STOCK MARKET PREDICTION USING ANN

Mruga Gurjar[1], Parth Naik[2], Gururaj Mujumdar[3], Prof. Tejaswita Vaidya[4]

[1]Student, Dept. of Computer Engineering, Sinhgad College of Engineering, Maharashtra, India.
[2]Student, Dept. of Computer Engineering, Sinhgad College of Engineering, Maharashtra, India.

---***---

Abstract - *Stock market is a place where shares of public listed companies are traded. Stock exchange facilitates stock brokers to trade company stocks and other securities. India's premier stock exchanges are the Bombay Stock Exchange and National stock exchange. Stock price prediction is one of the most widely studies and challenging problems, attracting researchers from many fields including economics, history, finance, mathematics and computer science. The volatile nature of the stock market makes it difficult to apply simple time-series or regression techniques. Our project tries to predict future stock prices using machine learning techniques on the NSE. It uses linear regression and SVM regression. Linear regression will be used for predicting open price of the stock for the next day using close price of the stock for the previous day. SVM regression will be used for predicting the difference between close and open prices of the stock for the next day. External factors like foreign exchange rate, NSE index, moving averages, relative Strength index etc are used to get maximum accuracy.*

The project attempts to predict whether a stock price sometimes in the future will be higher or lower than it is on a given day. We find a little predictive ability in the short run but definite predictive ability in the long run.

Key Words: **Machine Learning, Artificial Neural Networks, Stock Market, Stock Price, Feed Forward Artificial Neural Networks.**

1. INTRODUCTION

In recent times stock market predictions is gaining more attention, maybe due to the fact that if the trend of the market is successfully predicted the investors may be better guided. The profits gained by investing and trading in the stock market greatly depends on the predictability. If there is a system that can consistently predict the direction of the dynamic stock market will enable the users of the system to make informed decisions. More over the predicted trends of the market will help the regulators of the market in taking corrective measures.

1.1 Stock Market

A stock market, equity market or share market is the aggregation of buyers and sellers (a loose network of economic transactions, not a physical facility or discrete entity) of stocks (also called shares), which represent ownership claims on businesses; these may include

securities listed on a public stock exchange as well as those only traded privately[1]. Examples of the latter include shares of private companies which are sold to investors through equity crowd funding platforms. Stock exchanges list shares of common equity as well as other security types, e.g. corporate bonds and convertible bonds.

1.2 Stock Trade

Trade in stock markets means the transfer for money of a stock or security from a seller to a buyer[2]. This requires these two parties to agree on a price. Equities (stocks or shares) confer an ownership interest in a particular company.

Participants in the stock market range from small individual stock investors to larger trader investors, who can be based anywhere in the world, and may include banks, insurance companies, pension funds and hedge funds. Their buy or sell orders may be executed on their behalf by a stock exchange trader.

1.2 Predictions

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[3]. The successful prediction of a stock's future price could yield significant profit. The efficient-market hypothesis suggests that stock prices reflect all currently available information and any price changes that are not based on newly revealed information thus are inherently unpredictable. Others disagree and those with this viewpoint possess myriad methods and technologies which purportedly allow them to gain future price information.

2. LITERATURE SURVEY

In the last two decades forecasting of stock returns has become an important field of research. In most of the cases the researchers had attempted to establish a linear relationship between the input macroeconomic variables and the stock returns. But with the discovery of nonlinear trends in the stock market index returns[4], there has been a great shift in the focus of the researchers towards the nonlinear prediction of the stock returns. Although, there after many literature have come up in nonlinear statistical modeling of the stock returns, most of them required that the nonlinear model be specified before the estimation is done. But for the reason that the stock market return being noisy, uncertain, chaotic and nonlinear in nature, ANN has

evolved out to be better technique in capturing the structural relationship between a stock's performance and its determinant factors more accurately than many other statistical techniques[5] In literature, different sets of input variables are used to predict stock returns. In fact, different input variables are used to predict the same set of stock return data. Some researchers used input data from a single time series where others considered the inclusion of heterogeneous market information and macro economic variables. Some researchers even pre-processed these input data sets before feeding it to the ANN for forecasting.

1. A recent study (et al.Risul Islam Rasel , Nasrin Sultana ,Nasimul Hasan, IEEE 2016) has shown that ANN model can be more advantageous compared to other SVM or LR models and the Advantages are Increase in accuracy with multiple attributes[4]. Works well even if attributes and output do not have a clear relation. Also, some disadvantages also must be considered which are Time required for prediction is more than other methods Can face overfitting problem.

