

Construction of Optimal Portfolio Using Sharpe's Single Index Model and Markowitz Model

An Empirical Study on Nifty 50 Stock

Subhodeep Chakraborty¹ and
Ajay Kumar Patel²

¹ PGDM Candidate, GL Bajaj Institute of Management
and Research, Greater Noida
E-mail: subhodeep12@gmail.com

² Assistant Professor, GL Bajaj Institute of Management
and Research, Greater Noida
E-mail: ajay.patel@glbimr.org



ISSN 2348-2869 Print

© 2017 Symbiosis Centre for Management
Studies, NOIDA

Journal of General Management Research, Vol. 5,
Issue 1, January 2018, pp. 86–103

Abstract

The main focus of this research is to construct an optimal portfolio in Indian Market with the help of Sharpe Single index model. The construction of an optimal portfolio has become increasingly challenging in recent years, as investors expect to maximize return and minimize risk from their respective investment therefore a good combination of portfolio will give maximum return for a particular level of risk. An investor needs to have proper knowledge of security analysis and portfolio theory for making corrective investment decisions. In 1950, Markowitz, who was considered the father of modern portfolio theory, mainly because he is the first person who gave a mathematical model for portfolio optimization and diversification. Modern portfolio theory (MPT) is a theory of finance that attempts to maximize portfolio expected return for a given amount of risk, or minimize the risk for a given level of expected return. Markowitz theory advises investors to invest in multiple securities rather than pulling all eggs in one basket. In order to overcome the Markowitz Model, William Sharpe, tried to

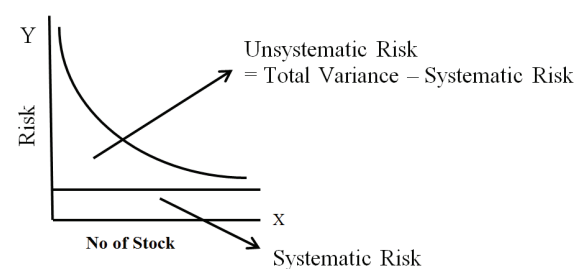
simplify the process of data inputs and reaching a solution, by developing a simplified variant of the Markowitz model. In the Sharpe's model, the desirability of any securities inclusion in the portfolio is directly related to its excess return-to-beta ratio. The proposed method formulates a unique cut off point (Cut off rate of return) and selects stocks having excess of their expected return over risk free rate of return surpassing this cut-off point. Then they are ranked from highest to lowest order and then the Percentage of investment in each of the selected security is then decided on the basis of respective weights assigned to each security. In this research, all 50 stocks of NSE NIFTY 50 Index are taken into consideration and Weekly data of all these stock for the period of September 14,2016 to September 15,2017 have been considered which further converted into annually. Further the proportion of investment of each 50 stock in the optimal portfolio was also calculated and along with risk and return of the selected stock are also been calculated with the help of Markowitz Model This study gains more importance as stocks included in Nifty 50 represent majority of market capitalisation of NSE. The Nifty 50 hold about 62.9% of the market capitalization of the stocks listed on NSE.

Keywords: Markowitz Theory, Sharpe's Single Index Model, Optimal Portfolio, Cut Off Rate, Excess Return-to-Beta Ratio, Percentage of Investment, NSE NIFTY 50 Index, Market Capitalization.

INTRODUCTION

Portfolio is the combination of securities such as stocks, bonds and money market instruments. The process of blending together the broad asset so as to obtain optimum return with minimum risk if called portfolio construction. Investment in more than one

security has been discussed always in portfolio management, which includes the security evaluation and the optimal portfolio. To make wise decisions in investment, there is a need for knowledge on security analysis and portfolio management. An investor is always risk-averse so they aim at attaining maximum return with minimum risk. Many investors hold the assets in order to reduce the risk. For this purpose, investor has to construct a portfolio of assets which is an efficient portfolio (minimum risk for a given expected return) which comprises of different classes of assets (stocks). In the year 1950, Markowitz Model state that in order to obtain benefit investors must invest in more than one securities, i.e. diversification help to reduce the risk. The Markowitz Model is based on several assumptions (1) Investors estimate risk on variability of return, (2) Investors are based on expected return and variance of return, (3) If we diversified, Risk will be decreased or reduced. Analyst have the opinion that if more and more portfolio is added, unsystematic risk can be reduced.



In Markowitz Model, a number of information have to be estimated. For example, if a financial institution buys 150 stocks, it has to estimate 11,475, i.e. $N(N + 3)/2$. Therefore, in order to overcome the Markowitz Model, in 1964, W.E. Sharpe developed a new and simpler model to analyse the portfolio. According to this model. security's return is correlated to a single index which is usually a market index. All securities that are traded

on the exchange will be a part of the market index. Sharpe's Single Index Model (SIM) demands only $(3n+2)$ bits of information. For example, if you buy 50 stocks, the total number of information estimates to $(3*50+2)$, i.e. 150 information whereas it is $(n(n+3)/2)$ bits of information in Markowitz model, i.e. 1325 information's. In Sharpe's Index Model, Stock prices are related to the market index and this relationship could be used to estimate the return of stock. The present paper seeks to construct an optimal portfolio using Sharpe's Single Index model and comparison between Sharpe's Single Index Model (SIM) & Markowitz Model and taking into consideration stocks of Nifty 50. The study is relevant in present times because the not many authors have constructed optimal portfolio showing comparison between Sharpe's Single Index Model (SIM) & Markowitz Model during the period considered for study.

OBJECTIVES OF THE STUDY

1. To Understand the Portfolio theory – Sharpe Index Model & Markowitz Model.
2. To construct an optimal portfolio using stocks listed in NIFTY 50.
3. To see the Comparison between Sharpe's Single Index Model (SIM) & Markowitz Model.
4. To know which Securities are performing well and which are performing low in the market.
5. To calculate respective proportion for each selected stock to be invested in the portfolio for the time period 14 Sept 2016 to 15 Sept 2017.

LIMITATIONS OF THE STUDY

The following are the limitations of the study:

- The study is purely based on secondary data.
- This study is based on Weekly data.
- The results of the study may not be universally applicable.
- Due to time limit only one-year data have been taken.

NEED FOR THE STUDY

Every investor undergoes confusion while selecting securities for his portfolio. He also faces dilemma while deciding about the proportion of investment to be made in each security. To help investors get out of such chaotic situations the Sharpe's Single Index model may be used to construct an optimal portfolio. This helps the investor to find a portfolio that best suits his needs. The present study is undertaken to prove that by applying this model an individual can construct a portfolio with maximum return for a given level of risk.

