Project Dissertation

Portfolio Construction & Evaluation

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<<Designation>>

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Certificate from the Institute

This is to certify that the Project Report titled **Portfolio Construction and Evaluation**, is a bonafide work carried out by **Mr. Karmesh Aakash Shaw** of MBA 2013-15 and submitted to Delhi School of Management, Delhi Technological University, Bawana Road, Delhi-42 in partial fulfillment of the requirement for the award of the Degree of Masters of Business Administration.

Signature of Guide   Signature of Head (DSM)

Place: Seal of Head

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<u>Declaration</u>

I **<u>Karmesh Aakash Shaw</u>**, student of MBA 2013-15 of Delhi School of Management, Delhi Technological University, Bawana Road, Delhi-42 declare that Dissertation Report on **<u>Portfolio Construction and Evaluation</u>** submitted in partial fulfillment of Degree of Masters of Business Administration is the original work conducted by me.

The information and data given in the report is authentic to the best of my knowledge.

This Report is not being submitted to any other University for award of any other Degree, Diploma and Fellowship.

Name of the student

Place:

Date

Acknowledgement

Accomplishment of a task with desired success calls for dedication towards work and prompting guidance, co-operation and deliberation from seniors.

At the outset, I would like to thank Dr. Archana Singh, Associate Professor, Delhi School of Management for her support and professional approach in guiding me through the careful details of the project.

I am very grateful to my guides, Miss Khushbu Madan who not only helped me on this topic but also helped me to understand the nuances of capital market. In spite of having a very busy schedule, they made sure in every way that we acquire the best possible exposure and knowledge during our project.

I would be failing in my duty if I do no express my deep sense of gratitude to Sri P.K. Suri, H.O.D. and all the faculty members for their valuable advice and guidance in this project.

Abstract

The aim of this project is to construct effective portfolio for the large cap companies. This study enables to know the performance of Sensex thirty companies having larger market capitalization. The analysis given on this project is on the basis of risk & return and on Sharpe index model. This project suggests which stock should be selected amongst large cap industries so as to construct an optimum portfolio.

For this a brief profile of the companies are created. The stock price movement, beta values & closing index points of the companies for the past four year are collected for analysis. Risk free rate of return is calculated. All the values obtained are interpreted and analyzed using Sharpe's single index model.

After constructing the portfolio, returns of the constructed portfolio is compared with the market so as to evaluate its performance.

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1. INTRODUCTION

1.1 Introduction of Project

The risk of an entire portfolio comprises of unsystematic risk also known as idiosyncratic risk and systematic risk which is. Systematic risk means the risk common to all the other securities, i.e. market risk. Unsystematic risk means the risk associated with an individual asset. It can be easily diversified away to smaller levels by simply including a greater number of assets in the entire portfolio. The same is not possible applicable for systematic risk within one common market. Depending on the market index, a portfolio of approximately 30-50 stocks in developed markets such as USA or UK will render the portfolio evenly diversified such that risk exposure is reduced to systematic risk only. In developing countries a large number of securities are required, due to high asset volatility.

A smart investor should not take any diversifiable risk, as only non-diversifiable risks were rewarded within the scope of this entire model. Therefore, the required rate of return on an asset, i.e. the return that will compensate for the risk taken, must be linked to its riskiness in the portfolio context—i.e. its contribution to the entire portfolio riskiness—as opposed to its "stand alone risk." In the CAPM context, entire portfolio risk is represented by very high variance i.e. less predictability. In other word we can say the beta of the portfolio is the defining factor & important factor in rewarding the systematic exposure taken by an investor.

A rational investor always attempts to minimize risk and maximize return on his investment. Investing in more than 1 security is a strategy to attain this often-conflicting goal. In 1952 Harry M. Markowitz developed a model that could be used to systematically operationalize the old adage – don't put all eggs in one basket. Markowitz's portfolio model is concerned with selecting optimal portfolio by risk adverse investors. According to the model risk adverse investors should select efficient portfolios, the portfolio that maximizes return at a given level of risk or minimize risk at a given level of return, which can be formed by combining securities having less than perfect positive correlations in their returns. Markowits, model was theoretically elegant and conceptually sound. However, its serious limitation was the volume of work well beyond the capacity of all except a few analysts.

To resolve the problem William Sharpe developed a simplified variant of the Markowitz model that reduces substantially its data and computational requirements (Sharpe 1963). As per Sharpe's model, the construction of an optimal portfolio is simplified if a single number of measure the desirability of including a stock in the optimal portfolio. If we accept his model, such a number exists. In this case, the desirability of any stock is directly related to its excess return-to-beta ratio. If the stocks are ranked from highest to lowest order by excess return to beta that represents, the desirability of any stock's inclusion in a portfolio. The number of stocks selected depends on a unique cut off rate such that all stocks with higher ratios will be included and all stocks with lower ratios excluded.

Markowitz's original work still defines the main analytical tool for choosing —optimal‖ portfolios. In practice, however, most of the work of the portfolio manager is done in preparing the inputs for the Markowitz model (the forecasts for portfolio return and portfolio variance), and in interpreting the *outputs* of the model. The most recent advances in portfolio management have focused on ways to analyze in more detail the different sources contributing to the total risk in a portfolio.

1.2 Objectives

As Warren Buffet has rightly said "Do not put all your eggs in one basket". Smart investors ensure that they do not invest all the money on a single stock instead they diversify their portfolio. To diversify either they can do fundamental analysis or use Sharpe's single Index model.

In this study we use Sharpe's single index model to create such a portfolio. This research is being carried out from the perspective of a manager so as to understand whether Sharpe's single index model can be used practically to construct a portfolio which can beat the index but with lower risk.

Through this research work we also intend to gain the following objectives

- Gain Excel proficiency—calculations, functions, formulas, and Excel best practices.
- Getting acquainted with Financial Markets and Industry Analysis.
- Determining the unsystematic risk of a stock from its variance.
- To find the difference in returns of the portfolio constructed from the Index and also calculate its standard deviation.

2. REVIEW OF LITERATURE

The techniques that are used to solve the problem of optimal portfolio selection all have their drawbacks. To solve these problems, we propose a new approach driven by utility-based multi-criteria decision making setting, which utilizes fuzzy measures and integration over intervals. The novel approach for an optimal portfolio selection has shown significant impact on the improvements of the existing techniques both theoretically and experimentally. A common criterion for this assessment is the expected return-to-risk trade-off as measured by the Sharpe ratio. Given that the ideal, maximized Sharpe ratio must be estimated, we develop, in this paper, an approach that enables us to assess ex ante how close a given portfolio is to this ideal. For this purpose, we derive the large-sample distribution of the maximized Sharpe ratio, as obtained from sample estimates, under very general assumptions. This distribution then represents the spectrum of possible optimal return-risk trade-offs that can be constructed from data.

 Seegopaul, Hamish; Gupta, Francis; Prestbo, John (2005), For many plan sponsors, the greatest allocation to a single asset class is generally to domestic large-cap equities, so even a marginal difference in the performance of this asset class over a long period can result in significant differences in the value of overall plan. Gotoh, Jun-ya; Takeda, Akiko(2011), the reformulation of robust counterparts of the VaR and conditional value-at-risk (CVaR) minimizations contain norm terms and are shown to be highly related to the ν-support vector machine, a powerful statistical learning method. For the norm-constrained VaR and CVaR minimizations, a nonparametric theory validate is posed on the basis of the error bound for the ν-SVM.Dale, Garry (2009), The adviser's job, often with the help of a computerized modeling tool, is to balance the asset weighted portfolio against the client's assessed risk profile. Admittedly, this sounds complex, but, in simple terms, a client's risk profile is a measure of how much capital they are prepared to lose over a given period of time. Not, as many understand it, where the client fits on a scale of one to ten. Jacobson, Brian J (2006), one of the challenges of using downside risk measures as an alternative constructor of portfolios and diagnostic device is in their computational complexity, intensity, and opaqueness. The question investors, especially high-net-worth investors who are concerned about tax efficiency, must ask is whether downside risk measures offer enough benefits to offset their implementation costs in use.

A final insight is an outline of how to forecast risk using distributional scaling. Marketing business weekly (2008), Calibration proved superior to existing method of averaging 2 or more separate optimizations methods made with 1 or more riskier models. First, optimal solution is guaranteed as there is was no ad hoc averaging done after the optimization process. Second, conservative solutions that are explicitly avoided as secondary tracking error constraint is always binding and not reversible. Third, there most often is a major synergistic benefit when both the risk models affect the solution completely.

