markowitz Portfolio Theory.

Capital Market theory is based on following assumptions:

i. Investors make decisions solely on the basis of risk and return assessments. This implies that expected return and variance are the only factors considered in investment decisions. Investors are mean variance optimizers in Markowitz sense.

ii. Securities are infinitely divisible.

iii. There are no restrictions on short selling.

iv. There are many investors and buy or sell transaction of any investor will not affect the price of the securities.

v. There are no transaction costs or taxes.

vi. There is a risk free asset in the market besides risky assets. Hence investors can borrow or lend any amount at the same risk free rate.

vii. Investors have identical or homogeneous expectations about expected returns, variances of expected returns and covariances of all pairs of securities. This assumption is important so as to have a unique efficient frontier. If the expectations of the investors differ in terms of returns, variances and covariances then there would be a number of efficient frontiers which would further complicate the problem.

Introduction of Risk Free Asset (or Risk Free Lending and Borrowing)

As per Portfolio Theory the shape of Efficient Frontier is a concave curve. It can be seen in Fig 9.5 that the original efficient frontier as derived under Portfolio Theory is curve AMB. When a risk free asset is introduced in the capital market then the efficient frontier becomes a straight line which originates from risk free return on Y axis and is tangent to the original efficient frontier at point M. This line is RFMD. This new efficient frontier which is a straight line is called Capital Market Line(CML). Thus Capital Market Line is the line which starts from Rf and is tangent to the original efficient frontier at point M. The CML shows a linear relationship between portfolio return and Risk. Every point on CML shows an efficient portfolio (which is actually a combination of the efficient portfolio M and risk free asset). The intercept of CML is Rf i.e. risk free rate which shows that if there is no risk, the return earned must be equal to Rf. It can be observed that the slope of CML is $[(E(R_M)- Rf)]/\sigma_M$ which is market risk premium per unit of market risk. Fig 9.5 shows Capital Market Line.

The Capital Market Line is given in equation (9.8)

$$E(R_p) = R_f + \frac{[(E(R_M) - R_f)]}{\sigma_M} \cdot \sigma_p \quad \text{.....(9.8)}$$

Where : E(Rp) = Expected return of a portfolio

Rf = Risk free rate of interest

$E(R_M)$ = Expected Return on Market Portfolio

σ_M = Standard deviation (total risk) of Market portfolio

σ_p = Standard deviation (total risk) of the portfolio

Equation (9.8) can be written as

Expected Return = Reward for Time + (Reward per unit of total market risk) X (Total portfolio Risk)

The Capital Market line shows that the return from a portfolio depends upon risk free rate, reward per unit of market risk and total risk of the portfolio. The higher the risk the greater will be the expected return.

The CML has the following features

- CML shows a linear and positive relationship between expected return and risk of a portfolio.
- It originates from Rf i.e. risk free rate. Hence the intercept of CML is Rf.
- The slope of CML is reward to variability ratio i.e. $[(E(RM)- Rf)]/\sigma_M$
- CML is tangent to original efficient frontier at point M, i.e. the Market Portfolio or the optimal portfolio of risky assets.
- Only efficient portfolios consisting of risk free asset and portfolio M lie on CML.
- CML is upward sloping because price of risk must be positive since investors are risk averse.

