

Unit IV : Portfolio Analysis

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Do not save what is left after spending; spend what is left after saving. – **Warren Buffett**

Never put all your eggs in one basket. – **Warren Buffett**

Introduction :

Portfolio means a collection of investments all owned by the same individual or organization. Portfolio may be defined as a bundle of securities. These investments often include stocks, which are investments in individual businesses; bonds, which are investments in debt that are designed to earn interest; and mutual funds, which are essentially pools of money from many investors that are invested by professionals or according to indices.

Definition of Portfolio Analysis :

Portfolio Analysis is the process of reviewing or assessing the elements of the entire portfolio of securities or products in a business. The review is done for careful analysis of risk and return. Portfolio analysis conducted at regular intervals helps the investor to make changes in the portfolio allocation and change them according to the changing market and different circumstances. The analysis also helps in proper resource / asset allocation to different elements in the portfolio.

Portfolio Management :

Portfolio Management is the **art and science** of making decisions about investment mix and policy, matching investments to objectives, asset allocation for individuals and institutions, and balancing risk against performance. **The art of selecting the right investment policy for the individuals in terms of minimum risk and maximum return is called as portfolio management.** It also refers to managing an individual's investments in the form of bonds, shares, cash, mutual funds, etc. so that he earns the maximum profits within the specific time frame. Portfolio management refers to managing money of an individual under the expert guidance of portfolio managers. **It is done by analyzing the strengths, weaknesses, opportunities and threats** in different investment alternatives to have a risk return trade off. Portfolio management is all about strengths, weaknesses, opportunities and threats in the choice of debt v/s. equity, domestic v/s. international, growth v/s. safety, and many other tradeoffs encountered in the attempt to maximize return at a given appetite for risk. Portfolio is nothing but the combination of various stocks in it. **Understanding the dynamics of market is the essence of Portfolio Management.**

This means Portfolio Management basically deals with three critical questions of investment planning.

1. Where to Invest?
2. When to Invest?
3. How much to Invest?

Portfolio is the combination of assets. It refers to a collection of investment tools such as stocks, shares, mutual funds, bonds, and cash and so on depending on the investor's income, budget and convenient time frame.

Types of Portfolio :

There are two types of portfolio –

- a) **Market Portfolio :** The market portfolio is a theoretical bundle of investments that includes every type of asset available in the investment universe, with each asset weighted in proportion to its total presence in the market. The expected return of a market portfolio is identical to the expected return of the market as whole.
- b) **Zero Investment Portfolios :** A portfolio of assets formed where the group of investments collectively forms a zero net value. Such an investment portfolios can be achieved by simultaneously purchasing securities and selling equivalent securities resulting to a net zero.

Need for Portfolio Management :

Portfolio management presents the best investment plan to the individuals as per their income, budget, age and ability to undertake risks. Portfolio management minimizes the risks involved in investing and also increases the chance of making profits. Portfolio managers understand the client's financial needs and suggest the best and unique investment policy for them with minimum risks involved. Portfolio management enables the portfolio managers to provide customized investment solutions to clients as per their needs and requirements.

Modern Portfolio Management :

There are differences between Traditional and Modern Security Analysis. In traditional form of security analysis greater emphasis is placed on analyzing risk return relationship and in modern security analysis **the intrinsic (Central) value** is given more significance. Another point of difference is the effect of personal needs, desires and wants forming the basis of portfolio selection but in modern security analysis, greater emphasis is laid on **scientific approach** to security analysis in terms of estimating risk and return of portfolio and the risk return trade off estimated by the investors.

Types of Portfolio Management :

Portfolio Management is further of the following types -

a) Active Portfolio Management:

As the name suggests, in an active portfolio management service, the portfolio managers are actively involved in buying and selling of securities to ensure maximum profits to individuals. The aim of active portfolio management is to **outperform the benchmark**. (For example, BSE-SENSEX, NSE-NIFTY50, etc.).

b) Passive Portfolio Management:

In a passive portfolio management, the portfolio manager deals with a fixed portfolio designed to match the current market scenario. Discretionary Portfolio management services an individual authorizes a portfolio manager to take care of his/her financial needs on his/her behalf. The individual issues money to the portfolio manager who in turn takes care of all his investment needs, paper work, documentation, filing and so on. In discretionary portfolio management, the

portfolio manager has full rights to take decisions on his client's behalf. In nondiscretionary portfolio management services, the portfolio manager can merely advise the client what is good and bad for him but the client reserves full right to take his own decisions.

