CONSTRUCTION OF EQUITY PORTFOLIO OF LARGE CAPS COMPANIES OF SELECTED SECTORS IN INDIA WITH REFERENCE TO THE SHARPE INDEX MODEL

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Abstract

Security analysing 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. In these investments, generally both rationale and emotional responses are involved. So, investing in financial securities is considered to be one of the attractive areas for investing and saving while it is also acknowledged to be one of the most risky areas 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. An investor who understands the fundamental principles and analytical aspects of portfolio management has a better chance of earning higher returns. In this research 18 stocks from three different large caps sectors are taken for study. The risk and return of all the stocks are studied individually. Based on the study top five stocks are selected for forming optimum portfolio. The final step in the process is to determine the number of shares of each stock to be purchased. This method helps us to carefully select the stocks and also the proportion of investment to be made in each stock, thereby yielding higher returns.

Key words: Stock, Sharpe, Beta, Market variance, Residual Variance, Index and stock price

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Introduction

An investor considering investment in securities is faced with the problem of choosing from among a large number of securities and how to allocate those funds over this group of securities. But, another hurdle that exists is that the investor has a problem of deciding which securities to hold and how much to invest in each of them. The main factor that governs portfolio selection is risk and return characteristics. So, the general trend is that the investor tries to choose the optimal portfolio taking into consideration the risk and return element of all possible portfolios. Portfolio construction is investing in a variety of funds or investment options that work together to meet the requirements of the investor. As the risk element of individual securities as well as portfolios change the investor must periodically review and revise the investment portfolios.

Here in we are mainly focused on Equity portfolio construction. Portfolio constructions are of two types, they are Traditional Approach and Modern Approach. The traditional approach is based on Current Income, Capital Appreciation, Tax Considerations, Liquidity and Safety. Traditional approach usually begins with the analysis of constraints, and then we will determine the objectives of investment. After determining the objectives the type of portfolio is selected. The portfolio can comprise of Bonds and Common Stock or only Bonds or only Common Stocks. After selecting the type of portfolio the risk and return of the selected type is assessed. The last step of Traditional approach is diversification. Similarly, the Modern approach of portfolio construction comprises of three methods. They are Markowitz Model of portfolio construction which was developed by Harry M. Markowitz in 1969, the Sharpe Index Model of portfolio construction developed by William Sharpe and later John Linter and Jan Mossin formulated the development of the Capital Asset Pricing Model of portfolio construction.

An investor invests his funds in a portfolio expecting to get good returns consistent with the risk that he has to bear. The return realized from the portfolio has to be measured and the performance of the portfolio has to be evaluated. It is evident that rational investment activity involves creation of an investment portfolio. Portfolio management comprises all the processes involved in the creation and maintenance of an investment portfolio. It deals specifically with the security analysis, portfolio analysis, portfolio selection, portfolio revision & portfolio evaluation. Portfolio management makes use of analytical techniques of analysis and conceptual theories regarding rational allocation of funds. Portfolio management is a complex process which tries to make investment activity more rewarding

and less risky. The selection of portfolio depends upon the objectives of the investor. The selection of portfolio under different objectives are based on the following decisions, they are Objectives and Asset mix, Growth of income and Asset mix, Capital appreciation and Asset Mix, Safety of principle and Asset Mix and Risk and return analysis. Investment is no longer a simple process. It requires a scientific knowledge, a systematic approach and also professional expertise. Portfolio management is the only way through which an investor can get good returns, while minimizing risk at the same time. So the purpose portfolio management objectives can be divided into Risk minimization, Safeguarding capital, Capital Appreciation, Choosing optimal mix of securities and Keeping track on performance.

