

Portfolio Construction of Selected Stocks Using Sharpe’s Index Model

Dr. Ujjwal M. Mishra¹ Dr. Harshal Raje²

Associate Professor¹ Sinhgad College of Engineering,

Department of Management Studies, Pune

Assistant Professor²

MIT WPU, Pune

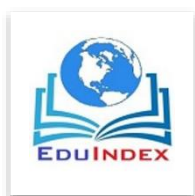
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Abstract

Risk and return plays an important role in making any investment decisions. Decision include Investment should be done or not and which securities should be included in portfolio. Determining efficient portfolios within an asset class (e.g., stocks) can be achieved with the Single index (beta) model proposed by Sharpe. Sharpe's single-index model was applied by using the monthly closing prices of 10 companies listed in BSE price index for the period from January 2019 to October 2019. From the empirical analysis it can be concluded that out of Nine companies only Five company is selected for investment purpose on the basis of Cut-off point. 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 stocks. This research findings and suggestions would be helpful to investors for investing in banking and IT sector.

Introduction

Portfolio is a bundle of or a combination of individual assets or securities. The portfolio theory provides normative approach to investors to make decisions to invest their wealth in assets or securities under risk (See Mullins 1982 and Butters et. al.). It is based on the assumption that investors are risk-averse.



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.

Objectives

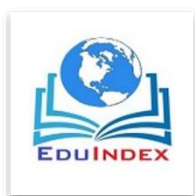
1. To study the trends of Equity in the stock market for selected companies.
2. To get a practical knowledge as to the idea embedded in Sharpe's Index Model.
3. To study the Beta factor of 9 companies.
4. To construct an Optimal Portfolio using Sharpe's Index Model i.e. to find out the type of scrips on S&P500 BSE SENSEX in which investment is to made.
5. To find out the proportion to be invested in particular selected scrip in the portfolio.

Limitations

1. The study has focused only on BSE Sensex index 9 companies and not considered other industries or companies for research purpose.
2. The time frame for stock prices in this project is limited to one year only (January 2018 to December 2018).

Research Design and Methodology

The research design used to carry out this study is descriptive research because it deals with statistical data and the main aim of the report is to describe the factors affecting the problem mentioned. For this study, the secondary data was drawn from the official website of Bombay Stock Exchange (BSE) and other relevant sources. The data regarding stock performance and profile are collected through “Exploratory Research Design” particularly through the study of secondary sources and discussions with experts in the field.



Sampling Design: Sampling Techniques

Purposive Sampling Technique

Convenience sampling

Population

Banking and IT sectors will be the population under this section.

Sampling unit

- Axis Bank
- ICICI Bank
- State Bank of India
- HDFC Bank
- Central Bank of India
- Canara Bank
- TATA Consultancy Services
- Infosys
- Larsen & Toubro

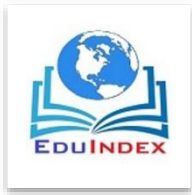
Sampling Frame

The data analyzed between 1st January 2019 to 31st Oct 2019.

Data Analysis

The data required for this has been collected from secondary sources. 9 companies listed under S&P BSE Sensex have been selected for the study. The chosen company belongs to various sectors.

Mean Returns of the BSE companies listed on Sensex



SI No.	Company Security (i)	Ri
1.	Axis Bank	12.04
2.	ICICI Bank	9.44
3.	State Bank of India	(4.17)
4.	HDFC Bank	9.47
5.	Central Bank of India	(63.20)
6.	Canara Bank	(26.14)
7.	TATA Consultancy Services	27.49
8.	Infosys	24.09
9.	Larsen & Toubro	2.42

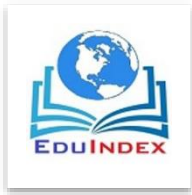
Interpretation: The above table reveals that TATA Consultancy Services has the highest return of 27.49% and Central Bank of India has the lowest mean return of negative 63.20%. In order to know the market risk faced by each security, the beta values of the selected companies have been calculated and tabulated in next table

