

Table of Contents

1. INTRODUCTION.....	3
1.1. Introduction	3
1.2. Objectives.....	5
2. REVIEW OF LITERATURE.....	6
3. RESEARCH METHODOLOGY	13
3.1. Scope of the Study	13
3.2. Data Collection.....	13
3.3. Introduction of major companies	15
4. DATA ANALYSIS	30
4.1. Introduction to the case.....	30
4.2. Data Analysis.....	32
4.3. Findings &Recommendations	43
4.4. Limitations.....	44
4.5. Conclusion.....	44
5. BIBLIOGRAPHY/REFERENCES.....	45
6. Adherence Sheet.....	47

Table 3.1 : List of companies Constituting Sensex	15
Table 4.1 Excess return to beta ratio	33
Table 4.2 Sorted Excess return to beta ratio for 30 companies	35
Table 4.3 Calculation of Variance of Sensex	36
Table 4.4 Cutoff point values for Stocks	37
Table 4.5 Selection of stocks among 30 companies	38
Table 4.6 Proportion of funds invested	38
Table 4.7 Calculation of Standard deviation, Variance, Gain & Sharp Ratio	42

1. INTRODUCTION

1.1. Introduction

The risk of a portfolio comprises systematic risk and unsystematic risk which is also known as idiosyncratic risk. Systematic risk refers to the risk common to all the securities, i.e. market risk. Unsystematic risk is the risk associated with an individual assets. It can be diversified away to smaller levels by including a greater number of assets in the portfolio. The same is not possible for systematic risk within one market. However, in international portfolio selection this can to some extent be reduced. Depending on the market, a portfolio of approximately 20-30 securities in developed markets such as the UK or the USA will render the portfolio sufficiently diversified such that risk exposure is limited to systematic risk only. In developing markets a large number is required, due to the higher asset volatility.

An investor should not take on any diversifiable risk, as only non-diversifiable risks are rewarded within the scope of this model. Therefore, the required return on an asset, that is, the return that will compensate for risk taken, must be linked to its riskiness in a portfolio context, i.e., its contribution to overall portfolio riskiness—as opposed to its "stand alone risk." In the CAPM context, portfolio risk is represented by higher variance i.e. less predictability. In other word the beta of the portfolio is the defining 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. Markowitz's 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

Smart investors ensure that they do not invest all the money in 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.

The study, specifically seeks to gain the following objectives

- Expand the difference in selected portfolio and Sensex returns as well as Nifty.
- Getting acquainted with Financial Markets.
- Understand and estimate the unsystematic risk of a stock.
- Measure returns of the portfolio constructed using the Index and also variability of returns.

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 and 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 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.

A Bilbao, M Arenas, M Jiménez, B Perez Gladish and M V Rodríguez (2004), Expert estimated 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) Opined that 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) has stated that 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 investor's 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. Equation 1 can be used to support this purpose.

$$R_i = \alpha_i + \beta_i R_m + e_i \quad \longrightarrow \quad \boxed{\text{Equation 1}}$$

Where, R_i 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.

β_i - The slope of straight line i.e., a measure of a fund's net sensitivity with respective market movements.

R_m - The rate of return of the market index.

e_i - 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. β_i indicates the sensitivity of the stock return to the changes with the return of market, i.e., 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, $\sigma^2 = \beta_i \sigma_m^2 + \sigma_{ei}^2$

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 = $\beta_i^2 * \text{variance of market index.} = \beta_i^2 * \sigma_m^2$

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- $R_i - R_f$. 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 $(R_i - R_f) / \beta_i$ 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 C_i & are thus included in the optimal portfolio.

Methodology:

Step 1: A brief profile of each of the 30 companies of sensex index is chosen.

Step 2: For a period of 7 years data of the each companies have been recorded.

Step 3: For applying Sharpe's index model R_i , R_m , σ_{ei}^2 , β_i , σ_m^2 , R_f values are required. So all these data are collected and calculated for proceeding further.

Step 4: the cut-off point C^* is calculated using the formula:

$$C_i = \frac{\sigma_m^2 * \sum (R_i - R_f) \beta_i / \sigma_{ei}^2}{1 + \sigma_m^2 * \sum \beta^2 / \sigma_{ei}^2} \longrightarrow \boxed{\text{Equation 2}}$$

Step 5: After C_i for the companies are calculated the value got were put in a table and then the interpretations were made.

Step 6: the C_i values go on increasing up to a certain point and then start decreasing. The highest point is called cut-off point(C^*).the securities which are above C^* point are chosen to the portfolio.

Step 7: Once the securities for portfolio are chosen, the proportion in which they should be invested is to be determined. this can be done using a formula where X_i denotes

the proportion, $X_i = \frac{Z_i}{\sum Z_i}$ → Equation 3

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

Step 8: Return on portfolio can be made known with the formula $R_p = \sum X_i R_i$ → Equation 4

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

3. RESEARCH METHODOLOGY

Research design or research methodology is the procedure of collecting, analysing 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 is a descriptive study on the construction of portfolio of stocks. The data taken for the study is Secondary in nature. The data has been collected from various websites like Bombay Stock Exchange (BSE) and also from the databases of Ebsco and Proquest. The study is conducted with the financial data for the past four years from 1 April 2011 to 1 April 2015. The sample size of 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 because they are activity trade
- Of the thirty company of the index, the companies are chosen and analyzed based on their performance in the past five fiscal years.
- No other factors other than the Share price movements, index movements, rate of return on government securities and beta values for the securities for the past seven years are taken for analysis.

3.2. Data Collection

The companies constituting the Sensex index have chosen for applying Sharpe's single index model and hence construct optimal portfolio. Bombay stock exchange limited is the oldest stock exchange in Asia with a rich heritage popularly known as "BSE" ,it was established as "THE NATIVE SHARE & STOCK BROKERS ASSOCIATION" in 1875.it is the first stock exchange in the country to obtain permanent recognition in 1956 from the government of India under the securities contracts(regulation) act,1956.the exchange's pre-eminent role in the development of the Indian capital market is widely recognized and its index, SENSEX,I s tracked worldwide. SENSEX, first compiled in 1986, was calculated on a "market capitalization weighed"

methodology of 30 component stocks representing a sample of large, well- established and financially sound companies. The base year of SENSEX is 1978-1979.the index is widely reported both in domestic and international markets through print as well as electronic media.

