ABSTRACT

The development of investment in Indonesia necessitates a comprehensive understanding of proper investment management. Stock prices exhibit high volatility, with fluctuations that are difficult to predict and often deviate from the assumption of a normal distribution. While the Brownian motion method is widely utilized in stock price modeling, it fails to accurately capture sharp spikes in leptokurtic data. To address this limitation, the Variance Gamma model is applied, modifying the Brownian motion process by incorporating a random time component governed by a Gamma process. This model includes three parameters to regulate volatility, kurtosis, and skewness. This study examines the daily stock return data of PT Industri Jamu dan Farmasi Sido Muncul from December 2023 to December 2024. Parameter estimation for the Variance Gamma model is conducted using the Moment Method and the Maximum Likelihood Method. Model accuracy is assessed using the Mean Absolute Percentage Error (MAPE). The findings indicate that the Variance Gamma model, when applied using the normal standard process approach of a Gamma process, achieves a MAPE of 4.150345%, whereas the difference approach utilizing two independent Gamma processes results in a MAPE of 4.515595%. Both approaches demonstrate superior accuracy compared to the Geometric Brownian Motion with Jump model, which yields a MAPE of 6.866523%. Given its lower MAPE value, the Variance Gamma model proves to be more suitable for modeling stock prices characterized by jumps and non-normal distributions.

Keywords: Stocks, Brownian motion, Leptokurtic, Variance Gamma, kurtosis, skewness