LITERATURE REVIEW

Tanuj Nandan and Nivedita Srivastava (2017) constructed a portfolio using stocks of NIFTY 50. In the study, it was found to be an easy and simple method to calculate optimal portfolio. In this method, fewer number of variables are used as compared to Markowitz Model. **Dr. S. Poornima and Aruna P. Ramesh (2015)** construct a portfolio using Sharpe Index Model using stock of BSE. In THE study, it was found that only 20 company's stock are chosen to construct a portfolio and yearly price are taken into consideration instead of daily or weekly. **B.N. Dutta (Smriti Mahavidyalaya) and Burdwan (2011)** construct an optimal portfolio empirically taking BSE SENSEX as market performance index and considering

daily indices along with the daily prices of sampled securities for the period of April 2001 to March 2011. **Nalini (2014)** in her study considered 15 stocks of various sectors from S&P index, taking BSE Sensex as market index. It was found that risk can be reduced by diversifying the portfolio. Only four stocks were selected in the optimal portfolio. **Vardarajan**, in his study of 20 stocks from Steel, Banking and Media and Entertainment sector concluded that SIM acts as a tool for portfolio selection and helps investors in taking informed decisions. The stock market is volatile and investors need to regularly monitor and update their portfolio. **M Sathyapriya** construct portfolio using Sharpe Index Model with reference to Infrastructure sector and Pharmaceutical Sector. In this study twenty different stocks listed in NSE picked from Infrastructure & Pharmaceutical industries. **Chintan A. Shah (Assistant Professor, Bhagwan Mahavir College of Business Administration, Surat) 2015**, construct portfolio using Sharpe Index Model with reference Using Sharpe Index Model & Camp for BSE Top 15 Securities. **Andrade, Pratibha Jenifer (2012)** aimed at developing an optimal portfolio of equity of IT sector through Sharpe's Single Index Model. In this study, a sample of six top performing IT companies traded in BSE has been chosen. The data is related to the daily returns of the securities and the market index has been collected through secondary sources. Data has been collected for a period of three years i.e. 2009 to 2011. It was found that the optimal portfolio has been constructed with five companies. **Debasish, Satya Swaroop and Khan, Jakki Samir (2012)** selected a sample fourteen stocks from the various manufacturing sectors like automobiles, cement, paints, textiles oil& refineries and

these are traded in the NSE. The daily data for all the stocks for the period Jan 2003 to November 2012 has been considered. Percentage of investment in each of selected stock is decided based on respective beta value, stock movement variance unsystematic risk, return on stock risk free return. Among the fourteen selected companies an optimal portfolio using Sharpe's Single Index Model constituted only three stocks. The proportion of investment to be made was also calculated using Single Index Model.

Thus, the literature survey made for the present study showed that there is enough scope for studying the utility of Sharpe's Single Index Model under the Indian conditions especially considering the securities of companies traded through the BSE which is one of the oldest stock exchange in the world and which is considered as one of the major attractions to any investor, either individual or institutional.

RESEARCH METHODOLOGY

Descriptive and Qualitative research is done and Secondary Data is used for the study. Data has been collected from website like www.nseindia.com, <https://in.finance.yahoo.com>, <http://money.rediff.com> and <https://in.investing.com>. For the current study, Nifty 50 Index is taken into consideration as Market Index. Weekly NSE INDICES and prices of all the 50 stocks of Nifty 50 are taken for the period September 14, 2016 to September 15, 2017 for computing weekly return of each security. The weekly price is calculating by using the formula: $R_i = (R_2 - R_1) / R_1$ where R_2 = closing price of week 2, R_1 = closing price of week 1 and R_i = return of stock. The Weekly mean return of all individual stock was calculated using Excel. The Week return is then converted

into annual Return by using Excel formula, i.e. = [(1 + weekly mean) ^52] – 1. For risk-free rate of return 91-day T-bills: 6.1081%* is taken from the RBI website and for Market risk variance of Nifty 50 is been calculated. Beta, Unsystematic Risk, Systematic Risk and Cut-off point is also calculated by using Excel. Securities with their 'Excess Return to Beta' is also been calculated. A number of financial and technical tools has been used for analysing data.

Category	Present Methodology
Research Design	› Descriptive › Quantitative
Sources of Data	Secondary, from NSE, RBI, etc. websites, and databases
Sample Population	NIFTY 50 Stock

Sample Companies

Selected Securities are Categorize as per the industry

Sl. No.	Name of the Industry	Company
1.	Financial Services	HDFC Bank, YES Bank, India Bulls, IndusInd Ltd., ICICI Bank, Kotak Mahindra Bank
2.	Automobile	Maruti Suzuki Eicher Motors
3.	Metals	Hindalco Industries Tata Steel Vedanta Ltd.
4.	Energy	BPCL GAIL (India) Power Grid Reliance Industries IOC
5.	Telecom	Bharti Airtel
6.	Consumer Goods	Hindustan Unilever
7.	Construction	Larsen & Toubro
8.	Shipping	Adani Ports and Special Economic Zone Ltd.
9.	Information Technology	Wipro

Construction of Optimal Portfolio using Sharpe's Index Model

Fischer and Jordan (1995) state that stocks to be included in optimal portfolio are determined on the basis of their 'Excess return to beta ratio.' As per the rule of ranking, security having highest 'excess return to beta ratio' will be placed in the first position, followed by the security with second highest beta ratio, and so on and so forth. Thereafter a cut-off point will be calculated and all the stock whose 'excess return to beta ratio' is above the cut-off point is included in the portfolio. The Steps in Constructing Optimal Portfolio are as follows:

- The Weekly return of the Stocks are calculated by using the formula:

$$R_i = (R_2 - R_1) / R_1$$

where R_2 = closing price of week 2,

R_1 = closing price of week 1,

R_i = return of stock

The Week return is then converted into annual Return by using Excel formula, i.e. = [(1 + weekly mean) ^52] – 1

The variance of all the stocks are calculated by using the formula in Excel = Varp (Number1, Number2).

Where Number 1 and Number 2 are the range of the return of Stock 1 to Stock 50.

- Beta – It is a measure of a security's or portfolio's volatility, compared with rates of return on the market as a whole. Beta is a slope and can take any real value ($\beta \in R$). Beta is nothing but Regression.
- Risk or variance of a security comprises of two components: (a) systematic risk, and (b) unsystematic risk. Variance due to index is the systematic risk and the residual variance is unsystematic risk.

