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Forecasting of Stock Market Using Predictive Analysis

A Dissertation submitted

By

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(11311074)

To

Department of Computer Science & Engineering

In partial fulfillment of the Requirement for the

Award of the Degree of

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of

Miss. Manveer Kaur

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ABSTRACT

In stock market two opposite teams are involves in any type of transaction in which they exchange stocks from buyer to seller. The financial tools used to implement the stock market are the shares, bonds, derivatives, mutual funds. Stock market is always dynamic i.e. It is always uneven and sporadic. Whenever we try to make predictions the results of the future foreknowledge are always discontinuous. Patterns of the stock market are of non uniform nature. Holding and vending of shares in stock market is done by the consideration of some decision making algorithms

Prediction simply is a testimonial about the future. It is simply a remark for telling about the forthcoming. Stock market prediction is processes of eventual description of forthcoming state of the stocks in the market or it can also vaticinators about the financial tools of the stock market. Stock market can be perceived as problem for data mining and computational intelligence. The dynamism of stock market can be predicted by the amount of increment and decrement of the financial appliances. For the indication of impasse in the market we need to prognosticate the stock market. It is easy to take decision for peculiar stock need to buy or not. There is a problem of time management in the prediction of stock market. Timely results are needed but sometimes outcomes don't come in timely manner. So to produce the consistent and accurate results we have produced the new modified algorithm. This new enhanced and modified algorithm produces the predictions in timely manner with appropriate accuracy.

CERTIFICATE

This is to certify that **Akriti Mahajan** has completed M.Tech dissertation proposal titled **Forecasting of Stock Market Using Predictive Analysis** under my guidance and supervision. To the best of my knowledge, the present work is the result of her original investigation and study. No part of the dissertation proposal has ever been submitted for any other degree or diploma.

The dissertation proposal is fit for the submission and the partial fulfillment of the conditions for the award of M.Tech Computer Science & Engg.

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Akriti Mahajan

DECLARATION

I hereby declare that the dissertation proposal entitled, submitted **Forecasting of Stock Market Using Predictive Analysis** for the M.Tech Degree is entirely my original work and all ideas and references have been duly acknowledged. It does not contain any work for the award of any other degree or diploma.

Date:

Akriti Mahajan

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1.1 Data Mining

In 21st century, every day a vast amount of data is being generated in different fields. This data can be in any form such as text, image, audio, video etc. So extraction of meaningful information from large amount of data is difficult. As data is being generated and stored in different formats so we need a specific process to analyze this data and to take proper action on it .So this technology has generated a new chance for exploiting the information from the databases. A process of obtaining information from huge amount of data by using various mining techniques such as statistics, artificial intelligence, neural networks and decision tree is known as data mining.

It is a powerful technology which helps the organizations to emphasis on useful information in their data ware houses. The aim of data mining process is to obtain information from large data sets and transform it into understandable format for future use. Data mining tools helps the organizations to make knowledge driven decisions by predicting future trends and behavior. Now a day, data mining techniques are used by many companies with consumer focus in retail, finance, communication, and marketing companies. Data mining consists of following steps: - Firstly it extracts data, transform it, and load transaction data into the data warehouse system. Then data is stored in a database system. Then, data is analyzed by using application software. Finally it represents the data in a useful format, such as bar charts, tables or graphs.

Data mining is a part of knowledge discovery process in database. Knowledge discovery in databases and data mining are sometimes used as synonyms. It deals with mining hierarchy which involves text mining as well as web mining.

Thus, in this hierarchy, firstly knowledge discovery in database is placed then data mining is placed and then text mining is placed. It is a process of extracting useful knowledge and

interesting patterns from vast data. Hence data mining is the process of obtaining information or identifying patterns from repositories.

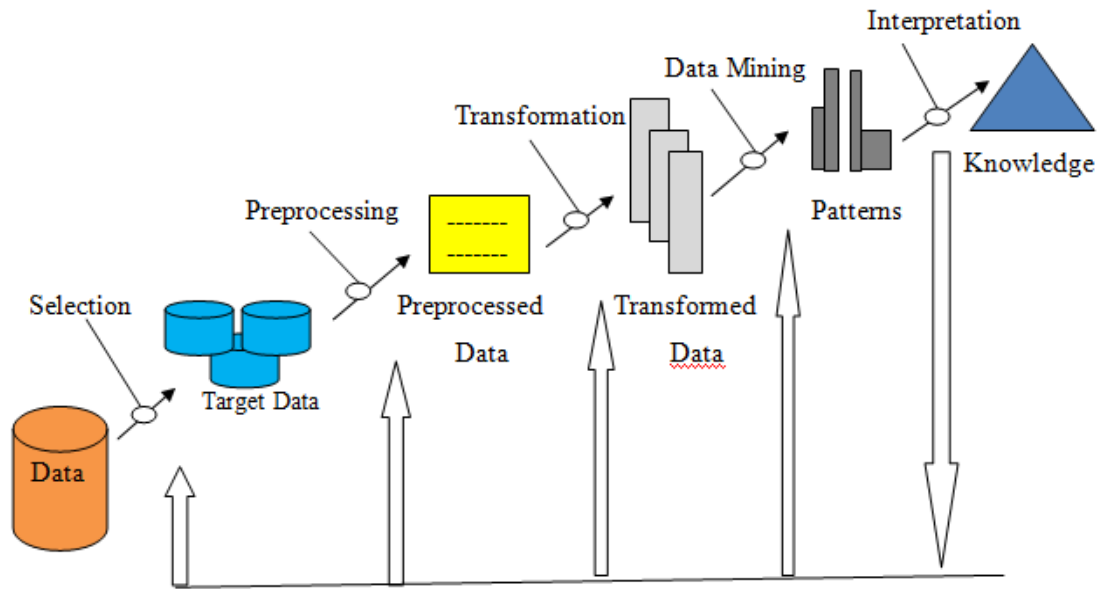


Figure 1: Data Mining

Steps of data mining in knowledge discovery process are:

1. Cleaning of data - Process of removing inconsistent and noisy data.
2. Integration of data- Process of combining data from multiple data sources.
3. Selection of data- Process of retrieving relevant data from database for analyzing.
4. Transformation of data- Process of transforming data into appropriate format for mining.
5. Mining of data- Process of extracting patterns from data by using intelligent methods.
6. Pattern evaluation- Process of identifying interesting patterns.
7. Knowledge presentation- Process of representing extracted knowledge to end user by using various visualization and knowledge representation techniques.

1.2 Challenges of Data Mining

There are so many problems and pitfalls in data mining systems. System giving precise and fast results on small training sets, may behave entirely diverse when applied to a larger database. The data mining system works perfect for consistent data but performance eventually reduces with inclusion of little noisy data. So challenges of data mining systems are:

- Inconsistent and Noisy Data
- Difficult Training Set
- Dynamic Databases
- Large Databases
- Security and Privacy issues

1.3 Data Mining Tasks

Data mining tasks are categorized as following: Descriptive and Predictive tasks where Descriptive tasks illustrates the basic properties of data in database which involves description of classes, identification of frequent patterns, extraction of association, mining of correlations and clusters. Predictive tasks make predictions by deducting current data. The purpose of data mining is to create descriptive and predictive model. A descriptive model represents the characteristics of data sets whereas predictive model allows miner to predict future value of specific variable.

1.4 Prediction/Forecasting

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.

1.5 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.

1.5.1 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.

1.5.2 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 behavior 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 behavior, 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

Firstly, data mining methods will be used for analyzing the historical price of stocks and obtain useful knowledge by calculating values of financial indicators. Then the classification of transformed data is done by using decision trees obtained through application of Artificial Intelligence strategies. At last, decision trees assessed and evaluated, which provides total profit and accuracy rates associated to capital gains.

1.6 Role of Data Mining in Stock Market

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 lacks behind because of prejudiced decisions of humans on stock market based on day to day mind set of human behavior. 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.

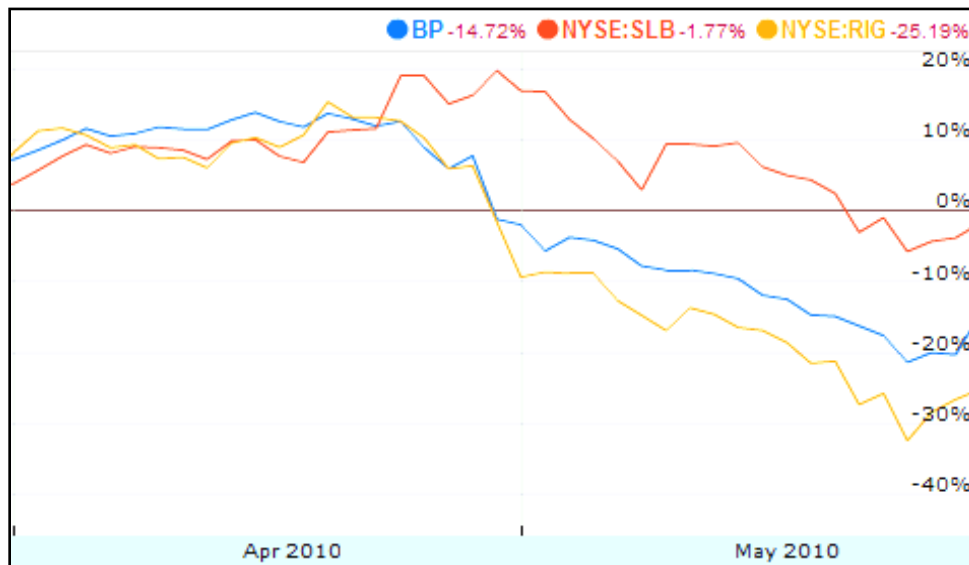


Figure 2: Stock Prediction

1.7 Environment for Stock Market Prediction

Let's take an example where preceding stock data is downloaded from the finance section of yahoo. The stock rates of Google Inc. (GOOG) and Yahoo Inc. (YHOO) were studied.

