Research Paper Finance

Optimal Portfolio-Does Number of Scrips Matter?

*Suresh Chandra Das ** Dr. Bishnupriya Mishra

* Asst.Prof, Department of Business Management, C.V.Raman College of Engineering, Bhubaneswar, Odisha

** Professor and Director, P.J.Group of Institutions, Bhubaneswar, Odisha

ABSTRACT

Security analyzing and selection of portfolios and managing them in the right manner helps in improving the investor's awareness about the trends and changes that exist in the market and helps the investors as a very attractive avenue for investment. Creation of an optimum portfolio helps to reduce risk, without sacrificing returns. Portfolio management deals with the analysis of individual securities as well as with the theory and practice of optimally combining securities into good portfolios. In this research the stocks from CNX NSE Nifty Index and Nifty Junior Index are taken. The Sharpe optimal model method has been applied to find out optimal portfolio for three consecutive years.

Keywords : Optimal Portfolio, Beta Coefficient, Expert beta

1. INTRODUCTION

Portfolio is a combination of securities such as stocks, bonds and money market instruments. The process of blending together the broad assets classes so as to obtain optimum return with minimum risk is called portfolio Construction. Diversification of investment helps to spread risk over many assets. A diversification of securities gives the assurance of obtaining the anticipated return on the portfolio. In a diversified portfolio, some securities may not perform as expected but others may exceed the expectation and making the actual return of the portfolio reasonably close to the anticipated one.

2. OBJECTIVE OF THE STUDY

The study has the following objectives:

1. To construct an optimal portfolio in different market scenario.
2. To allocate investment in different stocks considering risk-return criteria.
3. To construct an optimal portfolio and analyze the risk and return, which notifies the company to meet the future needs of capital.
4. To guide investors to find out the company that gives the maximum return with minimum risk.

3. SCOPE OF THE STUDY

Selections of companies are restricted to nifty index and Nifty Junior Index only. The companies are chosen and analyzed based on their performance in the past three years. No other factor other than the share price movements, index movement, rate of return on government securities and beta values for the securities for the past three years are taken for analysis.

4. METHODOLOGY AND RESEARCH DESIGN

In the study secondary data source are used. The data has been collected from various websites like National Stock Exchange (NSE), Reserve Bank of India (RBI), etc., and also from the databases of Ensco and Proquest. The expected returns and beta values have been calculated. All the values obtained above are interpreted and analyzed using Sharpe model.

4.1 Sharpe's Optimal Portfolio

Sharpe has provided a model for the selection of appropriate securities in a portfolio. The selection of any stock is directly related to its excess return-beta ratio.

4.2 Beta Coefficient

Beta coefficient is the relative measure of non-diversifiable risk. It is an index of the degree of movement of an asset's return in response to a change in the market's return.

β = Correlation $* \frac{\sigma(Y)}{\sigma(X)}$

Where, $\sigma(Y)$= Standard Deviation of Individual Stock

$\sigma(X)$ = Standard Deviation of Market

4.3 Return

The total gain or loss experienced on an investment over a given period of time, calculated by dividing the asset's cash distributions during the period, plus change in value, by its beginning-of-period investment value is termed as return. So Return can be calculated with the following formula:

$$\frac{\text{Today's Market Price} - \text{Yesterday's Market Price}}{\text{Yesterday's Market Price}} \times 100$$

Risk-free rate of return (Rf) Risk-free rate of return is the required return on a risk free asset, typically a three month treasury bill.

Excess Return-Beta Ratio = $\frac{Ri - Rf}{\beta i}$

Where, Ri = the expected return on stock

Rf = the return on a riskless asset

βi = the expected change in the rate of return on stock associated with one unit change in the market return.

Excess return-to-beta ratio is calculated for each security in the portfolio and securities are ranked in descending order of magnitude according to their excess return-to-beta ratio. Further, the number of stocks selected in the optimum portfolio depends on a unique cutoff rate such that all stocks with excess return-to-beta ratios greater than this unique cut off rat

are included and all stocks with lower ratios excluded.

4.4 Cut-off point

$$Ci = \frac{\sigma m^2 \sum_{i=1}^{n} \frac{(Ri-Rf)\beta i}{\sigma ei^2}}{1+\sigma m^2 \sum_{i=1}^{n} \frac{\beta i^2}{\sigma ei^2}}$$

Where σm^2, = variance of the market index.

σei^2= variance of a stock's movement that is not associated with the movement of market index that is stock's unsystematic risk.

4.5 Investment to be made in each security

$$Xi = \frac{Zi}{\sum_{i=1}^{n} Zi}$$

Where, Xi = the proportion of investment of each stock. And

$$Zi = \frac{\beta i}{\sigma ei^2}\left(\frac{Ri-Rf}{\beta i} - C^*\right)$$

Where C*, = the cut-off point.