(a) Systematic Risk = $\beta_i^2 * \text{Market Risk} = (\beta_i^2 \sigma_m^2)$

(b) Unsystematic Risk = Total Variance – Systematic Risk = σ^2_{ei}

(# Note-Market Risk (σ_m^2) is the Variance of NIFTY 50)

- The 'excess return to beta ratio' is calculated for each stock included in the study.
- The stocks are ranked in descending order as per the beta ratio ($R_i - R_f/\beta$).
- A cut off rate (C_i) is calculated for all the securities using the formula

$$C_i = \frac{\sigma_m^2 \sum (R_i - R_f) \beta / \sigma_{ei}}{1 + \sigma_m^2 \sum \beta_i^2 / \sigma_{ei}}$$

- The proportion of each stock to be invested in portfolio is calculated using the formula $W_i = Z_i / \sum Z_i$

Where $Z_i = \beta_i^2 / \sigma_{ei} (R_i - R_f / \beta - C)$

DATA ANALYSIS AND INTERPRETATION

Various statistical and financial tools and techniques have been used for optimal portfolio construction using SIM. The data relating to weekly stock prices along with weekly market indices for the period September 15, 2017 to September 14, 2017 have been collected from the website of NSE (www.nseindia.com) and also from (www.yahoofinance.com). Various statistical data such as mean stock return (R_i), mean index return (R_m), variance of individual stock (σ^2_{2i}) and market return, beta, systematic risk and unsystematic risk of all the 50 securities have been collected. Data inputs which have been collected are arranged in Table 1. It is found from Table 1 that stocks like Tata motors, Axis bank, Tata motors ltd dry, Cipla Ltd, Coal India Ltd, Techm, Sun Pharma, Dr Reddy, Lupin Ltd. have negative

returns. The negative returns may be due to macroeconomic events taking place in the economy such as **Gold prices, Volatility in fuel prices, Performance of the international markets, Government Stabilities Impact, GST Impact**. From the Table 1 It can be seen that majority of securities like Indian Oil Corporation Ltd, GAIL Ltd, HDFC Bank, Tata Motors Ltd DRY, Cipla Ltd, Coal India Ltd, Techm, Sun Pharma, Dr Reddy, Lupin Ltd and many more have beta less than 1. The movement of such securities is slow than market movement, hence called defensive securities. The investors who are risk averse prefer to invest in such securities.

Fischer and Jordan (1995) state that stocks to be included in optimal portfolio are determined on the basis of their 'excess return to beta ratio'. The securities on the basis of 'excess return to beta ratio' are ranked from Highest to Lowest and securities with 'highest excess to beta ratio' occupies the first position followed by the second position and so forth. As per as the Table 2, it seems that Eicher Moters Ltd occupies the first position followed by LUPIN Ltd in the second position. Finally, the Cut-off Point for each of the securities are also calculated.

As per as Sharpe's Index Model Securities with negative return are ignored in selection portfolio. So, the securities that are selected are shown in Table 3.

Out of total 50 stocks considered for the study, 37 securities have positive return and from that only 6 stocks are eligible for inclusion in optimal portfolio. Once the composition of stocks included in optimal portfolio is determined, the final step is to find proportion of each of these selected stocks in portfolio. The proportion of amount to be invested in each stock gives a fair idea to

Table 1: Data Inputs

Sl. No.	Security Name	Mean Return (Ri)	Variance (σ^2)	Beta	Risk Free Rate of return R(f)	Market Risk (σ_{2m})	Unsystematic Risk (Total Variance-Systematic Risk)	Excess Return (Ri - Rf)	β_{i2}	Systematic Risk ($\beta_i \sigma_{2m}$)	Excess Return to Beta Ratio (Ri - Rf)/ β
1	Eicher Motors Ltd.	0.46475	0.0019726	0.00641	0.061081	0.00020258	0.0019726	0.403674	0.00004110	0.0000000	62.96674801
2	LUPIN Ltd.	-0.32889	0.0014296	-0.00867	0.061081	0.00020258	0.0014295	-0.389968	0.00007518	0.0000000	44.97476965
3	Tata Steel Ltd.	0.97913	0.0017280	0.06412	0.061081	0.00020258	0.0017272	0.918047	0.00411114	0.0000008	14.31803813
4	India Bulls	0.65710	0.0022354	0.08715	0.061081	0.00020258	0.0022338	0.596014	0.00759576	0.0000015	6.838658055
5	GAIL Ltd.	0.44136	0.0011330	0.08659	0.061081	0.00020258	0.0011315	0.380281	0.00749843	0.0000015	4.391562024
6	Vedanta Ltd.	1.16333	0.0027411	0.29102	0.061081	0.00020258	0.0027239	1.102251	0.08469486	0.0000172	3.787495818
7	Dr Reddy	-0.26334	0.0016993	-0.09020	0.061081	0.00020258	0.0016977	-0.324425	0.00813582	0.0000016	3.596774567
8	M&M Ltd.	-0.05154	0.0007722	-0.03333	0.061081	0.00020258	0.0007720	-0.112625	0.00111079	0.0000002	3.379255494
9	Adani Ports and Special Economic Zone	0.49941	0.0017227	0.21033	0.061081	0.00020258	0.0017138	0.438330	0.04423883	0.0000090	2.084008013
10	Wipro Ltd.	0.25777	0.0007310	0.09629	0.061081	0.00020258	0.0007292	0.196689	0.00927119	0.0000019	2.042739036
11	IndusInd Ltd.	0.50548	0.0007155	0.23677	0.061081	0.00020258	0.0007042	0.444403	0.05606063	0.0000114	1.87693108
12	HDFC Bank	0.43336	0.0003884	0.21363	0.061081	0.00020258	0.0003791	0.372280	0.04563858	0.0000092	1.74262546
13	Hindalco Industries Ltd.	0.82588	0.0020601	0.44072	0.061081	0.00020258	0.0020207	0.764803	0.19423358	0.0000393	1.735350707
14	Maruti Suzuki India Ltd.	0.47926	0.0008172	0.24366	0.061081	0.00020258	0.0008052	0.418180	0.05936885	0.0000120	1.716264042
15	Indian Oil Corporation Ltd.	0.51098	0.0014044	0.27152	0.061081	0.00020258	0.0013895	0.449895	0.07372483	0.0000149	1.656928934
16	CIPLA Ltd.	-0.01935	0.0010506	-0.05552	0.061081	0.00020258	0.0010500	-0.080428	0.00308209	0.0000006	1.448727221
17	Power Grid Corp. Ltd.	0.22663	0.0003989	0.13044	0.061081	0.00020258	0.0003955	0.165546	0.01701394	0.0000034	1.269161669

