**A study of Portfolio Construction using Markowitz Model and Capital Asset Pricing model (CAPM)**

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**Abstract:**

This research study explores the construction of an optimal investment portfolio using the Markowitz Model and the Capital Asset Pricing Model (CAPM). The Markowitz Model, also known as Modern Portfolio Theory (MPT), provides a mathematical framework for selecting and managing a portfolio by analyzing the risk-return tradeoff for individual assets. By leveraging historical market data, this model identifies an optimal combination of assets that maximizes expected returns while minimizing risk through diversification. The Capital Asset Pricing Model (CAPM), on the other hand, is used to quantify the relationship between an asset's systematic risk and its expected return. CAPM allows for the estimation of expected returns based on a firm's beta coefficient, which measures sensitivity to market fluctuations.

This study constructs a well-diversified portfolio consisting of ten companies from various industries, utilizing historical financial data obtained from sources such as the National Stock Exchange (NSE), Investing.com, Yahoo Finance, and Google Finance. The selection of assets is guided by their risk-return characteristics, ensuring a balanced representation of firms with different levels of market exposure. The research employs quantitative analysis techniques, including risk and return calculations, variance and covariance analysis, Sharpe Ratio assessment, and CAPM regression modeling. These analytical tools are applied using software such as Microsoft Excel and SPSS, ensuring robust statistical evaluations of portfolio performance.

**Keywords:**
Markowitz Model, Modern Portfolio Theory, Capital Asset Pricing Model (CAPM), Risk-Return Tradeoff, Portfolio Optimization, Systematic Risk, Beta Coefficient, Diversification, Sharpe Ratio, Regression Analysis, Stock Market, Investment Portfolio, Financial Modeling

**Introduction:**

Investment refers to the allocation of funds in financial or real assets to generate returns over time. It involves purchasing assets such as stocks, bonds, or real estate to build wealth and create an additional source of income. Unlike consumption, where assets are used for immediate needs, investment aims to enhance financial stability and accumulate wealth for the future.

A portfolio is a collection of financial assets held by an individual or an institution to achieve financial goals. Portfolios typically include stocks, bonds, real estate, gold, and other investment vehicles. A well-diversified portfolio helps investors mitigate risks by spreading investments across various asset classes, reducing exposure to individual asset fluctuations.

The Markowitz Model, developed by Harry Markowitz in the 1950s, is a fundamental framework for constructing investment portfolios. It emphasizes diversification to optimize the trade-off between risk and return. By analyzing expected returns, variances, and covariances of assets, the model generates an efficient frontier, which consists of the optimal portfolio combinations that offer the highest return for a given level of risk. This model revolutionized financial decision-making by proving that diversification reduces risk without compromising returns.

The Capital Asset Pricing Model (CAPM) helps determine the expected return of an asset based on its systematic risk, measured by beta. The CAPM equation states that an asset's expected return is equal to the risk-free rate plus a risk premium proportional to the asset’s beta. This model enables investors to assess whether a stock is overvalued or undervalued by comparing its expected return with its actual performance in the market.

**Research Objective and Portfolio Construction**

This study applies the Markowitz Model and CAPM to construct an optimal portfolio comprising 10 companies from diverse sectors. Using the Markowitz Model, we analyze the risk-return tradeoff of each company and identify an optimal portfolio that maximizes returns for a given level of risk. By calculating the expected return, variance, and covariance of each company's stock, we derive an efficient frontier that represents the best portfolio combinations.

Additionally, CAPM helps estimate the expected return of each company based on its systematic risk relative to the market. This combination of models ensures an optimal and diversified portfolio that balances risk and return. The selected companies come from various sectors to enhance diversification, reduce unsystematic risk, and improve overall portfolio performance.

Through this research, we demonstrate the effectiveness of MPT and CAPM in constructing a risk-optimized portfolio, suitable for risk-averse investors seeking stable and enhanced returns.

**Literature review:**

**Saravanan A. Nataraja P.:** made a review on Advances in Management; the study suggests that optimal portfolio can be constructed by using Sharpe’s Single Index Model using NSE; NIFTY 50 stocks have been used as market index for constructing the portfolio. This study uses data on daily bases for a certain period of time which involves a unique way off formulating known as cut off point and later the percentage of each stock is selected along with their respective weights and other variance and covariance. The optimal portfolio considers four best stocks selected from the nifty fifty short listed stocks or scripts obtaining the return of 0.116%.