List of companies constituting SENSEX index:

SL. No.	Company Name	Industry
1	Adani Ports & SEZ Ltd	Port and Shipping
2	Asian Paints Ltd	FMCG
3	Axis Bank Ltd	Bank – Private
4	Bajaj Auto Ltd	Automobile
5	Bharat Heavy Electricals Ltd.	Electric Equipment
6	Bharti Airtel Ltd	Telecommunication
7	Cipla Ltd.	Pharmaceuticals & Drugs
8	Coal India Ltd.	Mining & Minerals
9	Dr. Reddys Laboratories Ltd.	Pharmaceuticals & Drugs
10	GAIL (India) Ltd.	Gas Transmission
11	HDFC	Finance – Housing
12	HDFC Bank Ltd.	Bank – Private
13	Hero MotoCorp Ltd.	Automobile
14	Hindustan Unilever Ltd.	FMCG
15	ICICI Bank Ltd.	Bank - Private
16	Infosys Ltd.	IT - Software
17	ITC Ltd.	FMCG
18	Larsen & Toubro Ltd.	Construction
19	Lupin Pharmaceutical Ltd.	Pharmaceuticals & Drugs
20	Mahindra & Mahindra Ltd.	Automobiles
21	Maruti Suzuki India Ltd.	Automobiles
22	NTPC Ltd.	Power Generation
23	Oil & Natural Gas Corporation Ltd.	Oil Exploration
24	Reliance Industries Ltd.	Refineries
25	State Bank Of India	Bank - Public

26	Sun Pharmaceutical Industries Ltd.	Pharmaceuticals & Drugs
27	Tata Consultancy Services Ltd.	IT - Software
28	Tata Motors Ltd.	Automobiles
29	Tata Steel Ltd.	Steel/Sponge Iron
30	Wipro Ltd.	IT – Software

Table 3.1 : List of companies Constituting Sensex

3.3. Introduction of companies

Adani Ports & SEZ Limited

Adani Ports and Special Economic Zone is the seamless integration of three verticals consisting of Ports, Logistics and Special Economic Zone (SEZ). The company has pan India presence and owns / operates ports and terminals in nine locations, covering the entire Indian coastline. The Mundra Port in the Gulf of Kachchh is the flagship port of APSEZ. It is also India's largest commercial port and has a SEZ, contiguous to the port. Other major ports includes: Dahej Port, Gujarat; Hazira Port, Gujarat; Tuna – Tekra (Terminal), Gujarat; Murmugao (Terminal), Goa; Vizag (Coal Terminal), Andhra Pradesh; Vizhinjam (Port), Kerala – Under development; Ennore (Container Terminal), Tamil Nadu; Kattupalli (Container Terminal), Tamil Nadu; and Dhamra Port, Odisha.

Asian Paints Limited

The company has come a long way since its small beginnings in 1942. It was set up as a partnership firm by four friends who were willing to take on the world's biggest, most famous paint companies operating in India at that time. Over the course of 25 years, Asian Paints became a corporate force and India's leading paints company. Driven by its strong consumer-focus and innovative spirit, the company has been the market leader in paints since 1967. Today, it is double the size of any other paint company in India. Asian Paints manufactures a wide range of paints for decorative and industrial use.

Axis bank Limited

Axis Bank is the third largest private sector bank in India. The Bank offers the entire spectrum of financial services to customer segments covering Large and Mid-Corporates, MSME, agriculture

And Retail Businesses.

The Bank has a large footprint of 2589 domestic branches (including extension counters) and 12,355 ATMs spread across the country as on 31st March 2015. The overseas operations of the Bank are spread over nine international offices with branches at Singapore, Hong Kong, Dubai (at the DIFC), Colombo and Shanghai; representative offices at Dhaka, Dubai, Abu Dhabi and an overseas subsidiary at London, UK. The international offices focus on corporate lending, trade finance, syndication, investment banking and liability businesses.

Axis Bank is one of the first new generation private sector banks to have begun operations in 1994. The Bank was promoted in 1993, jointly by Specified Undertaking of Unit Trust of India (SUUTI) (then known as Unit Trust of India), Life Insurance Corporation of India (LIC), General Insurance Corporation of India (GIC), National Insurance Company Ltd., The New India Assurance Company Ltd., The Oriental Insurance Company Ltd. and United India Insurance Company Ltd. The shareholding of Unit Trust of India was subsequently transferred to SUUTI, an entity established in 2003.

With a balance sheet size of Rs. 4,61,932 crores as on 31st March 2015, Axis Bank has achieved consistent growth and stable asset quality with a 5 year CAGR (2010-11 to 2014-15) of 21% in Total Assets, 18% in Total Deposits, 22% in Total Advances and 24% in Net Profit.

Bajaj Auto Limited

Manufactures and markets Bajaj scooters, 3 wheelers and spare parts. Incorporated in 1946 as a limited private company, it went public in 1961. Currently the company has four plants at Akurdi, Chakan, Walujand, Pantnagar with a combined installed capacity which can produce 5,050,000 No.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 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)

It was incorporated as a government 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, it has divested a part of its shares to public and various financial institutions. At present the government of India holds 67.73% in the total equity capital of BHEL.

It is one of the largest engineering and manufacturing enterprise in India in the energy- related sector, today. The company's operations are 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 Limited

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

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 anthelmintic, cardiovascular & 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.

Coal India Limited

Coal India Limited (CIL) as an organized state owned coal mining corporate came into being in November 1975 with the government taking over private coal mines. With a modest production of 79 Million Tonnes (MTs) at the year of its inception CIL today is the single largest coal producer in the world. Operating through 81 mining areas CIL is an apex body with 7 wholly owned coal producing subsidiaries and 1 mine planning and Consultancy Company spread over 8 provincial states of India. CIL also fully owns a mining company in Mozambique christened as 'Coal India Africana Limitada'. CIL also manages 200 other establishments like workshops, hospitals etc. Further, it also owns 26 technical & management training institutes and 102 Vocational Training Institutes Centers. Indian Institute of Coal Management (IICM) as a state-of-the-art Management Training 'Centre of Excellence' - the largest Corporate Training Institute

in India - operates under CIL and conducts multi-disciplinary management development programs.

CIL having fulfilled the financial and other prerequisites was granted the Maharatna recognition in April 2011. It is a privileged status conferred by Government of India to select state owned enterprises in order to empower them to expand their operations and emerge as global giants. So far, the select club has only five members out of 217 Central Public Sector Enterprises in the country.

Dr.Reddy's Laboratories Limited

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.

Gail (India) Limited

GAIL (India) Limited is the largest state-owned natural gas processing and distribution company in India, It is headquartered in New Delhi. It has following business segments: Natural Gas, Liquid Hydrocarbon, Liquefied petroleum gas Transmission, Petrochemical, City Gas Distribution, Exploration and Production, GAILTEL and Electricity Generation. GAIL has been conferred with the Maharatna status on 1 Feb 2013, by the Government of India. Only six other Public Sector Enterprises (PSEs) enjoy this coveted status amongst all central CPSEs. GAIL has been listed in the 131st position among India's Most Trusted brands according to the Brand Trust Report 2014, a study conducted by Trust Research Advisory.

HDFC Bank:-

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}

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.

Hero Motocorp Limited

Hero Motocorp Ltd., formerly Hero Honda, is an Indian motorcycle (<250cc) and scooter manufacturer based in New Delhi, India. The company is the largest two wheeler manufacturer in India. In India, it has a market share of about 46% share in 2-wheeler category.^{[2][4]} The 2006 Forbes 200 Most Respected companies list has Hero Honda Motors ranked at #108. On 31 March 2013, the market capitalization of the company was INR 308 billion (USD 5.66 billion).

Hindustan Unilever Ltd (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 GlucoBiols Ltd.

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 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 ton 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.

