

# Comparative Study and Analysis of Stock Market Prediction Algorithms

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## Abstract

Stock market is an important part of economy of a country. Prediction of stock market prices is an important issue in finance. Stock market prediction is the act of trying to determine the future value of a company stock or other financial instrument traded on an exchange. In stock price prediction the relationship between inputs and outputs are non-linear in nature, hence prediction is very difficult. In this paper we have proposed stock prediction system, which make comparison of 4 algorithms (Forecasting Algorithm, Moving Averages Algorithm, Regression Algorithm, and Neural Network Algorithm) and give the best prediction decision based on these algorithms.

**Keywords:** Artificial Neural Network, Stock Market, Multilayer Perception, General Regression Neural Network, Auto-Regression Integrated Moving Average.

## 1. Introduction

Human want to make his life easier using various technologies. New technologies are used to solve human problem. So one of the difficult task is share market. Share market affects the business. It plays an important role in growth of an industry that eventually affects economy of a country. It is a common platform for companies to raise funds for company by allowing customers to buy shares at an agreed price. Now there are new technologies are available in share market field. Many tools and techniques are available for share market to help user. There is need of an experienced person to help new user for make decision about sale and purchase of share. There is need of designing a computational model that can predict certain aspects of stock movements. Back propagation algorithm with time and profit based adjusted weight factors. Time series forecasting is used to forecast the future based on historical observations. Traditional methods, such as time-series regression, exponential smoothing and Auto

Regressive Integrated Moving Average is based on linear models. All these methods assume linear relationships among the past values of the forecast variable and therefore non-linear patterns cannot be captured by these models. Using Time-series ARIMA Model a time series is forecasted by transformations such as differencing and logging. ARIMA model is depends on auto-regressive terms, non-seasonal differences, lagged forecast errors in the prediction equation. Back propagation neural network architecture is multi layer feed forward neural network. During the back propagation phase of learning, signals are sent in reverse direction. The inputs are sent to the BPN and the output obtained from the net could be either binary 0, 1 or bipolar -1, +1 activation function.

So we design a system which help user for making decision about share. System has intelligence like human for choosing best choice. This type of technology called Artificial Intelligence (AI). The artificial intelligence technology is work like human neural system. Using artificial intelligence Artificial Neural Network (ANN) is developed.

In this paper, comparison between 4 algorithms-forecasting Algorithm, Moving Averages Algorithm, Regression Algorithm, and Neural Network Algorithm is done to drawn best decision for share market.

## 2. Related Work

Share market is an important part of economy of a country. It plays an important role in growth of an industry that eventually affects economy of a country. Stock market is common platform for companies to raise funds for company by allowing customers to buy shares at an agreed price.

We predict the stock portfolio price using different algorithms of artificial neural network for prediction that buy or sell or hold the stock portfolio of particular company on the basis of analyzing the stock portfolio previous months of closing price.

We use artificial neural network methods like Forecasting, Linear regression, and Moving averages. In forecasting method, the system is taking the three days last and the current year stock portfolio closing price from the predicted date and performs calculations on it for predicting the stock portfolio price.

Moving averages method, system is take the ten days' stock portfolio closing price from the predicting date and calculate the stock price. In this method an alpha is set for the predicting value it is a constant for this method.

Regression method, it is a statistical assessing the association between two variables. It is used to find relationship between two variables.

Neural networks method has effective, general purpose approach for pattern recognition, classification, and clustering and especially time series prediction with a great degree of accuracy. Nevertheless, their performance is not always satisfactory. Back propagation algorithm is the best algorithm to be used in Feed Forward Neural Network (FNN) because it reduces an error between the actual output and desired output in a gradient descent manner.

In share market large amount of investment is happen. Shareholders invest their money in many companies. Many websites are available to give updates about share to their shareholders. This website gives information about share market. Newly entered person in stock market need help of experienced person's advice. Using experienced person's knowledge new user can make efficient decision. So, there is no software or tool available to help new user. Stock market prediction has certain issue. Researcher cannot discover method for prediction of stock market price movement.

In this system we generate a share value which is close to changes in share market using various algorithm comparisons.

### 2.1 Work flow of block diagram:

#### 1] Fetch Stock Data:

In This System Stock portfolio data will fetch from using Yahoo API and perform the analysis on the stock exchange data (opening price, closing price, high, low) for the prediction of next day decision.

#### 2] Analysis Data:

System performs analysis on stock data using 4 algorithms:

- a) Moving average algorithm
- b) Forecasting algorithm
- c) Neural nephron algorithm
- d) Regression algorithm.

