



A Study on Usage of Sharpe's Single Index Model In Portfolio Construction With Reference To Cnx Nifty

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ABSTRACT

Portfolio management is the crucial decision for any investor. It is important to decide where to invest and how much to invest. The present study focuses on constructing the optimal portfolio with the help of Sharpe Single Index model. Sharpe Single index model uses various inputs such as excess return to beta ratio, unsystematic risk, market return and variance etc to construct the optimal portfolio. In present study, portfolio is constructed from stocks of CNX nifty. Data is collected from top ten companies of CNX nifty based on their weights for the time period of August 2014. Out of 10 stocks, 4 stocks are selected for investing namely State Bank of India, Tata Motors Ltd, Housing Development Finance Corporation Ltd, Reliance Industries Ltd. Sharpe model suggest investors to invest major portion of their money (54.14%) in State Bank of India.

KEYWORDS : Portfolio construction, CNX Nifty, Sharpe Single Index model

INTRODUCTION:

Sharpe's Single Index model was developed by William Sharpe for the construction of portfolio using less number of inputs than Markowitz model. The major assumption of Sharpe's Single index model is that the covariation of the security can be explained by one single factor known as Index. One version of the model which is called as market model uses the market index such as S&P500 as the factor. The market model states that the security's performance is related to its portfolio's performance according to the beta of security. The model firstly ranks the securities based on their excess return to beta ratio. After that all the securities are arranged according to their excess return to beta ratio. Then cut off rate is calculated and it is compared with excess return to beta ratio for deciding whether to invest in that security or not. And in last step, the model explains how much percentage should be invested in selected security to make a portfolio.

LITERATURE REVIEW:

(Dr. Sathya Swaroop Debasish, 2012) Studied "Optimal Portfolio Construction in Stock Market-An Empirical Study on Selected Stocks in Manufacturing Sectors of India". The study states that risk and return play an important role in making any investment decisions. This study analyzed the opportunities that are available for investors. Sharpe Single Index model was used to construct the portfolio. The data was collected from NSE Nifty and top 14 stocks were used to construct the portfolio. Based on the calculations, three stocks namely Hero Motor Corp., Tata Motors and Asian Paints were included in the Optimal Portfolio constructed.

(Kapil Sen and CA Disha Fattawat, 2014) Studied Sharpe's Single Index Model and its Application Portfolio Construction. The study reveals that the construction of optimal portfolio investment by using Sharpe's Single Index Model is easier and more comfortable than by using Markowitz's Mean-Variance Model.

(Sarker, 2013) Studied "Optimal Portfolio Construction: Evidence from Dhaka Stock Exchange in Bangladesh". Sharpe's single-index model was applied by using the monthly closing prices of 164 companies listed in Dhaka Stock Exchange (DSE) for the period from July 2007 to June 2012. Out of 164 companies taken for the study, 7 companies were showing negative returns and the other 157 companies are showing positive returns. The results are almost similar to the earlier results (e.g. Paudel and Koirala, 2006; Singh, 2007; Kumar, 2011; Elton et al., 1976; and Meenakshi and Sarita, 2012).

(Naveen, 2014) Studied "Application of Sharpe Single Index Model to BSE". The study shows that Sharpe gave a road map to construct the optimal portfolio. The study shows that cut off rate plays a vital role in constructing the optimal portfolio. The study also states that investor should continuously monitor his portfolio because market situation keeps on changing so investor should revise his portfolio accordingly.

RESEARCH METHODOLOGY:

The present study focuses on constructing the portfolio using Sharpe Single Index model. For this purpose, top ten companies of CNX Nifty as listed below are selected based on their weight. Monthly return (August 2014) and risk free rate of return is used for the calculation.

Name of Company	
I T C Ltd.	HDFC Bank Ltd.
Reliance Industries Ltd.	Larsen & Toubro Ltd.
ICICI Bank Ltd.	Tata Consultancy Services Ltd.
Infosys Ltd.	State Bank of India
Housing Development Finance Corporation Ltd.	Tata Motors Ltd.

PROBLEM STATEMENT:

Portfolio construction is the crucial decision of the investor. It is very much important for an investor to decide where to invest and how much to invest. So, the main problem found and used as a base of the present study is the problem faced by investors while deciding regarding where to invest and in which proportion they should invest.

