

## Optimum Portfolio (Banking Sector) Construction Using Sharpe Single Index Model

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### Introduction

Portfolio Management is a process encompassing many activities of investment in assets and securities. It is a dynamic and flexible concept and involves continuous and systematic analysis, judgment and operations. Portfolio is the collection of financial or real assets such as equity shares, debentures, bonds, treasury bills and property etc. is a combination of assets or it consists of collection of securities. These holdings are the result of individual preferences, decisions of the holders regarding risk, return and a host of other considerations. Portfolio management concerns the construction and maintenance of a collection of investment. It is the investment of funds in different securities in which the total risk of the portfolio is minimized while expecting maximum return from it. It primarily involves reducing risk rather than increasing return.

Return is obviously important though, and the ultimate objective of portfolio manager is to achieve a chosen level of return by incurring the least possible risk. Keeping a portfolio of single security may lead to a greater likelihood of actual return somewhat different from that of the expected return. Hence it is common practice to diversify securities in the portfolio. Keeping this fact in mind, it tried to construct portfolio with diversification of investments in all sectors.

### Review of literature

**P, S. A. (2012).** This study aims at analyzing the opportunity that are available for investors as per as returns are concerned and the investment of risk thereof while investing in equity of firms belonging to Nifty 50 stocks in the national stock exchange. From the empirical analysis, it is found that returns on either individual securities or on portfolio comprises of securities of different companies listed in Nifty 50 stocks under various sectors are asymmetrical and heterogeneous. Out of 50 companies taken for the study, 6 companies are showing negative return and the other 44 companies are showing positive returns. Out of 50 companies, 24 companies where market beta is above 1, show that the investments in these stocks are outperforming than the market. it is found that Indian security market in information context Sharpe's single index market model will hold good. Further it helps to elicit that the return on securities of different portfolio is independent of the systematic risk prevailing in the market.

**(Khan, 2012).** This study aims at analyzing the opportunity that are available for investors as per as returns are concerned and the investment of risk thereof. Out of 14 companies taken for the study, 3 companies are showing negative return and the other

11 companies are showing positive returns. With regard to beta values, out of 14 companies selected, only one company stock showed beta above 1, indicating that the investments in this stock is outperforming than the broader market. Our study is based on the Sharpe Single index model and thus limited to the lacunas of this model.

**B.N. Dutta Smriti Mahavidyalaya, B. (2013).** From this study it is clear 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. In his seminal contribution Sharpe argued that there is a considerable similarity between efficient portfolios generated by SIM and Markowitz's Model. This model can show how risky a security is, if the security is held in a well-diversified portfolio. This study is made on the basis of small sample ( $n < 30$ ) i.e. 21 sampled securities. It can be extended to a large sample to get a more accurate result.

**In the Indian scenario, Varadharajan (2011)** constructed an optimal equity portfolio with the help of Sharpe Index model. The study was conducted with the financial data from April 2006 to March 2011. The sample size was limited to 19. He took these companies from Banking and Information Technology. The portfolio was constructed with the top 5 stocks that meet the criteria to be included in the portfolio according to Sharpe Index Model. The portfolio predominantly consisted of stocks from the banking sector, and one stock from IT sector.

### **Statement of problems**

Savings and investment are the two important factors in forming strong capital base to an economy. Individuals are different in their saving and investment behaviour. Instead of investing in a single investment avenue, it is always better to invest in various alternatives to spread risk. Investment in different avenue leads to the construction of a portfolio. Construction of an efficient portfolio helps an investor to reduce the risk and to get sufficient returns. Many stock broking companies are helping individuals to plan their investment and enjoy greater additional returns.

The present study is an attempt to construct a portfolio of banking stocks using Sharpe Single Index Model.

### **Objectives**

- To construct an optimal portfolio by implementing Sharpe's single index model.
- To evaluate the performance of the selected scrip.
- To suggest the proportion of investment in each selected scrip.

### **Research Design**

A descriptive study on the construction of portfolio of banking stocks using Sharpe's single index model is carried out in this research work. The data taken for the study is secondary in nature. The data has been collected from the official website of Bombay Stock Exchange (BSE), namely <http://www.bseindia.com/>. The study is conducted with the financial data of 24 months from January 2011 to December 2012. The sample size of the study is limited to daily stock price series of 10 selected banks, top 10 banking sector stocks were selected based on PE ratio, and these stocks are also part of the BSE Sensex.

**Statistical Tools used in this study.**

**a) Returns**

The daily return on each of the selected stocks is calculated with the following formula.

$$R_{it} = \frac{P_{it}}{P_{it-1}} - 1$$

Where  $P_t$ ,  $P_{t-1}$  are the share price at time  $t$  and  $t-1$  for security  $i$ .

**b) Standard Deviation**

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

Where  $R_i$  = the expected return on stock  $i$ ;  $R_f$  = the return on a riskless asset and Beta = the expected change in the rate of return on stock  $i$  associated with one unit change in the market return.

