STOCK MARKET PREDICTION LITERATURE REVIEW AND ANALYSIS

A PROJECT PROGRESS REPORT

Submitted by

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Under the supervision of

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APPROVAL SHEET

This thesis entitled **"Stock Market Prediction Literature Review and Analysis"**, Prepared and submitted by **DIPANKAR PURKAYASTHA** in partial fulfilment of the requirement for the degree of **Bachelor of Technology** in **Computer Science and Engineering** has been examined and hereby recommended for approval and acceptance.

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DECLARATION

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Date: _____

CERTIFICATE

It is certified that the work contained in the thesis titled **Stock Market Prediction Literature Review and Analysis** by Dipankar Purkayastha, has been carried out under my/our supervision and that this work has not been submitted elsewhere for a degree

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It is a matter of great pleasure to present this progress report on " Stock Market Prediction Literature Review and Analysis ". We are grateful to our project supervisor Prof. PARTHA PRATIM DEB, who has been of invaluable assistance to our project with his advice and suggestions. We are very much thankful to our sir for giving us the opportunity to do this project.

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ABSTARCT

In a financially volatile market, as the stock market, it is important to have a very precise prediction of a future trend. Because of the financial crisis and scoring profits, it is mandatory to have a secure prediction of the values of the stocks. Predicting a non-linear signal requires advanced algorithms of machine learning. The literature contains studies with different machine learning algorithms such as ANN (artificial neural networks) with different feature selection. The results of this study will show that the algorithm of classification SVM (Support Vector Machines) with the help of feature selection PCA (Principal component analysis) will have the success of making a profit.

This paper systematically reviews studies that forecast **stock market prediction and analysis** using different methods. We extract and synthesise 150 research papers, we found different methods by which we can predict the stock market condition and by which investors can easily invest their money in the stock market. Some of those methods are:-

(1) Methods using FUZZY LOGIC methods and (2) Fundamental Analysis

(3) Artificial Neural Network **(4)** Data Mining

(5) Hidden Markov Model .

FUZZY TIME SERIES forecasting methods, which have been widely studied in recent years, do not require constraints as found in conventional approaches. On the other hand, most of the time series encountered in real life should be considered as fuzzy time series due to the vagueness that they contain. Although numerous methods have been proposed for the analysis of time series in the literature, these methods fail to forecast seasonal fuzzy time series. Neuro-Fuzzy system used to predict the stock market fluctuation. NEURAL NETWORK and NEURO-FUZZY systems are identified to be the leading machine learning techniques in stock market index prediction area. The Traditional techniques are not cover all the possible relation of the stock price fluctuations. There are new approaches to known in-depth of an analysis of stock price variations.

NN and MARKOV Model can be used exclusively in the finance markets and forecasting of stock price.Forecasting stock return is an important financial subject that has attracted researchers' attention for many years. It involves an assumption that fundamental information publicly available in the past has some predictive relationships to the future stock returns.

INTRODUCTION

Today we live and breathe data. Forecasting the stock exchange data is an important financial subject which involves an assumption that the fundamental information publicly available in the past has some predictive relationships to the future stock returns. Stock market forecasting contains uncovering the market trends, planning investment tactics, identifying the best time to purchase the stocks and which stocks to purchase. A stock exchange or equity business sector is a non-direct, non-parametric framework that is difficult to model with any sensible exactness. It is the mix of speculators who need to purchase or offer or hold a share at a specific time. Prediction will continue to be an exciting locale of research, making scientists in the analytics field always desiring to enhance the existing forecasting models. The motivation is that companies and individuals are empowered to make investment decisions to develop viable system about their future endeavors.

Stock price prediction is a heated topic in prediction study of financial area. The stock market is essentially a non-linear, nonparametric system that is extremely hard to model with any reasonable accuracy. Investors have been trying to find a way to predict stock prices and to find the right stocks and right timing to buy or sell. Most of the techniques used in technical analysis are highly subjective in nature and have been shown not to be statistically valid. Recently, data mining techniques and artificial intelligence techniques like decision trees, rough set approach, and artificial neural networks have been applied to this area. Data mining refers to extracting or mining knowledge from large data stores or sets. Some of its functionalities are the discovery of concept or class descriptions, associations and correlations, classification, prediction, clustering, trend analysis, outlier and deviation analysis, and similarity analysis. Data classification can be done in many different methods; one of those methods is the classification by using Decision Tree. It is a graphical representation of all possible outcomes and the paths by which they may be reached.

The use of ANN in business environments has been increasing over the last few years. Excellent algorithm has been applied to predict stock price or index. Interest in neural networks has led to a considerable surge in research activities in the past decade. Artificial neural network models are based on the neural structure of the brain.The brain learns from experience and so do artificial neural networks. As a useful analytical tool, ANN is widely applied in analyzing the business data stored in database or data warehouse. Identifying customer behavior patterns and predicting stock price are emerging areas of neural network research and its application. Most of the companies have created new methods of evaluating financial data and investment decisions. Artificial Neural Networks are being used by most companies for improved forecasting capabilities in analysis of stock market. So, artificial neural network suits better than other models in predicting the stock market.

The idea of forecasting using neural network is to find an approximation of mapping between the input and output data through training. The trained neural network is then used to predict the values for the future This research work presents the use of artificial neural network as a forecasting tool for predicting the stock market price.

Mostly the approaches are in terms of fundamental approach and technical approach. For the long-term valuation fundamental approach is used. Every stock is having its own value that does not depend on the price of the stock that is known as Intrinsic value. The proposed model works through phases of data collection, feature processing, fuzzy logic mapping and stock value calculation. Fuzzy logic is used to map the quality as well as quantity valuation factors. The IF THEN rules are applied on the linguistic variable. The fuzzy model outcomes the stock value which is used to provide stock worth. The stock value is calculated by Dividend discount model. Accuracy of the system is 0.77. The results offer the backbone for the value and not the price.

Another method is DATA MINING. Decision making process for business can be risky. Corporate decision makers have to make decisions to protect company‟s benefit and lower the risk. In order to evaluate data mining approach on forecasting, a tool, called IFF, was developed for evaluating and simulating forecasts. Specifically data mining techniques‟ and simulation‟s ability to predict, evaluate and validate Port Industry forecasts is tested. Accuracy is calculated with data mining methods. Finally the probability of user‟s and simulation model‟s confidentiality is calculated. The results of the research indicate that data mining approach on forecasting and Monte Carlo method have the capability to forecast on Port industry and, if properly analyzed, can give accurate results for forecasts.

We study a multivariate Markov chain model for categorical data sequences to fuzzy time series. The proposed method gets higher average forecasting accuracy rate than some of the existing methods on temperature prediction.

The future stock returns have some predictive relationships with the publicly available information of present and historical stock market indices. ARIMA is a statistical model which is known to be efficient for time series forecasting especially for short-term prediction. In this paper, we propose a model for forecasting the stock market trends based on the technical analysis using historical stock market data and ARIMA model. This model will automate the process of direction of future stock price indices and provides assistance for financial specialists to choose the better timing for purchasing and/or selling of stocks. The results are shown in terms of visualizations using R programming language. The obtained results reveal that the ARIMA model has a strong potential for short-term prediction of stock market trends.

LITERATURE REVIEW

Over the past two decades many important changes have taken place in the environment of financial markets. The development of powerful communication and trading facilities has enlarged the scope of selection for investors.

Forecasting stock return is an important financial subject that has attracted researchers' attention for many years. It involves an assumption that fundamental information publicly available in the past has some predictive

relationships to the future stock returns. In order to be able to extract such relationships from the available data, data mining techniques are new techniques that can be used to extract the knowledge from this data. For that reason, several researchers have focused on technical analysis and using advanced math and science. Extensive attention has been dedicated to the field of artificial intelligence and data mining techniques. Some models have been proposed and implemented using the above mentioned techniques, the authors of Tsang, P.M., Kwok, P., Choy, S.O., Kwan, R., Ng, S.C., Mak, J., Tsang, J., Koong, K., and Wong, T. made an

empirical study on building a stock buying/selling alert system using back propagation neural networks (BPNN), their NN was codenamed NN5. The system was trained and tested with past price data from Hong Kong and Shanghai Banking Corporation Holdings over the period from January 2004 to December 2005. The empirical results showed that the implemented system was able to predict short-term price movement directions with accuracy about 74%.

The research by Wu, M.C., Lin, S.Y., and Lin, C.H., used decision tree technique to build on the work of Lin. where Lin tried to modify the filter rule that is to buy when the stock price rises k% above its past local low and sell when it falls k% from its past local high. The proposed modification to the filter rule was by combining three decision variables associated with fundamental analysis. An empirical test, using the stocks of electronics companies in Taiwan, showed Lin's method outperformed the filter rule. According to Wu, M.C., Lin, S.Y., and Lin, C.H.,, in Lin's work, the criteria for clustering trading points involved only the past information; the future information was not considered at all. The research by Wu, M.C., Lin, S.Y., and Lin, C.H., aimed to improve the filter rule and Lin's study by considering both the past and the future information in clustering the trading points. The researchers used the data of Taiwan stock market and that of NASDAQ to carry out empirical tests. Test results showed that the proposed method outperformed both Lin's method and the filter rule in the two stock markets.

The model of Wang, J.L., Chan, S.H. (2006) "Stock market trading rule discovery using two-layer bias decision tree", applied the concept of serial topology and designed a new decision system, namely the two layer

bias decision tree, for stock price prediction. The methodology developed by the authors differs from other studies in two respects;

first, to reduce the classification error, the decision model was modified into a bias decision model.

Second, a two-layer bias decision tree is used to improve purchasing accuracy. The empirical results indicated that the presented decision model produced excellent purchasing accuracy, and it significantly outperformed than random purchase.