Beta values of the BSE 9 Companies listed on Sensex

SI No.	Company Security (i)	Beta
1.	Axis Bank	1.38
2.	ICICI Bank	0.97
3.	State Bank of India	1.67
4.	HDFC Bank	0.45
5.	Central Bank of India	2.10
6.	Canara Bank	1.88
7.	TATA Consultancy Services	0.65

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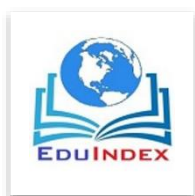
8.	Infosys	0.36
9.	Larsen & Toubro	0.73

Interpretation: The above shows the beta values of the company's stock return. A beta below 1 indicates either an investment in stocks with lower volatility than the market, or a volatile investment whose price movements are not highly correlated with the market. Central Bank of India has the highest beta value of 2.10 which means it is highly volatile. Canara Bank 1.88, State Bank of India 1.67, Axis Bank 1.38 these stocks also have high beta values which means these stocks are also volatile.

Ranking of the stocks based on Excess Return to Beta Ratio

SI No.	Company Security (i)	R _i	R _f	Beta	R _i -R _f	$\frac{R_i - R_f}{Beta}$	Rank
1.	Axis Bank	12.04	0.269	1.38	11.77	8.53	5
2.	ICICI Bank	9.44	0.269	0.97	9.17	9.45	4
3.	State Bank of India	(4.17)	0.269	1.67	-4.44	-2.66	7
4.	HDFC Bank	9.47	0.269	0.45	9.20	20.45	3
5.	Central Bank of India	(63.20)	0.269	2.10	-63.47	-30.22	9
6.	Canara Bank	(26.14)	0.269	1.88	-26.41	-14.05	8
7.	TATA Consultancy Services	27.49	0.269	0.65	27.22	41.88	2
8.	Infosys	24.09	0.269	0.36	23.82	66.17	1
9.	Larsen & Toubro	2.42	0.269	0.73	2.15	2.95	6

Interpretation: The table depicts the excess return and excess return to beta ratio. Excess return is the difference between expected return on the stock and the risk free rate of interest. The risk free rate of interest is assumed to be 0.269% in the study. The excess return to beta ratio measures the additional return on a security per unit of the systematic risk. Table 4.12 shows that



Infosys has the highest excess return to beta ratio of 66.17 while that of Central Bank of India has been negative 30.22.

This ratio provides the relationship between potential risk and reward from a company's stock. The ranking of the stocks done on the basis of excess return to beta ratio reveals that Infosys stocks rank first, the Central Bank of India stock ranks the last.

Sample Companies based on their Ranks and Unsystematic Risk

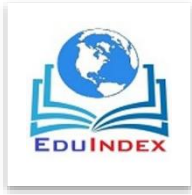
Sr. No.	Company Security (i)	$\sigma^2 e_i$	$\frac{((R_i - R_f)\beta_i)}{\sigma^2 e_i}$
1.	Axis Bank	38.43	0.422654176
2.	ICICI Bank	28.21	0.315310174
3.	State Bank of India	20.46	-0.362404692
4.	HDFC Bank	88.63	0.046711046
5.	Central Bank of India	17.73	-7.517597293
6.	Canara Bank	35.22	-1.409733106
7.	TATA Consultancy Services	228.74	0.07734983
8.	Infosys	56.59	0.151532073
9.	Larsen & Toubro	45.73	0.034321015

Interpretation: The table reveals that out of above 9 companies, Axis Bank has the highest unsystematic risk of 0.422654176 and Central Bank of India has the least value of unsystematic risk of -7.517597293. As the next step 'Ci' is computed and tabulated below in Table 4.13.

To calculate Ci values for all the stocks according to the ranked order is computed using the following formula:

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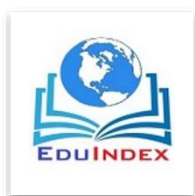
$$\text{Cut-off Rate } C_i = \frac{\sigma_m^2 \sum_{t=1}^J \frac{(R_i - R_f) \beta_i}{\sigma_{ei}}}{1 + \sigma_m^2 \sum_{t=1}^J \frac{\beta_i^2}{\sigma_{ei}^2}}$$

σ_m^2 = variance in the market Index, σ_{ei}^2 = variance in the Stock movement in unsystematic Risk.