Lupin Pharmaceuticals

Lupin Pharmaceuticals, Inc. is the U.S. wholly owned subsidiary of Lupin Limited, which is among the top five pharmaceutical companies in India. Through our sales and marketing headquarters in Baltimore, MD, Lupin Pharmaceuticals, Inc. is dedicated to delivering high-

quality, branded and generic medications trusted by healthcare professionals and patients across geographies.

Lupin Limited, headquartered in Mumbai, India, is strongly research focused. It has a program for developing New Chemical Entities. The company has a state-of-the-art R&D center in Pune and is a leading global player in Anti-TB, Cephalosporins (anti-infectives) and Cardiovascular drugs (ACE-inhibitors and cholesterol reducing agents) and has a notable presence in the areas of diabetes, anti-inflammatory and respiratory therapy.

Mahindra and Mahindra Limited

Mahindra and Mahindra Limited (M&M) is an Indian multinational automobile manufacturing corporation headquartered in Mumbai, Maharashtra, India. It is one of the largest vehicle manufacturers by production in India and the largest manufacturer of tractors across the world. It is a part of Mahindra Group, an Indian conglomerate.

It was ranked as the 10th most trusted brand in India, by The Brand Trust Report, India Study 2014. It was ranked 21st in the list of top companies of India in Fortune India 500 in 2011.

Its major competitors in the Indian market include Maruti Suzuki, Tata Motors, Ashok Leyland, Toyota, Hyundai Motor Company, Mercedes-Benz India and others.

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 honored 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 has this, with range of 12 models in 60 variants, Maruti Suzuki Company fit every car-buyer's budget.

NTPC

NTPC is India's largest energy conglomerate with roots planted way back in 1975 to accelerate power development in India. Since then it has established itself as the dominant power major with presence in the entire value chain of the power generation business. From fossil fuels it has forayed into generating electricity via hydro, nuclear and renewable energy sources. This foray will play a major role in lowering its carbon footprint by reducing greenhouse gas emissions. To strengthen its core business, the corporation has diversified into the fields of consultancy, power trading, training of power professionals, rural electrification, ash utilization and coal mining as well.

NTPC became a Maharatna company in May 2010, one of the only four companies to be awarded this status. NTPC was ranked 431st in the '2015, Forbes Global 2000' ranking of the World's biggest companies.

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. SBI was 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 3 amalgamation known as the Imperial Bank of India on January 1921. This bank took on the triple role that of 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.

Sun Pharmaceutical Industries Limited

Sun Pharmaceuticals was established by Mr. Dilip Shanghvi in 1983 in Vapi with five products to treat psychiatry ailments. Cardiology products were introduced in 1987 followed by gastroenterology products in 1989. Today it is the largest chronic prescription company in India and a market leader in psychiatry, neurology, cardiology, orthopedics, ophthalmology, gastroenterology and nephrology.

The 2014 acquisition of Ranbaxy will make the company the largest pharma company in India, the largest Indian pharma company in the US, and the 5th largest specialty generic company globally.

Over 72% of Sun Pharma sales are from markets outside India, primarily in the US. The US is the single largest market, accounting for about 50% turnover; in all, formulations or finished dosage forms, account for 93% of the turnover. Manufacturing is across 26 locations, including plants in the US, Canada, Brazil, Mexico and Israel. In the US, the company markets a large basket of generics, with a strong pipeline awaiting approval from the U.S. Food and Drug Administration (FDA).

Sun Pharma was listed on the stock exchange in 1994 in an issue oversubscribed 55 times. The founding family continues to hold a majority stake in the company. Today Sun Pharma is the second largest and the most profitable pharmaceutical company in India, as well as the largest pharmaceutical company by market capitalization on the Indian exchanges.

The Indian pharmaceutical industry has become the third largest producer in the world in terms of volumes and is poised to grow into an industry of \$20 billion in 2015 from the current turnover of \$12 billion.

Tata Motors:-

Tata Motors Ltd Controlled by the House of Tata's, 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):

Tata Consultancy Services Limited (TCS) is an Indian multinational information technology (IT) service, consulting and business solutions company headquarter in Mumbai, Maharashtra. It is a subsidiary of the Tata Group and operates in 46 countries. TCS is one of the largest Indian companies by market capitalization (\$80 billion). TCS is now placed

among the 'Big 4' most valuable IT services brands worldwide. In 2015, TCS is ranked 64th overall in the Forbes World's Most Innovative Companies ranking, making it both the highest-ranked IT services company and the first Indian company. It is the world's 10th largest IT services provider, measured by the revenues. As of December 2015, it is ranked 10th on the Fortune India 500 list.

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 services company and the 1st outside America to receive IEEE Software Process Award. Wipro's Technologies complete range of IT Services addresses the needs of both business requirements & technology to help organizations to leverage leading-edge technologies for business improvement. Wipro Technologies takes charge of the IT needs of the whole enterprise. The gamut of 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 is powered by the expert skills of over 7,500 technical specialists and state of the art BS 15000 certified infrastructure for its operations support.

4. DATA ANALYSIS

4.1. Introduction to the case

Risk-free rate of return:

Risk free security has 0 variance or standard deviation. The risk free securities have no risk at all of default. The government bonds or T-bills are approximate example of risk free securities as they do not have risk of default. The yield of 5 years Government Bond is considered as the risk free rate of return for our calculation purpose. So R_f is 7.44%.

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.

$$\beta = \text{Correlation} * \frac{\sigma_y}{\sigma_x}$$

Where, σ_y = Standard Deviation of Individual Stock,

σ_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.

$$\text{Return} = ((\text{Today's market price} - \text{Yesterday's market price}) / \text{Yesterday's market price}) * 100$$

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 (R_f)

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

Excess Return-Beta Ratio

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

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

$$C_i = \frac{\sigma_m^2 * \sum (R_i - R_f) \beta_i / \sigma_{ei}^2}{1 + \sigma_m^2 * \sum \beta^2 / \sigma_{ei}^2}$$

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

$$X_i = \frac{Z_i}{\sum Z_i}$$

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

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

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

4.2. Data Analysis

S.No.	Company	31-April-09	31-April-16	Returns (R _i)	β _i	$\frac{R_i - R_f}{\beta_i}$	Rank
1	Adani Ports	74.4	232.35	212.2983871	1.24	165.2083767	18
2	Asian Paints	86	868.8	910.2325581	0.79	1142.77539	4
3	Axis Bank	97	451.1	365.0515464	2.12	168.6846917	17
4	Bajaj Auto	639.5	2481	287.9593432	0.85	330.0227567	10
5	Bharat Heavy Electricals	316	123.85	-60.8069620	2.02	-33.7856247	27
6	Bharti Airtel	676.95	355.3	-47.5145874	0.85	-64.6524558	30
7	Cipla	232.75	521.1	123.8882922	0.49	237.6495758	14
8	Coal India	322.5	280.8	-12.9302325	0.83	-24.5424488	26
9	Dr. Reddys Laboratories	525	3067.5	484.2857143	0.35	1362.416327	3
10	GAIL (India)	260	355.8	36.84615385	0.9	32.67350427	22
11	HDFC	325.7	1109.3	240.5894995	0.82	284.328658	11
12	HDFC Bank	209	1089.5	421.291866	1.09	379.680611	9
13	Hero MotoCorp	1104.5	3020	173.42689	0.79	210.1099873	15
14	Hindustan Unilever	232.35	876	277.0174306	0.39	691.224181	6
15	ICICI Bank	80.65	238.4	195.5982641	2.01	93.61107667	21
16	Infosys	348.7	1209.65	246.9027818	0.58	412.8668651	7
17	ITC	186.2	325.2	74.650913	0.55	122.20166	19
18	Larsen & Toubro	396.9	1232.5	210.5316201	1.79	113.4590056	20
19	Lupin	137.8	1526	1007.402032	0.05	19999.24064	1
20	Mahindra & Mahindra	440.25	1292.1	193.4923339	0.75	248.0697785	12
21	Maruti Suzuki India	807.25	3674.4	355.1749768	1.7	204.5499863	16
22	NTPC	190.8	134.5	-29.5073375	0.93	-39.7283199	28
23	ONGC	209.3	214.65	2.556139513	1.13	-4.32200043	25

