# FROM MEAN VARIANCE TO ROBUST OPTIMIZATION: REASSESSING RISK MANAGEMENT IN PORTFOLIO CONSTRUCTION

**NAGAVARSHINI R N**

***A project report submitted***

***in partial fulfillment of the requirement for the award of the degree of***

**MASTER OF ARTS**

**IN**

**FINANCIAL ECONOMICS**


**May 2025**

**MADRAS SCHOOL OF ECONOMICS**

**Chennai- 600025**

## ABSTRACT

Portfolio optimization plays a central role in financial economics by helping investors achieve an optimal trade-off between risk and return. While the classical Mean-Variance Optimization (MVO) framework, introduced by Harry Markowitz, has been foundational, it relies on assumptions such as normally distributed returns and stable market conditions—assumptions that often do not hold in practice. This dissertation addresses these limitations by evaluating robust optimization techniques including Mean Absolute Deviation (MAD), Conditional Value at Risk (CVaR), and Robust Quadratic Programming (RQP), which better account for tail risks, non-normal distributions, and model uncertainty.

The study focuses on the Nifty 50 index over the period from January 2020 to December 2024, using daily data for 1,242 trading days. Stock return and fundamental data for all Nifty 50 companies were sourced from the CMIE Prowess database. A subset of 15 stocks was selected using a Factor-Based Stock Ranking Model, which ranks stocks based on a weighted combination of Annual Return, 6-Month Return, Volatility, Sharpe Ratio, Maximum Drawdown, and the Number of Positive Months. The top-ranked stocks formed the investment universe for portfolio construction.

Each of the four optimization models—MVO, MAD, CVaR, and RQP—was applied to this selected subset, and their performances were evaluated using risk-adjusted metrics.

Results show that RQP achieved the highest cumulative and annualized returns, offering strong long-term growth. CVaR demonstrated superior performance during the COVID-19 stress period, with the lowest drawdowns and highest risk-adjusted returns. MAD produced a stable portfolio with balanced risk exposure, while MVO delivered high returns with significant volatility. Overall, robust models outperformed the classical approach, with RQP and CVaR standing out in terms of both resilience and efficiency. The findings underscore the value of integrating robust optimization with factor-based stock selection to improve portfolio performance in uncertain market environments.