The authors Enke, D., Thawornwong, S. presented an approach that used data mining methods and neural networks for forecasting stock market returns. An attempt has been made in this study to investigate the predictive power of financial and economic variables by adopting the variable relevance analysis technique in machine learning for data mining. The authors examined the effectiveness of the neural network models used for level estimation and classification. The results showed that the trading strategies guided by the neural network classification models generate higher profits under the same risk exposure than those suggested by other strategies.

The research by Cao, Q., Leggio, K.B., and Schniederjans, M.J., was basically a comparison between the work of Fama and French's model and the artificial neural networks in order to try to predict the stock prices in the Chinese market. The purpose of this study is to demonstrate the accuracy of ANN in predicting stock price movement for firms traded on the Shanghai Stock Exchange. In order to demonstrate the accuracy of ANN, the authors made a comparative analysis between Fama and French's model and the predictive power of the univariate and multivariate neural network models. The results from this study indicated that artificial neural networks offer an opportunity for investors to improve their predictive power in selecting stocks, and more importantly, a simple univariate model appears to be more successful at predicting returns than a multivariate model.

Al-Haddad et al., presented a study that aimed to provide evidence of whether or not the corporate governance & performance indicators of the Jordanian industrial companies listed at Amman Stock Exchange (ASE) are affected by variables that were proposed and to provide the important indicators of the relationship of corporate governance & firms' performance that can be used by the Jordanian industrial firms to solve the agency problem. The study random sample consists of (44) Jordanian industrial firms. The study founds a positive direct relationship between corporate governance and corporate performance.

Hajizadeh et al. provided an overview of application of data mining techniques such as decision tree, neural

network, association rules, and factor analysis and in stock markets. Prediction stock price or financial markets

has been one of the biggest challenges to the AI community. Various technical, fundamental, and statistical indicators have been proposed and used with varying results. Soni surveyed some recent literature in the

domain of machine learning techniques and artificial intelligence used to predict stock market movements.

Artificial Neural Networks (ANNs) are identified to be the dominant machine learning technique in stock market prediction area.

El-Baky et al., proposed a new approach for fast forecasting of stock market prices. The proposed approach

uses new high speed time delay neural networks (HSTDNNs). The authors used the MATLAB tool to simulate results to confirm the theoretical computations of the approach.

V. Vamitha, M. Jeyanthi, S. Rajaram and T. Revathi,s research about Multivariate Markov Chain also gave a new approach in the stock market prediction systems. Since 1993 researchers proposed many methods for forecasting enrollments, Temperature prediction, stock price etc in time variant and time invariant first order, higher order, two factor and dual variables. In this paper, we propose a model to temperature prediction from correlated categorical data sequence obtained from similar source. We study a multivariate Markov chain model for categorical data sequences to fuzzy time series. The proposed method gets higher average forecasting accuracy rate than some of the existing methods on temperature prediction.

Anass Nahil prposed a new method on stock market prediction which will help many investors to invest their money in right time by which they will get more benefit in near future. Their proposed method was about support vector machine (SVM)**.** It is a popular tool in time series forecasting for the capital investment industry. This machine learning technique which is based on a discriminative classifier algorithm, forecasts more accurately the financial data. By examining the stock price of 5 Moroccan banks, the experiment shows that the SVM can perform better when we add the global evolution of the market to the independent variables. To express the global evolution of the market, three indices of the Casablanca Stock Exchange are used : MASI, MADEX and Banks Sector Index.

Narendra Pahuja, Abhishek Oturkar, Kailash Sharma, Jatin Shrivastava, Dimple Bohra's ARIMA model made a huge change in stock market prediction. Over the years it is observed that stock market data is nonlinear, chaotic & dynamic. This paper is going to present a predictive model for prices of the stocks with the help of ARIMA model. The stock data which is published from the Bombay Stock Exchange (BSE) & National Stock Exchange (NSE) has been used with the model developed for the prediction of stock price. From the results which are obtained, we come to the conclusion that for short-term prediction the ARIMA model has a great potential & also it shows competence with the already present methods for stock price prediction

Mahantesh Angadi, Amogh Kulkarni Sai proposed the method of stock market prediction by using Data Mining Techniques with R. In this work, we explore recurrent neural networks with character-level language model pre-training for both intraday and interday stock market forecasting. In terms of predicting directional changes in the Standard & Poor's 500 index, both for individual companies and the overall index, we show that this technique is competitive with other state-of-the-art approaches.

Nghiem Van Tinh,Nguyen Thi Thu Hien Nguyen Tien Duy proposed the method by using k-means clustering algorithm. Most of the fuzzy forecasting methods based on fuzzy time series used the static length of intervals, i.e., the same length of intervals. The drawback of the static length of intervals is that the historical data are roughly put into intervals, even if the variance of the historical data is not high. In this paper, we present a new method for forecasting enrolments based on Fuzzy Time Series and K-Mean clustering(FTS-KM). To verify the effectiveness of the proposed model, the empirical data for the enrolments of the University of Alabama are illustrated, and the experimental results show that the proposed model outperforms those of previous some forecasting models with various orders and different interval lengths.

OBJECTIVE

The main objective of this study is to study about different methodology's and get a stock market prediction tool to obtain more accurate stock prediction price and to evaluate them with some performance measures. This study can be used to reduce the error proportion in predicting the future stock prices. It increases the chances for the investors to predict the prices more accurately by reducing error percentage and thus gain benefits in share markets.

After getting the idea about different methods of stock market forecasting techniques we can understand that by using which methods we will get more accurate results. Then we will be able to reduce the amount of error by which investers can invest their valuable money in stock market at a right time.

Relevant Works

Wilson and Sharda [1] studied prediction firm bankruptcy using neural networks and classical multiple discriminant analysis, where neural networks performed significantly better than multiple discriminant analysis.

Min and Lee were doing prediction of bankruptcy using machine learning. They evaluated methods based on Support Vector Machine, multiple discriminant analysis, logistic regression analysis, and three-layer fully connected back-propagation neural networks. Their results indicated that support vector machines outperformed other approaches.

5 Lee was trying to predict credit rating of a company using support vector machines. They used various financial indicator and ratios such as interest coverage ratio, ordinary income to total assets, Net income to stakeholders' equity, current liabilities ratio, etc. and achieved accuracy of around 60%. Predicting credit rating of the companies were also studied using neural networks achieving accuracy between 75% and 80% for the United States and Taiwan markets.

Tsai and Wang [2] did a research where they tried to predict stock prices by using ensemble learning, composed of decision trees and artificial neural networks. They created dataset from Taiwanese stock market data, taking into account fundamental indexes, technical indexes, and macroeconomic indexes. The performance of Decision Tree + Artificial Neural Network trained on Taiwan stock exchange data showed Fscore performance of 77%. Single algorithms showed F-score performance up to 67%.

Kim and Han [3] used a genetic algorithm to transform continuous input values into discrete ones. The genetic algorithm was used to reduce the complexity of the feature space. This paper proposes a novel evolutionary computing method called a genetic quantum algorithm. Genetic Quantum Algorithm is based on the concept and principles of quantum computing such as qubits and superposition of states. Instead of binary, numeric, or symbolic representation, by adopting bit chromosome as a representation Genetic Quantum Algorithm can represent a linear superposition of solutions due to its probabilistic representation. As genetic operators, quantum gates are employed for the search of the best solution.

There are many tools and software available out there that provide forecasting of stock market entities, share quantity and share value for a given financial organization. Most of them claim to predict the stock market with near to 100% accuracy but the opinions from the users vary. Some of the popular tools and software with their methodologies are mentioned as follows.

Market track

Its stock market forecast system consists of two major parts: an extensive database and a forecast model. The forecast model reads the database and then makes a prediction of where the market is headed. From this prediction, it determines a trading position for the Dow Diamonds or the SP500 Spiders [5]. The database and forecast are updated daily at the close of trading.

It uses a neural network model in combination with a genetic algorithm to calculate the SP500 forecast. The calculations are somewhat complex but can be summarized by the following three procedural steps.

Step one: The genetic algorithm is used to find the optimum neural network structures and inputs. This calculation basically determines how the networks will be wired.

Step two: Using the information from the first step, a set of networks is initialized and then trained on about 75 percent of the market data (in-sample) in their database, which currently consists of about 7200 days of data. They use an evolutionary program to train the networks (i.e. to determine the neural network weights).

Step three: After training, the networks are rigorously tested on the remaining 25 percent of market data (out-of-sample). Networks that fail the test are discarded. Networks that pass the test are included in the library that they use to calculate the forecast. The number of neural networks currently in their library varies from day to day, but normally contains more than 400. 7 Input to the networks are technical and fundamental market data. The table below shows the types of data that are currently used by the model:

- Dow Jones Industrial Average closing value
- Dow Jones Industrial Average theoretical high value
- Dow Jones Industrial Average theoretical low value
- Dow Jones Transportation Average closing value
- Dow Jones Utility Average closing value
- New York Stock Exchange total volume
- New York Stock Exchange number of advancing stocks
- New York Stock Exchange number of declining stocks
- New York Stock Exchange number of new highs
- New York Stock Exchange number of new lows
- New York Stock Exchange advancing volume
- New York Stock Exchange declining volume
- SP500 closing value

- SP500 trailing earnings
- Yen-Dollar exchange rate
- Treasury bill discount rate
- Commodity Research Bureau index

The above data are filtered and normalized and certain functions of these data are computed. It currently computes 63 separate input variables at the close of each trading day.

Figure 2.1: Forecasting method for Markettrak 8 The 63 inputs are applied to a neural network and after some number crunching the network outputs a value between -1.0 and +1.0, with -1.0 being a very strong down market signal and +1.0 being a very strong up market signal. A value near zero would indicate a neutral market signal. They apply the inputs to each network in our library and an average of their outputs is computed. This average network output is used with position set points to determine a trading position for the Dow Diamonds or the SP500 Spiders for the next trading day.