Ci of selected Companies Stocks

Rank	Company Security (i)	$\sigma_m^2 \sum (R_i - R_f) \beta_i \div \sigma_{ei}^2$	$1 + \sigma_m^2 \sum \frac{\beta_i^2}{\sigma_{ei}^2}$	Ci
1	Infosys	1.515384	1.02290157	1.481456324
2	TATA Consultancy Services	2.288910712	1.041372323	2.197975365
3	HDFC Bank	2.756071944	1.064220117	2.589757419
4	ICICI Bank	5.90951753	1.397754325	4.227865674
5	Axis Bank	10.13641839	1.893304676	5.353823142
6	Larsen & Toubro	10.47978817	2.009836493	5.214249121
7	State Bank of India	6.856557474	3.372935222	2.032816233
8	Canara Bank	-7.2402398	4.376455949	-1.654361402
9	Central Bank of India	-82.41502829	6.863765594	-12.00726149

Interpretation: The table represents the Ci of selected companies. The β_i / σ_{ei}^2 and its cumulative are necessary for the calculation of Ci. The Ci values goes on increasing from -12.007 to 5.3538 and thereafter, starts declining. Therefore, the value of 5.3539 is considered as



the ‘cut-off point’. The securities which come after the cut-off point will not be considered for the optimal portfolio construction. The Ci is calculated and tabulated as under:

Proportion of Investment Proposed

Rank	Company Security (i)	Ci	Zi	Xi
1	Infosys	1.481456324	0.386881493	47%
2	TATA Consultancy Services	2.197975365	0.103790395	13%
3	HDFC Bank	2.589757419	0.076630707	9%
4	ICICI Bank	4.227865674	0.140846918	17%
5	Axis Bank	5.353823142	0.114044342	14%

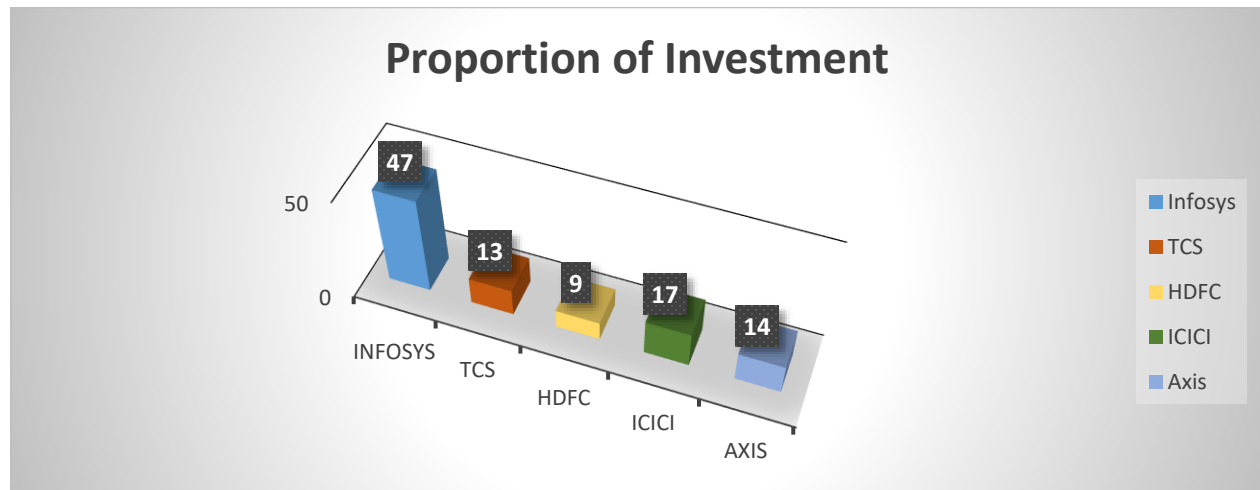
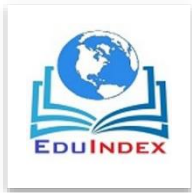
Xi and Zi are to be determined to know how much funds needs to be invested in each security using the following formula:

$$X_i^0 = \frac{Z_i}{\sum_{j=1}^N Z_j}$$

Where,

$$Z_i = \frac{\beta_i}{\sigma_{ei}^2} \left(\frac{R_i - R_f}{\beta_i} - C^* \right)$$

Interpretation: The above table represents the proportion of investment to be made in each security. The 5 securities ranking from 1 to 5 are selected for the optimum portfolio construction. The percentage of funds to be invested in each security is presented in Bar graph.



