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BOOKS

- Bowersox, Donald J., Closs, David J., (1996), "Logistical Management." Tata McGraw, Hill, New Delhi.
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- Always indicate the date that the source was accessed, as online resources are frequently updated or removed.

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A STUDY ON CONSTRUCTION OF EQUITY PORTFOLIO (OIL, IT, STEEL AND BANKING STOCKS) WITH REFERENCE TO THE SHARPE INDEX MODEL

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ABSTRACT

This research aims at constructing an optimal portfolio that maximizes the overall return and minimizes the risk associated with the individual stocks using the Sharpe Single 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. Thus even if some of the sectors do not perform well as expected, it will be compensated by the excess returns from the other sectors that exceed the expectation. This is how risk is diversified .This method of construction of optimal portfolio is very effective and convenient as revision of the optimal portfolio can be an ongoing exercise. The existence of a cut-off rate is also extremely useful because most new stocks that have an excess return-to beta ratio above the cut-off rate can be included in the optimal portfolio. Thus this study helps the investors to minimize risk and maximize the return of their investment.

KEYWORDS
Stock, Capital Market, Sharpe Index Model, Companies.

INTRODUCTION

An investment portfolio in general context implies a combination of securities, bonds and money market instruments blended together to obtain optimal return with minimum risk. But in the context of investment in securities market itself we generally go for portfolio construction. This is because a portfolio of single security would lead to higher risk and lesser return or even loss. A diversification of investments helps to spread risk over many assets. Similarly a diversification of securities gives the assurance of obtaining the anticipated return on the portfolio with minimum risk.

APPROACHES IN PORTFOLIO CONSTRUCTION

Commonly there are two approaches in the construction of portfolio of securities viz. traditional approach and Modern Approach. In the traditional approach, investor's needs in terms of income and capital appreciation are evaluated and appropriate securities are selected to meet the need of the investor. In the modern approach, portfolios are constructed to maximize the expected return for a given level of risk. It views portfolio construction in terms of the expected return and the risk associated with obtaining the expected return.

THE SHARPE INDEX MODEL

As we saw in the early discussions regarding investment, the investor always like to purchase a combination of stocks that provides the highest return and has the lowest risk. He wants to maintain a satisfactory reward to risk ratio. Traditionally analyst paid more attention to the return aspect of the stocks. Now a days risk has received increased attention and analyst are providing estimates of risk as well as return.

Thus Sharpe Single Index Model sheds light on both risk and return of stocks and helps to formulate an optimal portfolio with maximum return and minimum risk as much as possible. The co-movement of stock price with market index is given as beta of shares. This co-movement indicates that there is an underlying factor that affects market index as well as stock prices. Stock prices are related to market index and this relationship could be used to estimate the return on stock.

$$R_i = \alpha_i + \beta_i R_m + e_i$$

Where,

R_i = Expected return on security i

α_i = intercept ot the straight line or alpha co-efficient

β_i = slope of the straight line or beta co-efficient

R_m = the rate of return on market index

e_i = error term

According to the equation, the return of a stock can be divided into two components, the return due to market and return independent of the market. β_i indicates the sensitiveness of the stock return to the changes in the market return

Need for the Study

Investing in individual securities is associated with high risk, where as investing in a portfolio of securities helped to spread the risk over many securities and thus reducing overall risk involved. Portfolios, which are combinations of securities, tend to spread risk over many securities and thus help to reduce the overall risk involved. This is called diversification of investments which helps to spread risk over many assets. This method of construction of optimal portfolio is very effective and convenient as revision of the optimal portfolio can be an ongoing exercise. 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.

OBJECTIVES OF THE STUDY

PRIMARY OBJECTIVE

- To construct an optimum portfolio of stocks from the selected companies using Sharpe Single Index Model, that maximizes the return and minimizes the risk associated with the individual stocks.

