The Martingale Options Price Valuation for European Puts Using Stochastic Differential Equation Models

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Abstract : In modern financial mathematics, valuing derivatives such as options is often a tedious task. This is simply because their fair and correct prices in the future are often probabilistic. This paper examines three different Stochastic Differential Equation (SDE) models in finance; the Constant Elasticity of Variance (CEV) model, the Balck-Karasinski model, and the Heston model. The various Martingales option price valuation formulas for these three models were obtained using the replicating portfolio method. Also, the numerical solution of the derived Martingales options price valuation equations for the SDEs models was carried out using the Monte Carlo method which was implemented using MATLAB. Furthermore, results from the numerical examples using published data from the Nigeria Stock Exchange (NSE), all share index data show the effect of increase in the underlying asset value (stock price) on the value of the European Put Option for these models. From the results obtained, we see that an increase in the stock price yields a decrease in the value of the European put option price. Hence, this guides the option holder in making a quality decision by not exercising his right on the option.