



A Study on Construction of Optimal Portfolio for Selected Stocks using Sharpe's Single Index Model

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ABSTRACT

Security analysis and portfolio management have emerged as the most concerning aspect of rational investment and decision-making. A portfolio is a mixture of securities such as stocks, bonds and other money market instruments. The process of unification of the broad asset classes to obtain the best return with the least risk is called portfolio construction. Portfolio performance analysis consists of examining the risk-return characteristics of the portfolio. The study emphasises the impact of selected stocks for optimal portfolio returns on the market returns in the NIFTY index, the result of an optimal portfolio by using Sharpe's single index model. In this study, the stocks from the different metal companies are included since these sectors are of prime importance for the real growth of an economy. Using the Sharpe Single Index model, to build an optimum stock portfolio among selected stocks belonging to the top trading companies in India. And calculate the proportion of investment to be made into each of the select stocks that are included in the optimal stock portfolio and find out the excess return to beta value ratio, by giving ranking stocks and then evaluating the cut-off point. The study finds and suggests the investors and top-level management by revealing that two companies are in the optimal portfolio: Adani Power with a proportion of 77.90% and Jindal steel with a proportion of 22.10%.

Key Words: portfolio construction, optimal portfolio, Sharpe's single index model, Adani Power, Jindal steel, Beta, Risk Return

DOI Number: 10.48047/NQ.2022.20.20.NQ109007

NeuroQuantology2022;20(20): 46-58

1.1 INTRODUCTION

Security analysis and portfolio management have emerged as the most concerning aspect of rational investment and decision-making. The portfolio is a mixture of securities such as stocks, bonds and money market instruments. The process of blending the various asset classes to get an optimum return with less risk is called portfolio construction. A portfolio

tries to trade off the risk-return preferences of an investor by not putting all eggs in a single basket and thus allows for sufficient diversification. Markowitz was the first who laid the "Modern portfolio theory" to risk. He analytical tool for the analysis and selection of the optimal portfolio. Thisque portfolio approach won him Nobel Prize in 1990. The work done by Markowitz was supported and



extended by William Sharpe. He simplified the amount and type of input data required to perform portfolio analysis. He made various and complex calculations easy which were essential to reach an optimal portfolio. This simplification is achieved through a single index model. This model given by Sharpe is the simplest and the most vigorously used one.

The study reveals an optimal portfolio using Sharpe's single index model. This paper is built around building up an optimal portfolio by balancing the positive and negative correlation existing between the securities and in turn getting returns closer to the anticipated results. For this study, the stocks from the different metal companies are included since these sectors are of prime importance for the real growth of an economy.

1.2 Traditional Approach to Portfolio Construction

1. Security Analysis: Security analysis is the primary step of portfolio management. Security analysis is intended for which helps to calculate the value of various assets. There are two alternative approaches to security analysis namely Fundamental analysis and Technical analysis.

2. Portfolio Analysis: Security analysis delivers a set of securities suitable for investment. From these securities, a large number of portfolios can be constructed by choosing a different set of securities and also by the varying weight of securities. Diversification has the effect of reducing the portfolio risk by lessening the unsystematic risk which affects individual security or industry. Whereas diversification reduces the return from the portfolio. A rational investor has to find out the most efficient portfolio by choosing the appropriate trade-off between risk and return.

3. Portfolio Selection: Portfolio analysis that gives a variety of portfolios available for

investment. Out of these portfolios, an optimal portfolio is chosen for investment.

4. Portfolio Revision: As the economy and business environment change the return from securities also changes. The portfolio has to include new securities which promise high returns and exclude securities which have become underperformers. Hence, after the construction of an optimal portfolio, the investor has to intermittently monitor the portfolio to confirm that it remains optimal.

5. Portfolio Evaluation: The evaluation of the portfolio provides feedback about performance to evolve a better management strategy. The return and risk of the portfolio over some time are evaluated. These values are compared with standard values such as the market index to assess the portfolio's relative performance.

1.3 Return and Risk Analysis of Portfolio

Portfolio performance analysis consists of examining the risk-return characteristics of the portfolio.