When the computed value of the average network output is above the long position set point, a long position is indicated. When the value of the average network output is below the short position set point, a short position is indicated. When the average network output falls between these two set points, a cash position is indicated. Because of the timing of the update, trades may be made in the extended sessions or at open of the next trading day. When computing our performance, all trades are assumed to take place at the session close. The current trading position along with recent average network output values and the average network output set points are shown on our forecast page.

Stock Forecasting Software

www.stock-forecasting.com (Center of Mathematics & Science, Inc., Chicago, United States of America) provides innovative price-prediction technology for active Day Traders, Short- and Long-term Investors. They develop web-based software for stock market forecasting and analysis.

The artificial intelligence www.stock-forecasting.com software is based on neural network technology, advanced statistical methods and non-periodic stock price wave analysis. The Stock-Forecasting software predicts stock prices, generates trading "Buy-Hold-Sell" signals, computes the most profitable company to invest in and analyzes the accuracy of predictions

REQUIREMENT ANALYSIS AND FEASIBILITY STUDY

Feasibility Study

Simply put, stock market cannot be accurately predicted. The future, like any complex problem, has far too many variables to be predicted. The stock market is a place where buyers and sellers converge. When there are more buyers than sellers, the price increases. When there are more sellers than buyers, the price decreases. So, there is a factor which causes people to buy and sell. It has more to do with emotion than logic. Because emotion is unpredictable, stock market movements will be unpredictable. It's futile to try to predict where markets are going. They are designed to be unpredictable.

There are some fundamental financial indicators by which a company's stock value can be estimated. Some of the indicators and factors are: Price-to-Earning (P/E) Ratio, Price-to-Earning Growth (PEG) Ratio, Price-to-Sales (P/S) Ratio, Price/Cash Flow (P/CF) Ratio, Price-to-Book Value (P/BV) Ratio and Debt-to-Equity Ratio. Some of the parameters are available and accessible on the web but all of them aren't. So we are confined to use the variables that are available to us.

The proposed system will not always produce accurate results since it does not account for the human behaviours. Factors like change in company's leadership, internal matters, strikes, protests, natural disasters, change in the authority cannot be taken into account for relating it to the change in Stock market by the machine.

The objective of the system is to give a approximate idea of where the stock market might be headed. It does not give a long term forecasting of a stock value. There are way too many reasons to acknowledge for the long term output of a current stock. Many things and parameters may affect it on the way due to which long term forecasting is just not feasible.

Requirement Analysis

After the extensive analysis of the problems in the system, we are familiarized with the requirement that the current system needs. The requirement that the system needs is categorized into the functional and non-functional requirements. These requirements are listed below: 3.2.1 Functional Requirements Functional requirement are the functions or features that must be included in any system to satisfy the business needs and be acceptable to the users. Based on this, the functional requirements that the system must require are as follows:

- The system should be able to generate an approximate share price.
- The system should collect accurate data from the NEPSE website in consistent manner.

Non-Functional Requirements

Non-functional requirement is a description of features, characteristics and attribute of the system as well as any constraints that may limit the boundaries of the proposed system. The non-functional requirements are essentially based on the performance, information, economy, control and security efficiency and services. Based on these the non-functional requirements are as follows:

- The system should provide better accuracy.
- The system should have simple interface for users to use.
- To perform efficiently in short amount of time

SYSTEM ANALYSIS

A. Problem Statement :- A stock exchange market depicts savings and investments that are advantageous to increase the effectiveness of national economic. The future stock returns have some predictive relationships with the publicly available information of present and historical stock market indices. The investors decide the better time to sell/buy/hold a share in stock market based on the former relationship. Every investor is interested in predicting the future stock prices, whether the investor may be a long-term investor or a day-trader. This possesses a major challenge to design and develop an effective and efficient predictive model that assists the investors to take appropriate decisions.

B. Existing Systems :- One of the significant financial subject that has engrossed the researcher's attention for many years is forecasting the stock returns. Investors in the stock market have been attempting to discover an answer to estimate the stock trends in order to decide the better timing to buy or sell or hold a share. Forecasting the stock trends have been done both on qualitative analysis and quantitative analysis. There are many statistical models available for forecasting stock trends and choosing an appropriate model for a particular forecasting application depends on the format of the data.

C. Proposed Study :- In this work we propose a prediction model for the time series stock market data. This model will automate the process of change of stock price indices based on technical analysis and provides assistance for financial specialists to choose the better timing for purchasing and selling stocks. Data mining techniques are used to develop the prediction model and R programming language is used for visualization of results.

SYSTEM DESIGN AND ARCHITECTURE

Use Case Diagram

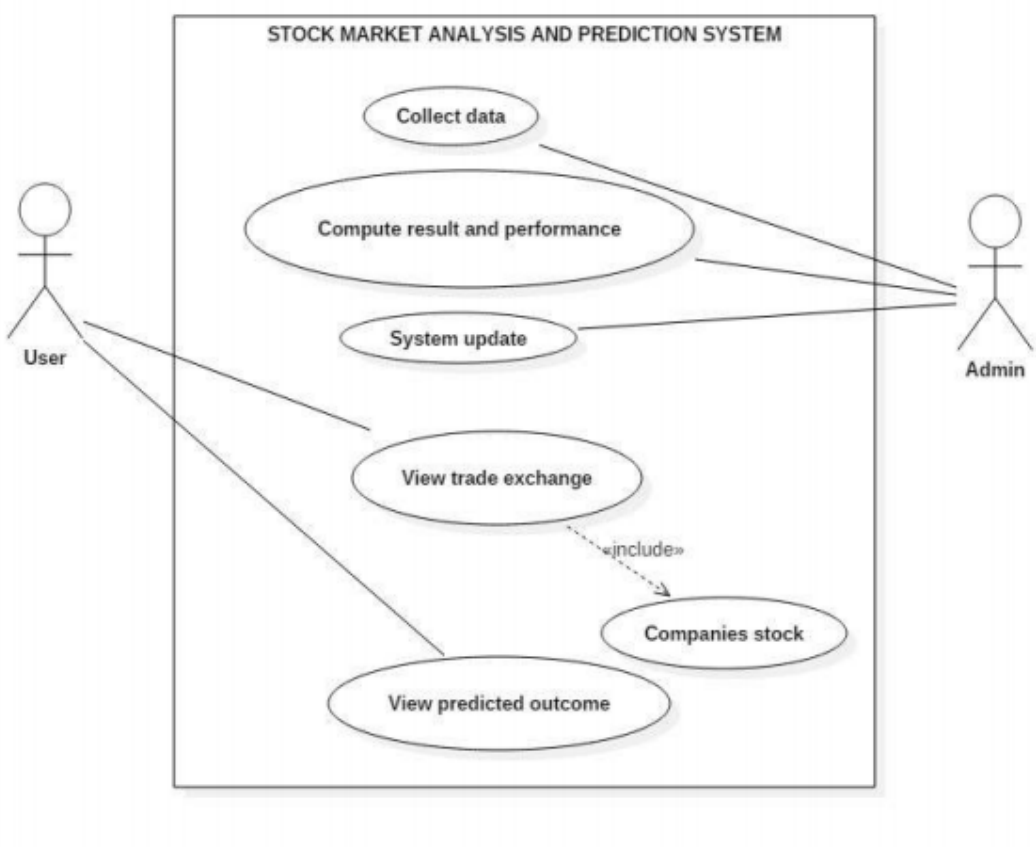

Figure 4.1: Use Case Diagram for the system

Use case index

Use case ID	Use case name	Primary actor	scope	complexity	priority
1	Collect data	admin	in	high	1
2	Compute result and prepare	admin	in	high	1
3	System update	admin	in	high	1
4	View trade exchange	user	in	medium	2
5	Company stock	user	in	medium	2
6	View predicted outcome	user	in	high	1

Use case description:

Use case ID:1

Use case name: Collect data

Description: Every required data will be available in Nepal stock exchange. Admin will be able to collect the data for system.

Use case ID:2

Use case name: Compute result and performance

Description: Prediction result will be handled and generated by admin. The system will be built, through which the result of prediction and system performance will be analyzed.

Use case ID: 3

Use case name: System update

Description: With the change of market and technology regular update of system is required. Beside there the predict result of stock exchange and their actual price will be updated by admin in regular basis.

Use case ID: 4

Use case name: View traded exchange

Description: Company trading which is held at NEPSE can be viewed by user.

Use Case ID: 5

Use Case Name: Company Stock

Description: It is extended feature of view traded exchange. This includes the stock value of particular company.

Use Case ID: 6

Use Case Name: View predicted outcome

Description: This use case is must important in whole project. The key feature of this project is to predict the stock value of hydropower companies. Thus, this will be available in user interface and viewer can observe them.

