INTISARI

OPTIMISASI PORTOFOLIO TERBATAS MENGGUNAKAN *PARTICLE SWARM OPTIMIZATION* (PSO) DAN *MEAN ABSOLUTE DEVIATION* (MAD) BERBASIS *VALUE AT RISK* (VaR) DAN ANALISIS KLASTER: Studi Kasus Saham Indeks IDX Quality 30

oleh

Syakhrul Afandi

21/483096/PA/21060

Investasi merupakan komitmen dalam menempatkan sejumlah dana dengan harapan memperoleh keuntungan di masa mendatang. Namun, dalam berinvestasi terdapat risiko berupa kemungkinan perbedaan antara *return* yang diharapkan dengan *return* yang diperoleh. Salah satu pendekatan dalam optimisasi portofolio adalah *Mean Variance*, namun metode ini memiliki kelemahan karena memerlukan asumsi normalitas dan dapat menghasilkan bobot negatif yang memungkinkan *short selling*. Oleh karena itu, penelitian ini menggunakan *Particle Swarm Optimization* (PSO) dan *Mean Absolute Deviation* (MAD) sebagai alternatif, karena keduanya tidak memerlukan asumsi normalitas dan menghasilkan bobot positif. Pengelompokan saham dalam pembentukan portofolio dilakukan menggunakan analisis klaster K-Medoid berdasarkan variabel fundamental dan statistik, seperti *Return on Asset* (ROA), *Return on Equity* (ROE), *Earning per Share* (EPS), *Price Earning Ratio* (PER), *Mean Return*, dan Standar Deviasi *Return*. PSO merupakan algoritma optimasi berbasis *swarm intelligence* yang meniru perilaku sekawanan burung dalam mencari posisi terbaik. Sementara itu, MAD yang diperkenalkan oleh Konno & Yamazaki menawarkan pendekatan alternatif dengan meminimalkan penyimpangan absolut *return* dari ekspektasi *return*. Penelitian ini menggunakan data harga penutupan harian saham yang tergabung dalam indeks IDX Quality 30. Kinerja portofolio dievaluasi menggunakan *Value at Risk* (VaR), *Sharpe Ratio*, dan *Profit/Loss* dalam periode

lima hari. Hasil penelitian menunjukkan bahwa metode MAD lebih unggul dalam metrik VaR dan *Profit/Loss*, sedangkan PSO menunjukkan performa lebih baik dalam *Sharpe Ratio*. Dengan demikian, dalam konteks studi kasus ini, metode MAD dianggap lebih optimal dibandingkan PSO dalam pembentukan portofolio dengan batasan tertentu.

Kata kunci: Investasi, Optimisasi Portofolio, *Particle Swarm Optimization*, *Mean Absolute Deviation*, K-Medoid.

ABSTRACT

CONSTRAINED PORTFOLIO OPTIMIZATION USING PARTICLE SWARM OPTIMIZATION (PSO) AND MEAN ABSOLUTE DEVIATION (MAD) BASED ON VALUE AT RISK (VaR) AND CLUSTER ANALYSIS: A Case Study of IDX Quality 30 Index Stocks

by

Syakhrul Afandi

21/483096/PA/21060

Investment is a commitment to allocate a certain amount of funds with the expectation of gaining profits in the future. However, investing involves risks in the form of potential discrepancies between expected returns and actual returns. One common approach in portfolio optimization is the Mean Variance method; however, this method has several limitations, such as requiring the assumption of normality and allowing negative weights, which implies short selling. Therefore, this study employs Particle Swarm Optimization (PSO) and Mean Absolute Deviation (MAD) as alternatives, as both methods do not require the assumption of normality and result in positive weights. Stock clustering in portfolio construction is performed using K-Medoid clustering analysis based on fundamental and statistical variables, such as Return on Assets (ROA), Return on Equity (ROE), Earnings per Share (EPS), Price to Earnings Ratio (PER), Mean Return, and Standard Deviation of Return. PSO is an optimization algorithm based on swarm intelligence that mimics the behavior of a flock of birds in finding the best position. Meanwhile, MAD, introduced by Konno & Yamazaki, offers an alternative approach by minimizing the absolute deviation of returns from expected returns. This study utilizes daily closing price data of stocks listed in the IDX Quality 30 index. Portfolio performance is evaluated using Value at Risk (VaR), Sharpe Ratio, and Profit/Loss over a five-day period. The results show that the MAD method outperforms in terms of VaR and Profit/Loss metrics, while PSO demonstrates better performance in terms of the Sharpe Ratio. Thus, within the context of this case study, MAD is considered more optimal than PSO for portfolio construction under certain constraints.

Keywords: Investment, Portfolio Optimization, Particle Swarm Optimization, Mean Absolute Deviation, K-Medoid.