2. Chan., Wong.,and Lam., implemented a neural network model using the technical analysis variables for listed companies in Shanghai Stock Market. In this paper performance of two learning algorithm and two weight initialization methods are compared. The results reported that prediction of stock market is quite possible with both the algorithm and initialization methods but the performance of the efficiency of the back propagation can be increased by conjugate gradient learning and with multiple linear regression weight initialization.

3. A comparative literature survey is also done on Support Vector Machine to prove tha results of ANN are more accurate than SVM. Some of the disadvantages found (et al. Phayung Meesad, IEEE 2014) are Only attributes having clear relationship can be supplied as attributes[2]. Or else accuracy percentage is dropped.

3. MOTIVATION

3.1 Financial

Many people are interested in the financial market. And need guidance and accurate predictions to invest wisely. Investors are always looking for the accurate future results. template sample paragraph.

3.2 Applications and News channels

There are many applications that try to predict the stocks but they do not give detailed information about the prediction. Thus with a successful model for stock prediction , we try to gain insight about market behavior over time , spotting trends that would otherwise not have been noticed.

Motivation behind using ANN :

Neural network is used for prediction because they are able to run nonlinear mappings between input and outputs. It is possible that ANN outperforms traditional analysis like Linear Regression.

4. METHODOLOGY

4.1 Factors used for predictions

1. **Moving Averages:**

A moving average (MA) is a widely used indicator in technical analysis that helps smooth out price action by filtering out the "noise" from random price fluctuations. It is a trend-following, or lagging, indicator because it is based on past prices. In our project we have used simple moving averages for 1 day, 7 days and 15 days.

2. **Stochastic Oscillator :**

The stochastic oscillator is a momentum indicator comparing the closing price of a security to the range of its prices over a certain period of time. The sensitivity of the oscillator to market movements is reducible by adjusting that time period or by taking a moving average of the result.

$$\%K = 100 * (C - L_{14})/(H_{14} - L_{14})$$

where:

C - the most recent closing price

L14 - the low of the 14 previous trading sessions

H14 - the highest price traded during the same 14-day period

%K - the current market rate for the currency pair

3. **Standard Deviation:**

Standard deviation is a measure of the dispersion of a set of data from its mean. It is calculated as the square root of variance by determining the variation between each data point relative to the mean. If the data points are further from the mean, there is higher deviation within the data set.

4. **On-Balance Volume:**

On-balance volume (OBV) is a momentum indicator that uses volume flow to predict changes in stock price. He believed that, when volume increases sharply without a significant change in the stock's price, the price will eventually jump upward, and vice-versa.

4.2 Algorithm

For stock price predictions ANN technique is used with backpropagation. During training phase forward propagation is done in neutral network. After the forward

pass output value is generated at the output layer nodes. During the forward pass initially total input to node is calculated, then the output of the node is calculated using activation function.

In feed-forward ANN, the neurons receive a number of inputs, the neuron total input is calculated using formula -

$$TotalInput = n_1 * w_1 + n_2 * w_2 + \ldots + n_m * w_m + 1 * w_b$$

Where:
$n_1, n_2, \ldots, n_n$ - Input neurons
$w_1, w_2, \ldots, w_n$ – Weights associated with input neurons
w_b – Weight associated with bias

Output of neuron is calculated using activation function-

$$Activation function = 1 / \left(1 + e^{(-TotalInput)}\right)$$

Where:
Total Input – The total input to the neuron

The backward propagation of errors, of back propagation, is a common method of training artificial neural networks and used in conjunction with an optimization method such as gradient descent. The algorithm repeats a two phase cycle, propagation and weight update.
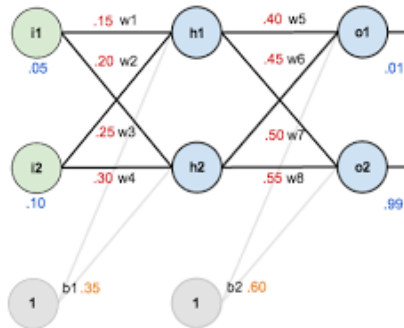

Fig -1: ANN Working

During back-propagation phase the output after forward pass is compared with the expected output which is then used to adjust link weights.

The previous studies have used various forecasting techniques in order to predict the stock market trends. Some attempted to forecast the daily returns where others developed forecasting models to predict the rate of returns of individual stocks. In many papers it was also found that researchers have attempted to compare their results with other statistical tools. And these findings provide strong motivation for modeling forecasting tools for stock market prediction.

The uniqueness of the research comes from the fact that the research employs a neural network based forecasting approach on National Stock Exchange index (CNX S&P Nifty 50) Furthermore, as not much work has been done on the forecasting of Indian stock market indices using neural network, this paper will actually help to understand the micro-structure of Indian market.