24	Reliance Industries	1670.8	1023.9	-38.7179794	1.06	-43.5452636	29
25	State Bank Of India	116.75	191.4	63.94004283	1.75	32.28573876	23
26	Sun Pharmaceutical	233.85	819	250.2245029	0.34	714.0720673	5
27	Tata Consultancy Services	566.2	2479.05	337.8399859	0.24	1376.666608	2
28	Tata Motors	47.41	396.7	736.7433031	1.9	383.8438437	8
29	Tata Steel	250.65	336.2	34.13125873	1.72	15.51817368	24
30	Wipro	286	574.4	100.8391608	0.38	245.7872654	13

Table 4.1 Excess return to beta ratio

Note: - 1. The value of Betas has been taken from Reuter's website

2. Return (R_i) is the total return which the stock has achieved over the period of 7 years.

Lupin yielded the maximum return among the companies selected and Bharti Airtel yielded lower return following that Reliance Industries, NTPC and Bharat Heavy Electricals Limited 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 a model for the selection of appropriate securities in a portfolio. The excess return of any stock is directly related to its excess return to beta ratio. It measures the additional return on a security (excess of the risk less asset return) per unit of systematic risk. The ratio provides a relationship between potential risk and reward. Ranking of the stocks are done on the basis of their excess return to beta. Based on the excess return to beta ratio the scrip's are ranked from 1 to 30, with Lupin being in the first rank and Bharti Airtel being in the last. The excess return to beta ratio was calculated using 7.44% as risk free rate of return.

Company	31-April-09	31-April-16	Returns (R _i)	β _i	$\frac{R_i - R_f}{\beta_i}$	Rank
Lupin Ltd.	137.8	1526	1007.402032	0.05	19999.24064	1
Tata Consultancy Services Ltd.	566.2	2479.05	337.8399859	0.24	1376.666608	2
Dr. Reddys Laboratories Ltd.	525	3067.5	484.2857143	0.35	1362.416327	3
Asian Paints	86	868.8	910.2325581	0.79	1142.77539	4
Sun Pharmaceutical Industries Ltd.	233.85	819	250.2245029	0.34	714.0720673	5
Hindustan Unilever Ltd.	232.35	876	277.0174306	0.39	691.224181	6
Infosys Ltd.	348.7	1209.65	246.9027818	0.58	412.8668651	7
Tata Motors Ltd.	47.41	396.7	736.7433031	1.9	383.8438437	8
HDFC Bank Ltd.	209	1089.5	421.291866	1.09	379.680611	9
Bajaj Auto Ltd.	639.5	2481	287.9593432	0.85	330.0227567	10
HDFC	325.7	1109.3	240.5894995	0.82	284.328658	11
Mahindra & Mahindra Ltd.	440.25	1292.1	193.4923339	0.75	248.0697785	12
Wipro Ltd.	286	574.4	100.8391608	0.38	245.7872654	13
Cipla Ltd.	232.75	521.1	123.8882922	0.49	237.6495758	14
Hero MotoCorp Ltd.	1104.5	3020	173.42689	0.79	210.1099873	15
Maruti Suzuki India Ltd.	807.25	3674.4	355.1749768	1.7	204.5499863	16
Axis Bank Ltd.	97	451.1	365.0515464	2.12	168.6846917	17
Adani Ports	74.4	232.35	212.2983871	1.24	165.2083767	18
ITC Ltd.	186.2	325.2	74.650913	0.55	122.20166	19
Larsen & Toubro Ltd.	396.9	1232.5	210.5316201	1.79	113.4590056	20
ICICI Bank Ltd.	80.65	238.4	195.5982641	2.01	93.61107667	21
GAIL (India) Ltd.	260	355.8	36.84615385	0.9	32.67350427	22
State Bank Of India	116.75	191.4	63.94004283	1.75	32.28573876	23
Tata Steel Ltd.	250.65	336.2	34.13125873	1.72	15.51817368	24
Oil & Natural Gas Corporation Ltd.	209.3	214.65	2.556139513	1.13	-4.32200043	25
Coal India Ltd.	322.5	280.8	-12.9302325	0.83	-24.5424488	26
Bharat Heavy Electricals Ltd.	316	123.85	-60.8069620	2.02	-33.7856247	27
NTPC Ltd.	190.8	134.5	-29.5073375	0.93	-39.7283199	28

Reliance Industries Ltd.	1670.8	1023.9	-38.7179794	1.06	-43.5452636	29
Bharti Airtel Ltd.	676.95	355.3	-47.5145874	0.85	-64.6524558	30

Table 4.2 Sorted Excess return to beta ratio for 30 companies

S.No.	Date	Sensex	Return	S.No.	Date	Sensex	Return
1	9-Apr	10519.195		44	12-Nov	18814.195	0.2602669
2	9-May	13275.92	26.2066156	45	12-Dec	19380.605	3.010546
3	9-Jun	14808.625	11.5450003	46	13-Jan	19856.295	2.4544641
4	9-Jul	14476.4	-2.2434561	47	13-Feb	19380.33	-2.3970484
5	9-Aug	15343.455	5.989438	48	13-Mar	19161.545	-1.1289023
6	9-Sep	16249.62	5.9058732	49	13-Apr	18883.45	-1.4513183
7	9-Oct	16649.185	2.458919	50	13-May	19947.44	5.6345106
8	9-Nov	16310.52	-2.0341236	51	13-Jun	19163.675	-3.9291508
9	9-Dec	17054.36	4.5604922	52	13-Jul	19738.94	3.0018512
10	10-Jan	16886.205	-0.9859942	53	13-Aug	18508.955	-6.2312617
11	10-Feb	16160.62	-4.2969098	54	13-Sep	19452.93	5.1000988
12	10-Mar	17115.73	5.9101074	55	13-Oct	20235.08	4.0207311
13	10-Apr	17662.33	3.1935535	56	13-Nov	20729.6	2.4438747
14	10-May	16748.505	-5.1738644	57	13-Dec	21026.22	1.4309007
15	10-Jun	17119.005	2.2121377	58	14-Jan	20876.72	-0.711017
16	10-Jul	17816.57	4.0747987	59	14-Feb	20551.815	-1.5563029
17	10-Aug	18147.63	1.8581579	60	14-Mar	21694.095	5.5580493
18	10-Sep	19147.55	5.5099206	61	14-Apr	22568.41	4.0301981
19	10-Oct	20311.755	6.0801774	62	14-May	23826.335	5.5738309
20	10-Nov	20031.73	-1.3786352	63	14-Jun	24997.66	4.9160939
21	10-Dec	19813.3	-1.09042	64	14-Jul	25596.085	2.3939241
22	11-Jan	19351.64	-2.330051	65	14-Aug	25953.6	1.3967566
23	11-Feb	17993.295	-7.0192759	66	14-Sep	26787.74	3.2139665
24	11-Mar	18683.665	3.8368181	67	14-Oct	26902.545	0.4285729
25	11-Apr	19393.665	3.800111	68	14-Nov	28280.965	5.1237532
26	11-May	18520	-4.5048989	69	14-Dec	27639.53	-2.2680803
27	11-Jun	18093.885	-2.3008369	70	15-Jan	28310.14	2.4262714