Sl. No.	Security Name	Mean Return (R_i)	Variance (σ^2)	Beta	Risk Free Rate of return $R(f)$	Market Risk (σ_{2m})	Unsystematic Risk (Total Variance - Systematic Risk)	Excess Return ($R_i - R(f)$)	β_{i2}	Systematic Risk ($\beta_i \sigma_{2m}$)	Excess Return to Beta Ratio ($R_i - R(f) / \beta$)
18	HUL Ltd.	0.39344	0.0005964	0.45098	0.061081	0.00020258	0.0005552	0.332362	0.20338451	0.0000412	0.736974546
19	Bharti Airtel Ltd.	0.27320	0.0009897	0.30486	0.061081	0.00020258	0.0009709	0.212115	0.09294245	0.0000188	0.695767067
20	Larsen & Tourbro Ltd.	0.26200	0.0005089	0.29164	0.061081	0.00020258	0.0004916	0.200915	0.08505529	0.0000172	0.68890972
21	Kotak Mahindra Ltd.	0.28356	0.0005768	0.33880	0.061081	0.00020258	0.0005535	0.222475	0.11478593	0.0000233	0.656654626
22	Tata Power	0.15779	0.0011615	0.18985	0.061081	0.00020258	0.0011542	0.096713	0.03604125	0.0000073	0.509430591
23	Ultracemco	0.09708	0.0010726	0.07141	0.061081	0.00020258	0.0010715	0.036001	0.00509969	0.0000010	0.504128225
24	NTPC Ltd.	0.12518	0.0007404	0.15452	0.061081	0.00020258	0.0007356	0.064097	0.02387504	0.0000048	0.414828592
25	TCS Ltd.	0.08103	0.0009729	0.06984	0.061081	0.00020258	0.0009719	0.019945	0.00487711	0.0000010	0.285600233
26	BPCL	0.35849	0.0017472	1.35180	0.061081	0.00020258	0.0013770	0.297406	1.82736713	0.0003702	0.220007513
27	Ambuja Cements Ltd	0.12116	0.0011050	0.35521	0.061081	0.00020258	0.0010795	0.060078	0.12617720	0.0000256	0.169132374
28	ICICI Bank	0.23620	0.0011344	1.35078	0.061081	0.00020258	0.0007647	0.175124	1.82459383	0.0003696	0.129646763
29	Asian Paints Ltd.	0.08997	0.0023673	0.73411	0.061081	0.00020258	0.0022581	0.028891	0.53892099	0.0001092	0.039355282
30	ITC	0.08029	0.0013284	1.1379709	0.061081	0.00020258	0.0010661	0.019208	1.29497767	0.0002623	0.016879009
31	ZEE ENT Enterprises Ltd.	0.05524	0.0010936	0.31225	0.061081	0.00020258	0.0010738	-0.005842	0.09749777	0.0000198	-0.018709213
32	Bank of Baroda	-0.07456	0.0022600	1.05849	0.061081	0.00020258	0.0020330	-0.135644	1.12039367	0.0002270	-0.128149429
33	Bajaj Auto Ltd.	0.03093	0.0006101	0.19684	0.061081	0.00020258	0.0006022	-0.030151	0.03874441	0.0000078	-0.153178332
34	State Bank of India	0.10982	0.0012338	-0.27772	0.061081	0.00020258	0.0012182	0.048739	0.07712969	0.0000156	-0.175494093

Sl. No.	Security Name	Mean Return (R_i)	Variance (σ^2)	Beta	Risk Free Rate of return $R(f)$	Market Risk (σ_{2m})	Unsystematic Risk (Total Variance - Systematic Risk)	Excess Return ($R_i - R(f)$)	β_{i2}	Systematic Risk ($\beta_i^2 \sigma_{2m}$)	Excess Return to Beta Ratio ($(R_i - R(f))/\beta$)
35	Tata Motors	-0.25918	0.0015848	1.73376	0.061081	0.00020258	0.0009758	-0.320263	3.00591723	0.0006089	-0.184722063
36	Auribindo Pharma Ltd.	0.00374	0.0021322	0.30707	0.061081	0.00020258	0.0021131	-0.057345	0.09429319	0.0000191	-0.186746168
37	Axis Bank	-0.14583	0.0011333	1.09257	0.061081	0.00020258	0.0008915	-0.206912	1.19371068	0.0002418	-0.189380702
38	Bharti Infratel Ltd.	0.09771	0.0015752	-0.10279	0.061081	0.00020258	0.0015731	0.036633	0.01056535	0.0000021	-0.356397246
39	Oil and Natural Gas Corporation Ltd.	-0.01686	0.0007115	0.21176	0.061081	0.00020258	0.0007024	-0.077940	0.04484339	0.0000091	-0.368055091
40	INFY	-0.15213	0.0006476	0.4997247	0.061081	0.00020258	0.0005970	-0.213209	0.24972475	0.0000506	-0.426653659
41	Sun Pharma	-0.32308	0.0019267	0.895129	0.061081	0.00020258	0.0017643	-0.384165	0.80125628	0.0001623	-0.429172879
42	Bosch Ltd.	-0.03731	0.0009547	0.22532	0.061081	0.00020258	0.0009444	-0.098390	0.05077085	0.0000103	-0.436658754
43	HCLTECH	0.12578	-0.1317553	-0.13176	0.061081	0.00020258	-0.1317588	0.064699	0.01735947	0.0000035	-0.491053462
44	TECHM	-0.02146	0.0012528	0.11810	0.061081	0.00020258	0.0012500	-0.082546	0.01394664	0.0000028	-0.698970404
45	Hero Motocorp Ltd	0.11497	0.0010511	-0.07285	0.061081	0.00020258	0.0010500	0.053892	0.00530706	0.0000011	-0.739765763
46	ACC Ltd.	0.01305	0.0007822	0.05614	0.061081	0.00020258	0.0007816	-0.048028	0.00315140	0.0000006	-0.855542037
47	Tata Motors Ltd DVR	-0.31417	0.0018688	0.34287	0.061081	0.00020258	0.0018450	-0.375248	0.11756043	0.0000238	-1.094430756
48	Coal India Ltd.	-0.19032	0.0009425	0.17078	0.061081	0.00020258	0.0009366	-0.251398	0.02916625	0.0000059	-1.472043803
49	Reliance Industries Ltd.	0.61905	0.0009919	-0.28675	0.061081	0.00020258	0.0009752	0.557973	0.08222576	0.0000167	-1.945848842
50	YES Bank	0.63396	0.0015446	-0.20970	0.061081	0.00020258	0.0015357	0.572880	0.04397412	0.0000089	-2.73190066

