RESEARCH METHODOLOGY

This chapter will describe how the authors have approached the problem and gathered information to solve the purpose. Issues that are explained in this chapter are the different methods and approaches used in this thesis. The indexes used in our analysis are defined and how we have assembled the portfolio. To illustrate the theory the authors will start by defining the fundamental concepts which lie as a foundation for the Modern Portfolio Theory, supported by other relevant tools.

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3.1 INTRODUCTION

When writing a thesis, the chosen methodology helps the authors investigate and write a thesis that fits the specific needs and wants, and will provide the best to answer the specific questions. The choices of methods have to be done to reach the best possible conclusions.

Which types of methods and approaches that are used are determined by the set purpose:

“The purpose of this thesis is to investigate if an investor can apply modern portfolio theory in order to achieve a higher return than investing in an index portfolio”.

Some types of choices that have to be made are whether to conduct a qualitative- or quantitative method, inductive- or deductive approach, whether to use primary or secondary data in your thesis.

3.2 RESEARCH PROBLEM

We might have different theories and models but we need to identify in Indian market up to which extent we can use it.

There are thousands of different investments to choose from, with different risk and return profiles. With so many different options, the investor may feel unsettled to take the right direction when picking stocks that fulfills the expectations. There are several different areas to discover before allocating in specific stocks. Looking in to this, the research problem is to analyze NIFTY 50 index as a portfolio and to judge it against portfolios created according to Markowitz and Sharp theories.
However, the key of successful portfolio management lies in the execution. A strong portfolio management program can turn any sinking investment around and do the following:

- Maximize value of investments while minimizing the risk
- Allow investors to schedule resources more efficiently
- Reduce the number of redundant investments and make it easier to kill loss making investments

So far in India, most of the middle class earners have been risk-averse and therefore park most of their savings in Fixed Deposits and Other Savings Accounts, though the yield from such investment avenues is very low. However, the recent trend has been such that more people have been attracted towards investment in Equities. The trend is only set to go upwards in the years to come, as the Indian middle class becomes more risk friendly.

So the main aim of this research is to depict a path to propagate the most optimal portfolio available in the market for the Indian customers and measure practical applicability of MTP theories on Indian market.

3.3 TITLE OF RESEARCH STUDY

The title of the study is “practical Application of modern portfolio theory”

3.4 SCOPE OF STUDY

The scope of research work can be divided into two types, geographical scope as well as functional scope.
Geographical Area

This study is based on companies comes under Nifty of NSE. Thus, the companies which come under umbrella of NSE NIFTY or its Indices only coved in study.

Functional Area

This research work contains a small part of portfolio construction. Among all alternatives of portfolio construction modern portfolio theories are applied to selected companies only. In this study data 10 years data is considered for analysis of the research problem.

3.5 OBJECTIVES OF STUDY:

- To study effectiveness of modern portfolio theories.
- To compare modern portfolio theory with sharp’s theory.
- To examine whether an optimal portfolios present the investor with superiors than the selected index.
- To evaluate Modern portfolio theories effect on risk and return of index.
- To judge Effects of model on Indian security market.
- To Obtain and construct a optimum portfolio for the investment.

3.6 DATA COLLECTION

This study is completely based on the secondary data. Secondary research can be described as the most widely used method for data collection. This process involves accessing information that is already gathered from either the originator or a distributor of primary research. Secondary research includes collecting information from third-party sources such as company websites, sales and accounting records, magazine articles and marketing research reports. It also includes any previously gathered information used by the marketer from any internal or external source.
In this research work, this data is collected from various sources especially from the journal- Journal of Portfolio management, and other journals, Magazines, articles, authenticated sites, books and published or unpublished documents related to portfolio management.

3.7 SIGNIFICANCE OF THE STUDY

Present work helps in identifying most appropriate securities to invest. In different economic condition performance of different sectors would be different so with this study optimum portfolio constructed and evaluated against Indian economy.