Following are the attributes of data set available for above given two companies:

Date, Opening price, Maximum price, Minimum price, Closing Price, Volume, Adj. Close

Instinctively, the yesterday's stock value will have the most impact on the value of today's stock on the basis of efficient market hypothesis. Here date attribute can be taken as the X-Axis for time series prediction have integer values attached to every date, therefore the most latest date tag available in the data set gets the uppermost value whereas the oldest date tag gets the lowermost value.

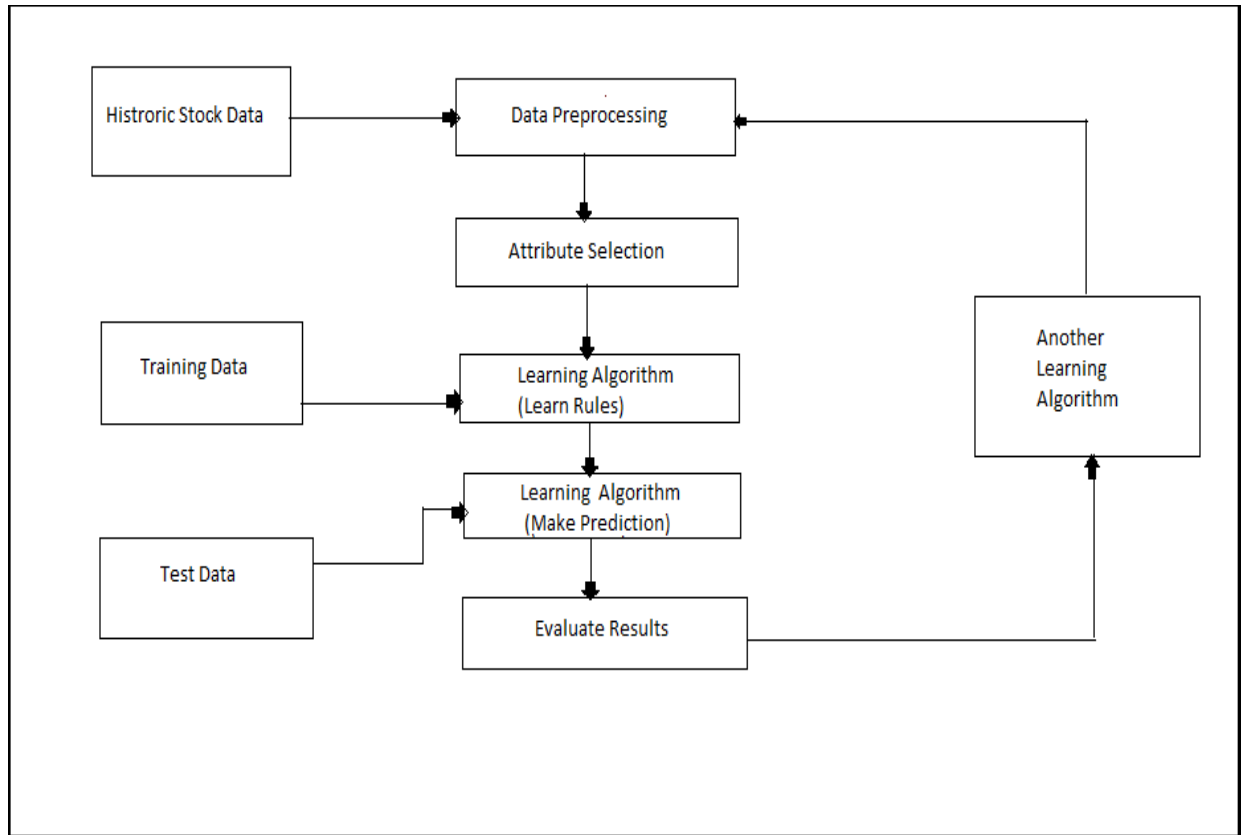


Figure 3 : General Environment for Stock Rate Prediction

1.8 Fundamental Analysis Based Stock Prediction

1.8.1 Introduction to Fundamental Analysis

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 fundamental analyst fully inspects the present and future overall physical condition of the economy for determining the intrinsic value.

1.8.2 Assumptions of Fundamental Analysis

1. Present and future stock value depends on stock’s intrinsic value and it helps in predicting the investment return.
2. 90% of investors are commonsensical in investigating the detail of investments.

1.8.3 Advantages of Fundamental Analysis

1. It is an organized approach and it has the capability to forecast the diversity before they presented on the charts.
2. It is a superior method for long-term constancy and growth.

1.8.4 Disadvantages of Fundamental Analysis

1. To make all the knowledge official for the purpose of computerization becomes very difficult and justification of this knowledge is subjective.
2. It becomes difficult to predict the stock rate in less time using fundamental analysis.

1.9 Technical Analysis Based Stock Prediction

1.9.1 Introduction to Technical Analysis

Technical analysis is a way to assess the stocks by analyzing statistics originated by preceding rates, activities of market and volume. Apex, bottoms, drifts, patterns and other parameters are looked upon which are going to affect movements of stock rates frequently depend on their preceding values and preceding values of other associated variables. It checks out patterns and indicators on stock charts which is going to help in deciding future

performance of stocks. 90% of the foremost stock investors use it. In spite of its ample use, it is criticized because of its subjective nature.

In recent times, neural networks have been successfully enforced on time-series problems to get superior multivariate forecasting ability. Neural networks have superior observation capabilities by scaling input and output values of given patterns. Neural networks are usually vigorous against noisy or missing data; those have enormously enviable properties in time series foretelling problems. An abundance of neural network architectures have been deployed for the analysis of share market.

1.9.2 Assumptions of Technical Analysis

Market moves in trends utter by persistently varying beliefs of capitalist in reply to variety of services. History has a habit of repeating itself that is to say share market is going to behave in same way if same type of input is given to it. Share values have affinity to go with drift in place of going against it. Investors are 90% psychosomatic in response to variation in environment of market in predictable ways.

1.9.3 Advantages of Technical Analysis

1. Used by 90% of the foremost stock investors.
2. Used to perform short time period analysis of stock data.

1.9.4 Disadvantages of Technical Analysis

1. In spite of its high usage, it is castigated because of its subjective nature.
2. Chart representation can be interpreted by different persons in different manners.

1.10 Technology Followed:

1.10.1 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 .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.

The universal process of ANN learning has three incessant steps:

- Calculate temporary outputs
- Contrast outputs with desired targets
- Weight adjustment and repeat the process

1.10.2 Basic Concepts of Artificial Neural Networks

An artificial neural network (ANN) is defined as a mathematical model based on biological neural networks. It encompasses of an interconnected group of artificial neurons which can compute values from inputs and are capable of machine learning as well as pattern matching. Neuron is a basic unit of nervous system such as brain. Concept of ANN is inspired from central nervous system. Biological neuron stores knowledge in their memory bank, while in an artificial neuron, information is distributed through the network and stored in the form of weighted interconnection.

In ANN, neurons are spread in few hierarchical layers. Mostly neural networks consist of three layers: input, hidden, and output. No data processing is done at input layer. The input layer takes the inputs and passes it to hidden layer. There can be more than one hidden layers in ANN. At these hidden layers, all the complexity resides and the computations are done. The information is distributed through the network and stored in the form of interconnections. There are interconnections between artificial neurons are called weights.

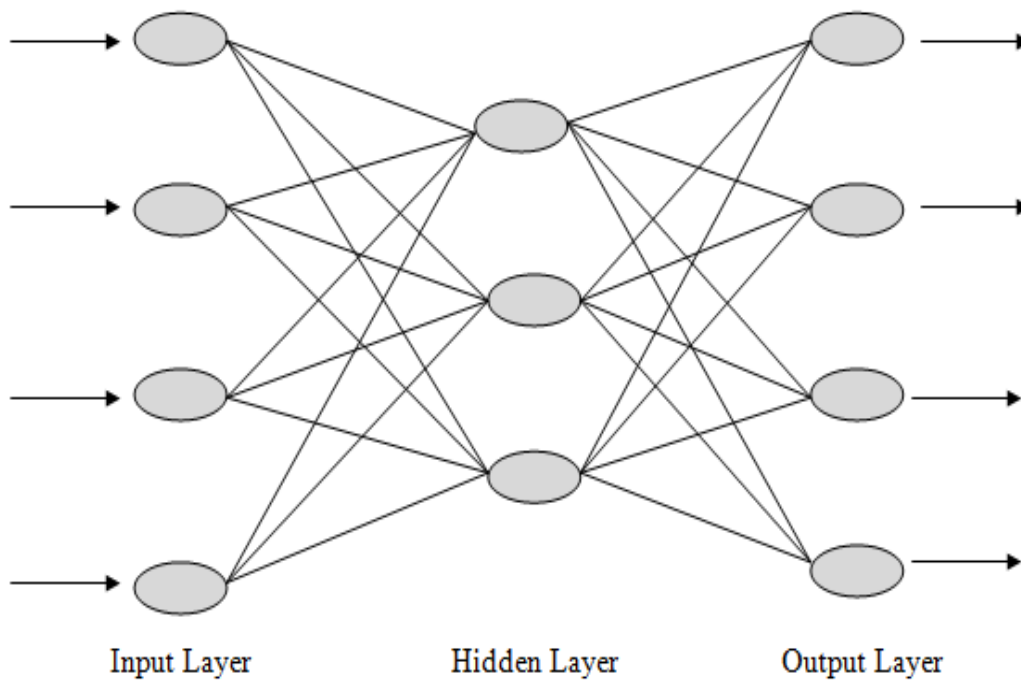


Figure 4: Representation of ANN

1.10.3 Working of ANN

1. Firstly, it accepts input sample.
2. Then perform weight summation.
3. Apply weight summation to input layer neurons.
4. Process all the inputs at each neuron by using transfer function to get individual outputs.
5. Pass this output to hidden layer neurons.
6. If hidden layer neurons are not completed, repeat steps 1 to 4 again.
7. Then Pass output of hidden layer neurons to all output layer neurons to get final output.
8. If output is not correct then repeat previous steps again.
9. Display the final output.

