# INTRODUCTION

## *Portfolio*

Investing in securities such as shares, debentures and bonds is now conside as one of the best avenues for investing one's savings. It is indeed rewarding, involves a great deal of risk and calls for scientific knowledge as well as artistic s on the part of portfolio manager or investor. Most investors want to invest i group of securities rather than one single security, such group of securities h together as an investment is known as 'Portfolio'. Creation of portfolio helps to red risk without sacrificing return. The process of blending together the broad asset cla so as to obtain optimum return with minimum risk is called **Porfolio Constructi**

Diversification of securities gives the assurance of obtaining the anticipated ret on portfolio. The principle behind it is that if the investment is done in several securit the risk will be diversified and minimized. The loss in one security will be compensat by the gain in another. Keeping investment in one security may lead to, greater likelyho of the actual return somewhat different from that of the expected return. Hence, is beneficial to invest in diversified portfolio.
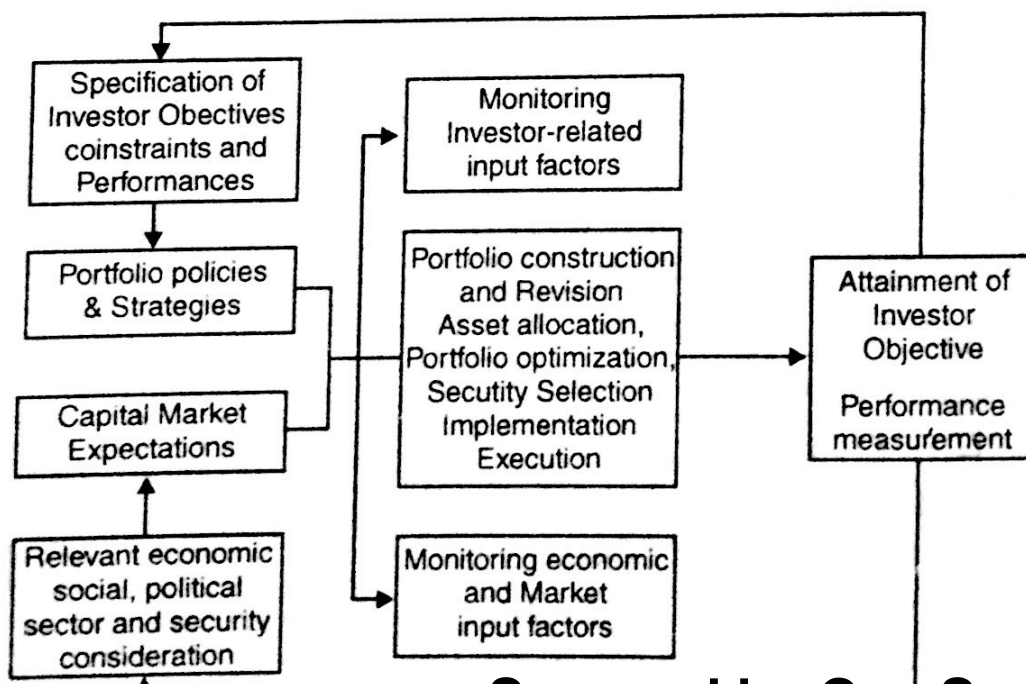
# PORTFOLIO CONSTRUCTION

Portfolio construction refers to allocation of funds among variety of financi assets open for investment. Portfolio theory concern itself with Principles governir such allocation. The objective of this theory is to elaborate such principles in whic risk can be minimized and return can be maximized.

# PORFOLIO MANAGEMENT

It is a dynamic and flexible concept and involves continuous and systematic analysi judgement and operation.

It comprises all process involved in creation & maintenance of an investment portfoli

**It makes use of analytical techniques of analysis and conceptual theorie regarding rational allocation of funds.**

1. It involves construction of portfolio taking into account investors objectives, constraint, preference for risk and return and tax liability.
2. It involves that portfolio is reviewed and adjusted from time to time in tune with the market conditions.
3. The evaluation of portfolio performance is to be done by the manager in terms of targets set for risk and return and changes in the portfolio are to be affected to meet the changing conditions.

**It is a complex process which tries to make investment activity more rewarding and less risky. It involves mainly five steps :**

1. Security analysis
2. Portfolio analysis
3. Portfolio selection
4. Portfolio revision
5. Portfolio evaluation

# OBJECTIVES OF PORTFOLIO MANAGEMENT

The objective of Portfolio Management is to invest in securities in such a way that one maximizes one's returns and minimizes risk in order to achieve one's investment objective.