After applying above 4 algorithms find the most efficient algorithm for calculating predicted value and making decision we called it as filtered algorithm.

#### 3] Analysis using Filtered Algorithm:

Once get the filtered algorithm we find the predicted value and decision using this algorithm. Take last month of data analyze it using filtered algorithm according to that put the result to users.

#### 4] Decision to Customers

System gives decision in the following form

- a) Sale- Our system recommends customer to sale a stock according to that customer will make the profit
- b) Buy- Our system recommends customer to buy a stock so in a way that customer will make the profit
- c) Hold- Our system recommends customer to hold a stock so in way that customer avoid his/her loss

## 3. Methodolgy

To develop stock market prediction system, it requires parameters such as follows:

#### 1) Data set:

To predict any value, it requires large amount of input data. Processing these data and applying algorithms on it, we can predict the future value. So in this system, we

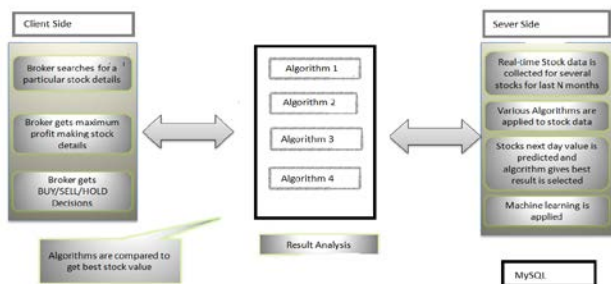


Fig.1 Proposed system architecture

required share market data which can take from Yahoo! or other companies.

2) Data Processing:

Applying four algorithms on input data set:

a) Forecasting algorithm:

The process of making predictions of the future based on past and present data and analysis of trends is called Forecasting. Example might be estimation of some variable of interest at some specified future date. Both might refer to formal statistical methods employing time series, cross-sectional or longitudinal data, or alternatively to less formal judgmental methods.

b) Moving Averages:

In statistics, a moving average (rolling average or running average) is a calculation to analyse data points by creating a series of averages of different subsets of the full data set. It is also called a MM or rolling mean and is a type of finite impulse response filter. Variations include: simple, and cumulative, or weighted forms.

c) Neural Nephron Algorithm:

Neural network is made of no of neurons. The neural network is created by input layer, hidden layer and output layer. Neural network is depending on other parameters such as number of layers in network, no of neurons in input layer, no of neurons in hidden layer, Rate of momentum, Network learning rate. It gives correct output after processing input data.

Feed-Forward NN:

The neurons are organized in the form of layers. Input is given from the previous layer and feed their output to the next layer. Connections to the neurons in the same layers are not permitted.

Single layer network: It is simplest kind of neural network, which consists of a single layer of output nodes. The inputs are fed directly to the outputs via a series of weights.

Multilayer networks:

Network consisting of input node, output node and one or more hidden layers are called multilayer networks.

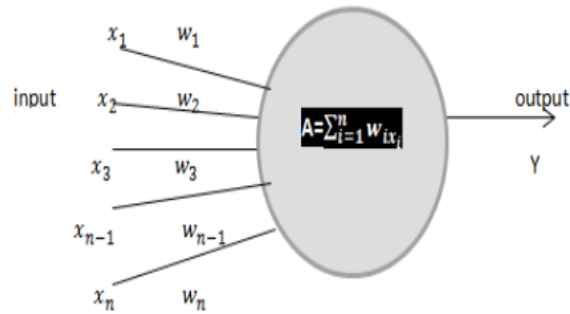


Fig.2 Internal Structure of a Node

d) Regression Algorithm:

A regression is a statistical analysis assessing the association between two variables. It is used to find the relationship between two variables. We will first find slope, intercept and use it to form regression equation.

$$\text{Regression Equation}(y) = a + bx \tag{1}$$

$$\text{Slope } (b) = (NXY - (X)(Y)) / (NX^2 - (X)^2) \tag{2}$$

$$\text{Intercept } (a) = (Y - b(X)) / N \tag{3}$$

3) Comparison of Algorithms:

Using artificial intelligence these four algorithms are compared. Using multilayer perceptron neural network, which algorithm gives best prediction of stock market is identified. The neural network is made up of no. of neuron. The human body contains number of neurons which contain certain information and that information passes from one neuron to another neuron. The information is processing at neurons and produces the output. In that way the ANN is work. In our system ANN is made up of layers of neurons. First layer is connected to input data, then in multilayer network there are no of hidden layers and final output layer are present. ANN gives efficient algorithm. This most efficient algorithm for calculating predicted value and making decision we called it as filtered algorithm.

