

## **APPLICATION OF SINGLE SHARPE INDEX ON THE OPTIMUM PORTFOLIO CONSTRUCTION IN INDIAN CAPITAL MARKET**

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### **ABSTRACT –**

In today's concept, Indian securities market is a highly volatile and sensitive market. The best way to analysis the market for getting good returns is through portfolio construction. Thus, the main focus of this research is to construct an optimal equity portfolio using the sharpe index model (SIM) Method. In this research, the sectors of energy and FMCG has been taken into consideration for constructing the optimum portfolio. Nineteen companies were taken into studied out of which the energy companies were BPCL, CAIRN INDIA, HPCL, IOC, NTPC, RIL, TATA POWER, ONGC, GAIL and FMCG companies are HUL, TATA GLOBAL, BRITTANIA, ITC, DABUR, GODREJ, MARICCO, EMAMI, MCDOWELL'S, JUBLIANT FOODWORKS have been selected and excess to beta ratio has been calculated and ranked the companies based on that ratio. The cut-off point was calculated based on the highest value and cut-off point should be used to calculate the proportion of money to be invested in each stock. This research findings and suggestions would be helpful to investors for investing in media and entertainment sector.

**Keywords: Risk, Return, Portfolio, Residual Variance, Sharpe.**

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## **1. INTRODUCTION**

The history of Indian stock Markets is recognised as one of the oldest in Asia. The evolutions of Indian Stock Market Indian Stock Markets is traced back nearly 200 years ago. Its existence in the market is considered as a most predominant market due to the globalization and liberalization which happened in the year of 1990's. Though it happened only less than 2% of total population invests in stocks. Primarily it has been divided into two parts, Primary market and secondary market. IPO happens in primary market and trading of issued shares will happen in secondary market. Security analysis and portfolio management will help to construct the optimum portfolio for the equities market and helps to make the right decision for investment.

### **1.1. FUNDAMENTALS**

A company's growth outlook is linked to its business prospects and how well its management is capitalizing on the existing opportunities. The quality of a company's management is crucial so pay attention to the management practices of a company and its level of corporate governance.

## **2. REVIEW OF LITERATURE**

Debasish Dutt (1998) explored that an appropriate selection of securities can ensure good returns to investors and can also help to reduce the losses. An attempt is made to construct optimal portfolio by applying share single index model of capital asset pricing. Nine stocks were selected for constructing an optimal portfolio from BSE 100 index. It was found that, all the stocks selected turned out to be stocks of banks. The portfolio is constructed using Sharpe optimal index to obtain the optimal and effective portfolio returns.

P. Varadharajan (2012) says the construction of equity portfolio of large caps companies of selected sectors in India with reference to the sharpe index model. in this research 18 stocks from three different large caps sectors are the risk and return of all the stocks are studied individually. Based on the study top five stocks are selected for forming optimum portfolio. The final step in the process is to determine the number of shares of each stock to be purchased. The portfolio is constructed using sharpe optimal index to obtain the optimal and effective portfolio returns.

Dr. S. Poornima, Aruna P Remesh (2015) in their research “construction of optimal portfolio using sharpe’s single index model- a study with reference to banking & it sector” in this research 10 companies from banking sector and 10 companies from it sector listed in the Bombay stock exchange (NSE) were selected. Share prices for the period of January 2011 to December 2015.

Dr. Sathya Swaroop, Debasish Jakki, Samir khan (2012) in their research used 14 selected stocks from the various manufacturing sectors like automobiles, cements, paints, textiles and oil & refineries sectors have been taken into consideration they were the stocks listed in NSE – Nifty. The portfolio is constructed using sharpe optimal index to obtain the optimal and effective portfolio returns.

Dr. R. Nalini (2014) study have taken consideration of about fifteen companies from the S&P BSE SENSEX index were selected for the study. Among the fifteen sample companies only four were selected for optimal portfolio using SIM. The portfolio is constructed using sharpe optimal index to obtain the optimal and effective portfolio returns.

Dr. K. V. Ramanathan, K. N. Jahnavi (2014) in the study have referred that media and entertainment sector has been taken into consideration for constructing the optimum portfolio. Twenty companies like PVR, Sun Network, Inox, Raj television have been selected and the portfolio is constructed using sharpe optimal index to obtain the optimal and effective portfolio returns.