Return: The return of a portfolio is attained by its average total return over a standard holding period, generally one year. The total return comprises of investment income such as dividends plus capital gain/loss. The rate of return made by the portfolio is compared with the benchmark like a market index. A portfolio return is

$$R_p = \sum_{i=1}^n X_i R_i$$

Where, R_p = Portfolio average return, X_i = Weight or proportion of security 'i' in the portfolio, R_i = Expected return of Security i

Risk : Risk is the option of not realizing a return or getting a return less than expected. The risk is broadly classified into two types i.e., Systematic & Unsystematic Risk

1.4 Modern Approaches to Portfolio Selection

In the modern approach of portfolio selection, the stocks are not selected based on the need



for income or appreciation. The selection is done on the basis of risk and returns analysis. Modern Portfolio Theory (MPT) methods investing by inspecting the whole market and

the complete economy. The theory is an alternative to the older method of analysing each investment's individual merits. One of these is Sharpe's single index model.

The following are steps related to the construction of an optimal portfolio using a single index model:

This model first gets the securities based on their excess return to beta ratio. After that, all securities are set according to their ranks. Then cut-off rate is calculated and it is compared with an excess return to beta for deciding whether to select the security for investment or not. The model explains the weight that should be allocated to each security to obtain an optimal portfolio.

Step 1: Calculate the excess return to the beta ratio for each security under consideration

$$\text{Excess return to beta ratio} = (R_i - R_f) / \beta_i$$

Where R_i = Expected return of Security i

R_f = Risk-free rate of return

β_i = the Beta co-efficient of the security or excess return of the security over the market index

Step 2: Ranking the securities based on the additional return to beta ratio.

Step 3: Calculate the cut-rate using the formulae.

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

Step 4: Selection of securities for investment. If $(R_i - R_f) / \beta_i$ is greater than the cut-off rate, then the security will be included in the portfolio.

Step 5: The proportion to be invested in each security is calculated.

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

Where

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

C^* is the cut-off rate

1.5 Portfolio Evaluation Methods

There are different evaluation methods which are commonly used for portfolio evaluation are

1. Sharpe's Ratio, 2. Treynor's Ratio, 3. Jensen's Performance Index

1.5.1. Sharpe's Ratio: Sharpe's performance index or Sharpe's ratio was developed by William Sharpe which gives a single value to be used for the performance ranking of enormous portfolios. The index assigns the highest value to the portfolio which has the best risk-adjusted average rate of return.

Sharpe's ratio measures the risk premium of the portfolio relative to the total amount of risk in the portfolio. This risk premium is equal to the difference between the portfolio's average rate of return and risk-averse return.

$$\text{Sharpe Ratio} = (R_p - R_f) / \sigma_p$$



1.5.2. Treynor's Ratio: Treynor's ratio was developed by Jack Treynor. It is the ratio of risk premium to the volatility of return. The risk premium is the difference between the average return of the portfolio riskless rate of return. Volatility of portfolio is measured by the portfolio beta.

$$\text{Treynor's Ratio} = \frac{R_p - R_f}{\beta_p}$$

1.5.3 Jensen's Measure: This absolute risk adjusted return measure was developed by Michael Jensen. This ratio attempts to measure the differential between actual return of the portfolio and the expected return of the portfolio.

$$\text{Jensen's Measure} = R_p - E(R_p) = \alpha + \beta_p (R_m - R_f)$$

Importance of dating hazards upheld in numerous tests. The varieties among the listing of costs of backpedalling on unmistakable things recommend various **2.1 REVIEW OF LITERATURE**

Kenneth R. French, G. William Schwert, Robert F. Stambaugh (1987) "Expected stock returns and volatility," in this study examines the relation between benefit levels and resource change will help broker agents choose higher and extra right opportunity judgements in making an interest in a dispersion of businesses. between stock returns and stock market volatility. It is observed that the expected market risk premium (the expected return on a stock portfolio subtracted from Treasury bill yield) is positively related to the predictable volatility of stock returns. It has been evidence that unexpected stock market returns are negatively related to the unexpected change in the volatility of stock returns. This negative relation gives indirect evidence of a positive relationship between expected risk premiums and volatility.

