ABSTRACT

The public interest in stock investment continues to rise despite the Jakarta Composite Index (IHSG) recording a 0.22% year-to-date (ytd) decline in 2024. One potential stock is PT XL Axiata Tbk (EXCL.JK), which reported a net profit of IDR 1.3 trillion in the third quarter of 2024, with positive prospects from its merger with Smartfren. This study aims to optimize the Cascade Forward Neural Network (CFNN) using Quantum Particle Swarm Optimization (QPSO) to predict the daily stock prices of PT XL Axiata Tbk. CFNN was chosen for its ability to capture complex patterns in data, while QPSO effectively addresses the limitations of backpropagation in finding globally optimal solutions. The research data includes 501 daily closing stock prices from October 1, 2022, to October 31, 2024, obtained from finance.yahoo.com. Data processing involves cleaning, normalization, and Partial Autocorrelation Function (PACF) analysis to identify significant lags. The CFNN model uses a RELu activation function in the hidden layer and a linear activation function in the output layer. Optimization is performed using QPSO with 10 particles, parameter $\alpha = 0.5$, and update weight range of -0.3 to 0.3. The model's evaluation is based on the Mean Absolute Percentage Error (MAPE). The results show that the CFNN achieved a testing MAPE of 0.80%, which significantly decreased to 0.13% after optimization using QPSO. This study demonstrates that QPSO can significantly improve the accuracy of stock price predictions using CFNN, providing benefits for investment decision-making and enriching the literature on the application of artificial intelligence in finance.

Keywords: Cascade Forward Neural Network, Quantum Particle Swarm Optimization, Stock Price Prediction, Partial Autocorrelation Function (PACF), Mean Absolute Percentage Error (MAPE), Model Optimization.