
Nonlinear Time Series Modelling using Alternating Conditional Expectation: A Case Study on Colombo Stock Exchange

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Time series modeling is a dynamic research area and is commonly applied in real life. While a lot of research is focused on linear analysis of time series, the actual data is often nonlinear. Recently nonlinear time series models have gained much attention due to the fact that linear time series models faced various limitations in many empirical applications. There are many kinds of nonparametric methods such as the kernel smoothing, local linear regression, penalized regression, alternating conditional expectation (ACE) algorithm and so on to model nonlinear behaviors. The accuracy of the forecast might be enhanced by modeling the nonlinear behaviors of the series. As the Colombo Stock Exchange is the major financial trading agency in Sri Lanka, attention was paid to model and forecast the Standard & Poor's Sri Lanka 20 (S&P SL 20) index. Although many researchers have modeled stock market indices using Box-Jenkins methodology, published researches on modeling S&P SL 20 index using nonparametric techniques are relatively less. Generally, stock prices are chaotic and show nonlinear behaviors. BDS test is a powerful tool for detecting serial dependence in time series. The BDS test applied, reject linearity of the S&P SL 20 series. Among different types of nonparametric techniques, this study focuses on ACE algorithm to model and forecast the S&P SL 20 index. When applying the ACE algorithm on real data, the expected values are replaced by the corresponding sample values. To estimate conditional expectations, the Super-smoother method is used in this study. The error measure criteria used here is Root Mean Square Error (RMSE) and its value is 1.59. The RMSE of the best linear model ARIMA (1,1,0) is 21.14. The results show that the ACE method can successfully be applied as a better approach to model the S&P SL 20 index.

Keywords: Alternating conditional expectation algorithm, Nonlinear time Series, Nonparametric methods