The report has taken three sectors into consideration existing in the Indian scenario for building an optimum portfolio combination. The three sectors which are taken are the Indian Power Sector, Indian Shipping Sector and Indian Textile Sector as these sectors are generally good performing sectors in the market. Primarily, the power sector is taken as this industry is responsible for the production and delivery of electrical energy in sufficient quantities to meet the demand for electricity in all domestic, industrial and commercial operations so; they are viewed as a public utility or defensive industry so this sector performs considerably good in the market. Secondly, the shipping sector is taken as this industry has been operating for a long period of time and major exports and imports are involved in this industry so a lot of foreign exchange is involved and this helps to increase the overall economy of the nation, so investing in this sector will provide good returns as this sector works on a good basis. Thirdly, the Textile sector is taken for portfolio selection and construction as they are concerned with the design, manufacture, trade and distribution of fabrics and this sector has come a long way since the independence period from domestic production of cotton, wool etc. to an organised industry using latest leveraging modern technologies, innovations and electronics in producing all types of fabrics. This industry is like a defensive industry as the demands for clothes never reduce so constant growth can be expected over an expected period of time.

Hence, these sectors are taken for portfolio construction and over a period of time good returns can be expected. Also, Government has huge investments in these companies so they usually will perform very well in the market and will develop more in the market in the period to come so investors can expect lower risk in these sectors as demand doesn't reduce so they will perform consistently and meet the expectations of the investors.

Statement of the problem

The report has been prepared for the basis of studying the various avenues or sectors where investors can invest their savings in a group of securities or portfolios. Creation of portfolios 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. Hence, the Power sector, shipping sector and Textile sector have been considered. It is also essential to educate about investment options in the market so that the investors can earn higher returns. As market fluctuations exist the investors have to always careful and keenly the market movement to invest at the right moment in the right kind of securities to reduce risk and increase returns.

Objectives

The main objective of this project is to find the optimum portfolio from the selected companies in Power sector, Shipping sector and Textile sector. At the end of the analysis a portfolio of five stocks with maximum return for a given risk is constructed which shows how much proportion of money is to be invested in each security wholly taken from different sectors. These sectors are generally consistently performing as these kinds of sectors are depended by the public in a large extent and active government participation in the activities of companies in these sectors shows the importance they have to national economy.

Theoretical Framework

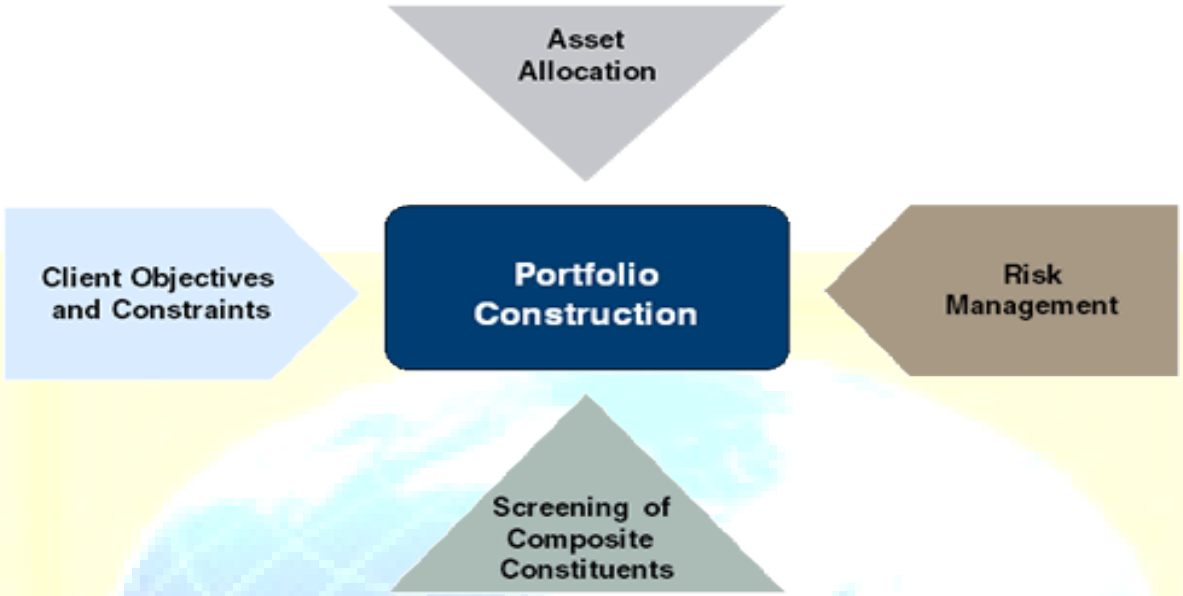
AJ Du Plessis, M Ward (2009), explained the possibility of identifying the right kind of attributes in an portfolio ensuring good returns in the future. It stresses on the importance of applying the Markowitz model of portfolio selection with respect to the Johannesburg Securities Exchange to analyse if an optimal portfolio can be identified and be used as an effective guideline method for trading purposes. It concludes on how an optimal portfolio is selected and rebalanced periodically and comparing the returns with the JSE index rate thereby, showing how a particular trading strategy can outperform in the market. G Van der Hoek, AHG Rinnooy Kan, GT Timmer (1983), investigated the optimal selection of smaller efficient portfolios from the market that can be