OBJECTIVE:

- To make the portfolio of CNX Nifty by using Sharpe Single Index model.

TOOLS AND TECHNIQUES USED FOR STUDY:

- Sharpe Single Index model has been used for constructing the portfolio.

PORTFOLIO CONSTRUCTION USING SHARPE SINGLE INDEX MODEL:

Step 1: Ranking the securities based on excess return to beta ratio which is calculated as $R_i - R_f / B_i$ where R_i means return of the security, R_f means risk free rate of return and B_i stands for the systematic risk prevailing in the market.

$$R_f = 8.565\%$$

TABLE 1: RANKING OF SECURITIES BASED ON EXCESS RETURN TO BETA RATIO:

Name of Company	R_i	R_f	$R_i - R_f$	Beta	$R_i - R_f / B_i$	Rank
I T C Ltd.	-0.05	8.565	-8.615	0.71	-12.13	8
Reliance Industries Ltd.	-0.03	8.565	-8.595	1.15	-7.47	7
ICICI Bank Ltd.	0.23	8.565	-8.335	1.82	-4.58	1

Infosys Ltd.	0.33	8.565	-8.235	0.4	-20.59	9
Housing Development Finance Corporation Ltd.	-0.04	8.565	-8.605	1.2	-7.17	6
HDFC Bank Ltd.	0.03	8.565	-8.535	1.23	-6.94	5
Larsen & Toubro Ltd.	0.02	8.565	-8.545	1.56	-5.48	2
Tata Consultancy Services Ltd.	-0.14	8.565	-8.705	0.4	-21.76	10
State Bank of India	-0.01	8.565	-8.575	1.44	-5.95	3
Tata Motors Ltd.	0.78	8.565	-7.785	1.19	-6.54	4

*Returns and Rf is for August 2014

Step 2: Calculating the cut off rate using following formula. Highest cut off rate will be regarded as C*.

$$C_i = (\sigma_m^2 * \sum ((R_i - R_f) * B_i) / \sigma_{e_i}^2) / (1 + \sigma_m^2 * (\sum B_i / \sigma_{e_i}^2))$$

Where, σ_m^2 = market variance, $R_i - R_f$ = Market risk Premium, $\sigma_{e_i}^2$ = unsystematic risk

TABLE 2: CALCULATION OF SYSTEMATIC RISK:

Rank	Company	R ²	Systematic Risk = Return * R ²	Unsystematic Risk ($\sigma_{e_i}^2$) = Return - Systematic risk	(R _i - R _f) * B _i	((R _i - R _f) * B _i) / $\sigma_{e_i}^2$	$\sum ((R_i - R_f) * B_i) / \sigma_{e_i}^2$	A = $\sigma_m^2 * \sum ((R_i - R_f) * B_i) / \sigma_{e_i}^2$
1	ICICI Bank Ltd.	0.64	0.1472	0.0828	-15.170	-183.209	-183.209	-3867.54
2	Larsen & Toubro Ltd.	0.52	0.0104	0.0096	-13.330	-1388.563	-1571.771	-33180.1
3	State Bank of India	0.45	-0.0045	-0.0055	-12.348	2245.091	673.319	14213.77
4	Tata Motors Ltd.	0.33	0.2574	0.5226	-9.264	-17.727	655.592	13839.56
5	HDFC Bank Ltd.	0.54	0.0162	0.0138	-10.498	-760.728	-105.136	-2219.42
6	Housing Development Finance Corporation Ltd.	0.47	-0.0188	-0.0212	-10.326	487.075	381.940	8062.746
7	Reliance Industries Ltd.	0.52	-0.0156	-0.0144	-9.884	686.406	1068.346	22552.78
8	I T C Ltd.	0.22	-0.011	-0.039	-6.117	156.837	1225.183	25863.61
9	Infosys Ltd.	0.06	0.0198	0.3102	-3.294	-10.619	1214.564	25639.45
10	Tata Consultancy Services Ltd.	0.06	-0.0084	-0.1316	-3.482	26.456	1241.020	26197.93
	Market Variance (σ_m^2)	21.11						

TABLE 3: CALCULATION OF C_i :