B Perez Gladish; M V Rodríguez (2006), Expert estimations that of future Betas of each financial asset have also been included in the portfolio selection model denoted simply as `Expert Betas' and modeled as strange fuzzy numbers. Value, ambiguity & fuzziness are 3 important basic concepts involved in the model which provide systematic information about fuzzy numbers that represent `Expert Betas' & that are simple to handle. Clarke, Roger (2002),The ex-ante relationship is a generalized version of a previously developed "fundamental law of active management" and provides an important strategic perspective on the potential for active management to add value. The ex post correlation relationship represents a practical decomposition of performance into the success of the return-prediction process and the "noise" associated with portfolio constraints. Rudin, Alexander M; Morgan, Jonathan S,(2006), Despite the importance of diversification in portfolio construction, our current methods of measuring it are inefficient. Implementation in hedge fund strategies reveals that various hedge funds offer less diversification than may have been thought, and that there has been reduced diversification in the past several years,

Kangari, R, Riggs, L S,(1988)Two major obstacles are risk evaluation associated with each project and the correlation coefficient between projects, which describes the efficiency of the diversification. The probabilistic approach that is suggested is a more realistic approach to the evaluation of correlation. It is not possible for a contractor to completely diversify a portfolio, so industry risk cannot be eliminated. Borkovec, Milan; Domowitz, Ian(2010)Accounting for trading costs ex ante delivers superior net returns, broader diversification, lower turnover, and a portfolio robust to noisy alpha signals, relative to standard mean-variance stock selection and portfolio construction. Mitigation of transaction costs, leading to improvement in realized returns

and better alignment of return with risk, begins at the portfolio construction stage and therefore should not be controlled only at the level of trading desks.

A major consequence of our understanding of a number of alternative investment strategies as being inherently short event risk is to reassess their role as diversifiers for conventional stock-and-bond portfolios. The nature of correlation changes dramatically during eventful times. In the fall of 1998, for example, the correlation of market-neutral hedge funds to broad markets approached 1.0. Therefore, one should probably not rely on diversification arguments in advocating hedge-fund investments. Instead, one should probably note whether an investor is particularly well paid for assuming a fund's risks and also decide whether an investor is in a unique position to assume risks that others wish to lay off or not taken on.

Assuming that the rational investor seeks to maximize the expected net return for a given level of volatility, or equivalently seeks to minimize portfolios ex- ante risk for any given expected return, Markowitz [1952, 1959] triggered the development of modern portfolio theory with the introduction of the mean-variance framework. The concept of portfolio efficiency quantifies existing link between risk and return of a portfolio and the complete set of optimal (or efficient) portfolios consequently forms the mean-variance frontier. Built upon the mean-variance framework, the Capital Asset Pricing Model (CAPM) as developed by Sharpe [1964], Lintner [1965] and Mossin [1966] states that under some certain conditions and taking different levels of investors' risk tolerance into account, the portfolio that provides the highest reward per unit of risk, better known as Maximum Sharpe Ratio (MSR) portfolio should be held by all market participants.

Although mean-variance analysis and the CAPM are two pillars of modern finance, these models have been scrutinized since their introduction. Especially simplified assumptions, namely the aim of rational and risk averse investors to maximize economic utilities without influencing prices, having homogeneous investment views based on all information to be available at the exact time to all investors, trading without any costs and holding a well-diversified portfolio, have been strongly criticized. While Roll [1977] passed criticism on the observability of the tangential portfolio, Merton [1980] found that already small changes in return estimates can lead to completely different optimal weights in a portfolio construction process. In a nutshell, due to

the CAPM general assumptions and the question about availability of risk and return estimates, the mean-variance framework is known to have difficulties in its practical implementation.

Extending the work from Merton [1987], Malkiel and Xu [2006] found that if investors do not hold the market portfolio, unsystematic risk is positively related to stock returns. According to Martellini [2008], taken together with the fact that asset pricing theory implies a positive premium for systematic risk, these findings suggest a positive relationship between total volatility and expected returns. However, Haugen and Baker [1991] were the first to provide empirical evidence for the inefficiency of market capitalization-weighted indices and exclusively focused on risk in their alternative portfolio construction process. Repeatedly investing into a stock portfolio constructed to expose investors to minimum risk as measured by variance provided a higher Sharpe Ratio (SR) than the Wilshire 5000 index in the period 1972-1989 and therewith inspired further risk-based investing approaches. This paper adopts the question of how to construct an optimal portfolio regarding different risk objectives and contributes to existing literature by examining using Sharpe's single index method.

.**Various method of constructing optimal portfolio:**

The famous methods for constructing portfolios are' ¬

- Markowitz model
- Sharpe's single index model

 On observing the stock prices over a considerable period of time reveals that almost all of the stock prices move along with the Sensex & Nifty. When the market increases, stock prices are also seen to increase and vice-versa. This then indicates that some underlying factors do affect the market index and this relationship can be used to estimate the total return on stock. To support this purpose, the following equation can be used:

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

   Where, Ri is expected return on the security i

        α i - alpha co-efficient which means the amount by which a particular fund has outperformed the market taking into the account of its exposure to market risk.

Bi is a slope of straight line i.e., a measure of a fund's net sensitivity with respective market movements.

Rm: the rate of return of the market index.

ei - error term

According to the above stated equation, the return of the stock can be divided into 2 major components, the return independent of the market & the return due to the market. βi indicates the sensitivity of the stock return to the changes with the return of market ie sensex. The single index model is based on certain assumption. These are that stocks vary together because of some common movement in the capital market & there are also no effects beyond the market that accounts the stock similar movement with market. The expected return, co-variance and standard deviation of the single index model as described represents the joint movement of stocks.

The covariance of returns between securities j & i = $\beta i \, \beta j$

The variance of security's return, $\sigma^2 = \beta_i \, \sigma^2_m + \sigma^2_{ei}$

The variance of the security has two components which are market risk and unsystematic risk or also known as unique risk. The variance as explained by the index which is sensex is referred to as systematic risk. The unexplained variance is called residual variance also known as unsystematic risk.

Systematic risk = β_i^2 * variance of market index. = $\beta_i^2 * \sigma_m^2$

Unsystematic risk=total variance - systematic risk

Sharpe's optimal portfolio

Sharpe had provided a model so that the selection of right securities in a portfolio can be made. The selection of any security is directly related to its excess return divided by beta ratio- Ri-Rf. The excess return is calculated as the difference between the return on the stock & the risk less rate of interest which is offered on a government securities or a treasury bill. The excess return to beta ratio also measures the additional return on a security per unit of systematic risk also called non-diversifiable risk. This important ratio provides a relationship between potential risk &

return. Ranking of the chosen stocks are done on the basis of their respective excess return to beta ratio. Portfolio managers would like to include securities with higher ratios. The selection of such stocks depends on unique cut-off rate such as all securities with higher ratios of (Ri-Rf)/ βi are included & the stocks with lower rank are let go off. The cut-off point is represented by C *. The stocks ranked above C* have very high excess returns to beta as compared to the cut-off point Ci & are thus included in the optimal portfolio.

Methodology:

Step 1: A short profile of some of the 30 companies of sensex was chosen.

Step 2: for a short period of four years data of each of the companies had been recorded.

Step 3: To apply Sharpe's index model Ri, Rm, βi, σ_{ei}^2, σ_m^2, Rf values were required. So all the required data were collected & calculated for proceeding further.

Step 4: Cut-off point C* was calculated using the following formula:

$$Ci = \frac{\sigma_m^2 * \Sigma(Ri\text{-}Rf)Bi/\ \sigma_{ei}^2}{(1+ \sigma_m^2 * \Sigma B^2/\ \sigma_{ei}^2)}$$

Step 5: After computation of Ci for the various companies the value calculated were put in a tabular form and then the interpretations were made accordingly.

Step 6: The Ci values firstly go on increasing up to a certain level and then start decreasing gradually. The highest point arrived at is called cut-off point. The securities which are above cut off point point were chosen for the portfolio.

Step 7: Once the stocks for portfolio were chosen, the proportion in which these should be invested is also to be determined. This was done using a simple formula where Xi denotes the proportion of money, **Xi=Zi / ΣZi**

Where Zi =([Ri-Rf]/B$_i$ -C*)*(βi/ σ_{ei}^2)

Step 8: total return on the portfolio can be made known with the given formula Rp=ΣXiRi

Step 9: σ_p^2 gives the total risk associated with portfolio.

3. RESEARCH METHODOLOGY

Research design or research methodology is the procedure of collecting, analyzing and interpreting the data to diagnose the problem and react to the opportunity in such a way where the costs can be minimized and the desired level of accuracy can be achieved to arrive at a particular conclusion.

This was a descriptive study on the optimal construction of portfolio of stocks. The data that is used for the study is Secondary in nature. The data had been collected from several websites like Bombay Stock Exchange (BSE) and also from the databases of Ebsco and Proquest. The study is conducted with the help of data for the past four years from 1 April 2011 to 1 April 2015. The sample size for the study is limited to 30 large cap companies. They are a combination of stocks from various sectors namely Banking, Information Technology, Energy, FMCG, Infra, Pharma, etc..

3.1 Scope of the Study
- Selection of companies is restricted to Sensex thirty only.
- Of the thirty company of the index, the companies are chosen & analysed based on their financial performance in the last four fiscal years.
- No other factors except that of the index movements, share price movements, beta values and rate of return on government securities for the securities for the past four years were taken for analysis.

3.2 Data Collection
The companies which constitute the sensex index have been chosen for applying the Sharpe's single index model & hence construct an optimal portfolio. Bombay stock exchange limited which is the oldest stock exchange in the Asian continent with a rich & vast heritage popularly known as "BSE". BSE was established as "The Native Share & Stock Brokers Association" in the year 1875. BSE is the first stock exchange in India to obtain permanent recognition in the year 1956 from the mighty government of India under the securities contracts act, 1956. BSE pre-eminent role in the great development of the capital market is still widely recognized & its index, SENSEX is tracked worldwide. SENSEX, which was first compiled in 1986, was to be calculated on a "market capitalization weighed" methodology of large 30 component stocks

representing a mix sample of large, well- established & financially sound companies. The base year of SENSEX was 1978-1979. SENSEX is widely reported both in domestic & international markets through print in newspapers as well as electronic media.