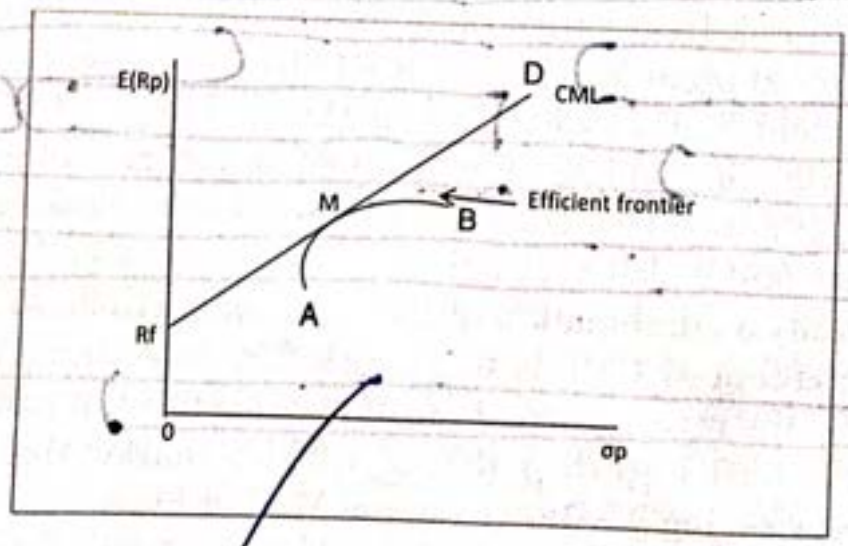


FIG 9.5 : CAPITAL MARKET LINE

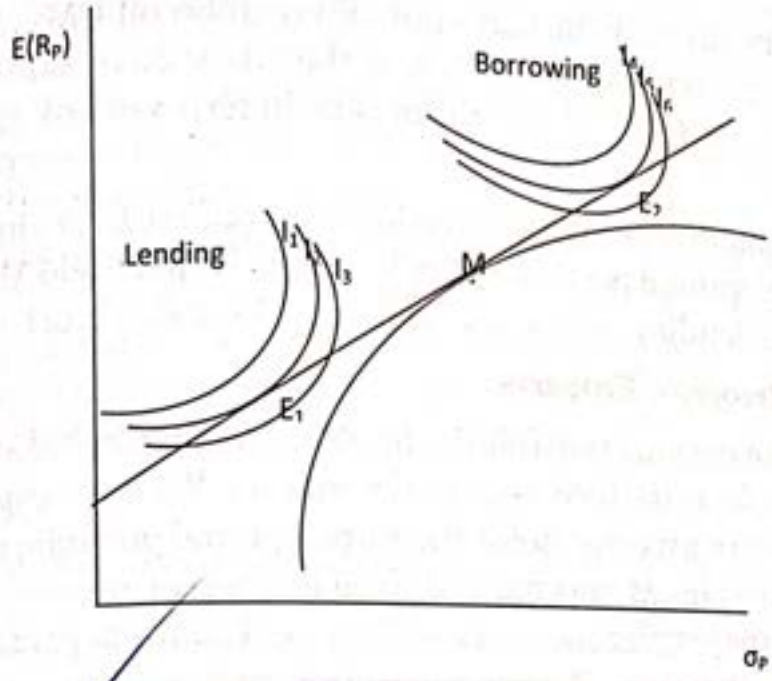


FIG 9.5A : CAPITAL MARKET LINE AND OPTIMAL PORTFOLIOS

The portfolios that lie on CML are efficient portfolios. All the portfolios that lie on CML are a combination of the following two.

i. Efficient portfolio M which is the optimal portfolio of risky assets; and

ii. A risk free asset (either lending or borrowing).

Now the problem of portfolio selection is simplified. Every investor will now have an optimal portfolio which is on CML. It must be noted that there are many portfolios on CML but they all comprise of the same optimal portfolio of risky asset i.e. portfolio M and a risk free asset. Hence every investor will have the same optimal portfolio of risky assets i.e. portfolio M and combine it with risk free lending or borrowing to suit his risk return preferences. Portfolios to the left of point M include risk free lending and hence are relevant for a more risk averse or conservative investor. These portfolios are termed as **Lending Portfolios or Defensive Portfolios.** Portfolios to the right of point M include risk free borrowing and hence are relevant for a less risk averse or aggressive investor. These portfolios are termed as **Borrowing Portfolios or Aggressive Portfolios.** An investor which does not want to have risk free asset (i.e. neither risk free lending nor risk free borrowing) will choose portfolio M. This is shown in Fig 9.5A. It can be seen that the conservative investor has his optimal portfolio as E1 while an aggressive investor has his optimal portfolio as E2. Both E1 and E2 have the same optimal portfolio of risky assets i.e. portfolio M. But conservative investor has risk free lending (or investing in risk free asset as well) while aggressive investor is borrowing at risk free rate and investing the entire funds in optimal risky portfolio M.

9.3.3 From Capital Market Theory to Capital Asset Pricing Model (CAPM)

We have already stated that Capital Market Theory is an extension of Portfolio theory and explains as to how an investor selects his optimal portfolio in a capital market which has risky securities as well as risk free asset. A risk averse investor selects an efficient optimal portfolio of risky assets (which is market portfolio) and combines it with risk free lending or borrowing as per his risk return preferences.

Capital Asset Pricing Model (CAPM) is an extension of Capital Market Theory. Capital asset pricing model shows how risky assets are priced in efficient capital market. CAPM has been developed by Sharpe (1964), Lintner (1965) and Mossin (1966) in independent research papers. CAPM helps in the prediction of expected return on a security or portfolio. The expected return determined through CAPM can then be used to find out whether a security is earning more or less than the expected return. From investment point of view an investor should select securities which provide higher return than the one expected by CAPM.

The Capital Market Line as derived under Capital Market Theory shows all efficient portfolios consisting of the market portfolio and a risk free asset. The market portfolio is efficiently diversified as it includes all available securities in the market. CML relates expected return on a portfolio [E(Rp)] to its total risk (σp) and shows that there is a positive and linear relationship between the two.

In Chapter 3 we discussed about the risk and return of a security. Total risk of a security comprises of two components – Systematic Risk and Unsystematic Risk.