ascertained by an implicit enumeration algorithm of these securities whose beta coefficient of variance is negative in the aspect of Markowitz method of portfolio selection. Based on an efficient heuristic method it aids in generating positive optimum portfolios. The article concludes on saying that a dynamic extension of the Markowitz model could have been used in order to relate between the transactions cost and size of the respective securities. Francesc J Ortí , José Sáez, Antonio Terceño (2002), stated that the Markowitz model of portfolio selection is a classic optimization model stressing on two shortcomings with two objectives i.e., maximize returns and minimize risk. The article concludes by emphasising on the fact that one must prevent taking a portfolio using variance and also portrays that the fuzzy return on portfolio model is easier to implement and enables a predictable risk definition to the investors mind, than the Markowitz model. Frank J Fabozzi, Harry M Markowitz, Francis Gupta (2008), stated that the main objective of portfolio selection is the grouping and construction of the portfolios to maximize returns expected on them with a certain level of risk. Investors generally use modelling techniques on the historical data and based on their future expected returns, the optimal portfolio selection is done and this allows computing the investment risk and expected return on a portfolio. Also, the theory of portfolio selection shifts from individual risk to the entire risk of the portfolio and shows the possibility of combining risky assets to produce an optimum portfolio. Rainer Baule (2008), focused on the problems faced usually by small investors during portfolio selection like transaction costs in the form of banks and brokerage fee. Hence, due to this the investors are forced to choose smaller assets. These factors lead to an optimization problem where transaction costs dominate risk costs. Hence, investors are forced to choose more cost-effective commodities like index certificates and exchange traded funds, depending on the level of invested wealth in these items. Aouni, Belaïd (2009), explained on problems involved during analysis and selection of portfolios having multi-dimensional attributes in the market making it difficult for the investors to make conclusions based on the expected risk, return and liquidity. Hence, high investment on such securities cannot guarantee high returns always so sometimes compromises have to be made with a specific amount of investment. The article mainly focuses on various approaches on portfolio selection like stochastic dominance model, multi attribute utility model, multi objective programming model, discriminant analysis, heuristic methods, neural networks, multi objective and multi criteria based methods and analyse which is preferable for the investor to get more returns on minimum risk. Marcus Davidsson (2010), focused on two important factors during