List of companies constituting SENSEX index:

SL. No.	Company Name	Industry
1	Axis Bank Ltd.	Bank – Private
2	Bajaj Auto Ltd.	Automobile
3	Bharat Heavy Electricals Ltd.	Electric Equipment
4	Bharti Airtel Ltd.	Telecommunication
5	Cipla Ltd.	Pharmaceuticals & Drugs
6	Coal India Ltd.	Mining & Minerals
7	Dr. Reddys Laboratories Ltd.	Pharmaceuticals & Drugs
8	GAIL (India) Ltd.	Gas Transmission
9	HDFC Bank Ltd.	Bank - Private
10	Hero MotoCorp Ltd.	Automobile
11	Hindalco Industries Ltd.	Aluminium
12	Hindustan Unilever Ltd.	FMCG
13	HDFC.	Finance - Housing
14	ICICI Bank Ltd.	Bank - Private
15	Infosys Ltd.	IT - Software
16	ITC Ltd.	FMCG
17	Larsen & Toubro Ltd.	Construction
18	Mahindra & Mahindra Ltd.	Automobiles
19	Maruti Suzuki India Ltd.	Automobiles
20	NTPC Ltd.	Power Generation
21	Oil & Natural Gas Corporation Ltd.	Oil Exploration
22	Reliance Industries Ltd.	Refineries
23	Sesa Sterlite Ltd.	Mining & Minerals
24	State Bank Of India	Bank - Public
25	Sun Pharmaceutical Industries Ltd.	Pharmaceuticals & Drugs
26	Tata Consultancy Services Ltd.	IT - Software
27	Tata Motors Ltd.	Automobiles
28	Tata Power Company Ltd.	Power Generation
29	Tata Steel Ltd.	Steel/Sponge Iron
30	Wipro Ltd.	IT - Software

Table 3.1: List of companies constituting Sensex

Bajaj Auto Limited:-

Manufactures and markets Bajaj scooters, 3 wheelers & spare parts. Incorporated in 1946 as a limited private company, it went public in 1961. Currently the company has four plants at Akurdi, Chakan, Waluj and Pantnagar with a combined installed capacity which can produce 5,050,000 nos of 2 wheelers and 3 wheelers. Further, the company also has an installed capacity to produce 75.20 MW of Wind power.

In 1975-76, the company co-promoted joint-sector company, Maharashtra Scooters. A plant which was set up at Satar and production of various models of Priya scooters commenced in 1978. Bajaj introduced a new technology which was ungeared simple scooter called Wave, for which the engine was to be powered by DTS. In 2006-07, Bajaj Auto entered into a JV in Indonesia with a financial consultancy group called Boentaro & formed partnership. Bajaj Auto Indonesia, a subsidiary where the company has 95% equity ownership. This JV Company is being used for assembling and selling 3 wheelers and high-end motorcycles

Bharat Heavy Electricals Ltd. (BHEL)

Figure 3.1.1: Bhel Logo

It was incorporated as a government of India owned organization in 1952. After liberalization of the Indian economy which was really important, the government decided to divest a small portion of its total holding. In 1991-92, government had divested a part of its shares to public and various financial institutions of India. At present the government holds 67.73% in the total equity capital of BHEL.

It is one of the largest engineering & manufacturing enterprises in India in the energy- related sector. The company's operations was organized around 3 business sectors, namely Industry (includes Transportation, Transmission, Telecommunication and Renewable Energy) ,Power, & Overseas Business. This enables BHEL to have a strong customer orientation, to be sensitive to its needs and respond quickly to the changes in the market.

BHEL has won International Asia Pacific Quality Award from the International Asia Pacific Quality Organization through its Ranipet manufacturing Unit. It is the 1st engineering & Manufacturing organization and the first Public Sector Unit in the country to receive this award.

Bharti Airtel Ltd :
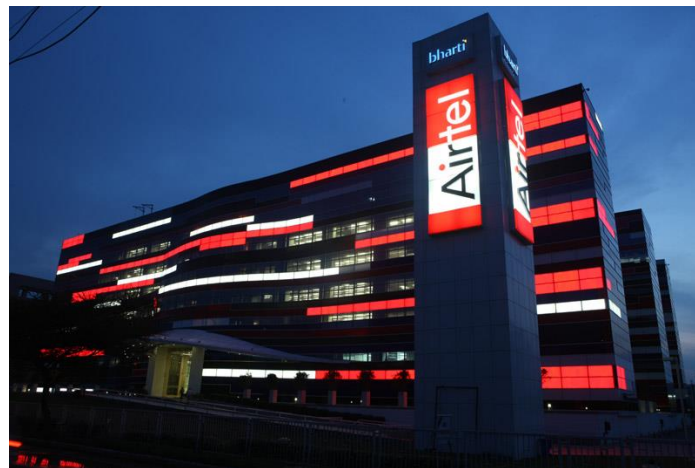
Figure 3.1.2: Airtel

Was incorporated on July, 1995, for promoting investments in diversified telecommunication service projects. The company which was formed as a 80:20 JV between the rich Bharti Group through its small subsidiary Bharti Telecom & STET International Netherlands, a company which was promoted by Telecom Italia, Italy. Bharti is India's leading private sector which provides telecom services with more than 40 million diverse customers in India comprising of 38.1 million mobile and approximately 1.9 million telephone & broadband customers and is 1st to have an all India presence. The company which was structured into 3 main units, long distance & enterprise services which offers carriers and corporates, Mobile Services which offers GSM

Mobiles Servies & Infotel Services which provides broadband & telephone,. The company was 1st GSM Operator to have more than 15 million customers & also the first telecom company which covered all the 23 telecom circles of India, with this coverage facility the company became the 1st operator to have an All-India footprint. All the services of company is being provided under brand name of AIRTEL

Cipla Ltd:-

Incorporated in the year June 1935, today Cipla is one of the largest manufacturer and marketer in formulations & bulk drugs. It has been ranked one in India by ORG IMS ratings 2006 in terms of retail pharma sales. All the bulk drug facilities of CIPLA have been approved by the US FDA & the formulation facilities have also been approved by the Medicine Control Agency (MCA), UK; Medicine Control Council (MCC), South Africa; Therapeutic Goods Administration, Australia and various other international agencies. It has manufacturing facilities at Bangalore , Kurkumbh, Vikroli in Mumbai & Patalganda. CIPLA products are currently registered in over 160 countries.

Cipla has a vast product range which includes anti-bacterial, antibiotics, anti- asthmatics, anti-inflammatory anthelminites, cardiovasculars & anti-cancer. In the domestic formulation market, antibiotics are the mainstay, which contributes close to 50% of the total company's revenue. The company also expanded its facilities at Baddi in Himachal Pradesh. The company is also planning to set up a very large drug formulation manufacturing facility for its various dosage forms as a Special Economic Zone in Goa & also planning major additions to its manufacturing facilities at Bangalore & Kurkumbh.

Reddy's Laboratories:-

Figure 3.1.3: R&D Centre

Established in May 1984, is a leading Indian pharma company with vertically integrated operations. Dr. Reddy develops, manufactures and markets a wide range of pharmaceutical products not only in India but also overseas. It produces finished dosage forms, diagnostic kits, active pharmaceutical ingredients, critical care & biotechnology products. Dr. Reddy has over 190 finished dosage brands and 70 active pharmaceutical ingredients (API) currently in production. In 2006, Dr. Reddy involved de- bottlenecking of existing capacities and adding up new lines, so as to meet growing international demand for generics as well as customs pharmaceuticals services. During the year company has made 2 major acquisitions. The first one was the purchase of Roche's active pharmaceutical ingredients Business, its order-book and its manufacturing plant in Mexico. The other acquisition was that a betapharm, Germany.

HDFC Bank:-

Figure 3.1.4: HDFC

HDFC which was earlier promoted by the mightier Industrial Credit and Investment Corporation (ICIC) of India with initial equity reservation for the financial giant International Finance Corporation (IFC) and the Royal Highness, Aga Khan. HDFC provides housing loans to corporates, individuals & developers. It has a Centre for Housing Finance which provides technical assistance to various national governments & housing finance institutions in various developing countries like South Asia & Africa. Another function is to also act as a co-coordinator of the coalition of various housing finance institutions in Asia & the Pacific, a public and private sector partnership (PPP) project, funded by the mammoth United Nations Development Programed. HDFC Bank has also been working closely with National Housing Bank (NHF) to frame various appropriate foreclosure norms so that the securitization of housing debt will be possible.

In the year 2006, HDFC Bank opened an office in London so as to cater to the needs of non-resident Indians (NRIs). HDFC Bank was selected as the best Indian company in the 'Financial Institutions/ Financial Services' /NBFC category at the Dun & Bradstreet - American Express Awards 2006.

