

A Novel proposed ANN_GBM Hybrid Statistical Approach for Time series Forecasting under the Volatility

R. M. Kapila Tharanga Rathnayaka ^{a*}, D.M.K.N. Seneviratna ^b

^a Faculty of Applied Sciences, Sabaragamuwa University of Sri Lanka, Belihuloya,

^b Faculty of Engineering, University of Ruhuna, Sri Lanka

*Correspondence: kapiar@appsc.sab.ac.lk

The time series analysis and forecasting is an essential methodology which can be widely used for identifying meaningful characteristics to make future ad-judgements, especially making decisions in finance under the numerous type of economic policies and reforms. Miscellaneous type of forecasting methodologies can be seen in the literature. However, most of these models have been shown the poor realistic under the non-stationary frame work.

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) 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 based on traditional time series approaches such as exponential smoothing and auto regressive moving average. In the second part, Geometric Brownian Motion (GBM) algorithm is applied. In the last stage, newly proposed combined approach of Artificial Neural Network (ANN) with GBM algorithm (ANN_GBM) and Artificial Neural Network with ARIMA (ANN_ARIMA) methodologies are implemented successfully for forecasting long term predictions.

According to the error analysis results, newly proposed ARIMA-GBM is highly accurate with lowest RMSE error values. Furthermore, the RMSE reveal that ($RMSE[ARIMA] > RMSE[GBM] > RMSE[ANN_ARIMA] > RMSE[ANN_GBM]$), newly proposed ANN_GBM model has been giving high accurate predictions in long term scenario under the high volatility than traditional forecasting approaches.

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