**The specific objectives of Portfolio Management are as follows.**

**1. Safety of Investment.** It is priority consideration while making investment. Other considerations like income, growth etc. come into picture only after safety on one's investment is assured. Investment safety means minimization of risks. There is no such thing as Zero-risk investment. But one should minimize the overall risk or bring into an acceptable level by developing a balanced and efficient portfolio.

**2. Stable Current Returns.** Once the safety of investment is assured, the Portfolio should yield a steady current incomes. The current income means dividend or interest. The current income at least should match opportunity cost of funds of investor.

**3. Appreciation of Value of Capital.** A good portfolio should appreciate in value in order to protect the investor from any erosion in purchasing power due to inflation. Therefore while selecting securities, some securities in portfolio, should be such that they tend to appreciate in real value after adjusting for inflation.

**4. Marketability.** A good portfolio must consist of investment which can be marketed without difficulty. If there are too many unlisted shares or inactive shares in one's portfolio, he will face problem in liquidating or encashing them, or in switching from one investment to other. It is therefore practical to invest in companies listed on major stock exchanges, and are actively traded.

**5. Tax Planning.** Tax is an important variable in total investment planning. Therefore a good portfolio should enable its owner to enjoy a favourable tax shelter. The portfolio should be developed, considering, not only income tax, but also capital gains tax.

# APPROACHES IN PORTFOLIO CONSTRUCTION

There are basically two approaches in the construction of portfolio of securities.

1. Traditional Approach
2. Modern Approach

# 1. Traditional Approach

In this Approach, investors need in terms of income and capital appreciation is evaluated and appropriate securities are selected to meet the needs of investor. The common practice in traditional approach is to evaluate entire financial plan of individual.

**It deals with mainly two major decisions.**

(a) Determining the objective of the portfolio.

(b) Selection of securities to be included in the portfolio.

**The above two decisions involve six steps to be followed :**

1. Analysis of constraints of investor.
2. Formulation of objectives.
3. Then based on these objectives, selection of securities.
4. Study of risk & return of security.
5. Assigning of weights to securities like Bonds, Stocks, Debentures.
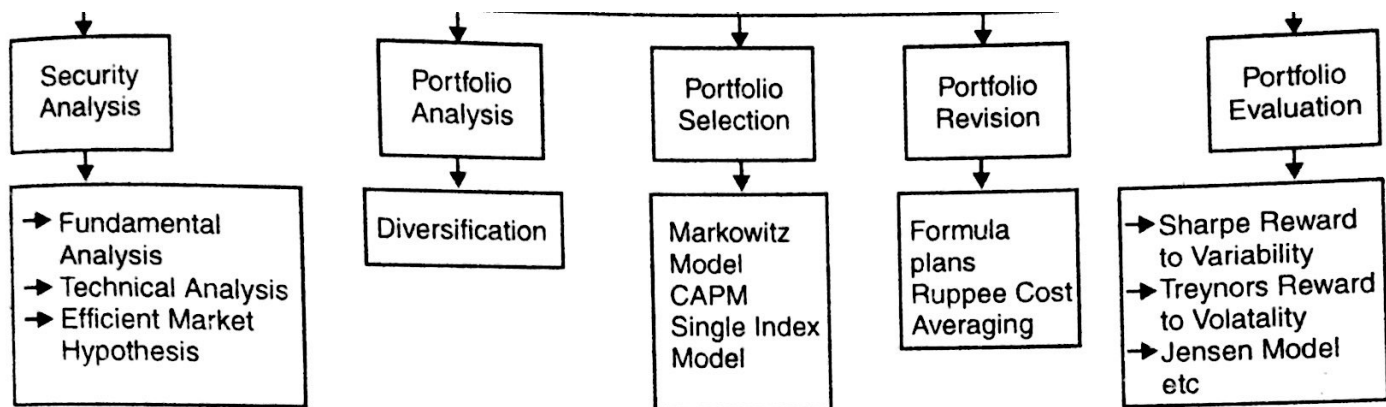6. Diversification.