Hussein Abedi Shamsabadi (2012) in their study, degrees of threat for financial backers in the essential property. Assessing the In an ideal manner, the investigation reconsiders price and valuing speculation and experimental pursuit to make generally speaking execution actions assessing extraordinary task areas. To own the reason for the evaluation, the exact proof is referenced inside the extent of commercial centre danger and result.

Koh Xin Rui (2014) in their study, to commence with, because of this reality this exam utilizes low repeat it is a month-to-month reality. Long-phrase exploration should utilize high-repeat information that is a week after seven days or constant information for longer time periods. Second, while breaking down the CAPM, fate search may furthermore get mindful of various factors while in transit to impact variants in expected benefit impacts. 3rd, the long-phrase examination can boost the gander finally to at the very least 10 years being a strategy to cowl more businesses also to be had records. The particular beta portfolio should be used in protracted-term research as opposed to the beta of every business endeavour.

Gurinder Singh and Kaur Navleen (2015) in their study titled "Speculation Determination Increased Investment decision in Currency markets India" observed that a combination of country understanding merchants and not brokers on the Indian Stock Market. Persons who end upward brokers would physique feel shaky in the event that they lose cash inside the commercial centre and the risk of contributing. You can find classifications of folks who are fit to be contributed, in any case, brokers need a gratifying plan, which is no longer the handiest yet in addition has a phenomenal size. Assessment motivators related to the principle leader to purchasers curiously will be aiding plenty of folks making an interest in few rich for advertisements situated due to reality its effect developing people. Lucidity is legitimate and must be conceded to them through various techniques among Business and Investment. But, the matter of SIP (Systematic Investment decision Plan) will be an incredible decision for a pair with low benefits.



Roni Bhowmik's (2020) "Unpredictability and Currency markets Analysis Bali" suggests, compositions with writing as a task. This paper provides a complete writing that fundamentally has some expertise in the see of stock substitute results and unpredictability the use of efficient examination techniques in numerous money related business areas all throughout the complete world. This particular determine is decided by also are - look for school of most present and convenient writing on unpredictability and commercial centre results.

Bedanta Bora(2021) "Hazard and Return Relationship A great Empirical Study BusinessBSEinIndia"demonstrates,venturesinsidethestockcommercialcentrehitadangerthat high level. The genuine go back that a financial backer gets from a content maylikewise vary from that of the claimed return and the chance is communicated as much asthe assortment of the return.Thus, it is essential to perceive this is of the rate of return and the recognitionofdangerconcerned.Thisspecificpaperattempttochoosetherelationship between protections results and commercial centre returns and seems at beta sense of balance for 30 BSE Sensex gatherings. Illustrative insights, a pair of relationship exploration and beta examination might be done

Frank J Fabozzi, Harry M Markowitz, Francis Gupta (2008), opined that the main objective of portfolio selection is the grouping and construction of the portfolios to huge returns expected of them with a certain level of risk. Investors generally use modelling techniques on historical data and based on their future expected returns, the optimal portfolio selection is done and this allows computing the investment risk and expected return on a portfolio. Also, the theory of portfolio selection shifts from individual risk to the whole risk of the portfolio and results from the possibility of combining risky assets to produce an optimum portfolio.

In the Indian scenario,**Varadharajan (2011)**built an optimal equity portfolio with the aid of the Sharpe Index model. The study was led with the financial data from April 2006 to March 2011. The sample size was restricted to 19. He chose companies from Banking and Information Technology. The portfolio was made with the top 5 stocks that reach the criteria to be addedto the portfolio according to Sharpe Index Model. The portfolio predominantly comprised stocks from the banking sector and one stock from the IT sector.

In a recent study **Saravanan and Natarajan (2012)** attempt to form an optimal portfolio by using Sharpe's Single Index Model.NSE Nifty Index has been considered in this study. Thedata for all the stocks and indices for the period of April 2006 to December 2011 has been measured. They make the cut-off point and selected stocks having an excess of their expected return over a risk-free rate of return exceptional this cut-off point. The investment in each of the selected stocks is then considered on the basis of respective weights given to each stock reliant on respective beta value, stock movement variance unsystematic risk, return on a stock and risk-free return vis-à-vis the cut-off return. Out of the empirical study, it was determined that returns on either individual securities or on a portfolio involves of securities of different companies listed in Nifty 50 stocks under various sectors are asymmetrical and heterogeneous. The optimal portfolio includes four stocks selected out of 50 shortlisted scrips, giving a return of 0.116. Later, it helps to cause that return on securities of the different portfolios is independent of the systematic risk usual in the market.

