

ABSTRACT

THE LAGRANGE METHOD WITH A MEAN SEMIVARIANCE APPROACH IN CONSTRUCTING AN OPTIMAL PORTFOLIO

By

Novita Koes Wardani

NIM. 24010120420013

**Master of Mathematics Study Program, Departemen of Matematics, Faculty
of Science and Matematics, Diponegoro University**

Investment decisions involve the allocation of resources in the present with the expectation of gaining future returns, but they are inherently accompanied by unavoidable risks. These risks need to be managed through the construction of an optimal portfolio. The main issue examined in this study is the limitation of the Mean Variance approach in addressing downside risk, which is particularly relevant under unstable market conditions. Therefore, an alternative approach, Mean Semivariance, is integrated with the Lagrange method to obtain a more effective portfolio optimization solution. This study aims to construct a mathematical model for an optimal portfolio that explicitly accounts for downside risk. The model is formulated through an objective function and a system of constraints solved using the Lagrange multiplier method. The results indicate that the Mean-Semivariance approach yields more conservative portfolio weights compared to the Mean Variance approach. Risk evaluation using Value at Risk (VaR) and Conditional Value at Risk (CVaR) shows that the portfolio optimized through the Mean Semivariance approach provides better protection against loss potential. Thus, this approach can be relied upon as a more responsive portfolio optimization strategy toward negative risk under volatile market dynamics.

Keywords: Portfolio Optimization, Mean Variance, Mean Semivariance, Downside Risk, Value at Risk (VaR), Conditional Value at Risk (CVaR)