Table 2

Sl. No.	Securities	BETA(β_i)	$(R_i - R_f) / \beta_i$	Var(σ^2)	$(R_i - R_f) * B$	$(R_i - R_f) * B / (\sigma^2)$	$C_i (R_i - R_f) * \beta_i$	$\beta_i^2 / (\sigma^2)$	$C_i \beta_i^2 / (\sigma^2)$	Mrkt. Var (σ_{2m})	C
1	Eicher Motors Ltd.	0.006410904	62.96674801	0.001972624	0.002587914	1.311914369	1.311914369	0.020835035	0.020835035	0.000202583	0.026565924
2	LUPIN Ltd.	-0.008670814	44.97476965	0.00142956	0.003381339	2.365300529	3.677214898	0.052591721	0.073426755	0.000202583	0.074383428
3	Tata Steel Ltd.	0.064118211	14.31803813	0.001727996	0.05886353	34.06462594	37.74184084	2.379140607	2.452567363	0.000202583	0.728394863
4	India Bulls	0.087153676	6.838658055	0.002223536	0.051944827	23.23778872	60.97962956	3.398004189	5.850571552	0.000202583	1.104441571
5	GAIL Ltd.	0.086593465	4.391562024	0.001132991	0.032929812	29.06448406	90.04411362	6.618256535	12.46882809	0.000202583	1.456285876
6	Vedanta Ltd.	0.291023818	3.787495818	0.002741058	0.320781439	117.0283297	207.0724434	30.89860303	43.36743111	0.000202583	2.233069779
7	Dr Reddy	-0.090198768	3.596774567	0.0016993	0.029262702	17.22044318	224.2928865	4.787746038	48.15517715	0.000202583	2.300022472
8	M&M Ltd.	-0.033328479	3.379255494	0.000772176	0.003753635	4.861109905	229.1539964	1.438515056	49.59369221	0.000202583	2.315711159
9	Adani Ports and Special Economic Zone	0.210330293	2.084008013	0.001722727	0.09219408	53.51635515	282.6703516	25.67953426	75.27322646	0.000202583	2.267971813
10	Wipro Ltd.	0.096287008	2.042739036	0.000731042	0.018938617	25.90633832	308.5766899	12.68215757	87.95538403	0.000202583	2.247170172
11	IndusInd Ltd.	0.236771269	1.87693108	0.000715519	0.105221946	147.0567281	455.6334181	78.34956205	166.3049461	0.000202583	2.1126666477
12	HDFC Bank	0.213631879	1.74262546	0.000388386	0.079530951	204.7731012	660.4065192	117.5083837	283.8133298	0.000202583	1.98215605
13	Hindalco Industries Ltd.	0.440719394	1.735350707	0.002060089	0.337063387	163.6159244	824.0224436	94.28406817	378.0973979	0.000202583	1.927718638
14	Maruti Suzuki India Ltd.	0.243657234	1.716264042	0.000817231	0.101892619	124.6802504	948.702694	72.64631044	450.7437084	0.000202583	1.897002371
15	Indian Oil Corporation Ltd.	0.271523169	1.656928934	0.001404415	0.122156806	86.98057283	1035.683267	52.49505337	503.2387617	0.000202583	1.874196293
16	CIPLA Ltd.	-0.055516604	1.448727221	0.001050602	0.004465113	4.250053087	1039.93332	2.933646186	506.1724079	0.000202583	1.871949493
17	Power Grid Corp. Ltd.	0.130437496	1.269161669	0.000398945	0.021593441	54.12636149	1094.059681	42.64733391	548.8197418	0.000202583	1.828973806

Sl. No.	Securities	BETA(β_i)	$(R_i - R_f) / \beta_i$	Var(σ_2)	$(R_i - R_f) * B$	$(R_i - R_f) * B_i / (\sigma_2)$	$C. (R_i - R_f) * \beta_i$	$\beta_i^2 / (\sigma_2)$	$C. \beta_i^2 / (\sigma_2)$	Markt. Var (σ_{2m})	C
18	HUL Ltd.	0.450981716	0.736974546	0.00059636	0.149889206	251.3400602	1345.399742	341.0430678	889.8628097	0.000202583	1.432456839
19	Bharti Airtel Ltd.	0.304864637	0.695767067	0.000989682	0.064666294	65.34050165	1410.740243	93.91146088	983.7742705	0.000202583	1.365492219
20	Larsen & Toubro Ltd.	0.291642394	0.68890972	0.000508878	0.058595413	115.1462808	1525.886524	167.1427728	1150.917043	0.000202583	1.271275939
21	Korak Mahindra Ltd.	0.338800717	0.656654626	0.000576772	0.075374709	130.6836484	1656.570173	199.0142814	1349.931325	0.000202583	1.183861548
22	Tata Power	0.189845327	0.509430591	0.001161494	0.018360514	15.8076648	1672.377837	31.03006588	1380.961391	0.000202583	1.169230151
23	Ultracemco	0.07141209	0.504128225	0.001072576	0.002570896	2.396935689	1674.774773	4.754615136	1385.716006	0.000202583	1.167026575
24	NTPC Ltd.	0.154515505	0.414828592	0.000740429	0.00990405	13.37610224	1688.150875	32.24488983	1417.960896	0.000202583	1.15049679
25	TCS Ltd.	0.069836338	0.285600233	0.000972907	0.001392905	1.431694083	1689.582569	5.012930372	1422.973826	0.000202583	1.147552037
26	BPCL	1.35180144	0.220007513	0.00174718	0.402034497	230.1047557	1919.687325	1045.894993	2468.868819	0.000202583	0.762315717
27	Ambuja Cements Ltd.	0.355214298	0.169132374	0.001105023	0.021340649	19.3123963	1938.999721	114.1850955	2583.053914	0.000202583	0.736585481
28	ICICI Bank	1.35077527	0.129646763	0.001134381	0.236552683	208.5301936	2147.529915	1608.448905	4191.502819	0.000202583	0.506389556
29	Asian Paints Ltd.	0.734112381	0.039355282	0.00236725	0.021209387	8.95950292	2156.489418	227.6569384	4419.159757	0.000202583	0.482595651
30	ITC	1.137970855	0.016879009	0.001328416	0.02185794	16.45414241	2172.94356	974.8287079	5393.988465	0.000202583	0.399192256
31	Zee Ent Enterprises Ltd.	0.312246335	-0.018709213	0.00109355	-0.001824107	-1.668059478	2171.275501	89.15711466	5483.14558	0.000202583	0.392457718
32	Bank of Baroda	1.058486502	-0.128149429	0.002259971	-0.14357781	-63.53081694	2107.744684	495.7557548	5978.901335	0.000202583	0.349643734
33	Bajaj Auto Ltd.	0.196836008	-0.153178332	0.000610054	-0.005934805	-9.72832629	2098.016358	63.50980685	6042.411141	0.000202583	0.344401561
34	State Bank of India	-0.277722332	-0.175494093	0.001233799	-0.013535806	-10.97083606	2087.045522	62.51399033	6104.925132	0.000202583	0.339120568
35	Tata Motors	1.733758123	-0.184722063	0.001584785	-0.555259231	-350.3688798	1736.676642	1896.735425	8001.660557	0.000202583	0.215708814

