Forecasting Stock Market Returns Using Artificial Neural Networks

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Abstract **- A stock market is an inventory and derivatives trading platform at a negotiated price. The stock market is driven by supply and demand of shares. One of the most developing industries is in every nation stock market. Predicting and analyzing stock market data is an important part of today's economy. The prediction of stock performance is one of the most difficult problems in time series data analysis. The stock market process is clearly quite unpredictable; therefore, it is greatly influenced by various variables. This has become a major undertaking in business and finance. There are numerous kinds of algorithms used to predict/foresee. Machine learning algorithms have been extensively utilized in recent decades to forecast financial time series. Although automated trading systems using artificial intelligence (AI) have become a popular subject, few instances utilize the established technique developed for the building of automatic trading systems by traders in stocks. This article examines stock market returns using artificial neural networks.**

Index Terms **- Forecasting Stock, Market Returns, Artificial Neural Networks, Machine Learning, etc.**

I.INTRODUCTION

Predictability of stock returns is one of investors' most significant concerns. Many writers try to explain the cross-section of inventory returns, utilizing different variables such as the income-price relationship, business size and inventory price momentum and the effectiveness of these components. Conversely, investors themselves must determine how returns may be processed and forecast, including selection and weighting of these variables. Many individuals now have an indirect or direct connection to this industry. Knowing market trends is thus important. Thus, individuals are interested in predicting stock price with the growth of the stock market. However, given the dynamic nature and the ability to alter stock prices rapidly, the forecast of the stock price is a difficult job. Most stock markets are a non-parametric, non-linear, noisy and determinist system of chaos. As the technology increases, stock traders are using intelligent trading systems rather than fundamental analyzes to forecast stock prices to enable them take quick investments. One of the traders' primary objectives is to anticipate the stock price so that they may sell it or purchase the stock before the price increases. The efficient market hypothesis says that stock prices cannot be predicted and stocks act at random. The expertise of an experienced trader for forecasting the stock price appears to be extremely tough to replace. However, with a considerable number of data and technical advances available, we can now develop a suitable prediction algorithm, whose findings may enhance profits for traders or investment companies. The accuracy of an algorithm is thus directly proportional to the benefits that the program makes. During the last several decades, price swings have been predicted for stock markets via different artificial intelligence techniques. According to the effective market theory, stock prices are quickly adjusted to new information as it becomes public knowledge, such that stock market movements cannot be predicted. However, a great deal of research is now being undertaken on the application of neural networks to stock markets and points out that a forecasting of stock market shifts is feasible since future information is not efficient in past price changes in stock markets.

1.1 Artificial Neural Network for Stock Market Results Prediction

The Artificial Neural Network is a method which has been extensively investigated and used for applications in engineering and scientific areas for different objectives, from control systems to artificial

intelligence. Its generalizing capabilities have attracted not just praise from the engineering and scientific disciplines, but also interest in the implementation of ANN by finance scholars and practitioners over recent years. "The three areas that are extensively explored in the fields of finances are bankruptcy prediction, debt risk assessment and security market applications." The findings have been positive, since ANN has greater generalization capability than traditional statistical techniques or benchmarks. With such extensive study and demonstrated ANN's capacity in the field of security market application and the increasing significance of the role of equities securities in Singapore, the project has encouraged the conceptual development in its use of ANN in stock selection. With its demonstrated generalization capacity, the ANN can deduce the features of the performing stocks from past trends. The success of stocks reflects their profitability and the quality of the underlying company's management. The ANN is therefore utilized as a tool to identify the complex links between stock performance and associated financial and technical factors.

II. REVIEW OF LITERATURE

Qi & Zhang, (2008) investigated the best modeling of trend time series using Neural Network. They used four different approaches, i.e., raw data, raw data with a time index, de-trending and differencing for modeling various trend patterns and concluded Neural Network gives better results.

Artificial neural networks have been extensively utilized because of their varied character to resolve various issues. Yodele et al. (2012), proposed a hybrid technique to forecast future stock prices to enhance current approaches, i.e., a mixture of variables from fundamental and technical analysis of the stock market indicators; Y Kara & A Boyacioglu (2011) examined stock market price index movement utilizing two Artificial Neural Network and Vector Machine Support models (SVM). They evaluated the performance of the two models and found that the ANN models had a substantially superior average performance than the SVM model.

Prasaddas, and Padhy, (2012)Machine learning methods such as Artificial neural networks (ANNs), support vector regression (SVR), genetic algorithms (GA) and hybrid models were extensively utilized in recent decades to forecast financial time series. Moreover, the time series issue includes dynamic time-warping (DTW), which is frequent in the stock market and manages scaling and shifting. The newly established DTW Network is an algorithm contender for data processing in financial time series.