5. LITERATURE REVIEW

The literature review has been segregated into two parts i.e., review of literature from global context and Indian context.

5.1 Literature Review in Global context

Rachel Campbell et.al (2001), says about optimal portfolio selection is that a portfolio selections a model which allocates financial assets by maximizing expected return subject to the constraint that the expected maximum loss should meet the Value-at-Risk limits set by the risk manager. Similar to the mean-variance approach a performance index like the Sharpe index is constructed. Furthermore when expected returns are assumed to be normally distributed, it is shown that the model provides almost identical results to the mean-variance approach. According to Tang, (2004) portfolio diversification also can be achieved by having sufficient number of assets in the portfolio. Previous studies show that the numbers of required asset are varied. It ranged from 10 to 40 assets.

R.B.Paudel and Sujan Koirala (2006), tried to find out whether or not Markowirz and Sharpe models of portfolio selection offer better investment alternatives to investors. They evaluated 30 stocks and took 5 stocks into optimal portfolio under the Sharpe model. Bilbao A, Arenas M, Rodriguez M V and Antomil J (2007), studied "On Constructing Expert Betas for Single-Index Model", proposed a methodological approach of an extension of Sharpe's Single Index model, called "Sharpe's Model with Expert Betas". This extension was carried out through the construction of betas obtained from both statistical and imprecise expert estimations.

Kwok Wai Yu, Xiao Qi Yang, Heung Wong (2007), this paper explained the applications of the Sharpe rule in portfolio measurement and management. It proposes that a portion of the portfolio value should be invested in some other assets for portfolio improvement. With the help of Sharpe rule they determined that the new stocks are worthy of adding to the old portfolio if they satisfy a condition, in which the average return rate of these stocks is greater than the return rate of the old portfolio multiplied by the sum of the elasticity of the Value at Risk and 1.

5.2 Literature Review in Indian context

The study of Laha, Bhowmick & Subramaniam (2004) propose two new methods of portfolio allocation which are applicable for all return distributions. The properties of these new methods are compared with that of Markowitz's mean-variance method using extensive simulation. It is found that the new methods perform appreciably in terms of growth of wealth as well as protecting against the downside risk, in situations where the return distributions of one or more of the stocks is heavy-tailed. Nanda et al selected stocks from the clusters to build a portfolio, minimizing portfolio risk and compare the returns with that of the benchmark index i.e. Sensex.

C.Nateson and B.Arun Rajesh (2010) constructed portfolio using Sharpe's Single Index Model. They choose eight stocks for constructing an optimal portfolio from Nifty 50 and six stocks have been selected from Nifty Junior. The respective portfolio beta's were calculated and capital allocation for each stock was also determined. Thus, the analysis of the portfolio provides the rationale for forming an optimal portfolio of the securities instead of buying only a single security. 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.

A.Saravanan and P.Natarajan (2012) attempted to construct an optimal portfolio by using Sharpe's Single Index Model. For this purpose NSE Nifty Index has been considered. The daily data for all the stocks and index for the period of April 2006 to December 2011 have been considered. From the empirical analysis, it was concluded 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. The optimal portfolio consists of four stocks selected out of 50 short listed scrips, giving the return of 0.116. Significance of beta is not consistent with all security return, leading to the conclusion that every security depends to some extent on the overall performance of the market. P.Varadharajan and Ganesh (2012) selected companies from three sectors namely power sector, shipping sector and textile sector for construction of optimal portfolio. From each sector six companies were selected, so a total of eighteen companies. They selected these companies on the basis of market capitalization. From the analysis, they found out optimal portfolio consisting of five companies.

6. DATA ANALYSIS

Optimal portfolio has been determined with the help of Sharpe's single index model for three consecutive years viz., 2010, 2011 and 2012. Table-1 represents the optimal portfolio and the absolute proportion of investment in each security included in the portfolio of 2010.

Table-1: Optimal Portfolio for the year 2010

COMPANY	Ri-Rf/βi	Ci	Proportion of Investment
Asian Paints	1.119474537	0.0504	19.5346224
Glaxo	0.921299243	0.0886	17.16416764
Dr Reddy	0.749965074	0.133	16.09708844
Shriram Finance	0.736166188	0.19	17.32554197
Bank of Baroda	0.688493351	0.247	17.58301878
Bajaj Auto	0.399556977	0.268	8.316916101
Siemens	0.310236138	0.271	3.565121121
Infosys	0.282054408	0.276	0.236291981
HDFC Bank	0.281292199	0.28	0.177231576

Source: Own Compilation with Excel

In the Year 2010, the Highest Ci value which is taken as C*(Cut-off Point) that we have calculated by putting the formula is 0.28, i.e the Stocks ranked above C* have high excess returns to beta than the cut-off Ci and all the stocks ranked below C* have low excess returns to beta. Accord-

ing to Sharpe's Optimal Portfolio theory the Securities/Stocks which are lying above the Cut-Off Point will be considered to be Securities selected for Optimal Portfolio. The portfolio is well diversified and the proportion of investment is also not limited to or dominated by one company. The investment proportion is more in Asian Paints, Glaxo, Dr.Reddy, Shriram Finance, Bank of Baroda and Bajaj Auto.