Elements of Portfolio Management :

a) Proper Asset Allocation:

The key to effective portfolio management is the long-term mix of assets. Asset allocation is based on the understanding that different types of assets do not move in concert, and some are more volatile than others. Asset allocation seeks to optimize the risk/return profile of an investor by investing in a mix of assets that have low correlation to each other. Investors with a more aggressive profile can weight their portfolio toward more volatile investments. Investors with a more conservative profile can weight their portfolio toward more stable investments.

b) Diversification:

The only certainty in investing is it is impossible to consistently predict the winners and losers, so the prudent approach is to create a basket of investments that provide broad exposure within an asset class. Diversification is the spreading of risk and reward within an asset class. Because it is difficult to know which particular subset of an asset class or sector is likely to outperform another, diversification seeks to capture the returns of all of the sectors over time but with less volatility at any one time. Proper diversification takes place across different classes of securities, sectors of the economy and geographical regions.

c) Rebalancing and Restructuring:

It is used to return a portfolio to its original target allocation at annual intervals. It is important for retaining the asset mix that best reflects an investor's risk/return profile. Otherwise, the movements of the markets could expose the portfolio to greater risk or reduced return opportunities. For example, a portfolio that starts out with a 70% equity and 30% fixed-income allocation could, through an extended market rally, shift to an 80/20 allocation that exposes the portfolio to more risk than the investor can tolerate. Rebalancing almost always results in the sale of high-priced/low-value securities and the redeployment of the proceeds into low-priced/high-value or out-of-favor securities. This annual exercise enables investors to capture gains and expand the opportunity for growth in high potential sectors while keeping the portfolio aligned with the investor's risk/return profile.

Portfolio Selection :

Portfolio Selection is the process of finding out the optimal portfolio which would be one generating highest return with the lowest risk. This is done with the objective of maximizing the investor's return. **Diversification is done for reducing the risk in a portfolio.** The investor usually combines a limited number of securities thereby creating a large number of portfolios and in different proportions. This is known as portfolio opportunity set. Every portfolio in the opportunity set is characterized by an expected return and some risk in terms of variance or standard deviation. Some portfolios in a portfolio opportunity set are of interest to an investor depending upon the risk and return as measured by standard deviation. A portfolio will dominate over others if it has a lower **standard deviation**. These portfolios which are dominated by other

portfolios are known as **inefficient portfolios**. **Efficient portfolios** are the ones in which the investor is interested to invest.

Efficient Portfolio :

An Efficient portfolio is the one which yields maximum return at minimum risk at a given level of return. The Dominance Principle is used as a base to identify the efficient portfolio. A portfolio having maximum return for a specific level of risk is preferred over other portfolios having similar risk. Investors maximize their terminal wealth by going for high yielding securities at a given risk level. Only efficient portfolios are feasible in the long run which fulfills this need of the investors. The expected returns and risk measured by standard deviation of portfolio returns can be estimated as done in the table below.

Portfolio Number	Expected Return in %	Standard Deviation (Risk)
1	5	4.5
2	7	5.6
3	9	7.8
4	11	7.8
5	13	11.3
6	13	12.8
7	15	13.1
8	17	14.5
9	18	16.4
10	20	17.2
11	22	18.9
12	25	19.1

By comparing the portfolios at the given risk and return, if we compare portfolio No. 5 and 6 with the same return at 13%, an investor would select Portfolio No. 5 since the risk is low at 11.3 as compared to portfolio No. 6. Similarly, if we compare portfolio No. 3 and 4, having similar risk depicted by standard deviation of 7.8 an investor would choose portfolio No. 4 since it yield at higher return at 11% compared to portfolio No. 3.

Thus we can lay down general criteria for portfolio selection as -

1. Between two portfolios having the same risk, an investor would choose the one with higher expected return.
2. Between two portfolios having the same return, an investor would choose the one with lower risk.

This is because of the rational natures of the investors who is **risk averse** and want more returns.