Dharmaraja Selvamuthu, Vineet Kumar and Abhishek Mishra (2019)The support vector machine (SVM), support vector regression (SVR) and back propagation network are the most popular methods for the predicting of time series (BPNN). In this post we utilize neural networks based on three distinct learning algorithms, namely: Levenberg-Marquardt, Scaled Conjugate Gradient and Bavarian Regularization for prediction on the stock market. All three methods offer 99.9 percent accuracy using tick data. The accuracy of the data collected during the next 15 minutes decreases to 96.2 percent, 97.0 percent, and 98.9 percent for LM, SCG and Bayesian regularization, respectively.

III. RESEARCH METHODOLOGY

This is the back-propagation network. BP network. It is a multi-layer forward network, learning via a minimal average square error. It may be used in the fields of linguistic integration, identification and adaption, etc. The BP network is half-controlled learning. First of all, the artificial neural network must acquire a precise criteria for learning so that it works. Electronic Learning tips may be mentioned as follows. If the results of the network are incorrect, the network should scale down the probability of producing the same error next time via learning. This project utilizes data processing techniques to examine previous market share statistics to forecast the required values more correctly.

Algorithm: -

1. Accept input sample
2. Perform its weighted summation.
3. Apply it to input layer neurons.
4. Process all inputs at each neuron by transfer function to get individual.
5. Hidden layer and repeat 1,2,3,4 steps pass it as an input to all neurons of for hidden layer neurons.
6. Pass output of hidden layer neurons to all output layers and repeat 1,2,3,4 steps to get final output.
7. Display the final output.

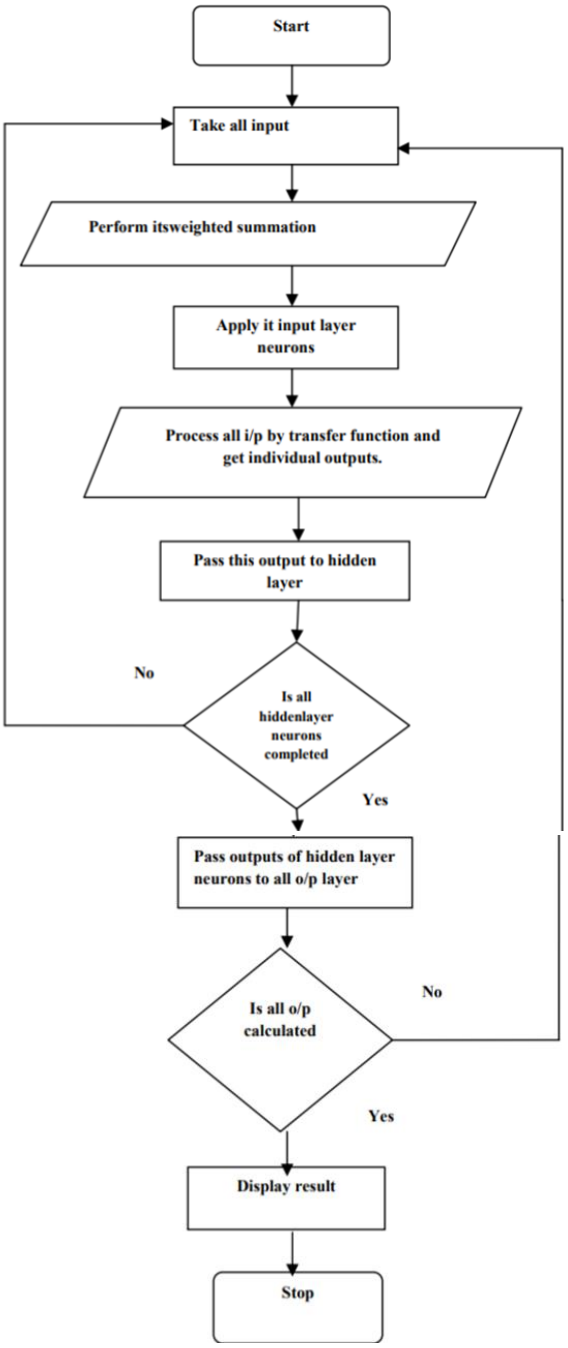

Figure 1: BP Algorithm Flowchart

3.1 MATHEMATICAL MODEL

Error calculation:

Calculating Root Mean Square,

Let RMS is denoted as Root Mean Square,

E is denoted as Error of difference between actual value and predicted value GE means Global Error.

$$E = \sqrt{GE}/size$$

Updating, error value,

$$GE += \Delta * \Delta$$

Where, delta=expected value-actual value

Activation function:

Sigmoid

$$Result = 1/(1 + G^{-d})$$

Tan hyperbolic:

$$Result = e^{d} * 2.0 - 1.0/e^{d}2.0 + 1.0$$

IV. RESULTS AND DISCUSSIONS

Testing was performed on different companies and results obtained were quite satisfactory. We are showing the Table of actual and predicted price results of companies. From the table prediction accuracy is good.