HDFC :{Housing Development Finance Corporation}

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Hero Honda :-

A JV company promoted by Honda Motor Company of Japan & Hero Cycles of India, is the world's largest 2 wheeler manufacturing Company. Honda Motors of Japan the technical & Financial Collaborator holds up to 26% stake in the entire company. The market share of the company in the Indian motorcycle market is 40%. Hero Honda has launched 5 new models namely CD-Dawn an entry segment bike, KARIZMA for power and sport segment, Splendor Plus, Passion Plus and AMBITION 135 which is a premium segment. In line with its efforts of introducing the world's best technologies to India, the company also announced the launch of India's 1st motorcycles with Fuel Injection technology in July 2006, with the launch of 135 cc Glamour FI. With this, Honda Motor of Japan will debuts this technology globally in 135 cc category, with Hero Honda joint venture. The company was the only 2 wheeler company named amongst the elite top 10 companies in India by the Asia 100 Leadership Report by the Wall Street Journal.

Hindustan Unilever Ltd (HUL)

Figure 3.1.5: Products of HUL

This Company was incorporated in the year 1934. In July 2007, the company changed its name from Hindustan Lever Ltd (HLL) to Hindustan Unilever Ltd (HUL). With this change, the company's new corporate identity also represented by a new logo came into effect. During 2004, the company's subsidiaries Lever India Exports Ltd, Merry weather Food Products Ltd, Lipton India Exports Ltd, Toc Disinfectants Ltd, International Fisheries Ltd were all merged with the company as of December 31, 2005 with effect from the respective appointed dates which was stipulated in the Merger Scheme approved by the mighty High Court of Mumbai, Maharashtra. Vasishti Detergents Ltd also came in to the umbrella of the company as a result of entire amalgamation of the Tata Oil Mills Company Ltd. VDL was also merged with the company on February 27, 2006 pursuant to a Scheme of Arrangement which was sanctioned by the royal High Court of Mumbai with retrospective effect from July 2, 2005. HUL transferred the soap and soap intermediate manufacturing facilities located at Sewari in Mumbai to Bon Ltd on 16th July, 2005. In December 2004, HUL obtained approval from its shareholders and transferred its own Functionalized biopolymer business to a group called Riddhi Siddhi Gluco Biols Ltd.

Hindalco India:-

Hindalco Industries which is a flagship company of the Aditya Birla Group, is of the India's largest integrated aluminum producer. Hindalco has also emerged as the leading player in the Copper business in India with the latest acquisition of Copper business of earlier known as Indo Gulf Corporation, a Aditya Birla Group company. Hindalco is the market leader with 42% market share.   In 2006-07, the Installed capacity of Aluminum Metal, Electricity (Co-generation), , Electricity, Gold and Silver capacities was also expanded by enhancing to 7000 tonnes, 100 MW, 7.4 MW, 8.5 Tonnes and 75 tonnes respectively. By enhancing, Installed capacity of Aluminum Metal, Electricity, Electricity (Co- generation), Gold and Silver the total installed capacity stood as 461000 tonnes, 1009.2 MW, 212.8 MW, 15 Tonnes and 150 Tonnes respectively.

 ICICI Bank:-

ICICI was incorporated in Feb.'94 and received its banking license from RBI in May.'94. ICICI Bank is a commercial bank promoted by ICICI Ltd which is an Indian Financial Institution. It is still the 2nd largest bank in India. The bank has over 855 branches & extension counters across different parts of India and over 3272 ATMs across the whole country. During 2006-07, Sangli Bank Ltd was also merged with ICICI Bank Ltd and this merger was approved by RBI to the scheme of amalgamation effective April 18, 2007. The Board of Directors which is an important aspect of ICICI Bank at its meeting held on March 2007 approved the incorporation of a new wholly owned private subsidiary. The Bank has also proposed to transfer its holding in ICICI Lombard General Insurance Company Ltd, ICICI Prudential Life Insurance Company, ICICI Prudential Trust Ltd and ICICI Prudential Asset Management Company Ltd to its proposed new wholly owned subsidiary.

Infosys Technologies:-

 Infosys Technologies Ltd was incorporated on July 2, 1982, as a private limited company. It became public ltd company on June 1993 and subsequently the name was changed to Infosys Technologies Ltd. It was the 1st Indian company to be listed on an American Stock Exchange. The Company is one of India's leading IT services companies. It is mainly engaged Out-Sourced

application and Infrastructure Services, Product R&D Services, Enterprise Services and Consulting Services.

Infosys also develops and markets certain company owned software products range. The company has received award 'First Position in South Asian Federation of Accountants Best presented Accounts Award 2005 in the Communication and IT Sector based on the evaluation of the Annual report of the entire company. Wired Magazine has ranked No.8 on Wired 40. Infosys was named 'India Best Managed Company' based on a study Conducted by Business Today & A T Kearney.

ITC Ltd.

ITC is a leading FMCG Cigarette major is 1 of the most valuable companies in India. Rated among the World's top Big Companies by Forbes magazine. Even though it is renowned for its Cigarette business it a has business interests in Hotels; Paper & Packaging; Paperboards, agri exports and some other FMCG products like safety matches, branded packaged foods, Incense Sticks and Greeting Cards etc. It pioneered the manufacture of cigarettes in India, ITC has maintained its leadership position since 1910. It has diversified its brands across various products categories. Its successful brands include Wills,Gold Flake, Classic, Scissors & Bristol. ITC also sells 2 luxury filter brands of the parent company called Benson & Hedges and 555.

In 2005, ITC was awarded the ISO 9001:2000 standard By Det Norske Veritas as a recognition of its premium quality products and processes. ITC units at Munger and Tiruvottiyur are certified to ISO 14000,9000 and 18000. ITC has also won three India stars, 3 Asia Stars and 1 World star Award for making innovative packaging.

Larsen & Tourbo:-

Founded in 1937 by two Danish engineers, Henning Holk Larsen & Soren Kristian Toubro, as a limited partnership firm, Larsen & Toubro then became a private limited company in 1947 & a public limited one in 1951.

Larsen & Toubro is one of the largest engineering conglomerates of SE Asia. Larsen & Toubro manufactures a gamut of engineering products like industrial, earthmoving and chemical machinery, switchgears, welding alloys & valves. Larsen & Toubro diversified into shipping after acquiring 2 bulk carriers from Japan in the period of 1981-82. In 1983-84, Larsen & Toubro commenced operations at its one-million tonne cement plant at Awarpur, Maharashtra.

Larsen & Toubro enhanced its installed capacity of its Steel structural fabrication & Ready Mix Concrete by 2500 MTs & 942900 M3 respectively. With this massive expansion the total installed capacity of its Steel Structural Fabrication & Ready Mix Concrete increased to 19000 MTs & 3129000 M3 respectively.

Maruti Udyog Limited

Established in 1981, which had a prime objective to meet the ever growing demand of having a personal transport, which is caused due to lack of efficient public transport system. The incorporation of the company was unique through an Act of Parliament. Suzuki Motor of Japan was chosen from 7 other prospective partners worldwide. Suzuki Motor was due not only chosen because of its undisputed leadership in small cars but also due to commitments to actively bring to Maruti Udyog Limited contemporary technology and mighty Japanese management practices (that had caused Japan overtake USA to the status of the top & superior auto manufacturing country in the world). A new license and a Joint Venture agreement was signed between Suzuki Motor Company & Government of in Nov 1982. In 2001, Maruti Udyog Limited became one of the 1st automobile companies, globally, to be honoured with certificate of an ISO 9000:2000. The production, R&D is spread across 300 acres with three fully-integrated production facilities. The Maruti Udyog Limited plant has already rolled out 4.4 million vehicles. The fact goes on to say that, on an average 2 vehicles roll out of the factory in every minute. Maruti Udyog Limited takes approximately 15 hours to make a complete car. Not only this, with range of 12 models in 60 variants, Maruti Suzuki Company fits every car-buyer's budget.

ONGC:-

Oil and Natural Gas Corporation was set up in 1957 with a significant contribution in industrial and economic growth of India, is a leading National Oil Company of this country engaged mainly in exploration, development and also production of crude oil, natural gas and some key value added products. ONGC was subsequently converted into a public limited company in May.'93 following new liberalized open economic policy adopted by the Government of India in June, 1991 sought to deregulate & de license the core sector (including petroleum sector which is key) with partial disinvestment of Government equity in Public Sector Undertakings and other key measures. ONGC is developing a 740 MW Power Plant at Tripura primarily to monetize idle gas. The project was scheduled to be completed by 2008. ONGC is also taking initiatives to develop various non-conventional energy sources & has planned to set up 2 Wind Power Projects of 100 MW combined at Gujarat and Karnataka state with approximate total investment of Rs.5000 Million.

Reliance Industries:-

Reliance Industries Ltd started its business in 1967 as a small textile manufacturer. In Jun 8, 1973 Reliance Industries was incorporated & adopted its current name in year 1985. Initial business was to manufacture textiles products in large number. Over the years, Reliance Industries has transformed into a petrochemical major.

Reliance Industries is the largest private sector business company in India Reliance Industries operations capture value addition at each & every stage, from the production of gas and crude oil to polyester, chemical products and polymer, and finally to the production of textiles. Reliance Industries operates mainly in India but it has business activities and customers in around 100 countries all round the world. It has production facilities at 3 major & key locations in India and a further four other locations in Europe. Reliance Industries also has exploration and production interests in countries like Yemen and Oman.

Reliance Industries is the world's largest producer of Polyester & Yarn. Reliance Industries is also the world's 5th largest producer of paraxylene, 6th largest producer of du ethylene glycol , 8th largest producer of Purified terephthalic concentrated acid (PTA) & the largest producer of

Polypropylene. Within the country like India, the market share of the company is unknowingly in a leading position for all its primary major businesses in India.

