

# **CONSTRUCTION OF OPTIMAL PORTFOLIO ON SELECTED STOCKS OF NSE USING SHARPE'S SINGLE INDEX MODEL AND MARKOWITZ MODEL**

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DOI: <https://www.doi.org/10.58257/IJPREMS35917>

## **ABSTRACT**

This research paper investigates the construction of an optimal portfolio using Sharpe's Single Index Model and the Markowitz Model. The study focuses on selected stocks from the National Stock Exchange (NSE), specifically the Nifty 50 index. The key objective is to maximize returns while minimizing risk by leveraging quantitative models. Data from June 2019 to June 2024 was analyzed using historical return data for portfolio construction. The results show that portfolios optimized with the Sharpe and Markowitz models provide different risk-return profiles, allowing investors to make informed decisions based on their risk tolerance. The study offers insights into how these models can help construct efficient portfolios that align with an investor's financial goals.

## **1. INTRODUCTION**

Investing involves allocating financial resources to generate future income or capital appreciation. One key strategy in investment management is constructing a portfolio, which helps diversify risk while maximizing returns. A portfolio is a combination of various financial instruments, such as stocks, bonds, and commodities. The goal of portfolio construction is to maximize returns for a given level of risk, which is essential for prudent investment management.

The stock market plays a pivotal role in the economy, providing a platform for buying and selling financial assets like stocks and bonds. The Nifty 50 index is a benchmark in the Indian stock market, comprising 50 of the most liquid and large-cap stocks. To construct an optimal portfolio, it is important to consider both the return and risk characteristics of stocks.

Two widely recognized portfolio optimization models are Sharpe's Single Index Model (SIM) and Markowitz's Modern Portfolio Theory (MPT). SIM simplifies the selection of stocks by using a single market index to estimate systematic risk, while MPT focuses on diversification to optimize the risk-return trade-off.

## **2. LITERATURE REVIEW**

1. Bhattacharya and Singh (2022) conducted a comparative study on Sharpe's Single Index Model (SIM) and the Markowitz Model in the Indian stock market. Their results showed that the Markowitz Model provides better diversification and risk management. In contrast, SIM is more suited for investors looking for a simpler and quicker portfolio construction method.
2. Qin (2022) evaluated the efficiency of SIM and the Markowitz Model in the Chinese stock market. Qin found that while SIM offers higher returns for moderate risk, the Markowitz Model excels in long-term risk diversification. The study highlights the strengths of each model based on different investor goals.
3. Sarker (2015) compared SIM, the Markowitz Model, and the Constant Correlation Model (CCM) using data from the Dhaka Stock Exchange. Sarker concluded that the Markowitz Model produced the best risk-return profile, but SIM was noted for its ease of use and computational efficiency.

## **3. RESEARCH METHODOLOGY**

1. Data Collection: The study uses secondary data from the NSE website, Investing.com, MoneyControl, and Yahoo Finance. The risk-free rate is taken as 6.1081%, derived from the 91-day Treasury Bill rate on the RBI website. The Nifty 50 index is used as the benchmark.
2. Sample: Weekly data from June 6, 2019, to June 30, 2024, was collected for all 50 stocks in the Nifty 50 index.
3. Portfolio Construction:
  - Sharpe's Single Index Model: This model calculates the excess return-to-beta ratio for each stock and ranks them. Stocks with ratios above a certain cut-off point are selected for the portfolio. The allocation of funds to each stock is based on the ratio of excess return to beta.
  - Markowitz Model: The model constructs the portfolio by calculating the covariance between each stock and optimizing the weights to achieve the best risk-return trade-off.

4. Analysis Tools: The following metrics were used to analyze the stocks:

- Mean Return
- Variance
- Beta
- Systematic Risk
- Unsystematic Risk
- Excess Return to Beta Ratio

#### **4. DATA ANALYSIS AND INTERPRETATION**

1. Mean Return Analysis: The mean return for each stock was calculated, with Adani Enterprises showing the highest mean return (0.01461), indicating strong performance. Stocks like Tata Motors (0.00884) and Apollo Hospitals (0.00665) also demonstrated solid growth.
2. Variance Analysis: Variance was calculated to measure the volatility of each stock. AEL had the highest variance (0.00610), signifying higher risk compared to other stocks like Nestle, which had lower variance (0.00077).
3. Beta Analysis: Beta values for the stocks were calculated to assess their market sensitivity. IndusInd Bank showed a beta of 2.07199, indicating high sensitivity to market movements, while Tata Steel had a beta of 0.26219, suggesting lower sensitivity.
4. Systematic and Unsystematic Risk: Systematic risk (market-related) and unsystematic risk (specific to the stock) were analyzed for each security. Adani Enterprises exhibited higher unsystematic risk, which could be mitigated through diversification.
5. Sharpe's Single Index Model: Stocks like Adani Enterprises, Tata Motors, and Hindalco had the highest excess return-to-beta ratios, making them ideal candidates for portfolio inclusion based on Sharpe's model.
6. Markowitz Model: The covariance between stocks was analyzed to create an efficient frontier. The optimal portfolio constructed using the Markowitz model included a diversified selection of stocks with balanced risk-return characteristics.

#### **5. FINDINGS AND SUGGESTIONS**

1. Comparison of Models: The Sharpe Single Index Model offers a simpler approach to portfolio construction by focusing on excess return to beta, making it ideal for investors looking for a quicker method. The Markowitz model, however, provides a more comprehensive portfolio by taking into account the covariance between securities, making it better suited for investors who are willing to spend more time on portfolio diversification.
2. Portfolio Optimization: Investors should consider using a combination of both models depending on their risk tolerance and investment horizon. For short-term investments, the SIM may be more practical, while the Markowitz model is better for long-term, diversified investments.
3. Risk Management: The study emphasizes the importance of balancing systematic and unsystematic risk in portfolio construction. Stocks with high unsystematic risk should be diversified across different industries to minimize overall portfolio risk.

#### **6. CONCLUSION**

This study demonstrates that both Sharpe's Single Index Model and Markowitz's Modern Portfolio Theory offer valuable insights into portfolio construction. While the Sharpe model is useful for quick optimization based on excess return to beta ratios, the Markowitz model provides a more detailed approach to diversification and risk management. Investors can utilize both models based on their risk preferences and investment goals to achieve an optimal balance of return and risk in their portfolios.

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