Markowitz Portfolio Theory :

Markowitz portfolio theory is also known as Modern Portfolio Theory. The author of the modern portfolio theory is Harry Markowitz who introduced the analysis of the portfolios of investments in his article '**Portfolio Selection**' published in the **Journal of Finance in 1952**. He got Nobel Prize in Economic Sciences in the year 1990. He is best known for his pioneering work in modern portfolio theory. He studied the effect of asset **risk, return, correlation and diversification** on probable investment portfolio returns.

Before this study, the investors would examine investments individually, build up portfolios of attractive stocks and not consider how they related to each other. Markowitz showed

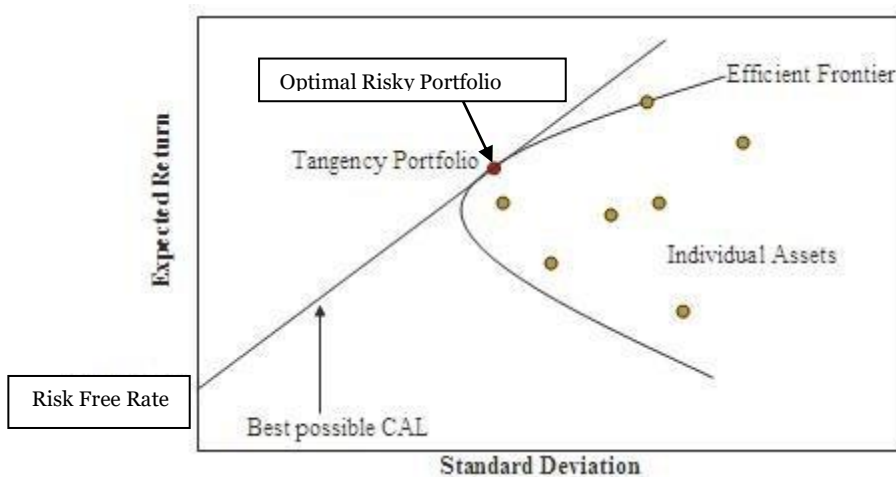
how it might be possible to better of these simplistic portfolios by taking into account the correlation between the returns on these stocks.

The **diversification** plays a very important role in the modern portfolio theory. The theory also focuses on the benefits of diversifying the portfolio i.e. investing in different asset classes like stocks, bonds, real estate, gold etc. It is based on the underlying fact of **‘Do not put all your eggs in one basket’**.

Markowitz approach is viewed as a **single period approach**. At the beginning of the period the investor must make a decision in what particular securities to invest and hold these securities until the end of the period. Because a portfolio is a collection of securities, this decision is equivalent to selecting an optimal portfolio from a set of possible portfolios. Essentiality of the Markowitz portfolio theory is the **problem of optimal portfolio selection**.

Markowitz Efficient Frontier :

The concept of **Efficient Frontier** was also introduced by Markowitz and is easier to understand than it sounds. It is a **graphical representation of all the possible mixtures of risky assets for an optimal level of Return** given any level of risk, as measured by standard deviation.



The chart above shows a **hyperbola showing all the outcomes for various portfolio** combinations of risky assets, where Standard Deviation is plotted on the X-axis and Return is plotted on the Y-axis.

The Straight Line (Capital Allocation Line) represents a **portfolio of all risky assets and the risk-free asset**, which is usually a triple-A rated government bond.

Tangency Portfolio is the point where the **portfolio of only risky assets meets the combination of risky and risk-free assets**. This portfolio maximizes return for the given level of risk.

Portfolio along the lower part of the hyperbola will have lower return and eventually higher risk. Portfolios to the right will have higher returns but also higher risk. **Markowitz Portfolio Theory** (Modern Portfolio Theory or Passive Investment Approach) is the base idea of the ways to wealth concept.

- There are **two main concepts** in Modern Portfolio Theory –
- a) Any investor's goal is to maximize return for any level of risk.
 - b) Risk can be reduced by creating a diversified portfolio of unrelated assets.

Other names for this approach are **Passive Investment Approach** because you build the right risk to return portfolio for broad asset with a substantial value and then you behave passive and wait as it growth.