1.10.4 Advantages of Neural Network

1. Neural networks are capable in estimating complex mappings.
2. Neural networks are flexible with respect to inconsistent, noisy and missing values.
3. Neural network does not make a priori suppositions about distribution of data.
4. Neural Networks are adaptable in nature.

5. We can implement neural networks in parallel hardware.

1.10.5 Processing Unit

A neural network is basically a set of interconnected neural processing units which emulates the activity of brain. These basic processing units are called neurons.

Figure illustrates a single neuron in a neural network.

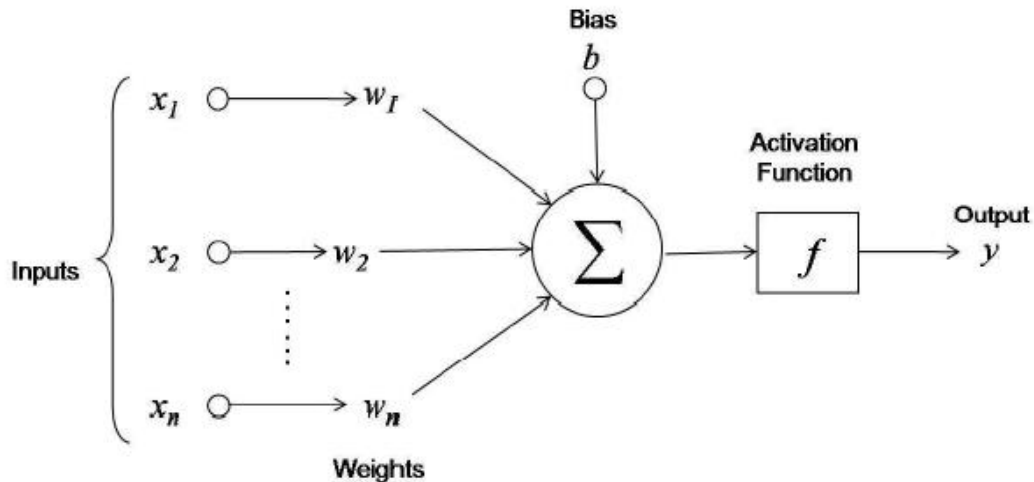


Figure 5: Single neuron

In above figure, each input x_i has a weight w_i which represents the strength of that particular connection. The sum of the weighted inputs and the bias b is given as input to the activation function f to generate the output y . Neural Networks supports a number of activation functions: a linear activation function which returns the same number which was fed to it is equivalent to having no activation function. A log-sigmoid activation function (known as unipolar sigmoid function) squashes the output to the range between 0 and 1. This is the most widely used sigmoid function. A hyperbolic tangent activation function (also known as bipolar sigmoid function) is also similar to a log-sigmoid function, which generates outputs between -1 and 1.

1.10.6 Neural Network Topologies

Neural networks can be divided into two categories on the basis of pattern of connections: feed forward neural networks and recurrent neural networks.

1. In feed forward neural networks, data moves forward from input nodes to output nodes in only one direction. There are no cycles or loops in the network.
2. In recurrent neural networks, the connections between units form a directed cycle.

1.10.7 Learning used in Neural Networks

There are three types of learning used in neural networks are:

1. Supervised learning: - In this learning, both inputs and the corresponding desired outputs are provided to a neural network; the network learns to infer the relationship between them.
2. Unsupervised learning: - In this learning, only inputs are provided to neural network and the network looks for patterns by itself. Reinforcement Learning might be looked at as an intermediary form of the above two kinds of learning.
3. Reinforcement learning: - In this learning, the environment provides input to the neural network, receives output, and then provides a feedback. The network will adjust its parameters according to the environmental response. This process is continued until an equilibrium state is reached

1.10.8 A Pure Neural Network Forecasting Model

A pure neural network forecasting model takes raw time series as input signal to predict the future. Such a forecasting model is easy to implement.

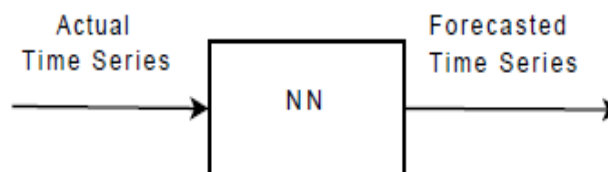


Figure 6: A Pure Neural Network Forecasting Model

1.11 Artificial Neural Network Forecasting

Artificial neural networks (ANNs) are supple computing frameworks that we can apply on a plenty of time series foretelling problems with a high amount of correctness. Performance of

artificial neural network is not ample for some real time problems, in spite of its so many advantages. Improvement in time series forecasting correctness is an important but yet tough job facing by forecasters. A both imaginary and experiential finding helps to indicate that we can get better prediction performance by integrating different models. Neural networks dwell in a large area in financial applications and research.

Specially, stock market forecasting is a very active field of study. Researchers have published several works setting guiding principle to building good Neural Networks. Notably and some other researchers have discussed a step by step approach for the appropriate building of ANNs for forecasting financial and economic time series data. They focus on all the important design parameters of back-propagation feed-forward networks and ways of configuring them starting from pre-processing of data, functions and methods to use, and network configurations to make.

Many studies have demonstrated the forecast ability of the traditional neural network models. For instance, applies multilayer feed forward neural networks to forecast Taiwan Dollar/US Dollar exchange rate and the results generated are better than ARIMA model. Therefore we can say that the neural network approach is a competitive and robust method for the forecasting. Another study shows that uses three neural-network-based forecasting models, i.e. Standard Back propagation (SBP), Scaled Conjugate Gradient (SCG) and Back propagation with Bayesian Regularization (BPR), to forecast the ex- change rates of six foreign currencies against Australian dollar. The results show that all the NN-based models outperform traditional ARIMA model and SCG based model performs best.

1.12 Summary

In this chapter we have given the brief introduction about the topic i.e. how we can do the prediction of the stock market, especially we concentrated on the NASDAQ historical dat. First of all in this chapter we have learnt about the meaning of stock market prediction. How it can be done and about its advantages and disadvantages are also explained. Then for the stock prediction method like artificial neural network can be used. Then we have studied about the technique of ANN, its advantages, disadvantages. For getting the previous facts and figures of stock market forecasting we have studied the background for the stock prediction.

Some of the techniques like fuzzy logic has also being studied. In this chapter we have learnt about the basic concepts of neural networks and learning methods. The neural network concept is used for the forecasting of the stock values.

So we have studied about the types of neural networks. Here we try to study the artificial neural network model for the stock prediction. Also the forecasting models are studied which contain the information about how the data is collected, how it is forecasted, and how it can be plotted with the help of graphs. It includes the overall introduction about stock market, its attributes and different factors which affects its trend i.e. the complete formulation of the stock market forecasting, we also try to find out reasons for having diversity in movements of stock market.

REVIEW OF LITERATURE

[1] Dong, Guanqun, Kamaladdin Fataliyev, and Lipo Wang. "One-step and multi-step ahead stock prediction using backpropagation neural networks." *Information, Communications and Signal Processing (ICICS) 2013 9th International Conference on*. IEEE, 2013.

Forecasting of stock market is not an easy task, mainly because of dynamic behavior of the stock price movement in short time period. Many techniques are being used for stock price forecasting. Now days, neural networks (NNs) have become one of the important techniques. The behavior of stock price movement is highly unpredictable. It is quite impossible to model with a pure mathematical function. Moreover, a large set of factors is required to explain a specific stock. These two factors are the most important motivations for the neural network approach in stock prediction. In this paper, they first propose the improved One-Step ahead prediction system and compare its performance with original forecasting technique. . Then, they explored a difficult multi-step prediction problem and improve multi-step prediction system by using recursive algorithm. Then performances of One-step and Multi-step systems are compared on the basis of accuracy. They have taken hit ratio as a performance measure. Hit ratio indicates how often neural network gives right prediction in terms of direction of price movement.

[2] Khirbat, Gitansh, Rahul Gupta, and Sanjay Singh. "Optimal Neural Network Architecture for Stock Market Forecasting." *Communication Systems and Network Technologies (CSNT), 2013 International Conference on*. IEEE, 2013.

Prediction of stocks accurately has always attracted the market analysts. The forecasting of stocks is done by using trading constraints and Price ratio. With the advancement of Artificial Neural Networks, it becomes possible to analyze a data set in temporal domain. The use of Time Series Forecasting enables us to predict the value of an entity in the future based on the past outputs.

By using feed-forward back propagation neural network, the present best fit solution for stock market forecasting produces a forecast result with 58% accuracy. In this paper, we have used the data set containing financial stock price as a time series data. This time series data is forecasted by feeding it to a multi-layer back propagation neural network. This paper considers factors like Earnings per Share (EPS) and public confidence. They have introduced an empirically defined neural network architecture of the form which gives an optimal structure for predicting the future value of a stock by inferring the near future value by the present value comparisons. The results obtained after the training and testing of the financial data are very favorable.

[3] AL-RADAIDEH, QASEM A., AA ASSAF, and EMAN ALNAGI. "PREDICTING STOCK PRICES USING DATA MINING TECHNIQUES." The International Arab Conference on Information Technology (ACIT'2013). 2013.

In this paper author has been integrated the knowledge about Forecasting and Stock Predicting using data mining techniques. Forecasting of share market is a significant issue in field of finance which appealed researcher's attention from very long time. It comprises a hypothesis that preceding stock knowledge has some foretelling associations to the future value of stock returns. It helps the investors to opt the best timing to buy or sell stocks on the basis of knowledge obtained from preceding data of stock market. The decision will be on the basis of decision tree classifier which is a data mining technique.

In this paper, projected model uses CRISP data mining technique which is used over preceding data of three foremost companies comes under Amman Stock Exchange (ASE). Their proposal create decision rules which gives recommendations to investors regarding buying or selling stocks by using the decision tree classifier on historical stock prices. This projected model helps the investors to take the correct decision while selling or buying stocks based on analysis of historical stock prices. The results obtained for this projected model were not ideal for the reason that some factors were not concerned such as political proceedings impact on market, local and global economic conditions of country, and investor's hope from the influenced stock market.

