

INTISARI

OPTIMISASI PORTOFOLIO SAHAM MENGGUNAKAN ALGORITMA GREY WOLF OPTIMIZATION BERDASARKAN KLASSTER HIERARKI AGGLOMERATIVE DAN K-MEANS++

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Pembentukan portofolio saham yang optimal merupakan salah satu tindakan yang dapat dilakukan investor untuk meminimalisir risiko ketika berinvestasi. Pada skripsi ini dibahas mengenai optimisasi portofolio saham menggunakan algoritma *Grey Wolf Optimization* (GWO) berdasarkan penyusunan portofolio dengan metode kluster hierarki *agglomerative* dan K-Means++. Data yang digunakan adalah data *closing price* saham harian dari 45 saham pada indeks LQ-45.

Sebelum melakukan analisis kluster untuk membentuk portofolio, dilakukan uji normalitas untuk data *return* saham karena hasil optimisasi menggunakan algoritma GWO akan dibandingkan dengan optimisasi portofolio *Mean Variance* yang memerlukan asumsi normalitas *return* saham. Setelah terbentuk portofolio yang terdiri dari beberapa saham, dilakukan optimisasi portofolio menggunakan algoritma GWO dan metode *Mean Variance*. Kemudian, dilakukan perbandingan kinerja portofolio berdasarkan analisis kluster, yaitu kluster hierarki *agglomerative* (metode *single linkage* dan *average linkage*) dan kluster K-Means++, serta berdasarkan metode pembobotan portofolio, yaitu antara metode *Mean Variance* dan Algoritma GWO. Kinerja portofolio tersebut dibandingkan dengan menggunakan *sharpe ratio* untuk melihat kombinasi portofolio manakah yang mampu memberikan kinerja yang lebih baik.

Kata Kunci: *Grey Wolf Optimization*, portofolio *Mean Variance*, analisis kluster, K-Means++, *sharpe ratio*.

ABSTRACT

STOCK PORTFOLIO OPTIMIZATION USING GREY WOLF OPTIMIZATION ALGORITHM BASED ON AGGLOMERATIVE HIERARCHICAL AND K-MEANS++ CLUSTER

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Optimizing an optimal stock portfolio is one of the actions that investors can take to minimize risk when investing. In this undergraduate thesis, we will discuss about stock portfolio optimization using the Grey Wolf Optimization (GWO) algorithm based on the preparation of a portfolio with agglomerative hierarchical clustering and K-Means++ methods. The data used is daily closing price data from 45 stocks on the LQ-45 index.

Before performing cluster analysis to form a portfolio, a normality test is conducted for stock return data because the optimization results using the GWO algorithm will be compared to Mean Variance portfolio optimization, which requires the assumption of normality of stock returns. After a portfolio consisting of several stocks is formed, portfolio optimization is carried out using the GWO algorithm and the Mean Variance method. Then, the portfolio performance is compared based on cluster analysis, namely agglomerative hierarchical clustering (single linkage and average linkage methods) and K-Means++ clustering, as well as based on portfolio weighting methods, namely Mean Variance method and GWO algorithm. The portfolio performance is compared using the Sharpe ratio to see which portfolio combination is able to provide better performance.

Keywords: Grey Wolf Optimization, Mean Variance portfolio, cluster analysis, K-Means++, sharpe ratio.