

An Integrated Framework for Rational Investment Portfolio Construction: Combining FITradeoff and the Markowitz Optimization Model

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Abstract

Determining the optimal capital allocation among pre-selected assets is one of the most critical challenges in investment portfolio management. This study applies the Markowitz mean-variance optimization model to the portfolio construction stage of a broader investment framework, receiving as input the shortlist of assets generated by the preceding multicriteria pre-selection stage. The Markowitz model is a quantitative portfolio optimization approach that mathematically defines capital allocation by minimizing portfolio variance, or equivalently its standard deviation, subject to return and weight constraints. It relies on the expected return of each asset and the covariance structure among them to identify efficient portfolios, defined as those offering the maximum return for a given level of risk. Four optimization approaches were implemented to accommodate different investor profiles: minimizing portfolio risk, maximizing the Sharpe Index, minimizing risk for a target return of 2%, and maximizing return for a risk tolerance of 6%. The model was applied to 16 pre-selected stocks across 8 market sectors, using 24 months of historical monthly returns. Results show that optimal portfolios concentrated capital in as few as five assets, demonstrating that efficient diversification depends on the covariance structure among assets rather than the quantity held. Three stocks appeared consistently across all configurations, reflecting their favorable risk-return contribution to the portfolio. These findings confirm that the Markowitz model, when combined with a rational pre-selection stage, produces efficient and investor-aligned portfolios in a transparent and reproducible manner.

Keywords

Portfolio Optimization, Decision Support Tool, Asset Management

Biography

Rafael de Azevedo Palhares is a doctoral candidate in Production Engineering at the Federal University of São Carlos (UFSCar), Brazil. He previously served as a faculty member in the Production Engineering undergraduate program at the Universidade Federal Rural do Semi-Árido (UFERSA), Campus Angicos, where he taught courses in Probabilistic Modeling and Production Systems Simulation, Operations Research II, Fundamentals of Production Engineering, and Integrated Production Systems Design. He holds an M.Sc. in Production Engineering from the Federal University of Rio Grande do Norte (UFRN, 2020) and a B.Sc. in Production Engineering from UFERSA (2017). He is the developer of the Weighted Fuzzy Reference Ideal Method (W-FRIM), a multicriteria decision-making method published in the journal *Expert Systems with Applications*.