ABSTRACT

The construction of an optimal stock portfolio is a crucial issue in investment management due to uncertainty in risk and return faced by investors. This study aims to optimize a stock portfolio from the IDXBUMN20 index by employing K-Medoids clustering as the basis for stock selection and the Mean-Variance Efficient Portfolio method based on Ledoit–Wolf shrinkage to enhance the stability of risk estimation. The data used in this study consist of daily closing prices of stocks included in the IDXBUMN20 index during the period from August 2025 to February 2026. The K-Medoids clustering analysis is applied to 20 stocks included in the IDXBUMN20 index based on financial performance characteristics, such as Return on Assets, Net Profit Margin, and Earning per Share, thereby selecting representative stocks from each cluster according to the highest expected return as candidates for portfolio construction. After obtaining four optimal clusters, the optimal portfolio is formed using the Mean-Variance Efficient Portfolio method with a covariance matrix estimator based on Ledoit–Wolf shrinkage, which results in a well-distributed and balanced allocation of portfolio weights, consisting of BBTN at 20.00%, TINS at 19.68%, BBNI at 40.63%, and PGEO at 19.69%. Portfolio risk is measured using Value at Risk (VaR) with the Historical Simulation method at a 95% confidence level, indicating a relatively low and well-controlled maximum potential loss of 0.0269. Portfolio evaluation using Sharpe Ratio shows a value of 0.1220 These results demonstrate that the combination of K-Medoids clustering and Mean-Variance Efficient Portfolio based on Ledoit–Wolf shrinkage produces an optimal portfolio.

Keywords: Portfolio Optimization, K-Medoids, Mean-Variance Efficient Portfolio, Ledoit–Wolf Shrinkage, Value at Risk, Sharpe Ratio.