- **Systematic Risk or Non-Diversifiable Risk :** Systematic risk is the risk which is caused by factors beyond the control of a specific company such as general factors in market, GDP, Inflation, Interest rates, Tax policy, Govt. Policies etc. These factors affect all the companies and cause variability in their returns. Systematic risk cannot be reduced by holding an efficiently diversified portfolio. Therefore systematic risk is that part of total risk which cannot be eliminated by diversification. This part of risk arises because all the securities, on an average, move in the direction of market return. Market risk is the primary source of systematic risk of a security. Hence systematic risk and market risk terms are used interchangeably. Changes in market cause changes in a security's return and hence no security

can escape systematic or market risk. Systematic risk of a security is indicated by beta coefficient (β). β captures the sensitivity of a security's return with respect to market return.

Unsystematic Risk : Unsystematic risk is that part of total risk which is diversifiable. Unsystematic risk is caused by factors which are within the control of a specific company such as management, operational efficiency, labour conditions, financial leverage etc. The sources of unsystematic risks are business risk and financial risk. It is termed as diversifiable risk because in an efficiently diversified portfolio unsystematic risk can be completely eliminated. Diversification is using a number of securities to reduce risk. Securities which are less than perfectly positively correlated can be combined together to diversify away unsystematic risk.

It can be observed that unsystematic risk reduces to zero in an efficiently diversified portfolio and hence the only relevant risk in such a portfolio is systematic risk. Market portfolio, M, is an efficiently diversified portfolio and hence it must not contain any unsystematic risk. Therefore as per capital market theory the only relevant risk which is priced in-capital market is systematic risk and not the total risk.

β: An indicator of Systematic Risk

We have explained in the previous section that in an efficiently diversified portfolio i.e. Market portfolio, there is no unsystematic risk. All the unsystematic risk has been diversified away. Hence total risk of the Market portfolio comprises of only systematic risk. It implies that as per Capital Market theory, the only risk which is priced in the market is systematic risk and not unsystematic risk.

β is an indicator of systematic risk of a security. It measures the sensitivity of a security's returns with respect to market return. It is an index or a number which shows whether a security is less sensitive or more sensitive to the market return. The more sensitive (or responsive) a security's returns is to market return, the higher will be the value of β.

- If a security has $\beta \leq 1$ then it is less responsive to changes in market returns.
- On the other hand if $\beta > 1$ then the security is more responsive to changes in market return.
- A risk free asset is not responsive to changes in market returns and hence the β of a risk free asset is always 0.

- The β of market portfolio is always 1. This is because here we are relating market portfolio with itself and hence it must be one.

It must be noted that β of a security measures the resultant change in a security's return for a unit change in return of market portfolio. When β is 0.80 then an increase in market return by 10% is likely to increase security's return by 8%. On the other hand a 10% decline in market return will result into a decline of 8% in security's return. When β is 1.5 then it implies that a 10% increase in market return is expected to increase the security's return by 15% and similarly a 10% decrease in market return is expected to decrease the security's return by 15%.

The calculation of β is discussed in detail in Chapter 3. Here we are giving only the relevant formulae:

β of a security can also be calculated as

$$\beta = \frac{Cov(S,M)}{\sigma_{M^2}} \quad \text{.....(9.9)}$$

Where Cov(S,M) = Covariance between returns of security S and Market Return

σ_{M^2} = Variance of Market returns or simply Market Variance

Now we know that $Cov(SM) = \sigma_S \times \sigma_M \times Correl(SM)$

Therefore

$$\beta = \frac{\sigma_s \times \sigma_M \times correl(SM)}{\sigma M^2}$$

Hence $\beta = \frac{\sigma S}{\sigma_M} \times correl(SM) = \rho_{SM} \times \frac{\sigma_S}{\sigma_M}$ .....(9.9A)

Where, σ_S = Standard Deviation of Returns on security S

σ_M = Standard Deviation of Returns on market portfolio M

Correl(SM) = Coefficient of Correlation between the returns of security S and Market returns.

Illustration 9.8 explains the calculation of β in case of a security.

Total Risk (σ) and β

Both σ and β are measures of risk. But they are also different and capture different amounts of risks. It is important to mention here that standard deviation (σ) is a measure of total risk of a security or portfolio. β on the other hand is an indicator of systematic risk.

9.4 CAPITAL ASSET PRICING MODEL

Capital asset pricing Model is an equilibrium model used to predict expected return on a security or portfolio. Capital Asset pricing Model shows that there is a positive and linear relationship between expected return and systematic risk. As per this model, in the capital market, only systematic risk is priced. Unsystematic risk, being a diversifiable risk, is not priced in capital market. It implies that the investor gets a reward only for bearing systematic risk, and not for unsystematic risk. CAPM is built on the premise that in market portfolio there is no unsystematic risk because it is efficiently diversified portfolio. Hence Capital Market Line which shows the relationship between expected return and total risk should in fact show a relationship between expected return and systematic risk indicated by β factor.