**c) C\* Determination for ranking the stocks**

$$C_i = \frac{\sigma_m^2 \sum_{i=1}^N \left( \frac{R_i - R_f}{\sigma_{ei}^2} \right) \times \beta_i}{1 + \sigma_m^2 \sum_{i=1}^N \left( \frac{\beta_i^2}{\sigma_{ei}^2} \right)}$$

The highest  $C_i$  value is taken as the cut – off point  $C^*$ . The stocks ranked above  $C^*$  have high excess return to beta than the cut – off  $C_i$  and all the stock below  $C^*$  has low excess returns to beta. If the number of stock is large, there is no need to calculate the  $C_i$  values for all the stocks after the ranking has been done. It can be calculated until the  $C^*$  value is found and after calculating for one or two stocks below it the calculations can be terminated.

**d) Construction of the Optimal Portfolio**

$$X_i = \frac{Z_i}{\sum_{i=1}^N (Z_i)}$$

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

The first expression indicates the weights on each security and they sum up to one. The second shows the relative investment in each security. The residual variance or the unsystematic risk has a role in determining the amount to be invested in each security.

**Analysis and Findings**

**Table 1**

**Calculated value of return, beta and excess return to beta ratio and ranks for selected stock in Indian banking sector**

<b>BANKS</b>	<b>RETUR N (Ri)</b>	<b>BETA</b>	<b>MARKET VARIANC E</b>	<b>UNSYSTEMAT IC RISK</b>	<b>RISK FREE (Rf)</b>	<b>(Ri- Rf)/BET A</b>	<b>RAN K</b>
BANK OF BARODA	13.0614	1.0356	34.3869	57.3065	0.0825	12.5327	<b>5</b>
CANARA BANK	27.1288	1.3651	34.3869	140.2929	0.0825	19.8127	<b>4</b>
BANK OF INDIA	-0.7514	1.4617	34.3869	126.9764	0.0825	-0.5705	<b>8</b>
IDBI BANK	-13.4701	1.7268	34.3869	36.6569	0.0825	-7.8484	<b>9</b>
STATE BANK OF INDIA	10.4470	1.2492	34.3869	61.3805	0.0825	8.2969	<b>7</b>
HDFC BANK	-42.5129	1.4365	34.3869	249.5036	0.0825	-29.6522	<b>10</b>
AXIS BANK LTD	15.7610	1.6782	34.3869	40.2200	0.0825	9.3425	<b>6</b>
FEDERAL BANK LTD	50.5658	1.0444	34.3869	37.7236	0.0825	48.3371	<b>2</b>
YES BANK LTD	64.7956	1.5224	34.3869	52.0183	0.0825	42.5073	<b>3</b>
KOTAK MAHINDRA	50.4314	0.9281	34.3869	25.5213	0.0825	54.2494	<b>1</b>

**Analysis and Interpretation**

It can be seen from the table that Kotak Mahindra yielded the maximum return (54.2494) among the companies selected and HDFC BANK yielded lowest return of -29.6522 .The returns on stock investment are negative for three companies and positive for the remaining ten. Further, beta is a measure of the systematic risk associated with stock returns and higher beta value signify that the volatility in stock return is high and thus not always desirable. It can be seen from table-1 that with the exception of IDBI Bank (with beta of 1.7268), the other beta values are lesser. The lowest beta is observed for KOTAK MAHINDRA with value of 0.9281.

According to the Sharpe model the excess return of any stock is directly related to its excess return to beta ratio. It measures the additional return on a security (excess of the risk less asset return) per unit of systematic risk. The ratio provides a relationship between potential risk and reward.For the calculation of this ratio, the rate of return on the Bank FD Rates which is found to be 8.25% for the period under study. Ranking of the stocks are done on the basis of their excess return to

beta. Based on the excess return to beta ratio the scrip's are ranked from 1 to 10, with KOTAK MAHINDRA being in the first rank and HDFC BANK being in the last.

**Table 2**  
**Determination of Cut-off Rate C\***

Cut-off rate of I stock can be calculated using the simple formula: –

$$C_i = \frac{\sigma_m^2 \sum \frac{(R_i - R_f) \beta_j}{\sigma_{cj}^2}}{1 + \sigma_m^2 \sum \frac{\beta_j^2}{\sigma_{cj}^2}}$$

BANK	(R <sub>i</sub> -R <sub>f</sub> )/BETA	((R <sub>i</sub> -R <sub>f</sub> )/UNR)*BETA	(BETA SQ)/UNR	CUMU-C	CUMU-D	MARKET VARIANCE	C*(COR)
KOTAK MAHINDRA BANK	54.2494	1.8310	0.0338	1.8310	0.0338	34.3869	29.1409
FEDERAL BANK LTD	48.3371	1.3977	0.0289	3.2286	0.0627	34.3869	35.1907
YES BANK LTD	42.5073	1.8939	0.0446	5.1226	0.1072	34.3869	<b>37.5824</b>
CANARA BANK	19.8127	0.2632	0.0133	5.3857	0.1205	34.3869	36.0045
BANK OF BARODA	12.5327	0.2345	0.0187	5.6203	0.1392	34.3869	33.3945
AXIS BANK LTD	9.3425	0.6542	0.0700	6.2745	0.2092	34.3869	26.3276
STATE BANK OF INDIA	8.2969	0.2109	0.0254	6.4854	0.2347	34.3869	24.5895
BANK OF INDIA	-0.5705	-0.0096	0.0168	6.4758	0.2515	34.3869	23.0806
IDBI BANK	-7.8484	-0.6384	0.0813	5.8374	0.3328	34.3869	16.1291
HDFC BANK	-29.6522	-0.2452	0.0083	5.5922	0.3411	34.3869	15.1062