3. RESEARCH METHODOLOGY

3.1 Statements of the problem

Due to the volatile nature of the capital market, the decision-making process for an investor is very difficult. The major factors to be considered while making investment decisions are risk and return. So, portfolio management is a very important decision for an investor. A study on the construction



of an optimal portfolio using Sharpe's single index model with special reference to Nifty top trading companies in an effort to construct an optimal portfolio from 5 shares which are constituents of the Nifty index. Five years of monthly historical data is used in the analysis. This study is very helpful to get an awareness of various decisions in the capital market.

3.2 Statement of the Problem (Research Gap)

The high inflation rate prevailing in the economy erodes the value of investments in risk-free assets such as bank deposits and debt instruments. The investor has to allocate a few portions of their savings to high return in financial instruments such as equity for fulfilling their long-term goals. Hence, the problem under study is to construct an optimal portfolio using Sharpe's optimization model and conduct an evaluation of the portfolio with other portfolios of same return or risk to evidence that this optimization model is simple and highly suitable for portfolio construction

3.3 Scope and Significance of Study

The effectiveness of a portfolio will decide the best of assets under portfolio and their proportions. There for an investor who want to invest their own shall be thorough with the methods of security analysis, portfolio analysis, portfolio selection, portfolio evaluation and revision.

This study attempts to know almost all the points required to reach optimal portfolio which is crucial for an investor.

The primary objective is to construct an optimal stock portfolio among selected stocks from the various metal and power companies in India.

3.4 Objectives of the Study

1. To study the impact of selected stocks for optimal portfolio returns on the market returns in NIFTY index.
2. To build an optimum stock portfolio among selected stocks belong to the top trading companies in India, using Sharpe Single Index model.
3. To calculate the proportion of investment to be made into each of the select stocks that is included in the optimal stock portfolio.
4. To find out the excess return to beta ratio, rank the stocks based on it, and then evaluate the cut-off point.

3.5 Hypothesis of the study

HO1: There is no significant relationship between the impact of selected stocks for optimal portfolio returns on the market returns NIFTY index.

HO2: There is no significant relationship between the excess return to beta ratio, ranking the stocks based on it and evaluating the cut-off point based on it.

HO3: There is no significant relationship between the proportion of investment to be made into each of the select stocks and the optimal stock portfolio.

3.6.1 Sample Size

Totally 5 companies which are part of Nifty index. The list of companies that have been selected for the study are as follows.

- 1.JSW Steel
- 2.TATA Steel
- 3.Jindal Steel&power
- 4.SAIL
- 5.Adhani Power

3.6.2 Sources of Data

The price movements of NSE Nifty index and stock prices are the fundamental data for the study. The main source of information is web sites, Magazines and journals like Indian Journal of Finance and Indian Journal of Research etc.,

3.6.3 Tools for Data Analysis



The data collected from sources has been analysed using Statistical tools like Arithmetic mean, standard deviation, Alpha, Beta, Covariance, Sharpe Index measure are used.

3.6.3.1 Calculation of Returns:

$$\text{Rate of Return (r)} = \frac{\text{Div} + (p_1 - p_0)}{p_0} * 100$$

Where, Div = Dividend per share, P0 = Opening price

3.6.3.2 Calculation of Average Return

$$\text{Average Return / Expected Return} = \frac{\sum x}{n}$$

∑ x = Total Sum of Returns, n = Total No. of years

3.6.3.3 Calculation of Standard Deviation

$$\text{Standard Deviation} = \sqrt{\frac{\sum (x - \bar{x})^2}{n}}$$

3.6.3.4 Calculation of Beta

$$= \frac{\text{cov}(r_i, r_m)}{\text{var}(r_m)}$$

3.7 Limitations of the Study

1. Duration of the study is limited, so extensive and deep study such as fundamental analysis and technical analysis could not be possible.
2. The beta value changes from time to time. It may not replicate the future volatility of returns. So, the portfolio needs to be created periodically.
3. The study is confined to only 5 companies of which are the part of Nifty index

