

ABSTRACT

APPLICATION OF HIGH ORDER CHEN FUZZY TIME SERIES METHOD USING PARTICLE SWARM OPTIMIZATION FOR FORECASTING THE STOCK INDEX OF INDONESIAN ISLAMIC BANKS

By

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This study aims to forecast the stock index of Bank Syariah Indonesia (BSI) using the High Order Chen Fuzzy Time Series (HOCFTS) method integrated with Particle Swarm Optimization (PSO). Forecasting financial data such as stock indices requires models capable of handling data uncertainty and non-linearity. The Chen Fuzzy Time Series method offers a flexible approach by utilizing fuzzy logic, and its higher-order variant improves accuracy by incorporating multiple past observations. However, determining optimal interval partitioning remains a challenge. To address this, PSO is employed to optimize interval lengths and enhance forecasting performance. Monthly stock index data of BSI from June 2018 to Desember 2024 were analyzed. Forecasting was conducted using the HOCFTS model from order 1 to 8, and the accuracy of each model was evaluated using Mean Absolute Percentage Error (MAPE). The results show that the fourth-order model with PSO optimization yields the lowest MAPE, indicating superior forecasting accuracy compared to other orders. This research contributes to the development of hybrid forecasting models in Islamic financial markets, providing more accurate tools for investors and financial analysts to make informed decisions.

Keywords: Fuzzy Time Series, Chen Model, High Order, Particle Swarm Optimization, Stock Index Forecasting, Bank Syariah Indonesia.

ABSTRACT

PENERAPAN METODE *FUZZY TIME SERIES* CHEN ORDE TINGGI MENGUNAKAN ALGORITMA *PARTICLE SWARM* *OPTIMIZATION* UNTUK PERAMALAN INDEKS SAHAM BANK SYARIAH INDONESIA

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Penelitian ini bertujuan untuk meramalkan indeks saham Bank Syariah Indonesia (BSI) dengan menerapkan metode *High Order Chen Fuzzy Time Series* (HOCFTS) yang diintegrasikan dengan *Particle Swarm Optimization* (PSO). Peramalan data keuangan seperti indeks saham memerlukan model yang mampu menangani ketidakpastian dan karakteristik nonlinier. Metode *Fuzzy Time Series* Chen menawarkan pendekatan yang fleksibel melalui penerapan logika *fuzzy*, sementara orde tinggi dari metode ini meningkatkan akurasi dengan mempertimbangkan beberapa pengamatan data sebelumnya. Namun, penentuan pembagian interval yang optimal tetap menjadi tantangan, sehingga PSO digunakan guna mengoptimalkan panjang interval dan meningkatkan kinerja peramalan. Penelitian ini menganalisis data indeks saham bulanan BSI dari Juni 2018 hingga Desember 2024. Model ini digunakan untuk meramalkan data dari orde 1 hingga 8, dan akurasi setiap model dievaluasi menggunakan *Mean Absolute Percentage Error* (MAPE). Hasil penelitian menunjukkan orde keempat dengan optimasi PSO menghasilkan nilai MAPE terendah, yang menunjukkan akurasi peramalan terbaik dibandingkan orde lainnya.

Keywords: *Fuzzy Time Series*, Model Chen, Orde Tinggi, *Particle Swarm Optimization*, Peramalan Indeks Saham, Bank Syariah Indonesia.