

Stock Market Forecasting Techniques: A Survey

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Abstract - In recent years, forecast of stock exchange has gained lot of interest. Stock forecast helps investors or individuals interested in stock to know in which stock to invest, to get high rate of profit. With the assistance of recent technologies like data processing and artificial intelligence, analysis is performed on the dataset and it can help to generate an accurate prediction model. Some of the popular techniques for stock market prediction are artificial neural network, Hidden Markov Model (HMM), various machine learning techniques, data mining, fuzzy system and also deep learning techniques. This paper surveys various traditional as well as recent techniques used for stock market prediction.

Key Words: Artificial Neural Network (ANN), Machine Learning, Deep Learning, Support Vector Regression, Hidden Markov Model (HMM), Stock market, prediction.

1. INTRODUCTION

Prediction of financial markets or stock price has been one among the most important challenges. The rise in the market price plays a vital role for the expansion of the corporate sector. Stock market is a public market that allows an individual to purchase, sell and trade stocks. Stock exchange is another name that can be used to refer it. Share is an agreement provided by an organization or a company that entitles the holder within the possession of an organization. An individual owning a share or stock can earn dividend i.e., a part of the company's profit. Stock is defined as a collection of shares. Stock market can also involve trading between two investors, in which it gets investors together to sell and buy shares in companies. Many state that stock exchange is referred as a barometer of the market or the country's economy and development. By buying more products, its product value increases, hence their market profits increases and in turns its share value. As one can gain profit by investing in stock, there's risk of losing the capital. Hence, stock prediction is important for an investor before investing money. Stock market prediction is one of the methods of predicting future worth of company stocks. Long-term trading and short-term trading are the categories of trading done in stock market. In recent years, results have shown that artificial intelligence and machine learning techniques have given promising results for this application. Machine learning is classified into various categories, namely; supervised learning, semi-supervised learning, un-supervised learning and reinforcement learning. For stock market prediction, supervised learning method is considered. Supervised learning is further divided into classification algorithms and regression algorithms. The general flow of forecast of stock market price using neural network involves the following steps. The stock index price of various firms is used as the dataset for prediction process. This dataset consists of date, high price, low price, open price and close price value of stock price of each day. This dataset is given as the input to the model, which is further divided into train and test dataset. Once the model training is complete, it is tested using the test dataset. The model accuracy can be indicated using MSE (Mean Square Error) and RMSE (Root Mean Square Error) value. Lastly a graph is plotted with y-axis indicating the average mean of close price values and x-axis indicating the no of days. This paper reviews various methods and models employed to train and to predict the price which are trained and tested using a variety of stock dataset of different firms.

2. LITERATURE REVIEW

Ayodele A. Adebisi, Aderemi O. Adewuni and Charles K. Ayo [1] have given a process for developing a stock price predictive model using ARIMA model. For the stock price prediction, dataset was gathered from NSE (Nigeria Stock Exchange) and NYSE (New York Stock Exchange). The e-views software v-5 is the tool used for implementation. The criteria used for the study for each stock index to determine best ARIMA model are Schwarz or Bayesian information criteria, relatively smaller standard error of regression, relatively high adjusted R^2 . The two dataset used are nokia stock index and zenith bank index. Both datasets returned smallest value for Bayesian information criteria and relatively smaller standard error of regression for ARIMA (2, 1, and 0) and ARIMA (1, 0, and 1). Hence, the results states that ARIMA models has potential to predict stock price on short term basis.

Mustain Billah, Sajjad Waheed and Abu Hanifa [2] have proposed an improved Leven-berg Marquardt (LM) training algorithm which is a type of ANN algorithm. The dataset was generated using DSE (Dhaka stock exchange) with a time ranging from Jan 2013 to April 2015. The ANN model was developed using the MATLAB 2010a's neural network (NN) tool. In the study, coefficient of multiple determinations (R^2) and RMSE were used to compare performance and accuracy of the models. The comparison was done by training the data using different neural network i.e., NN with traditional LM, NN with improved LM and

ANFIS (Adaptive Neural Fuzzy Inference System). Results shows that the neural network with improved LM algorithm has lowest RMSE value of 53% less than the other methods and also proved that the memory and computing time needed for improved LM are 54% and 34% less accordingly to traditional LM algorithm 59% and 47% less accordingly then ANFIS.

Suchira Chaigusin, Chirathamjaree, Judy Clayden [3] conducted an experiment on forecast of Stocks Exchange of Thailand (SET) using feed forward back propagation neural networks. They suggested that identification of right parameters for neural networks model in forecasting of SET is important. Different factors influencing the Thai stock market were used for development of model such as Nikkei index, Dow Jones index, Hang Sang index, minimum loan rate (MLR) of exchange rate of the Thai Baht, gold prices. Data with time period of 2003 was used. After research three network models for SET index prediction were considered suitable i.e., 3 layer, 4 layer, and 5 layer neural network with the MAPE of the prediction of each models were 1.26594, 1.14719 and 1.14578 respectively.