**This can be explained with help of flow chart as given below.**
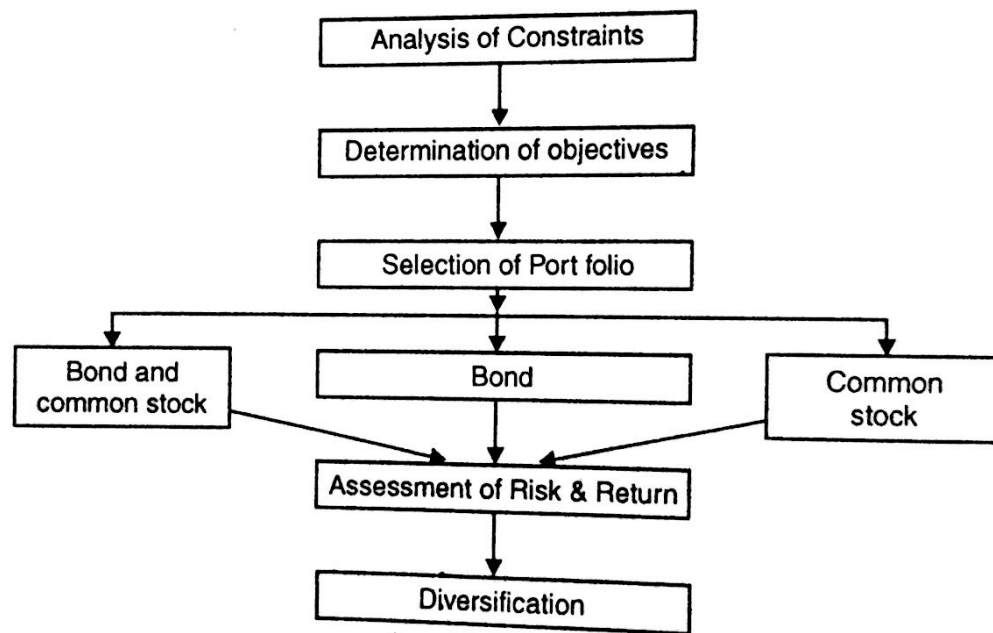


Steps in Traditional Approach

# 2. Modern Approach

If involves construction of portfolio so as to maximize the expected return for a given level of risk. It views Portfolio Management in terms of expected return and the risk associated with obtaining the expected return. Statistical analysis is used for measurement of risk and Mathematical programming for selection of Assets in portfolio in efficient manner. Harry M. Markowitz is credited with developing ths first modern portfolio model. An 'Efficient Portfolio' is one which is expected to yield the highest return for a given level of risk or lowest risk for a given level of return.

| Security Analysis | Portfolio Analysis | Portfolio Selection | Portfolio Revision | Portfolio Evaluation |
|---|---|---|---|---|
| → Fundamental Analysis<br>→ Technical Analysis<br>→ Efficient Market Hypothesis | Diversification | Markowitz Model<br>CAPM<br>Single Index Model | Formula plans<br>Ruppee Cost Averaging | → Sharpe Reward to Variability<br>→ Treynors Reward to Volatality<br>→ Jensen Model etc |

Portfolio Management is a process comprising of large number of activities aimed at maximimizing investor's return, with minimum possible risk. It comprises of five phases.

**1. Security Analysis.** Large number of securities such as Equity shares, Debentures, Bonds, Deep discount bonds; Zero coupon bonds, Flexi bonds, Global Depository Receipts (GDRs) etc. are available for investment. From these securities, the investor has to choose those securities which he considers worth while to be included in investment portfolio. This calls for detailed analysis of available securities. Security analysis consists of examining the risk return characteristics of individual securities. The basic objective of security analysis is to find out whether the security is over-priced or under-priced, because basic strategy in securities investment is to buy under-priced securities and sell over-priced securities.

**Security analysis involves three approaches :**
- ✔ Fundamental Analysis
- ✔ Technical Analysis
- ✔ Efficient market Hypothesis.

**2. Portfolio Analysis.** A portfolio is happy blending of securities, to maximize return and minimize risk. Investors resort to diversification i.e. they attempt to spread risk by not putting all their eggs into one basket. Security analysis provides the investor with set of desirable securities, and from these securities, large number of portfolio can be constructed with their own risk and return characteristics. The return is calculated mathematically and risk statistically.

Hence portfolio analysis consist of identifying the range of possible portfolio that can be constituted from given set of securities and calculating their return and risk for further analysis.

**3. Portfolio Selection.** Refers to the process of selecting efficient portfolio. 'An efficient portfolio' is one which is expected to yield the highest return for a given level of risk or lower risk for given level of return. Harry M. Markowitz Model provid

keep investment effective. This involves purchase and sale of equity, bonds etc, whi in turn result in change in Beta and duration.

**Basically there are two techniques of portfolio revision.**

✔ Formula Plans

✔ Rupee Cost Averaging.

**5. Portfolio Evaluation.** It is the proces which is concerned with assessin the performance of portfolio over a selected period of time, in terms of return ar risk. This process involves measurement of actual return, realised from portfolio ar the risk born by the portfolio, over the period of investment. It is necessary to judg whether the objective of investment have been properly achieved. It also provid mechanism for identifying weakness in the investment process and for improving th weakness.

It proviides feedback for improving entire Portfolio Management process.

