ABSTRACT

BLACK SCHOLES MERTON (BSM) MODELING FOR EUROPEAN OPTION PRICING BASED ON STOCK PRICE VOLATILITY PREDICTION USING LONG SHORT TERM MEMORY (LSTM) NETWORK

By
Ana Khofifahturizqi
NIM: 24010122420011
Master of Mathematics Program, Department of Mathematics, Faculty of Science and Mathematics, Diponegoro University

The Black Scholes Merton model is referred to as the model for European option price valuation. The model is influenced by the parameters of initial stock price, strike price, risk free interest rate, maturity time, and stock price volatility. In fact, the stock price volatility parameter is a key factor in determining the option price and accurate prediction of daily stock price volatility can improve the accuracy of the option pricing model. Therefore, this study aims to predict volatility using Long Short Term Memory (LSTM) for the development of the Black Scholes model in the prediction of European type option prices. The development is applied to Afric Industries SA (AFI) and Microsoft Corporation (MSFT) companies with daily closing stock price data. The results of the stock price volatility prediction research show that the best model is shown with the RMSE value of AFI shares of 0,001076 and MSFT shares of 0,00086. The results of the prediction of stock price volatility are then used to develop the Black Scholes model by entering other parameters. Based on the development of the Black Scholes model on AFI and MSFT company data, it was analysed intrinsically or theoretically using the Black Scholes model that the call option experienced a profit (in the money) and the put option experienced a loss (out of the money). The results of the comparison between the prediction of option prices using the model and the option prices on the market obtained an error in the purchase option price of 10,61 and the sale option price of 23,6 using the Root Mean Squared Error (RMSE). Based on the comparison results of European type options using RMSE, it can be used to predict the price of European type options.

Keywords: Long Short Term Memory (LSTM), Volatility, Black Scholes Merton Model, European Option Price