CONTRIBUTION TO THE KNOWLEDGE

Through this research study the knowledge of researcher particularly regarding statistical tools and technique and statistical test will improve.

This research study gives depth explanation of modern portfolio theories and its application.

CONTRIBUTION TO THE SOCIETY

This research wills provides a framework to the investors for making them oven strategy of investment.

Investors can find a optimum portfolio and accordingly they can invest their hard money as per their risk tolerance level.

CONTRIBUTION TO THE INDUSTRY

We are taking NSE NIFTY as barometer of INDIAN economy so with this study performance of nifty and its different indexes are measured.

Again Broadly it would be significant to two parties. First is Portfolio and assets management companies and stock broking houses to determine and find a optimum portfolio to invest.
3.8 RESEARCH DESIGN

The research design is the conceptual framework within which researcher study is conducted and it construct the blue print for collection of data, measurement of data, statistical tools for analysis and analysis of variance. Research design included an outline of what the researcher will do from writing the hypothesis and its operational implication to the final analysis of data.

Decisions regarding what, when, how much, by what means concerning an inquiry or a research study constitute a research design, further more researcher design means arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure. Good researcher design is often features like flexible, appropriate, efficient, and economical. Here hypothesis testing research is those where the researcher tests the hypothesis of casual relationship between variables. Researcher ensures the minimization of bias and maximization reliability of the evidence collected. Coding should be done carefully to avoid error in coding and for this purpose the reliability of researcher to be believed.

Researcher decided proper plan to action and define variable. Variable also identified dependent and independent. Researcher specified research processing and analyzing of the data.

3.9 SAMPLING DESIGN

A. Sources of Data

The data collected mainly in this research will all secondary data.

The data will be collected from various web-sites. The data of the monthly share prices of the scrip and nifty has been taken from the NSE’s website.

B. Sampling
For the research purpose NSE 50 is considered as a sample as well other studies based on sector indices.

A first criterion for the selection of the appropriate market index can be a high Value of $R^2$ when running a regression of one or more stocks with it, as in such case means that the fluctuations in the returns of the index explain quite well the variation in the returns of the stocks.

Another criterion can be the number of stocks included in a market index. A larger number of stocks included in an index is preferable as it indicates the use of a larger sample as a proxy of the market.

Moreover, we have to take under consideration the method of weighting. Usually, the value-weighted indices (i.e. indices weighted according to the stock market price of their stocks) are preferable from the equal-weighted indices (i.e. indices having equal weights for each stock.

In the case of the national Stock Exchange (NSE), which we are going to select for this study I have to choose amongst the following indices:

**S&P CNX Nifty**

The CNX Nifty is a well-diversified 50 stock index accurately reflecting overall market conditions. The reward-to-risk ratio of CNX Nifty is higher than other leading indices, making it a more attractive portfolio hence offering similar returns, but at lesser risk.

**CNX Nifty Junior**

The CNX Nifty Junior Index comprises of the next rung of liquid securities after those forming part of CNX Nifty. It may be useful to think of the CNX Nifty and the CNX Nifty Junior as making up the 100 most liquid stocks in India.

**CNX 100**

The CNX 100 tracks the behavior of combined portfolio of two indices viz. CNX Nifty and CNX Nifty Junior. It is a diversified 100 stock index. The maintenance of the CNX
Nifty and the CNX Nifty Junior are synchronized so that the two indices will always be disjoint sets; i.e. a stock will never appear in both indices at the same time

**CNX 200**

The CNX 200 Index is designed to reflect the behaviour and performance of the top 200 companies measured by free float market capitalization. The index comprises of 200 such companies that are listed on the National Stock Exchange (NSE).

**S&P CNX 500**

The CNX 500 is India’s first broad-based benchmark of the Indian capital market for comparing portfolio returns vis-à-vis market returns.