28	11-Jul	18631.78	2.9727999	71	15-Feb	28802.405	1.7388293
29	11-Aug	17102.8	-8.2063013	72	15-Mar	28636.595	-0.5756811
30	11-Sep	16506.405	-3.4871191	73	15-Apr	27996.075	-2.2367184
31	11-Oct	16826.78	1.9409132	74	15-May	27247.575	-2.6735891
32	11-Nov	16590.475	-1.4043388	75	15-Jun	27137.91	-0.4024762
33	11-Dec	16069.785	-3.1384876	76	15-Jul	27997.36	3.166972
34	12-Jan	16308.495	1.4854586	77	15-Aug	26858.005	-4.0695087
35	12-Feb	17792.665	9.1005945	78	15-Sep	25652.68	-4.4877682
36	12-Mar	17480.65	-1.7536159	79	15-Oct	26893.425	4.8367071
37	12-Apr	17337.13	-0.8210221	80	15-Nov	26137.86	-2.8094785
38	12-May	16621.02	-4.1304991	81	15-Dec	25562.075	-2.2028774
39	12-Jun	16598.73	-0.1341073	82	16-Jan	25018.515	-2.1264314
40	12-Jul	17114.835	3.1093041	83	16-Feb	23748.465	-5.0764404
41	12-Aug	17499.755	2.249043	84	16-Mar	24306.4	2.3493518
42	12-Sep	18060.37	3.2035591	85	16-Apr	25311.87	4.1366471
43	12-Oct	18765.355	3.9034915	86	16-May	25492.62	0.7140918

Variance – 22.202

SD - 4.711

Table 4.3 Calculation of Variance of Sensex

S.No	Company	$\frac{(R_i - R_f)\beta_i}{\sigma_{ei}^2}$	$\sigma_m^2 \sum_{i=1}^N \frac{(R_i - R_f)\beta_i}{\sigma_{ei}^2}$	$\frac{\beta_i^2}{\sigma_{ei}^2}$	$\sum_{i=1}^N \frac{\beta_i^2}{\sigma_{ei}^2}$	$1 + \sigma_m^2 \sum_{i=1}^N \frac{\beta_i^2}{\sigma_{ei}^2}$	CI
1	Lupin	19999.24	30.672922	7.3665E-	7.3665E-	1.001533704	30.625
2	TCS	1376.666	77.104190	0.001619	0.001693	1.035261019	74.478
3	Dr. Reddy	1362.416	208.62759	0.004636	0.006330	1.131797887	184.332
4	Asian Paints	1142.775	1265.9357	0.044438	0.050768	2.057008669	615.425
5	Sun Pharma	714.0720	1301.7823	0.002411	0.053180	2.107208987	617.775
6	HUL	691.2241	1419.4810	0.008178	0.061358	2.277484738	623.266

7	Infosys	412.8668	1544.1352	0.014501	0.075860	2.579408184	598.639
8	Tata Motors	383.8438	2065.0579	0.065183	0.141043	3.936529476	524.588
9	HDFC Bank	379.6806	4357.1111	0.289951	0.430995	9.973322413	436.876
10	Bajaj Auto	330.0227	4460.8261	0.015094	0.446089	10.2875885	433.612
11	HDFC	284.3286	4695.5412	0.039649	0.485739	11.11309497	422.523
12	M & M	248.0697	4743.6077	0.009306	0.495045	11.306857	419.533
13	Wipro	245.7872	4755.016	0.002229	0.497275	11.35327531	418.823
14	Cipla	237.6495	4821.0917	0.013354	0.510629	11.63131041	414.492
15	Hero Motors	210.1099	4930.3755	0.024982	0.535611	12.15143746	405.744
16	Maruti	204.5499	5635.6464	0.165605	0.701217	15.59935212	361.274
17	Axis Bank	168.6846	6092.2567	0.130013	0.831231	18.3062385	332.796
18	Adani Ports	165.2083	6183.9867	0.026668	0.857899	18.86147663	327.863
19	ITC	122.2016	6214.0514	0.011816	0.869716	19.10750142	325.215
20	L & T	113.4590	6340.6546	0.053595	0.923311	20.22335122	313.531
21	ICICI Bank	93.61107	6508.5225	0.086131	1.009442	22.01660004	295.618
22	GAIL (India)	32.67350	6555.7859	0.069478	1.078921	23.46313655	279.407
23	SBI	32.28573	6602.1610	0.068991	1.147912	24.89953234	265.152
24	Tata Steel	15.51817	6614.607	0.038523	1.186436	25.70159864	257.361
25	ONGC	-4.32200	6609.0404	0.061869	1.248305	26.98971553	244.872
26	Coal India	-24.5424	6586.9665	0.043199	1.291504	27.88913103	236.184
27	BHEL	-33.7856	6500.9390	0.122299	1.413804	30.43540706	213.597
28	NTPC	-39.7283	6398.5552	0.123779	1.537584	33.01250555	193.822
29	Reliance	-43.5452	6370.5001	0.030945	1.568529	33.65678065	189.278
30	Bharti Airtel	-64.6524	6353.9204	0.012317	1.580846	33.91322372	187.358

Table 4.4 Cutoff point values for Stocks

Cutoff Point

The selection of the stocks depends on a unique cut-off rate such that all stocks with higher ratios of excess return to beta are included and stocks with lower ratios are left out. The cumulated values of C_i start declining after a particular C_i and that point is taken as the cut-off point and that stock ratio is the cut-off ratio C . In Table 3 the highest value of C_i is taken as the cut-off

point that is C^* . Here Hindustan Unilever has the highest the cut-off rate of $C^*=623.2669953$. All the stocks having C_i greater than C^* can be included in the portfolio.