Subject Matter of the Markowitz Theory :

Before the development of Markowitz theory, combination of securities was made through 'simple diversification'. The layman could make superior returns on his investments by making a random diversification in his investments.

A portfolio consisting of securities of large number will always bring a superior return than a portfolio consisting of ten securities because the portfolio is more diversified.

The simple diversification would be able to reduce unsystematic or diversifiable risk. In securities, both diversifiable and un-diversifiable risks are present and an investor can expect 75% risk to be diversifiable and 25% to be un-diversifiable.

Simple diversification at random would be able to bring down the diversifiable risk if about 10 to 15 securities are purchased. Unsystematic risk was supposed to be independent in each security. Many research studies were made on diversification of securities. It was found that 10 to 15 securities in a portfolio would bring adequate returns. Too much diversification would also not yield the expected return.

Some experts have suggested that diversification at random does not bring the expected return results. Diversification should be related to industries which are not related to each other. Many industries are correlated with each other in such a way that if the stock of 'X' increased in price the stock of 'Y' also increased and vice versa.

By looking at the trends, industries should be selected in such a way that they are unrelated to each other. A person having on his portfolio about 8 to 10 securities will reduce his risk but if he has too many securities as described above it would not lead to any gain.

If systematic risk is reduced by simple diversification, research studies have shown that an investor should spread his investments but he should not spread himself in so many investments that it leads to 'superfluous (extra) diversification'. When an investor has too many assets on his portfolio he will have many problems. These problems relate to inadequate return.

It is very difficult for the investor to measure the return on each of the investments that he has purchased. Consequently, he will find that the return he expects on the investments will not be up to his expectations by over diversifying.

The investor will also find it impossible to manage the assets on his portfolio because the management of a larger number of assets requires knowledge of the liquidity of each investment, return; the tax liability and this will become impossible without specialized knowledge.

An investor will also find it both difficult and expensive to look after a large number of investments. This will also have the effect of cutting into the profits or the return factor on the investments.

If the investor plans to switch over investments by selling those which are unprofitable and purchasing those which will be offering him a high rate of return, he will involve himself in high transaction costs and more money will be spent in managing superfluous diversification.

The research studies have shown that random diversification will not lead to superior returns unless it is scientifically predicted. Markowitz theory is also based on diversification. He believes in asset correlation and in combining assets in a manner to lower risk.

Assumption of the Markowitz Theory :

- Markowitz theory is based on the modern portfolio theory under several assumptions.
- i) The market is efficient and all investors have in their knowledge all the facts about the stock market and so an investor can continuously make superior returns either by predicting past behavior of stocks through technical analysis or by fundamental analysis of internal company management or by finding out the intrinsic value of shares. Thus, all investors are in equal category.
 - ii) All investors before making any investments have a common goal. This is the avoidance of risk because they are risk averse.
 - iii) All investors would like to earn the maximum rate of return that they can achieve from their investments.
 - iv) The investors base their decisions on the expected rate of return of an investment. The expected rate of return can be found out by finding out the purchase price of a security dividend by the income per year and by adding annual capital gains. It is also necessary to know the standard deviation of the rate of return expected by an investor and the rate of return which is being offered on the investment. The rate of return and standard deviation are important parameters for finding out whether the investment is worthwhile for a person.
 - v) Markowitz brought out the theory that it was a useful insight to find out how the security returns are correlated to each other. By combining the assets in such a way that they give the lowest risk maximum return could be brought out by the investor.
 - vi) From the above, it is clear that every investor assumes that while making an investment he will combine his investments in such a way that he gets a maximum return and is surrounded by minimum risk.
 - vii) The investor assumes that greater or larger the return that he achieves on his investments, the higher the risk factor surround him. On the contrary, when risks are low the return can also be expected to be low.
 - viii) The investor can reduce his risk if he adds investment to his portfolio.
 - ix) An investor should be able to get higher return for each level of risk 'by determining the efficient set of securities'.

Markowitz Model :

Markowitz approach determines for the investor the efficient set of portfolio through three important variables i.e. return, standard deviation and coefficient of correlation. Markowitz model is called the '**Full Covariance Model**'.

Through this model the investor can, with the use of computer, find out the efficient set of portfolio by finding out the tradeoff between risk and return, between the limits of zero and infinity. According to this theory, the effects of one security purchase over the effects of the other security purchase are taken into consideration and then the results are evaluated.