**Aditya Jaiswal, Anshuman Pathak, Atish Kumar Majee, Kushagra Kumar , Manas Kumar Sarkar , Soubhik Maji (2023):** One of the most popular machine learning methods used today; enables a computer system to learn how to make choices by being rewarded for its successes. RL can be considered to be an extremely powerful tool for optimization and decision-making. It is an approach to machine learning in which the agents are trained to make a sequence of decisions. An agent can learn a sequence of actions to maximize rewards and thereby achieve the desired goal. In portfolio optimization, the agent is the portfolio manager, the environment is the financial market, the actions are the portfolio allocations, and the rewards are the portfolio returns.

**ARPIT AWAD, AADITYA RAJ, GOURAV RAY, PUSPARNA CHAKRABORTY, SANKET DAS, SUBHASMITA MISHRA (2022):** Stock market offers platform where people buy and sell shares of publicly listed companies. Generally stock prices are quite volatile; hence predicting them is daunting task. There are still many researches going to develop more accuracy in stock price prediction. Portfolio construction refers to allocation of different sector stocks optimally to achieve maximum return by taking minimum risk. A good portfolio can help investor earn maximum profit by taking minimum risk. Beginning from Dow Jones Theory a lot of advancement has happened in area of building efficient portfolio. In this project we have tried to predict future value of few stocks from six important sectors of Indian economy and also built portfolio. As part of the project, our team has conducted a study of performance of various Time series, machine learning (regression and classification) and deep learning models in stock price prediction on selected stocks from the chosen six important sectors of the economy. As part of building an efficient portfolio we have studied multiple portfolio optimization theories beginning from MPT (Modern Portfolio theory). We have built minimum variance portfolio and optimal risk portfolio for all the six chosen sectors by using past five years’ daily stock price as training data and have also conducted back testing to check the performance of the portfolio. We look forward to continue our study in area of stock price prediction and asset allocation and consider this project as first stepping stone.

**Loana Coralia Zavera (2017):** in his paper titled, “Application of Markowitz Model on Romanian Stock Market”, tested application of Markowitz model in Romanian market by creating a portfolio comprised of three securities. The study achieved its target of the practical application of Markowitz model to set up an optimal portfolio and the author concluded that by investing in efficient portfolios - the ones located on the efficient frontier, investors afford to get maximum return on investment given a certain level of risk.

**Bilal Aslam, Rubaiyat Ahsan Bhuiyan, and Changyong Zhang (2023):** Constructing a portfolio from a large number of active stocks is a critical as well as challenging investment decision due to high volatility and biased decision making. The abundance and availability of financial data gives machine learning (ML) an advantage to optimize investment decisions. The k-means algorithm is used to cluster observations into different groups, each of which contains those with similar properties. In this paper, three factors are considered to cluster stocks and select clusters with best performing stocks for portfolio construction. It enhances the cardinal investment decision of stock selection to construct optimized portfolios. The out-of-sample performance demonstrates high economic gains from the proposed strategy with an average Sharpe ratio of 0.7.

**Debajit RABHA & Dr. Rajkumar Girdhari (2022):** Portfolio plays an important role for an investor as it reduces the risk and maximize the return on investment. But portfolio construction is a complicated process. To ease the process of portfolio construction many academicians developed optimal portfolio construction model, the Sharpe Single Index model is one of them. The present study has used the Sharpe Single Index model to construct an optimal portfolio in the Indian Capital Market using blue chip companies listed with NSE from 1st January 2011 to 21st January 2021. For the present study total 27 blue chip stocks were found and their weekly and monthly closing price data collected. After analysis of the data the study found that for the weekly data out of 27 securities only 1 security is found to be eligible for the optimal portfolio whereas 18 securities are found for the monthly data. The reason for finding this contrary result may be due to data variation. So, from this finding we can say that for the particular model it is better to use monthly data rather than using daily or weekly data which are too volatile to predict the returns of the securities and construct a portfolio. The result of the study would be useful to long-term investors who can either copy this portfolio or pick and choose from among these stocks.

