

Efficient Artificial Neural Network based Practical Approach of Stock Market Forecasting

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Abstract: Forecasting accuracy is that the most vital think about choosing any foretelling strategies. Analysis efforts in rising the accuracy of foretelling models square measure increasing since the last decade. The {suitable} stock alternatives those square measure suitable for investment may be a tough task. The key issue for every capitalist is to earn most profits on their investments. Available market 2 opposite group's square measure involves in any kind of group action during which they exchange stocks from client to marketer. Patterns of the exchange square measure of non uniform nature. Holding and marketing of shares available market is completed by the thought of some higher cognitive process algorithms. Main Objective of labour is to development of a Time-Series neural network that achieved a highest % likelihood of predicting a market rise and market drop as compare to existing strategies. Thus to supply the consistent and correct results, there's have to be compelled to manufacture the new changed rule. This new increased and changed rule produces the predictions in timely manner with acceptable accuracy. The accurate results have been shown in this paper.

Keywords: Neural Network, Forecasting, Stock Market, Time Series, Data Mining.

I. INTRODUCTION

Prediction or Forecasting means exploring the future knowledge on the basis of previous knowledge. Prediction is required in various fields such as fraud detection, stock market prediction, weather prediction etc. Prediction is used by merging with the other data mining techniques such as classification, pattern matching etc. By examining past events, we can make a prediction about future event. For Example combination of decision tree analysis of each historical transaction with classification and past pattern matches are used to identify the next day's opening price of stock market, by using previous day's opening and closing prices.

Stock Market: A stock market is a combination of buyers and sellers of shares and which act as safeties listed on a stock exchange as well as those which could be traded privately. A stock market index is termed as a method of measuring a stock market as a whole. The important type of market index is the broad-market index which consists of the huge liquid stocks of the country. In most of the countries, there exist a one major index which dominates benchmarking, index derivatives, index funds and research applications. Additionally other particular indices frequently find interesting applications. In country like India, we can see various situations where a devoted industry fund uses an industry index as a benchmark. In country like India, ownership groups of clear categories exist as it becomes appealing to monitor the performance of classes of companies sorted by tenure group.

Stock Classification: Classification of stock is done on the basis of type of company. It is basically counted as the company's value, or in other cases taken as the level of return that is expected from the company. So the stocks

are basically classified as which are generally known to us such as Growth Stocks, Value Stocks, Small Cap Stocks, Large Cap Stocks, and Mid Cap Stocks. Stocks are classified on the basis of their characteristics. Some stocks are classified according to their potential growth in the long run and the others as per their current values. Similarly, we can classify stocks according to their capitalization.

Stock Market Prediction: A stock market is a combination of buyers and sellers of shares and which act as safeties listed on a stock exchange as well as those which could be traded privately. The basic function of a stock market is businesses of stocks between investors. Stocks are assembled into industry groups according to their main business focus (such as IT, Banks, Manufacturing).

A transaction is the keen of an investor to sell some stocks and the request of another to buy them. Each stock is not only considered by its price but by others variables also. There exist a relationship between all these variables and only by deep study we can find the behaviour of a stock over time. The stock market is considered as irregular and unpredictable in manner. Patterns allow the prediction of movement may be originated. Stock market analysis deals with study of these patterns. Buying and selling orders of stocks depending on different decision making algorithms. To predict the stock market's future behaviour, different decision making algorithms are applied on past and present financial data.

Therefore stock market prediction can be viewed as an artificial intelligence problem in the field of data mining. For prediction of future stock trend, various investment strategies can be study, create and analysis by using data mining techniques.

Following are the variables used in stock market:

Variable	Description
Price	Stock's Current Price
Opening Price	Stock's Opening Price for a specific trading day
Closing Price	Stock's Closing Price for a specific trading day
Volume	Volume of Stock transactions (buy/sell)
Change	Difference between Opening and Closing stock value
Change (Percentage)	Opening and Closing stock value difference Percentile

Table 1 Stock Variables

Forecasting of stock market involves finding market trends, designing investment approaches, recognizing the best time when to purchase the stocks and what stocks to purchase. There are so many researchers who try to predict stock prices by using statistical and machine learning methods. But those methods lack behind because of prejudiced decisions of humans on stock market based on day to day mind set of human behaviour. We can determine hidden patterns can by applying data mining techniques in an appropriate manner which was not possible by traditional approaches. We can obtain future price prediction with higher level of accuracy by applying business intelligence with data mining techniques. The vast amount of data generated by stock markets forces the researchers to apply data mining techniques to make investment decisions. Following are the challenges of stock market which we can effectively address by using mining techniques:

1. Prediction of future stock price
2. Development of efficient methods for predicting patterns and future trends.
3. Optimal utilization of capital resources of investors.
4. Boost up the country economy.
5. Maintenance of market stability.
6. Increase transparency in the market.
7. Protection of investors and investments.