State Bank Of India:-

State Bank of India's origin goes back to in the early decade of the nineteenth century with the key establishment of then Bank of Calcutta in Calcutta off course on 2 June 1806. 3 years later the bank was re-designed known as Bank of Bengal on 2 January 1809. SBIwas the first joint-stock bank for British India sponsored by the then Government of Bengal. Two other key banks the Bank of Bombay on April 1840 & the Bank of Madras on April 1843 also started its operations. These 3 banks together remained at the apex of now modern banking in India till their all 3amalgamation known as the Imperial Bank of India on January 1921. This bank took on the triple role that of a a banker's bank, commercial bank and a key banker to the government.

The Bank is actively involved strategically in non-profit activity also called as community services banking apart from usual normal banking activity. All the other branches and administrative offices in the whole country sponsored and actively participated in large number of welfare and important social causes. This reflects that the bank touches perfectly with the lives of people anywhere in several ways.

Tata Motors:-

Tata Motors Ltd Controlled by the House of Tatas, is the 5th -largest manufacturer of medium and heavy commercial vehicle and the 2nd largest medium and heavy bus manufacturer in the entire world. The commercial diesel vehicles, which were then called Tata Mercedes Benz, are now sold under the name of Tata after the expiry of the collaboration agreement with the Daimler-Benz, Germany. Apart from manufacturing light, the medium and heavy commercial vehicles, it also manufactures utility vehicles, passenger cars, excavators and machine tools. The manufacturing units are located at Jamshedpur, Lucknow, Pune and Pant Nagar in Uttarakhand.

In 2006-07, Tata Motors initiated steps to establish a Small Car plant in Singur, West Bengal for NANO with a capacity of 250,000 vehicles per annum which was a failure The company is also

setting up a green field manufacturing facility in Uttarakhand. The plant will be of manufacturing capacity of 225,000 vehicles per annum.

TATA STEEL LTD:-

Tata Steel Ltd (formerly TISCO) was incorporated in 1907. Over the Years, Tata Steel has diversified to manufacture, apart from saleable steel, cold-rolled strips, Welded-steel tubes, seamless tubes, alloy steel ball bearing rings, carbon and alloy Steel bearing rings; bearings, Ferro Manganese, metallurgical machinery, Ferro chrome, etc.

The company's subsidiaries include Tata Pigments ,Tata Refractories, Kalimati Investment, Tata Korf, Stewarts & Lloyds of India, Tata Incorporated, Tata SSL, TM International logistics Ltd, Jamshedpur Utilities & Services Co Ltd,Lanka Special Tubes Ltd, The Indian Steel and wire products Ltd, Sila Eastern Ltd, NatSteel Asia Pte Ltd, Hooghly Metcoke & Power company Ltd.

The company acquired Rawnet Ferrous Industries Pvt Ltd, Orissa, which was a Ferro Alloys plant with a capacity of 50,000 tpa of high carbon chrome.

TCS (Tata Consultancy Service):

TCS is the leading provider of highly flexible financial management software that powers mid-sized businesses to large sized businesses.

Company's mission is to maximise the business success of its customers through the installation, maintenance & then support of superior financial management as well as other software solutions.

TCS has set a number of strategic & tactical objectives that reflect in their mission, aim and collective goals:

 • To establish the company as best global organization for small to large-scale deployment of financial management and other software solutions on the Cache platform so as to establish a fully object oriented component based application process, which will enable them to deliver robust and efficient software quicker and more reliable than any competitor.

 • to ensure that its customers can operate their respective business software solutions on infrastructures that match their criteria.

Expertise

• With the sole focus on the customer, they have the business and accounting skills necessary to completely understand & implement the structure best suited for their customers.

 • With a focus on Inter Systems Cache, they have the right technical expertise to implement the latest innovations so as to ensure the maximum return on investment.

 • TCS employees are its biggest asset, and at TCS they have individuals who combine skills, backgrounds and various cultures to provide a cohesive, well-built and outstanding team.

WIPRO

Wipro Technologies is the number one provider of integrated business (IB), technology and process solutions on a global delivery platform. Wipro is a global service provider delivering technology driven business solutions which meets the strategic objectives of its clients. Wipro has 50+ 'Centers of Excellence' which creates solutions around specific needs of various industries. Wipro Technologies delivers unmatched business value to its customers through a combination of quality frameworks, process excellence & service delivery innovation. Wipro Technologies is the World's 1st CMMi Level 5 certified software provider company and the 1st outside America to receive IEEE Software Process Award. Wipro's Technologies complete range of IT Services which addresses the needs of both business requirements & technology to help organizations to leverage worlds leading-edge technologies for rapid business improvement. Wipro Technologies takes charge of the IT needs of the whole enterprise. The gamut of sophisticated services extends from Enterprise Application Services, to e-Business solutions. Wipro's Technologies enterprise solutions have served and will continue to serve clients from a range of industries which includes Energy and Utilities, Telecom, Finance and Media and Entertainment.

Wipro was powered by the expert rich skills of over 7,500 technical specialists & state of the art BS 15000 certified which is important in infrastructure for its operations to support.

Risk-free rate of return:

Risk free security has null variance or standard deviation. These securities have no risk at all of default. The government bonds or T-bills are proper example of risk free securities as they do not have risk of default. The yield of 5 years Goverment Bond was considered as the risk free rate of return for our complex calculation purpose. So R_f is 7.1%.

Return on Market

The return on the market is the return which will be obtained by the companies constituting the sensex. The returns of all the leading 30 companies purpose are considered & only the yearly values were shown in the table given below for calculating purpose.

Date	Close
1 Apr, 2015	27,886.21
1 Apr, 2014	22,417.80
1 Apr, 2013	19,504.18
2 Apr, 2012	17,318.81
1 Apr, 2011	19,135.96

Table 3.2: Value of Sensex on certain dates

4. DATA ANALYSIS

4.1. Introduction to the case

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.

$\beta = \text{Correlation} * \sigma(Y)/\sigma(X)$

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 = ((Today's market price – Yesterday's market price)/Yesterday's market price)*100

Efficient Portfolio

A portfolio that maximizes return for a given level of risk or minimizes risk for a given level of return is termed as an efficient portfolio.

Correlation

A statistical measure of the relationship between any two series of numbers representing data of any kind is known as correlation.

Risk-Free Rate Of Return (Rf)

Risk-free rate of return is the required return on a risk free asset, typically 5 year G Bond.

Excess Return-Beta Ratio

Excess Return- Beta Ratio = R_i-R_f/β_i

Where, R_i= the expected return on stock,

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.

Cut-Off Point

$$C_i = \frac{\sigma_m^2 * \Sigma (R_i - R_f) B_i / \sigma_{ei}^2}{(1 + \sigma_m^2 * \Sigma B^2 / \sigma_{ei}^2)}$$

Where σ_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 that is stock's unsystematic risk.

Investment To Be Made In Each Security

X_i=Z_i/ΣZ_i

i=1

Where, X_i= the proportion of investment of each stock.

And Z_i=β_i/NRV (R_i-R_f/β_i-C_i)

Where, C_i = the cut-off point.

4.2 Data Analysis

Name of Stock	Market price as on 21/4/11	Current Market Price 21/4/15	Returns (Ri)	Beta (Bi)	(Ri-Rf)/Bi	Rank
Axis Bank Ltd	290.2	522.9	80.2%	1.93	37.87	13
Bajaj Auto Ltd	1477	2028.0	37.3%	0.84	35.96	15
Bharat Heavy Electricals Ltd	436.6	231.1	-47.1%	1.41	-38.42	30
Bharti Airtel Ltd	367	404.6	10.2%	0.79	3.98	19
Cipla Ltd	316.9	649.0	104.8%	0.47	207.86	5
Coal India Ltd	352.6	375.0	6.4%	0.76	-0.98	21
Dr.Reddy's Laboratories Ltd	1680.5	3498.7	108.2%	0.26	388.82	4
GAIL (India) Ltd	475.1	383.0	-19.4%	0.69	-38.38	29
HDFC Bank Ltd	476	1012.0	112.6%	1.12	94.20	8
Hero MotoCorp Ltd	1863.7	2315.0	24.2%	0.62	27.61	16
Hindalco Industries Ltd	216.5	136.9	-36.8%	1.31	-33.50	27
Hindustan Unilever Ltd	285	913.0	220.4%	0.53	402.36	3
HDFC	706	1273.0	80.3%	0.87	84.15	9
ICICI Bank Ltd	216.6	313.5	44.7%	1.77	21.26	18
Infosys Ltd	1461	2132.3	45.9%	0.69	56.30	11
ITC Ltd	192.5	345.3	79.4%	0.51	141.72	6
Larsen & Toubro Ltd	1121.6	1710.3	52.5%	1.7	26.70	17
Mahindra and Mahindra Ltd	768	1192.9	55.3%	0.87	55.43	12
Maruti Suzuki India Ltd	1265.6	3546.0	180.2%	1.55	111.67	7
NTPC Ltd	185	154.6	-16.4%	0.98	-24.01	24
ONGC	295.3	322.7	9.3%	0.95	2.29	20
Reliance Industries Ltd	1032	887.0	-14.1%	1.09	-19.40	23
Sesa Goa Ltd	311.9	208.0	-33.3%	1.17	-34.54	28
State Bank of India	281.2	285.5	1.5%	1.49	-3.75	22
Sun Pharma	222.5	944.4	324.4%	0.51	622.21	1
Tata Consultancy Services Ltd	1237.2	2433.4	96.7%	0.17	526.95	2
Tata Motors Ltd	248.4	535.0	115.4%	1.61	67.25	10
Tata Power Company Ltd	127.4	78.8	-38.2%	1.48	-30.60	26
Tata Steel Ltd	629.5	346.1	-45.0%	1.72	-30.31	25
Wipro Ltd	447	557.4	24.7%	0.48	36.66	14