Name of Stock	Cutoff Point
Lupin	30.62595159
Tata Consultancy Services	74.47801941
Dr. Reddys Laboratories	184.332908
Asian Paints	615.4255581
Sun Pharmaceutical Industries	617.7756269
Hindustan Unilever	623.2669953

Table 4.5 Selection of stocks among 30 companies

Name of Stock	Z_i	$\frac{Z_i}{\sum Z_i}$
Lupin	29.41974	0.3437351
Tata Consultancy Services	8.789490	0.1026948
Dr. Reddys Laboratories	15.607037	0.1823499
Asian Paints	29.664134	0.3465905
Sun Pharmaceutical Industries	0.6828999	0.0079788
Hindustan Unilever	1.425091	0.0166505

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 C_i 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 4.6 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 Asian paints and Lupin with a proportion of 34.7% and 34.4% respectively. Following that Dr. Reddy, TCS, Hindustan Unilever and Sun Pharma are the next six companies where investment can be made. Evidently, the companies chosen for the investments are growing at a steady rate in the recent years.

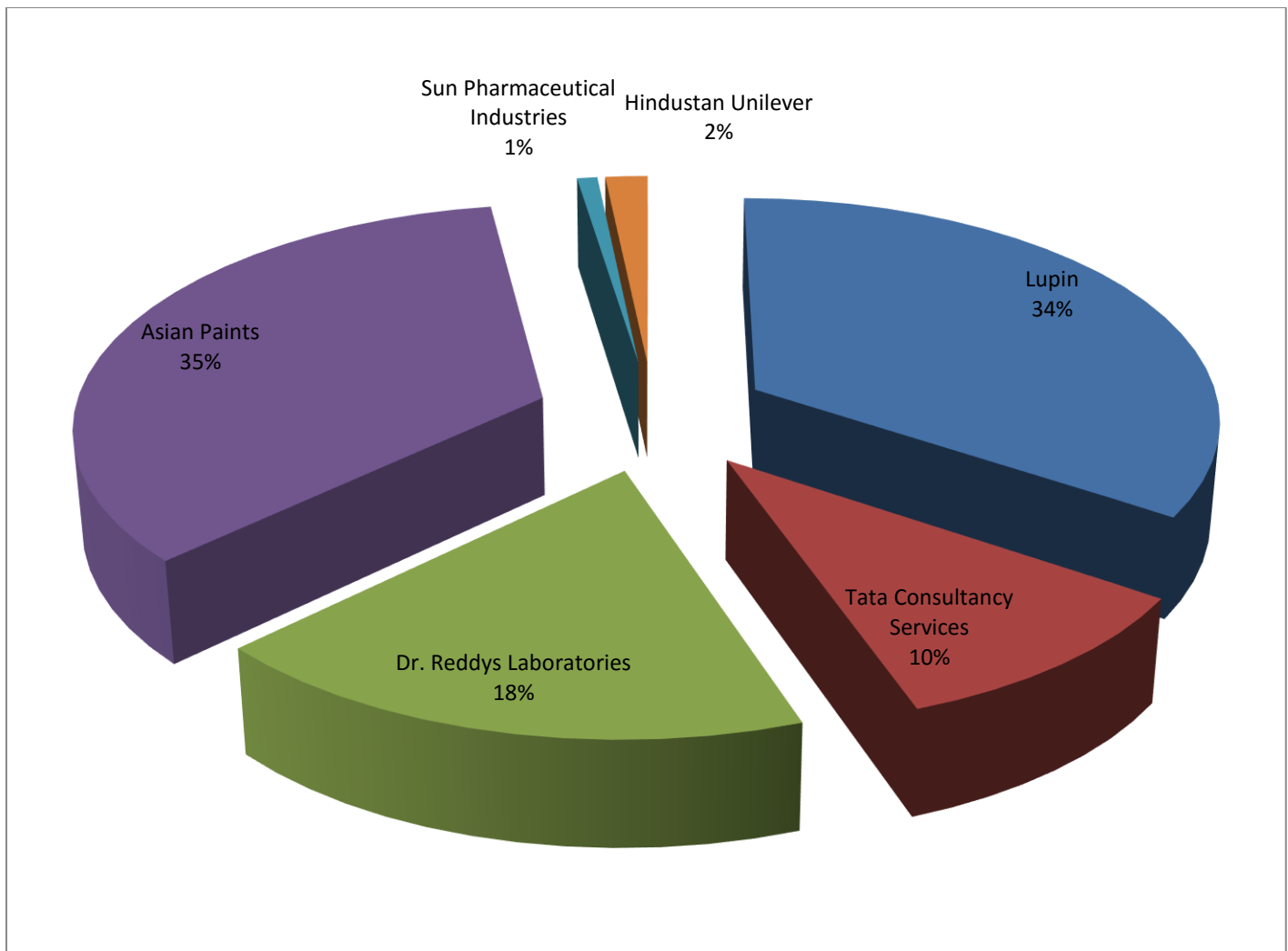


Figure 4.1 Proportion of funds invested

Date	Portfolio Value	Return	Sensex	Return	Nifty	Return
9-Apr	100000		10519.1		3241.474976	
9-May	117946.909	17.94642138	13275.92	26.20661562	3994.049927	23.21705262
9-Jun	125292.8927	6.228212126	14808.625	11.54500027	4418.225098	10.62017698
9-Jul	132774.2243	5.971074248	14476.4	-2.24345609	4294.25	-2.80599325
9-Aug	144387.9218	8.746951816	15343.455	5.989437982	4548.600098	5.923038901
9-Sep	152196.2874	5.407907779	16249.62	5.905873221	4832.100098	6.232686846
9-Oct	170514.9721	12.03622308	16649.185	2.458919039	4934.725098	2.123817759
9-Nov	185131.5352	8.572011539	16310.52	-2.03412359	4838.25	-1.95502477
9-Dec	198854.4139	7.412501981	17054.36	4.560492247	5082.900147	5.056583413
10-Jan	200250.4265	0.702027467	16886.205	-0.98599419	5038.425049	-0.87499452
10-Feb	207164.8072	3.452866893	16160.62	-4.29690981	4833.699951	-4.06327564
10-Mar	217631.9844	5.052584634	17115.73	5.910107409	5132.449952	6.180565696
10-Apr	225755.4754	3.732673343	17662.33	3.193553532	5280.274902	2.880202464
10-May	234404.2316	3.831028291	16748.505	-5.17386437	5032.575195	-4.69103809
10-Jun	251502.4119	7.294313862	17119.005	2.21213774	5163.899903	2.60949321
10-Jul	262327.5101	4.304172716	17816.57	4.07479874	5351.550049	3.633884264
10-Aug	263137.5626	0.308794342	18147.63	1.858157883	5449.349854	1.827504258
10-Sep	271748.9212	3.272569102	19147.55	5.509920579	5738.274903	5.302009538
10-Oct	287371.7323	5.748987352	20311.755	6.08017736	6110.600098	6.488451691
10-Nov	307735.8522	7.086333704	20031.73	-1.37863517	6014.425049	-1.57390514
10-Dec	316322.8019	2.79036375	19813.3	-1.09042004	5934.224854	-1.33346403
11-Jan	298691.5369	-5.57382045	19351.64	-2.33005102	5798.849854	-2.28125835
11-Feb	278026.8214	-6.91841345	17993.295	-7.01927588	5388.475098	-7.07683017
11-Mar	280434.0469	0.865824929	18683.665	3.836818104	5610.100098	4.112944682
11-Apr	294228.8545	4.919091573	19393.665	3.800110953	5818.850098	3.720967476
11-May	307864.7814	4.634462836	18520	-4.50489889	5551.975098	-4.58638726
11-Jun	313849.7262	1.944017363	18093.885	-2.30083693	5426.899902	-2.25280542
11-Jul	325389.8397	3.676955112	18631.78	2.972799927	5597.175049	3.137613556
11-Aug	314529.2423	-3.33771868	17102.8	-8.20630127	5135.949951	-8.24031933
11-Sep	321277.1886	2.14541143	16506.405	-3.48711906	4964.050049	-3.34699332
11-Oct	320485.8512	-0.24630987	16826.78	1.940913239	5064	2.013475892
11-Nov	317516.4038	-0.92654553	16590.475	-1.40433879	4983.700195	-1.58569915