**NIFTY Midcap 50**

The primary objective of the Nifty Midcap 50 Index is to capture the movement of the midcap segment of the market. The index comprises of 50 stocks listed and is also available for trading in F&O segment at National Stock Exchange (NSE).

**CNX Midcap**

The mid cap segment of the stock market is being increasingly perceived as an attractive investment segment with high growth potential. The primary objective of the CNX Midcap Index is to capture the movement of the midcap segment of the market. The CNX Midcap Index comprises 100 tradable stocks listed on the National Stock Exchange (NSE).

**CNX Smallcap**

The CNX Smallcap Index is designed to reflect the behaviour and performance of the small cap segment of the financial market. The CNX Smallcap Index comprises 100 tradable stocks listed at the National Stock Exchange (NSE).
**LIX 15**

LIX 15 Index is designed to provide exposure to the liquid stocks while making the index easily replicable and tradable. In order to make the index easily replicable and tradable, criteria’s such as minimum turnover ratio and free float market capitalization are applied while stock selection.

**CNX Auto**

The CNX Auto Index is designed to reflect the behaviour and performance of the Automobiles segment of the financial market. The CNX Auto Index comprises 15 tradable, exchange listed companies. The index represents auto related sectors like Automobiles 4 wheelers, Automobiles 2 & 3 wheelers, Auto Ancillaries and Tyres.

**CNX Bank**

The CNX Bank Index is an index comprised of the most liquid and large capitalized Indian Banking stocks. It provides investors and market intermediaries with a benchmark that captures the capital market performance of the Indian banks. The Index has 12 stocks from the banking sector, which trade on the National Stock Exchange (NSE).

**CNX Energy**

CNX Energy sector Index includes companies belonging to Petroleum, Gas and Power sectors. The Index comprises of 10 companies listed on National Stock Exchange of India (NSE).

**CNX Finance**

The CNX Finance Index is designed to reflect the behavior and performance of the Indian financial market which includes banks, financial institutions, housing finance and other financial services companies. The CNX Finance Index comprises of 15 stocks that are listed on the National Stock Exchange (NSE).
**CNX FMCG**

The CNX FMCG Index is designed to reflect the behaviour and performance of FMCGs (Fast Moving Consumer Goods) which are non-durable, mass consumption products and available off the shelf. The CNX FMCG Index comprises of 15 stocks from FMCG sector listed on the National Stock Exchange (NSE).

**CNX IT**

The CNX IT index provides investors and market intermediaries with an appropriate benchmark that captures the performance of the Indian IT companies. The CNX IT Index comprises of 20 companies listed on the National Stock Exchange (NSE).

**CNX Media**

The CNX Media Index is designed to reflect the behaviour and performance of the Media & Entertainment sector including printing and publishing. The CNX Media Index comprises of 15 stocks from Media & Entertainment sector that are listed on the National Stock Exchange (NSE).

**CNX Metal**

The CNX Metal Index is designed to reflect the behaviour and performance of the Metals sector (including mining). The CNX Metal Index comprises of 15 stocks that are listed on the National Stock Exchange (NSE).

**CNX Pharma**

CNX Pharma Index captures the performance of the pharmaceutical sector. The Index comprises of 10 companies listed on National Stock Exchange of India (NSE).

**CNX PSU Bank**

The CNX PSU Bank Index captures the performance of the PSU Banks. The Index comprises of 12 companies listed on National Stock Exchange (NSE).
**CNX Realty**

CNX Realty Index is designed to reflect the behaviour and performance of Real Estate companies. The Index comprises of 10 companies listed on National Stock Exchange of India (NSE).

**C. Coverage**

The researcher would cover the time period up to past 10 years in order to address the said research problem. Again few of the indexes are taken from its inception on NSE.

