

ABSTRACT

The energy sector is strategic to Indonesia's economy, yet its stocks are highly susceptible to volatility due to fluctuations in global commodity prices, government energy policies, and the ongoing transition to renewable energy sources. This study aims to identify and estimate the best Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model to capture the volatility of energy stocks listed in the LQ45 index from January 2022 to March 2025 and to evaluate the accuracy of volatility forecasts for April 2025. A quantitative approach was employed, using time series analysis methods including stationarity testing with the Augmented Dickey-Fuller (ADF) test, model identification using Autoregressive Integrated Moving Average (ARIMA), checking for Autoregressive Conditional Heteroskedasticity (ARCH) effects, volatility modeling with GARCH methods, and evaluating out-of-sample forecast accuracy. Autoregressive (AR) models explain a variable's current value based on its past values (lags), whereas Moving Average (MA) models describe a variable's current value based on previous errors or residuals. The findings indicate that the volatility characteristics of energy stocks vary significantly, exhibiting high persistence, with the best-fitting models identified as follows: ADMR (ARMA(1,1)-GARCH(1,1), persistence 0.9449), ADRO (AR(1)-GARCH(1,1), persistence 0.8300), AKRA (MA(2)-GARCH(1,1), persistence 0.9952), ITMG (AR(5)-GARCH(1,1), persistence 0.9945), and PTBA (MA(1)-GARCH(1,1), persistence 0.9329). High volatility persistence in these stocks indicates prolonged effects of price shocks, requiring investors to carefully consider the associated risks. Stocks MEDC and PGAS did not fulfill heteroskedasticity assumptions and thus could not be modeled with GARCH methods. Forecast results for April 2025 demonstrated high accuracy with low Average Mean Squared Error (AMSE) values ranging from 0.00065 to 0.00442, confirming the viability of GARCH models for investment strategy purposes. Aggressive investors might prefer ADMR and ADRO stocks, while moderate to conservative investors should consider ITMG, AKRA, or PTBA, which exhibit high volatility persistence but more controlled fluctuations, emphasizing the importance of understanding volatility characteristics for effective risk management and investment optimization.

Keywords: Stock Volatility, Energy Stocks, LQ45, GARCH, Forecasting Model Indonesia Stock Exchange