11-Dec	303161.5096	-4.52099295	16069.785	-3.13848759	4815.199951	-3.38102689
12-Jan	306077.635	0.96190489	16308.495	1.48545858	4946.399903	2.724704131
12-Feb	321267.1826	4.962645377	17792.665	9.100594506	5394.475098	9.058612401
12-Mar	338570.9845	5.386109388	17480.65	-1.75361588	5317.675049	-1.42367973
12-Apr	360800.2824	6.565624021	17337.13	-0.82102210	5266.524903	-0.96188927
12-May	374022.595	3.664717944	16621.02	-4.13049910	5034.275147	-4.40992419
12-Jun	371063.4483	-0.79116791	16598.73	-0.13410729	5028.300049	-0.11868834
12-Jul	376903.2987	1.573814525	17114.835	3.109304146	5190.474854	3.225241203
12-Aug	379873.0545	0.78793574	17499.755	2.249043009	5306.625	2.237755683
12-Sep	389927.661	2.646833281	18060.37	3.203559136	5475.425049	3.180930422
12-Oct	388020.2928	-0.48915949	18765.355	3.903491457	5351.775147	-2.25827037
12-Nov	400385.6152	3.186772086	18814.195	0.260266859	5716.800049	6.820632257
12-Dec	420017.5861	4.90326581	19380.605	3.010546027	5894.149902	3.102257408
13-Jan	422415.2157	0.570840279	19856.295	2.454464141	6026.199952	2.24035785
13-Feb	425703.5934	0.778470464	19380.33	-2.39704839	5862.425049	-2.71771438
13-Mar	434494.6376	2.065062251	19161.545	-1.12890234	5788.025147	-1.26909770
13-Apr	453020.7371	4.263826955	18883.45	-1.45131825	5720.024903	-1.17484361
13-May	485617.4431	7.195411455	19947.44	5.634510643	6070.350098	6.124539682
13-Jun	485717.6214	0.02062907	19163.675	-3.92915080	5788.599854	-4.64141671
13-Jul	530273.1075	9.173125308	19738.94	3.001851159	5884.550049	1.657571734
13-Aug	501163.8612	-5.48948190	18508.955	-6.23126165	5463.675049	-7.15220359
13-Sep	515683.6492	2.897213686	19452.93	5.100098844	5730.699951	4.887276414
13-Oct	552780.0334	7.193632032	20235.08	4.020731067	6005	4.786501672
13-Nov	557482.4828	0.850690889	20729.6	2.443874697	6152.525147	2.456705196
13-Dec	552705.3377	-0.85691392	21026.22	1.430900741	6272.600098	1.951636899
14-Jan	557404.8187	0.850268781	20876.72	-0.71101700	6192.774903	-1.27260137
14-Feb	568370.1258	1.967207098	20551.815	-1.55630290	6108	-1.36893241
14-Mar	584955.213	2.918008245	21694.095	5.558049253	6471.149903	5.945479748
14-Apr	591431.299	1.107108013	22568.41	4.030198079	6760.125	4.465591144
14-May	586763.0099	-0.78932060	23826.335	5.573830855	7101.024903	5.042804726
14-Jun	600405.2446	2.324999101	24997.66	4.916093894	7469.774903	5.192912362
14-Jul	668286.6308	11.30592824	25596.085	2.393924071	7631.550049	2.165729866
14-Aug	706914.5088	5.780136288	25953.6	1.396756574	7754.175049	1.606816429

14-Sep	765495.6186	8.286873313	26787.74	3.213966463	8011	3.312086062
14-Oct	762397.7337	-0.40469008	26902.545	0.428572922	8027.300049	0.20347084
14-Nov	809610.89	6.192719914	28280.965	5.123753162	8453.625	5.310938278
14-Dec	833449.246	2.94442138	27639.53	-2.26808031	8294.150147	-1.88646708
15-Jan	870859.098	4.488557893	28310.14	2.426271358	8531.024902	2.855925572
15-Feb	907785.5795	4.240236056	28802.405	1.738829268	8691.975098	1.886645483
15-Mar	975111.3553	7.416484383	28636.595	-0.57568109	8694.175293	0.025312946
15-Apr	974452.2408	-0.06759376	27996.075	-2.23671843	8493.200196	-2.31160622
15-May	919310.9111	-5.65870007	27247.575	-2.67358906	8243.349854	-2.94176913
15-Jun	919129.0147	-0.01978616	27137.91	-0.40247618	8203.725098	-0.48068754
15-Jul	963940.7577	4.875457338	27997.36	3.166971959	8485.075196	3.429540783
15-Aug	996460.1606	3.373589366	26858.005	-4.06950869	8144.399903	-4.01499438
15-Sep	1001678.908	0.523728697	25652.68	-4.48776817	7797.25	-4.26243685
15-Oct	1047062.796	4.530782003	26893.425	4.83670712	8133.474854	4.312095341
15-Nov	974932.6752	-6.88880563	26137.86	-2.80947852	7915.125	-2.68458264
15-Dec	951246.2204	-2.42954774	25562.075	-2.20287735	7765.174805	-1.89447665
16-Jan	938823.7899	-1.30591115	25018.515	-2.12643144	7589.524903	-2.26202122
16-Feb	941777.04	0.314569159	23748.465	-5.07644038	7213.125	-4.95946594
16-Mar	905237.8293	-3.87981540	24306.4	2.349351842	7406.350098	2.67879869
16-Apr	891386.2335	-1.53016094	25311.87	4.136647138	7754.425049	4.699682656
	Annual Return	37%		13%		13%
	SD	4.292507141		4.711899386		4.611948452
	Variance	18.42561755		22.20199583		21.27006852
	Gain	791.3862335		140.6255422		139.2252017
	Sharpe Ratio	182.6313173		28.26578652		28.57473431