4. DATA ANALYSIS AND INTERPRETATION

4.1 Calculation of impact of selected stocks for optimal portfolio on the NIFTY market returns for the period from 01-01-2017 to 31-12-2021:

Table 1

Impact of selected stocks for optimal portfolio on the NIFTY market returns

| <i>Regression Statistics</i> | | | | | |
|------------------------------|--|--------|--|--|--|
| Multiple R | | 0.6868 | | | |
| R Square | | 0.4718 | | | |
| Adjusted R Square | | 0.4228 | | | |
| Standard Error | | 4.0640 | | | |
| Observations | | 60 | | | |

| <i>ANOVA</i> | | | | | |
|--------------|-----------|-----------|-----------|----------|-----------------------|
| | <i>Df</i> | <i>SS</i> | <i>MS</i> | <i>F</i> | <i>Significance F</i> |
| Regression | 5 | 796.48 | 159.30 | 9.65 | 1.3E-06 |
| Residual | 54 | 891.86 | 16.52 | | |
| Total | 59 | 1688.34 | | | |

| | <i>Coefficients</i> | <i>Standard Error</i> | <i>t Stat</i> | <i>P-value</i> |
|------------------------|---------------------|-----------------------|---------------|----------------|
| Intercept | 0.35 | 0.55 | 0.63 | 0.53 |
| JSW Steel Returns (%) | 0.02 | 0.07 | 0.28 | 0.78 |
| TATA Steel Returns (%) | 0.11 | 0.08 | 1.33 | 0.19 |



| | | | | |
|----------------------------------|------|------|------|------|
| Jindal Steel & Power Returns (%) | 0.09 | 0.04 | 2.08 | 0.04 |
| SAIL Returns (%) | 0.05 | 0.05 | 0.97 | 0.34 |
| Adani Power Returns (%) | 0.04 | 0.02 | 1.51 | 0.14 |

Interpretation:

From the data collected it has been observed that there is an impact of selected stocks ftheor optimal portfolio on the NIFTY market price volatility for the period from 1st January 2017 to 31st December 2021 more likely with Jindal Steel & Power Returns and Adani Power Returns.

Reject the null hypothesis-HO1: There is no significant relationship between the impact of selected stocks for the optimal portfolio on the market price volatility NIFTY index.

4.2.1 Calculation of beta, Unsystematic risk and Standard Deviation:

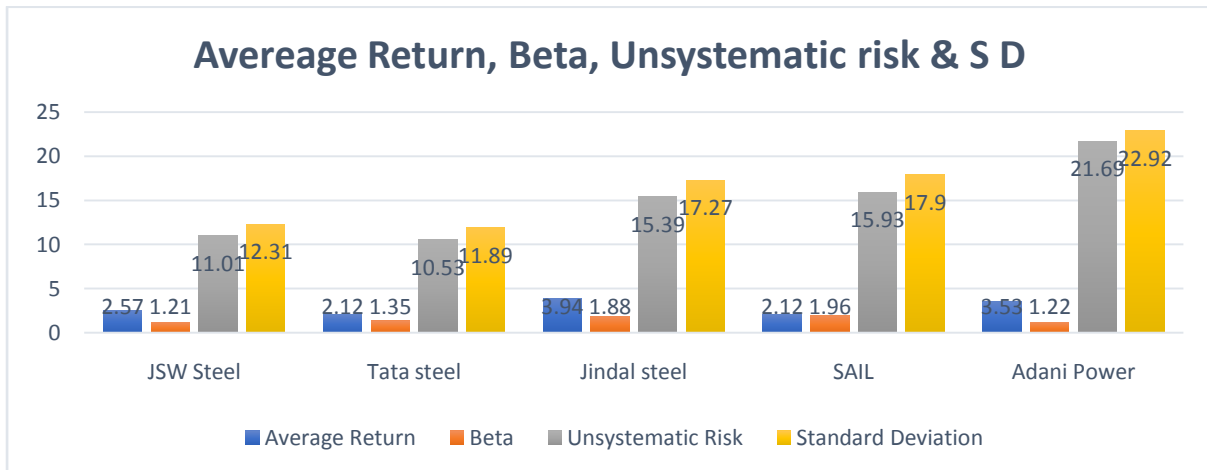
Table 2
 Calculation of beta, Unsystematic risk and Standard Deviation