**D. Hypotheses:**

**H0:** Assets Allocation by investing in negatively correlated assets reduces risk.

Sub hypothesis 1A: There is negative correlation between CNX ENERGY AND AUTO INDEX

Sub hypothesis 1B: There is negative correlation between CNX Nifty and GOLD

**H0:** Assets Allocation by investing in positively correlated assets increases your risk.

Sub hypothesis 2A: CNX Bank Index and CNX Finance Index are positively correlated

Sub hypothesis 2B: CNX Nifty and CNX 100 Index are positively correlated

**H0:** Modern portfolio theory gives higher return

**H0:** NSE 50 represents optimal portfolio.
E. Analysis of data

For the analysis of data following tools shall be taken into consideration:

- Means
- Standard deviations
- Covariance
- Variances
- Beta
- correlation
- Various parametrical and non-parametrical tests.
- Modern portfolio theories and models for its application

3.10 THE MARKOWITZ MODEL

Investing in financial assets such as stocks is a very common form of investment, which is a long term investment enabling high levels of risk. Portfolio theory has developed models of expected return to risk and measures of measuring them in order to provide an investor with best possible tools of analyzing the available information and making rational decisions.

Harry Markowitz is generally acknowledged as the father of modern portfolio theory after publishing his seminal paper in 1952, for which he (jointly) received a Nobel Prize in 1990. Markowitz (1952) and Tobin (1958) showed that it was possible to identify the composition of an optimal portfolio of risky securities, given forecasts of future returns and an appropriate covariance matrix of share returns. This research endeavours to apply the theory of Markowitz to the Johannesburg Securities Exchange (JSE) to establish whether an optimal portfolio can be identified and used as an effective trading rule. Weekly data over 11 years on the top 40 JSE listed companies was analysed to
construct the study found that the trading strategy significantly outperformed the market in the period under review. Most people agree that holding two stocks is less risky than holding one stock.

One of the important notions of portfolio theory has been the **diversification of risk** by forming portfolios of assets instead of investing all of our money on just a single stock. By diversifying our investment in several assets we reduce the total risk taken and thus the possibility of loss of our money.

Another interesting concept is the separation of the total risk of an investment in **systematic risk** which is attributed to factors affecting the total of the market (i.e. macroeconomic factors, GDP growth rate, unemployment, inflation rate etc.) and all of the stocks and thus it is not reduced through diversification (non-diversifiable risk). On the other hand, there is the **non-systematic risk**, which is attributed to factors unique for each company, the stock of whom we examine, such as the efficiency of the company’s administration, its dividend policy etc. Thus the non-systematic risk can be reduced (i.e. diversifiable risk) by forming a portfolio of several stocks exhibiting the highest possible negative correlation between them.

Portfolio theory was firstly developed by Markowitz and has contributed significantly in the progress of financial analysis, as according to it, investors have the ability to combine several financial assets and thus forming a portfolio. A portfolio can be defined as a combination of stocks or other financial assets which is characterized by the weights of investment on each of its assets. By forming optimal portfolios, the investors aim to minimize their investment risk.

The fundamental assumption of Markowitz was that investors prefer to avoid risk, i.e. they are risk averse. In other words, investors accept to take more risk only when there is the possibility of getting higher returns from the investment.

Portfolio theory as was developed by Markowitz, is based on the following four **assumptions**:

1. Investors have a clear and isolated investment horizon.

---

2. Every single stock for the investors is represented by a probability distribution of the expected returns. The expected price of this distribution is a measure of the expected return of the stock while the variance of the returns gives us a measure of its risk.

3. A portfolio of single stocks can be completely described by the expected return of the portfolio and the relevant variance of this return.

4. Investors exhibit rational behaviour as this is determined by the following two basic adoptions:

Investors prefer the highest possible returns for each level of risk. Investors prefer the less possible risky returns for each level of returns.

Thus portfolio theory attempts to specify the best portfolio under conditions of uncertainty. It examines the possible combinations of single stocks in portfolios with characteristics of risk and expected returns and provides an investor with the ability of choosing one which maximizes the expected benefit of the investor.

The basic points of Markowitz’s theory are the following:

1. The basic characteristics of a portfolio are the expected return and a measure of dispersion of the possible returns around the mean return.