Sl. No.	Securities	BETA(β_i)	$(R_i - R_f) / \beta_i$	Var(σ^2)	$(R_i - R_f) * \beta_i$	$(R_i - R_f) * \beta_i / (\sigma^2)$	$C_i (R_i - R_f) * \beta_i$	$\beta_i^2 / (\sigma^2)$	$C_i \beta_i^2 / (\sigma^2)$	Markt. Var (σ_{2m})	C
36	Auribindo Pharma Ltd.	0.307071961	-0.186746168	0.002132233	-0.017608892	-8.258428563	1728.418213	44.22274701	8045.883304	0.000202583	0.213510281
37	Axis Bank	1.092570674	-0.189380702	0.001133336	-0.226065766	-199.4693302	1528.948883	1053.271682	9099.154985	0.000202583	0.167125317
38	Bharti Infratel Ltd.	-0.102787887	-0.356397246	0.001575229	-0.003765462	-2.390421627	1526.558461	6.707183216	9105.862169	0.000202583	0.16674178
39	Oil And Natural Gas Corporation Ltd.	0.211762585	-0.368055091	0.000711521	-0.016504839	-23.19654933	1503.361912	63.02466643	9168.886835	0.000202583	0.163085403
40	INFY	0.499724677	-0.426653658	0.000647609	-0.10654598	-164.5221712	1338.839741	385.6105953	9554.49743	0.000202583	0.139406421
41	Sunpharma	0.895129195	-0.429172879	0.001926663	-0.343877462	-178.4834527	1160.356288	415.8777536	9970.375184	0.000202583	0.115807052
42	Bosch Ltd.	0.225323885	-0.436658754	0.000954713	-0.022169338	-23.22115352	1137.135135	53.17917776	10023.55436	0.000202583	0.112890352
43	HCL Tech	-0.131755333	-0.491053462	0.00060869	-0.008524427	-14.00455564	1123.130579	28.51941127	10052.07377	0.000202583	0.111185236
44	TECHM	0.118095877	-0.698970404	0.001252815	-0.009748286	-7.781103617	1115.349475	11.13223617	10063.20601	0.000202583	0.110293391
45	Hero Motcorp Ltd	-0.072849554	-0.739765763	0.001051063	-0.003925979	-3.73524534	1111.61423	5.049227105	10068.25524	0.000202583	0.109869167
46	ACC Ltd.	0.056137356	-0.855542037	0.000782203	-0.002696157	-3.446878614	1108.167351	4.028882817	10072.28412	0.000202583	0.109484888
47	Tata Motors Ltd DVR	0.342870867	-1.094430756	0.001868824	-0.128661752	-68.84638	1039.320971	62.90610861	10135.19023	0.000202583	0.102048759
48	Coal India Ltd.	0.170781284	-1.472043803	0.000942497	-0.042933993	-45.55343404	993.7675373	30.94570551	10166.13593	0.000202583	0.097280377
49	Reliance Industries Ltd.	-0.286750351	-1.945848842	0.000991898	-0.159998908	-161.3057662	832.4617712	82.8973776	10249.03331	0.000202583	0.080834121
50	YES Bank	-0.209700063	-2.73190066	0.00154464	-0.120132917	-77.77406902	754.6877022	28.4688496	10277.50216	0.000202583	0.073080042

Table 3

Sl. No.	Securities	Mean Return (R _i)	BETA (β _i)	(R _i -R _f)/β _i	Var(σ ₂)	(R _i -R _f) * B	(R _i -R _f) * B / (σ ₂)	C. (R _i -R _f) * β _{il}	β _i ² / (σ ₂)	C. β _i ² / (σ ₂)	Mkt. Var(σ _{2m})	C
1	Eicher Motors Ltd.	0.46475	0.006410904	62.96674801	0.001972624	0.002587914	1.311914369	1.311914369	0.020835035	0.020835035	0.000202583	0.026565924
2	Tata Steel Ltd.	0.97913	0.064118211	14.31803813	0.001727996	0.05886353	34.06462594	37.74184084	2.379140607	2.452567363	0.000202583	0.728394863
3	India Bulls	0.65710	0.087153676	6.838658055	0.00223536	0.051944827	23.23778872	60.97962956	3.398004189	5.850571552	0.000202583	1.104441571
4	GAIL Ltd.	0.44136	0.086593465	4.391562024	0.001132991	0.032929812	29.06448406	90.04411362	6.618256535	12.46882809	0.000202583	1.456285876
5	Vedanta Ltd.	1.16333	0.291023818	3.787495818	0.002741058	0.320781439	117.0283297	207.0724434	30.89860303	43.36743111	0.000202583	2.233069779
6	Adani Ports and Special Economic Zone	0.49941	0.210330293	2.084008013	0.001722727	0.09219408	53.51635515	282.6703516	25.67953426	75.27322646	0.000202583	2.267971813
7	Wipro Ltd.	0.25777	0.096287008	2.042739036	0.000731042	0.018938617	25.90633832	308.5766899	12.68215757	87.95538403	0.000202583	2.247170172
8	IndusInd Ltd.	0.50548	0.236771269	1.87693108	0.000715519	0.105221946	147.0567281	455.6334181	78.34956205	166.3049461	0.000202583	2.112666477
9	HDFC Bank	0.43336	0.213631879	1.74262546	0.000388386	0.079530951	204.7731012	660.4065192	117.5083837	283.8133298	0.000202583	1.98215605
10	Hindalco Industries Ltd.	0.82588	0.440719394	1.735350707	0.002060089	0.337063387	163.6159244	824.0224436	94.28406817	378.0973979	0.000202583	1.927718638
11	Maruti Suzuki India Ltd.	0.47926	0.243657234	1.716264042	0.000817231	0.101892619	124.6802504	948.702694	72.64631044	450.7437084	0.000202583	1.897002371
12	Indian Oil Corporation Ltd.	0.51098	0.271523169	1.656928934	0.001404415	0.122156806	86.98057283	1035.683267	52.49505337	503.2387617	0.000202583	1.874196293
13	Power Grid Corp. Ltd.	0.22663	0.130437496	1.269161669	0.000398945	0.021593441	54.12636149	1094.059681	42.64733391	548.8197418	0.000202583	1.828973806
14	HUL Ltd.	0.39344	0.450981716	0.736974546	0.00059636	0.149889206	251.3400602	1345.399742	341.0430678	889.8628097	0.000202583	1.432456839
15	Bharti Airtel Ltd.	0.27320	0.304864637	0.695767067	0.000989682	0.064666294	65.34050165	1410.740243	93.91146088	983.7742705	0.000202583	1.365492219
16	Larsen & Toubro Ltd.	0.26200	0.291642394	0.68890972	0.000508878	0.058595413	115.1462808	1525.886524	167.1427728	1150.917043	0.000202583	1.271275939
17	Korak Mahindra Ltd.	0.28356	0.338800717	0.656654626	0.000576772	0.075374709	130.6836484	1656.570173	199.0142814	1349.931325	0.000202583	1.183861548