SYSTEM FLOW DIAGRAM

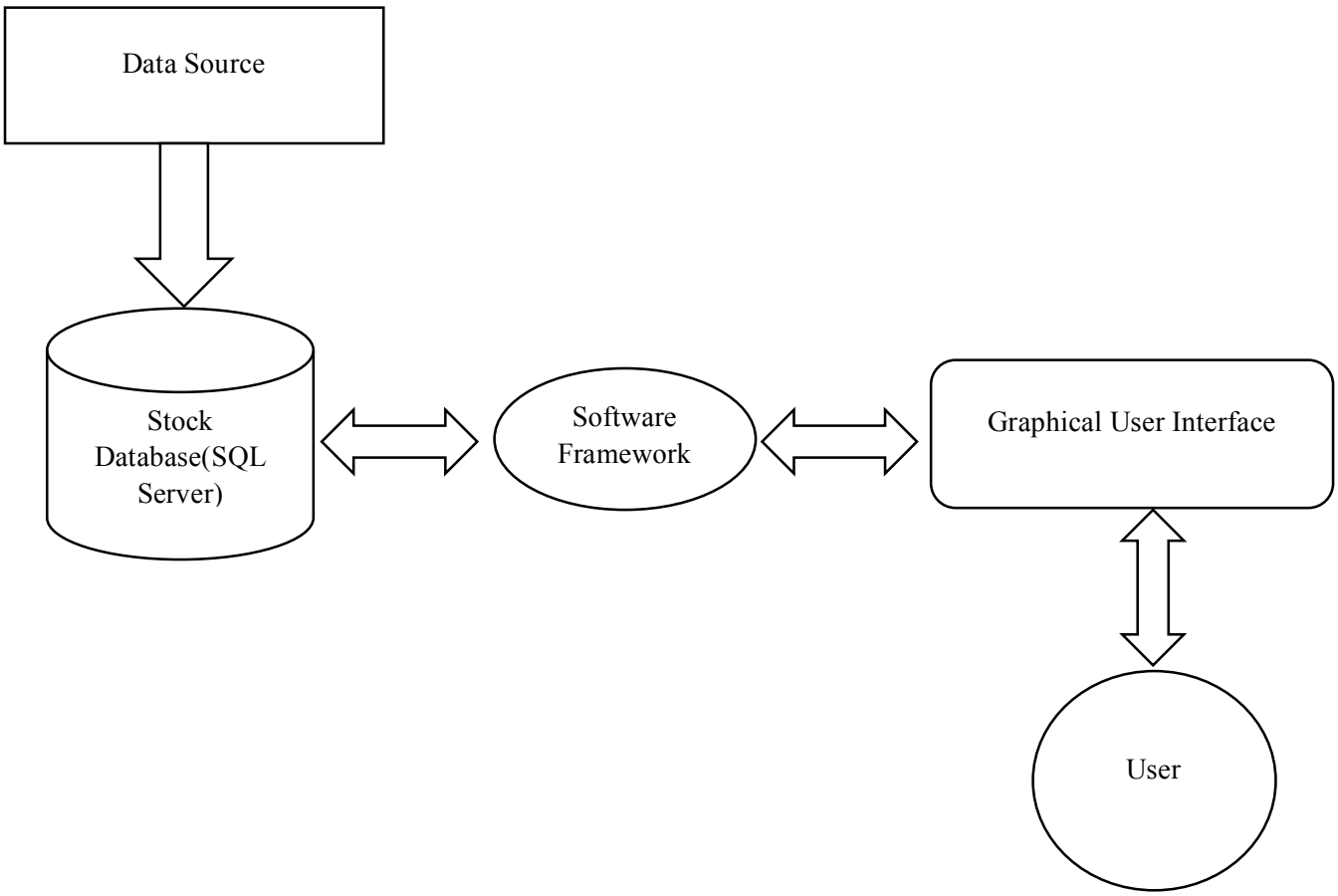

Fig :- system flow diagram

IMPLEMENTATION STEPS

System architecture is a model that defines the behavior of a system in the conceptual model. The huge systems are decomposed into subordinate systems to provide similar set of services. The beginning layout strategy of perceiving these sub-systems and building up a structure for sub-systems control and cooperation is called architecture design. As shown above, Fig. 4.1 includes seven major steps to implement the system and each step is explained below.

A. Understanding the Objective

The first step in developing a project is to understand the objective which involves an understanding of the intent and essentials of a system. This comprehension is used as a problem description and a preparatory system to accomplish the expectations. The objective of our project is neither to build a system that makes billions nor to waste billions too. But the objective is to develop a system that finds the direction of change of stock price indices based on the co-relations between stock prices and help the investors in the stock market in taking a decision whether to buy/sell/hold a stock by providing the results in-terms of visualizations.

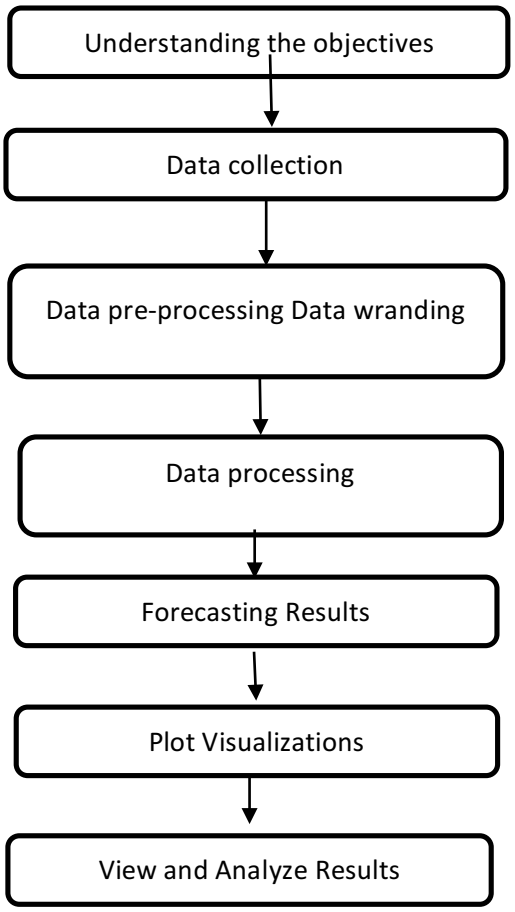

Fig 4.1 System architecture

B. Data Collection

Once the understanding of the objective is over, the next step is to collect the data. Data collection involves the understanding of initial observations of the data to identify the useful subsets from hypotheses of the hidden information. We use the data from Google finance.

C. Data Pre-processing: Data Wrangling

The data pre-processing stage involves all the activities to prepare the final dataset from the preparatory raw information. The data preparation tasks can be performed several times as there is no specific order. These tasks include the selection of a record, table, attribute and cleaning of data for modeling tools.

D. Data Processing: Data Training

In technical analysis investors use the auto regressive and moving average models to forecast the stock trends. Major steps involved here are **identification, parameter estimation and forecasting**. These steps are repeated until an appropriate model is identified for prediction.

E. Forecasting Results

The process of making predictions of the future by relying upon the past and present data is known as forecasting. Various prediction techniques are used by the stock analysts to evaluate the future stock trends value. Prediction also offers a significant standard for organizations that have a long-term perception of actions. We use 'forecast' package for predicting the future stock trends based on the analysis of past trends. This 'forecast' package provides a number of forecasting functions for displaying the time series predictions along with exponential smoothing and space models.

F. Plot Visualizations

Data visualization is a graphical representation of the numerical data. After forecasting the stock market trends we visualize the results for short-term investment assistance in-terms of line charts, candlesticks charts, bar charts, and histograms.

G. View and Analyze Results

Once after plotting the results in-terms of visualizations we can find out the correlations to get the short-term predictions. In the next section we provide some of the screen shots by which the investor can analyze and predict the future stock trends of a particular company at a specific time period. So the investors in the stock market can use this as assistance to sell/buy/hold a share.

Surveyed stock markets and related data sets

The list of stock markets authors have obtained their data for training and testing of their perspective models is shown in Table 1. Surveyed articles focus on forecasting returns of a single stock market index or of multiple stock market indexes. However, several studies concentrate in forecasting returns of a single stock or multiple stocks (Ajith, Baikunth, & Mahanti, 2003a; Atsalakis & Valavanis, 2006a, 2006b).

Articles in Table 1 may be classified in three categories.

The first category includes articles that use as input data indexes from well developed markets in Western Europe, North America and other solid economy countries.

Ettes (2000), Setnes and Van Drempt (1999) model the Amsterdam stock exchange. Brownstone (1996), Kanas and Yannopoulos (2001) model the FTSE stock index. Lendasse, De Bodt, Wertz, and Verleysen (2000) studies the Belgian market. The Madrid stock exchange is examined by Fernandez-Rodriguez, Gonzalez-Martel, and Sosvilla-Rivebo (2000), Perez-Rodriguez, Torrab, and Andrada-Felixa (2004). The German DAX is forecasted by Rast (1999), Schumann and Lohrbach (1993), Siekmann, Gebhardt, and Kruse (1999), Steiner and Wittkemper (1997). These markets belong to well developed European markets.

Baek and Cho (2002), Chun and Park (2005), Kim and Chun (1998), Kim (1998), Oh and Kim (2002) model the Korean stock index. Cao, Leggio, and Schniederjans (2005), Yiwen, Guizhong, and Zongping (2000), Zhang, Jiang, and Li (2004), Zhongxing and Liting (1993) examine the Shangai stock market. Lam (2001) forecasts the Hong Kong stock exchange, Chen, Leung, and Daouk (2003), Kuo (1998), Wang (2002), Wang and Leu (1996) study the Taiwan stock index. Baba and Kozaki (1992), Huang, Nakamori, and Wang (2005), Jaruszewicz and Mandziuk (2004), Kimoto, Asakawa, Yoda, and Takeoka (1990), Mizuno, Kosaka, and Yajima (1998) forecast the Japanese Stock.

Ajith et al. (2003a), Ajith, Sajith, and Sarathchandran (2003b), Chen, Abraham, Yang, and Yang (2005a) attempt to forecast the NASDAQ stock exchange, and Chaturvedi and Chandra (2004), Halliday (2004), Leigh, Paz, and Purvis (2002) try to forecast the NYSE. The S&P 500 has the highest percentage of preference among studies as in Armano, Marchesi, and Murru (2004), Casas (2001), Malliaris and Salchenberger (1993), Tsaih, Hsu, and Lai (1998). Olson and Mossman (2003) studies the Toronto stock exchange index. Surveyed markets are the North America well developed markets. This survey includes also studies from the Australian Stock Index, surveyed by Barnes, Rimmer, and Ting (2000), Pan, Tilakarante, and Yearwood (2005), Vanstone, Finnie, and Tan (2005).