**Dr UMA Kumar (2023):** The creation of an ideal portfolio has grown more difficult in recent years, for making wise investing decisions; an investor has to have a solid understanding of security analysis and portfolio theory. The primary goal of this study is to use the Sharpe Single Index Model (SIM) to build an ideal portfolio for the Indian Market. Sharpe Single Index Model (SIM) is preferred over the Markowitz Model because it takes fewer inputs and is simpler to compute. Investors are always looking to take risks and put their money into various investment products in order to earn a decent return. They usually invest their savings in the highly volatile stock Market. This volatility is referred to as the risk of the market, and in order to protect investors from these volatilities, the stock market has developed a new concept called a portfolio. With a portfolio, investors have the opportunity to lower their risk by dividing their total investment into a group of securities. Maximizing returns with the least amount of risk is a key factor for any investor to consider when selecting stocks for a portfolio. This research paper main goal is to use the Sharpe Single Index Model to build an ideal portfolio out of equities that are listed on the NSE Nifty 50. For the aim of this study, monthly data for NSE Nifty 50 stocks from 1st August 2017 to 31st July 2022 have been taken into account. The study reveals that only eight companies out of 50 are suitable for portfolio construction, by using Sharpe's Single Index Model. They are Power Grid, Coal India, Tata Consumer Products, Bajaj Auto, Tata Consultancy, Titan Company, ITC, and Tech Mahindra. So, the study concludes that this information serves to be beneficial for investors and other market participants in selecting stocks to form a portfolio and maximize their return.

**Dr. N Krishnamoorthy and Mahabub Basha S (2020):** The main thrust of this study is to construct optimal portfolio using Sharpe single index model with reference to BSE Sensex. Portfolio construction is an important process for the investors/ portfolio managers in the capital markets. In this paper we made an attempt to apply Sharpe single index model to BSE Sensex 30 stocks. In order to construct the portfolio of BSE Sensex 30 stocks with 5 years data i.e from June 2016 to July 2021 have considered. The proposed method formulates a unique cut-off rate and selects those securities to construct optimal portfolio and whose excess return to beta ratio is higher than the cut off rate. Study found that nine stocks included in optimal portfolio and highest weightage of funds allocated in Dr reddy‘s Labs. It is concluded that the pre and post Covid-19 period Pharmaceutical and Financial services companies posted reasonable returns and highest risk in the study period.

**Evangelos Ioannidis, Iordanis Sarikeisoglou and Georgios Angelidis (2023):** A key parameter when investing is Time Horizon. One of the biggest mistakes investors make is not aligning the timeline of their goals with their investment portfolio. In other words, time horizons determine the investment portfolio you should construct. We examine which portfolios are the best for long-term investing, short-term investing, and intraday trading. This study presents a novel approach for portfolio construction based on Network Science. We use daily returns of stocks that compose the Dow Jones Industrial Average (DJIA) for a 25-year period from 1998 to 2022. Stock networks are estimated from (i) Pearson correlation (undirected linear statistical correlations), as well as (ii) Transfer Entropy (directed non-linear causal relationships). Portfolios are constructed in two main ways: (a) only four stocks are selected, depending on their centrality, with Markowitz investing weights, or (b) all stocks are selected with centrality-based investing weights. Portfolio performance is evaluated in terms of the following indicators: return, risk (total and systematic), and risk-adjusted return (Sharpe ratio and Treynor ratio). Results are compared against two benchmarks: the index DJIA, and the Markowitz portfolio based on Modern Portfolio Theory. The key findings are as follows: (1) Peripheral portfolios of low centrality stocks based on Pearson correlation network are the best in the long-term, achieving an extremely high cumulative return of around 3000% as well as high risk-adjusted return; (2) Markowitz portfolio is the safest in the long-term, while on the contrary, central portfolios of high centrality stocks based on Pearson correlation network are the riskiest; (3) In times of crisis, no portfolio is always the best. However, portfolios based on Transfer Entropy network perform better in most of the crises; (4) Portfolios of all stocks selected with centrality-based investing weights outperform in both short-term investing and intraday trading. A stock brokerage company may utilize the above findings of our work to enhance its portfolio management services.