# PORTFOLIO RISK & MARKOWITZ MODEL

# INTRODUCTION

A portfolio is a combination or collection of securities. It may be defined a combination of securities designed by investor to invest his money with the objectiv of minimising his risk and maximising return. Most investors do not invest in a singl asset, they invest in a portfolio of asset, as they do not want to put all their eggs i one basket. They want to diversify, meaning that their portfolio should include mor than one security.

**This is because diversification can reduce risk.**

**Risk is of two types :**

(a) Systematic risk

(b) Unsystematic risk.

**Systematic risk** is non-diversifiable risk and is associated with external factor which are beyond the control of individual firm. It is risk associated with securitie market as well as with the economic, sociological, political and legal considerations o prices of all securities in the economy.

The effect of these factors is to put pressure on all securities in such a wa that prices of all stocks will move in the same direction. For example, in period o boom, prices of all securities will rise and indicate that economy is moving toward prosperity.
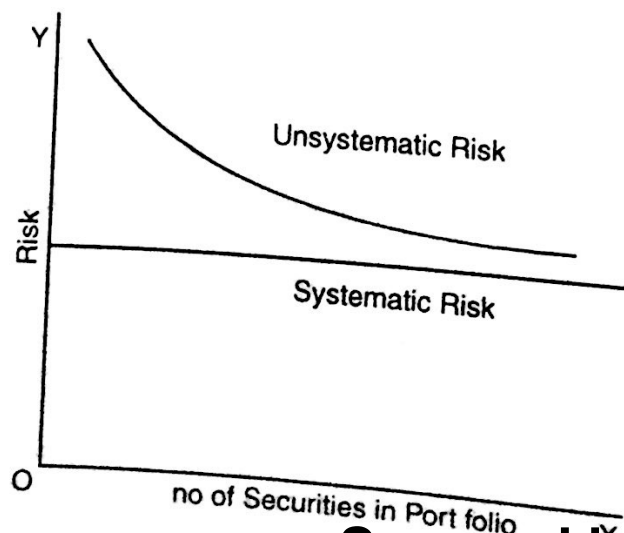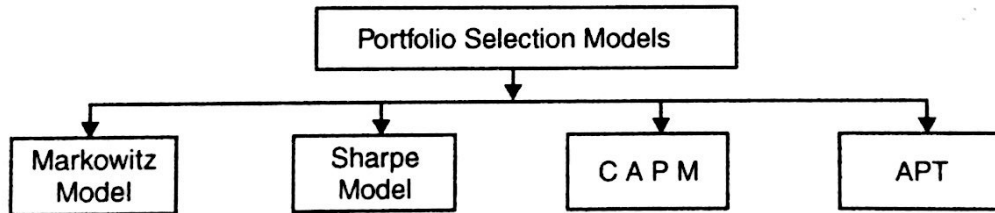
**Unsystematic risk** or diversifiable risk is unique to a firm or industry. This part of risk can be totally reduced through diversification. This risk is caused by factors such as Labour strike, Bad management policies and Consumer preferences. It is said that if investment is made in portfolio consisting of 10 securities the unsystematic risk can be reduced to negligible.

## Portfolio Selection Models

The process of blending together the broad asset classes so as to obtain optimum return with minimum risk is called portfolio construction. Traditionally portfolio selection has been considered as an art and even craft. The decision to construct portfolio were not based on careful thought out plan or strategy rather they were based on intution and whims of investor overlooking the analysis of security in risk-return perspective. But in modern approach portfolios are constructed to maximise the expected return for a given level of risk. It views portfolio construction in terms of expected return and risk associated with obtaining the expected return for a given level of risk. It views portfolio construction in terms of expected return and risk associated with obtaining the expected return.

**There are certain models for portfolio selection, these are :**

1. Markowitz Model
2. Sharpe Model
3. Capital Asset Pricing Model
4. APT Model

```
                    ┌─────────────────────────────┐
                    │  Portfolio Selection Models  │
                    └─────────────────────────────┘
                                   │
        ┌──────────────┬───────────┴───────────┬──────────────┐
   ┌──────────┐   ┌──────────┐         ┌──────────┐    ┌──────────┐
   │Markowitz │   │ Sharpe   │         │  C A P M │    │   APT    │
   │ Model    │   │ Model    │         │          │    │          │
   └──────────┘   └──────────┘         └──────────┘    └──────────┘
```

## 1. Markowitz Model

Harry M. Markowitz is credited with developing the first modern portfolio Analysis Model. He started with the idea of risk aversion of average investors and their desire to maximise the expected return with least risk. His model is thus theoretical framework for analysis of risk and return and their relationship. He used the **Statistical analysis** for **measurement of risk** and **mathematical programming** for **selection of assets** in the portfolio in an efficient manner. His framework led to concept of efficient portfolio. An efficient portfolio is expected to yield the **highest return** for a given **level of risk** or **lowest** risk for a given level of return.

