

## INTISARI

### OPTIMISASI PORTOFOLIO MENGGUNAKAN ALGORITMA WHALE OPTIMIZATION DAN GREY WOLF OPTIMIZATION BERDASARKAN KLAUSTERISASI K-MEANS++ DAN DBSCAN

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Satu di antara cara yang sering dilakukan investor dalam meminimalisir risiko dalam berinvestasi adalah dengan membentuk portofolio yang berisi aset-aset dengan korelasi rendah. Skripsi ini membahas mengenai penentuan bobot optimal portofolio saham menggunakan algoritma *Whale Optimization Algorithm* (WOA) dan *Grey Wolf Optimization* (GWO) berdasarkan pembentukan portofolio dengan analisis kluster K-Means++ dan DBSCAN. Data yang digunakan adalah data *closing price* saham harian yang termasuk dalam indeks saham LQ-45. Pembentukan portofolio dilakukan dengan memilih saham-saham yang memiliki *return* berdistribusi normal karena hasil optimisasi dengan algoritma metaheuristik akan dibandingkan dengan optimisasi portofolio *Mean Variance* yang memerlukan asumsi normalitas *return* saham. Setiap kluster diwakilkan oleh saham dengan nilai *sharpe ratio* tertinggi. Portofolio yang terbentuk dilakukan penentuan bobot optimal dengan metode *Whale Optimization Algorithm*, *Grey Wolf Optimization*, dan *Mean Variance*. Selanjutnya, dilakukan penilaian kinerja portofolio menggunakan *sharpe ratio* untuk menentukan kombinasi saham dan bobot yang dapat memberikan kinerja yang lebih baik. Hasilnya, portofolio WOA berdasarkan kluster K-Means++ memiliki *sharpe ratio* tertinggi, yaitu sebesar 2.34178. Terakhir, akan dilihat kinerja portofolio di pasar saham selama tujuh hari pengamatan. Algoritma WOA hasil kluster DBSCAN menghasilkan rata-rata keuntungan tertinggi.

*Kata Kunci: Mean Variance, Grey Wolf Optimization, Whale Optimization Algorithm, Portofolio, Saham, Sharpe Ratio, K-Means++.*

## ABSTRACT

*PORTFOLIO OPTIMIZATION USING WHALE OPTIMIZATION AND GREY WOLF OPTIMIZATION ALGORITHMS BASED ON K-MEANS++ AND DBSCAN CLUSTERING*

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One of the common methods employed by investors to minimize risk in investing is by forming a portfolio consisting of assets with low correlation. This undergraduate thesis discusses the determination of optimal stock portfolio weights using the Whale Optimization Algorithm (WOA) and Grey Wolf Optimization (GWO) based on portfolio formation with K-Means++ and DBSCAN cluster analysis. The data used includes daily closing stock prices belonging to the LQ-45 stock index. The portfolio formation involves selecting stocks with normally distributed returns, as the optimization results with metaheuristic algorithms will be compared with Mean Variance portfolio optimization, which requires the assumption of normality in stock returns. Each cluster is represented by the stock with the highest Sharpe ratio. The formed portfolios have their optimal weights determined using the Whale Optimization Algorithm, Grey Wolf Optimization, and Mean Variance methods. Subsequently, portfolio performance is assessed using the Sharpe ratio to identify stock combinations and weights that yield better performance. The results show that the WOA portfolio based on DBSCAN clusters has the highest Sharpe ratio, specifically at 2.34178. Finally, the portfolio's performance in the stock market is observed over a seven-day period, indicating that the WOA-DBSCAN algorithm generates higher average profits than the other portfolios.

*Keywords: Mean Variance, Grey Wolf Optimization, Whale Optimization Algorithm, Portfolio, Stocks, Sharpe Ratio, K-Means++*