[4] Mahmud, Mohammad Sultan, and PhayungMeesad. "Time series stock price prediction using recurrent error based neuro-fuzzy system with momentum." *Electrical Engineering Congress (iEECON), 2014 International.IEEE, 2014.*

In this paper they proposed a new approach for stock market price prediction using recurrent error based neuro-fuzzy system with momentum (RENFSM). They say that stock market analysis is essential not only for making profit or avoiding big losses, but also to identify the direction of the market. The direction point of the market has major effects on capital investment, other business issues and socio-economical level of the country. This research shows that there is a positive relationship between price momentum of certain days and the rate of price change on each day. It is expected if solid momentum continues the growth of accuracy will increase. Additionally, the model comparisons showed tested results of different preprocessing methods with different impacts on the performance. The authors have confirmed the effectiveness of the proposed model by testing it on stock price prediction of two companies and in the research it is found that the proposed model can provide better performance for stock market price prediction than ANFIS and traditional recurrent type ANFIS networks.

[5] Agrawal, J. G., V. S. Chourasia, and A. K. Mitra. "State-of-the-art in stock prediction techniques." *International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering* 2 (2013): 1360-1366.

Stock market and variables of stock markets are explained. Stock market is affected by many political and economic factors. The significant triumphant foretelling of stock market achieved superlative results with smallest amount of input data. To obtain accurate forecast, determining relevant factors is a complex mission and for this continuous analysis of preceding trend of stock market is obligatory. Moreover, the activities of stock market are gauged and estimated in order to obtain relevant information for guiding the investors regarding when to invest in market. It is going to help the investor in gaining profit all the way through his investment in stock market. They studies huge number of possessions from organization reports, research papers, internet and other sources.

By revising various stock prediction techniques, author has reached a conclusion that the present techniques are not greatly appropriate for foretelling of stock market behavior. There is a gap between user requirement and technologies for accurate prediction of stock system. If all the economic and political factors those have an effect on the stock market are also carefully measured rather than only measuring technical indicators, we can acquire superior results.

[6] Soni, Sneha. "Applications of ANNs in stock market prediction: a survey." *International Journal of Computer Science & Engineering Technology* 2.3 (2011): 71-83. Chong Tan "Financial Time Series Forecasting Using Improved Wavelet Neural Network", 2009.

In this paper author surveys literature in the field of machine learning techniques and artificial intelligence used for foretelling the activities of stock market. Artificial Neural Networks (ANNs) are acknowledged to be the foremost machine learning technique in the domain of stock market forecasting. After survey author has concluded that ANNs has ability to extract useful information from large set of data therefore ANNs play very important role in stock market prediction.

This is comparatively a new way as compared to previous techniques and a favorable field in foretelling of stock market's future behavior. ANNs are appreciably more precise than other competitive techniques and approaches such as genetic algorithms, linear regression analysis models for forecasting of stock market. Generally researchers used foreign share market's datasets in comparison to Indian share market's dataset. Various parameters of stock market such as movement of set index, closing value of the index, moving average crossover inputs, fundamental analysis, stock share value, daily returns of stock and numerous of other parameters are also considered to analyze the activities of stock market for prediction purpose. In future work we can explore the use of neural networks in case of other applications and also comparison of this model can be done with other models.

[7] Simon, Selvan, and Arun Raoot. "ACCURACY DRIVEN ARTIFICIAL NEURAL NETWORKS IN STOCK MARKET PREDICTION." *International Journal on Soft Computing* 3.2 (2012).

The correctness of stock market foretelling becomes more difficult and worthwhile for researchers and other participants of share market such as brokers, investors etc due to globalization. For improvement of forecasting accuracy Company's financial potency, country's local and global economic situations have to be taken into account. In stock market forecasting area Artificial Neural Networks (ANN) has been acknowledged as one of the governing data mining techniques. In this paper, survey on various ANN models has been done which are being experimented in stock market forecasting with unique enhancement techniques to improve the correctness. Moreover, the best possible research strategies are explored in these accuracy driven ANN models.

[8] Boonpeng, Sabaithip, and Piyasak Jeatrakul. "Enhance the performance of neural networks for stock market prediction: An analytical study." *Digital Information Management (ICDIM), 2014 Ninth International Conference on*. IEEE, 2014.

The research of stock prediction is a challenging task, because stock market movement is very uncertain in nature. Moreover, many factors affect the stock price such as sentiment of investors, exchange rates, and an economic crisis. Author describes that ANN has the ability to map the hidden data patterns which is related between input and output. ANN can solve complex mathematical problems such as a stock market prediction. Many researchers have projected various techniques to improve the performance of ANN prediction model practically. Therefore, in order to understand the current trend of using ANN in the stock market prediction, recent techniques to improve the ANN performance are to be investigated. In this paper, the three factors are used to organize the phase of implementing techniques on the ANN model. These are the pre-processing phase, the processing phase and the post-processing phase. This review shows that each phase has an importance to enhance the performance of the prediction model. In order to apply the techniques effectively, there are recommendations needed to consider in each phase. This review paper presents techniques to improve the performance of ANN from the year 2006 to 2013.

[9] Kumar, D. A., and S. Murugan. "Performance analysis of indian stock market index using neural network time series model." *Pattern Recognition, Informatics and Mobile Engineering (PRIME)*, 2013 International Conference on. IEEE, 2013.

In this paper author has explained forecasting based on time series data for stock prices, currency exchange rates, price indices is one of the active research areas in many fields such as finance, mathematics, machine learning etc. Initially, the problems of time series analysis and prediction are solved by statistical models. From the past few years, large number of neural networks is proposed to solve problems of financial data and to produce accurate results. It describes statistical model integrated with ANN gives better result than single model. This paper discusses basic ideas of time series data, importance of stock indices, need of neural networks and survey of previous work. Then forecasting accuracy is analyzed and measured with reference to an Indian stock market index such as Bombay Stock Exchange (BSE) and Nifty. In this study, it is found that the right parameters number of epochs, learning rate and momentum is 2960, 0.28 and 0.5 respectively for forecasting network by conducting various experiment.

[10] Babulo, S. Arun Joe, B. Janaki, and C. Jeeva. "Stock Market Indices Prediction with Various Neural Network Models." *International Journal of Computer Science and Mobile Applications* 2.3 (2014): 42-46.

Forecasting of share market index becomes one of the important issue in the field of finance and investment. Even though a large number of index predictors have been deployed during the last decade, they provide pitiable performance because movement of stock index is very uncertain, volatile and asymmetric in nature. Artificial Neural Network (ANN) is a technique that is intensely studied and broadly used in forecasting of stock market. So, there is no official method to conclude the most favorable neural network for forecasting purpose in the literature.

In this paper various types of Neural Network models which are useful for stock forecasting are described. Modular Neural Network, ARIMA-based Neural Networks, Genetic Algorithm, Recurrent Network, Back propagation Network, Radial Basis Function, Branch

Network, Functional Link Artificial Neural Network, Feed Forward Neural Network, Fuzzy Neural Network etc are used for prediction in this paper. In this research analysis of these neural networks are performed for forecasting purpose to help the investors.

[11] Manjul Saini , A.K.Singh” Forecasting Stock Exchange Market and Weather Using Soft Computing “,International Journal of Advanced Research in Computer Science and Software Engineering , 2014.

Recently forecasting stock market return is gaining more attention, may be because of the fact that if the direction of the market is successfully predicted the investors may be better guided. Prediction of financial time series is done by using artificial neural networks. ANNs build internal models of the problem and are therefore suited for fields in which accurate mathematical models cannot be formed, e.g. meteorology and economics. The main objective of this paper is to study the use of soft computing in the field of Stock Exchange Market and weather forecasting. Artificial Neural Network with advanced back -propagation algorithm is used to forecast the daily stock market returns and weather condition in dehradun (u.k). Advanced Back propagation learning technique is essentially focused in this study. This learning technique tries to reduce the error between the output given by network and the actual desired output value. The error calculation is done after the comparison of net output value to the desired output value and after that this error is feedback through the network where as an effort weights are adjusted to reduce the error. This process is continuously performed until the error reaches to a nominal value.

[12] Chen, Zheng, and Xiaoqing Du. "Study of Stock Prediction Based on Social Network." Social Computing (SocialCom), 2013 International Conference on. IEEE, 2013.

In his paper author have explained that Stock Market plays an important role in a country's economic development. They consider that investors make their investment decision on the basis of social information regarding stocks. They have considered Shanghai stock market for predicting its stock behavior. Their propose system learn from action of people and make a connection between stock price and people's behavior. They have studied Chinese social media Guba.com a social networking site like Facebook and twitter where Chinese people

discuss about stock market. After collection of data from Guba.com, a social behavior graph is created on the basis of eleven characteristics and their correlation coefficients are tested with stock price and trading behavior. They have used back propagation algorithm for future prediction of stock and the result shows that their strategy works efficiently and provide 56.28% profit in 3 months.

[13] Bhagwant Chauhan” Stock Market Prediction using Artificial Neural Networks “, International Journal of Computer Science information and Technology, 2014.

The aim of this paper is to implement neural networks with back propagation algorithm for stock market prediction. A neural network is a great data-modeling tool based on human neurons that is capable in capturing and representing complex input/output relationships. The inspiration for the development of neural network technology stemmed from the desire to develop a simulated system that may well perform “intelligent” tasks same as performed by the human brain. Back propagation is one of the popular approaches to implement concept of neural networks. It is a form of supervised learning for multi-layer nets. Error data computed at the output layer is back propagated to earlier ones, and then weights are adjusted to get more accuracy in results.

It is most frequently used training algorithm in current neural network applications. In this paper, to forecast the future trend of the share market and the volatility of share price a data mining technique is applied on preceding share market data. In this paper the scarcity that exists in present conventional statistical analysis of stock market is pointed out by authors, after that a three-tier architecture of the neural network consist of input layer, output layer and hidden layer is created by using back propagation approach to forecast the stock market. Finally, researchers got an enhanced predictive model for getting better correctness of forecasting.