Sl. No.	Securities	Mean Return (R_i)	BETA (β_i)	$(R_i - R_f) / \beta_i$	Var(σ_i)	$(R_i - R_f) * B$	$(R_i - R_f) * B / (\sigma_i)$	$C_i (R_i - R_f) * \beta_{il}$	$\beta_i^2 / (\sigma_i)$	$C_i \beta_i^2 / (\sigma_i)$	Markt. Var(σ_{2m})	C
18	Tata Power	0.15779	0.189845327	0.509430591	0.001161494	0.018360514	15.8076648	1672.377837	31.03006588	1380.961391	0.000202583	1.169230151
19	Ultracemco	0.09708	0.07141209	0.504128225	0.001072576	0.002570896	2.396935689	1674.774773	4.754615136	1385.716006	0.000202583	1.167026575
20	NTPC Ltd.	0.12518	0.154515505	0.414828592	0.000740429	0.00990405	13.37610224	1688.150875	32.24488983	1417.960896	0.000202583	1.15049679
21	TCS Ltd.	0.08103	0.069883638	0.285600233	0.000972907	0.001392905	1.431694083	1689.582569	5.012930372	1422.973826	0.000202583	1.147552037
22	BPCL	0.35849	1.35180144	0.220007513	0.00174718	0.402034497	230.1047557	1919.687325	1045.894993	2468.868819	0.000202583	0.762315717
23	Ambuja Cements Ltd	0.12116	0.355214298	0.169132374	0.001105023	0.021340649	19.3123963	1938.999721	114.1850955	2583.053914	0.000202583	0.736585481
24	ICICI Bank	0.23620	1.35077527	0.129646763	0.001134381	0.236552683	208.5301936	2147.529915	1608.448905	4191.502819	0.000202583	0.506389556
25	Asian Paints Ltd.	0.08997	0.734112381	0.039355282	0.00236725	0.021209387	8.95950292	2156.489418	227.6569384	4419.159757	0.000202583	0.482595651
26	ITC	0.08029	1.137970855	0.016879009	0.001328416	0.02185794	16.45414241	2172.94356	974.8287079	5393.988465	0.000202583	0.399192256
27	Zee Ent Enterprises Ltd	0.05524	0.312246335	-0.018709213	0.00109355	-0.001824107	-1.668059478	2171.275501	89.15711466	5483.14558	0.000202583	0.392457718
28	Bank of Baroda	-0.07456	1.058486502	-0.128149429	0.002259971	-0.14357781	-63.53081694	2107.744684	495.7557548	5978.901335	0.000202583	0.349643734
29	Bajaj Auto Ltd.	0.03093	0.196836008	-0.153178332	0.000610054	-0.005934805	-9.72832629	2098.016358	63.50980685	6042.411141	0.000202583	0.344401561
30	State Bank of India	0.10982	-0.277722332	-0.175494093	0.001233799	-0.013535806	-10.97083606	2087.045522	62.51399033	6104.925132	0.000202583	0.339120568
31	Auribindo Pharma Ltd.	0.00374	0.307071961	-0.186746168	0.002132233	-0.017608892	-8.258428563	1728.418213	44.22274701	8045.883304	0.000202583	0.213510281
32	Bharti Infratel Ltd.	0.09771	-0.102787887	-0.356397246	0.001575229	-0.003765462	-2.390421627	1526.558461	6.707183216	9105.862169	0.000202583	0.16674178
33	HCL Tech	0.12578	-0.131755333	-0.491053462	0.00060869	-0.008524427	-14.00455564	1123.130579	28.51941127	10052.07377	0.000202583	0.111185236
34	Hero Motcorp Ltd.	0.11497	-0.072849554	-0.739765763	0.001051063	-0.003925979	-3.73524534	1111.61423	5.049227105	10068.25524	0.000202583	0.109869167
35	ACC Ltd.	0.01305	0.056137356	-0.855542037	0.000782203	-0.002696157	-3.446878614	1108.167351	4.028882817	10072.28412	0.000202583	0.109484888
36	Reliance Industries Ltd	0.61905	-0.286750351	-1.945848842	0.000991898	-0.159998908	-161.3037662	832.4617712	82.8973776	10249.03331	0.000202583	0.080834121
37	YES Bank	0.63396	-0.209700063	-2.73190066	0.00154464	-0.120132917	-77.77406902	754.6877022	28.4688496	10277.50216	0.000202583	0.073080042

Table 4

Sl. No.	Companies	BETA	(Ri-Rf)/B	Var	C	B/Var	Zi	Xi
1	Eicher Moters Ltd.	0.006410904	62.96674801	0.001972624	0.026565924	3.249936876	197.1120412	0.194444514
2	Tata Steel Ltd.	0.064118211	14.31803813	0.001727996	0.728394863	37.10553657	445.3527825	0.4393258
3	India Bulls	0.087153676	6.838658055	0.00223536	1.104441571	38.98865033	176.343595	0.173957128
4	GAIL Ltd.	0.086593465	4.391562024	0.001132991	1.456285876	76.42905321	158.6553162	0.156508226
5	Vedanta Ltd.	0.291023818	3.787495818	0.002741058	2.233069779	106.1720762	156.262433	0.154147725
6	Adani Ports and Special Economic Zone	0.210330293	2.084008013	0.001722727	2.267971813	122.0914684	-120.0074603	-0.118383393
						$\Sigma Zi =$	1013.718708	1

the investor. It describes as to how the total investment needs to be allocated amongst the various selected stocks to get the maximum benefits of the optimum portfolio. Table 4 shows the proportion to be invested in various stocks which comprise of the optimal portfolio. The Cut-off point is 2.267971813 (as per Table 3).

NOTE: In selecting the companies or securities for optimum portfolio, it is clearly state that companies or securities with negative return must be omitted (As proposed by Sharpe, stocks which have negative returns should be ignored for selection in optimal portfolio.). Therefore, from the Table 2 it is clearly visible that Lupin, Dr. Reddy and M&M Ltd have negative return so these securities or companies are not selected to construct the optimum portfolio.

Companies	Portion of investment (Xi)
Eicher Moters Ltd.	0.194445
Tata Steel Ltd.	0.439326
India Bulls	0.173957
GAIL Ltd.	0.156508
Vedanta Ltd.	0.154148
Adani Ports and Special Economic Zone	-0.11838

This proportion of stocks in the composition of optimal portfolio can be shown in the following Pie diagram (Figure 1).

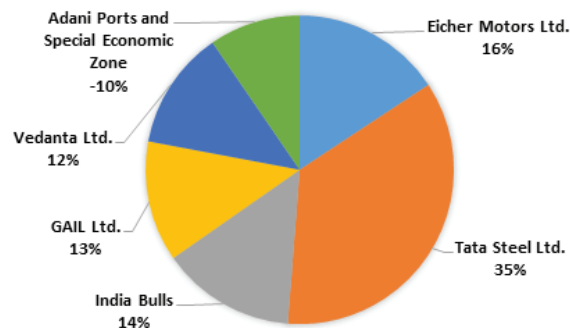


Figure 1: Portion of Investment (Xi)

Thus, six companies namely, Eicher Moter Ltd, Tata Steel Ltd, India Bulls, GAIL Ltd, Vedanta Ltd and Adani Ports and Special Economic Zone with their respective proportion have been invested to construct an optimal portfolio. Sharpe index model (SIM) resolves the problems involved in the selection of securities to construct a portfolio of an investor with a high return. The stock with negative Xi implies that these stocks are to be short sold. These Stock is Adani Ports and Special Economic Zone.