2. The rational investors select efficient portfolios. Such portfolios are those which maximize the expected return for a given level of risk and minimize the risk for a given level of return.

3. The construction of efficient portfolios is possible. This process requires analysis and knowledge of the basic characteristics of the investments such as the expected return, the variance of it and also the possible autocorrelations of the returns of those investments.
For example:-

Holding stocks from textile, banking and electronic companies is better than investing all the money on the textile companies stock. But building up the optimal portfolio is very difficult. Markowitz provides an answer. It is also known as modern portfolio theory.

Portfolio theory and the selection of the efficient portfolio include the following three stages:

1. **Analysis of the characteristics of the assets (i.e. stocks).**

In this stage the investor analyzes the returns of single stocks for a given time interval and estimates the expected return of the stock, its variance and the covariance and correlation coefficient between the returns of the stocks.

**Historical return**

Historical return can be calculated using following formula.

Return of stock i = Capital yield + Dividend yield

Where:

*Capital yield*: It is ought to the rise (capital profits) or fall (capital losses) of the price of the stock during the examined period.

*Dividend yield*: It is ought to the dividend which was distributed during the examined period.

As a consequence the total return of the stock i is estimated according to the formula:

\[ R_{it} = \frac{P_{it} - P_{it-1} + D_{it}}{P_{it-1}} \]

\[ P_{it} : \text{The price of the stock i during the period t} \]

\[ P_{it-1} : \text{The price of the stock i during the period t-1} \]

\[ D_{it} : \text{The dividend of the stock i during the period t} \]
**Expected return of the stock i: E(Rit):**

It equals the weighted average of the possible returns of the stock i where the weights are the probabilities of these returns, i.e.

\[ E(R_{it}) = \sum PiR_i \]

Where:

Pi : The possibility of getting the return Ri.

**Variance of the returns of the stock i:**

It is a measure of dispersion of the actual returns from the expected one and it measures the variability of the return of an asset. It is calculated as the weighted average of the squared deviations of the possible returns from the mean value, having as weights the probabilities of appearance of these returns and it is given by the following formula:

\[ \sigma^2 = \sum Pi (R - E(R))^2 \]

**Standard deviation of the returns of the stock i:**

\( \sigma (R_{it}) \): It is the square root of the variance of the returns of the stock i.

**Covariance between the returns of two stocks i and j**

The covariance between two stocks shows us the direction towards which, the returns of the stocks i, j tend to move. If the covariance is positive, then the returns of the two stocks i, j move to the same direction while, if it is negative move to the opposite one.

The covariance between the returns of the two stocks i, j is given by the formula:

\[ \text{COV}_{ij} = \frac{\sum [R_i - R_i][R_j - R_j]}{N} \]
**Correlation coefficient between two stocks i, j:**

As the covariance shows only the direction towards which, the returns of the stocks \( i, j \) tend to move, we need another measure which can give us the strength of their relation. This purpose is served by the correlation coefficient which takes values from the interval \([-1, 1]\). Depending on the values of the above coefficient we distinguish the following cases:

The correlation coefficient is calculated by the formula:

\[
    r_{ij} = \frac{\text{cov}_{ij}}{\sigma_i \sigma_j}
\]

**Coefficient of determination**

It is the squared price of the correlation coefficient and it represents the proportion of the total variation of a dependent variable explained by the regression of the dependent variable on the independent one, i.e. A value of \( R^2 = 65 \% \) means that the regression of the dependent variable on the independent, explains 65% of the total variation of the dependent one.

2. **Analysis of the portfolios.**

After the selection of the stocks in the previous stage, here an investor combines them in 2, 3 or any other number and forms portfolios from which he chooses those ones having the maximum expected return with the minimum possible risk. Such portfolios are called efficient portfolios and graphically presented they form the so-called efficient frontier.