Thangjam Ravichandra (2014) endeavors to build an ideal portfolio by utilizing sharpe’s single index model. For this reason, NSE Nifty and all the 50 stocks where are a part of it have been utilized as business record for planning portfolio for the period of April 2008 to December 2013. S. Devarajan and I. Francis Gnanasekar studied about the construction of optimal portfolio using sharpe's index model: a comparative analysis of Indian private and public-sector banks in post global financial crisis period” the study helps to analyze the risk and return of 34 selected private and public – sector banking stocks which are part of CNX 500 as market index. The portfolio is constructed using sharpe optimal index to obtain the optimal and effective portfolio returns.

Saugat Das and Ankit Agarwal (2014) has researched on optimal portfolio construction of pharmaceutical companies-a study on CNX Pharma index which consists of 10 pharmaceutical stocks and develops an approach to construct an optimal portfolio using the sharpe index model.

Chintan a. Shah bhagwan (2015) in his research “construction of optimal portfolio using sharpe index model& camp for BSE top 15 securities” was conducted based on the performance of bse15 securities through sharpe model. We have used the descriptive research design and used the secondary data collection methods.

P. Varadharajan (2011) constructed an equity portfolio (Oil, IT, Steel and Banking Stocks) with reference to the sharpe index model.The study includes 25 stocks from five different sectors. Only the secondary data for the past five years (2005 – 2006 to 2009 – 2010) are used in the study. The final portfolio thus constructed includes stocks from more than one sector.

Ch. Naveen(2014) from have done research on the title “application of sharpe single index model to BSE” he has selected 30 blue chip companies of BSE with 6 years data i.e. from January 2007 to December 2012 have been considered. Besides this, an attempt has been made to test the validity of the sharpe model to construct the portfolio.

### **3. STATEMENT OF PROBLEM**

Indian Capital Markets is highly volatile in the last two decades and there are huge number of gainers and losers in market. Even though lot of Economic indicators and Business affairs are influencing the market trend, there are lots of techniques available to predict the market to some extent. The present study considered on Sharpe optimal single index model. The portfolio should not be constructed based on the brand identity, current performance etc because that would not help investors in achieving the anticipated return. The main aim of portfolio construction is diversification and to maintain perfect negative correlation between the securities. Also, holding two or three stocks is always better than holding one. The optimum portfolio gives the investors a better clarity to invest the right proportion of money in the right stock and it helps the investors to get maximum returns with minimal risk.

### **4. OBJECTIVE OF THE STUDY**

1. To analyse the risk-return relationships of the sample stocks.

2. To evaluate stock performance on the basis of excess return to beta.
3. To construct Effective/Optimum portfolio for stocks after the determination of cut-off point on the basis of rank.
4. To calculate the proportion of money to be invested by investors out of their investment

## 5. RESEARCH METHODOLOGY

This present study used analytical analysis and used secondary data collection method in which the companies listed in NSE-NIFTY. 19 companies were selected for the study under energy and FMCG sector. Those companies who has been trading continuously for past 5 years from 1<sup>st</sup> January 2011 to 31<sup>st</sup> December 2015 in NSE-NIFTY has been taken as a sample. The data was collected from [www.nseindia.com](http://www.nseindia.com), [www.rbi.org.in](http://www.rbi.org.in) and [www.investing.com](http://www.investing.com). Tools used for the study was risk and return, beta and Sharpe optimal single index. The aim is to improve the practices of these companies in future.

### 5.1. TOOLS USED

#### 5.1.1. STOCK DESIRABILITY

To compare different stocks and identify the best stocks (stock which offer high returns and have low risk), the first step is to determine that part of the stock return accrued over and above the return from risk-free investments. By dividing this spread by beta ( $\beta$ ), the coefficient of the stock (systematic risks), and stock desirability can be determined thus,

$$\frac{(R_i - R_f)}{\beta_i}$$

Where,

$R_i$  = Expected stock return or the rate of stock return for the previous day.

$R_f$  = Risk free return.

$\beta_i$  = is the stock beta which is the sensitivity degree of the stock toward general risks influencing all securities.

### 5.1.2. CUT OFF POINT

The cut off point is nothing but to determine the stocks for which the excess return to beta ratio is higher than a particular unique cutoff point  $C^*$ . The value of the cutoff rate  $C^*$  is given by:

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

Where,

$C$  = Cutoff point per stock  
in the market index

$\sigma_m^2$  = variance

$R_i$  = Expected stock return

$R_f$  = Risk free return.