[14] Kar, Abhishek. "Stock Prediction using Artificial Neural Networks." Dept. of Computer Science and Engineering, IIT Kanpur.

In this paper author discussed a leading technique for the prevision of stock market indices i.e. Artificial Neural Network. The Neural Network model’s design is summarized with its salient characteristics and customized specifications in this paper. Implementation of a large

number of activation functions are done adjacent to options for cross validation sets. After that the algorithm is tested for predicting the future trends of Nifty stock index data set on the basis of preceding n day's values. In this paper 96% of correctness is achieved on the dataset. On the opponent, it also proves the premise that stock markets are really asymmetric in nature. When there is only one hidden layer in network the minimum error recorded was 3.5% in surfeit of testing and training data. Consequently it has been concluded that Neural Networks are successful tool for forecasting of stock market and we can also use these neural networks on real world datasets such as Nifty, Bombay Stock Exchange etc.

[15] Bhat, Aparna Anant, and S. Sowmya Kamath. "Automated stock price prediction and trading framework for Nifty intraday trading." 2013 Fourth International Conference on Computing, Communications and Networking Technologies (ICCCNT). IEEE, 2013.

The research on automated systems for Stock price prediction has gained much impetus in recent years due to its potential to yield profits. In this paper, they present an automatic trading system for Nifty by integrating various methods to improve the quality and precision of prediction for deciding the buying and selling calls for intra-day trading. Historical data has been used to implement the various technical indicators and also to train the Neural Network which will predict the movement for intraday Nifty. Additional, Sentiment Analysis techniques are also applied on popular blog articles written by domain experts and on user comments to find sentiment orientation, so that analysis can be further improved and better prediction accuracy can be achieved. The system makes a prediction for every trading day with these methods to forecast if next day will be a positive day or negative. Further, buy and sell calls for intra-day trading are also decided by the system thus achieving full automation in stock trading.

[16] Jageshwer Shriwas" Stock Price Prediction Using Hybrid Approach of Rule Based Algorithm and Financial News ", IJCTA, 2014.

In this paper author examines and analyzes 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 very high potential to find trends and hidden patterns, if a rational quantity of input data and desired output are provided to it. When there is an increase in number of input values, the forecasting quality also increases.

As a consequence they would like to use additional parameters than only using primary interest rates and indices previous data for developing a better index predictor. Stock market forecasting has been a field of huge interest for both researchers who are attempting to find out the information hidden in the past data of stock market and also for investors who wants to gain profit by trading stocks. It becomes very complex to devise a system that can forecast the future trend of stock market with adequate correctness due to enormously uncertain nature of stock market data. In consequence in this paper, they a finance index predictor based upon neural networks has been introduced.

[17] Khatri, Sunil Kumar, Himanshu Singhal, and Prashant Johri. "Sentiment analysis to predict Bombay stock exchange using artificial neural network."Reliability, Infocom Technologies and Optimization (ICRITO)(Trends and Future Directions), 2014 3rd International Conference on. IEEE, 2014.

The incursion of media in financial market has changed the way of doing business. Media is one of the most rising medium to exchange ideas & opinions, which plays very important role in influencing the thoughts of the investors which affects market transactions index values and figures. Therefore machine learning and sentiment analysis might be of great help in deducing psychology of people which affects the market and thus it can help us to predict the actual statistics. In this paper, sentiment analysis was formulated on data from social media then classification algorithm of machine learning is used to classify it. The analysis of classified data is done to calculate the net mood of comments. These comments are classified into four classes namely happy, sad, disappointing and hope. The net relative mood of all the classes per day is given as input to artificial neural network (ANN) to be trained for data of n days and their respective change in index value on each day. Then this network is used to predict the vector of Bombay Stock Exchange index value for $(n+1)$ th days.

[18] Liu, Chang, and Hafiz Malik. "A new investment strategy based on data mining and Neural Networks." *Neural Networks (IJCNN), 2014 International Joint Conference on.* IEEE, 2014.

Being profitable on the stock market is a challenging task. The future price forecasting on the basis of historical data could be considered as a method mainly falling in technical analysis domain, where the assessment of the securities is derived from the statistics generated by market activities. In this paper, we present a new investment strategy for optimal gains on investments in the stock market. Neural Network based framework is used for trading prediction and forecasting. To this end, statistical measures based on return and volatility are used to filter out low performing sectors in the stock market. A simple but effective method based on price Simple Moving Averages (SMAs) is used to measure volatility for a given stock.

The proposed NN-based system uses the strongest performing indices for stock market forecasting. A new framework based on neural networks is proposed here for investment in the stock market. The proposed framework aims at forecasting the Buy/Sell strategy with best profit constraints. Their preliminary investigation has shown the promising outputs. The additional continuation of this research work involves experimenting different neural network architectures and topologies to optimize the prediction performance; and combining the fundamental analysis into the forecasting by using other information such as local and global economic conditions, earning reports etc.

[19] Abhishek, Kumar, et al. "A stock market prediction model using Artificial Neural Network." *Computing Communication & Networking Technologies (ICCCNT), 2012 Third International Conference on.* IEEE, 2012.

explains that in this present world use of neural network has been found in various field of applications. It leads to the growth of different kind of models for stock markets and investment. Author describes that how to forecast stock market price by using given input parameters of stock market with the help of Artificial Neural Network. Feed forward

architecture is used in this paper for forecasting of stock market. Data of one year is used to train the network. The selected network despite the fact that was not able to forecast exact value but it is succeeded in forecasting the pattern of stock market.

The conduct research in this paper uses effortless and proficient approach for stock market forecasting by using Back-Propagation algorithm with Feed Forward Network. The 99% correctness of the network was recorded in case of train1m (which involves two layers, input layer has 10 neurons and output layer has 1 neuron) and Mean Square Error calculated is 0.00650. The 99% of correctness of network was recorded in case of traingdx (which similarly involves two layers, input layer has 10 neurons and output layer has 1 neuron) Mean Square Error calculated is 0.0430.

[20] Yetis, Yunus, Halid Kaplan, and Mo Jamshidi. "Stock market prediction by using artificial neural network." World Automation Congress (WAC), 2014. IEEE, 2014.

In this Paper, Artificial Neural Network (ANN), an intelligent mining technique is used for Predicting NASDAQ stock market index. Some input parameters of share market are given to train the network. It is focused on Multi-Layer Perception (MLP) technique that is a layered feed forward network trained by using back propagation. The network was trained by giving input data of stock market price in between 2012 and 2013. This technique gives good performance in case of NASDAQ stock prediction.

In this paper prediction model is created through different steps such as data collection, data pre-processing, classification and model evaluation. In this paper back propagation algorithm with feed forward network for prediction purpose. In this research network training is done with 5 inputs, input layer has 10 neurons and output layer has one neuron in network and the recorded performance of network is 1378.0411 at epoch 12 i.e. near about 99% performance recorded in case of this network. So this model can be very beneficial for investors to take good decision while buying or selling stocks. Though this approach gives us accurate prediction of future trends but it takes lot of time to train the network.

PRESENT WORK

In this chapter we will do evaluation of the problems that occur during the research work for the prevision of the stock market. Also along with the evaluation of the difficulties encounter we will proposed the research and system's objectives. And for the achievement of the objectives of the system proposed method will be introduced. The proposed methodology will provide the basis for the work or research to start.

3.1 Problem Formulation

In the research work, the results produced for the prediction are less accurate and takes very much time to produce the outcomes. So these problems will be encountered during the research i.e. The overall process is slow and results produced are not much accurate. In the prevision of the forthcoming accuracy must be considered. Also huge stock predictions data is very much difficult to handle. And prediction of the stock prices, shares every time is also a very difficult process to b maintained.

In the historical based evaluation we see that there is lots of use of artificial neural network. So, the main concentration gets focused on Multi Layer Perception (MLP) for training. It takes a lot of time to get trained but advantage is it generates accurate results because of exact approximation. They have applied efforts on Training (70%), Validation (15%) and testing (15%). We will try to adjust their efforts to get better results. The neural network technique will be used in our proposed work and accuracy will be improved using any programming tool. The results will also be analyzed using past records.

3.2 Proposed System's Objectives

There are some of the objectives which have to be set to be achieved in the overall process of research work. The main objectives of our research work are explained as below:

1. Our foremost objective is to attain the precise results of prevision of stock market
2. Assemble the classical Stock Data facts and figures and interpret it for Existing Prediction Technique.

3. Research on Adjustment on Performance Parameters for lead to the accuracy.
4. Implement Neural Network Technique on Real time Stock Data in any programming Language.
5. Generate the predicted results and compare it with actual results.

3.3 Research Methodology

The methodology is the method which has to be followed to complete the research process. The method we are going to explain here is the method for the accurate results of prediction. This section has been explained the steps which has been followed for forecasting accuracy. Initially the input data has been gathered from the available resources and exported to the excel file. Then, the algorithm's step has been mentioned.

In existing technique of implementation, the actual and predicted information is varies as per concern to accuracy and the hidden layers has been used for accuracy purpose but it is reliable so that with less complexity and time issue, the prediction should show the accurate result and our hypothesis is that the new technique will handle such issues with adjustment of hidden layers and reduce the processing time. The proposed research methodology is explained in the following steps:

1. Study and Analyze existing neural network techniques.
2. Research on these techniques for identification of issues.
3. Select particular method and study their performance parameters.
4. Adjust the parameters to get better results.
5. Analysis the performance and generate the results.