portfolio selection i.e., minimising the risk associated on the portfolios and increase the earning capacity by an investor on that portfolio the study of the article was based on the Kuwaiti Stock Market. It emphasises on rebalancing the portfolios in an effective manner where a rebalancing strategy is used to give equal weightage to the portfolio proportion by having 50% bond and 50% momentum which will help to achieve lower risk as it is diversified and higher returns. Ward, David J Griepentrog, Gary L (1993), explained how well an investor should invest mainly focusing on investment in defaulted bonds and how appropriately they should be diversified to earn higher rate of expected returns. Such kind of a portfolio attracts investors by giving higher returns but on the contrary will also increase the level of unsystematic risk. Hence, investors have to examine the risk and return factors carefully, as they offer higher returns than equities and normal bonds. Cassell, Merrill (1999), focused on how an efficiently balanced portfolio can meet the investors' expectations i.e., lowering risk level and maximising the returns. The article emphasises the fact that there is a positive relation between risk and return and this helps to select an optimum portfolio by investors. Also various types of risks like systematic and unsystematic risks are discussed in the article which is usually present during investing and concludes by saying that investors can reduce risk by following a simple strategy i.e., diversifying the investments that are having longer time periods. Emanuela Sciubba (2005), This article is framed for the purpose of studying the need for adopting the CAPM model in a heterogeneous trading scenario of portfolio selection i.e., different agents or traders exist in the market who advice the investors to invest in different portfolios according to different theories and convince the investors that an extensive kind of scrutiny has been done and then invested, but in reality they just go with some irrelevant method or some mean variance preferences under unfavourable conditions which will be risky for investors in the long run. Alina Lucia Trifan (2009), This article is based on the CAPM model based on the Romanian Capital Market and the purpose of this research is to find whether the relationship between risk and expected return is linear in nature, and if beta is a complete measure of the risk and if a higher risk is compensated by a higher return. The article concludes by stating that the intercept is statistically insignificant, upholding theory, for both individual assets and portfolios but an alternate model can be simulated which can help achieve more to investor's expectations and also get a comparison between local market and global economy. Robert Paff, Garry Twite (1999), focused on the related to CAPM wherein smaller firms tend to deliver abnormal returns when compared to larger firms. Here, conflicts exist within

the traditional approach as usually the returns on portfolio assets are decided from a single dimension or point of view i.e., risk to beta relationship. The article concludes by saying that beta is the crux of the model but some problems are usually observed like inability to explain cross sectional variances. George M Franfurter, Christopher G Lamoureux (1990), focused on the importance of applying the Sharpe Diagonal Model to simplify portfolio selection process by making an assumption i.e., covariance of the stocks are compared to the covariance of the market (beta) and the stocks with a lesser beta to return ratio are considered. The article concludes by relating to stocks having significant betas to a model framed by taking the covariance of the stock's rate of return which will help to improve the performance of the diagonal model. A Bilbao, M Arenas, M Jiménez, B Perez Gladish and MV Rodriguez (2005), emphasised on the approach to portfolio selection problem based on Sharpe's single index model and on Fuzzy Sets Theory. It considers estimations on future Betas of each financial asset which have been included in the portfolio selection denoted as 'Expert Betas' and modelled as fuzzy numbers. Also factors like value, ambiguity and fuzziness are taken and in order to select an optimal portfolio, a Goal Programming model is proposed taking imprecise investor's aspirations concerning asset's proportions on high and low risk assets. Pui Lam Leung, Wing Keung Wong (2008), proposed a multivariate Sharpe Ratio Statistic to test the hypothesis of the equality of multiple share ratios. The Sharpe ratio is used on 18 ishares and to test their equality in the market and concludes by saying that the equality among the shares were rejected and final implication was that these ishares perform differently in each year while some outperformed others also. Hence, the multivariate Sharpe model ratio helps investors to effectively evaluate their portfolio's performance and make better decisions on investments.

Model Framework



Methodology

For constructing the portfolio in this project we have selected companies from three sectors namely Power Sector, Shipping Sector and Textile Sector. From each sector six companies are selected, so a total of eighteen companies.

The companies are selected based on their market capitalization. Companies with the largest market capitalization in each sector are selected. Companies selected for analysis from Power sector are CESC, Gujarat Power Industries, GVK Power and Infra, Jayaprakash Power, NTPC and Tata Power. Companies selected from shipping sector are Bharthi Shipyard, Dredging Corp., Harrisons Malayalam, Mercator Lines, Shipping Corporation of India and Varun shipping. Companies selected from textile sector Bombay Dyeing, Bombay Rayon, Century Textiles, Patspin, Raymond and Eastern Silks. The data of the previous five financial year are used for the constructing the portfolio; ie, from 01-April-2006 to 31-March-2011. The steps in constructing the portfolio using the Sharpe Method are as follows. (All calculations are done in **MS Excel**).