SECONDARY OBJECTIVES

- To calculate the returns for each of the securities for a period of 5 years.
- To analyze the variability of returns associated with the security more formally.
- To rank the securities based on their excess return to systematic risk.
- To calculate the market variance and the market return.
- To understand the role of beta and standard deviation in measuring the relevant risk of security.
- To know the proportions to invest in each security, through cut-off point, through Sharpe index model.

SCOPE OF THE STUDY

- To compare the performances of the 25 selected companies of the five different sectors.
- The application of the Sharpe Index model to do the risk and return analysis.
- It provides information to the investors about the risk and return associated with each of the selected companies.

LIMITATIONS OF THE STUDY

- The time duration of the study is limited which is about 2 months.
- The data restricted to the past five years (2005-2006 to 2009-2010).
- The study is limited to 25 companies from 5 sectors, hence cannot be generalized.

THEROTECIAL FRAMEWORK

BK Stone 1967, says that in two index model of return generating process, return on a security is adjusted with Beta. It includes market responsiveness, volatility, systematic risk and more commonly the market risk. It is the best measure of non- diversifiable risk. Many stock index series now use them.**WF Sharpe, 1963.** A simplified model of relationship among securities for practical application is developed. As very less information is needed to be sacrified to make this model, there is only a low cost involved. This also is in confirmation with the past evidence. **Nancy L Jacob, 1954,** According to this study, an optimum portfolio should consist of a large number of stocks across different sectors and different companies but the proportion of each security is kept to the minimum. So due to this diversification risk is reduced and is an optimum selection model for small investors who do not have good market exposure. **Bruce F, 1965 Tracking** errors in index fund is very difficult. The difficulties may range from complex technical analysis to common errors. But these difficulties are minimum in mutual funds. This may be mainly due to market function. But still index funds have however outperformed mutual funds. **Kalman J. Cohen & Jerry A. Pogue, 1967,** Ex post performance of multi index models is not superior to that of single index formulation. This indicates the secondary importance of industry consideration for common stock portfolios. **Cheol S Eun & Bruse,** In spite of developing complex and innovative correlation structure of international share prices, there is no empirical evidence that a certain method is the most accurate. But, the best method to be relied upon so that only few errors occur is the National Mean Model which is supported by empirical evidence. **San Nan Chen & Stephen J. Brown, 1983,** In portfolio analysis methods, the estimation risk is not at all calculated or if calculated it is not accurate in many cases. So due to this error of estimation error it can lead to investors selecting sub optimal portfolios. **William F Sharpe, 1966,** Predictive ability of returns of portfolio is compared with the empirical evidence of the returns so earned. Based on this explicit relationships are developed between securities and the funds. **William F Sharpe, 1967,** In selecting the best portfolio, a mutual fund manager faces a lot of risks. Only less evidence shows the efficiency in terms of predictive ability of the fund manager and the standard deviation of the stock returns. However, with linear programming algorithm, along with certain modifications help them to make better selections. **Chow, G. (1995),** recognized that many investors evaluate performance relative to a benchmark and evaluate portfolio selection based on return and relative risk. For many investors, both these approaches fail to yield satisfactory results. A utility function that measures return, variance, and tracking error is more appropriate. Analysis of this utility function shows that its set of efficient portfolios includes the mean-variance efficient set, the mean-tracking-error efficient set, and all convex combinations of these two