Markowitz generated a number of portfolio within a given amount of money or wealth and given preferences of investors for risk and return.

If the investor wants a higher return he has to take higher risk. But if he prefers high return but low risk, there is a need for trade off between risk and return. Hence this theory emphases the need for maximisation of returns through a combination of securities whose total variability is lower.

The risk of each security is different from that of other and by proper combination of securities, one can arrive at a combination wherein risk of one is offset partly or fully by that of other. Hence as per this theory, **Expected returns**, the **Variance** of these returns and **Covariance of the returns** of the securities within the portfolio are to be

considered for the choice of portfolio. A portfolio is said to be efficient if it is expecte to yield the highest return possible for the lowest risk or a given level of risk.

## Assumptions

The Markowitz portfolio theory is based on following assumptions :

1. Investors are rational and behave in a manner as to maximise their utili with a given level of income or money.
2. Investors have free access to fair and correct information on returns and ris
3. The markets are efficient and absorb the information quickly and perfectl
4. Investors are risk averse and try to minimize the risk and maximise retur
5. Investors based decision on Expected returns and Variance or Standa deviation of these returns from mean.
6. Investors prefer higher returns to lower returns for a given level of risk.


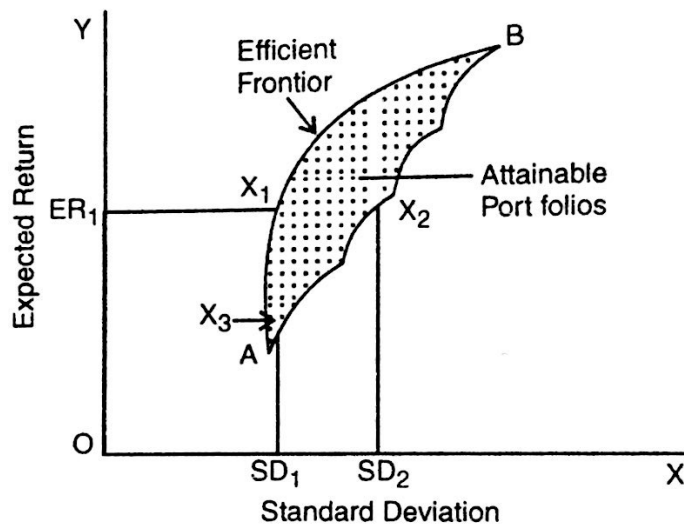
Fig. Graphical Presentation of Markowitz Model.

Given these assumptions, there are infinite number of portfolios available to t investor but the investor needs to be concerned with only those portfolios that are the **efficient set**

The shaded region represents the attainable set of portfolio with their own r and expected returns.

Any point inside the shaded region is not as efficient as corrosponding point efficient frontier i.e. **Arc AB.**

**For example.** Point $X_1$ offers the same expected return as $X_2$ but has smal standard deviation.

Any point below $X_1$ such as $X_3$ has same standard deviation as $X_1$ but has sma **Expected return.**

Hence after efficient set is defined, an investor has to select the **efficient portfo**

An efficient portfolio is one compared to which no other portfolio has the sa returns and a lower risk or same risk and high return. An investor's final choice of the efficient set depends upon his tastes.

An investor would prefer an option which would allow him to reach indiffere curve $L_1$ but he cannot do so because

If there are 100 risky securities under consideration, then

$$\text{Total} = \frac{(100^2 + 3 \times 100)}{2} = 5150$$

Parameters would need to be estimated, consisting of 100 expected returns, 100 variances and 4950 co-variances.

# CAPITAL ASSET PRICING MODEL

Modern Portfolio Theory proposes low rational investors will use diversification to optimize their portfolio and how a risky asset should be priced. The basic concept of the theory are Markowitz diversification, the efficient frontier, capital Assets Pricing Model the Alpha & Beta Co-efficient, The Capital Market Line and the Security Market Line.

Modern Portfolio theory models an asset's return as a random variable and models a portfolio as a weighted combination of assets ; the return of a portfolio is thus the weighted combination of the assets return. Moreover, a portfolio's return is a random variable, and consequently has an expected value and a variance. Risk in this model, is the standard Deviation of the Portfolio .return.

CAPM is the extension of Modern Portfolio Model suggested by Harry Markowitz. Capital market theory suggest us how assets should be priced in the capital markets if everyone behaved in the way portfolio theory suggests. The mechanism explaining how assets should be priced in capital market is known as Capital Asset Pricing Model.