| Company Name | Average Return | Beta | Unsystematic Risk | Standard Deviation |
|--------------|----------------|------|-------------------|--------------------|
| JSW Steel | 2.57 | 1.21 | 11.01 | 12.31 |
| Tata steel | 2.12 | 1.35 | 10.53 | 11.89 |
| Jindal steel | 3.94 | 1.88 | 15.39 | 17.27 |
| SAIL | 2.12 | 1.96 | 15.93 | 17.90 |
| Adani Power | 3.53 | 1.22 | 21.69 | 22.92 |

Source: data collected through the NSE website

Fig.1

Calculation of Average Return, beta, Unsystematic risk and Standard Deviation



Interpretation:

From the above calculation of Average Return, beta, Unsystematic risk and Standard Deviation

- **Return:**



- The Jindal steel company yields the highest return of 3.94% followed by Adani Power which has a return of 3.53%. Over the study period
- Among all the companies in the above table Tata Steel yielded the lowest return of 2.12%
- **Risk:**
- From the above table we observe that Adani Power has the highest risk of 22.92% followed by Havisk of 17.90%
- Among all the companies TATA Steel has the lowest risk of 11.89%.
- **Beta:**
- In the above list SAIL has the highest beta of 1.96 followed by Jindal Steel at 1.88
- JSW Steel has the lowest beta of 1.21
- **Unsystematic risk:**
- From the above table Adani Power has the highest unsystematic risk of 21.69%
- TATA STEEL has a lowest unsystematic risk of 10.53%

4.3 Calculation of excess Return to Beta Ratio of the selected stocks:

The excess return to beta ratio expresses the return from the investment in excess of the risk accepted by the investor.

*Risk free rate of interest = 0.55%

The individual returns are calculated and excess return to beta is found using the formula

$R_i - R_f / \beta$.

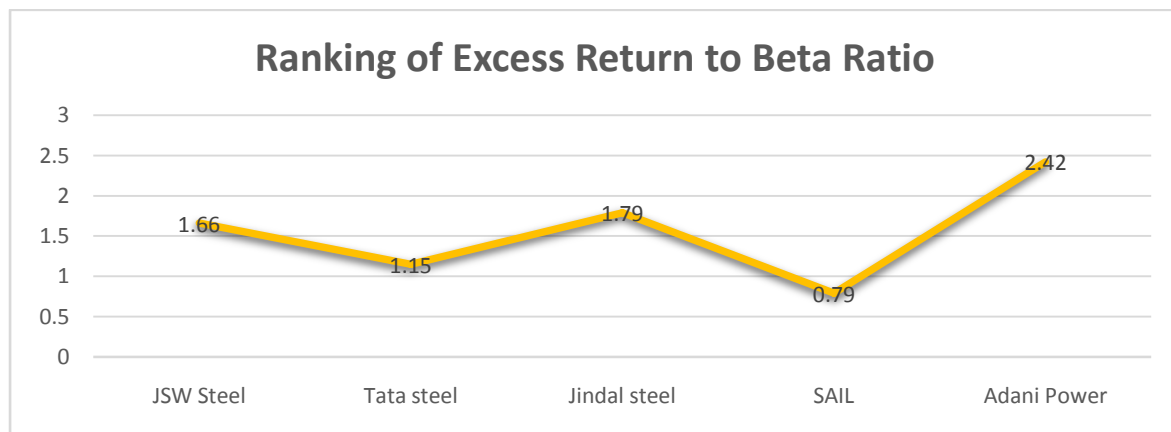
Where, R_i = Return on company security., R_f = Risk-free rate of return., β = Systematic risk.

Then the stocks are ranked according to the excess return to beta ratio.