**HENRIQUES AND ORTEGA:** We study different implementations of the sparse portfolio construction and rebalancing method introduced by Brodie et al. (Brodie, J., I. Daubechies, C. De Mol, D. Giannone, and I. Loris. 2009. “Sparse and Stable Markowitz Portfolios.” PNAS 106 (30): 12267–12272). This technique is based on the use of a l1-norm (sum of the absolute values) type penalization on the portfolio weights vector that regularizes the Markowitz portfolio selection problem by automatically eliminating the dynamical redundancies present in the time evolution of asset prices. We make specific recommendations as to the different estimation techniques for the parameters needed in the use of the method and we prove its good performance in realistic situations involving different rebalancing frequencies and transaction costs. Our empirical findings show that the beneficial effects of the use of sparsity constraints are robust with respect to the choice of trend and covariance estimation methods used in its implementation.

**Research methodology:**

It provides a systematic approach to conducting a study. It ensures legitimacy, accuracy, and scientific validity in research findings. This study aims to analyze the effectiveness of the **Markowitz Model** and **Capital Asset Pricing Model (CAPM)** in constructing optimal portfolios in the Indian stock market. By using historical stock data, the study compares the performance of portfolios built using both models to optimize returns and minimize risk.

**Problem Statement:**

Despite the widespread use of the **Markowitz Model** and **CAPM**, limited research exists on their comparative performance in the Indian stock market. This study addresses this gap by evaluating how well these models optimize portfolio returns while minimizing risk. Using historical data, the research will construct optimal portfolios and compare their effectiveness.

**Objectives of the Study:**

**Determining the Optimal Portfolio for Maximum Returns** – Constructing portfolios that maximize returns based on risk.

**Exploring the Concept of Diversification for Risk Minimization** – Understanding how diversification reduces investment risk.

**Examining the Impact of Asset Weights and Correlations on Risk and Return** – Analyzing how asset allocation affects portfolio performance.

**Research Design**

This study follows a **Descriptive Research Design**, which allows for the examination and summarization of **secondary data** from the stock market. Descriptive research helps analyze **trends, patterns, and statistical relationships** in financial data, providing a comprehensive understanding of portfolio performance.

**Data Collection:**

**Data Source:** The study relies on **secondary data,** obtained from sources such as **NSE, Investing.com, Yahoo Finance, and Google Finance.**

**Secondary Data:** Includes historical stock prices, financial reports, and research papers. This data is crucial for analyzing risk-return characteristics and constructing portfolios.

The study selects **10 companies** from **five key industries** to ensure diversification in the portfolio.

**Industries and Selected Companies:**

**IT Industry:** Tata Consultancy Services (TCS), Infosys

**Banking & Financial Industry:** SBI Bank, ICICI Bank

**Fast-Moving Consumer Goods (FMCG):** Hindustan Unilever (HUL), Nestlé India

**Pharmaceutical Industry:** Sun Pharmaceutical, Cipla

**Automotive Industry:** Tata Motors, Maruti Suzuki

The **historical stock prices** from **January 1, 2014, to December 1, 2024**, are analyzed using **monthly data** collected from **Investing.com**.

**Tools and Techniques Used for Analysis**

**Microsoft Excel** – For data management, visualization, and basic calculations.

**SPSS (Statistical Package for the Social Sciences)** – For statistical modeling and regression analysis.

**Techniques Applied:**

**Risk & Return Analysis** – Evaluates expected returns and volatility.

**Variance Calculation** – Measures the dispersion of stock returns.

**Covariance Analysis** – Determines relationships between asset returns.

**Sharpe Ratio** – Assesses risk-adjusted return to evaluate portfolio efficiency.

**CAPM Regression** – Estimates expected returns based on systematic risk (beta).

**DATA COLLECTION AND INTERPRETETION**

**Average Annual and monthly Return and Variance:**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Avg. monthly return | 1.56% | 1.38% | 1.82% | 1.88% | 1.27% | 1.32% | 1.19% | 1.25% | 1.56% | 1.83% |
| Monthly variance | 1.95% | 0.53% | 1.01% | 0.65% | 0.37% | 0.34% | 0.67% | 0.58% | 1.95% | 0.68% |
| Avg. annual return | 18.77% | 16.50% | 21.89% | 22.52% | 15.28% | 15.80% | 14.26% | 15.02% | 18.77% | 21.91% |
| Annual variance | 23.45% | 6.30% | 12.17% | 7.82% | 4.40% | 4.07% | 8.07% | 6.90% | 23.45% | 8.14% |

**Interpretation:**

The given data showcases the average monthly and annual returns, along with variances, for TCS, Infosys, SBI, ICICI, HUL, Nestlé India, Sun Pharma, Cipla, Tata Motors, and Maruti Suzuki.