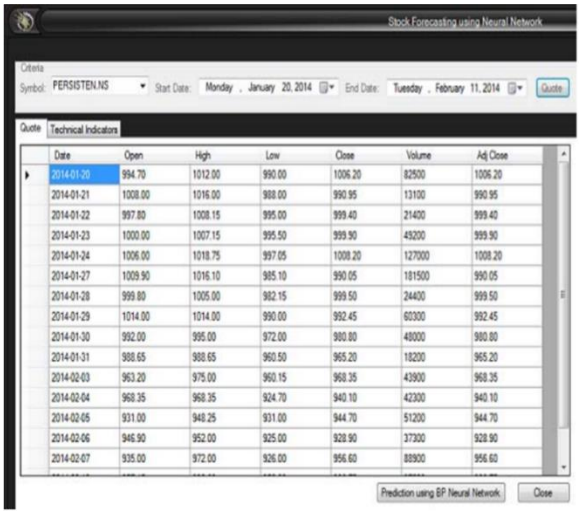

Figure 2: Showing the past stock price

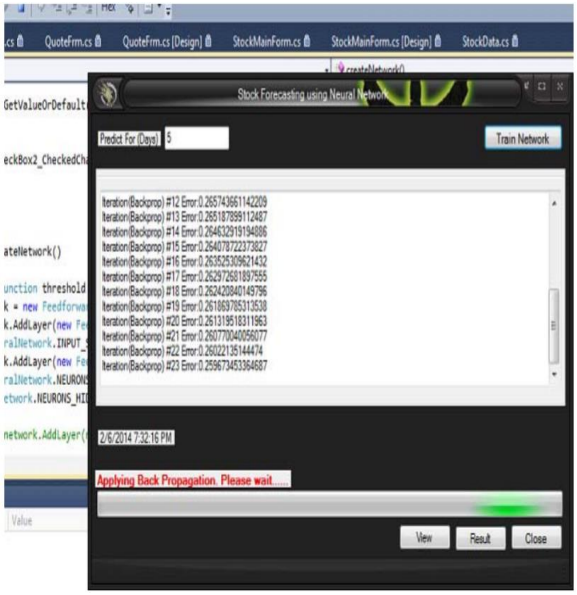

Figure 3: showing the process of algorithm

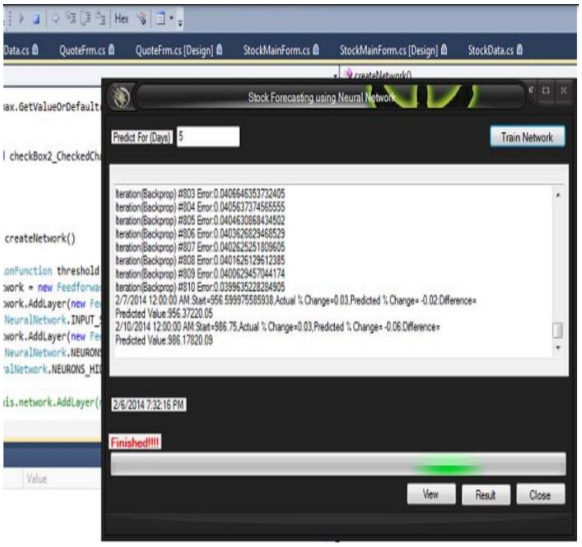

Figure 4: showing the actual price and predicted price

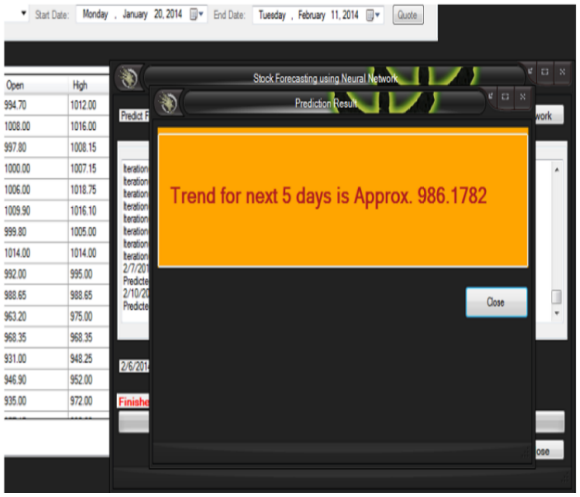

Figure 5: showing the Actual prediction result of next 5 days

V. CONCLUSION

The major difficulties in the stock market nowadays are predicting stock outcomes. The stock price data provides a time series of financial data that is harder to forecast owing to its dynamic features. A broad variety of difficult issues have been modeled using artificial intelligence systems such as artificial neural networks (ANN), Fuzzy inference system (FIS) and adaptive neuro-fuzzy inference system (ANFIS). "ANN shows higher prediction performance than traditional statistical techniques such as discriminatory analysis and logistic regression. In this article we attempted to summarize the use for stock market outcomes of the Artificial Neural Networks (ANN)." ANN have shown a high degree of accuracy in an effective and generic approach to pattern recognition, classification, grouping and, in particular, time series prediction. Their performance is nonetheless not always acceptable. Return propagation method is the ideal algorithm to employ in the feed forward neural network because it minimizes an error in gradual descent between the actual output and the intended output.

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