Table 3
 Calculation of Excess Return to Beta Ratio

| Company | Ri | Rf | Beta (β) | Ri-Rf/ β | Rank |
|--------------|------|--------|------------------|----------------|------|
| JSW Steel | 2.57 | 0.5583 | 1.21 | 1.66 | 3 |
| Tata steel | 2.12 | 0.5583 | 1.35 | 1.15 | 4 |
| Jindal steel | 3.94 | 0.5583 | 1.88 | 1.79 | 2 |
| SAIL | 2.12 | 0.5583 | 1.96 | 0.79 | 5 |
| Adani Power | 3.53 | 0.5583 | 1.22 | 2.42 | 1 |

Fig. 2
 Calculation of Excess Return to Beta Ratio



Interpretation:



It can be seen from the table that Adani Power has the maximum excess return to the beta ratio (2.42) and ranked 1 among the companies selected followed by Jindal steel with (1.79). and SAIL yielded the lowest excess return to the beta of 0.79

According to the Sharpe model, the excess return of any stock is directly related to its excess return to beta ratio. It deals the extra return on security (excess of the riskless asset return) as per unit of systematic risk. The ratio shows a relationship between sufficient risk and reward. For the calculation of this ratio, the risk-free return (Rf) is taken as the rate of return on the monthly average of Fixed deposit interest rate which is found to be 0.5583% for the period under study. Ranking of the stocks is done based on their excess return to beta. Based on the excess return to beta ratio the scrips are ranked from 1 to 5, with Adani power in the first rank followed by Jindal Steel and SAIL in the last.

4.4 Calculation of Cut-Off Point

The securities are rearranged based on the rank of (Ri - Rf)/ β Ratio.

the cut-off rate is calculated using the formulae
$$C_i = \frac{\sigma_m^2 \sum_{i=1}^N (R_i - R_f) \beta_i}{1 + \sigma_m^2 \sum_{i=1}^N \frac{\beta_i^2}{\sigma_{e_i}^2}}$$

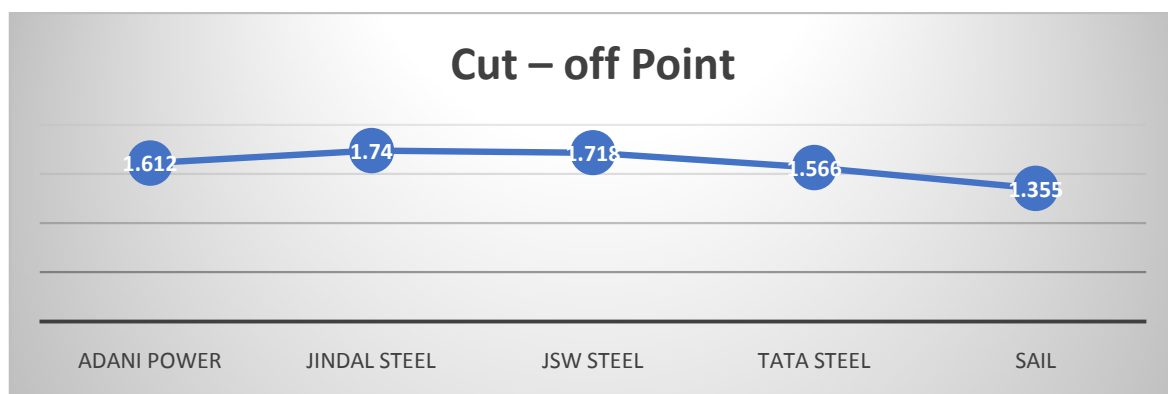
The calculation of the cut-off point is shown that the cut-off point Ci shows a character of increasing gradually and after reaching a peak value it start decreasing gradually. This point is the highest cut-off rate and it will be denoted as C*.

The cut-off point fixes which securities are to be comprised in the portfolio. The Securities with (Ri-Rf)/ β values up to cut-off point C* are included in the portfolio. Securities with (Ri-Rf)/ β values beyond cut off point are excluded from the portfolio.