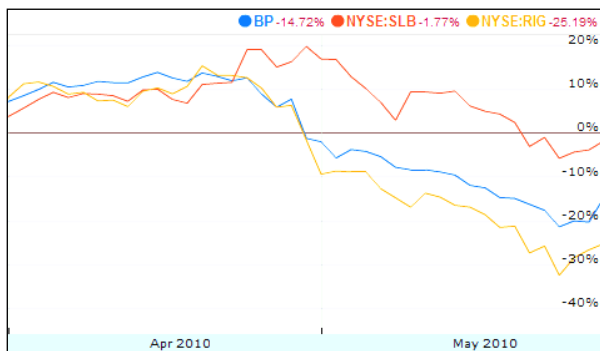


Figure 1: Stock Prediction

Fundamental analysis is a method which includes the in detail research of performance of company and productivity to calculate company's basic value by investigating it in the flesh in procurement of sales of its

products, man power quality, infrastructure and productivity on investment. Income, earnings, profit margins, future production and other data are used to find out the principal value of company and latent for future productivity. The investor can decide to buy the stock if intrinsic rate of a stock is more than present market rate, because the stock price will bound to rise and move towards its "intrinsic value". The investor may decide to sell the stock if this value of a stock is lower than the market price, since the stock rate is constrained to go downward and come nearer to its intrinsic value. The fundamentalist analyzer fully inspects the present and future overall physical condition of the economy for determining the intrinsic value.

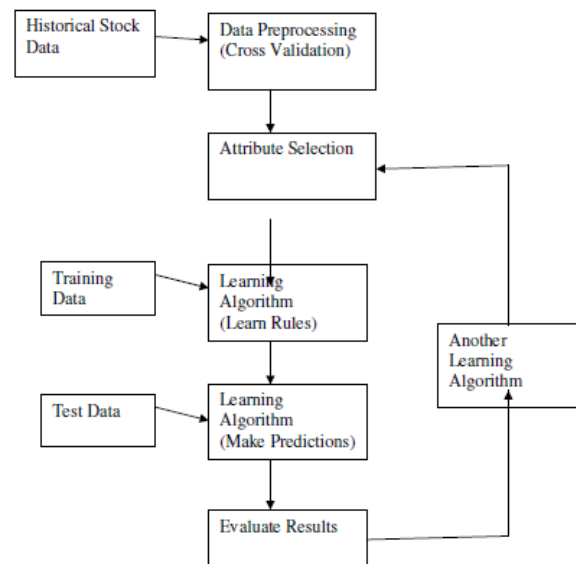


Figure 2 General Environments for Stock Rate Prediction

Artificial Neural Network

Artificial neural networks (ANNs) are information processing system that was firstly inspired by generalization of mathematical of human neuron. Human brain is an extremely complex, nonlinear, and parallel computer like information-processing system. Neural Networks are simplified models of biological neuron system. It is a system similar to a parallel distributed processor which is made up of simple processing units; those have a natural proclivity to store the experimental knowledge and making it accessible for use.

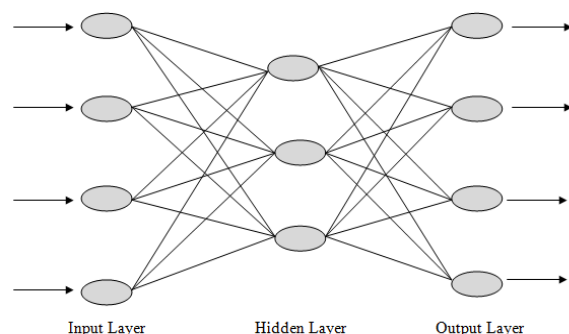


Figure 3: Representation of ANN

The basic processing element of an ANN is an artificial neuron. Similar as natural neuron in human brain, it receives inputs, process them and produce the appropriate output. The three fundamental elements of the neuron based model are: a set of synapses, an adder and an activation function. Every neuron receives some signals from other neurons or outside. Each neuron applies an activation function which is going to be fired when given threshold is less than total input.