Assumptions of CAPM:

CAPM is based on several simplified assumptions which are given below. All of the assumption of Capital Market Theory are used here.

Assumptions of CMT

i. All investors are risk averse.

ii. Investors make decisions solely on the basis of risk and return assessments. This implies that expected return and variance are the only factors considered in investment decisions. Investors are mean variance optimizers in Markowitz sense.

iii. Securities are infinitely divisible. One can buy or sell securities even in fractions.

iv. There are no restrictions on short selling.

v. There are many investors and buy or sell transaction of any investor will not affect the price of the securities. There is perfect competition in capital market.

vi. There are no transaction costs or taxes. The capital market is efficient and frictionless.

vii. Investors can borrow or lend unlimited amount at the same risk free rate.

viii. Investors have identical or homogeneous expectations about expected returns, variances and covariances.

ix. All the investors hold efficiently diversified portfolios having no unsystematic risk. The only relevant risk in estimating return is systematic risk.

The CAPM Model

As per CAPM there is a linear and positive relationship between expected return and systematic risk measured by β. CAPM is used to estimate expected return from a security or portfolio. β measures the sensitivity of a security's returns to the returns of market portfolio. It must be noted that securities differ in terms of their sensitivity to market portfolio. Some securities are less sensitive while others are more sensitive. Hence β of different securities and portfolios are also different. Moreover, as discussed earlier the unsystematic risk of a security can be diversified away and hence investor will not receive any return or risk premium for bearing unsystematic risk. The investor will receive risk premium only for the non diversifiable risk i.e. systematic risk as indicated by β.

The CAPM is stated as below: ..... (9.10)

$$E(Ri) = Rf + [(E(RM) - Rf] \beta i$$

Where E(Ri) = Expected rate of return from a security or asset

Rf = Risk free rate of return

$E(R_M)$ = Expected Return on Market portfolio

β_i = Beta coefficient or beta factor of security i, which is an indicator of security's systematic risk.

As per CAPM

Expected Return = Risk Free Rate + Market Risk Premium X Systematic Risk

Expected Return = Risk free rate + Risk premium

Expected Return = Reward for Time + Reward for Risk

Risk free rate is rate of return on a security which does not have any risk. Hence risk free rate is not a reward for bearing any risk. It is a compensation for time. It is therefore also termed as time value of money.

The market portfolio is the efficiently diversified portfolio which contains all the securities available in the market. Market risk premium is the excess of expected return on market over risk free return. Market risk premium is the price (or reward) per unit of risk in capital market. It must be noted here that we are concerned only with systematic risk here because in market portfolio, which is efficiently diversified portfolio, unsystematic risk is nil.

Risk premium of a security is calculated as the product of Market risk premium and systematic risk of the security as indicated by its β factor.

Thus we can say that the expected return from a security depends upon the following three factors.

1. *Risk free rate of return* : This is the pure time value of money. This is the compensation an investor must get just for time without any assumption of risk.
2. *Market risk premium* or the market price for risk : This is the reward an investor must get for bearing one unit of market risk or systematic risk.
3. *Amount of systematic risk indicated by* β : This is the relative amount of systematic risk in a security. The higher the systematic risk the higher will be the expected return.

It must be noted that risk free rate of return and market risk premium will be common for all the securities. Hence the only factor that causes difference in expected returns across various securities is β factor or systematic risk. The higher the systematic risk the greater will be the expected return from that security.

For example if we are given that

$R_f = 5\%$, $E(R_M) = 11\%$ and β of a security T, is 1.5 then the expected return of the security will be 14% as calculated below

Security Market Line (SML) :

The graphical presentation of Capital Asset Pricing Model is called Security Market Line (SML). Security market line shows the relationship between expected return and β factor indicating systematic risk. Hence it is drawn in a return – β space. Fig 9.6 shows a Security Market Line (SML). Security Market line is a straight line showing linear relationship between expected return and β factor. It has an intercept as Rf i.e. it originates from Risk free rate. It must be noted that when β is zero, the return an investor gets is equal

to risk free return. It passes through point M which shows market portfolio. Since β of market portfolio is always 1, point M will be corresponding to 1 on X axis and $E(R_M)$ on Y axis.

The slope of SML is market risk premium or $[E(R_M) - Rf]$.