sets. Optimizations with this utility function may find solutions that investors will actually use. **Goldfarb, D. & Iyengar, G. (2003),**have shown how to formulate and solve robust portfolio selection problems with modeling errors in the estimates of the relevant market parameters. Uncertainty structures for the market parameters are introduced and computation for them involves highly complex calculations these uncertainty structures correspond to confidence regions associated with the statistical procedures employed to estimate the market parameters. **Craig, MacKinlay A & Pastor, L. (1999),** have analyzed that in the presence of model mispricing due to a missing risk factor, the mispricing and the residual covariance matrix are linked together. The identity matrix effectively links the expected returns to the covariances, whereas using the true covariance matrix does not. **Ghazi F. Momani (2008), "Simple Techniques for Determining the Optimal Portfolio Case Study: Investment in Banks Sector in Amman Stock Market, Jordan"** The aim of this study is to gain knowledge of if the stock of commercial banks in Jordan eligible to be included in the optimal portfolio or not. In addition, the relation of the location of these banks in the optimal portfolio and its variables which are the share turnover ratio, the earning per share dividend, the payout ratio, and the price earnings ratio by using simple regression analysis. Also, examinations were conducted on banks sector because of the high prices of stocks of this sector in Amman's stock market and the increase in trade of these stocks in the stock exchange compared to other sectors. The result of this research was that the Arab bank was the only bank to be included in the optimal portfolio and is the largest bank in Jordan with respect to capital volume and number of branches inside and outside of Jordan. As for the rest of the banks, they were not eligible to be included in the optimal portfolio, but very close to be included. Also the result of the analysis was that a statistical indication did not exist between the location of the bank in the portfolio and the factors that were inspected in this study. Also, the correlation and correlation of coefficient were weak in all the previously mentioned variables which indicate the inefficiency of Amman's stock exchange in applying the model. **Ferhan Salman (2002), "Risk-return-volume relationship in an emerging stock market"** This paper aims to provide empirical evidence for the risk-return-volume relationship in the Istanbul Stock Exchange (ISE) for the period of January 2, 1992 - May 29, 1998. The Generalised Autoregressive Conditional Heteroscedasticity-in-Mean (GARCH-M) specification reveals that daily return volatility is time-varying and highly persistent. In addition, return is positively associated with risk, i.e. the estimate of the conditional standard deviation. Contemporaneous changes in volume have a positive effect on returns. The previous day's change in volume affects positively conditional volatility of returns. **Anton Abdulbasah Kamil, Adli Mustafa and Khlipah Ibrahim (2009), "Stochastic Optimization for Portfolio Selection Problem with Mean Absolute Negative Deviation Measure"** The most important character within optimization problem is the uncertainty of the future returns. To handle such problems, in this paper the authors have utilized probabilistic methods alongside with optimization techniques. They developed single stage and two stage stochastic programming with recourse. The models were developed for risk adverse investors and the objective of the stochastic programming models is to minimize the maximum downside semi deviation. They used an approach called "Here-and-Now" approach where the decision-maker makes decision "now" before observing the actual outcome for the stochastic parameter. They compared the optimal portfolios between the single stage and two stage models with the incorporation of the deviation measure. The models were applied to the optimal selection of stocks listed in Bursa Malaysia and the return of the optimal portfolio was compared between the two stochastic models. The results showed that the two stage model outperforms the single stage model in the optimal and in-sample analys