**This model is based on the following assumptions :**

1. The investor objective is to maximise the utility of terminal wealth.
2. Investor makes choices on the basis of risk and return assessments.
3. The purchase or sale of shares can be undertaken in infinitely divisible units.
4. Investors can shortsell any amount of shares without limit.
5. Purchase or sales by single investor cannot affect prices. It means there is perfect competition, where investors in total determine prices by their actions.
6. There are no transaction costs.
7. The purchase or sale of securities is done in the absence of personal income tax.
8. The investor can borrow or lend any amount of funds desired at identical risk less rate (Example : Treasury bill rate).
9. Investors have identical expectation with regard to the relevant decisions period, the necessary decision input, their form and size.
10. Information is freely and simultaneously available to investors.
11. Investors have homogeneous expectation of risk and return.

The investorneeds to estimate the expected returns and variances for all securities under consideration. Furthermore, all the convariances among these securities need to be estimated and the risk free rate needs to be determined. Once this is done, the investor can identify the composition of the tangency portfolio as well as its expected return and standard deviation. At this juncture the investor can proceed to identify the optimal portfoilo by nothing where one of his or her indifference curves touches but does not intersect the efficient set. This portfolio involves as investment in the

# Concept of Arbitrage Pricing Theory (APT)

This model has been developed by S Ross, using a notion that security returns are not based on one single factor (index) of the market; instead each security is linked with multiple factors and returns get influenced by these factors. APT believes that the return generating process of a particular security/portfolio does not get influenced by its association with the market portfolio; rather it is influenced by several logical factors – gross domestic product (GDP), national income, personal disposable income, inflation, interest rate, consumer price index, wholesale price index, bank rate, foreign exchange rate, etc. APT also emphasizes the fundamental of **'one single price'** which implies that market remains in equilibrium and two identical securities, having same degree of risk will command same price, i.e. will have same return in the market in the long run. However, due to short-term disequilibrium, there may be difference in the return of two securities with the same risk level, which will attract the process of arbitrage and investors will be able to generate safe returns.

APT is one of the modern portfolio theories, which is based on the rational behavior of investors. Theory is of 'one price opinion', which implies that two identical securities with same level of risk must have same return; if due to certain imperfections in the market these offer different returns, then investors would sell the security with low return and buy the one with high return.

Arbitrage pricing theory has two basic outcomes – it helps in assigning price to securities by identifying the securities/portfolios as

(a) Underpriced
(b) Overpriced
(c) Efficiently priced

It also focuses on the fact that returns for a particular share is derived from its association will multiple factors, i.e. more than one factor affecting the performance of the company. This association of an individual share/portfolios with different factors is established with the help of a sensitivity factor called beta ($\beta_i$). In single index model and CAPM, each share has only one beta showing the relationship of returns of the share with the index of the market or market portfolio. But in APT, there are more than one beta value for a particular share; return of a share with each of the factors are shown with the help of a separate beta value. For example, a share is affected by seven factors then it will have seven beta values, each showing relationship of the returns of the share with the factor separately. Due to the relationship with many factors, it is called **multiple factor model**.

## Assumptions of APT

Arbitrage Pricing Theory is based upon certain assumptions if these assumptions are found valid then the findings and logic of the model are applicable. These assumptions are as follows:

1. Investors are risk-averse and utility maximizers
2. Investors have homogenous beliefs
3. Markets are perfect
4. Multi-factor effect
5. Dominance principle
6. Equilibrium of the market
7. Efficient frontier

**1. Investors are risk-averse and utility maximizers**  APT is based on the assumption that each investor is risk-averse, i.e. has the tendency to either avoid the risk or minimize it. It is believed that every investor prefers high return as compared to low return for a given level of risk. Investors need to be compensated suitably for the risk assumed by them. Utility maximization implies that investors prefer to maximize the terminal wealth of the investment by selecting such avenues, which offer maximum return for the risk preference of the investor. The combined effect of risk aversion and utility maximization is that, investors select the securities/portfolios using the dominance principle.

*Utility maximization implies that investors prefer to maximize the terminal wealth of the investment.*

**2. Investors have homogenous beliefs**  Homogenous belief implies that each investor has similar kind of risk return estimate about different investment avenues. This assumption has direct impact on the identification of securities into different categories. Arbitrage pricing theory has an objective to assign value to different securities in the sense that it helps in identifying these into three different and exclusive categories. This categorization is done by comparing expected returns with the realized returns from a security. It is done as follows.

- Undervalued securities having expected return < realized return
- Efficiently priced securities having expected return = realized return
- Overvalued securities having expected return > realized return

All this identification is similar in manner by almost all the investors as each one has homogenous estimate about the expected return and risk about securities.

