Chapter 10

On Developing and Performance Evaluation of Adaptive Second Order Neural Network With GA-Based Training (ASONN-GA) for Financial Time Series Prediction

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ABSTRACT

Financial time series forecasting has been regarded as a challenging issue because of successful prediction could yield significant profit, hence require an efficient prediction system. Conventional ANN based models are not competent systems. Higher order neural networks have several advantages over traditional neural networks such as stronger approximation, higher fault tolerance capacity and faster convergence. With the aim of achieving improved forecasting accuracy, this article develops and evaluates the performance of an adaptive single layer second order neural network with GA based training (ASONN-GA). The global search ability of

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GA has been incorporated with the better generalization ability of a second order neural network and the model is found quite capable in handling the uncertainties and nonlinearities associated with the financial time series. The model takes minimal input data and considered the partially optimized weight set from previous training, hence a significant reduction in training time. The efficiency of the model has been evaluated by forecasting one-step-ahead closing prices and exchange rates of five real stock markets and it is revealed that the ASONN-GA model achieves better forecasting accuracy over other state of the art models.

1. INTRODUCTION

Stock market behaves very much like a random walk process and the stock market index prediction has been considered as an important and challenging task for the researchers. Due to the influence of uncertainties involved in the movement of the market, the stock market forecasting is regarded as a difficult task. Stock movement prediction is also difficult due to its nonlinearities, highly volatile in nature, discontinuities, movement of other stock markets, political influences and other many macro-economical factors and even individual psychology. Various economic factors such as oil prices, exchange rates, interest rates, stock price indices in other countries, domestic as well as global economic situations, etc. have been influencing the market behavior. As more and more money is being invested in the stock market by common investors, brokers and speculators, they get anxious about the future trend of the stock prices in the market. Hence, an effective and accurate forecasting model is necessary in order to predict the stock market behavior. If the direction of the market is successfully predicted, the investors may be better guided and also monetary rewards will be substantial. In recent years, many new methods for the modeling and forecasting the stock market have been developed including linear as well as nonlinear models.

Exchange rate prediction is relevant to all sorts of firms and interesting for international companies which want to decrease exchange exposure. The foreign exchange rates have an important role in the financial market as well as economy of a country. Its area of influence includes not only interest rate and inflation but also the economic stability of any country. While deciding the monetary policies of any country FOREX rates acts as a vital factor. Global economy also comes under the influence of FOREX rate. Various massive economic crises such as The Asian crisis of 1997-98, China’s undervalued Yuan (1994-2004) and Japanese yen’s gyrations from 2008 to mid-2013, portrays the influence of FOREX rate on global economy. Hence to maintain the national as well as international economic stability numerous research activities have been carried out in this area. Till now it is one of the most
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