RESEARCH METHODOLOGY

RESEARCH DESIGN

This is a descriptive study on the construction of portfolio of stocks with reference to Sharpe's single index model.

UNIT OF ANALYSIS

Since the study is aimed at analyzing the risk and return associated with individual stocks, the unit of analysis is 'individual'.

TIME HORIZON

The study is conducted with the past five years data from 2005-2006 to 2009-2010.

METHOD OF DATA COLLECTION

The study uses the secondary data collected from various sources such as NSE website and the RBI website.

POPULATION

All the stocks that are listed in the National Stock Exchange comprise the population of the study.

SAMPLING TECHNIQUE

The sampling technique adopted is 'purposive sampling'. Sampling is done with the purpose of evaluating the risk and return variations and constructing a portfolio thereby.

SAMPLE SIZE

The sample size is 25 consisting of stocks from five different sectors namely Oil & Gas, IT, Banking, Steel and Communication sector selected based on their market capitalization.

LIST OF COMPANIES UNDER STUDY

TELECOMMUNICATION	OIL & GAS	IT	STEEL	BANKING
Airtel	RIL	I-flex	Bhushan	Bank of Baroda
Reliance Comm.	Cairn	TCS	TATA	ICICI
Idea Mobile	IOC	Infosys	Jindal	HDFC
Tata Comm.	GAIL	HCL	JSW	SBI
GTL	ONGC	Wipro	SAIL	Canara Bank

All of the companies under study are listed in the National Stock Exchange.

TOOLS FOR ANALYSIS

Beta Coefficient

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

$$Beta, \beta = Correlation * \frac{\sigma\,(Y)}{\sigma\,(X)}$$

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

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

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.

$$Return = \frac{\text{Today's market price} - \text{Yesterday's market price}}{\text{Yesterday's market price}}$$

CORRELATION

A statistical measure of the relationship between any two series of numbers representing data of any kind is known as correlation. This is done in Excel without depending on manual formula

MARKET RETURN

Market Return is the return on the market portfolio of all traded securities. In this study Nifty return is taken as the market return.

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.

$$Excess\ Return - Beta\ Ratio = \frac{R_i - R_f}{\beta_i}$$

Where, R_i = the expected return on stock i

R_f = the return on a riskless asset

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

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

Where, $\sigma_m^{\,2}$ = variance of the market index

σ_{ei}^2 = variance of a stock's movement that is not associated with the movement of market index i.e. stock's unsystematic risk.

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

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

Where, C^* = the cut-off point.

ANALYSIS AND DISCUSSIONS

COMPARISON OF INDEX RETURN AND STOCK RETURN

EXCESS RETURN TO BATA RATIO

TABLE 2.1: CALCULATION OF EXCESS RETURN TO BETA RATIO

STOCKS	MEAN RETURN R_i	EXCESS RETURN $R_i - R_f$	BETA β	UNSYSTEMATIC RISK σ_{ei}^2	EXCESS RETURN TO BETA $\frac{R_i - R_f}{\beta_i}$	RANK
GTL	35.37	29.44	0.49	5.35	59.61	1
BHUSHAN	57.86	51.93	0.95	12.76	54.56	2
Bank of Baroda	47.89	41.96	1.00	10.37	42.6	3
CAIRN	31.27	25.34	0.73	9.21	36.1	4
HDFC	33.93	27.99	0.81	6.07	35.7	5
JINDAL	49.63	43.69	1.33	21.42	33.7	6
SBI	32.12	26.19	0.88	6.84	31.07	7
SAIL	45.09	39.16	1.39	12.62	28.73	8
JSW	39.39	33.46	1.23	14.17	28.26	9
Canara Bank	30.74	24.81	0.97	6.97	26.77	10
IFLEX	27.67	21.74	0.86	9.65	26.33	11
ICICI	30.68	24.75	1.12	10	23.12	12
RIL	25.04	19.11	0.95	8.99	21.14	13
GAIL	22.41	16.48	0.85	7.3	20.52	14
TATA STL.	25.39	19.46	1.12	11.52	18.2	15
AIRTEL	21.08	15.15	0.91	8.24	17.58	16
TATACOM	20.26	14.33	1.15	10.96	13.22	17
HCL	16.78	10.85	1.00	11.34	11.73	18
WIPRO	16.06	10.13	1.00	8.66	10.95	19
INFOSYS	12.92	6.99	0.75	6.57	10.54	20
ONGC	13.17	7.24	0.93	6.56	8.74	21
IDEA	5.12	-0.81	0.95	10.16	0.12	22
TCS	4.57	-1.36	0.75	9.7	-0.58	23
RCOM	2.99	-2.94	1.01	12.59	-1.99	24
IOC	3.36	-2.57	0.62	8.14	-2.64	25

DATA REQUIRED FOR CALCULATION

- Riskless Rate of Interest, R_f = 5.9
- Variance of the Market Index, σ_m^2 = 3.5