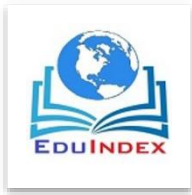
Proportion of Investment to be made

In the selected 9 companies for construction of Portfolio 5 companies have been selected for the optimal portfolio construction applying SIM. Once the companies on which investment is to be made are known it is essential to know the proportion of investment to be made in each company's security.

Findings

The findings of the present study are as follow:

- The stock return of TATA Consultancy has the highest return of 27.49 and Central Bank of India has the lowest return of (63.20). If the investor wants to earn a maximum return without considering the risk aspect then the investment can be made on those securities which yields higher return. Even though the return is high, the risk involved in the stock return should be considered while taking investment decision.
- The risk can be reduced if the portfolio reduced. The point of diversity is to achieve a given level of expected return while bearing the least possible risk.



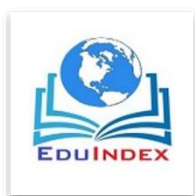
- The return from Central Bank of India security has the highest beta value of 2.10, Canara Bank has 1.88, SBI has 1.67, these stocks also have high beta values which means these stocks are also volatile. But, they are less volatile as compare to Central Bank.
- The excess return to beta ratio measures the additional return on a security per unit of systematic risk. Infosys stock return has the highest excess return to beta ratio of 66.17 and Central Bank of India is the lowest at (30.22). This ratio provides the relationship between potential risk and reward involved in a security's return.
- The 5 securities ranking from 1 to 5 based on the Ci values were identified along with the proportion of investment to be made. The proportion of the investment to be made is 47% in Infosys followed by 17% in ICICI, 14% Axis Bank, 13% in TCS, 9% in HDFC Bank stocks. This implies that the majority of funds be invested in company Infosys.

Conclusion

Constructing an optimal portfolio is a challenging task for the individual as well as the institutional investors. This project was an attempt to construct an optimal portfolio using the Sharpe's Index Model. Among the 9 selected companies, only 5 companies were selected for optimal portfolio. The final decision of investing should be made only after considering all the factors affecting the securities. These can be general economic factors or any other macroeconomic factors which govern the movement and action of the movement of these securities in the market. Many micro studies of this kind need to be conducted considering different types of samples.

The result of the present study and such micro level studies have more utility value to the fund managers of emerging economies such as our country India where the capital markets are still in their developing stages and many foreign institutional investors are also interested to invest in the leading stocks traded through the stock exchanges of these countries.

References



Books

- I M Pandey, “Financial Management 10th edition”, 2010, 99-102, 117-121
- Matt Krantz –“Fundamental analysis for dummies”, Edition 2 , Learning Made Easy Publication
- Martin J. Pring –“Complete Guide to Technical Analysis”, Volume 1, Shroff Publisher Pvt. Ltd., New Delhi

Journals:

1. Optimum Portfolio Construction Using Sharpe Index Model With Reference to Infrastructure sector and Pharmaceutical Sector, International Journal of Scientific and Research Publications, Volume 6, Issue 8, August 2016 490 ISSN 2250-3153
2. Sharpe’s Single Index Model And Its Application To Construct Optimal Portfolio: An Empirical Study, Great Lakes Institute of Management, Chennai March 2013 (Volume 7, Issue 1) ISSN 0973-9017.
3. A Study on Usage of Sharpe’s Single Index Model In Portfolio Construction With Reference To CNX Nifty, Volume-3, Issue-10, Oct-2014, ISSN No 2277 – 8160
4. The Single Index Model And The Construction Of Optimal Portfolio With Cnx pharma Scrip, Volume 6, Issue 1, January (2015), pp. 87-96, ISSN 0976-6502, J. Francis Mary
5. Construction Of Optimal Equity Portfolio Using The Sharpe Index Model With Reference To Banking And Information Technology Sectors In India From 2009-2013 International Journal of Business and Administration Research Review, Vol.2, Issue.3, Jan-March, 2014.