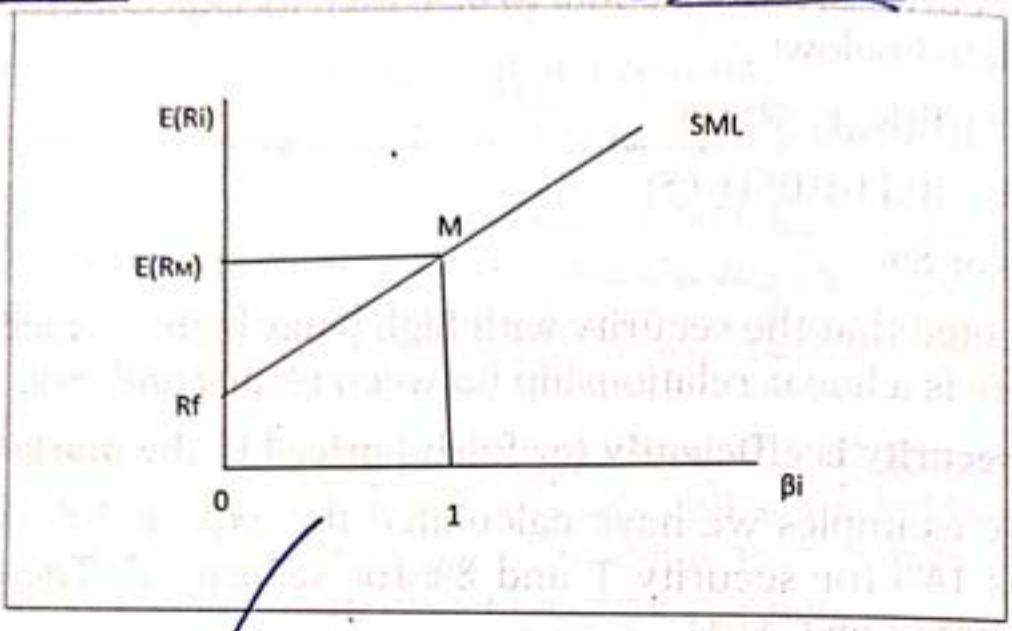


FIG 9.6 : SECURITY MARKET LINE

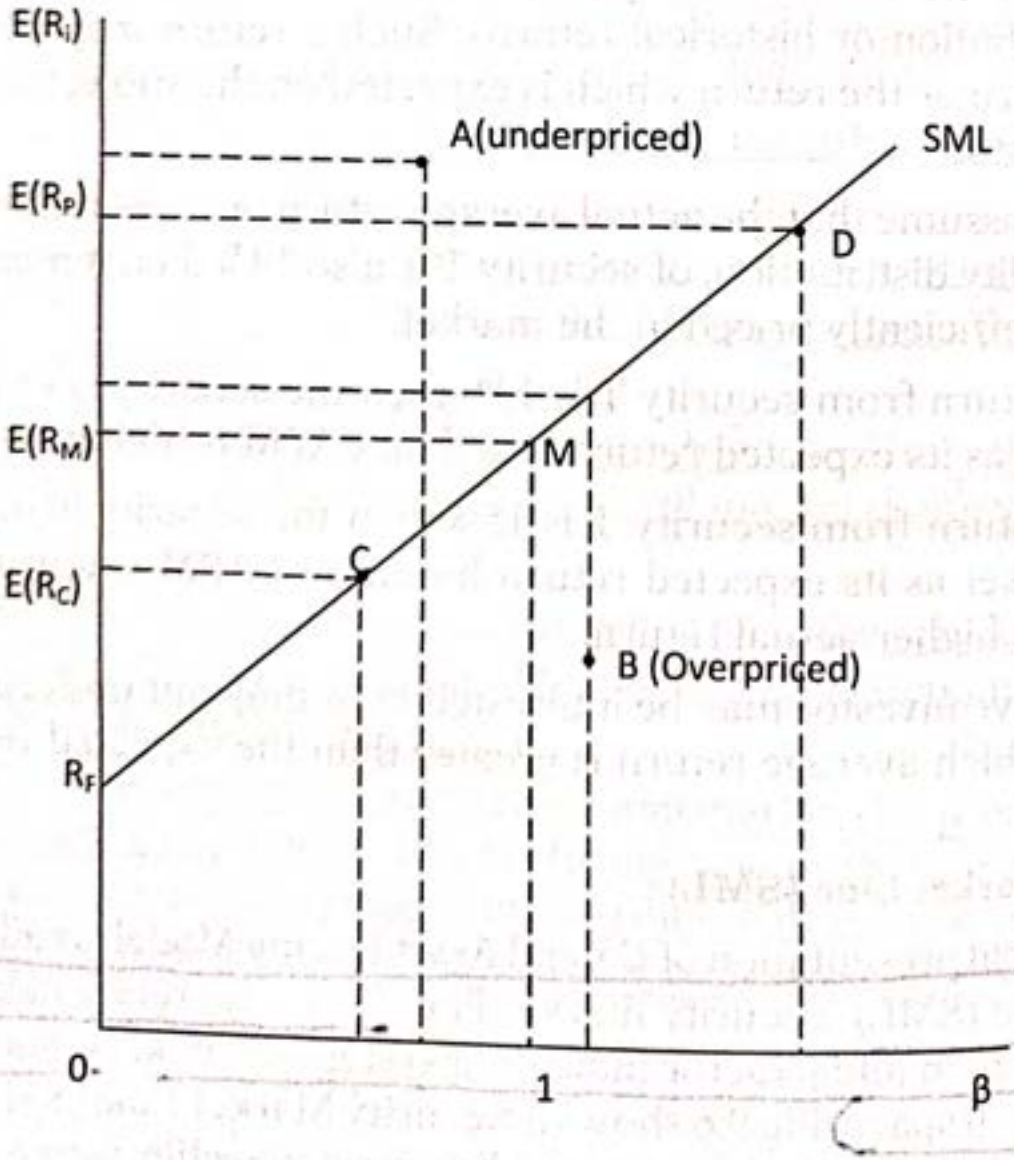


FIG 9.6A : SECURITY MARKET LINE

SML and pricing of securities:

- It must be noted that the securities which lie on SML are efficiently priced in the market. For such securities actual return (or expected return based on probability distribution) is equal to expected return based on CAPM. In fig 9.6A, securities C and D are efficiently priced.
- If a security lies below SML then it is inefficiently priced, in fact overpriced in the market. Such a security provides an actual return which is lower than the expected return based on CAPM. In fig 9.6A security B is overpriced in the market. A prospective investor should not invest in such a security.
- If a security lies above SML then also it is inefficiently priced, but it is underpriced in the market. Such a security provides an actual return which is higher than the expected return based on CAPM. In fig 9.6A, security A is underpriced in the market. A prospective investor should invest in such a security.

Position and Slope of SML:

Security Market Line (SML) is an upward sloping straight line. The position of SML depends upon Rf i.e. risk free rate and the slope of SML depends upon Market risk premium. This is shown in Fig 9.6B and 9.6C. In Fig 9.6B the original SML is S1 when risk free rate is Rf1. If there is an increase in risk free rate to Rf2, then a new SML will be derived as S2. This SML is parallel to S1 as there is no change in its slope.

In Fig 9.6C, Two SML lines are shown with different slopes. The higher the market risk premium, the higher will be the slope of SML and the more steeper will be the SML. It can be seen that the slope of the steeper SML, S1 is higher. If there is a decline in market risk premium, other things being equal, then the new SML, S2, will have a smaller slope.