4.3 Results

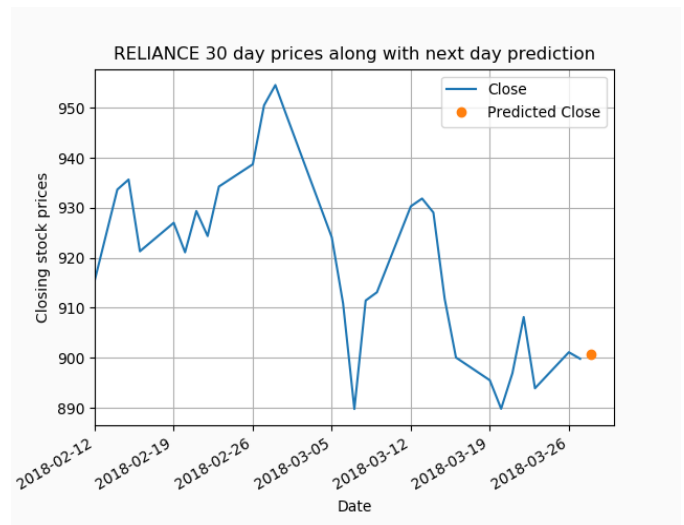The following is an example of how the predicted results are displayed to the user.

Fig -2: Prediction results for NSE RELIANCE as displayed to users

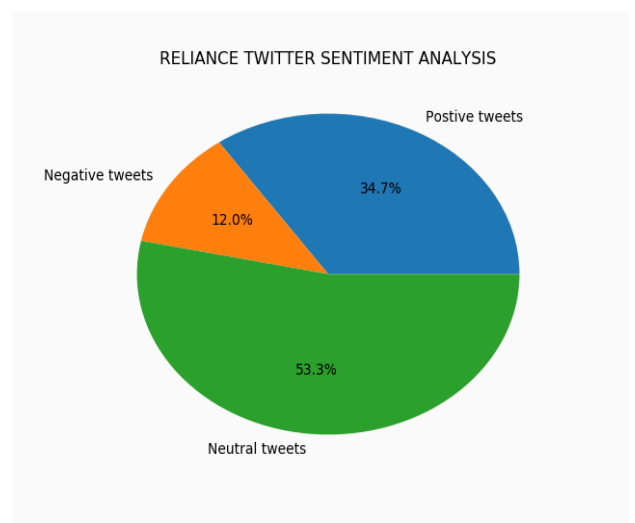The users are also provided with twitter sentiment analysis based on the latest 200 stocks of the company

Fig -3: Twitter sentiment analysis of NSE RELIANCE

5. CONCLUSION AND FUTURE SCOPE

In this project we have used machine learning techniques to predict stock prices, the machine learning technique used by us is Artificial Neural Networks. We train the ANN model by using historical stock data. Various features such as stochastic indicator, moving averages, RSI are extracted from the historical stock data. The dataset is then divided into training and testing sets which are used for training and testing the accuracy of the ANN model. The predicted stock prices help investors make smart investment decisions as well as help analysts to predict and study trends market stocks. Personalised user profiles ensure that user privacy is maintained as well as allow the users to select favourite stocks. The admin has the ability to add more stocks apart from the top 50 NSE stocks. The predicted prices are given for the next day, next 3 days, next 5 days. Graphical display of results help users easily understand results.

ACKNOWLEDGEMENT

REFERENCES

[1] Financial Instability Analysis using ANN and Feature Selection Technique: Application to Stock Market Price Prediction- Risul Islam Rasel, Nasrin Sultana , Nasimul Hasan, IEEE 2016

[2] Predicting Stock Market Price Using Support Vector Regression- Phayung Meesad, IEEE 2014

[3] [Stock market index prediction using artificial neural network- Amin Hedayati Moghaddam, Moein Hedayati Moghaddam, Morteza Esfandyari, Journal of Economics,2016.

[4] Rasel, Risul Islam, Nasrin Sultana, and Phayung Meesad. "An efficient modelling approach for forecasting financial time series data using support vector regression and windowing operators." International Journal of Computational Intelligence Studies 4.2 (2015): 134-150.

[5] Yetis, Y.; Kaplan, H.; Jamshidi, M., "Stock market prediction by using artificial neural network," in World Automation Congress (WAC), 2014 , vol., no., pp.718-722, 3-7 Aug. 2014

[6] Lucas, K., Lai, C., James, N., Liu, K.: Stock Forecasting Using Support Vector Machine. In: Proceedings of the Ninth International Conference on Machine Learning and Cybernetics, pp. 16071614 (2010).

[7] Stock Market, Wikipedia.

[8] Investopedia.

[9] mattmazur.com