$\beta_i$  = is the systematic risk per stock

$\sigma_{ei}^2$  = unsystematic risk per stock (variance)

### 5.1.3. CAPITAL DISTRIBUTION ON GOOD STOCKS

To fulfill the goal of an investment portfolio; the realization of highest return with lowest risk, there should be a good distribution, whereas the best stock enjoys the highest share, and so on.

The following mathematical equations achieve this:

$$X_i = \frac{Z_i}{\sum_{i=1}^n Z_i}$$

This Equation is a percentage determining the capital for each asset of the portfolios, where the total of the percentages, at the end of the day, is an integer number which

is number one. Therefore, they are weighted averages per stock. They, however, are calculated in accordance with the importance of the stock. The  $Z_i$  value is mathematically defined by the following equation

$$Z_i = \frac{\beta_i (R_i - R_f) - C_i}{\sigma_i^2 \beta_i}$$

## 6. OPTIMAL PORTFOLIO FOR NSE-ENERGY & NSE FMCG

The task is to determine and select only those stocks which are traded continuously with return greater than the risk free rate of return and with positive beta. The expected returns, variance, beta ( $\beta$ ) for all the 20 stocks. It has been that a few stocks have negative returns. This could be due to a host of reasons including sluggish market conditions.

As the criteria for selection mentioned above ignores stocks with negative returns, stocks with negative beta have been ignored. The Sharpe model will automatically exclude such stocks as its ranking is based on excess returns (return greater than risk free rate of return).

For determining which of these stocks will be included in the optimal portfolio, it is necessary to rank the stocks from highest to lowest based on excess return to beta ratio (from highest to lowest). This ranking is shown in (Table 1).

**TABLE 1: RANKING OF SECURITIES BASED ON EXCESSRETURN TO BETA RATIO:**

Excess Return to Beta Ratio					
Security	Mean Return	Beta	Unsystematic Risk	$\frac{R_i - R_f}{\beta_i}$	NEW RANK
BRITANNIA	228	0.49	0.005945	454	1
HUL	129.8	0.31	0.004086	393	2
DABUR	116	0.30	0.00206538	363	3
GODREJ	133	0.43	0.00386748	296	4
MARICCO	135	0.5476	0.002992872	234	5
EMAMI LTD	144	0.63	0.00661151	219	6
JUBLIANT	135	0.72	0.011048268	179	7
ITC	77	0.44	0.001977129	158	8
BPCL	132.42	1.27	0.0048	98	9
MCDOWELL	163	1.67	0.018185601	93	10

CAIRN	114.98	1.3574	0.0065	80	11
NTPC	46.3149	0.74869193	0.00168205	53	12
HIND PETRO	45.02	0.7846	0.0063	49	13
TATAGLOBAL	57	1.29	0.0048264	39	14
GAIL	43.01	1	0	36	15
POWER GRID	20.20102	1.027383	0.0027859	13	16
IOC	1.04	0.9246	0.005	-6	17
RIL	-3.86	1.4936	0.0043	-7	18
TATA POWER	2.547936	1.0352	0.0039	-9	19

The next step is to determine the stocks for which excess return to beta ratio is higher than a particular unique cutoff point  $C^*$ . From (Table 3) it may be noted that the cut off rate  $C^*$  is 127.823 and only the top Nine securities make it to the optimal portfolio.

**TABLE 2: CALCULATION OF SYSTEMATIC RISK:**

Security Name	Ri	$\beta$	$\sigma_{ei}^2$	$(R_i - R_f)$	$\sum_{i=1}^N \beta_i (R_i - R_f)$	$\sum_{i=1}^N \beta_i^2 (R_i - R_f)^2$	$\sum_{i=1}^N \beta_i (R_i - R_f) * \beta_i$
BRITANNIA	228	0.49	0.005945	18094.31077	18094.31077	39.24058893	
HUL	129.8	0.31	0.00409	9411.50514	27505.8159	59.65103778	
DABUR	116	0.30	0.002065	15891.54558	43397.36148	94.11455592	
GODREJ	133	0.43	0.003867	13879.28824	57276.64972	124.214152	
MARICCO	135	0.5476	0.002993	23438.20919	80714.85891	175.0438931	
EMAMI LTD	144	0.63	0.006612	12966.57345	93681.43235	203.1641119	
JUBLIANT	135	0.72	0.011048	8301.553455	101982.9858	221.1674418	
ITC	77	0.44	0.001977	15741.1565	117724.1423	255.3048157	
BPCL	132.4	1.27	0.0048	33338.635	151062.7773	327.6053133	
MCDOWELL	163	1.67	0.018186	14356.27044	165419.0477	358.7393263	
CAIRN	115	1.3574	0.0065	22570.42954	187989.4773	407.6871397	
NTPC	46.31	0.748692	0.001682	17543.84081	205533.3181	445.733941	
HIND PETRO	45.02	0.7846	0.0063	4747.452698	210280.7708	456.0295992	