Table 4
Calculation of cut – off Point

| Company | Ri-Rf/β | (Ri-Rf) *βi/ σ2 | Σ(Ri-Rf) βi/ σei2 | βi2/σei2 | Σ βi2/σei2 | Ci |
|--------------|---------|-----------------|-------------------|----------|------------|-------|
| Adani Power | 2.421 | 0.168 | 0.168 | 0.069 | 0.069 | 1.612 |
| Jindal Steel | 1.798 | 0.413 | 0.581 | 0.229 | 0.229 | 1.740 |
| JSW Steel | 1.662 | 0.220 | 0.802 | 0.132 | 0.432 | 1.718 |
| TATA Steel | 1.156 | 0.200 | 1.003 | 0.173 | 0.605 | 1.566 |
| SAIL | 0.795 | 0.192 | 1.195 | 0.241 | 0.847 | 1.355 |

Fig. 3
Cut – off Point



Interpretation:

The selection of the stocks depends on a unique cut-off rate such that all stocks with higher ratios of excess return to the beta are included and stocks with lower ratios are left out. The added values of C_i begins to declining after a particular C_i and that point is considered as the cut-off point and that stock ratio is the Cut-off Ratio C . The highest value of C_i is taken as the cut-off point which is C^* .

From the table, it is seen that Tata Steel has the highest the cut-off rate of $C^* = 1.740$. All the stocks having C_i greater than C^* can be included in the portfolio.

4.6 Calculation of Optimal Portfolio:

The proportion to be invested in each security (weight) is calculated using the following equation.

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

Where

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

C^* is the cut off rate

Table 5

The calculation of optimal portfolio is shown in the table below

| Company | B_i | $\sigma_{e_i}^2$ | $R_i - R_f / \beta_i$ | C^* | Z_i | $\sum Z_i$ | X_i |
|--------------|-------|------------------|-----------------------|-------|-------|------------|-------|
| Adani Power | 1.510 | 21.69 | 2.421 | 1.740 | 0.047 | 0.047 | 0.779 |
| Jindal Steel | 3.535 | 15.39 | 1.798 | 1.740 | 0.013 | 0.060 | 0.220 |

Interpretation:

After determining the securities to be included in the optimal portfolio, we have to determine the proportion of investment in each of these stocks. Only those stocks with Excess return to beta ratio more than C^* are to be selected in the optimal portfolio. It can be observed from the above table that only two stocks qualify to be included in the optimal portfolio on this criterion.

By using Sharpe index model, The maximum investment should be made in Adani Power with a proportion of 77.90%, and in Jindal Steel with investment proportion of 22.10%. Evidently, the companies chosen for the investments are growing at a steady rate in recent years.

5. FINDINGS AND SUGGESTIONS

5.1 Findings

From the above study, these are the findings and suggestions for investors and Top level management as follows

5.1.1 Impact of selected stocks returns on the returns of NIFTY index

It has been observed that there is impact of selected stocks for optimal portfolio returns on the NIFTY market returns for the period from 1st January 2017 to 31st December 2021 more likely with Jindal Steel & Power Returns and Adani Power Returns.

Reject the null hypothesis H_0 1: There is no significant relationship between the impact of selected stocks for optimal portfolio on the market price volatility NIFTY index.

5.1.2 Return and Risk

- The Jindal Steel company yields the highest return of 3.94% and Tata steel and SAIL yield the lowest return of 2.12%.
- Adani Power has highest risk of 22.92% and TATA steel has lowest risk of 11.89%.

➤ **Beta**

- From the above study, It reveals that SAIL has the highest beta of 1.962
- The JSW Steel has lowest beta of 1.214



➤ **Excess return to beta ratio**

- After calculating the Excess return to beta ratio, it is observed that
- The Adani Power has highest excess return to the beta ratio of 2.421 and ranked 1 among the selected companies.
- The SAIL has lowest excess return to beta ratio of 0.7959 and Ranked 5 among the selected companies.

Reject null Hypothesis HO2: There is no significant relationship between the excess return to beta ratio, ranking the stocks based on it and evaluating the cut-off point based on it.

5.1.3 Optimal Portfolio

The study reveals that there are two companies are there in the optimal portfolio Adani Power with a proportion of 77.90% and Jindal steel with the proportion of 22.10%.

Reject null Hypothesis HO3: There is no significant relationship between the proportion of investment to be made into each of the select stocks and the optimal stock portfolio.

5.2 Suggestions

The study using Sharpe's single index model suggests that investing in Adani Power with the proportion of 77.90% and The Jindal steel with a proportion of 22.10% is the Optimal Portfolio.

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