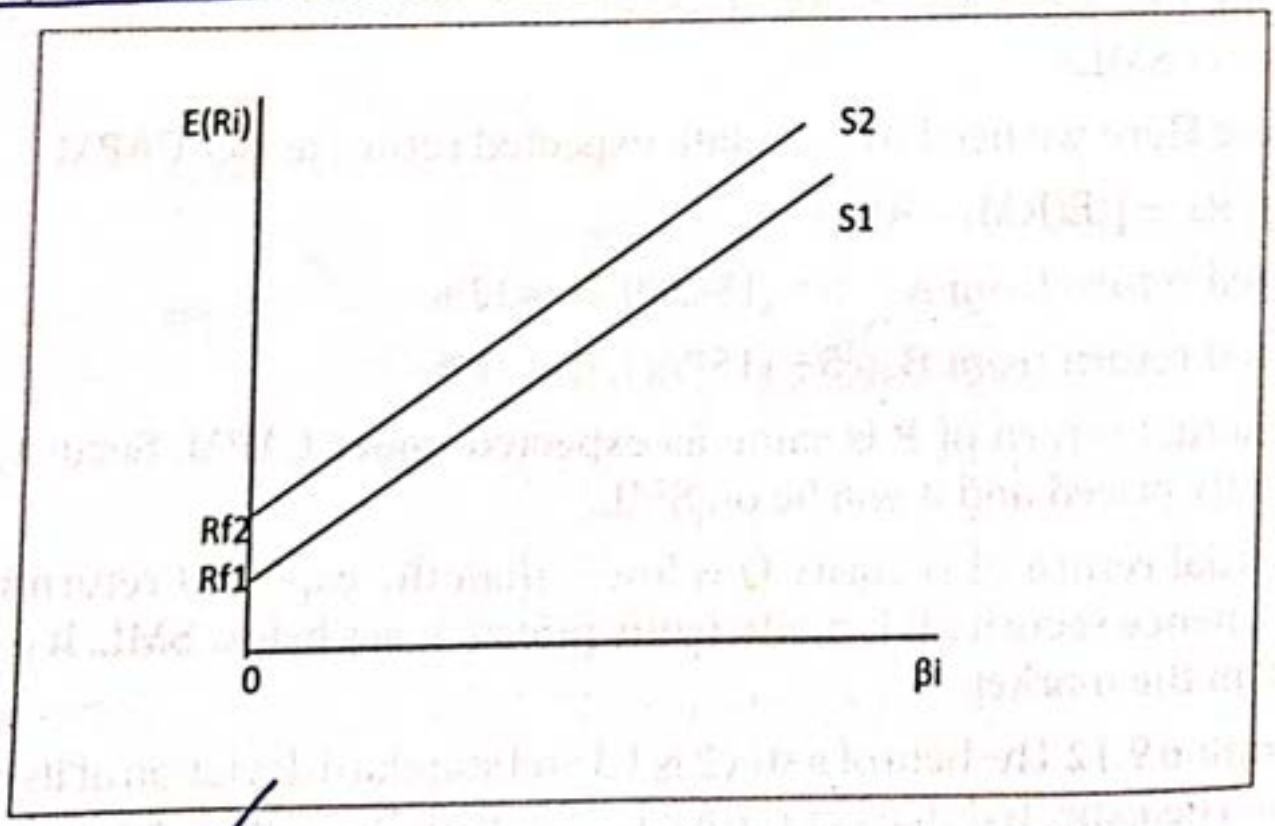


FIG 9.6B : SML WITH DIFFERENT RISK FREE RATES

Difference between SML and CML

1. SML shows the relationship between expected return and β factor which is a measure of systematic risk. CML shows the relationship between expected return and total risk as measured by σ of a portfolio.
2. On SML we can show both individual securities as well as portfolios. On CML only efficient portfolios are shown.
3. The slope of SML is Market Risk Premium. The slope of CML is the Reward to Variability ratio.
4. SML can be used to determine expected return from a security or portfolio. CML cannot be used to determine expected return of individual securities. CML is used to find out optimal portfolio for an investor.

9.6 USES OF CAPM

CAPM is by far the most celebrated model in finance and widely used in practice. It is used to determine the expected or required rate of return from a security. Two important uses of CAPM are

1. In wealth management industry, CAPM is used to find out securities which are underpriced or overpriced. So that a prospective investor can make investment in underpriced security and an existing investor can sell overpriced securities.
2. In Capital Budgeting decisions in Financial Management, we calculate weighted average cost of capital (WACC) as the appropriate discount rate. An important component of WACC is cost of equity. CAPM can be used to determine the cost of equity which is nothing but required rate of return from the investor.

9.7 CRITICISM/LIMITATIONS OF CAPM

CAPM is a popular model for asset pricing or determination of expected return. However it is criticised on the following grounds.

1. CAPM is based on many simplified and unrealistic assumptions which may not hold true in real life. In real life securities are not infinitely divisible, there are transaction costs and taxes, unlimited lending and borrowing is not possible at the same risk free rate and so on.
2. The estimation of β factor is not a simple task. We may calculate β using historical data. But past β values may not be valid in future. Hence β is not constant overtime. Hence any estimation error in β factor will result in an incorrect estimation of expected return.

* Sharpe Single Index Model

This model developed by WILLIAM SHARPE
It is a simplified method of diversification of portfolios.
The theory estimate, expected return and (risk) ← variance of securities.
It relates the return in a security to a Single Market Index.

This relation of any individual security with Market Index can be represented in a 'Regression line' (OR) 'characteristic line'.

Casual observation of stock prices over a period of time reveals that most of the stock prices move with market index.

↓

When Sensex (↑) → Stock prices tend to increase & vice-versa

↓

This indicate that some underlying factors affect market index as well as stock prices.

↓

Stock prices related to Market index and this relation could be used to estimate return on stock.

The equation of characteristic line is :