The second category focuses on studies that use indexes to forecast emerging markets. Studies from ex-Eastern Europe include Zorin and Borisov (2002) for the Latvian Riga stock exchange index, Walczak (1999), Wikowska (1995) for the Polish stock exchange index. Egeli, Ozturan, and Badur (2003), Yumlu, Gurgen, and Okay (2004, 2005) forecast the Istanbul Stock Exchange market. From Western European emerging markets, studies include Koulouriotis Koulouriotis (2004, 2001, 2002, 2005) for the Athens stock exchange, Andreou, Neocleous, Schizas, and Toumpouris (2000), Constantinou, Georgiades, Kazandjian, and Kouretas (2006)

for the Cyprus stock exchange. The Singapore stock exchange is the most popular emerging market, forecasted by Ayob, Nasrudin, Omar, and Surip (2001), Hui, Yap, and Prakash (2000), Kim (1998), Phua, Hoh, Daohua, and Weiding (2001).

The third category includes articles that do not focus on a particular stock exchange market index, but use independent stocks or portfolio of stocks, instead. A typical example of this category is the study by Pantazopoulos, Tsoukalas, Bourbakis, Bruen, and Houstis (1998) that uses as input the price of the IBM stock, the study of Steiner and Wittkemper (1997), who selected as inputs the 16 top/bottom stocks from the DAX and the research by Atsalakis and Valavanis (2006a, 2006b) applied to five stocks of the Athens Stock Exchange and the NYSE.

Table 1

List of surveyed stock markets

Stock market	Article
Athens stock exchange	Atsalakis and Valavanis (2006a, 2006b) and Koulouriotis et al. (2002, 2005)
Australian stock exchange	Barnes et al. (2000), Pan et al. (2005) and Vanstone et al. (2005)
Belgian stock market	Lendasse et al. (2000)
Cyprus stock exchange	Andreou et al. (2000) and Constantinou et al. (2006)
Financial times index	Brownstone (1996) and Kanas and Yannopoulos (2001)
German stock exchange	Schumann and Lohrbach (1993), Siekmann et al. (1999), Steiner and
Hong Kong stock exchange	Lam (2001)
Indonesia stock exchange	Situngkir and Surya (2003)
Istanbul stock exchange	Egeli et al. (2003) and Yumlu et al. (2004, 2005)
Korean stock exchange	Baek and Cho (2002), Chun and Park (2005), Kim (1998), Kim and Han
Madrid stock exchange	Fernandez-Rodriguez et al. (2000) and Perez-Rodriguez et al. (2004)
NASDAQ	Ajith et al. (2003a, 2003b), Chen et al. (2005a) and Chen, Dong and Zhao
New York stock exchange	Chaturvedi and Chandra (2004), Halliday (2004), Leigh et al. (2002)
NIKKEI –Tokyo stock exchange	Huang et al. (2005), Jaruszewicz and Mandziuk (2004), Baba and Suto (2000), Mizuno et al. (1998) and Kimoto et al. (1990)
Philippine stock market	Bautista (2001)
Polish stock market	Walczak (1999) and Wikowska (1995)
Riga stock exchange	Zorin and Borisov (2002)
Sao Paolo stock exchange	Raposo et al. (2002)
Shanghais stock market	Cao et al. (2005), Yiwen et al. (2000), Zhang et al. (2004) and Zhongxing)
Singapore stock exchange	Phua et al. (2001), Kim (1998), Hui et al. (2000) and Ayob et al. (2001)
Standard and Poor's 500 Index, NASDAQ and Dow Jones industrial average index	Ajith et al. (2003a, 2003b), Armano et al. (2004), Atiya et al. (1997), Casas (2001), Chen et al. (2005a, 2005b), Chenoweth and Obradovic (1996), Donaldson and Kamstra (1999), Grudnitski and Osburn (1993), Malliaris and Salchenberger (1993), Qi (1999), Pantazopoulos et al. (1998), Rech (2002), Thawornwong and Enke (2004), Tsaih et al. (1998), Wu et al. (2001), Kanas and Yannopoulos (2001) and Rech (2002)
Taiwan stock exchange	Chen et al. (2005b), Kuo (1998), Wang (2002) and Wang and Leu (1996)

INPUT VARIABLES

The number of input variables used in each model differs. In general, the average number of input variables is between four and ten; however, there are cases where only two input variables are used (Constantinou et al., 2006; Ettes, 2000). On the contrary, Olson and Mossman (2003), Zorin and Borisov (2002) use 59 and 61input variables, respectively Specific techniques are also utilized to choose the most impor-tant input variables for the forecasting process among a large num-ber of candidate ones, based on how each input affects obtained results. Some studies cover a large horizon of observations over a period of years. The mean value or the latest observed value of a stock is used to fill any missing observations.

The most commonly used inputs are the stock index opening or closing price, as well as the daily highest and lowest values, sup-porting the statement that soft computing methods use quite sim-ple input data to provide predictions.

About 30% of the surveyed articles use as input data stock or in-dex prices, that is, the daily closing price or some indicator depend-ing only on it, as in Barnes et al. (2000), Donaldson and Kamstra (1999), Halliday (2004), Tan, Prokhorov, and Wunsch (1995), Pai and Lin (2005), Pantazopoulos et al. (1998), Perez-Rodriguez et al. (2004), Rast (1999), Rech (2002), Walczak (1999), Wang and Leu (1996), Zhang et al. (2004) and Zhongxing and Liting (1993). The daily opening/closing price, the daily minimum/ max-imum price and, in some cases, the transactions volume are used by Ajith et al. (2003a), Ayob et al. (2001), Chandra and Reeb (1999), Chen et al. (2005a), Chun and Park (2005), Doesken, Abraham, Thomas, and Paprzycki (2005), Thammano (1999), Wang (2002) and Zhang et al. (2002). In addition, the daily closing price is used in combination with the closing price of previous days (usu-ally up to a week) by Andreou et al. (2000), Fernandez-Rodriguez et al. (2000), Pan et al. (2005), Tang, Xu, Wan, and Zhang (2002) and Atsalakis and Valavanis (2006b).

Studies that use daily data combined with closing prices of established markets like the Dow Jones, the S&P, or with exchange rates of strong currencies like USD, EURO, YEN include, Ajith et al. (2003a) who uses besides the main Stock Index that it forecasts an-other 7 indexes closing prices; Huang et al. (2005) who uses the S&P 500 and the USD/YEN exchange rate to forecast the NIKKEY in-dex; the study from Phua et al. (2001) who uses the DJ, NASDAQ, HIS and NIKKEY index values to forecast the Singapore stock ex-change; the study by Siekmann et al. (1999) who uses the DJ index values as well as the USD and EURO exchange rate, the study by Tabrizi et al. (2000) who forecasts the Tehran Stock exchange using Gold Coin value and the USD exchange rate; the study by Wikowska (1995) who uses the USD exchange rate to forecast the Polish stock index. In general, well established stock

index values and exchange rates are used by researchers who try to fore-cast emerging markets. That indicates that emerging markets are greatly influenced compared to well established markets.

About 20% of the surveyed articles use as inputs technical analysis factors that are sometimes combined with daily or pre-vious stock index prices, as in Armano et al. (2004) and Atsalakis and Valavanis (2006b). The technical analysis factors range from 2 to 25, with most articles using mostly a combination of all pre-viously described variables, and also fundamental analysis indi-cators and statistical data. An extreme case is reported in Kosaka, Mizuno, Sasaki, Someya, and Hamada (1991) who uses as input 300 stock prices! Table 2 summarizes input variable choices.

FORECASTING METHODOLOGIES

In this review paper we have discussed about different stock market prediction methods. By which any invester can invest their money in right time. They can sell, hold or buy stocks in the perfect time by using these methodologies.

Among different methodologies some methods are –

(I) ARTIFICIAL NEURAL NETWORK :-

Stock market predictions are one of the challenging tasks for financial investors across the globe. This challenge is due to the uncertainty and volatility of the stock prices in the market. Due to technology and globalization of business and financial markets it is important to redict the stock prices more quickly and accurately. Last few years there has been much improvement in the field of Neural Network (NN) applications in business and financial markets. Artificial Neural Network (ANN) methods are mostly implemented and play a vital role in decision making for stock market predictions. Multi Layer Perceptron (MLP) architecture with back propagation algorithm has the ability to predict with greater accuracy than other neural network algorithms. In this research, neural works predict tools are used to predict the future stock prices and their performance statistics will be evaluated. This would help the investor to analyze better in business decisions such as buy or sell a stock.

In recent years, many attempts have been made to predict the behavior of bonds, currencies, stocks, or stock markets. In this paper, the StandardlkPoors 500 Index is modeled using different neural network classification architectures. Most previous experiments used multilayer perceptrons for stock market forecasting. In this paper, a multilayer perceptron architecture and ZL probabilistic neural network are used to predict the incline, decline, or steadiness of the index. The results of trading with the advice given by the network is then compared with the maximum possible performance and the perfolrmance of the index. Results show that both networks can be trained to perform better than the index, with the probabilistic neural network performing slightly better than the multi layer perceptron.

(II) SUPPORT MACHINE VECTOR (SVM) :-

The challenge of stock forecasting is appealing because a small forecasting improvement can increase profit significantly. However, the volatile nature of the stock market makes it difficult to apply linear models, simple time-series or regression techniques. Consequently, support vector machine (SVM) has become a good alternative. It is a popular tool in time series forecasting for the capital investment industry. This machine learning technique which is based on a discriminative classifier algorithm, forecasts more accurately the financial data. By examining the stock price of 5 Moroccan banks, the experiment shows that the SVM can perform better when we add the global evolution of the market to the independent variables. To express the global evolution of the market, three indices of the Casablanca Stock Exchange are used : MASI, MADEX and Banks Sector Index.