Construction of Risk and Return using Markowitz Theory

It's an intricate task of selecting good investments by considering the trade-off between risk and return along with the combination of various types of investments for the investors. A rational investor always seeks to minimize risks and maximize returns on his investment in an optimal portfolio. For this purpose, investors ought to maximize the level of return at a given level of risk and alternatively to minimize the level of risk at a given level of return. This is done through the construction of portfolio of assets which is subject to the investor's portfolio. Therefore Risk-return analysis of the Selected 8 securities are calculated by the Help of Markowitz Model. To analyse return and risk characteristic of the stocks, the annual mean return and standard deviation are calculated. The Annual return on each stock is calculated as follows:

$$R_i = (R_2 - R_1) / R_1$$

where R_2 = closing price of week 2,
 R_1 = closing price of week 1,
 R_i = return of stock

The portfolio return can be calculated with the help of the following formula:

$$R_p = \sum X_i R_i$$

R_p – Return on Portfolio

X_i – portion of total portfolio invested in each security

R_i – Expected Return on portfolio

Therefore, Standard Deviation of

$$0.0687044206$$

$$= \sqrt{0.0687044206} = 0.262114872$$

The total computation of Portfolio return and risk are

1. Portfolio Return(R_p)=82.41%
2. Portfolio Risk=26.21%

FINDINGS

- It is found that out of 50 stocks considered for study, only 6(Six) stocks are chosen for inclusion in optimal portfolio.
- Tata Motors has the highest beta value of 1.733 which means it is highly volatile.
- The Cut-off point is 2.267971813.
- The stock with negative X_i inheres that these stocks are to be short sold. These Stock is Adani Ports and Special Economic Zone.
- Lupin, Dr. Reddy and M&M Ltd have negative return so these securities or companies are not selected to construct the optimum portfolio.
- By using the Markowitz Formula, the

Table 5: Calculation of Risk and Return

Securities	X_i	Return(R_i)	$X_i R_i$	$D = R_i - \sum(X_i R_i)$	D^2	$D^2 * X_i$
Eicher Moters Ltd.	0.19444451	0.46475	0.090369021274510	-0.359356721323405	0.129137253160308	0.02511003
Tata Steel Ltd.	0.4393258	0.97913	0.430156184985150	0.155016462626256	0.024030103685158	0.010557045
India Bulls	0.17395713	0.65710	0.114306391504314	-0.167016334909290	0.027894456126532	0.004852439
GAIL Ltd.	0.15650823	0.44136	0.069076716637303	-0.382749949762699	0.146497524043349	0.022928068
Vedanta Ltd.	0.15414773	1.16333	0.179325057525449	0.33922097338843	0.115070868786595	0.017737913
Adani Ports and Special Economic Zone	-0.1183834	0.49941	-0.059121850298130	-0.324701521628594	0.105431078147924	-0.012481289
Total	1	$\sum X_i R_i$	0.824111521628594		VARIANCE	0.068704206

total return and risk of these 6 stocks is 82.41% and 26.21% respectively.

CONCLUSION

The construction of optimal portfolio is tough and challenging. This paper attempts to construct an optimal portfolio taking 50 stocks of Nifty 50 Index. As evident from the above study, only 8 stocks fulfil the Construction of Optimal Portfolio Using Sharpe's Single Index Model and further these taking this 8-stock return and risk also been calculated by using the Markowitz Model. Use of cut off rate played a vital role in constructing the optimal portfolio. If the investor wants to earn a maximum return without considering the risk aspect then investment can be made on those securities which yield high returns. Even though the return is high, the risk involved in the stock return should be considered while taking investment decisions. The risk can be reduced if the portfolio is diversified. The point of diversity is to achieve a given level of expected return while bearing the least possible risk. There are macro and general economic factors which also affect the securities movement and their selection. These factors should also be considered while selecting securities for optimal study can be helpful in the field of investment finance. The investor should invest in a fund which has good net asset value and good performance history with respect to NAV. Net Asset Value (NAV) is a fund's market value per unit. It is calculated by dividing the total value of all the assets in a portfolio, minus all its liabilities. The outcome of the fund is derived by studying the periodical movements of fund's net asset value and by comparing the fund's performance over their respective benchmarks for the specified period. It was traced that the funds, which embarked lower

risk, did not always validate lower returns or vice versa. This states that the risks and return need not always be in a beeline or point-blank relationship. The optimal portfolio analysis and risk, return trade-off are determined by the challenging attitudes of investors towards a variety of economic, monetary, political and psychological forces prevailing in the stock market. Thus, the portfolio construction table would help an investor in investment decisions. And the investor would select any company among the fifteen companies from the above portfolio table. I also hope this will help the investors as a guiding record in future and help them to make appropriate investment decisions. It is clear that the construction of optimal portfolio investment by using Sharpe's Single Index Model is more comfortable.

RECOMMENDATION

Further studies can be made on other indices like NIFTY NEXT 50, NIFTY 500 and also on the securities that risk and return not always be in a beeline or point-blank relationship and with the given details, the performances of the different funds can be evaluated by using, Treynor and Jensen performance evaluation techniques.

REFERENCES

- [1] H. Markowitz, Portfolio Selection, Journal of Finance, 7(1), 1952, 77- 91.
- [2] H. Markowitz, Portfolio selection (John T. Wiley & Sons, Inc., New York, 1959).
- [3] Mandal, N. (2013). Optimal Portfolio Construction by Using Sharpe's Single Index Model. Journal of Institute of Public Enterprise, 36.
- [4] Nalini, R. (2014). 'Optimal Portfolio construction using Sharpe's Single Index

- Model-A study of selected stocks from BSE', *International Journal of Advanced Research in Management and Social Sciences*, 3(12), 72-93.
- [5] Naveen, C. Application of Sharpe Single Index Model to BSE.
- [6] Dr. S. Poornima, Aruna. P. Remesh: Optimal Portfolio Construction Using Sharpe's Single Index Model – A Study of Selected Stocks From BSE
- [7] Dr. Haider Nima. Teaching Staff/AL-Mustansiryah University, Economics and Administration College.
- [8] Research Scholar, PSG Institute of Management, PSG College of Technology, Coimbatore, Tamilnadu, India – Optimum Portfolio Construction Using Sharpe Index Model with Reference to Infrastructure sector and Pharmaceutical Sector.
- [9] Širůček Martin, Křen Lukáš, 2015. Application of Markowitz Portfolio Theory by Building Optimal Portfolio on the US Stock Market.
- [10] Suresh A.S., Assistant Professor, MBA Department, Krupanidhi School of Management, Chikkabellandur, Carmelaram Post, Gunjur Village, Bangalore, India – Optimal Portfolio Construction: An Empirical Study on Selected Mutual Funds.
- [11] Dr. M. Muthu Gopalakrishnan, Mr. Akarsh P K, Equity Analysis of Automobile Industry in Indian Stock Market.
- [12] I.M. Pandey, Financial Management, 10th Edition, 2010, Vikas Publishing House.
- [13] Yahoofinance.com
- [14] www.moneycontrol.com