A portfolio is characterized as efficient if:

There is no other portfolio with the same expected return, having less risk (i.e. smaller standard deviation)
There is no other portfolio with the same or smaller standard deviation, yielding higher expected return.

**Risk and expected return of portfolio**

MPT assumes that investors are risk averse, meaning that given two portfolios that offer the same expected return, investors will prefer the less risky one. Thus, an investor will take on increased risk only if compensated by higher expected returns. Conversely, an investor who wants higher expected returns must accept more risk. The exact trade-off will be the same for all investors, but different investors will evaluate the trade-off differently based on individual risk aversion characteristics.

**In general:**

- **Expected return:**

  \[ E(R_p) = \sum_i w_i E(R_i) \]

  where \( R_p \) is the return on the portfolio, \( R_i \) is the return on asset \( i \) and \( w_i \) is the weighting of component asset \( i \) (that is, the share of asset \( i \) in the portfolio).

- **Portfolio return variance:**

  \[ \sigma^2_p = \sum_i w_i^2 \sigma^2_i + \sum_i \sum_{j \neq i} w_i w_j \sigma_i \sigma_j \rho_{ij} \]

  Where \( \rho_{ij} \) is the correlation coefficient between the returns on assets \( i \) and \( j \). Alternatively the expression can be written as:

  Where \( \rho_{ij} = 1 \) for \( i=j \).

  Portfolio return volatility = Standard Deviation
Portfolio return =

$$w_A E(R_A) + w_B E(R_B) + w_C E(R_C)$$

3. Selection of the portfolio.

From all the portfolios of the efficient frontier, the investor chooses the portfolio which has the desirable level of “expected return – risk” according to his preferences and his behaviour i.e. risk lover or risk averse.

For example, a risk lover investor will accept to undertake a higher level of risk in order to gain a higher expected return, while a risk averse investor will forego an amount of expected return in order to secure having small risk for his investment.

3.11 SINGLE INDEX MODEL

As it is clear from the previous section of portfolio theory, the analysis according to Markowitz’s model requires a great number of calculations (i.e. expected return and variance for each stock candidate for inclusion in our portfolio, multiple covariances between them, etc.) in order to select an efficient portfolio of assets. This practical inefficiency in its application, led to the development of the Single Index Model or Market Model. Major contribution to its forming and its latter further development creating the Capital Asset Pricing Model, was given by the working papers of Sharpe (1964), Lintner (1965) and Mossin (1966).

The fundamental concept under this model is that the return of a stock $i$ is linearly dependent with the return of the market portfolio $m$. Thus, it accepts the basic assumption that there is no other factor affecting the stocks’ returns than the market. As a proxy of the market is usually used a relevant price index.

Main Outcome of the Single-Index Model
• If we assume that actual returns can be broken down into systematic (i.e. market-related) and firm-specific parts, then variance also can be broken down into two parts:

\[ \sigma_i^2 = \beta_i^2 \sigma_M^2 + \sigma^2(e_i) \]

• The Single-Index Model also gives us an easy way to calculate covariance between two assets:

\[ \text{Cov}(R_i, R_j) = \text{Cov}(\beta_i R_M, \beta_j R_M) = \beta_i \beta_j \sigma_M^2 \]

Suppose you are considering N risky assets. Using the single index model, how many pieces of information do you need to find the efficient frontier?

• \( \text{E(r)’s} = \alpha_i + \beta_i E(r_M) \)  \( \Rightarrow 2N + 1 \)

• \( \sigma_i^2 = \beta_i^2 \sigma_M^2 + \sigma^2(e_i) \)  \( \Rightarrow N + 1 \)

Total:  \( 3N + 2 \)

Thus, it’s a lot easier to figure out what the efficient frontier of risky assets is if you use an index model.
Applications of the Single Index Model (Market Model):

Systematic risk is one of the most common criteria for evaluating single stocks and portfolios of them and thus it is necessary its consistent and unbiased estimation. It has a lot of application in the field of finance such as:

For the estimation of beta coefficient for single stocks and portfolios, The simplification of the process of portfolio analysis and selection and Provides the necessary variables for using in indices such as the Treynor’s measure.