**3. Markets are perfect**   Perfect market condition is the supporting base for arbitrage pricing theory. It implies that there are large number of investors in the market and every kind of price-sensitive information is made available to all the investors as soon as such information gets generated. This happens only when different segments of the market work on the principle of full disclosure and transparency. The result of this is that none of the investors is in a position to create any kind of extra impact in the market by unduly influencing the share prices. The ultimate result of perfect market condition is that, securities/portfolios are priced efficiently in the long run.

**4. Multi-factor effect**   Single index model of Sharpe and CAPM are based on the assumption that each security/portfolio has an association with only one factor of the market and this factor is either the market portfolio or index of the market. Contrary to this, APT believes that each security has an association with more than one factor. The theory does not talk about the **type and number** of factors. Accordingly, return and risk of an individual security or portfolio will always be influenced by more than one factor, these may be such factors having direct effect on the performance of the company, like market share of the company, foreign exchange rate if the company has import export business, inflation rate, interest rate, monetary policy parameters in case of a bank or financial institution, gross domestic product and national income affecting the demand for the product of the company, etc. This association of each individual factor with the returns of the share is represented through beta of the security's return with the individual factor.

*Beta represents the volatility of the returns from the share for every one percent change in the returns of the associated factor. For example, share 'X' has beta 0.50 with factor 'A' and with factor 'B', its' beta is 0.35; now when factor 'A' shows an upward movement by 1 per cent, then the return of this share 'X' on account of this will increase by 0.50 per cent and similarly, when factor 'B' shows an upward movement by 1 per cent then also the return of this share will increase by 0.35 per cent. Similarly, when these factors show a decline, the returns from this share will decrease correspondingly.*

**5. Dominance principle**   Dominance principle implies that one security outperforms the other for the same price. Similarly, it may be that one portfolio outperforms the other for the same given price. By price here, we mean the level of risk. It is the dominance principle which helps in identifying efficient portfolios and generation of efficient frontier. The fundamental of dominance principle can be understood with the help of the following graph:

*Dominance principle implies that one security outperforms the other for the same price.*



**FIGURE 19.1**

Graph Showing Dominance Principle
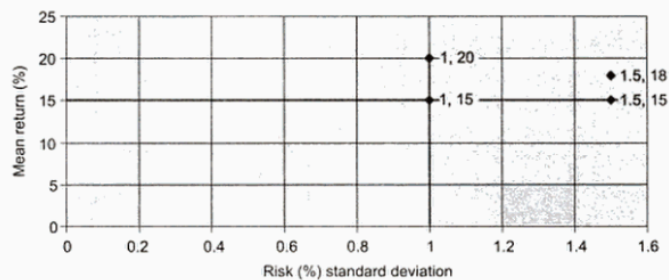
Here, for the risk level 1 per cent standard deviation we have two corresponding securities – one is having 20 per cent return and the other is having 15 per cent, one with 20 per cent return dominates the other as it is giving more return for the same level of risk. Similarly, if we look from the return, side for 15 per cent return, there are two securities – one having risk 1 per cent and another having risk 1.5 per cent. Certainly, the security with 1 per cent risk measurement dominates the another.

**6. Equilibrium of the market**   APT relies on the fact that securities markets function in equilibrium, which implies that the price of two identical securities having the same degree of risk must be the same. It clearly helps in

making an interpretation that two securities having same level of risk must generate same return in the long run. Thus, equilibrium theorem creates homogenous beliefs of the investors and helps in identifying mispricing of the securities. This is the basis of bringing in the concept of efficient portfolio. However, due to short-term disequilibrium, two securities with identical risk level might have different returns which will attract the process of arbitrage. As a result of the arbitrage process, securities will be priced efficiently in the long run and find a place on the efficient frontier. The implication of equilibrium of market results in the **law of one price**, i.e. securities with identical risk must generate same return.

**7. Efficient frontier**    An efficient frontier is the line on risk-return graph, joining all corner portfolios. A corner portfolio is the one, which is either efficient in itself or is created by combining certain efficient portfolios, these efficient portfolios offer optimum returns for the given level of risk. It is believed that all the portfolios, which are priced according to the fundamentals of market equilibrium, will generate optimum return for the given level of risk and will be priced efficiently; consequently get plotted on the efficient frontier. As market is considered to be efficient, each security and portfolio should fall on the efficient frontier in the long-run. This presence and knowledge of efficient frontier helps in the identification of different securities and portfolios as (a) underpriced, (b) priced efficiently, and (c) overpriced.

Securities or portfolios, which get plotted above the efficient frontier are underpriced and securities or portfolios below the efficient frontier are overpriced. This identification will lead to arbitrage process and ultimately, each security and portfolio will be on the efficient frontier in the long-run.