Table 4.1: Excess return to beta ratio

Note: - 1. The value of Betas has been taken from Reuters website

2. Return(R_i) is the total return which the stock has achieved over the period of 4 years.

Sun Pharma yielded the maximum return among the companies selected and Bharat Heavy Electricals Limited yielded lower return following that GAIL and Sesa Goa yielded lower return. Pharma and FMCG have shown a higher return in all the companies chosen for the analysis. It shows that Pharma is the growing sector and it is most preferred investable securities in India. Beta is greater than 1 in Axis Bank, State Bank of India, ICICI, Tata Motors, HDFC Bank and BHEL, which shows that these securities have more risk and at the same time the reward per unit of risks is also more. But in case of other companies with regards to beta it is less than 1 which shows it is less risky when compared to market risk.

Sharpe has provided an efficient model for the selection of appropriate stocks in a portfolio. The excess return on any security is directly related to its excess of return to beta ratio. This measures the additional return on a particular security per unit of systematic risk. The ratio which provides a direct relationship between the potential risk & reward. Ranking of these stocks are done on the basis of their respective excess return to beta ratio. Based on the calculated excess return to beta ratio the scrip's are ranked from 1 to 30, with Sun Pharma being in the first rank and BHEL being in the last. The excess return to beta ratio was calculated using 7.1% as risk free rate of return.

Name of Stock	Market price on 1/4/11	Current Market Price	Returns (Ri)	Beta (Bi)	(Ri-Rf)/Bi	Rank
Sun Pharma Ltd	222.5	944.4	324.4%	0.51	622.21	1
Tata Consultancy Services Ltd	1237.2	2433.4	96.7%	0.17	526.95	2
Hindustan Unilever Ltd	285	913.0	220.4%	0.53	402.36	3
Dr.Reddy's Laboratories Ltd	1680.5	3498.7	108.2%	0.26	388.82	4
Cipla Ltd	316.9	649.0	104.8%	0.47	207.86	5
ITC Ltd	192.5	345.3	79.4%	0.51	141.72	6
Maruti Suzuki India Ltd	1265.6	3546.0	180.2%	1.55	111.67	7
HDFC Bank Ltd	476	1012.0	112.6%	1.12	94.20	8
HDFC Ltd	706	1273.0	80.3%	0.87	84.15	9
Tata Motors Ltd	248.4	535.0	115.4%	1.61	67.25	10
Infosys Ltd	1461	2132.3	45.9%	0.69	56.30	11
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Hero MotoCorp Ltd	1863.7	2315.0	24.2%	0.62	27.61	16
Larsen & Toubro Ltd	1121.6	1710.3	52.5%	1.7	26.70	17
ICICI Bank Ltd	216.6	313.5	44.7%	1.77	21.26	18
Bharti Airtel Ltd	367	404.6	10.2%	0.79	3.98	19
ONGC Ltd	295.3	322.7	9.3%	0.95	2.29	20
Coal India Ltd	352.6	375.0	6.4%	0.76	-0.98	21
State Bank of India	281.2	285.5	1.5%	1.49	-3.75	22
Reliance Industries Ltd	1032	887.0	-14.1%	1.09	-19.40	23
NTPC Ltd	185	154.6	-16.4%	0.98	-24.01	24
Tata Steel Ltd	629.5	346.1	-45.0%	1.72	-30.31	25
Tata Power Company Ltd	127.4	78.8	-38.2%	1.48	-30.60	26
Hindalco Industries Ltd	216.5	136.9	-36.8%	1.31	-33.50	27
Sesa Goa Ltd	311.9	208.0	-33.3%	1.17	-34.54	28
GAIL (India) Ltd	475.1	383.0	-19.4%	0.69	-38.38	29
Bharat Heavy Electricals Ltd	436.6	231.1	-47.1%	1.41	-38.42	30

Table 4.2: Sorted Excess return to beta ratio for 30 companies

Date	Close	Returns	Date	Close	Returns
1 Apr, 2015	27,886.2	-0.25%	1 Apr, 2013	19,504.2	3.55%
2 Mar, 2015	27,957.5	-4.32%	1 Mar, 2013	18,835.8	-0.14%
2 Feb, 2015	29,220.1	0.13%	1 Feb, 2013	18,861.5	-5.19%
2 Jan, 2015	29,183.0	6.12%	2 Jan, 2013	19,895.0	2.41%
1 Dec, 2014	27,499.4	-4.16%	3 Dec, 2012	19,426.7	0.45%
3 Nov, 2014	28,694.0	2.97%	1 Nov, 2012	19,339.9	4.51%
1 Oct, 2014	27,865.8	4.64%	1 Oct, 2012	18,505.4	-1.37%
1 Sep, 2014	26,630.5	-0.03%	3 Sep, 2012	18,762.7	7.95%
1 Aug, 2014	26,638.1	2.87%	1 Aug, 2012	17,380.8	0.84%
1 Jul, 2014	25,895.0	1.89%	2 Jul, 2012	17,236.2	-1.11%
2 Jun, 2014	25,413.8	4.94%	1 Jun, 2012	17,430.0	7.47%
2 May, 2014	24,217.3	8.03%	2 May, 2012	16,218.5	-6.35%
1 Apr, 2014	22,417.8	0.14%	2 Apr, 2012	17,318.8	-0.49%
3 Mar, 2014	22,386.3	5.99%	1 Mar, 2012	17,404.2	-1.96%
3 Feb, 2014	21,120.1	2.96%	1 Feb, 2012	17,752.7	3.25%
1 Jan, 2014	20,513.9	-3.10%	2 Jan, 2012	17,193.6	11.25%
2 Dec, 2013	21,170.7	1.82%	1 Dec, 2011	15,454.9	-4.15%
1 Nov, 2013	20,791.9	-1.76%	1 Nov, 2011	16,123.5	-8.93%
1 Oct, 2013	21,164.5	9.21%	3 Oct, 2011	17,705.0	7.60%
2 Sep, 2013	19,379.8	4.08%	2 Sep, 2011	16,453.8	-1.34%
1 Aug, 2013	18,619.7	-3.75%	1 Aug, 2011	16,676.8	-8.36%
1 Jul, 2013	19,345.7	-0.26%	1 Jul, 2011	18,197.2	-3.44%
3 Jun, 2013	19,395.8	-1.84%	1 Jun, 2011	18,845.9	1.85%
2 May, 2013	19,760.3	1.31%	2 May, 2011	18,503.3	-3.31%
			1 Apr, 2011	19,136.0	

Variance	20.66
SD	4.55

Table 4.3: Calculation of Variance of Sensex

Name of Stock	(Ri-Rf)*Bi USR	Σ(Ri-Rf)*Bi USR	MarVar* Σ(Ri-Rf)Bi/USR
Sun Pharma Ltd	25.16	25.16	519.96
Tata Consultancy Services Ltd	2.38	27.54	569.18
Hindustan Unilever Ltd	17.34	44.89	927.54
Dr.Reddy's Laboratories Ltd	4.46	49.34	1019.61
Cipla Ltd	6.84	56.18	1161.00
ITC Ltd	7.13	63.31	1308.27
Maruti Suzuki India Ltd	33.95	97.27	2009.93
HDFC Bank Ltd	34.48	131.74	2722.39
HDFC Ltd	15.81	147.55	3049.06

Table 4.3: Cut-off point calculation for 9 companies

Name of Stock	Bi^2 USR	ΣBi^2 USR	1+ MarVar*ΣB^2/USR	Cutoff Point
Sun Pharma Ltd	0.04044	0.04044	1.8357	283.25302
Tata Consultancy Services Ltd	0.00452	0.04496	1.9291	295.05316
Hindustan Unilever Ltd	0.04310	0.08806	2.8197	328.94753
Dr.Reddy's Laboratories Ltd	0.01146	0.09952	3.0565	333.58608
Cipla Ltd	0.03292	0.13244	3.7367	310.70030
ITC Ltd	0.05029	0.18272	4.7759	273.93228
Maruti Suzuki India Ltd	0.30407	0.48680	11.0594	181.73933
HDFC Bank Ltd	0.36600	0.85280	18.6226	146.18731
HDFC Ltd	0.18786	1.04066	22.5045	135.48635

Cutoff Point values are decreasing

Table 4.4: Cut-off point calculation for 9 companies continued

Cutoff Point

The selection of the securities depends on a unique cut-off rate which was calculated such that all securities with higher ratios of the excess return to beta are included in portfolio and stocks with lower ratios are left out of it. The net cumulated values of Ci start declining gradually after a particular Ci & that particular point is taken as the cut-off point and that particular stock ratio is the cut-off ratio C obtained. In Table 3 the highest value of Ci as explained is taken as the cut-off point which is C*. Here Dr. Reddy has the highest cut-off rate of C*=333.58608. All the securities having Ci greater than C* must be included in the portfolio.