The optimal portfolio and the proportion of investment in each security in the portfolio have been depicted in table-2. The portfolio of the year 2012 is well diversified and it is combined of 16 securities of different sectors. The investment in securities is also scattered and that is a good sign of optimal investment strategy.

Table-2: Optimal Portfolio for the year 2011

COMPANY	Ri-Rf/βi	Ci	Proportion of Investment
Shriram Finance	4.681409783	0.0914	19.97518687
Asian Paints	3.049360464	0.189	16.57144713
Oracle	1.988447034	0.536	14.79839019
Dr Reddy	1.628127488	0.673	9.840781336
Bajaj Auto	1.351029917	0.789	6.218806532
BPCL	1.288003373	0.832	4.164153355
LIC	1.23404228	0.932	4.674237852
Crompton Grieves	1.227332491	0.982	4.123412203
Tata Motors	1.214257546	1.01	5.127340035
Wipro	1.211279853	1.02	3.509126727
Sesa Goa	1.178711869	1.03	3.733704164
M & M	1.154314241	1.05	2.420349681
Hero Honda	1.152622963	1.08	1.540751503
Ashok Leyland	1.146118031	1.09	1.822286644
Cipla	1.142464796	1.103	1.097449638
Infosys	1.111707408	1.110	0.382576142

Source: Own Compilation with Excel

In the Year 2011, the Highest Ci value which is taken as C*(Cut-off Point) that we have calculated by putting the formula is 1.1, i.e the Stocks ranked above C* have high excess returns to beta than the cut-off Ci and all the stocks ranked below C* have low excess returns to beta. Shriram Finance, Asian Paints, Oracle, Dr.Reddy are the prominent securities, in which proportion of investment is more compared to other securities.

The optimal portfolio for the year 2012 has been shown in table-3. There are eleven securities which have been included into the optimal portfolio for the year 2012. This portfolio is also optimally diversified.

Table-3: Optimal Portfolio for the year 2012

COMPANY	Ri-Rf/βi	Ci	Proportion of Investment
Asian Paints	1.348122446	0.0404	17.42462695
ITC	0.92241992	0.0673	13.34863522
HUL	0.82128117	0.0984	12.96028933
Oracle	0.766907847	0.166	15.17199876
HCL	0.559627284	0.245	11.38451134
Sun Pharma	0.557877461	0.251	10.82733452
HDFC Bank	0.404124096	0.276	7.046532269
Hindustan Petroleum	0.375359462	0.28	3.07305594
Grasim	0.353079792	0.289	3.242699106
Shriram Finance	0.331714146	0.303	4.231763307
Kotak Bank	0.316534361	0.306	1.288553271

Source: Own Compilation with Excel

In the Year 2012, the Highest Ci value which is taken as C*(Cut-off Point) that we have calculated by putting the formula is 0.306 , i.e the Stocks ranked above C* have high excess returns to beta than the cut-off Ci and all the stocks ranked below C* have low excess returns to beta. The investment in specific securities is comparatively more than other securities in the portfolio. The investment in Asian Paints, ITC, HUL, Oracle, HCL and Sun Pharma is more compared to others.

7. CONCLUSION

Sharpe suggested that the relationship of each security with the market index gives reasonably accurate information about that security and that it is needless to study the relationship of each security with every other security. The cut-off point has been formulated and stocks are selected on the basis of excess of their expected return over risk free rate of return surpassing this cut-off point. Percentage of investment in each of selected stocks is then decided on the basis of respective weights assigned to each stock depending on respective beta value, stock movement variance unsystematic risk, return on stock and risk free return vis-à-vis the cut off rate of return. Most of the researchers are having the notion that an efficient and optimal portfolio should comprise at least 10 scrips. In 2010, the number of scrip in the optimal portfolio is nine while in 2011 and 2012; the numbers of scrips are more than 10. It supports the fundamentals of optimal portfolio. There are some particular scrips which are part of optimal portfolio in various years. From investor point of view these shares are investment worthy. From this empirical analysis, to some extent one can able to forecast individual security's return through the market movement and can make use of it. In the second phase, it is found that Indian Security market in information context Sharpe's single index market model will hold well. Further it helps to elicit that return on securities of different portfolio is independent of the systematic risk prevailing in the market.

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