Abidatul Izzah, Yuita Arum Sari, Ratna Widyastuti, Toga Aldila Cinderatama [4] have proposed an Improved Multiple Linear Regression (IMLR) which was built into a mobile app based android platform for stock price prediction. IMLR is a hybrid technique which uses multiple linear regression with moving average. The data for prediction is collection from financial yahoo through which data is automatically accessed by yahoo financeAPI. The model is trained and tested on the Indonesia Stock Exchange (IDX) which is also called Jakarta Composite index. This app can help the user to observe daily stock values and also real time stock price prediction. Results show that the IMLP gives better results as compared to the common MLR.

Phayung Meesad, Risul Islam Rasel [5] conducted an experimental study in which SVR analysis is used as machine learning technique for prediction of stock market price and also to predict stock market trend. They used different types of windowing operators such as flatten windowing, basic rectangular windowing and de-flatten windowing to feed more reliable inputs into regression models which transforms time series data into generic data. The experiment was conducted using the Dhaka Stock Exchange (DSE), which had entries from 2009-2014 historical data. Results shows that, SVR models that were built using flatten window and rectangular window operator gave good stock price prediction results.

Poonam Somani, Shreyas Talele, Suraj Sawant [6] conducted a survey on prediction of stock price in the area of neural network, Support Vector Machines (SVM) and Hidden Markov Model (HMM). In this paper, the HMM was proposed for prediction method and comparison was conducted on the exciting techniques. Training of data was done using Baum Welch algorithm for HMM. The implemented algorithm was tested on three different stocks which are SBI, IDBI and ICICI. Results showed that the proposed model gave better accuracy then the traditional techniques.

Meryem Ouahilal, Mohammed El Mohajir, Mohamed Chahhou, Badr Eddine El Mohajir [7] proposed a novel hybrid approach which combines the SVR algorithm with the Hedrick Prescott filter (HP). This new model was proposed to parse and to normalize the data by filtering and to remove all exciting noise in financial time series. Experiments were conducted on Maroc Telecom (IMA) time series data which has data from 2004 to 2016. The experimental results showed that the proposed model gave better results in terms of price prediction since the MAPE error gave lowest error rate compared to other methods.

Rupesh A. Kamble [8] stated that to improve accuracy rate of short-term prediction, use of appropriate pre-processing technique and machine learning model is needed. In this paper, they proposed a prediction system using J48 algorithm and random forest for short-term prediction. Then pre-processing and using combination of data can provide a better accuracy rate and for long term stock prediction, using both the fundamental data as well as technical data of the company gives better results.

Siyuan Liu, Guangzhong Liao, Yifan Ding [9] used the RNN-LSTM to filter, extract feature value and to analyze the stock data. The experiment was conducted using the historical data of CSI 603899 index with the time period from 18-05-2014 to 29-01-2017. The experimental results showed that their LSTM model can play a better forecasting model, with an accuracy of about 72% for short term of data. This paper states that the model can be improved further by extracting more feature values to train the model.

Murga Gurjar, Parth Naik, Gururaj Mujumdar [10] proposed a project which tried to predict stock price using different machine learning techniques. They used linear regression to predict open price of the stock for next day and used Support vector machine regression to find the difference between close and open prices of the stock.

El Essam [11] presented a new technique namely PSOCoM (PSO with centre of mass technique) to form a new prediction model which was used to apply while training an adaptive linear combiner. The model was trained and tested using the historical data of three indices i.e., NASDAQ-100, Dow Jones industrial average and S&P-500. Results shows that the proposed PSOCoM technique model gave better results in terms of prediction accuracy than other PSO based models.

Dev Shah, Wesley Campbell, Farhana H. Zulkerine [12] conducted a comparative study between two neural network models namely LSTM and DNN to forecast daily and weekly prediction of Indian BSE sensex index. Historical data of Tech Mahindra stock was used as dataset. Results shows that for daily stock price prediction both the LSTM and DNN perform well and in case of weekly predictions LSTM RNN outperformed the DNN model and gives promising results in case of long term prediction.

Manoj S. Hedge, Ganesh Krishna, Dr Ramamurthy Srinath [13] approached an ensemble model for stock price prediction and recommendation model which informs on which stock to invest using the historical stock data, tweets and news of various companies. The model was trained using the 20 year period Indian National Stock Exchange (NSE). This model uses RNN (LSTM) to predict the future stock. The predicted stock is converted into graphical image. Than a CNN classifier is trained using this image to recommend which stock to invest in.

3. CONCLUSION

This paper presents a survey of different techniques such as machine learning techniques, hidden Markov model, ARIMA model and also deep learning techniques. It is observed that selection of the right parameters for the dataset used for prediction plays important role good prediction accuracy. Various machine learning models as well as hybrid and ensemble model give higher rate of accuracy. To get even better accuracy fundamental analysis can be used which uses sentiment analysis and feature selection along with machine learning and deep learning techniques.

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