Name of Stock	Cutoff Point
Sun Pharma Ltd	283.25
Tata Consultancy Services Ltd	295.05
Hindustan Unilever Ltd	328.95
Dr.Reddy's Laboratories Ltd	333.59

Table 4.5: Selection of stocks among 15 companies

Name of Stock	Zi	$\frac{Zi}{\Sigma Zi}$
Sun Pharma Ltd	22.89	63.5%
Tata Consultancy Services Ltd	5.14	14.3%
Hindustan Unilever Ltd	5.59	15.5%
Dr.Reddy's Laboratories Ltd	2.43	6.8%

Table 4.6: Proportion of funds invested

Construction Of Optimum Portfolio

After determining the securities to be selected, one should find out how much should be invested in each security. The percentage of funds to be invested in each security can be estimated. As already mentioned all the stock with Ci greater than cut off point can be included in the portfolio. Here the top four companies according to excess return to beta ratio is taken for calculating the proportion of investment.

Portfolio Investment

Table 5 shows the proportion of investment in each stock. And it indicates the weights on each security and they sum up to 100 percentage. By using Sharpe index model thus we are able to find out the proportion of investments to be made for an optimal portfolio. The maximum investment should be made in Sun Pharma with a proportion of 63.5%. Following that TCS, HUL and Dr. Reddy are the next three companies where investment can be made. Evidently, the companies chosen for the investments are growing at a steady rate in the recent years.
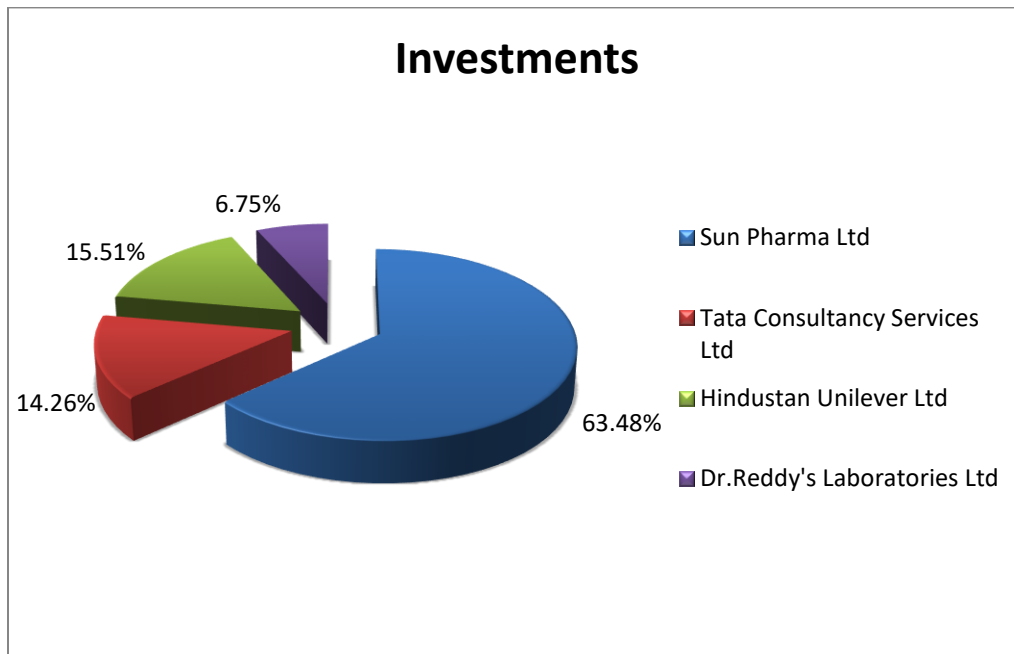

Figure 4.1: Proportion of Funds

Portfolio Performance

	Sensex	Returns	Nifty	Returns	Portfolio	Returns	MidCap	Returns	Smallcap	Returns
Start	**22,359.5**		**6,694.4**		**100000**		**7,197.6**		7,265.1	
End of W1	22,629.0	1.21%	6,776.3	1.22%	106285.5	6.29%	7,338.5	1.96%	7,523.2	3.55%
End of W2	22,628.8	0.00%	6,779.4	0.05%	106268.4	-0.02%	7,339.3	0.01%	7,524.0	0.01%
End of W3	22,688.1	0.26%	6,782.8	0.05%	105419.6	-0.80%	7,373.6	0.47%	7,597.3	0.97%
End of W4	22,403.9	-1.25%	6,694.8	-1.30%	106024.1	0.57%	7,357.5	-0.22%	7,532.8	-0.85%
End of W5	22,994.2	2.63%	6,858.8	2.45%	104837.1	-1.12%	7,456.1	1.34%	7,593.7	0.81%
End of W6	24,121.7	4.90%	7,203.0	5.02%	103558.6	-1.22%	7,765.7	4.15%	7,885.8	3.85%
End of W7	24,693.4	2.37%	7,367.1	2.28%	99464.36	-3.95%	8,668.3	11.62%	9,128.0	15.75%
End of W8	24,217.3	-1.93%	7,230.0	-1.86%	103528.3	4.09%	8,467.2	-2.32%	9,015.7	-1.23%
End of W9	25,396.5	4.87%	7,583.4	4.89%	103098.9	-0.41%	9,098.5	7.46%	9,774.0	8.41%
End of W10	25,228.2	-0.66%	7,542.1	-0.54%	107505.4	4.27%	8,935.9	-1.79%	9,674.6	-1.02%
End of W11	25,105.5	-0.49%	7,511.5	-0.41%	108061.9	0.52%	8,962.0	0.29%	9,761.2	0.90%
End of W12	25,099.9	-0.02%	7,508.8	-0.04%	112182.7	3.81%	9,205.2	2.71%	10,022.3	2.67%
End of W13	25,962.1	3.43%	7,751.6	3.23%	118001.8	5.19%	9,545.8	3.70%	10,508.0	4.85%
End of W14	25,024.4	-3.61%	7,459.6	-3.77%	122016.6	3.40%	8,875.2	-7.02%	9,688.1	-7.80%
End of W15	25,641.6	2.47%	7,663.9	2.74%	121577.3	-0.36%	9,252.8	4.25%	10,180.8	5.09%
End of W16	26,126.8	1.89%	7,790.5	1.65%	128218	5.46%	9,178.2	-0.81%	10,037.2	-1.41%
End of W17	25,480.8	-2.47%	7,602.6	-2.41%	127535	-0.53%	9,114.3	-0.70%	9,891.0	-1.46%
End of W18	25,329.1	-0.60%	7,568.6	-0.45%	126538.6	-0.78%	8,962.2	-1.67%	9,828.3	-0.63%
End of W19	26,103.2	3.06%	7,791.7	2.95%	132731.1	4.89%	9,007.9	0.51%	9,824.1	-0.04%
End of W20	26,419.6	1.21%	7,913.2	1.56%	136852.4	3.11%	9,340.9	3.70%	10,298.5	4.83%
End of W21	26,638.1	0.83%	7,954.4	0.52%	138643.4	1.31%	9,298.9	-0.45%	10,264.5	-0.33%
End of W22	27,026.7	1.46%	8,086.9	1.67%	139410.7	0.55%	9,668.8	3.98%	10,627.1	3.53%
End of W23	27,061.0	0.13%	8,105.5	0.23%	134903.2	-3.23%	9,983.1	3.25%	11,166.8	5.08%
End of W24	27,090.4	0.11%	8,121.5	0.20%	136012.6	0.82%	9,865.3	-1.18%	11,191.2	0.22%
End of W25	26,626.3	-1.71%	7,968.9	-1.88%	136303.2	0.21%	9,421.4	-4.50%	10,511.0	-6.08%
End of W26	26,568.0	-0.22%	7,945.6	-0.29%	142138.2	4.28%	9,511.4	0.96%	10,641.8	1.24%
End of W27	26,297.4	-1.02%	7,860.0	-1.08%	136035.4	-4.29%	9,444.4	-0.70%	10,611.0	-0.29%
End of W28	26,108.5	-0.72%	7,779.7	-1.02%	132069.9	-2.92%	9,272.5	-1.82%	10,314.0	-2.80%
End of W29	26,851.1	2.84%	8,014.6	3.02%	134266.4	1.66%	9,673.0	4.32%	10,662.7	3.38%
End of W30	27,865.8	3.78%	8,322.2	3.84%	139615.2	3.98%	9,834.6	1.67%	10,931.0	2.52%