The average monthly returns range between 1.19% (Sun Pharma) and 1.88% (ICICI), indicating consistent growth across these companies, with ICICI achieving the highest short-term return. Monthly variance, which reflects short-term risk, varies significantly, with TCS and Tata Motors having the highest volatility (1.95%) and Nestlé India exhibiting the lowest (0.34%).Annual returns align proportionally with monthly returns, spanning from 14.26% (Sun Pharma) to 22.52% (ICICI). TCS, Tata Motors, and Maruti Suzuki also exhibit high annual returns exceeding 18%, reinforcing their growth potential. However, the annual variances show variability in long-term risks, ranging from 4.07% for Nestlé India (lowest risk) to 23.45% for TCS and Tata Motors (highest risk). This indicates that higher returns often accompany higher risks.

**Annual Returns:**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TCS | INFOSYS | SBI | ICICI | HUL | NETSLE INDIA | SUN PHAR. | CIPLA | TATA MOTORS | MARUTI SUZUKI | Risk Free rate |
| 18.77% | 16.50% | 21.89% | 22.52% | 15.28% | 15.80% | 14.26% | 15.02% | 18.77% | 21.91% | 7.37% |

**Interpretation:**

The annual returns data reveals the performance of various companies relative to each other and the risk-free rate of 7.37%. Among the companies analyzed, ICICI demonstrates the highest annual return at 22.52%, closely followed by Maruti Suzuki (21.91%) and SBI (21.89%). These returns indicate strong growth potential, making them attractive options for investors willing to assume some risk.On the other hand, Sun Pharma (14.26%), Nestlé India (15.80%), HUL (15.28%), and Cipla (15.02%) exhibit relatively lower annual returns, though they still outperform the risk-free rate. These companies may appeal to investors seeking steadier returns with moderate growth.

TCS and Tata Motors, both achieving 18.77% annual returns, offer a balanced profile of growth and risk, placing them in a middle ground among the analyzed companies. Infosys delivers a return of 16.50%, which is higher than the risk-free rate but lower than the most high-performing stocks in this list.

**Variance Covariance Matrix:**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | TCS | INFOSYS | SBI | ICICI | HUL | NETSLE INDIA | SUN PHAR. | CIPLA | TATA MOTORS | MARUTI SUZUKI |
| TCS | 23.27% | 1.61% | 7.79% | 6.76% | 0.16% | 1.17% | 3.60% | 3.05% | 23.27% | 5.90% |
| INFOSYS | 1.61% | 6.25% | 0.41% | 0.89% | 0.68% | 0.52% | 2.52% | 1.81% | 1.61% | 0.46% |
| SBI | 7.79% | 0.41% | 12.08% | 7.23% | 0.52% | 0.99% | 0.39% | -0.09% | 7.79% | 3.84% |
| ICICI | 6.76% | 0.89% | 7.23% | 7.76% | 0.96% | 1.79% | 1.02% | 0.27% | 6.76% | 3.74% |
| HUL | 0.16% | 0.68% | 0.52% | 0.96% | 4.36% | 2.11% | 0.08% | 0.41% | 0.16% | 1.54% |
| NESTLE | 1.17% | 0.52% | 0.99% | 1.79% | 2.11% | 4.04% | 0.86% | 0.81% | 1.17% | 2.12% |
| SUN PHARMA | 3.60% | 2.52% | 0.39% | 1.02% | 0.08% | 0.86% | 8.01% | 4.10% | 3.60% | 0.72% |
| CIPLA | 3.05% | 1.81% | -0.09% | 0.27% | 0.41% | 0.81% | 4.10% | 6.85% | 3.05% | 1.75% |
| TATA MOTORS | 23.27% | 1.61% | 7.79% | 6.76% | 0.16% | 1.17% | 3.60% | 3.05% | 23.27% | 5.90% |
| MARUTI SUZUKI | 5.90% | 0.46% | 3.84% | 3.74% | 1.54% | 2.12% | 0.72% | 1.75% | 5.90% | 8.08% |