**Analysis and Interpretation**

The selection of the stocks depends on a unique cut-off rate such that all stocks with higher ratios of excess return to beta are included and stocks with lower ratio are left out. The cumulated values of Ci start declining after a particular Ci and that point is taken as the cut-off point and that stock ratio is the Cut-off ratio C. The highest value of Ci is taken as the cut-off point that is C\*. From table-2 it is seen that yes bank has the highest the cut-off rate of C\*=37.5824. All the stocks having Ci greater than C\* can be included in the portfolio.

With this criterion, only three stocks namely Kotak Mahindra, Federal bank Ltd and Yes bank qualify to be included in the optimal portfolio.

**Table 3:**

**Construction of Optimum Portfolio**

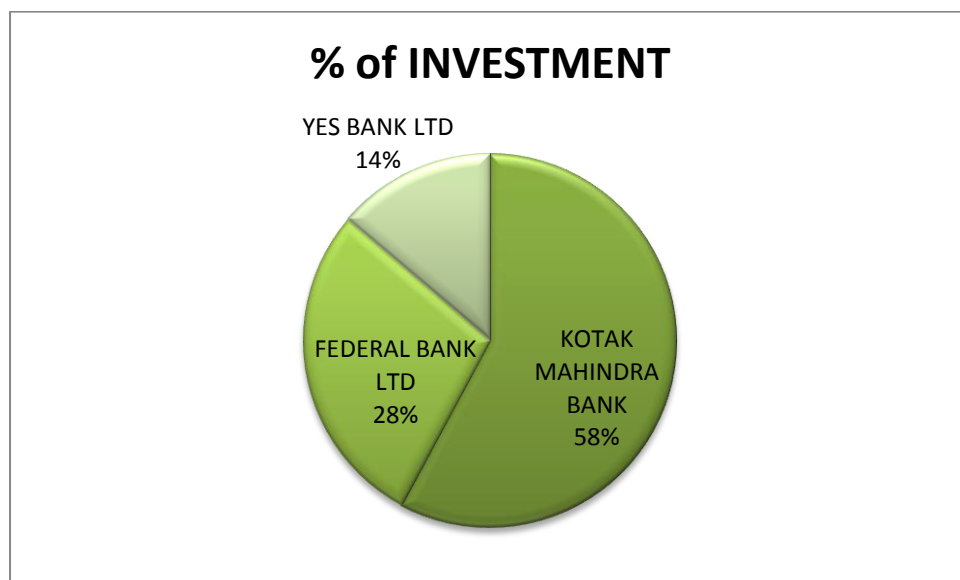
<b>BANK</b>	<b>C*</b>	<b>% of INVESTMENT</b>
KOTAK MAHINDRA BANK	29.1409	57.8352
FEDERAL BANK LTD	35.1907	28.4115
YES BANK LTD	37.5824	13.7533

**Analysis and Interpretation**

After determining the securities to be included in the optimal portfolio, we have to determine the proportion of investment in each of these stocks. Only those stocks with Excess return to beta ratio in table-2 more than C\* (37.5824) are to be selected in the optimal portfolio. It can be observed from table-2 that only three stocks qualify to be included in the optimal portfolio on this criterion. These are Kotak Mahindra, Federal bank Ltd and Yes bank with cut-off point (Ci) of 29.1409, 35.1907 and 37.5824, respectively as displayed in table-3.

By using Sharpe index model, we are able to find out the proportion of investments to be made for each of the three stocks included in the optimal portfolio. The maximum investment should be made in KOTAK MAHINDRA BANK with a proportion of 57.8352, followed by FEDERAL BANK LTD and YES BANK LTD, respectively. Evidently, the companies chosen for the investments are growing at a steady rate in the recent years.

**Figure 1**



## Conclusion

Risk and return play an important role in making any investment decisions. This study aims at analysing the opportunity that are available for investors as per as returns are concerned and the investment of risk thereof. Out of 10 companies taken for the study, 3 companies are showing negative return and the other 7 companies are showing positive returns. With regard to beta values, out of 10 companies selected, three company stock showed beta above 1.5, indicating that the investments in this stock is outperforming than the broader market. Finally out of the 10 automobile sector stocks that are included in BSE Sensex, only three stocks namely Kotak Mahindra, Federal bank Ltd and Yes bank is included in the Optimal Portfolio constructed in this study with maximum suggested investment in Kotak Mahindra Bank. Our study is based on the Sharpe Single index model and thus limited to the lacunas of this model.

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