(III) K-MEANS CLUSTERING and FUZZY TIME SERIES :-

Most of the fuzzy forecasting methods based on fuzzy time series used the static length of intervals, i.e., the same length of intervals. The drawback of the static length of intervals is that the historical data are roughly put into intervals, even if the variance of the historical data is not high. In this paper, we present a new method for forecasting enrolments based on Fuzzy Time Series and K-Mean clustering(FTS-KM). To verify the effectiveness of the proposed model, the empirical data for the enrolments of the University of Alabama are illustrated, and the experimental results show that the proposed model outperforms those of previous some forecasting models with various orders and different interval lengths.

(IV) ARIMA MODEL :-

Nowadays, the stock market is attracting more and more people's notice with its high challenging risks and high return over. A stock exchange market depicts savings and investments that are advantageous to increase the effectiveness of the national economy. The future stock returns have some predictive relationships with the publicly available information of present and historical stock market indices. ARIMA is a statistical model which is known to be efficient for time series forecasting especially for short-term prediction. In this paper, we propose a model for forecasting the stock market trends based on the technical analysis using historical stock market data and ARIMA model. This model will automate the process of direction of future stock price indices and provides assistance for financial specialists to choose the better timing for purchasing and/or selling of stocks. The results are shown in terms of visualizations using R programming language. The obtained results reveal that the ARIMA model has a strong potential for short-term prediction of stock market trends.

(V) MULTIVARIENT MARKOV CHAIN :-

Since 1993 researchers proposed many methods for forecasting enrollments, Temperature prediction, stock price etc in time variant and time invariant first order, higher order, two factor and dual variables. In this paper, we propose a model to temperature prediction from correlated categorical data sequence obtained from similar source. We study a multivariate Markov chain model for categorical data sequences to fuzzy time series. The proposed method gets higher average forecasting accuracy rate than some of the existing methods on temperature prediction.

(VI) DATA MINING TECHNIQUES WITH R :-

In the last few years, machine learning has become a very popular tool for analyzing financial text data, with many promising results in stock price forecasting from financial news, a development with implications for the Ecient Markets Hypothesis (EMH) that underpins much economic theory. In this work, we explore recurrent neural networks with character-level language model pre-training for both intraday and interday stock market forecasting. In terms of predicting directional changes in the Standard & Poor's 500 index, both for individual companies and the overall index, we show that this technique is competitive with other state-of-the-art approaches.

(VII) FIRST-ORDER FUZZY TIME SERIES :-

This paper proposes a novel improvement of forecasting approach based on using time-invariant fuzzy time series. In contrast to traditional forecasting methods, fuzzy time series can be also applied to problems, in which historical data are linguistic values. It is shown that proposed time-invariant method improves the performance of forecasting process. Further, the effect of using different number of fuzzy sets is tested as well. As with the most of cited papers, historical enrollment of the University of Alabama is used in this study to illustrate the forecasting process. Subsequently, the performance of the proposed method is compared with existing fuzzy time series time-invariant models based on forecasting accuracy. It reveals a certain performance superiority of the proposed method over methods described in the literature.

Many other different models are also available in stock market prediction. If someone wants to invest then they can choose any method for predict the stock market condition.

(VIII) Fuzzy dual-factor :-

There is an old Wall Street adage goes, ‘‘It takes volume to make price move”. The contemporaneous relation between trading volume and stock returns has been studied since stock markets were first opened. Recent researchers such as Wang and Chin [Wang, C. Y., & Chin S. T. (2004). Profitability of return and volume-based investment strategies in China’s stock market. Pacific-Basin Finace Journal, 12, 541–564], Hodgson et al. [Hodgson, A., Masih, A. M. M., & Masih, R. (2006). Futures trading volume as a determinant of prices in different momentum phases. International Review of Financial Analysis, 15, 68–85], and Ting [Ting, J. J. L. (2003). Causalities of the Taiwan stock market. Physica A, 324, 285–295] have found the correlation between stock volume and price in stock markets. To verify this saying, in this paper, we propose a dual-factor modified fuzzy time-series model, which take stock index and trading volume as forecasting factors to predict stock index.

In empirical analysis, we employ the TAIEX (Taiwan stock exchange capitalization weighted stock index) and NASDAQ (National Association of Securities Dealers Automated Quotations) as experimental datasets and two multiplefactor models, Chen’s [Chen, S. M. (2000). Temperature prediction using fuzzy time-series. IEEE Transactions on Cybernetics, 30 (2), 263–275] and Huarng and Yu’s [Huarng, K. H., & Yu, H. K. (2005). A type 2 fuzzy time-series model for stock index forecasting. Physica A, 353, 445–462], as comparison models. The experimental results indicate that the proposed model outperforms the listing models and the employed factors, stock index and the volume technical indicator, VR(t), are effective in stock index forecasting.

(IX) GUSTAFSON-KESSEL FUZZY CLUSTERING :-

Fuzzy time series forecasting methods do not require constraints found in conventional approaches. In addition, due to uncertainty that they contain, many time series to be forecasted should be considered as fuzzy time series. Fuzzy time series forecasting models consist of three steps as fuzzification, identification of fuzzy relations and defuzzification. Although most of the time series encountered in real life contain seasonal component, only few of these fuzzy time series approaches analyze seasonal fuzzy time series. Even though all these studies have various advantages, their biggest disadvantage is to take into consideration only the fuzzy set having the highest membership value rather than the membership value of observations belonging to each fuzzy set. This situation conflicts to fuzzy set theory and causes the loss of information thus, negatively affects on the forecasting performance. In this study, a seasonal fuzzy time series forecasting model, in which Gustafson-Kessel fuzzy clustering technique in fuzzification stage is initially used and membership values are taken into account in both the determining fuzzy relations and the defuzzification stages is proposed. The proposed method is applied to real life seasonal time series and substantial results are obtained.

(X) HIGH ORDER FUZZY TIME SERIES AND SIMULATED ANNEALING TECHNIQUE :-

This paper proposes a fuzzy forecasting problem to forecast the Alabama University enrolment dataset. A novel simulated annealing heuristic algorithm is used to promote the accuracy of forecasting. The algorithm enjoys two new neighbourhood search operators called 'subtitle' and 'adjust'. A Taguchi method is also used as an optimisation technique to tune the different parameters and operators of the proposed model comprehensively. The experimental results show that the proposed model is more accurate than existing models

(XI) Soft Computing :-

Forecasting the price movements in stock market has been a major challenge for common investors, businesses, brokers and speculators because Stock Prices are considered to be very dynamic and susceptible to quick changes. As more and more money is being invested, the investor get anxious of the future trends of the stock prices in the market and thus, creating a high desirable need for a more' intelligent' prediction model. Two soft computing models- Artificial Neural Network (ANN) and Fuzzy Neuro hybrid model were used to forecast the next day's closing price. The historical trading data was obtained from the Nigerian Stock Exchange for Dangote Sugar Refinery Plc . The results showed the power of Soft Computing techniques (SC) in stock Price Prediction.

(XII) Machine Learning and Sentiment Analysis :-

Stock market is a very volatile in-deterministic system with vast number of factors influencing the direction of trend on varying scales and multiple layers. Efficient Market Hypothesis (EMH) states that the market is unbeatable. This makes predicting the uptrend or downtrend a very challenging task. This research aims to combine multiple existing techniques into a much more robust prediction model which can handle various scenarios in which investment can be beneficial. Existing techniques like sentiment analysis or neural network techniques can be too narrow in their approach and can lead to erroneous outcomes for varying scenarios. By combing both techniques, this prediction model can provide more accurate and flexible recommendations. Embedding Technical indicators will guide the investor to minimize the risk and reap better returns.

LIMITATIONS

There are many limitations in the used methodologies which were used in this literature review paper. Among those methods some methods were not able to give much accurate predictions, some of them were unable to provide give long-term prediction, some can't give short-term prediction. Among those some methods uses python as programing language, by using python the process will run very smoothly but the whole process will be very much complicated as python is a new and difficult language.

- **STOCK MARKET PREDICTION USING ANN**

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

In this project, used machine learning techniques to predict stock prices is Artificial Neural Networks,it will give less accurate results.More reliable machine languages are also available which will use in future. In future work ANNs can also be explore for other applications and comparative study with other models

- **Stock price prediction based on SVM : The impact of the stock market indices on the model performance**

The challenge of stock forecasting is appealing because a small forecasting improvement can increase profit significantly. However, the volatile nature of the stock market makes it difficult to apply linear models, simple time-series or regression techniques. Consequently, **support vector machine (SVM)** has become a good alternative. It is a popular tool in time series forecasting for the capital investment industry. This machine learning technique which is based on a discriminative classifier algorithm, forecasts more accurately the financial data. By examining the stock price of 5 Moroccan banks, the experiment shows that the SVM can perform better when we add the global evolution of the market to the independent variables. To express the global evolution of the market, three indices of the Casablanca Stock Exchange are used : MASI, MADEX and Banks Sector Index.

The enhanced model provides a better fitting for the stock prices, particularly for those with an important market capitalization. This method is mainly for those persons who have much more market capitals. This is not for middle class marketers.