II. LITERATURE REVIEW

The main objective of this paper is to predict the gold price in the Forex market, it introduces the use of Quantum Differential Evolution Algorithm in a Neuro-fuzzy system composed of an Adaptive Neuro-Fuzzy Inference System (ANFIS) controller used in prediction of stock market, specified by an optimization technique based on a double chains quantum differential evolution algorithm, to evaluate the proposed model three performance measurements are used: Root Mean Squared Error (RMSE), percentage error and Mean Tendency Error (MTE). The algorithm was evaluated with actual financial data and proved the weakness of the comparative method by showing much improved and better predictions by finding the best value for optimization variable in ANFIS using a double chains quantum differential evolution algorithm [1].

Stock markets are affected by many uncertainties and interrelated economic and political factors at both local and global levels. The key to successful stock market forecasting is achieving best results with minimum required input data. To determine the set of relevant factors for making accurate predictions is a complicated task and so regular stock market analysis is very essential. More specifically, the stock market's movements are analysed and predicted in order to retrieve knowledge that could guide investors on when to buy and sell. It will also help the investor to make money through his investment in the stock market. This paper surveys large number of resources from research papers, web-sources, company reports and other available sources [2].

This paper discusses data mining techniques to process a dataset and identify the relevance of classification test data. Mining tools to solve large amounts of problems such as classification, clustering, association rule, neural networks, it is an open access tool directly communicates with each tool or called from java code to implement using this. In this paper they present machine learning data mining tool used for different analysis, Waikato Environment for Knowledge Analysis is introduced by university of New Zealand it has capacity to convert CSV file to Flat file. Their work shows the process of WEKA analysis of file converts and selection of attributes to be mined and comparison with Knowledge Extraction of Evolutionary Learning not only analysis the data mining classifications but also the genetic, evolutionary algorithms is the best efficient tool in learning.

They have provided an evaluation based on applying these classification methods to our dataset and measuring the accuracy of test results [3].

This research examines and analyses the use of neural networks as a prediction tool. Specifically a neural network's ability to predict future trends of Stock Market Indices is tested. Accuracy is compared against a traditional forecasting method. While only briefly discussing neural network theory, this research determines the feasibility and practicality of using data mining as a forecasting tool for the individual investor. Data mining algorithms have a great capability of finding hidden patterns and trends, if they are provided with a reasonable amount of input data and desired output. As the number of input values increases, the quality of prediction increases as well. Thus for a better indexes predictor, they would like to use more parameters than just the prime interest rate and indexes historical data. Prediction of stock market trends has been an area of great interest both to researchers attempting to uncover the information hidden in the stock market data and for those who wish to profit by trading stocks. The extremely nonlinear nature of the stock market data makes it very difficult to design a system that can predict the future direction of the stock market with sufficient accuracy. Thus in this paper, they introduced to the financial predictor based upon neural networks [4].

Rainfall prediction is one of the most important and challenging task in the modern world. In general, climate and rainfall are highly non-linear and complicated phenomena, which require advanced computer modeling and simulation for their accurate prediction. An Artificial Neural Network (ANN) can be used to predict the behaviour of such nonlinear systems. ANN has been successfully used by most of the researchers in this field for the last twenty-five years. This paper provides a survey of available literature of some methodologies employed by different researchers to utilize ANN for rainfall prediction. The survey also reports that rainfall prediction using ANN technique is more suitable than traditional statistical and numerical methods [5].

Data Mining is emerging research field in Agriculture crop yield analysis. In this paper their focus is on the applications of Data Mining techniques in agricultural field. Different Data Mining techniques are in use, such as K-Means, K-Nearest Neighbour (KNN), Artificial Neural Networks (ANN) and Support Vector Machines (SVM) for very recent applications of Data Mining techniques in agriculture field. In this paper consider the problem of predicting yield production. Yield prediction is a very important agricultural problem that remains to be solved based on the available data.

The problem of yield prediction can be solved by employing Data Mining techniques. This work aims at finding suitable data models that achieve a high accuracy and a high generality in terms of yield prediction capabilities. For this purpose, different types of Data Mining techniques were evaluated on different data sets [6].

III.OBJECTIVES

Today, the grand challenge of using a database is to generate useful rules from raw data in a database for users to make decisions, and these rules may be hidden deeply in the raw data of the database. The problem with predicting stock prices is that the volume of data is too large and huge. There is need of classification approach on the historical data available to try to help the investors to build their decision on whether to buy or sell that stock in order to achieve profit. Fundamental analysis involves analysis of a company's performance and profitability to determine its share price. By studying the overall economic conditions, the company's competition, and other factors, it is possible to determine expected returns and the intrinsic value of shares. There are different algorithms used for forecasting the data but accuracy is not up to. The accurate results will lead the company to the safe level. Growth prospects are related to the current economic environment. The Neural Network field can solve the problems.