CUT-OFF POINT

TABLE 2.2: CALCULATION OF CUT-OFF POINT

STOCKS	$\frac{R_i - R_f}{\beta_i}$	$\frac{(R_i - R_f) * \beta_i}{\sigma_{ei}^2}$	$\sum_{i=1}^{N} \frac{(R_i - R_f) * \beta_i}{\sigma_{ei}^2}$	$\frac{\beta_i^2}{\sigma_{ei}^2}$	$\sum_{i=1}^{N} \frac{\beta_i^2}{\sigma_{ei}^2}$	C_i
GTL	59.61	2.717	2.717	0.045	0.045	8.222
BHUSHAN	54.56	3.873	6.590	0.070	0.116	16.41
Bank of Baroda	42.6	4.068	10.659	0.097	0.214	21.36
CAIRN	36.1	1.998	12.658	0.057	0.271	22.75
HDFC	35.7	3.730	16.388	0.107	0.379	24.67
JINDAL	33.7	2.694	19.082	0.081	0.460	25.59
SBI	31.07	3.341	22.423	0.111	0.571	26.16
SAIL	28.73	4.329	26.752	0.154	0.726	26.45
JSW	28.26	2.873	29.626	0.104	0.830	26.55
Canara Bank	26.77	3.421	33.048	0.132	0.963	26.47
IFLEX	26.33	1.939	34.987	0.076	1.040	26.40
ICICI	23.12	2.761	37.749	0.124	1.164	26.04
RIL	21.14	2.014	39.763	0.099	1.264	25.66
GAIL	20.52	1.915	41.679	0.098	1.363	25.29
TATA STL.	18.2	1.891	43.571	0.108	1.471	24.80
AIRTEL	17.58	1.681	45.252	0.101	1.573	24.35
TATACOM	13.22	1.508	46.760	0.121	1.694	23.61
HCL	11.73	0.960	47.720	0.088	1.783	23.06
WIPRO	10.95	1.181	48.901	0.117	1.901	22.36
INFOSYS	10.54	0.798	49.700	0.085	1.987	21.87
ONGC	8.74	1.030	50.731	0.132	2.120	21.09
IDEA	0.12	-0.075	50.655	0.088	2.209	20.31
TCS	-0.58	-0.103	50.552	0.055	2.264	19.82
RCOM	-1.99	-0.234	50.317	0.080	2.345	19.13
IOC	-2.64	-0.195	50.122	0.047	2.392	18.72

The highest value of C_i is taken as the cut-off point i.e. C*. Here the cut-off rate is **C*= 26.55**.

CONSTRUCTION OF OPTIMAL PORTFOLIO

From the C_i values, the investment is made in the following stocks:

TABLE 2.3: STOCKS TO BE INCLUDED IN THE PORTFOLIO

STOCKS	CUT-OFF POINT
GTL	8.222
BHUSHAN	16.416
BANK OF BARODA	21.362
CAIRN	22.755
HDFC	24.678

PROPORTION OF INVESTMENT

TABLE 2.4: CALCULATION OF PROPORTION OF FUNDS TO BE INVESTED IN EACH STOCK

STOCKS	Z_i	X_i
GTL	3.05	0.35
BHUSHAN	2.08	0.24
BANK OF BARODA	1.55	0.18
CAIRN	0.76	0.09
HDFC	1.22	0.14

In the table, Z_i shows the relative investment in each stock. X_i indicates the weights on each security and they sum up to one.

