Chapter 68
Predicting Stock Market Price Using Neural Network Model

Naliniprava Tripathy
Indian Institute of Management Shillong, Shillong, India

ABSTRACT

The present article predicts the movement of daily Indian stock market (S&P CNX Nifty) price by using Feedforward Neural Network Model over a period of eight years from January 1st 2008 to April 8th 2016. The prediction accuracy of the model is accessed by normalized mean square error (NMSE) and sign correctness percentage (SCP) measure. The study indicates that the predicted output is very close to actual data since the normalized error of one-day lag is 0.02. The analysis further shows that 60 percent accuracy found in the prediction of the direction of daily movement of Indian stock market price after the financial crises period 2008. The study indicates that the predictive power of the feedforward neural network models reasonably influenced by one-day lag stock market price. Hence, the validity of an efficient market hypothesis does not hold in practice in the Indian stock market. This article is quite useful to the investors, professional traders and regulators for understanding the effectiveness of Indian stock market to take appropriate investment decision in the stock market.

1. INTRODUCTION

The prediction of stock market price is a significant issue in the economic literature today. The stock markets are affected by many market factors such as political events, institutional investor's choices, firms' policies, general economic conditions, foreign exchange risk, and psychology of investors. The stock markets are inherently noisy, non-stationary and deterministically chaotic nature. Stock market price behaves in highly non-linear and dynamic manner. Hence, forecasting stock market price is a challenging one. However, one can able to identify the non-linear pattern of stock market price and predict it by using Artificial Intelligence algorithms. The ANN gather hidden part of the data out of noisy information and predict the stock market price by comparing with the actual data. ANN successfully model nonlinear behavior and does not require prior knowledge on the functional form of the relation. It does not rely on

any parametric assumption and adapt itself to the dynamic changes in the data-generating process. The philosophy behind ANN approach is that it develops the architecture inspired by the biological nervous system. Therefore, the ANN is robust and flexible in model specification. However, little research work has been done so far to forecast the direction of stock market price in the Indian stock market after financial crises period 2008.

The present study tries to address this gap. The study has been undertaken to predict the daily movement of Indian stock market price direction by using Feedforward Neural Network model. Secondly, the study tries to determine the accuracy of the prediction of daily movement of stock market price by using Sign Correctness Percentage (SCP) and Normalized Mean Square Error (NMSE). The structure of the paper planned as follows: Section 2 presents the literature review; Section 3 elucidates the data and methodology Section 4 deliberates the empirical findings, and section 5 deals with concluding observations.

2. LITERATURE REVIEW

Several studies have predicted the stock market price in the past decades. Min Qi (1999) examined the forecasting ability of the United States (US) stock market returns by using Linear Regression and Non-linear Neural Network model. The study found that the Nonlinear NN model fits data better than the linear model and provides relatively accurate forecast than the linear model. Phua, et al. (2000) used NN with Genetic Algorithm to predict the Singapore stock market. The study found that the model predicts 81 percent accuracy of the direction of the stock market. Yochanan and Dorota (2000) examined the dynamic interrelations among Canada, France, Germany, Japan, United Kingdom (UK), US and World stock markets by using Ordinary Least Squares, General Linear Regression, Multi-layer Perceptron models of ANN. The study reported that NN consist of Multilayer perceptron model with logistic activation function predicts the daily stock market returns better than traditional Ordinary Least Squares and General Linear Regression model. The Multilayer Perceptron, with five units in the hidden layer, better predicts the stock indices of US, France, Germany, UK and World stock markets.

Qing Cao et al. (2005) predicted the Shanghai stock market using ANN model and accomplished that ANN model is a suitable tool to predict the Chinese stock markets. Altay & Satman (2005) compare the predictive performance of ANN and Regression model of Istanbul Stock Exchange. The study found that ANN outperforms the Regression model in predicting the future direction of Istanbul stock market. The prediction accuracy of ANN model reported 57.8percent, 67.1 percent and 78.3 percent for daily, weekly and monthly data of Istanbul Stock Exchange. Pan et al. (2005) used ANN model for predicting Australian stock market. The accuracy of ANN model reported 80 percent in predicting the price direction of Australian stock market. Dutta et al. (2006) investigated the ability of ANN to predict the Bombay Stock Exchange (BSE) closing values. The study used the Root Mean Squared Error (RMSE) and Mean Absolute Error (MAE) as an indicator of the performance of ANN model. The study found that ANN with more input variables gives healthier forecasting results. Avci (2007) used ANN model to forecast the daily and sessional returns of ISE -100 indexes. The study stated that ANN appropriately predicts the day-to-day and sessional returns of the ISE -100 indexes. Khan et al. (2008) compared the Back Propagation NN with the Genetic Algorithms based Back Propagation NN model. The study showed that Genetic Algorithm based Backpropagation NN reports more accurate forecasting result than Back Propagation NN in Indian stock market.

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