



Comparative study of the forecasting ability of some Backpropagation Artificial Neural Network Models with Learning Rate Adaptation for Colombo Stock Market

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A stock market is one of the fundamental types of financial markets. The stock market can also be thought of as a highly complex and adaptive system. Variation in stock price of the stock market can be considered as an indicator of the economical trend of a country. Thus, forecasting the behaviour of the stock market is at primary concern not only of the business community but also of the policy makers of a country.

The main aim of this research is to forecast the behaviour of a financial market with available financial time-series data using variants of Backpropagation algorithm for Artificial Neural Networks (ANN).

We present here the designing and analysis of few ANN models to predict future trend of the two financial indices used in the Colombo Stock Exchange (CSE) namely, the Milanka Price Index (MPI) and, the All Share Price Index (ASPI).

In so doing we consider here the two computational methods of input selection for the Training Algorithms for the ANN - the *Gradient Descent* and, the *Gradient Descent with Adaptive Learning Rate*.

We compare the forecasting ability of each model via Mean Square Error (MSE), Akaike Information Criteria (AIC) and the Bayesian Information Criteria (BIC). In addition, we examine the best network design for each model.

We use the CSE market data for the period 1985-2009 of which the first 1/3 has been used in training of the ANN, the second one-third for validation (in parallel with training) and the final (unseen) part to test against the forecasts made by the ANN.

Our results show that an ANN which uses historical market data as input with $30-10-n$ architecture (where $n=1,2,\dots,7$ represents the next n days for which the forecast is required) and which uses learning rate adaptation together with a trial-and-error model selection technique outperforms all the other models considered in the study in forecasting.

Keywords: Backpropagation Neural Networks, Learning Rate Adaptation, Forecasting of financial time-series.