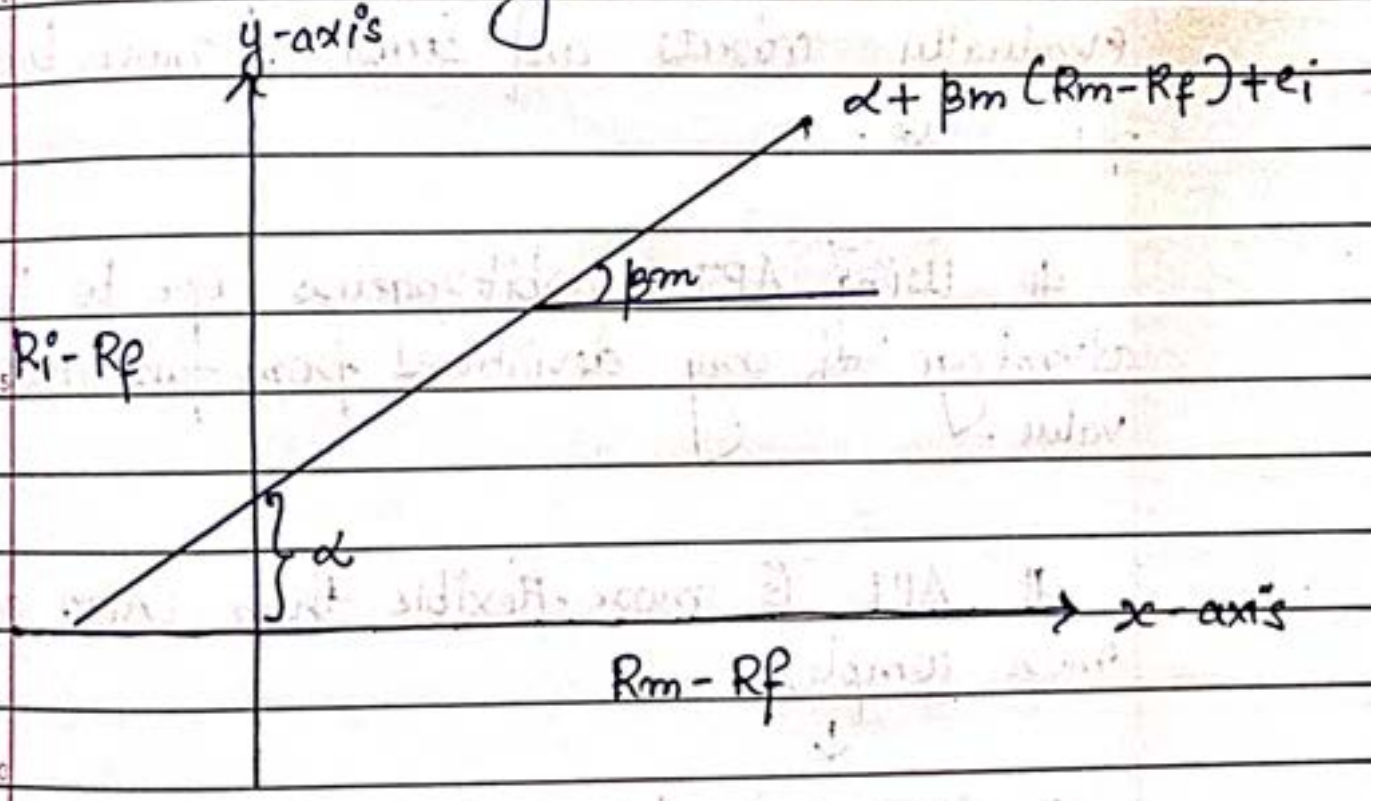
$$R_i - R_f = \alpha + \beta_{im}(R_m - R_f) + e_i$$

where; R_f = risk free return

α = return on security when only unsystematic risk is considered

β = Systematic risk

e_i = Residual component not captured by above variables.



$R_i - R_f$ = $\alpha_p + e_p$ + $\beta_{pm}(R_m - R_f)$

($R_i - R_f$: Excess return of portfolio)

($\alpha_p + e_p$: unsystematic component of p's excess Return)

($\beta_{pm}(R_m - R_f)$: Market (Systematic) component of p's excess return)

Arbitrage Pricing Theory

It was developed by economists Stephen Ross in 1976 as an alternative to the CAPM.

Unlike the CAPM, which assumes market ~~sometimes mispice securities, before~~ are perfectly efficient, APT assumes markets ~~are perfectly~~ sometimes mispice securities, before the market eventually corrects and securities move back to fair value.

Using APT, arbitrageurs hope to take advantage of any deviations from fair market value.

APT is more flexible than CAPM and more complex.

↓

CAPM only takes into account one factor - Market risk, while APT has multiple factors

↓

It takes considerable amount of Research to determine how sensitive a security is to various macroeconomic risks.

Multifactor asset pricing model

CAPM → $E(R) = Rf + Rp \times \beta$

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How many factors shall be used are subjective choices → investors will have varying results depending on their choices.

APT uses linear relationship b/w assets' expected price / return — and — number of macro economic variables that capture systematic risk.

Most reliable macro economic factors that could be used for price predictors
↳ ① Unexpected changes in Inflation
② GNP
③ GDP
④ Commodities price
⑤ Market index
⑥ Exchange rate.

$E(R) = Rf + (Rp \times \beta)$

where; $Rp = E(I) - E(Rf)$

Eg: GDP growth: $\beta = 0.6$, $Rp = 4\%$
Inflation rate: $\beta = 0.8$, $RP = 2\%$
Gold prices: $\beta = -0.7$, $Rp = 5\%$
Standard & Poor's 500 index return: $\beta = 1.3$
$Rp = 9\%$
Risk-free rate = 3%

Expected Return = 3% + (0.6 × 4%) + (0.8 × 2%)
+ (−0.4 × 5%) + (1.3 × 9%)

=

0.03 + 0.024 + 0.016 + (−0.035)
+ 0.117

= 0.152

i.e., 15.2%

* Calculation of Beta of a Security

Beta of Security = Coefficient of correlation × (S.D of Security Return / S.D of Market Return)