ABSTRACT

The Black-Scholes model is a widely utilized derivative pricing model and has proven to be successful. However, it is based on certain assumptions that have limitations. One of the major drawbacks is the assumption of constant volatility and the assuming of transaction costs. To better reflect the dynamic nature of the market and accommodate real-world conditions, it is necessary to develop a model that relaxes these assumptions. The original Black-Scholes option pricing model does not incorporate transaction expenses as a variable, despite their significance to traders. This assumption implies that financial markets are frictionless and devoid of transaction costs, including options that are not actively traded. Nevertheless, volatility plays a critical role in economic and financial research. It is a fundamental characteristic of financial markets, closely associated with market uncertainty and influencing the investment behavior of individuals and enterprises. Ornstein Uhlenbeck model is one of the financial models that assumes the transaction cost. Therefore, this study incorporates transaction cost on Ornstein-Uhlenbeck model. The main objective being comparing and analyzing the behavior of the asset price and volatility having transaction cost with other specific objectives being deriving an improved Black-Scholes equation using Ornstein-Uhlenbeck model with transaction cost, deriving the asset pricing equation using the Ornstein-Uhelenbeck with transaction cost, deriving the volatility equation from Ornstein-Uhlenbeck model having transaction cost and finally conduct a comparative analysis of the Volatility equation derived by incorporating transaction cost in contrast to other related models. The significance of incorporating transaction costs into the volatility equation is crucial for investors. This adjustment has a direct impact on the perceived risk and stability of a security, leading to lower volatility. The study also contributes to applied statistics by deriving a volatility equation-Stochastic in nature that exhibits the lowest volatility compared to other volatility equations.Therefore,long-term investors can utilize this model to make informed decisions regarding investment timing and expected returns. The study employed Ito process,the Vasicek model, an extension of the Ornstein-Uhlenbeck model, and utilized the maximum likelihood estimation method to estimate volatility. Through this analysis, it was discovered that within the Ornstein-Uhlenbeck model with transaction costs, there exists a positive correlation between volatility and asset prices. In other words, as volatility increases, asset prices have a tendency to rise. Additionally, the research examined the impact of transaction cost on volatility and concluded that it lowers volatility but it has a direct minimal impact on asset prices rather indirectly affects the volatility which in return affects the asset price. This impact on volatility reduces risk associated with investment hence creating confidence to the investor since the investment return will be higher. This implies that changes in transaction costs do not significantly influence the movement of asset prices but highly influence volatility. To verify the reliability of the asset price model, data from the Nairobi Security Exchange (NSE) was used and applied to the derived models to obtain the results on volatility and asst price behavior.