The flow chart for the steps followed in research methodology is shown as below:

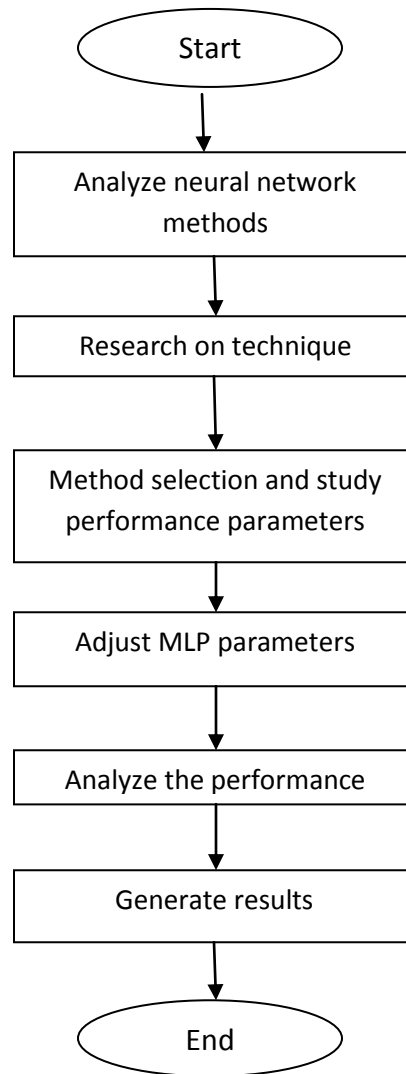


Figure 7: Flow chart of Research methodology

In methodology firstly we study the existing forecasting techniques that are used in the field of stock market prediction. Then we inspect the benefits of all those forecasting techniques that we have enlisted in above step. Afterwards we carry research on the issues and problems that occur in stock price forecasting on real time basis. After all above steps have been done, we apply the neural network approach on the collected real time data. Then we iteratively improve the algorithm's precision power thereby at last generating desired results.

RESULTS AND DISCUSSIONS

This chapter provides the steps to implement the proposed work. At the initial stage, the techniques need to be analyzed of prediction and the research will be initiated to find the issues and working of the forecasting algorithm. On the next stage, the parameters will be analyzed and the point of improvement in algorithm as well and further, the proposed work be implement using the programming tool to analyze the real working of algorithm. The different steps need to consider for design the algorithm of prediction.

4.1 Input Data

The data needed for the work is collected from the financial sites such as NASDAQ, NYSE, AMEX and we can also download historical stock data of a particular company from company's website such as YAHOO, RELIANCE etc. Among various finance sections we have taken the data of NASDAQ. The data is of 12 years i.e. from 4 May 1999 to 1 April 2011.

Firstly when the data was collected we got some values which were missing in the records of 1981 to 1991, even after searching other authenticated sites for the missing data, we were not able to get hold of full year data. Hence we ended up by not taking that year lap.

The data we have taken, i.e. which will be the input data to the proposed work is firstly imported in the excel file and afterwards only required years data was with held and rest data about others years were discarded. The final file we have as input file has extension .xls and contains the each day's data of stock from 1999 to 2011 yearly.

The input data has been taken for the test of proposed algorithm and has been shown as:

A	B	C	D	E	F	G
Date	Open	High	Low	Close	Volume	Adj Close
04/01/2011	2796.67	2802.63	2779.71	2789.6	2.1E+09	2789.6
03/31/2011	2774.23	2783.98	2769.52	2781.07	1.9E+09	2781.07
03/30/2011	2772.36	2779.95	2763.77	2776.79	1.8E+09	2776.79
03/29/2011	2727.83	2756.89	2720.19	2756.89	1.6E+09	2756.89
03/28/2011	2752.33	2754.63	2730.68	2730.68	1.7E+09	2730.68
03/25/2011	2746.34	2762.55	2740.17	2743.06	1.1E+08	2743.06
03/24/2011	2715.88	2740.39	2703.42	2736.42	2E+09	2736.42
03/23/2011	2677.56	2704.3	2660.17	2698.3	1.8E+09	2698.3
03/22/2011	2692.13	2695.46	2679.41	2683.87	1.7E+09	2683.87
03/21/2011	2675.47	2699.7	2674.99	2692.09	1.8E+09	2692.09
03/18/2011	2665.54	2665.56	2639.76	2643.67	2E+09	2643.67
03/17/2011	2656.08	2660.5	2634.17	2636.05	2E+09	2636.05
03/16/2011	2652.92	2669.27	2603.5	2616.82	2.6E+09	2616.82
03/15/2011	2619.4	2680.57	2618.5	2667.33	2.4E+09	2667.33
03/14/2011	2695.66	2715.22	2682.09	2700.97	1.8E+09	2700.97
03/11/2011	2689.65	2724.61	2689.41	2715.61	3.9E+09	2715.61
03/10/2011	2719.29	2721.21	2695.08	2701.02	2E+09	2701.02
03/09/2011	2756.34	2761.77	2737.68	2751.72	2E+09	2751.72
03/08/2011	2745.23	2775.41	2729.85	2765.77	1.8E+09	2765.77
03/07/2011	2793.19	2794.82	2724.51	2745.63	2.2E+09	2745.63
03/04/2011	2797.64	2798.07	2768.12	2784.67	1.9E+09	2784.67
03/03/2011	2774.48	2802.32	2774.48	2798.74	2E+09	2798.74
03/02/2011	2735.05	2763.95	2734.08	2748.07	2E+09	2748.07
03/01/2011	2791.08	2791.23	2730.72	2737.41	2.2E+09	2737.41
02/28/2011	2791.28	2798.43	2767.61	2782.27	2E+09	2782.27
02/25/2011	2752.16	2781.12	2751.81	2781.05	1.9E+09	2781.05
02/24/2011	2726.59	2745.29	2707.63	2737.9	2.1E+09	2737.9
02/23/2011	2755.2	2761.7	2705.54	2722.99	2.5E+09	2722.99
02/22/2011	2795.44	2808.18	2752.75	2756.42	2.3E+09	2756.42
02/18/2011	2833.35	2840.51	2823.65	2833.95	2.1E+09	2833.95
02/17/2011	2816.12	2835.2	2815.08	2831.58	1.9E+09	2831.58
02/16/2011	2815.09	2828.19	2811.52	2825.56	2.3E+09	2825.56

Table 2: Historical Input Data

4.2 Proposed Algorithm

In proposed algorithm neural network architecture is created which involves input layer having 20 neurons and hidden layer has 10 neurons. Delay time assigned is 10. Then network is trained by using trainlm function and after this past stock data is given as input to network. Then network will generate foretelling results of stock data and then these predicted results are compared with actual results. 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. Set Multi-step ahead prediction , $N = 20$;
3. //Network Architecture
 Set Delay = 10;
 Set Hidden Layers= 10;
4. Create and Train NARX Neural Network and modify the Divide function and Epochs.
5. Updated the NARX Network with
`net.divideFcn = 'dividerand';`
`net.divideMode = 'time'`
`net.performFcn = 'mse'`
`net.trainFcn = 'trainlm';%param.trainFcn;`
6. Updated the Feed Forward Function
`net.divideFcn = 'divideind';`
`net.trainFcn = param.trainFcn;`
`net.performFcn = 'mse';`
`net.trainParam.epochs = 300;`
`net.performParam.regularization = 0.8;`
7. Training the network: Assign time-delay network with 10 hidden Layers, train and simulate.
8. Multi-step ahead predictions with Input Series:
 - a) `inputSeriesPred = [inputSeries(end-delay+1:end),inputSeriesVal]`
 - b) `targetSeriesPred = [targetSeries(end-delay+1:end), con2seq(nan(1,N))]`
 - c) Train by Trainlm Technique Measure Performance
9. Results generated and find out the Mean Squared Error by Generating Graphs.

4.3 RESULTS

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

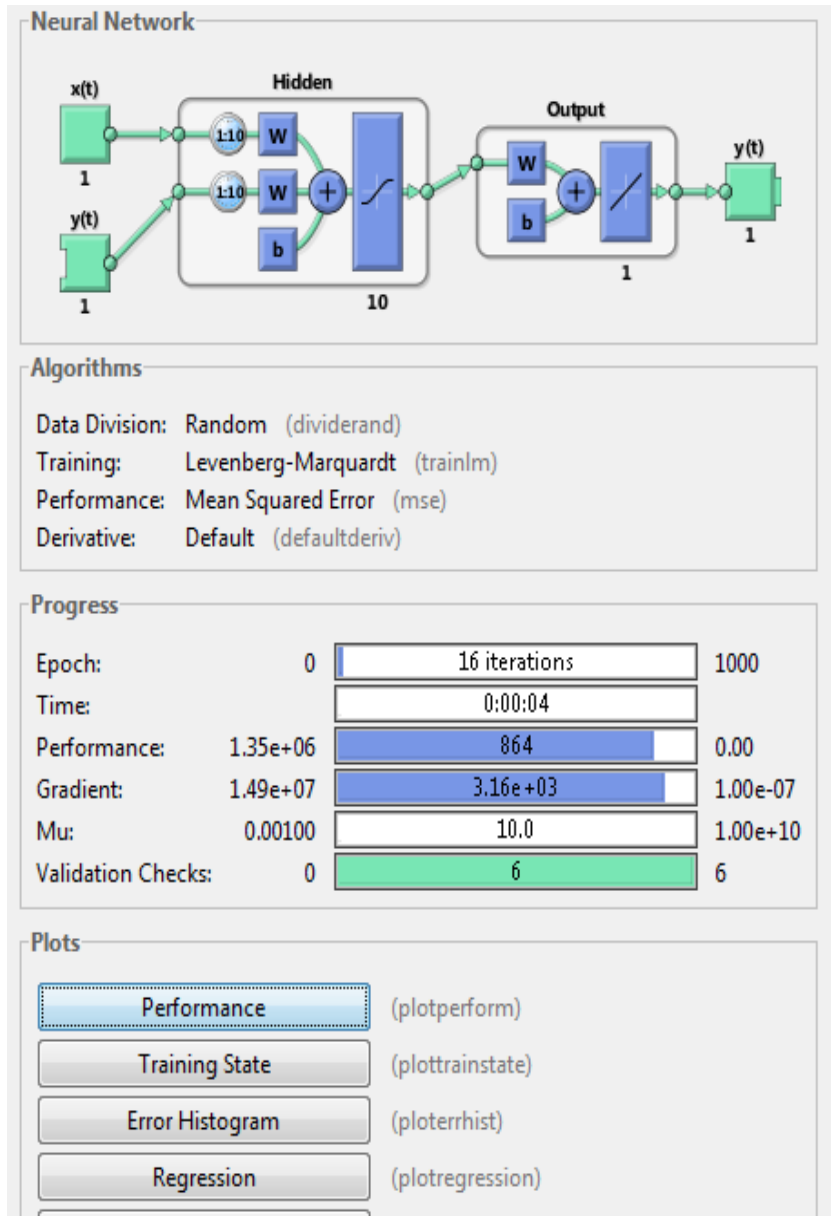


Figure 8: Neural network training (nntool)