Rank	Company	B _i ²	B _i ² / $\sigma_{e_i}^2$	$\sum B_i / \sigma_{e_i}^2$	$\sigma_m^2 * \sum B_i / \sigma_{e_i}^2$	1 + $\sigma_m^2 * \sum B_i / \sigma_{e_i}^2$	C _i = A/B
1	ICICI Bank Ltd.	3.3124	40.00483	40.005	844.50	845.50	-4.57
2	Larsen & Toubro Ltd.	2.4336	253.5	293.505	6195.89	6196.89	-5.35
3	State Bank of India	2.0736	-377.018	-83.513	-1762.97	-1761.97	-8.07
4	Tata Motors Ltd.	1.4161	2.709721	-80.804	-1705.76	-1704.76	-8.12
5	HDFC Bank Ltd.	1.5129	109.6304	28.827	608.53	609.53	-3.64
6	Housing Development Finance Corporation Ltd.	1.44	-67.9245	-39.098	-825.35	-824.35	-9.78
7	Reliance Industries Ltd.	1.3225	-91.8403	-130.938	-2764.10	-2763.10	-8.16
8	I T C Ltd.	0.5041	-12.9256	-143.864	-3036.96	-3035.96	-8.52
9	Infosys Ltd.	0.16	0.515796	-143.348	-3026.07	-3025.07	-8.48
10	Tata Consultancy Services Ltd.	0.16	-1.21581	-144.564	-3051.74	-3050.74	-8.59

It can be seen in above calculation that C* = -3.64.

Step 3: Selection of securities for investment. If $R_i - R_f / B_i$ is greater than the cut off rate then the security will be selected for investment.

TABLE 4: TABLE SHOWING SELECTION OR REJECTION OF SECURITIES:

Rank	Company	Ri-Rf/Bi	Ci	
1	ICICI Bank Ltd.	-4.58	-4.574	
2	Larsen & Toubro Ltd.	-5.48	-5.354	
3	State Bank of India	-5.95	-8.067	selected
4	Tata Motors Ltd.	-6.54	-8.118	selected
5	HDFC Bank Ltd.	-6.94	-3.641	
6	Housing Development Finance Corporation Ltd.	-7.17	-9.781	selected
7	Reliance Industries Ltd.	-7.47	-8.162	selected
8	IT C Ltd.	-12.13	-8.519	
9	Infosys Ltd.	-20.59	-8.476	
10	Tata Consultancy Services Ltd.	-21.76	-8.587	

Step 4: Calculating Proportion to be invested

TABLE 5: CALCULATION OF Zi (Proportion to be invested):

Sr no		A (Ri-Rf/Bi)-C*	B Bi/σei2	A*B Zi	Zi/Σ Z	%
1	State Bank of India	-2.31	-261.82	604.800	0.54141	54.14
2	Tata Motors Ltd.	2.9	2.277	6.603	0.00591	0.59
3	Housing Development Finance Corporation Ltd.	-3.53	-56.603	199.809	0.17887	17.89
4	Reliance Industries Ltd.	-3.83	-79.861	305.868	0.27381	27.38
				1117.079		100.00

It can be concluded from the above table that investor should invest 54.14% in State bank of India, 0.59% in Tata Motors Ltd , 17.89% in HDFC Corp. ltd and 27.38 % money in Reliance industries Ltd accord-

ing to Sharpe's Single Index model.

CONCLUSION:

Sharpe Single index model is an important and easy to use method of calculating optimum portfolio. The method uses less number of variables as compared to Markowitz model. It uses Single index for constructing the portfolio that's why it is known as Single index model. There are mainly three steps of Sharpe single index model: Ranking the stocks, Finding cut off rate and finding the proportion to be invested. In present study, top ten stocks of CNX nifty are used to make an optimal portfolio. Out of these stocks, investors are advised to invest in four stocks namely State Bank of India, Tata Motors Ltd, Housing Development Finance Corporation Ltd, Reliance Industries Ltd. Based on the Sharpe Single index model, investors are advised to invest their 54.14% in State bank of India, 0.59% in Tata Motors Ltd , 17.89% in HDFC Corp. ltd and 27.38 % money in Reliance industries Ltd. Apart from this, investors are suggested to continuously monitor their portfolio as the market situation changes very frequently. So it is important that investors also make changes in their portfolio time to time in order to get optimum return.

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