Limitations of Markowitz Theory :

Based on the above assumptions, the limitations of Efficient Market Frontier can be inferred as below -

- 1) The portfolio returns are not normally distributed but are heavily skewed on the tails.
- 2) The investors are irrational. They believe in risk taking, expecting that higher the risk, higher the returns.
- 3) In reality, the investors in the market have limited access to borrowing or lending of money at risk free rate.

Types of risks :

The distinction between different types of risks is elaborated as under -

- 1) **Unsystematic risk :** Also known as specific risk, it is a measure of risk associated with a particular security; also known as diversifiable risk. It is the type of uncertainty that comes with the company with which you invest or the industry where you invest. This risk can be mitigated by holding a diversified portfolio of many different stocks in many different industries.
- 2) **Systematic risk/ market risk :** It is a risk faced by all investors due to market volatility and this risk cannot be diversified away. This is the type of risk most people are referring to when they casually use the term 'risk' when discussing investments.
- 3) **Political risk :** It is the risk to an investment due to changes in the law or political regime. Potential changes in tax law or changes in a country's structure of governance are sources of political risk.
- 4) **Inflation risk :** Stocks, bonds and cash are all subject to the risk that one's investment will not keep pace with inflation. This risk can be mitigated by investing in inflation-protected Treasury bonds.
- 5) **Financial risk :** This risk is due to the **capital structure of a firm**. Corporate debt magnifies financial risk to a company's stocks and bonds.
- 6) **Management risk :** Investors using actively managed funds are exposed to the risk that fund or portfolio managers will under-perform benchmarks due to their management decisions or style. Investors can avoid this risk by selecting passively-managed index funds.
- 7) **Interest rate risk :** It is the risk associated with changes in asset price due to changes in interest rates. Bonds and bond funds face this type of risk. As interest rates rise, prices on existing bonds decline and vice versa. Interest rate risk is greater for bonds with longer maturities, and vice versa.



- 8) **Credit Risk / Default Risk** : It is the risk of default on account of non-payment. Holders of corporate and municipal bonds face this risk.
- 9) **Call risk** : It is the risk that a bond issuer, after a decline in interest rates, may redeem a bond early, forcing the bond holder to find a replacement investment that may not pay as well as the original bond.
- 10) **Reinvestment risk** : The risk that earnings from current investments will not be reinvested at the same rate of return as current investment yields. Coupon payments from a bond may suffer reinvestment risk if they cannot be reinvested at the same rate as the bond's yield.
- 11) **Currency risk** : Investors in international stocks and bonds are also exposed to the risk caused from changes in currency exchange rates. Investments in currencies other than the one in which the investor purchases most goods and services are subject to currency risks.
- 12) **Longevity risk** : It is the risk an investor will outlive his/her money.
- 13) **Shortfall risk** : It is the risk the portfolio will not provide sufficient returns to meet the investor's goal
- 14) **Diversifiable Risk** : This risk is **Company Specific or Non Systematic** and is connected with the random events of respective company whose stocks are being purchased. Diversification can reduce diversifiable risk. The good random events influencing one stock will be cancel out by the bad random events that influence another stock of the portfolio.
- 15) **Market Risk** : This risk is also called **Beta Risk or Non-Diversifiable Risk** and is connected with socio-political and macro-economic events that occur on global basis such as Macro Market Interest Rates, Inflation, War and Recession etc. **Market risk can never reduce through diversification.**

$$\begin{aligned}
 \text{Total Risk of Stock} &= \text{General Risk} + \text{Specific Risk} \\
 &= \text{Market Risk} + \text{Issuer Risk} \\
 &= \text{Systemic Risk} + \text{Non Systemic Risk}
 \end{aligned}$$

Difference between Systematic and Unsystematic Risk

No.	Basis	Systematic Risk	Unsystematic Risk
1.	Meaning	Systematic risk refers to the hazard which is associated with the market or market segment as a whole.	Unsystematic risk refers to the risk associated with a particular security, company or industry.
2.	Nature	Uncontrollable	Controllable
3.	Factors	External Factors	Internal Factors
4.	Affects	Large number of securities in the	Only particular company.