## Expected Return and Risk Under APT

**Expected returns**    By expected return, we mean the most likely level of the return, which should be maintained as per the performance of the company and association of individual share with different factors. An estimate about the most likely return can be made once forecast about the different factors and beta value is available. Total expected return can be bifurcated into two – return on account of company's performance called **Alpha** and return on account of security's association with the multiple factors called **Systematic Component of Return**.

**Alpha**    Alpha component of the return is on account of performance of the company. It can be termed as the return, which can be expected if all other factors have zero-value or the security has zero-beta with all the factors. **Alpha component of return is also termed as zero beta return**.

**Systematic component return**    This is such part of the total expected return, which is on account of the association of the security with different systematic factors, which affect returns from the share. This is represented with the help of beta.

**Random error term**    This represents extraordinary return from a security only when some extraordinary event like merger, acquisition, takeover, bonus declaration, etc., takes place. Generally, it is considered as zero.

The expectation of return from a particular security is based on the association of the security with the factors affecting the return. As per APT theorem, the following equation represents the expected return of a security:

$$\text{Expected Return} = \alpha_i + \beta_{ij1} \times j1 + \beta_{ij2} \times j2 + \beta_{ij3} \times j3 \ldots + \beta_{ijn} \times jn + e_i$$

$\alpha_i$ = Non-systematic return, i.e. return on account of the performance of the company or zero beta return

$\beta_{ij1}$ = Beta of the security with the first factor named as '$j1$'

$\beta_{ij2}$ = Beta of the security with the first factor named as '$j2$'

$j1$ = Value of first factor named as '$j1$'

$j2$ = Value of first factor named as '$j2$'

$e_i$ = Random error term

## Risk

Expected return from a security is subject to some kind of fluctuation. This fluctuation may be positive or negative. Fluctuation in the expected return is represented with the help of variance in the return. As expected return is divided into two – alpha component and systematic component; similarly, risk of a share can also be divided into two – systematic risk on account of system-wide factors and non-systematic risk on account of company-wide factors. Risk of a share is represented with the help of the following equation. Risk is represent as variance of the expected return which is as follows:

**Table showing arbitrage profit through zero initial investment**

|  | **Present Cash flow** | **Return after One Year** | **Cash flow after One Year** |
|---|---|---|---|
| Short sell 'O' | + 10,000 | – 900 | – 10,000 |
| Buy 'U' | – 10,000 | + 1,700 | + 10,000 |
| Net cash flow | 0 | + 800 | 0 |

Thus, by making such arbitrage, one can have Rs 800 with zero initial investment.

Likewise, portfolio B has risk 1.5 per cent and return 15 per cent; at the same time, we can observe that the portfolio 'O2' also has a risk of 1.5 per cent but its' return is only 13 per cent. Here portfolio 'O2' is identified as overvalued and 'B' as efficient as it is on the efficient frontier.

## Limitation of APT

Arbitrage Pricing Theory has practical implication, as it considers association of the security and portfolio with more than one factor affecting return and risk. It is an improvement over Sharpe's Single Index model and CAPM, yet it has limitations:

- It does not specify the type and number of factors affecting return and risk
- It is difficult to identify the factors affecting return and risk
- Different investors might identify different factors for the same security/portfolio; this will violate the assumption of homogenous beliefs
- Difficulty in calculating different beta values
- Effect of one factor on the return and risk can not be assessed precisely
- If the list of factors affecting the return and risk is infinite, then this theory does not find the practical implication
- With passage of time, type and number of factors for one security/portfolio might change, leading to inconsistency in comparison.

## Conclusion

Arbitrage Pricing Theory is an improvement over the single index model like that of Sharpe or CAPM. This theory believes that each security and portfolio has relationship with more than one factor and this relationship affects the return of it. APT does not specify the type and number of factors affecting returns from a security/portfolio, but it discusses that one single factor cannot influence returns and risk of a security/portfolio. Instead, return and risk are influenced by a set of multiple factors. Due to this, it is also called as multi-factor model. Theory rests upon the basic assumption of risk-averse and utility maximization behaviour of the investors. It also assumes that markets are perfect and each security and portfolio is in equilibrium in the long run. Due to this equilibrium, two identical securities must have the same return. However, certain short-term disequilibrium in the market can create distortion in the return of these securities, which will attract the process of arbitrage. Accordingly, if two securities have same level of risk, but are giving different return, then people will sell low yielding security and buy high yielding security, this process is called arbitrage. This arbitrage will finally put all the securities/portfolio on the efficient frontier. An efficient frontier is the one, which is created by joining the entire corner portfolio on the risk-return graph.