

INTISARI

OPTIMISASI PORTOFOLIO SAHAM JII70 MENGGUNAKAN ALGORITMA *HYBRID WHALE OPTIMIZATION* *ALGORITHM–PARTICLE SWARM OPTIMIZATION* (WOA-PSO) BERDASARKAN KLASTERISASI K-MEDOIDS

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Penelitian ini membahas pembentukan portofolio saham syariah dari indeks JII70 dengan mengintegrasikan klasterisasi K-Medoids dan empat metode optimisasi, yaitu *Mean–Variance Optimization*, *Whale Optimization Algorithm* (WOA), *Particle Swarm Optimization* (PSO), serta *Hybrid WOA–PSO*. Dari 42 emiten yang lolos penyaringan berdasarkan kelengkapan data dan Sharpe Ratio positif, klasterisasi K-Medoids menghasilkan lima klaster, kemudian dipilih satu saham representatif dari setiap klaster untuk membentuk portofolio terdiversifikasi. Proses optimisasi dilakukan pada ruang pencarian berbasis softmax dan dievaluasi menggunakan expected return tahunan, standar deviasi, dan Sharpe Ratio.

Hasil penelitian menunjukkan bahwa metode metaheuristik secara umum memberikan kinerja yang lebih baik dibandingkan pendekatan klasik Mean-Variance. *Hybrid WOA–PSO* menghasilkan Sharpe Ratio tertinggi sebesar 2,6505, diikuti oleh WOA dan PSO. Analisis konvergensi menunjukkan bahwa WOA dan PSO cepat mencapai kondisi stabil pada iterasi awal, sedangkan *Hybrid WOA–PSO* memiliki pola konvergensi yang lebih bertahap dan mampu menghindari konvergensi dini. Simulasi pasar selama sepuluh hari perdagangan menunjukkan bahwa *Hybrid WOA–PSO* mencatatkan rata-rata profit harian tertinggi, sehingga unggul dalam menghasilkan profit aktual dengan tetap menjaga efisiensi risiko–imbal hasil portofolio.

Kata Kunci: portofolio, metaheuristik, *K-Medoids*, *Whale Optimization Algorithm*, *Particle Swarm Optimization*, *Hybrid WOA–PSO*.

ABSTRACT

PORTFOLIO OPTIMIZATION OF JII70 STOCKS USING HYBRID WHALE OPTIMIZATION ALGORITHM-PARTICLES SWARM OPTIMIZATION (WOA-PSO) BASED ON K-MEDOIDS CLUSTERING

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This study examines the construction of a sharia-compliant stock portfolio from the JII70 index by integrating K-Medoids clustering with four optimization methods: Mean–Variance Optimization, Whale Optimization Algorithm (WOA), Particle Swarm Optimization (PSO), and the Hybrid WOA-PSO. From 42 stocks that passed screening based on data completeness and positive Sharpe Ratios, K-Medoids clustering produced five clusters, from which one representative stock from each cluster was selected to form a diversified portfolio. Portfolio optimization was conducted in a softmax-based search space and evaluated using annualized expected return, standard deviation, and Sharpe Ratio.

The results show that metaheuristic methods generally outperform the Mean-Variance approach. The Hybrid WOA–PSO achieved the highest Sharpe Ratio of 2.6505, followed by WOA and PSO. Convergence analysis indicates that WOA and PSO reach stable solutions rapidly in early iterations, whereas the Hybrid WOA–PSO exhibits a more gradual convergence pattern and effectively avoids premature convergence. A ten-day market simulation further shows that the Hybrid WOA–PSO records the highest average daily profit, demonstrating its advantage in generating actual returns while maintaining risk–return efficiency.

Keyword: portfolio, metaheuristic, K-Medoids, Whale Optimization Algorithm, Particle Swarm Optimization, Hybrid WOA–PSO.