Table 4.7: Return of Various Indexes over the week

	Sensex	Returns	Nifty	Returns	Portfolio	Returns	MidCap	Returns	Smallcap	Returns
End of W31	27,868.6	0.01%	8,337.0	0.18%	145524.7	4.23%	9,999.7	1.68%	11,117.2	1.70%
End of W32	28,046.7	0.64%	8,389.9	0.63%	145294.1	-0.16%	10,154.8	1.55%	11,217.4	0.90%
End of W33	28,334.6	1.03%	8,477.4	1.04%	140969.9	-2.98%	10,195.8	0.40%	11,325.8	0.97%
End of W34	28,694.0	1.27%	8,588.3	1.31%	142015.2	0.74%	10,270.6	0.73%	11,270.8	-0.49%
End of W35	28,458.1	-0.82%	8,538.3	-0.58%	139941.9	-1.46%	10,498.3	2.22%	11,474.7	1.81%
End of W36	27,350.7	-3.89%	8,224.1	-3.68%	140586.1	0.46%	10,108.6	-3.71%	11,068.5	-3.54%
End of W37	27,371.8	0.08%	8,225.2	0.01%	135877.8	-3.35%	10,000.4	-1.07%	10,922.2	-1.32%
End of W38	27,208.6	-0.60%	8,200.7	-0.30%	135758.2	-0.09%	10,451.3	4.51%	11,198.3	2.53%
End of W39	27,887.9	2.50%	8,395.5	2.37%	138228.2	1.82%	10,426.0	-0.24%	11,309.9	1.00%
End of W40	27,458.4	-1.54%	8,284.5	-1.32%	141058.9	2.05%	10,633.1	1.99%	11,366.1	0.50%
End of W41	28,121.9	2.42%	8,513.8	2.77%	145851	3.40%	10,695.7	0.59%	11,329.3	-0.32%
End of W42	29,278.8	4.11%	8,835.6	3.78%	154222.7	5.74%	10,738.6	0.40%	11,077.3	-2.22%
End of W43	29,183.0	-0.33%	8,808.9	-0.30%	152182.7	-1.32%	10,490.7	-2.31%	11,239.3	1.46%
End of W44	28,717.9	-1.59%	8,661.1	-1.68%	153053.3	0.57%	10,741.0	2.39%	11,426.2	1.66%
End of W45	29,094.9	1.31%	8,805.5	1.67%	154507.4	0.95%	10,836.2	0.89%	11,319.6	-0.93%
End of W46	29,231.4	0.47%	8,833.6	0.32%	153526.5	-0.63%	10,811.5	-0.23%	11,456.9	1.21%
End of W47	29,220.1	-0.04%	8,844.6	0.12%	148907	-3.01%	11,045.1	2.16%	11,209.6	-2.16%
End of W48	29,449.0	0.78%	8,937.8	1.05%	168034.5	12.85%	10,794.9	-2.27%	10,859.8	-3.12%
End of W49	28,503.3	-3.21%	8,647.8	-3.24%	164287.6	-2.23%	10,625.3	-1.57%	10,440.7	-3.86%
End of W50	28,261.1	-0.85%	8,570.9	-0.89%	165063.1	0.47%	10,359.9	-2.50%	11,146.7	6.76%
End of W51	27,458.6	-2.84%	8,341.4	-2.68%	161172.2	-2.36%	10,750.4	3.77%	11,431.1	2.55%
End of W52	28,260.1	2.92%	8,586.3	2.94%	169569.9	5.21%	10,950.5	1.86%	11,500.0	0.60%

SD		2.08%		2.08%		3.25%		3.02%		3.64%
Gain		26.39%		28.26%		69.57%		52.14%		58.29%
SR		9.24		10.18		19.23		14.92		14.04
Variance		4.34%		4.31%		10.54%		9.10%		13.28%

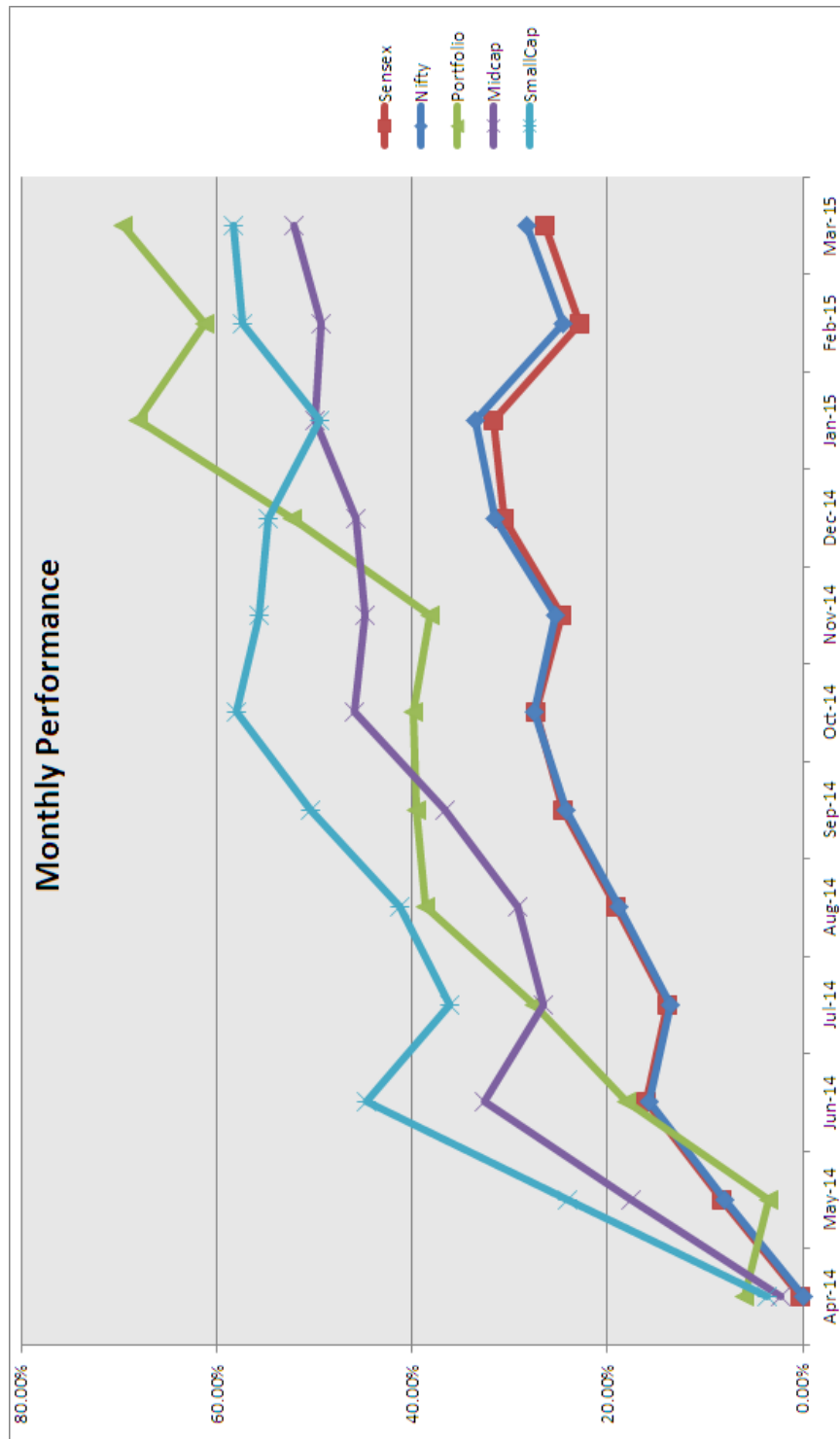*Table 4.8: Calculation of Gain, Risk & Sharp Ratio*

Figure 4.2: Monthly return by different Indexes

4.3 Findings & Recommendations

The Pharma and FMCG sectors are the major contributors for the portfolio. Among the selected 30 stocks, pharmaceutical sector is performing well. The beta values for those stocks are lesser than 1 which indicates, minimal risk is involved in those stocks. So we consider 2 stocks from Pharma, one stocks from FMCG sector and one from IT according to the cut-off value calculated. The Sun Pharma forms the major contribution with 63.5% followed by HUL with 15.5%.

From the graphs we can see that the portfolio constructed has easily beaten the market. The sharp ratio is also higher compared to market. So the portfolio constructed is efficient.

Some of the recommendations are:

□ The recommended proportion investments to the companies according to constructed portfolio are Sun Pharma 63.5%, TCS 14.26%, HUL 15.5%, and Dr. Reddy 6.75%.

□ Investors expecting high return for the minimal risk can go for Sun Pharma (β<1).

□ To investors who are risk lovers can go for M&M.

□ Investors better not to think about BHEL, ONGC, DLF, and HDFC.

4.4 Limitations

1. Only four years data could be considered for the construction of optimal efficient portfolio.

2. Due to time constraint we are doing for thirty scrip's.

3. The portfolio which was constructed purely on the basis of Sharpe's model. It basically considers the security price movements & does not take into consideration any economic specific factors, industry specific factors and company specific factors.

Conclusion

Though there are 30 stocks that meet the criteria for being included in the Portfolio, the portfolio is constructed with the top 4 niche stocks that meet the certain criteria to be included in the efficient portfolio according to the Sharpe Index Model. Those stocks are: Sun Pharma, HUL, TCS & Dr. Reddy. The portfolio predominantly consists of stocks from the pharmaceutical sector. The share market is more challenging, fulfilling and rewarding to resourceful investors willing to learn the trade for having effective returns with minimum risk involved. The optimal portfolio analysis and risk, return tradeoff are determined by the challenging attitudes of investors towards a variety of economic, monetary, political and psychological forces prevailing in the stock market. Thus the portfolio construction table would help an investor in investment decisions. And the investor would select any company among the thirty companies from the above portfolio table. I also hope this dissertation will help the investors as a guiding record in future and help them to make appropriate investment decisions.

5. **Bibliography**

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