i. Find the excess return to β ratio $= \frac{Ri - Rf}{\beta}$
ii. Arrange the calculated excess return to β ration in the descending order.
iii. Find the cut-off point

Cut-off Point,

$$Ci = \frac{6^2 \sum_{i=1}^{n} \left(\frac{(Ri - Rf)\beta}{\sigma^2 ei}\right)}{1 + 6^2 \sum_{i=1}^{n} \left(\frac{\beta^2}{\sigma^2 ei}\right)}$$

iv. Decide how much to be invested in each security.

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

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

Analysis and Discussions

The return of individual securities and also market return is calculated. The standard deviation, β, Correlation, 6²□ and 6²ei are also calculated. The highest β is for Bombay Dyeing. Using these values and the Risk Free rate of return (10.5%) we have calculated the excess rate of returns and the securities are ranked in the descending order based on the excess rate of return

Table 1.1 Excess returns to beta ratio

SECURITIES	Ri	β	(Ri-Rf)/β	RANK
CESC Limited	41.302	0.879	35.050	**10**
Gujarat Industries Power Co Ltd	88.254	0.650	119.665	**4**
GVK Power and Infra Ltd	-1.210	0.871	-13.447	**14**
Jayaprakash Power Ventures	118.513	0.791	136.631	**3**
NTPC Limited	68.278	0.606	95.318	**6**
TATA Power Company Ltd	132.635	0.712	171.482	**2**
Bharathi Shipyard Limited	-25.787	0.563	-64.404	**16**
Dredging Corp. of India Ltd	13.420	0.695	4.202	**13**
Harrisons Malayalam Ltd	19.405	0.705	12.627	**11**
Mercator Lines Limited	98.383	0.853	103.036	**5**
Shipping Corporation of India	14.262	0.799	4.711	**12**
Varun Shipping Company	-67.719	0.683	-114.533	**17**
Bombay Dyeing and Mfg Co Ltd	52.984	0.964	44.081	**9**
Bombay Rayon Fashions Ltd	164.287	0.800	192.332	**1**
Century Textiles and Industries Ltd	63.531	0.896	59.174	**8**
Patspin India Limited	54.848	0.499	88.898	**7**
Raymond Limited	6.398	0.271	-15.113	**15**
Eastern Silk Industries Limited	-172.072	0.596	-306.239	**18**
	Rf	**10.5**		

Table 1.2 after ranking the securities the cut-off point is calculated. The cut-off point obtained is **72.436**

