

Prediction of Stock Using Artificial Neural Networks

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Abstract- Forecasting financial market trends has been one of the most challenging tasks for both researchers and practitioners. Stock market is affected by many complex events such as business cycles, monetary policies, and interest rates, national and international factors. As the stock market data is non stationary and volatile, investors feel insecure during investing. Though Efficient Market Hypothesis (EMH) asserts that profit from price movement is difficult and unlikely, a large number of researchers, investors and analysts use different techniques to forecast stock index and stock prices. Also there has been no consensus on EMHs validity. The methods used for forecasting are Fundamental Analysis, Technical Analysis, traditional Time series analysis and Machine learning. As the stock market data exhibit nonlinearity, traditional methods are not satisfactory in predicting the market. Machine learning methods are aimed at identifying ever-changing patterns in data and are able to trace linear and nonlinear patterns. Artificial Neural Networks (ANN) has been found to be an efficient tool in modeling stock prices. In this paper ANN is used to predict the closing prices of selected stock under BSE or NSE. For our purpose multilayer feed forward Artificial Neural Network is used.

Index Terms-Artificial Neural Networks (ANN), BSE (Bombay Stock Exchange), Efficient Market Hypothesis (EMH), Forecasting stock. NSE (National Stock Exchange).

I. INTRODUCTION

From the beginning of the time it has been common goal of human beings to make life easier. The prevailing notion in society is that wealth brings comfort and luxury. So it is not surprising that there has been so much of work done on methods to predict markets. Forecasting financial market trends has been one of the most challenging tasks for both researchers and practitioners. Stock market is affected by many complex events such as business cycles, monetary policies, and interest rates, national and international factors. As the

stock market data is non stationary and volatile, investors feel insecure during investing. Efficient Market Hypothesis (EMH) asserts that profit from price movement is difficult and unlikely. A large number of researchers, investors and analysts use different techniques to forecast stock index and stock prices. There has been no consensus on EMHs validity. The methods used for forecasting are Fundamental analysis, Technical analysis, traditional Time series analysis and Machine learning.

Fundamental Analysis: It refers to analyzing companies by their financial statements, business trends, general economic conditions etc. It investigates value of company with regards to its potential growth in earnings. It starts with broad analysis of the economy, inflation and other important economic data. The key concepts are Economic analysis, Industry analysis, and company analysis.

Technical Analysis: It is a process of identifying trend reversals at an earlier stage to formulate the buying and selling strategy. Technical analysts seek to determine future price of a stock based solely on potential trends of the past price, which is in the form of Time series analysis. With the help of several factors and indicators they analyze the relationship between price-volume and supply & demand for the overall market and individual stock. Generally used technical tools are Dow Theory, volume of trading, short selling, charts, moving averages and oscillators.

Machine learning methods are aimed at identifying the elusive and ever-changing patterns in data and concerned with the design

International Journal of Technology and Science, ISSN (Online) 2350-1111, (Print) 2350-1103 Volume 3, Issue 3, 2016, pp. 1-4 and development of algorithms and techniques that allow computers to learn. In section 2 introductions to ANN and suitability is explained. Section 3 gives literature review on application of ANN. Section 4 gives an overview of ANN. Section 5 presents the methodology adopted. Section six gives results and performance analysis. In the last section conclusion is presented.

II. SUITABILITY OF ANN IN FORECASTING STOCK PRICES

ANNs are information processing models that attempt to mimic processing of information of the human brains. They are also able to learn nonlinear chaotic systems. They can understand past nonlinear values. It has the ability to learn from the past and generalize a model to forecast a future process. It can also adapt to changing market conditions. Neural Networks are classified according to learning mechanisms. Network is taught by presenting it with a set of sample data as inputs and by varying the weighting factors in the algorithm that determines the corresponding output states. The learning methods are supervised learning, unsupervised learning, and reinforced learning. There are three classes of networks namely, single layer feed forward network, and multilayer feed forward network and recurrent network. The real world systems are often nonlinear.

III. LITERATURE REVIEW

Financial markets as directed by multidimensional data presented to a trading system [1] are complex nonlinear systems. Neural networks are excellent tool [2] for combining otherwise disparate technical, fundamental and intermarket data within quantitative framework. Experts use charts and even intuition to navigate through massive amounts of information. Neural networks learn from experience instead of following equations and rules [3]. Multilayer neural networks [4] have been successfully applied to time series forecasting. Neural networks are excellent [5] mapping tools for complex financial data. A neural network model is expected to be general if model architecture is made less complex by using fewer input nodes. Previous studies have found encouraging results using artificial

intelligence technique to predict [7],[8] the movement of established financial markets. Emerging markets are characterized by high volatility, relatively smaller capitalization and less price efficiency. Joarder Kamaruzzaman and Rahul A Sarkar [10] in their paper investigate ANN based prediction modeling of foreign currency rates. There is evidence that stock returns are [11], [12], and [13] predictable and investors can earn returns superior to a simple buy and hold strategy. Research says that investors can rely on equity research [14], [15] in India for profit making investment decisions in stocks.