Table 4.7 Calculation of Standard deviation, Variance, Gain & Sharp Ratio

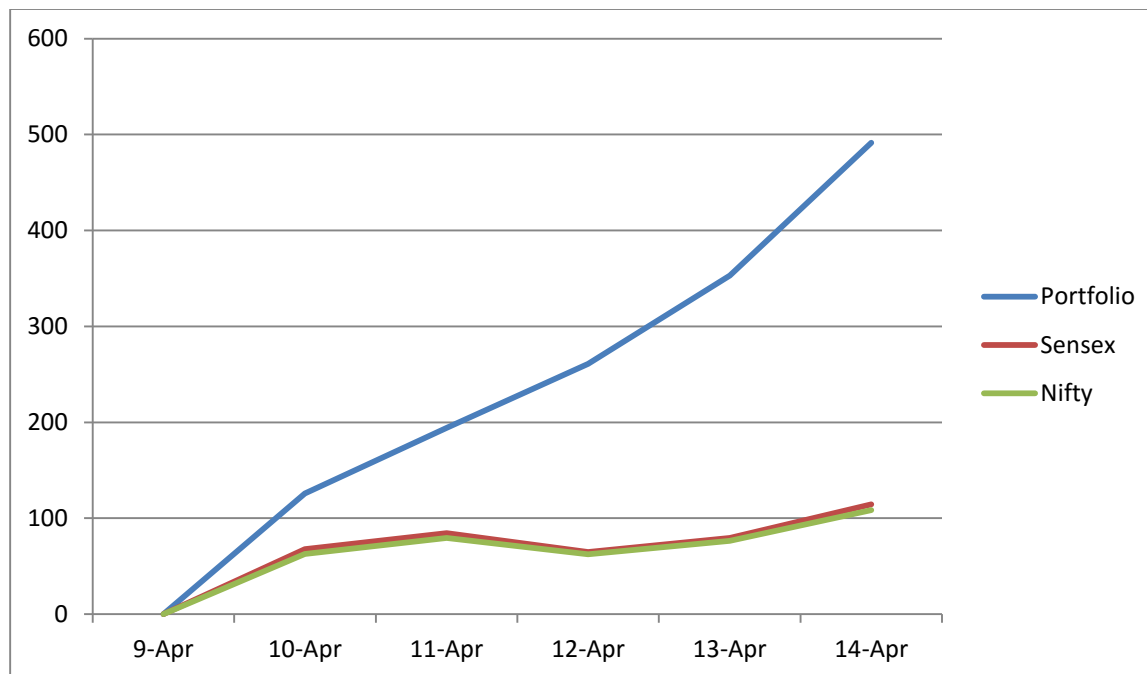


Figure 4.2 Monthly return by different Indexes

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 3 stocks from Pharma, 2 from FMCG sector and one from IT according to the cut-off value calculated. The Asian Paints and Lupin forms the major contribution with 34.7% and 34.4% respectively followed by Dr. Reddy with 18.2%.

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 Asian paints 34.7%, Lupin 34.4 %, Dr. Reddy 18.2%, TCS 10.2%, Hindustan Unilever 1.6% and Sun Pharma 0.8%.

- Portfolio obtained has beaten Sensex as well as Nifty as its Gain and sharpe Ratio is very high as compare to them with minimum risk.
- Portfolio Annual return is 37% over the period as compare to Sensex Annual return is 13%
- Investors expecting high return for the minimal risk can go for Lupin($\beta < 1$).
- To investors who are risk lovers can go for Axis Bank.
- Investors better not to think about Reliance, Bharti Airtel, BHEL, ONGC, Coal India and NTPC.

4.4. Limitations

1. Only Seven years data has been considered for the construction of optimal portfolio.
2. Due to time constraint we are doing for thirty scrip's.
3. The portfolio is constructed purely on the basis of Sharpe's model which basically considers the stock price movements and does not take into consideration company specific factors, industry specific factors and economic specific factors.

4.5. Conclusion

Though there are 30 stocks that meet the criteria for being included in the Portfolio, the portfolio is constructed with the top 6 stocks that meet the criteria to be included in the portfolio according to the Sharpe Index Model. Those stocks are: Hindustan Unilever, Lupin, TCS, Dr. Reddy, Asian Paints and Sun Pharma. The portfolio predominantly consists of stocks from the pharmaceutical sector and FMCG. 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/REFERENCES

- Gotoh, J.-y., & Takeda, A. (2014). On the Role of Norm Constraints in Portfolio Selection.
- Sen, K., & Fattawat, D. (2014). Sharpe's Single Index Model and its Application.
- Nithya, J. (2014). Optimal Portfolio Construction With Markowitz Model Among Large Cap's in India.
- Seegopaul, H., Gupta, F. & Prestbo, J. (2005). Toward an Optimal Domestic Large-Cap Equity, *The journal of portfolio management fall 2005*.
- Jacobson, B.J. (2006), "The Use of Downside Risk Measures in Tax-Efficient Portfolio Construction and Evaluation, *The journal of wealth management spring 2006*.
- Bilbao, A., Arenas M., Jiménez, M., Gladish, B.P., & Rodríguez, M.V. (2004). An extension of Sharpe's single-index model: portfolio selection with expert betas, *The journal of the operational research society vol. 57, no. 12 (dec., 2006), pp. 1442-1451*.
- Alexander, M. & Jonathan, S.(2006). A Portfolio Diversification Index.
- Clarke, R., Silva, H.D. & Thorley, S. (2002). Portfolio Constraints and the Fundamental Law of Active Management.
- Kangari, R, Riggs, L.S., (1988). Portfolio management in construction.
- Borkovec, M. & Domowitz, I. (2010). Create or Buy: A Comparative Analysis of Liquidity and Transaction Costs for Selected U.S. ETFs.
- Plessis, A.D., & Ward, M.(2009). A note on applying the Markowitz portfolio selection model as a passive investment strategy on the JSE.
- Kushalappa, S., & Kiran (2015). Construction of optimum portfolio with bse listed companies.
- Varadharajan, P. & Ganesh (2012). Construction of equity portfolio of large caps companies of selected sectors in India with reference to the Sharpe Index Model.
- Blog, B., van der Hoek, G., Rinnooy Kan, A.H.G., & Timmer, G. T.(1983). The Optimal Selection of Small Portfolios.
- Grewal, S.S., & Grewal, N. (1984). Profitable investment in shares.
- Benartzi & Thaler (2001). Naïve diversification.

- Zhu, Y., Zhou, G., 2009. “Technical analysis: An asset allocation perspective on the use of moving averages”. *Journal of Financial Economics* 92 (2009) 519–544
- Prasanna Chandra, “Investment Analysis and Portfolio Management”, 3rd edition, Tata Mcgrahill, June, 2009.
- S. Kelvin, “Portfolio Management”, 1st edition, August, 2008.
- McGill, (et al. 2005). *Fundamentals of Private pensions* 8th edition, page 755 – 762.
- www.bseindia.com
- www.nseindia.com(research section)
- <https://en.wikipedia.org>

6. Adherence Sheet

Particulars	Last Date	Signature of Mentor
Title of the Project/Area of Topic Finalization	21-Jan-16	
Literature Review/Objectives of the study	2-Feb-16	
Methodology	18-Feb-16	
Questionnaire/Data Collection tools	3-Mar-16	
Data Collection	17-Mar-16	
Analysis	24-Mar-16	
Conclusion and Recommendations	1-Apr-16	
First Draft	15-Apr-16	
Final Report/Binding and Submission	3-May-16	