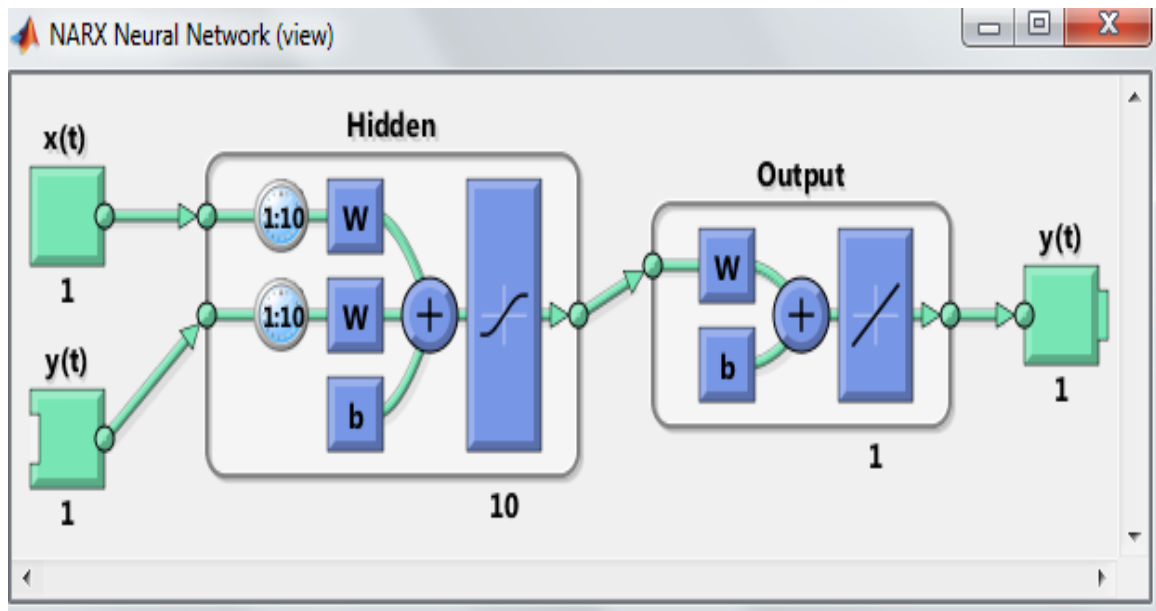


Figure 9: Narx Neural network (view 1)

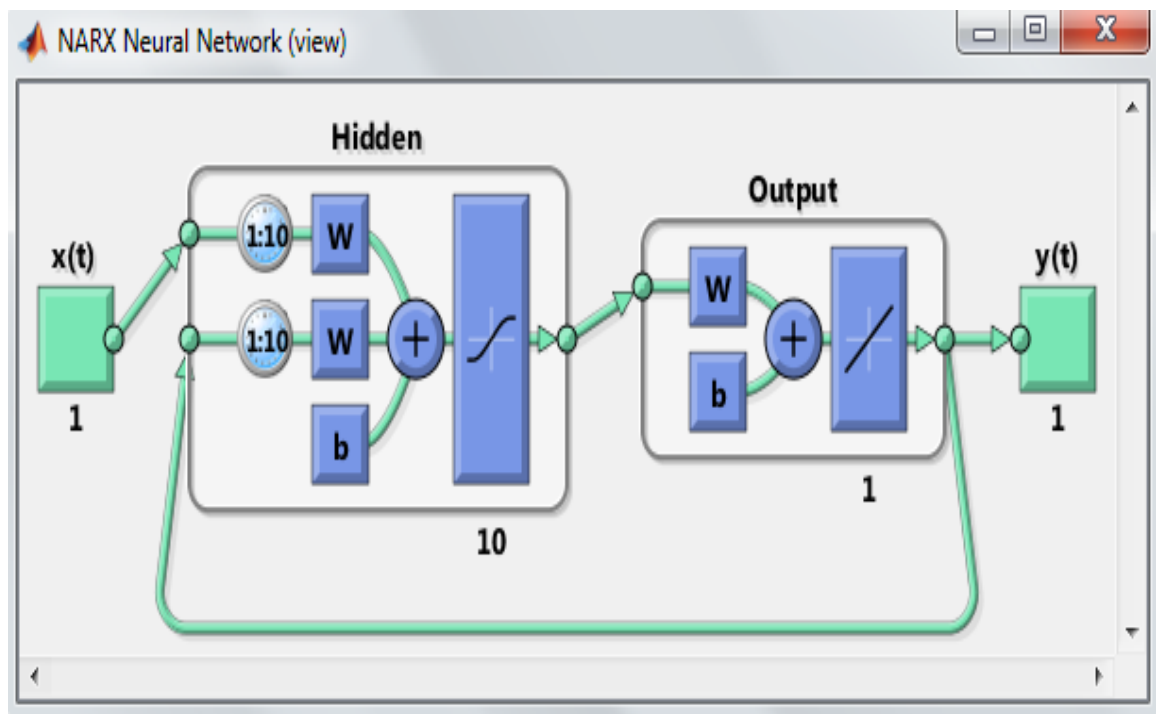


Figure 10: Narx Neural Network (view 2)

4.3.1 Output with Historical Information

The graphs have been generated and show the accuracy.

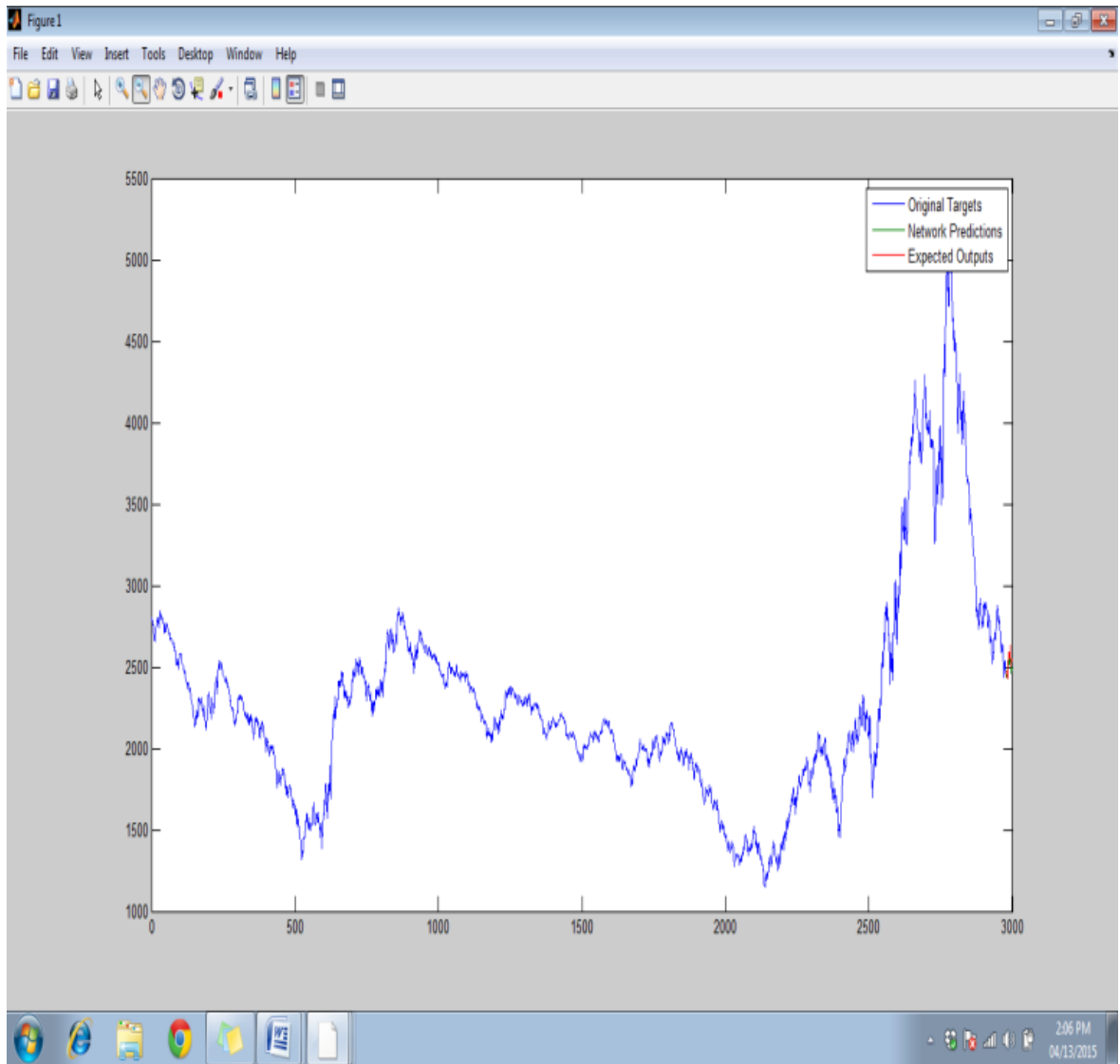


Figure 11: Network Output with Historical Information.

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

4.3.2 Expected Forecasted output

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.