- **ENROLLMENTS FORECASTING BASED ON AGGREGATED K-MEANS CLUSTERING AND FUZZY TIME SERIES**

Most of the fuzzy forecasting methods based on fuzzy time series used the static length of intervals, i.e., the same length of intervals. The drawback of the static length of intervals is that the historical data are roughly put into intervals, even if the variance of the historical data is not high. In this paper, we present a new method for forecasting enrolments based on Fuzzy Time Series and K-Mean clustering(FTS-KM). To verify the effectiveness of the proposed model, the empirical data for the enrolments of the University of Alabama are illustrated, and the experimental results show that the proposed model outperforms those of previous some forecasting models with various orders and different interval lengths.

There are two suggestions for future research: The first, we can apply proposed model to deal with more complicated real-world problems for decision-making such as weather forecast, crop production, stock markets, and etc. The second, we use more intelligent methods (e.g., particle swarm optimization, ant colony or a neural network) to deal with forecasting problems. That will be the future work of this research.

- **Stock Market Prediction using the ARIMA Model**

In the recent times it has been seen that stock market prediction is becoming an important field of financial forecasting. The people such as stock sellers & buyers, policy makers, the ones who keep interest in investing in the stock market and many others involved in this financial market are attracted to it. The aim of this paper is to come up with an efficient & effective model for stock market prediction. Over the years it is observed that **stock market data is nonlinear, chaotic & dynamic**. This paper is going to present a predictive model for prices of the stocks with the help of ARIMA model. The stock data which is published from the Bombay Stock Exchange (BSE) & National Stock Exchange (NSE) has been used with the model developed for the prediction of stock price. From the results which are obtained, we come to the conclusion that for short-term prediction the ARIMA model has a great potential & also it shows competence with the already present methods for stock price prediction

It's necessary to decide on the suitable ANN model considering the matter target. Varied applied math techniques could also be accustomed preprocess the information for improving performance. There are many challenges associated with accuracy of expected information; however using ARIMA model the prediction for six to eight months can be done.

In future work, Choose the best case for smooth run of the prediction system, extend the prediction time from six to eight to much more

- **Multivariate Markov Chain**

Since 1993 researchers proposed many methods for forecasting enrollments, Temperature prediction, stock price etc in time variant and time invariant first order, higher order, two factor and dual variables. In this paper, we propose a model to temperature prediction from correlated categorical data sequence obtained from similar source. We study a multivariate Markov chain

model for categorical data sequences to fuzzy time series. The proposed method gets higher average forecasting accuracy rate than some of the existing methods on temperature prediction.

From the experimental results the proposed method provides the smallest AFER and improves on other methods using fuzzy times series forecasting methods. We may obtain further accuracy by applying higher order multivariate Markov chain model on categorical data sequences.

- **Time Series Data Analysis for Stock Market Prediction using Data Mining Techniques with R**

In the last few years, machine learning has become a very popular tool for analyzing financial text data, with many promising results in stock price forecasting from financial news, a development with implications for the Ecient Markets Hypothesis (EMH) that underpins much economic theory. In this work, we explore recurrent neural networks with character-level language model pre-training for both intraday and interday stock market forecasting. In terms of predicting directional changes in the Standard & Poor's 500 index, both for individual companies and the overall index, we show that this technique is competitive with other state-of-the-art approaches.

***** This paper presented the use of a simple LSTM neural network with character level embeddings for stock market forecasting using only financial news as predictors

* Character embeddings models are simpler and more memory ecient than word embeddings and are also able to keep sub-word information

In the future we consider testing the use of character embeddings with more complex architectures and possibly the addition of other sources of information to create richer feature sets.

- # Forecasting Enrollment Model Based on First-Order Fuzzy Time Series

This paper proposes a novel improvement of forecasting approach based on using time-invariant fuzzy time series. In contrast to traditional forecasting methods, fuzzy time series can be also applied to problems, in which historical data are linguistic values. It is shown that proposed time-invariant method improves the performance of forecasting process. Further, the effect of using different number of fuzzy sets is tested as well. As with the most of cited papers, historical enrollment of the University of Alabama is used in this study to illustrate the forecasting process. Subsequently, the performance of the proposed method is compared with existing fuzzy time series time-invariant models based on forecasting accuracy. It reveals a certain performance superiority of the proposed method over methods described in the literature.

In this paper, we presented a novel time-invariant fuzzy time series method for forecasting university enrollments. To illustrate the forecasting process, historical data of the University of Alabama were used as they are summarized .The advantage of the proposed modification lies in utilization of automated forecasting method that operates on sorely available historical data (variations). To study the performance of the method, which

significantly improves forecasting accuracy as against other papers, we conducted experiments with different number of linguistic terms (2 7 r information span of immediate human memory). As appears from Table VII, the method described turns down average forecasting error below 3% for all cases examined.

- **Fuzzy dual-factor time-series for stock index forecasting**

There is an old Wall Street adage goes, ‘‘It takes volume to make price move”. The contemporaneous relation between trading volume and stock returns has been studied since stock markets were first opened. Recent researchers such as Wang and Chin [Wang, C. Y., & Chin S. T. (2004). Profitability of return and volume-based investment strategies in China’s stock market. Pacific-Basin Finace Journal, 12, 541–564], Hodgson et al. [Hodgson, A., Masih, A. M. M., & Masih, R. (2006). Futures trading volume as a determinant of prices in different momentum phases. International Review of Financial Analysis, 15, 68–85], and Ting [Ting, J. J. L. (2003). Causalities of the Taiwan stock market. Physica A, 324, 285–295] have found the correlation between stock volume and price in stock markets. To verify this saying, in this paper, we propose a dual-factor modified fuzzy time-series model, which take stock index and trading volume as forecasting factors to predict stock index. In empirical analysis, we employ the TAIEX (Taiwan stock exchange capitalization weighted stock index) and NASDAQ (National Association of Securities Dealers Automated Quotations) as experimental datasets and two multiplefactor models, Chen’s [Chen, S. M. (2000). Temperature prediction using fuzzy time-series. IEEE Transactions on Cybernetics, 30 (2), 263–275] and Huarng and Yu’s [Huarng, K. H., & Yu, H. K. (2005). A type 2 fuzzy time-series model for stock index forecasting. Physica A, 353, 445–462], as comparison models. The experimental results indicate that the proposed model outperforms the listing models and the employed factors, stock index and the volume technical indicator, VR(t), are effective in stock index forecasting.

To verify the improvement of the proposed model in the initial experiment, a longer period of another financial dataset is used as the second experimental dataset. An eleven-year period of NASDAQ, from 1996/1/4 to 2006/12/ 31, is selected and a one-year moving-window testing approach is used to go through the whole dataset (the ratio of training to testing is 2:1 (year)). With the reduplicated algorithms of the comparison models, we produce a comparison table which is listed in Table 3. It is obvious that From the experimental results, Tables 1–3, it is apparent that the proposed model performs better than the listing fuzzy time-series models employing multiple subjective factors. Based on this clear evidence, we conclude the research goal has been reached

- **A SEASONAL FUZZY TIME SERIES FORECASTING METHOD BASED ON GUSTAFSON-KESSEL FUZZY CLUSTERING**

Fuzzy time series forecasting methods do not require constraints found in conventional approaches. In addition, due to uncertainty that they contain, many time series to be forecasted should be considered as fuzzy time series. Fuzzy time series forecasting models consist of three steps as fuzzification, identification of fuzzy relations and defuzzification. Although most of the time series encountered in real life contain seasonal component, only few of these fuzzy time series approaches analyze seasonal fuzzy time series. Even though all these studies have various advantages, their biggest disadvantage is to take into consideration only the fuzzy set having the highest membership value rather than the membership value of observations belonging to each fuzzy set. This situation conflicts to fuzzy set theory and causes the loss of information thus, negatively affects on the forecasting performance. In this study, a seasonal fuzzy time series forecasting model, in which Gustafson-Kessel fuzzy clustering technique in fuzzification stage is initially used and membership values are taken into account in both the determining fuzzy relations and the defuzzification stages is proposed. The proposed method is applied to real life seasonal time series and substantial results are obtained.

In future studies, different clustering techniques can be implemented in fuzzification step and different types ANN structures that may provide more effective gains in the determination of fuzzy relations can be attempted.

- **Soft Computing Stock Market Price Prediction for the Nigerian Stock Exchange**

Forecasting the price movements in stock market has been a major challenge for common investors, businesses, brokers and speculators because Stock Prices are considered to be very dynamic and susceptible to quick changes. As more and more money is being invested, the investor get anxious of the future trends of the stock prices in the market and thus, creating a high desirable need for a more' intelligent' prediction model. Two soft computing models-Artificial Neural Network (ANN) and Fuzzy Neuro hybrid model were used to forecast the next day's closing price. The historical trading data was obtained from the Nigerian Stock Exchange for Dangote Sugar Refinery Plc . The results showed the power of Soft Computing techniques (SC) in stock Price Prediction.

ANN showed better prediction than Fuzzy Neuro model, here the main proposed method is ANN, but if neuro model was used then it could be very much better.