**Interpretation:**

The variance-covariance matrix provides insights into the volatility (variance) of individual stocks and the degree of their relationships (covariance) with others. Variance measures a stock's risk (volatility), while covariance highlights how two stocks move in relation to each other.From the matrix, TCS and Tata Motors exhibit the highest variance (23.27%), indicating that these stocks are the most volatile, presenting both high risk and potential high returns. On the other hand, HUL and Nestlé India have lower variances (4.36% and 4.04%, respectively), suggesting they are less volatile and thus more stable investments.The covariances reveal the degree of correlation between the stocks. For example, TCS shows significant positive covariance with Tata Motors (23.27%) and moderate covariance with SBI (7.79%) and ICICI (6.76%). This suggests that TCS shares similar movement trends with these stocks. Conversely, SBI and Cipla display a slightly negative covariance (-0.09%), indicating their returns tend to move in opposite directions.Sun Pharma has relatively high covariance with Cipla (4.10%) and Infosys (2.52%), suggesting these companies' returns often move together. However, it exhibits lower covariance with HUL (0.08%), indicating minimal correlation between their returns. Maruti Suzuki, while showing moderate variance (8.08%), has higher covariance with ICICI (3.74%) and Tata Motors (5.90%), suggesting some alignment in movement patterns. Conversely, it shows low covariance with HUL (1.54%) and Sun Pharma (0.72%), reflecting weaker relationships. Overall, this matrix highlights which stocks may share similar risks and returns. Highly volatile stocks like TCS and Tata Motors are strongly correlated with each other, while stable stocks like HUL and Nestlé India demonstrate limited connections with others, making them less dependent on broader market trends. This information can be used to diversify portfolios and manage risk.

**Equally Weighted Portfolio:**

|  |  |
| --- | --- |
| Equally Weighted Portfolio |  |
|  | Weight |
| TCS | 10% |
| INFOSYS | 10% |
| SBI | 10% |
| ICICI | 10% |
| HUL | 10% |
| NESTLE | 10% |
| SUN PHAR. | 10% |
| CIPLA | 10% |
| TATA MOTOR | 10% |
| MARUTI SUZUKI | 10% |
| SUM | 100% |
| Expected Return | 18.07% |
| SD. | 18.86% |
| Sharpe ratio | 56.78% |

**Interpretation:**

The table presents the performance details of an equally weighted portfolio consisting of 10 stocks: TCS, Infosys, SBI, ICICI, HUL, Nestle, Sun Pharmaceutical, Cipla, Tata Motors, and Maruti Suzuki, each with an equal weight of 10%. The total weight of the portfolio sums to 100%. The expected return for the portfolio is 18.07%, indicating the average return anticipated from the combined holdings of these stocks. The portfolio has a standard deviation of 18.86%, which reflects the degree of volatility or risk associated with the portfolio's returns. The Sharpe ratio, a measure of risk-adjusted return, is reported at 56.78%, which suggests that the portfolio has achieved a high return per unit of risk taken. This implies that the portfolio is relatively efficient in terms of generating returns for the level of risk involved.

**Optimal Weighted Portfolio:**

|  |  |
| --- | --- |
| Optimal Risky portfolio |  |
|  | Weight |
| TCS | 0% |
| INFOSYS | 20% |
| SBI | 5% |
| ICICI | 20% |
| HUL | 18% |
| NESTLE | 11% |
| SUN PHAR. | 1% |
| CIPLA | 10% |
| TATA MOTOR | 0% |
| MARUTI SUZUKI | 15% |
| SUM | 100% |
| Expected return | 18.40% |
| SD. | 15.06% |
| Sharpe ratio | 73.25% |
|  |  |

**Interpretation:**

The table presents the performance of an optimal risky portfolio with adjusted stock weights designed to maximize the portfolio’s return per unit of risk. The portfolio includes 10 stocks, with varying weights assigned to each stock. Notably, Infosys, ICICI, and HUL have the highest weights of 20%, 20%, and 18%, respectively, while TCS, Tata Motors, and Sun Pharmaceutical have no allocation or a very minimal one. The total portfolio weight sums to 100%. The expected return for the optimal risky portfolio is 18.40%, slightly higher than the equally weighted portfolio's expected return. The portfolio's standard deviation (SD) is 15.06%, indicating a lower level of risk or volatility compared to the equally weighted portfolio (18.86%). The Sharpe ratio for this portfolio is 73.25%, a significant improvement over the equally weighted portfolio’s Sharpe ratio of 56.78%. This indicates that the optimal risky portfolio delivers a higher return per unit of risk, making it more efficient in terms of risk-adjusted performance compared to the equally weighted portfolio.