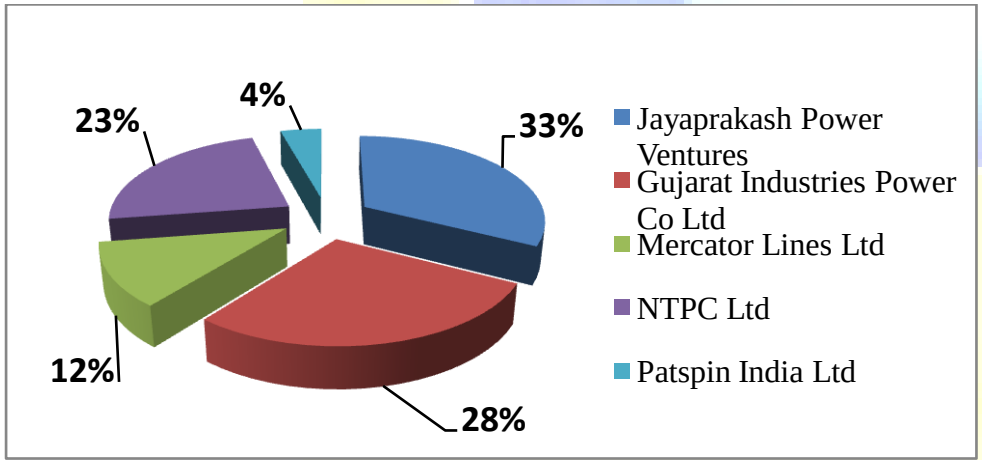
Securities	Ri	B	σ2 ei	(Ri-Rf)* β/σ2ei	E(Ri-Rf)*β/ σ2ei	σ2mE(Ri-Rf)*β/ σ2ei	β2/ σ2ei	Eβ2/ σ2ei	1+σ2mEβ2/ σ2ei	Ci
Bombay Rayon Fashions Ltd	164.287	0.800	15.829	7.768	7.768	29.633	0.040	0.040	1.154	25.677
Tata Power Company Ltd	132.635	0.712	8.136	10.691	18.460	70.418	0.062	0.103	1.392	50.591
Jayaprakash Power Ventures	118.513	0.791	13.766	6.203	24.663	94.079	0.045	0.148	1.565	60.111
Gujarat Industries Power Co Ltd	88.254	0.650	9.585	5.271	29.933	114.186	0.044	0.192	1.733	65.885
Mercator Lines Ltd	98.383	0.853	19.417	3.860	33.794	128.912	0.037	0.230	1.876	68.715
NTPC Ltd	68.278	0.606	5.299	6.610	40.403	154.125	0.069	0.299	2.141	72.003
Patspin India Ltd	54.848	0.499	16.861	1.312	41.716	159.131	0.015	0.314	2.197	**72.436**
Century Textiles	63.531	0.896	14.236	3.338	45.054	171.866	0.056	0.370	2.412	71.252
Bombay Dyeing	52.984	0.964	16.885	2.425	47.479	181.116	0.055	0.425	2.622	69.078
CESC Ltd	41.302	0.879	8.805	3.074	50.553	192.844	0.088	0.513	2.957	65.226
Harrisons Malayalam Ltd	19.405	0.705	16.078	0.391	50.944	194.334	0.031	0.544	3.075	63.208
Shipping Corporation of India	14.262	0.799	9.514	0.316	51.260	195.539	0.067	0.611	3.330	58.716
Dredging Corp. of India	13.420	0.695	11.593	0.175	51.435	196.206	0.042	0.653	3.489	56.234
GVK Power and Infra Ltd	-1.210	0.871	21.197	-0.481	50.954	194.371	0.036	0.688	3.626	53.611
Raymond Limited	6.398	0.271	9.913	-0.112	50.841	193.942	0.007	0.696	3.654	53.077
Bharati Shipyard Limited	-25.787	0.563	12.192	-1.677	49.164	187.545	0.026	0.722	3.753	49.968
Varun Shipping Company	-67.719	0.683	6.398	-8.350	40.815	155.694	0.073	0.795	4.031	38.620
Eastern Silk Industries Ltd	-172.072	0.596	17.210	-6.324	34.490	131.569	0.021	0.815	4.110	32.011

Five securities are selected for investment. These include the four companies immediately above the cut-off point and the company which gives the cut-off point. The proportion of money to be invested in these five securities is found out using Xi (%).

Table 1.3 Proposition of funds invested

Zi	β/6²ei	((Ri-Rf)/(β))-(Ci)	Zi	Xi (%)
Jayaprakash Power Ventures	0.057	64.196	3.6866	0.325
Gujarat Industries Power Co Ltd	0.068	47.228	3.2016	0.282
Mercator Lines Ltd	0.044	30.600	1.3442	0.119
NTPC Ltd	0.114	22.882	2.6176	0.231
Patspin India Ltd	0.030	16.462	0.4871	0.043

Figure 1.1 Proposition of funds invested



Findings

From the analysis we have found out the portfolio constructed from the eighteen companies selected. The portfolio consists of five companies, they are Jayaprakash Powers, Gujarat Power Corp., Mercator lines Ltd, NTPC, Patspin. The percentage of money to be invested in each security has also been found out. Out of these five stocks selected Jayaprakash Powers, Gujarat Power Corp and NTPC are from Power sector, Mercator Lines Ltd. is from shipping sector and Patspin Ltd. is from Textile sector.