Estimation of the beta coefficient:

Beta coefficient is a measure of the sensitivity in the expected return of a stock as compared to the returns of the market. It is considered as the most representative measure of the systematic risk of stocks and portfolios. As we saw in a previous section, the systematic risk is that part of the total risk which is attributed to all those factors (economical, political, social, etc.) affecting the total of the market and can be reduced through diversification thus its estimation is important.

Beta coefficient is the relative measure of non-diversifiable risk. It is an index of the degree of movement of an asset’s return in response to a change in the market’s return.

The beta coefficient is defined by the following formula:

\[ \beta_i = \frac{Cov(R_i, R_M)}{\sigma_M^2} \]

Where,

\[ Cov(R_i, R_M) = \text{The covariance between the returns of the stock i and the market’s portfolio m (usually represented by a relative price index of the local market, which by definition has a beta coefficient equal to one).} \]

\[ \sigma_M^2 = \text{Standard Deviation of Market} \]

The stocks and the portfolios are classified according to the price of their beta
coefficient. As larger as is the price of the beta coefficient, by that much is considered as risky the investment on this asset or portfolio. More clearly depending on the prices of the beta coefficient, we distinguish the following three major cases:

For $\beta < 1$: The stocks are characterized as defensive, i.e. with low risk and investing on them is rational on periods when the market exhibits depression (bear market).

For $\beta = 0$: the fluctuations of the market will not affect the returns of the corresponding stock.

For $\beta > 1$: The stocks are characterized as offensive, i.e. with high risk and investing on them is rational on periods when the market exhibits rise (bull market).

**Return**

The total gain or loss experienced on an investment over a given period of time, calculated by dividing the asset’s cash distributions during the period, plus change in value, by its beginning-of-period investment value is termed as return. So Return can be calculated with the following formula:

$$\text{Excess Return-Beta Ratio} = \frac{(R_i - R_f)}{\beta_i}$$

Where,

$R_i$ = the expected return on stock

$R_f$ = the return on a riskless asset

$\beta_i$ = the expected change in the rate of return on stock associated with one unit change in the market return.

Risk-free rate of return ($R_f$) Risk-free rate of return is the required return on a risk free asset, typically a three month treasury bill.

Excess return-to-beta ratio is calculated for each security in the portfolio and securities are ranked in descending order of magnitude according to their excess return-to-beta...
ratio. Further, the number of stocks selected in the optimum portfolio depends on a unique cutoff rate such that all stocks with excess return-to-beta ratios greater than this unique cut off rate are included and all stocks with lower ratios excluded.

**Cut-off point**

\[
Ci = \frac{\sigma_m^2 \Sigma (R_i - R_p) \beta_i}{1 + \sigma_m^2 \Sigma \beta_i^2 / \sigma_{ei}^2}
\]

Where,

\(Ci\) = the cut-off point.

\(\sigma_m^2\) = variance of the market index.

\(\sigma_{ei}^2\) = variance of a stock’s movement that is not associated with the movement of market index that is stock’s unsystematic risk.

**Investment to be made in each security**

\(Xi = Zi / \Sigma Zi\)

Where, \(Xi\) = the proportion of investment of each stock.

\(Zi = \) Total investment

**Simplification of the process of portfolio analysis and selection:**

The classical Single Index Model (S.I.M.) can be used for the simplification of the process of forming efficient portfolios according to the Markowitz’s theory. The major contribution of the S.I.M. is attributed to the reduction of the necessary parameters for estimating efficient portfolios.
For example, in the case that we want to include 30 different assets in a portfolio, we need to estimate 30 different expected returns, 30 different variances and 435 different covariances, each one for each pair of assets. Thus in total 495 parameters. On the other hand, by using the S.I.M. we just need to estimate 30 beta coefficients, 30 standard deviations and one standard deviation for the market. Thus the total number of the required parameters is reduced to 61.