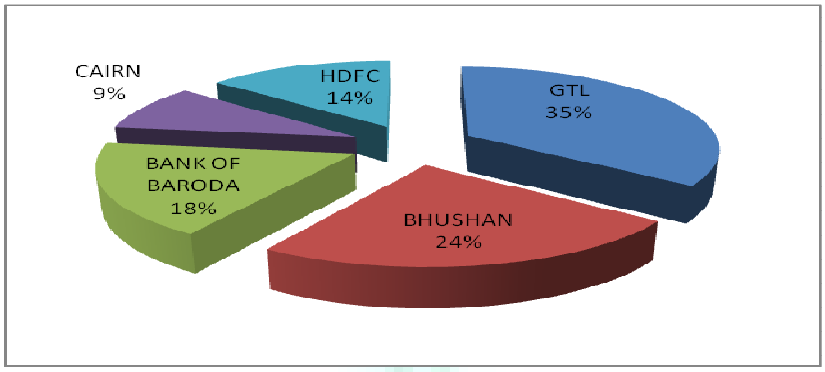
PORTFOLIO OF STOCKS

TABLE 2.5: PORTFOLIO OF STOCKS

COMPANY	PROPORTION OF INVESTMENT (%)
GTL	**35**
BHUSHAN	**24**
BANK OF BARODA	**18**
CAIRN	**9**
HDFC	**14**

From the above table, it can be inferred that maximum investment of 35.197% has to be invested in GTL ltd. The two banks BANK OF BARODA and HDFC pave way for around 17.953% and 14.065% respectively. 24.097% has to be invested in Bhushan Steel Ltd. and the least of around 8 % is preferred for Cairn India Ltd.

FIGURE 1.1 CALCULATION OF PROPORTION OF FUNDS TO BE INVESTED IN EACH STOCK



FINDINGS AND SUGGESTIONS

- Risk and return are directly proportional to each other. Higher the risk, higher the return of the stocks.
- The excess return to beta is positive for all the stocks included in the portfolio.
- The beta of the stocks included in the portfolio have relatively lower beta compared to the other stocks that are not included. Stocks included in the portfolio have a beta coefficient less than 1. The stocks rejected have a beta of more than 1.
- The risk associated with the individual stocks is not the same for all the years. It differs from time to time.
- In the study, all the steel stocks have higher β and yield higher returns compared to other stocks.
- The excess return to beta ratio of all the steel companies included in the study is positive and the four companies except Tata steel are ranked below 10.
- Banks have also performed well in the last five years compared to other sectors with respect to their share prices and excess return.
- The stocks with systematic risk β greater than 1 are riskier since, for 1 % change in market return, the change in stock return is greater than 1%.
- The results show that the steel sector is the most aggressive sector whereas Oil & Gas sector IT sector seems to be moderately riskier.
- The greatest proportion of investment of about 35% is made in GTL Ltd. which has the lowest beta value of 0.4938 among all the stocks included in the portfolio.
- The portfolio is diversified as the stocks belong to companies of different types. An optimum investment is thus made in Oil and Gas, Banking, Steel, IT and Telecommunications

SUGGESTIONS

- The maximum proportion of about 35% of the total investment has to be made in GTL Ltd.
- The beta, variance of the stocks keeps changing every now and then. So, the market should be analysed continuously.
- Investment should be made in stocks that have relatively lower beta and higher returns. This is because investors are rational.
- The proportion of the investment in each of the securities can change from time to time. The optimum portfolio is subject to change.
- Market analysis should be made regularly so that we can keep a check on losses.
- Investment advice should be got from technical experts regularly. Apart form this market watch is also recommended.
- The stocks have to be continuously analyzed and the portfolio has to be updated periodically.

CONCLUSION

Investing in individual securities is associated with high risk, where as investing in a portfolio of securities helped to spread the risk over many securities and thus reducing overall risk involved. Portfolios, which are combinations of securities, tend to spread risk over many securities and thus help to reduce the overall risk involved. This method of construction of optimal portfolio is very effective and convenient as revision of the optimal portfolio can be an ongoing exercise. The existence of a cut-off rate is also extremely useful because most new securities that have an excess return-to beta ratio above the cut-off rate can be included in the optimal portfolio. Thus this study helps the investors to minimize their overall risk and maximize the return of their investment over any period of time. The optimal portfolio thus developed proved to be the best investment option in NSE, but the daily market fluctuation based on international financial queues and emotions resulted in security price fluctuations beyond the predicted risk levels.

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