ABSTRACT

Crude oil has a crucial role in the global economy and is one of the main commodities in the financial market. The price of crude oil, especially the West Texas Intermediate (WTI) type, often fluctuates due to various factors such as geopolitical conditions, supply, and global demand. Therefore, forecasting crude oil prices is critical to help make better decisions in the energy and economic sectors. This study aims to compare the performance of the Autoregressive Fractionally Integrated Moving Average (ARFIMA) model with the effects of Generalized Autoregressive Conditional Heteroskedasticity (GARCH) and Exponential GARCH (EGARCH) in forecasting WTI crude oil prices. Based on the analysis results, WTI crude oil price data shows long memory characteristics, which is indicated by a slowdown in the decrease in the Autocorrelation Function (ACF) plot and a differencing (*d*) parameter value of 1,069428. Therefore, the ARFIMA model was chosen to address the long memory nature of the data. In addition, the heteroscedasticity test results show that there is non-constant volatility, so the GARCH and EGARCH models were applied to deal with changes in variance. The data used in this study is WTI crude oil prices from January 2, 2021, to October 15, 2024. The results showed that the ARFIMA(1,*d*,1)-EGARCH(1,1) model was the best model compared to ARFIMA-GARCH based on the MAPE value. This model is able to capture the fluctuation pattern of crude oil prices better and produces a Mean Absolute Percentage Error (MAPE) value of 7,93%, which is in the very good forecasting category (MAPE $\leq$ 10%). Thus, the ARFIMA-EGARCH model is proven to be superior in handling WTI crude oil price volatility compared to ARFIMA-GARCH.

Keywords: *WTI Crude Oil, ARFIMA, GARCH, EGARCH, Long Memory, MAPE, Forecasting*