Generally the required parameters in each case are given by the following table:

Table no: 1

Required parameters of modern portfolio theories

<table>
<thead>
<tr>
<th>Markowitz Model</th>
<th>Single Index Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected Returns</td>
<td>Beta coefficients</td>
</tr>
<tr>
<td>Standard Deviations</td>
<td>Standard Deviations</td>
</tr>
<tr>
<td>Correlation Coefficients</td>
<td>Standard Deviation of the market</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>Total</strong></td>
</tr>
<tr>
<td>N(N+3)/2</td>
<td>2N+1</td>
</tr>
</tbody>
</table>

3.12 CHAPTER PLAN

Here, we discussed the overview of the research work i.e. the frame work of the research work that which types of chapters are included in this study.

1. Introduction:-

This chapter deals with basic concepts and theoretical frame work of mordon portfolio theories. As well history and working of NSE is discussed in detail. This chapter is design to give an understanding and perspective of Modern Portfolio Theory. The background gives a historical view within the topic.
2. Review of Literature:-

This chapter deals with literature reviews of research work. These reviews are divided mainly in three parts review of portfolio management and review of portfolio management theories and review on stock exchange studies which are subdivided according to the book review and according to the article review.

3. Research Methodology:-

This chapter include Introduction, Research Methodology, Problem Identification, Title of the study, Scope of the study, Objectives of the study, Hypothesis for the study, Data Collection, Significance of the study, Period of the study, Sampling Design, Tools and techniques for analysis, Chapter plan, Limitations of the study and References of the research work.

4. Presentation of Sample units:-

Here brief overview of all the units of sample with its basic conception to its all statistics. This will helps in understanding all the samples in better manner. Here author will clarify the indexes which are taken as sample.

5. Data Analysis and Interpretation:-

In this chapter, researcher has put the information into calculation for deriving specific results. Various graphs and data regarding index performance and outcome of processed data is presented.

6. Summery, Findings and Suggestions:-
This chapter concludes or summarizes the total research work. In this chapter findings which derived after analysis and interpretation of the data has been included. It is also shows some recommendations i.e. suggestions with the help of the research study.

3.13 LIMITATION OF THE STUDY

Following limitations were encountered while preparing this project:

1. Limited Data: - This project is done based on the data collected by the source of secondary medium. This method is however not much helpful as it fails to provide the essential facts and findings necessary for exact interpretation and analysis.

2. Limited period: - This project is based on the data available of limited period of time of last ten years performance. Which is certainly not helpful to make this project report accurate in terms of various comparisons and growth analysis.

3. Limited area: - Also it was difficult to collect the data regarding the all the listed companies. Moreover, the topic chosen is very wide in terms of actual creation work as there are various methods available for carrying out the analysis of portfolio. Whereas, data and area for the project are available which make the situation contradictory and limits the scope.

4. Type of data used: - This project is completely based on secondary data collected from various sources like internet, magazines, newspapers and books etc.
References:


4. Web sites

- [http://www.nseindia.com/products/content/equities/indices/cnx_nifty.htm](http://www.nseindia.com/products/content/equities/indices/cnx_nifty.htm)
- [http://www.nseindia.com/products/content/equities/indices/cnx_nifty_junior.htm](http://www.nseindia.com/products/content/equities/indices/cnx_nifty_junior.htm)
- [http://www.nseindia.com/products/content/equities/indices/LIX_15.htm](http://www.nseindia.com/products/content/equities/indices/LIX_15.htm)
- [http://www.nseindia.com/products/content/equities/indices/LIX_15_Midcap.htm](http://www.nseindia.com/products/content/equities/indices/LIX_15_Midcap.htm)
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- [http://www.nseindia.com/products/content/equities/indices/cnx_midcap_200.htm](http://www.nseindia.com/products/content/equities/indices/cnx_midcap_200.htm)