TATAGLOBAL	57	1.29	0.004826	13350.24242	223631.0132	484.9818694
GAIL	43.01	1	0	0	223631.0132	484.9818694
POWERGRID	20.2	1.027383	0.002786	4905.144417	228536.1576	495.619509
IOC	1.04	0.9246	0.005	-1083.6312	227452.5264	493.2694705
RIL	-3.86	1.4936	0.0043	-3737.473488	223715.0529	485.1641239
TATA POWER	2.548	1.0352	0.0039	-2507.821371	221207.2316	479.7254869

**TABLE 3: CALCULATION OF C\*:**

Security Name	$\frac{\beta_i^2}{\sigma_{ei}^2}$	$\sum_{i=1}^N \frac{\beta_i^2}{\sigma_{ei}^2}$	$1+6^2_m \sum_{i=1}^N \frac{\beta_i^2}{\sigma_{ei}^2}$	$C_i$
BRITANNIA	39.81607664	39.81607664	1.086347931	36.12156641
HUL	23.96143172	63.78	1.138312369	52.40304806
DABUR	43.82104617	107.60	1.233345757	76.30833071
GODREJ	46.85244871	154.45	1.334953257	93.04756649
MARICCO	100.1933126	254.64	1.552239489	112.7686123
EMAMI LTD	59.13930252	313.78	1.68049312	120.8955333
JUBLIANT	46.3996472	360.18	1.781118643	124.173335
ITC	99.69473965	459.88	1.997323634	<b><u>127.823459</u></b>
BPCL	338.6187521	798.50	2.731675963	119.9283216
MCDOWELL	153.8172753	952.31	3.065254873	117.0340938
CAIRN	283.4668862	1235.78	3.680001005	110.7845186
NTPC	333.247883	1569.03	4.402705691	101.2409123
HINDPETRO	97.71383492	1666.74	4.614614754	98.82289715
TATAGLOBAL	342.7095164	2009.45	5.357838601	90.51819317
GAIL	0	2009.45	5.357838601	90.51819317
POWERGRID	378.8778595	2388.33	6.179499648	80.20382509
IOC	170.977032	2559.31	6.550292408	75.3049543
RIL	518.8002233	3078.11	7.675398888	63.21028143

Once the composition of the optimal portfolio is ascertained, the next step is to calculate the percentage to be invested in each security which is shown in Table 4. The optimum portfolio can be broken down into two parts:

1. The stock that is comprises
2. The percentage of funds allocated to each of these stocks

**TABLE 4: CALCULATION OF PROPORTION TO BE INVESTED:**

How Much to be Invested in Each Security		
	$Z_i = \frac{\beta_i}{\sigma_{\epsilon_i}^2} \left( \frac{R_i - R_f}{\beta_i} - C^* \right)$	$X_i = \frac{Z_i}{\sum_{i=1}^N Z_i}$
BRITANNIA	26730.14	19%
HUL	20289.78	15%
DABUR	34204.40	25%
GODREJ	18536.23	13%
MARICCO	19414.09	14%
EMAMI LTD	8647.34	6%
JUBLIANT	3310.95	2%
ITC	6752.33	5%
<b>Total</b>	<b>137885.25</b>	<b>100%</b>