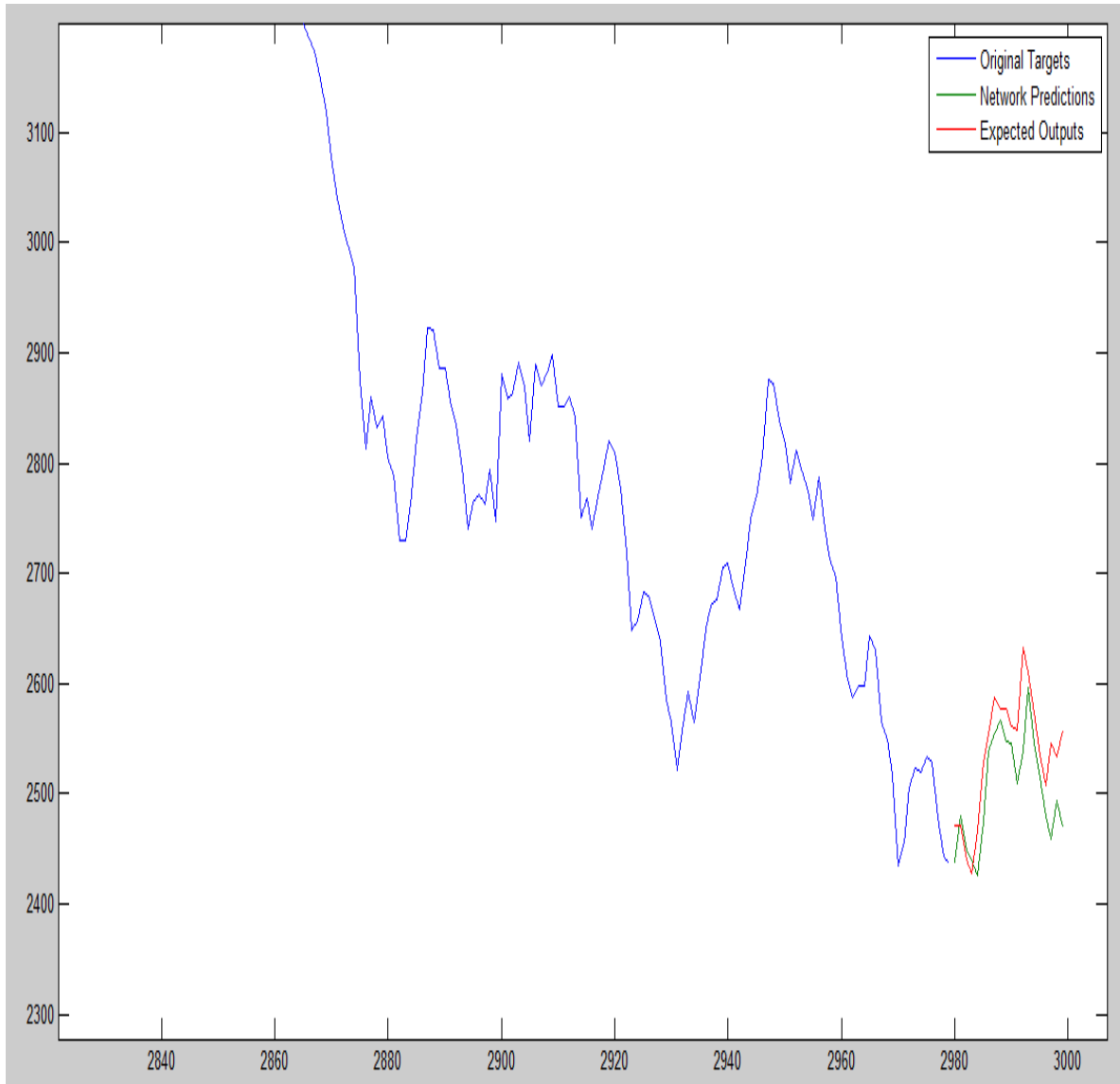


Figure 12: Target and Estimated Forecasted Output

4.3.3 Mean Squared Error

The MSE (Mean Squared Error) has been calculated and performance has been measured.

For analyzing the results, the Mean Squared Error (MSE) has been measured:

MSE Calculation: $n = \text{mean}((b-a)^2)$

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.

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 1199.1152.

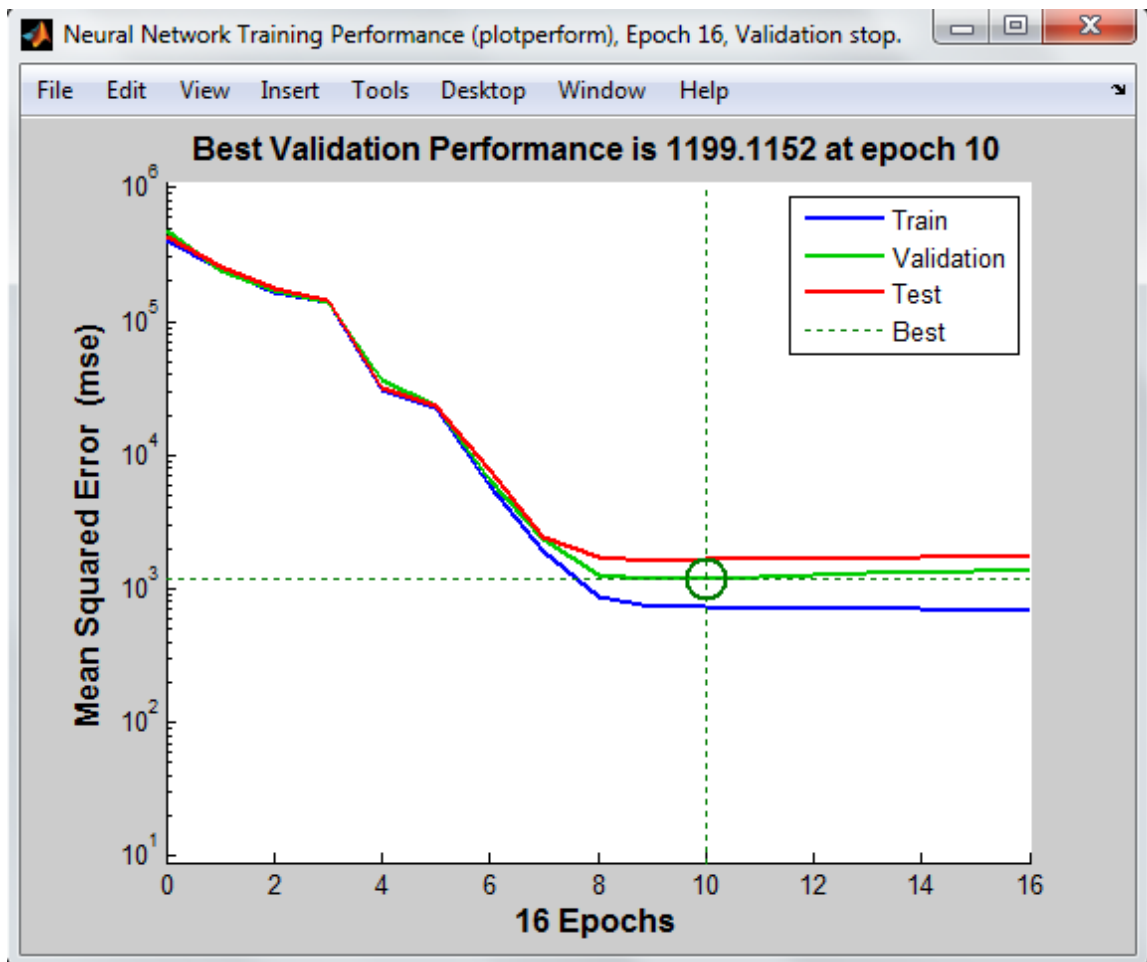


Figure 13: Neural Network Training Performance (plot perform)

In this result the blue line indicate the training process, green lines shows the validity of prediction and red line shows the testing. The dotted line indicates the best output.

The MSE is 1199.1152 at epoch 10.

CONCLUSION AND FUTURE SCOPE

5.1 Conclusion

In our research work we estimate the future values of stock data. We then analyzed then the various techniques used for forecasting the stock data. Afterwards we collected the information about the impacts of different parameters such as economy of country, psychology of investors, market value of company, reputation of company and it's income, revenues etc. From the financial sites or from official sites of company we have analysis the historical data from which we are able to collect the data that we required. Then we collect real time Stock data from sites like NASDAQ. Then on collecting all types of facts and figures an acknowledged technique is used i.e. Artificial Neural Network which is actually a computerized system based on biological neurons. The reason I choose this technique is because it is a foremost machine learning technique. In this firstly a network is created then trained. This artificial Neural Network is then used for stock forecasting. We have used the Artificial Neural Network (ANN) which has been applied for the stock market forecasting. This provides the proficient, faster and well organised forecasting. We worked on the training function as well as the divide function in order to reduce the Mean Square Error (MSE) and to get proficient results.

The results produced for the prediction are more accurate and takes very much less time to produce the outcomes. So these problems that were encountered during the research would get resolved. And prediction of the stock rates becomes very easy process. We achieve the best validation performance in our results we conclude that by the use of new enhanced algorithm for the stock prediction. After using this new proposed technique the competent and profitable results have been produced. The precise results are generated of prevision of stock market. The foretelling results produced by using enhanced algorithm are more price and accurate.

5.2 Future Scope

Although Artificial Neural Networks and Fuzzy inference engine near 1940's firstly but it becomes popular in late 2000's and significant work has been done in this context. Yet there's lot more space for improvement in this technique. Earlier work done have already been discussed in the previous chapters.

In future we can increase the accuracy in stock market forecasting by determining the affect of fundamental analysis variables such as economic conditions of country, political conditions of country etc. There is a great impact of social media on stock market so we can perform better prediction by performing sentiment analysis. The problem of time complexity would be resolved and accurate evaluation of previsions of stock market can be achieved.

Chapter 6

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ANN: Artificial Neural Networks

MLP: Multi Layer Perception

DM: Data mining

NARX: Nonlinear Autoregressive Neural Network

MSE: Mean Squared Error

SMA: Simple Moving Averages