		market	
5.	Types	Interest risk, market risk and purchasing power risk.	Business risk and financial risk
6.	Protection	Asset allocation	Portfolio diversification

Relationship between risk and return :

The risk and return relationship form the entire basis of investment decisions. Investors are risk averse; i.e., given the same expected return, they will choose the investment for which that return is more certain. Therefore, investors demand a higher expected return for riskier assets. Note that a higher expected return does not guarantee a higher realized return. Because by definition returns on risky assets are uncertain, an investment may not earn its expected return. The risk in holding deviates from actual return from the expected return maybe upward or downside. The mean (average) annual return increases as the dispersion of returns increases.

Measurement of Risk and Return :

Risk is the uncertainty of future returns. Risk can be measured as the difference between expected return and actual return. Expected returns are the anticipated returns for a future period. Risk is measured as **the difference between expected return and actual realized return.**

There are different techniques/tools of measuring risk -

1. Volatility :

Volatility is the range of price fluctuations as compared to the expected level of return. The more the changes in price the more volatile a stock is. Volatility brings uncertainty and hence greater risk. The past volatility data provides an insight into the risk of a stock.

2. Standard Deviation :

This is the most common measure of risk in investments in terms of variance or standard deviation. Standard Deviation indicates the likely volatility in the returns from the mean value of returns. It can be either in the form of an increase or a decrease from the mean.

3. Probability Distribution :

Probabilities indicate the likelihood of different outcomes and are in the form of decimals. Past occurrences are taken to estimate the probability with consideration for any changes expected in the future. To determine the single most outcomes from a specific probability distribution, the expected value is computed. Expected return or Ex-ante return is the mean return found by using probability distribution of expected return.

Diversification of Risk :

Risk can be reduced through diversification.

- a) The risk of investing in a single risky security, such as a stock or corporate bond, is very high due to the company-specific risks. Any number of unfortunate events could impact the rate of return. In the worst possible case, the company could go bankrupt, and the investor could lose the entire value of the investment.
- b) Company-specific risk is generally referred to as unsystematic risk or nonsystematic risk. Other names are unique-risk, firm-specific risk, or diversifiable risk.
- c) Unsystematic risk can be eliminated by holding a broad portfolio of risky assets; e.g., many different securities in many different industries. This is easy to accomplish by owning a

total market stock or bond index fund. Unsystematic risk is risk that can be diversified away.

- d) The risk that remains after diversifying away unsystematic risk is systematic risk. Other names are market risk or non-diversifiable risk. A total stock or bond market fund has systematic risk. In an efficient market, assets with known systematic risks will be priced lower and thereby compensate investors through higher expected returns. This expected relationship only applies to systematic risks. There is no reward for incurring unsystematic risk, and investors may therefore seek broad diversification without reducing the expected return of their portfolio. After diversification, the next step in managing portfolio risk is asset allocation.

Portfolio Analysis :

At some time in the future, the actual return will be one of many possible outcomes. The various outcomes have some probability of occurring. The expected return is just the average of these possible returns weighted (multiplied) by the respective probabilities of occurring. Standard deviation of annual returns is most useful for measuring risk over shorter time periods. For measuring risk over longer time periods, the dispersion of possible cumulative returns is a better measure of risk. This is because over many years, a relatively small difference in annualized rate of return can result in a large difference in cumulative returns. The cumulative return on your investments at a specified future time is referred to as terminal wealth. The dispersion of possible terminal wealth is referred to as terminal wealth dispersion.

- a) The collection of multiple investments is referred to as portfolio. Mostly large size organizations and also some individuals maintain a portfolio of their different investments and hence the risk and return is considered as the entire portfolio risk and return. Portfolio may be composed of two or more bonds, stocks, securities and investments or combination of all.
- i) This is because trading individual securities creates costs - brokerage costs, bid-ask spreads and price impact
- ii) There is a critical mass value, below which it does not pay to actively manage a portfolio - it is far better to invest in funds.
- iii) The larger a portfolio, the more choices become available in terms of assets - this is largely because some components of trading costs - the brokerage costs and the spread - may get smaller for larger portfolios.
- iv) If a portfolio becomes too large, it might start creating a price impact which might cause trading costs to start increasing again.