4) Analysis using Filtered Algorithm:

Once get the filtered algorithm we find the predicted value and decision using this algorithm. Take last month of data analyse it using filtered algorithm according to that put the result to users.

## 4. Conclusions

In this paper using previous data about stock market prices, we can predict the next day stock market price. User can easily make decision about the stock market by

using this system. In this system we use artificial neural network for choosing best algorithm which gives best solution.

## 5. References

- [1] Banerjee, D. "Forecasting of Indian Stock Market using Time series ARIMA Model", Business and Information Management (ICBIM), in 2nd International Conference, 2014, pp. 131 – 135.
- [2] Osman Ahmed Abdalla, Abdelrahman Osman Elfaki, Yahya Mohammed AlMurtadha "Optimizing the Multilayer Feed-Forward Artificial Neural Networks Architecture and Training Parameters using Genetic Algorithm" International Journal of Computer Applications (0975 – 8887) Vol.96,No.10, 2014.
- [3] D. A. Kumar and S. Murugan, "Performance Analysis of MLPFF Neural Network Back Propagation Training Algorithms for Time Series Data", in 2014 World Congress on Computing and Communication Technologies (WCCCT), 2014, pp. 114–119.
- [4] G. Dong, K. Fataliyev and L. Wang, "One-step and multi-step ahead stock prediction using backpropagation neural networks", in Information, Communications and Signal Processing (ICICS) 2013 9th International Conference , 2013, pp. 1–5.
- [5] W. Ming-Tao and Y. Yong, "The Research on Stock Price Forecast Model Based on Data Mining of BP Neural Networks", in 2013 Third International Conference on Intelligent System Design and Engineering Applications (ISDEA), 2013, pp. 1526–1529.
- [6] K. Kim, "Artificial neural networks with evolutionary instance selection for financial forecasting", Expert Syst. Appl., Vol. 30, No. 3, 2006, pp. 519–526.
- [7] A. Chen, M. T. Leung, and H. Daouk, "Application of neural networks to an emerging financial market: forecasting and trading the Taiwan Stock Index", Comput. Oper. Res., vol. 30, no. 6, 2003, pp. 901–923.
- [8] Javier Contreras, Rosario Espnola, "ARIMA Models to Predict Next-Day Electricity Prices", Power Systems, IEEE Transactions on 2003, Vol.18, No. 3, pp. 1014 – 1020.
- [9] Nair, B.B. Dharini, N.M.Mohandas, V.P., " A Stock Market Trend Prediction System Using a Hybrid Decision Tree-Neuro-Fuzzy System ", Advances in Recent Technologies in Communication and Computing (ARTCom) 2010 International Conference , 2010, pp. 243 - 247 .
- [10] Chen Chen, Wu Dongxing, Hou Chunyan, Yuan Xiaojie, "Exploiting Social Media for Stock Market Prediction with Factorization Machine" ,Web Intelligence (WI) and Intelligent Agent Technologies (IAT), 2014 IEEE/WIC/ACM International Joint Conferences , 2014, pp. 142 – 149.
- [11] Olson Dennis, Mossman Charles, "Neural Network Forecasts of Canadian Stock Returns Using Accounting Ratios", International Journal of Forecasting, vol.19, 2003, pp. 453-465.
- [12] Ryota, K., Tomoharu, N, "Stock market prediction based on interrelated time series data", Computers & Informatics (ISCI), 2012 IEEE Symposium, 2012, pp. 17 - 21.
- [13] Chang Sim Vui, Gan Kim Soon, Chin Kim On, Alfred R., Anthony P. , "A review of stock market prediction with Artificial neural network (ANN)" ,Control System, Computing and Engineering (ICCSCE) 2013 IEEE International Conference ,2013, pp. 477 – 482.
- [14] Somani, P., Talele, S., Sawant, S., "Stock market prediction using Hidden Markov Model", Information Technology and Artificial Intelligence Conference (ITAIC), 2014 IEEE 7th Joint International, 2014, pp. 89 – 92.
- [15] Contreras, J., Espinola, R., Noga, J., F. and Conejo, A. J. "ARIMA models to predict next day electricity prices", IEEE transactions on power system, vol.18, no.3, 2003, pp.1014-1020.
- [16] H. Mizuno, M. Kosaka, H. Yajima and N. Komoda , "Application of Neural Network to Technical Analysis of Stock Market Prediction," Studies in Informatic and Control, vol.7, no.3, 1998, pp.111-120.