IV. ARTIFICIAL NEURAL NETWORKS

Artificial neural network is an information processing system. Elements called neurons process the information. Signals are transmitted by means of connection links.

The links possess an associated weight, which is multiplied along with incoming signal. The output signals obtained by applying activations to the input neural net can generally be a single layer or multilayer net. Typical multilayer artificial neural network, abbreviated as MNN, comprises an input layer, output layer and hidden (intermediate) layer of neurons.

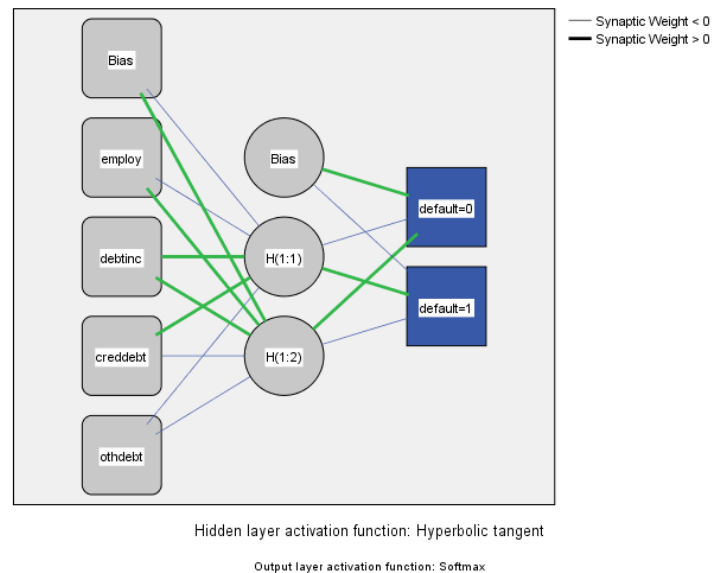


Figure 1. Feed forward architecture with one hidden layer

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 There will be one input and one output and number of hidden layers may vary from zero to any number. The adjustment of weights is known as training of the neurons of the neural network. The input of the first sample is presented to the network and after calculation an output is determined. The output is compared with target value of the sample and weights are adjusted in such a way that error between outputs and targets is minimized. The common error function is Sum of square error. The weight updating is called as training algorithm and several such algorithms are available. They are listed below;

- I Gradient descent (Incremental mode)
- li Gradient descent (Batch mode)
- lii Gradient descent with incremental mode.
- Iv Gradient descent with variable learning

V. USE OF NEURAL NETWORK IN FORECASTING

The neural network in this study was designed to predict the closing price of the stock. The data used are TCS stock from NSE between the period January 1, 2015 and Feb 28, 2016. For the neural network the data is divided into 70:30 and 70% data is used for training and 30% is used for prediction. Architecture selection is automatic with one hidden layer. It uses hyperbolic tangent function for activation. Using IBM-SPSS the data is analyzed. Inputs to the network are opening price, high, low, closing price and volume of the stock. The network consists of five input neurons and one output neuron. The study is used to predict any other future values. There are different ways to construct and implement neural network for forecasting: Multilayer Perceptron is used in this work. Sumofsquare error function is used to measure the performance of the network. Activation function used is hyperbolic tangent. The trained network thus obtained has been tested with randomly selected data from 30% data set.

VI. RESULTS AND DISCUSSION

Analysis is done to know the effectiveness of Multilayer perceptron. Past historical prices are compared with predicted value. Table I displays

the comparison between actual closing values and predicted values of closing prices. Forecasting error is also calculated.

Table I. Actual Value Vs Predicted value of stock TCS

Actual value	Predicted value	Forecasting error in%
2460	2455.01	0.1784
2445.50	2427.93	0.7184
2576.10	2576.67	0.02113
2553	2529.43	0.9232
2552.25	2532.98	0.75502

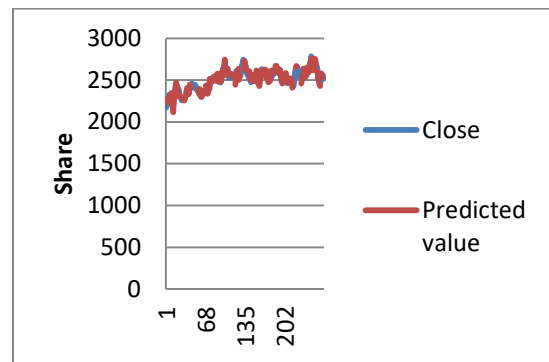


Figure 2. Graphical presentation of Predicted and actual closing prices

Table II. Evaluation of Neural Network

Input Variables	Network Architecture	Forecasting performance
I. Opening price II. High III. Low IV. Closing price V. Volume	5-19-1	Sum Of Square Error 4.992e-5

It is a known fact that the performance of ANN for forecasting depends on many factors and findings cannot be compared with other studies.

VII. CONCLUSION

In our study Multilayer Perceptron Neural Network is used to forecast the stock prices of the selected stock. The predicted results demonstrate that ANN has been able to predict stock prices with better accuracy.

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