**Finding:**

The ideal equally weighted portfolio, which is formed on the basis of the Markowitz model and Capital Asset Pricing model (CAPM), attempts to achieve an optimal trade-off between risk and return by dividing investments equally among selected companies.

The study utilizes secondary data obtained from websites like NSE, Investing.Com, Yahoo Finance, and Google Finance.

The study sample consists of 10 companies from various sectors: IT, Banking, Finance, FMCG, Pharmaceuticals, and Automotive.

Analysis is performed through instruments like Excel and SPSS, and methods like Risk & Return analysis, Variance, Covariance, Sharpe Ratio, and CAPM Regression.

The Markowitz Model enables us to analyze the risk-return tradeoff of each firm and identify the most appropriate mix of portfolio that will give maximum returns for a given amount of risk.

CAPM provides a framework for determining the expected return of each company based on its systematic risk, or beta, relative to the market as a whole.

The portfolio consists of 10 companies in different industries, providing a well-diversified asset base to be able to minimize risk and maximize returns.

Analysis was done with the assistance of Excel and SPSS for data handling and calculation related to the research.

**CAPM Regression:**

TCS has a moderate positive correlation between its return and the market's return. TCS is more unstable than the market.

Infosys has a moderate positive correlation between its return and the market's return. The model explains a small portion of the variation in Infosys's returns.

The return of SBI has high positive correlation with the market return. The model explains a huge percentage of SBI's return variation.

The return of ICICI shows high positive correlation with the return of the market. The model explains a big percentage of variation in ICICI's return.

HUL has a poor positive correlation between its returns and the market return. The model's explanatory power for the behavior of HUL's returns is poor.

Nestle India: It shows a weak positive correlation between Nestle India's returns and the market return. The model explains only a portion of the variance in Nestle India's returns.

Sun Pharmaceutical Industries: The results indicate a poor positive relationship between Sun Pharma returns and the market return. The model is a poor one to explain Sun Pharma return movements.

Cipla: The results indicate a poor positive relationship between Cipla returns and the market return. The model is a poor one to explain variation in Cipla returns.

Tata Motors: The profile is similar to that of TCS, representing a moderate positive relationship of returns between Tata Motors and the return of the market with Tata Motors exhibiting greater volatility.

The study concludes that this information is useful for investors and other market participants in the selection of stocks to form a portfolio and maximize their return.

**Conclusion:**

The aim of this research study was to construct an effective portfolio using the integration of the Markowitz Model and the Capital Asset Pricing Model (CAPM). The Markowitz Model was applied to analyze the risk-return tradeoff for all 10 selected companies from 5 industries. This analysis assisted in obtaining an estimate of a portfolio that would maximize returns for a given level of risk. In support of this, CAPM provided a framework for explaining the return each company is expected to earn as a function of its systematic risk measured through its beta value relative to the market. The integration of these two frameworks enabled the construction of an optimal diversified portfolio, tailored to a specific risk level and equivalent to the systematic risk exposure of each company. The study used secondary data acquired through websites like NSE, Investing.com, Yahoo Finance, and Google Finance. The research established the primary findings as developing an optimal risky portfolio. The portfolio was characterized through stock weights scrupulously adjusted to get maximum return for a unit of risk. Specifically, the optimal risky portfolio had an expected return of 18.40%, standard deviation of 15.06%, and a Sharpe ratio of 73.25%. Further, CAPM regression for all 10 companies gave some vital information regarding market return versus the return on each company individually. This was both by the establishment of beta values as well as by examining if the vital relation existed or not. Overall, the study promotes an improved understanding of portfolio construction methods using the Markowitz Model and CAPM, thus enlightening the real methods of optimizing returns in a portfolio as well as reducing risk within the Indian stock market scenario.

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