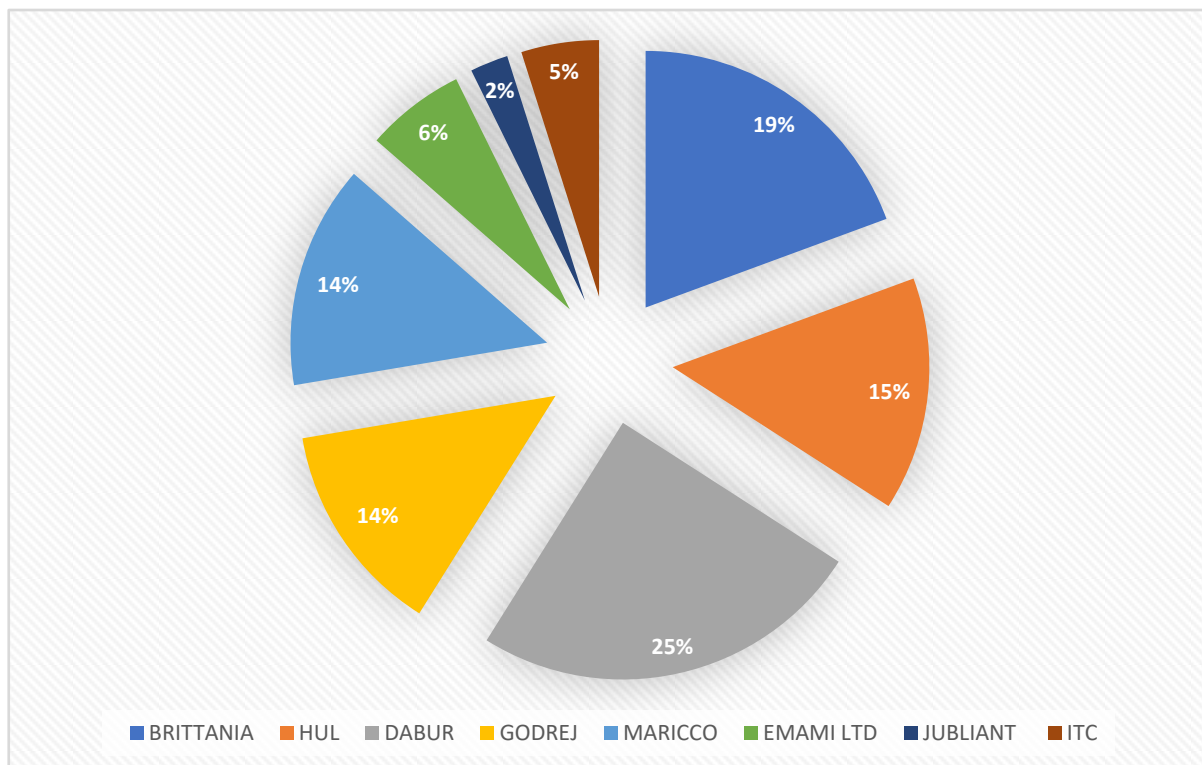
The above table shows the proportion of investment in each stock. And it indicates the weights on each security and they sum up to 100 percentage. By using Sharpe index model thus, we are able to find out the proportion of investments to be made for an optimal portfolio. The maximum investment should be made in Dabur with a proportion of 25%. Following that Britannia (19%), HUL (15%), Maricco (14%), Godrej (13%), Emami Ltd. (6%), ITC (5%) and Jubliant(2%) are the next six companies where major percentage of investment can be made.

## 7. MANAGERIAL IMPLICATION

Sharpe index model (SIM) provides a risk and return analysis of the stocks, to select the securities to be included in the portfolio. The companies were selected based on the return on

investment. Out of 50 companies that are listed in National Stock Exchange (NSE) only 19 companies were selected for analysis since others have negative return. These stocks were ranked based on the return to systematic risk.

The securities with a high return of about seven companies have been selected from the estimation of cut-off rate. The cut-off rate specifies the minimum return on risk below which the securities should not be included in the portfolio. The proportion of investment in these securities is proceeded to make an optimal portfolio.



Thus, eight companies namely, Dabur, Britannia, HUL, Maricco, Godrej, Emami Ltd., ITC and Jubliant with their respective proportion have been invested to construct an optimal portfolio with a high return on investment. Sharpe index model (SIM) resolves the problems involved in the selection of securities to construct a portfolio of an investor with a high return.

## 8. CONCLUSION

Sharpe Single Index Model provides solution to a challenging task for the individual as well as the institutional investors in constructing an optimal portfolio. The Single Index Model uses less number of variables as compared to Markowitz model that provides an ease on computation for investors. Out of the stock selected from National Stock Exchange (NSE), investors are advised to invest in the eight companies namely Dabur, Britannia, HUL, Maricco, Godrej, Emami Ltd., ITC and Jubilant.

The Sharpe Single Index Model also provides the details of proportion to be invested in each securities of their portfolio. Apart from this, Investors must continuously monitor their portfolio based on the changes in the market situations. It is important for the investors to make changes in their portfolio to get an optimal return on investment.

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