Recommendations

Based on the calculation and the analysis it has been found out that the portfolio can be constructed from the five securities selected. The proportion of money to be invested in each of the securities is also found out. The percentage wise break up is given below

Security	Percentage (%)
Jayaprakash Power Ventures	33
Gujarat Industries Power Corp.	28
Mercator Lines Ltd	12
NTPC	23
Patspin Limited	4

These recommendations are based on Sharpe Index Model, but the final decision should be taken only after considering other factors as the complete or overall value of the risk and return of the securities cannot be decided by just ascertaining on a basis of a single calculation as various other factors are present which will affect the growth or decline of these securities.

Conclusion

The optimum portfolio is constructed using Sharpe method. The proportions of money that has to be invested in these securities are also calculated. The portfolio is constructed using the data from the previous five years. 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.

References

- A Bilbao, M Arenas, M Jiménez, B Perez Gladish and MV Rodriguez (2005), An extension of Sharpe's single-index model: portfolio selection with expert betas, Journal of the Operational Research Society (2006) 57, 1442–1451
- AJ Du Plessis, M Ward (2009), A note on applying the Markowitz portfolio selection model as a passive investment strategy on the JSE, Investment Analysts Journal, No. 69
- Alina Lucia Trifan (2009), TESTING CAPITAL ASSET PRICING MODEL FOR ROMANIAN CAPITAL MARKET, Annales Universitatis Apulensis Series Oeconomica, 11(1).
- Aouni, Belaïd (2009), Multi attribute Portfolio selection – New Perspective, INFOR; Feb 2009; 47, 1; ABI/INFORM Complete pp. 1
- Cassell, Merrill (1999), Risk and return, Financial Management; Oct 1999; 77, 9; ABI/INFORM Complete pp. 22-24
- Emanuela Sciubba (2005), The evolution of portfolio rules and the capital asset pricing model, Economic Theory 29: 123–150 DOI 10.1007/s00199-005-0013-2
- Frank J Fabozzi, Harry M Markowitz, Francis Gupta (2008), Portfolio Selection, JWPR026-Fabozzi c01 June 22, pp. 6:54
- Francesc J Ortí , José Sáez, Antonio Terceño (2002), On The Treatment of Uncertainty in Portfolio Selection, Vol. VII, No. 2, November, FUZZY ECONOMIC REVIEW
- G Van der Hoek, AHG Rinnooy Kan, GT Timmer (1983), The Optimal selection of small Portfolios, Management Science (pre-1986); 29, 7; ABI/INFORM, pp. 792
- George M Franfurter, Christopher G Lamoureux (1990), Insignificant Betas and the Efficacy of the Sharpe Diagonal Model for portfolio selection, Decision Sciences; Fall 1990; 21, 4; ABI/INFORM Complete. pp. 853
- Marcus Davidsson (2010), Expected Return and Portfolio Rebalancing, International Journal of Economics and Finance Vol. 3, No. 3; pp. 123-136
- Pui Lam Leung, Wing Keung Wong (2008), On testing the equality of multiple Sharpe ratios, with application on the evaluation of iShares, The Journal of Risk; Spring 2008; 10, 3; ABI/INFORM Complete pp. 15-21
- Rainer Baule (2008), Optimal portfolio selection for the small investor considering risk and transaction costs, OR Spectrum (2010) 32:61–76 DOI 10.1007/s00291-008-0152-5
- Robert Paff, Garry Twite (1999), To B or not to B, Jassa, Issue 3, Spring, 1999
- Ward, David J Griepentrog, Gary L (1993), Risk and Return in Defaulted Bonds, Financial Analysts Journal; May/Jun 1993; 49, 3; ABI/INFORM Complete pg. 61
- Security analysis and Portfolio management by Donald E Fischer and Ronald J Jordan (6th Edition), Pearson Publications.
- www.nseindia.com
- www.info.shine.com
- www.rbi.org