The time series prediction method will be implemented to improve the accuracy. There are number of algorithms for prediction. The main objective is to analyse the historical data available on stocks with accuracy using time series prediction technique with neural network as one of the classification methods of data mining in order to help investors to know when to buy new stocks or to sell their stocks. Analysing stock price data over several years may involve a few hundreds or thousands of records, but these must be selected from millions.

1. To analyse of Existing Prediction Technique.
2. To identify the issues in the existing method.
3. To collect the Historical Stock Data.
4. Research on Performance Parameters for lead to the accuracy.
5. To identify the improvement Factor and apply using Neural Network.
6. Implement Neural Network Technique on Real time Stock Data in any programming Language.
7. To analyse the results and plot graphs.

IV.PROPOSED METHODOLOGY

The proposed approach used is basically the alteration and conversion of the previously used Time Series Neural Network algorithm into a new refined and enlightened algorithm for the stock Rate Prediction.

1. Study of existing Forecasting Methods/Techniques.
2. Identify and analyze the benefits of forecasting technique.
3. Research on the real time issues of prediction.
4. Choose the reliable technique to improve the accuracy.
5. Flow Development of new research and its Implementation in any of the language for making it understandable steps.
6. Analyze the results.
7. Source of Research will be internet, Web Sites and Journals.

Input:

In this, the proposed algorithm is applied on the collected data also the methodology explained before is applied to generate the efficient results. The results are shown with the predicted values of stocks in the form of graphs. First of all the networks are created then the the graph of actual and predicted data is drawn, after that we calculate the mean square error

	A	B	C	D	E	F	G
1	Date	Open	High	Low	Close	Volume	Adj Close
2	15/06/2007	2625.33	2630.51	2620.72	2626.71	2.42E+09	2626.71
3	14/06/2007	2584.14	2604.76	2583.93	2599.41	1.94E+09	2599.41
4	13/06/2007	2558.47	2582.31	2556.72	2582.31	2.09E+09	2582.31
5	12/06/2007	2560.41	2576.89	2547.99	2549.77	2.05E+09	2549.77
6	11/06/2007	2569.64	2584.82	2566.84	2572.15	1.61E+09	2572.15
7	08/06/2007	2541.14	2573.74	2534.97	2573.54	1.91E+09	2573.54
8	07/06/2007	2577.37	2585.73	2541.38	2541.38	2.72E+09	2541.38
9	06/06/2007	2599.56	2599.56	2578.81	2587.18	2.16E+09	2587.18
10	05/06/2007	2611.16	2613.31	2595.01	2611.23	2.18E+09	2611.23
11	04/06/2007	2606.05	2619.75	2604.85	2618.29	1.95E+09	2618.29
12	01/06/2007	2614.01	2626.4	2608.69	2613.92	1.88E+09	2613.92
13	31/05/2007	2599.47	2607.9	2594.29	2604.52	2.29E+09	2604.52
14	30/05/2007	2556.17	2592.59	2551.68	2592.59	1.97E+09	2592.59
15	29/05/2007	2561.04	2576.36	2558.4	2572.06	1.65E+09	2572.06
16	25/05/2007	2547.41	2560.03	2544.46	2557.19	1.56E+09	2557.19
17	24/05/2007	2577.21	2585.73	2531.28	2537.92	2.35E+09	2537.92
18	23/05/2007	2592.62	2600.94	2576.23	2577.05	2.01E+09	2577.05
19	22/05/2007	2580.04	2593.03	2573.95	2588.02	1.94E+09	2588.02
20	21/05/2007	2560.93	2587.87	2560.85	2578.79	1.97E+09	2578.79
21	18/05/2007	2548.07	2559.03	2540.67	2558.45	2E+09	2558.45
22	17/05/2007	2544.32	2547.71	2535.47	2539.38	1.92E+09	2539.38
23	16/05/2007	2532.71	2547.42	2519.35	2547.42	2.06E+09	2547.42
24	15/05/2007	2544.67	2557.78	2523.83	2525.29	2.19E+09	2525.29
25	14/05/2007	2564.05	2568.93	2537.92	2546.44	1.94E+09	2546.44

Table 2 Historical Input Data

The performance measure used here is Mean Square Error (MSE) which is used to train the neural network. MSE calculated as difference between predicted output and actual output. While training process the errors are back propagated to the system from output layer. Output layer contains the predicted values which are to be compared with actual values to find out the correctness of our algorithm. The proposed algorithm is as follows:

1. Set up and initialize real time data of stock market for every day's yearly data
2. //Network Architecture
Set Delay = 10;
Set Hidden Layers= 10;
3. Create and Train NARX Neural Network and modify the Divide function and Epochs.
4. Modify the NARX Network Parameters with Neural Network Training Method
5. Training the network: Assign time-delay network, train and simulate.
6. Multi-step ahead predictions with Input Series:
7. Results generated and find out the Mean Squared Error by Generating Graphs.

