Geometric Brownian Motion Based Hybrid Approach for the Analysis High volatile Financial Time Series

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Data forecasting and analysing is a process which can be used for making future predictions. Miscellaneous type of forecasting methodologies can be seen in the literature. Generally, these traditional approaches have been referring to use formal statistical methods for employing time series data under the stationary and normality assumptions. However, most of these traditional approaches have been shown the poor realistic under the high volatility with non-stationary conditions.

The main purpose of this study is to take an attempt to understand the behavioral patterns and seek to develop a new hybrid forecasting approach for forecasting financial data under the high volatile fluctuations. The results are implemented on Colombo stock exchange (CSE), Sri Lanka over the six year period from June 2009 to November 2015.

The methodology of this study is running under the three main phases as follows. In the first phase, stock market validations are identified using the traditional time series approach namely autoregressive integrated moving average (ARIMA). In the second part, volatility patterns are identified using Geometric Brownian Motion (GBM) algorithms. In the last stage, Artificial Neural Network and GBM based proposed ANN-GBM hybrid approach was applied to predict the results.

According to the error analysis results, new proposed ARIMA-GBM is highly accurate (less than 10%) with lowest RMSE error values. Furthermore, the RMSE reveal that (RMSE[ARIMA]>RMSE[GBM] >RMSE[ANN_ARIMA]>RMSE[ANN_GBM]), new proposed ANN_GBM model is more significant and gives best solution for predicting short term predictions in high volatility fluctuations than traditional forecasting approaches.

Keywords: ARIMA, ANN, ARIMA-ANN, CSE and Volatility

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