V. RESULTS

The graphs have been generated and show the accuracy. In this output of the historical information there are three colour lines blue, red and green. The red colour indicates the expected outcomes. Blue colour indicates the original values.

The green colour indicates the network predictions the two graphs have been plotted. First graph shows complete results and second graph shows the zoomed output to show the clear output results.

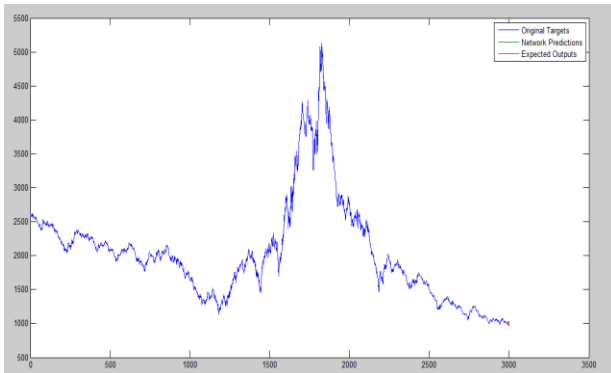


Figure 4 Network Output with Historical Information.

In this figure the expected output is shown which the result of the prediction. This result is shown in depth here. This shows the actual and predicted data. There are three colour lines blue, red and green. The red colour indicates to the actual output and blue colour indicates to the original values. The green lines show the predicted values which is near to the actual data.

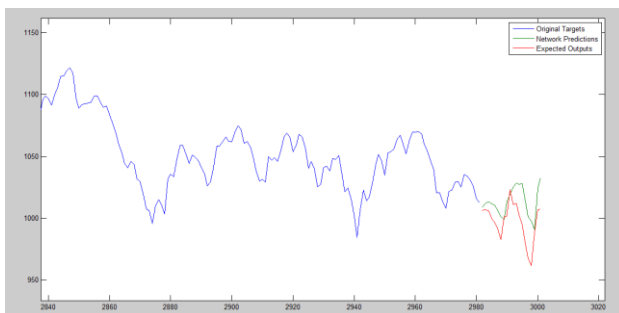


Figure 5 Target and Estimated Forecasted Output

Mean Square Error

The MSE (Mean Squared Error) has been calculated. The mean squared error calculates the average of the “errors” squares and tells about the difference in the estimator and what needs to be estimated. It can also be seen as a function which tells about the risk.

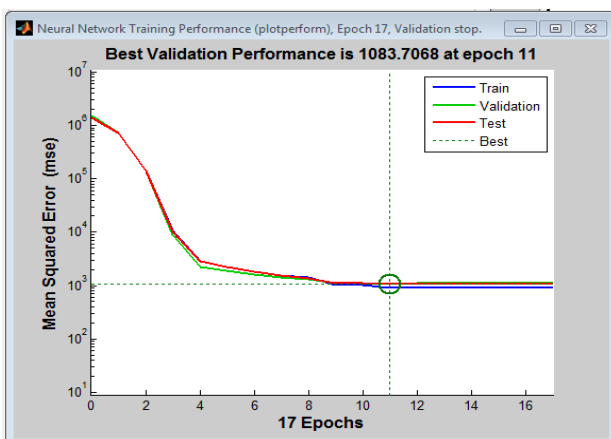


Figure 6 MSE Calculation

The outcome of our proposed work is calculated by the use of above graph. The outcome for the mean squared error comes out to be 1083.7068

VI. CONCLUSION AND FUTURE WORK

In this paper, we have been proposed the stock rate prediction steps and techniques which can be used for forecast the stock price based on time series and neural network which has been demonstrated the real working of proposed algorithm. The MSE value shows the accuracy of the algorithm and regularization logic improved the problem of over fitting and takes required time only. In future, the algorithm can be able to increase the accuracy available market foretelling by determinant they have an effect on of elementary analysis variables like economic conditions of country, political conditions of country etc. there's an excellent impact of media on exchange so we are able to perform higher prediction by playing sentiment analysis. The matter of your time quality would be resolved and correct analysis of previsions of exchange may be achieved.

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