- **A Predictive Stock Market Technical Analysis Using Fuzzy Logic**

Decision making process in stock trading is a complex one. There are numbers of technical indicators that are used by traders to study trends of the market and make buying and selling decisions based on their observations. This research seeks to deploy fuzzy inference to stock market, with four indicators used in technical analysis to aid in the decision making process in order to deal with probability. The four technical indicators are the Moving Average Convergence/Divergence (MACD), Relative Strength Index (RSI), Stochastic Oscillator (SO) and On-Balance Volume (OBV). The fuzzy rules are a combination of the trading rules for

each of the indicators used as the input variables of the fuzzy system and for all the four technical indicators used, the membership functions were also defined. The result is a recommendation to buy, sell or hold. Data were collected for two Nigerian banks for testing and evaluation of the system. The technical indicators were then computed for each data and from the computed technical indicators; experiment was carried out for two months. The system generated satisfactory recommendation as when to buy, sell or hold, when the output is compared with actual data collected from the Nigerian Stock Exchange. The system can therefore act as an effective model for traders in the stock market when there is a combination of the recommendation with the individual's trading skills

The system mimics the behaviour of technical traders in interpreting technical indicators. By combining four different technical indicators as inputs, a more reliable system is built. The system involved mapping the technical indicators as inputs which are "fuzzified", creating membership functions to associate inputs and outputs via fuzzy rules and translating the fuzzy output into crisp

- **Stock Market Prediction Using Machine Learning**

In the finance world stock trading is one of the most important activities. Stock market prediction is an act of trying to determine the future value of a stock other financial instrument traded on a financial exchange. This paper explains the prediction of a stock using Machine Learning. The technical and fundamental or the time series analysis is used by the most of the stockbrokers while making the stock predictions. **The programming language is used to predict the stock market using machine learning is Python**. In this paper we propose a Machine Learning (ML) approach that will be trained from the available stocks data and gain intelligence and then uses the acquired knowledge for an accurate prediction. **In this context this study uses a machine learning technique called Support Vector Machine (SVM)** to predict stock prices for the large and small capitalizations and in the three different markets, employing prices with both daily and up-to-the-minute frequencies.

SVM algorithm works on the large dataset value which is collected from different global financial market ,it will not work for small data set values. Also, SVM does not give a problem of over fitting. Numerical results suggest the high efficiency

- **Stock market prediction using Multi Expression Programming**

The use of intelligent systems for stock market predictions has been widely established. In this paper **we introduce a genetic programming technique (called Multi-Expression programming) for the prediction of two stock indices**. The performance is then compared with an artificial neural network trained using Levenberg-Marquardt algorithm, support vector machine, Takagi-Sugeno neuro-fuzzy model, a diff erence boosting neural network. We considered Nasdaq-100 index of Nasdaq Stock MarketSM and the S&P CNX NIFTY stock index as test data.

The fluctuations in the share market are chaotic in the sense that they heavily depend on the values of their immediate forerunning fluctuations. It is difficult for one of the intelligent paradigms to perform well for diff erent stock indices.

- **Fuzzy Time Series Forecasting of Low Dimensional Numerical Data**

Various classical techniques such as **linear regression, nearest neighbor** have been used in developing predictive models in the past. But the methodologies developed using fuzzy time series includes a wide array of work that requires special attention. The time series analysis has been of great importance to engineering and economy problems. In this paper, we present a brief summary of the various infamous methodologies available in the literature for forecasting of numerical data using fuzzy time series that includes stock prediction, temperature prediction, foreign exchange daily price estimate, crop production, educational enrollments forecasting, inventory demand and also a brief mention of the limitations of fuzzy time series.

In time series analysis, event characterization function is employed that correlates the occurrence of a future event with the occurrence of some event in the past. The variation of temporal patterns with effect to the noise also degrades the stability. The approach that can be put to use before determining the event characterization function is to select the appropriate function that can model the behaviour of a non-linear real world problem in a more specific manner.

COLLECTED DATA

Dow Jones - DJIA - 100 Year Historical Chart

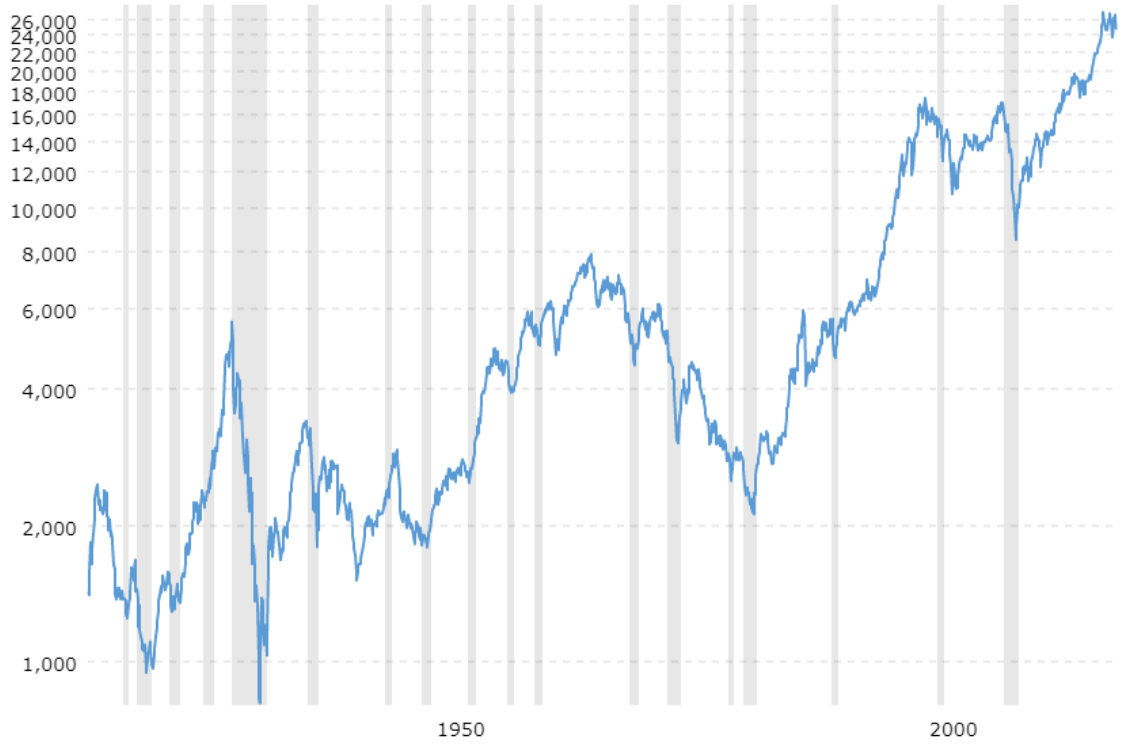

Fig.1 – HISTORICAL CHART FROM 1900 TO 2000

Fig.2 – HISTORICAL CHART FROM 1970 TO 2010

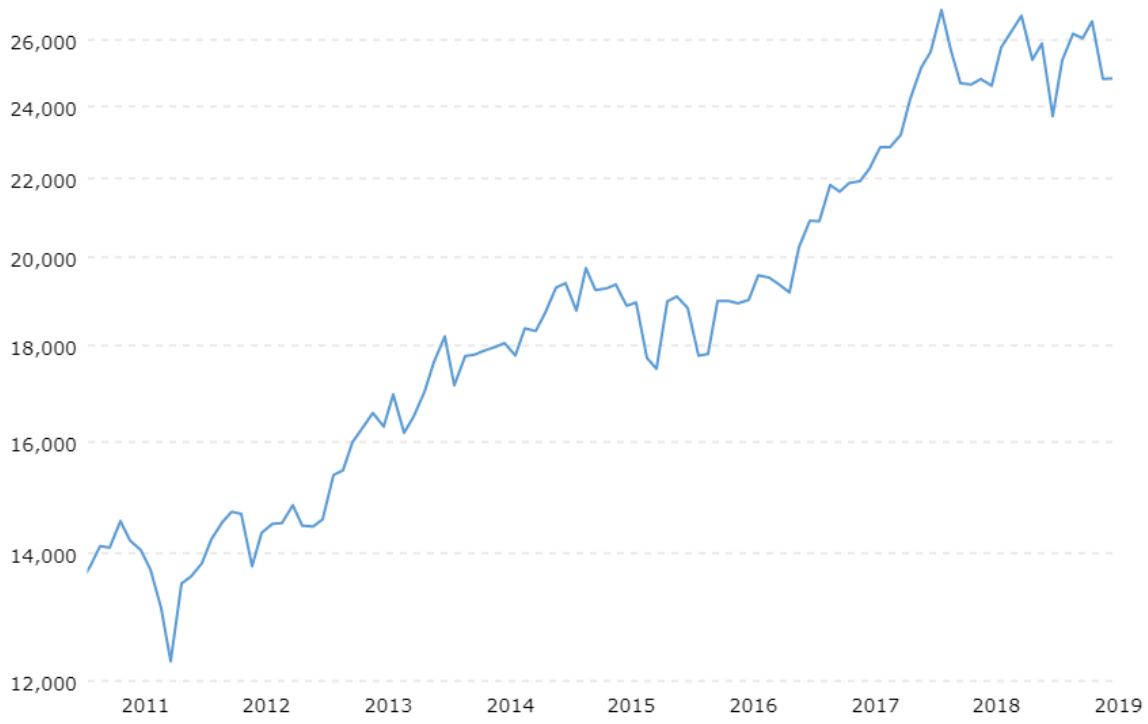

Fig.3 – HISTORICAL CHART FROM 2011 TO 2019

	row.names	INFY.Open	INFY.High	INFY.Low	INFY.Close	INFY.Volume
1	2007-01-03	27.76	28.14	27.37	27.91	6122400
2	2007-01-04	27.80	27.90	27.42	27.70	3664000
3	2007-01-05	27.52	27.75	27.32	27.57	2944200
4	2007-01-08	27.30	27.72	27.20	27.50	3155000
5	2007-01-09	27.50	27.50	27.00	27.30	4014800
6	2007-01-10	27.26	27.30	26.70	27.12	4642800
7	2007-01-11	27.34	28.32	27.31	28.11	7734600
8	2007-01-12	28.32	29.12	28.28	29.03	6994800
9	2007-01-16	28.88	28.94	28.52	28.66	3122000
10	2007-01-17	28.78	28.88	28.68	28.70	3342600
11	2007-01-18	28.68	28.75	27.88	28.03	2697000
12	2007-01-19	27.82	28.22	27.65	28.06	1875600
13	2007-01-22	28.28	28.54	28.00	28.37	3017400
14	2007-01-23	28.24	28.98	28.10	28.80	3511000
15	2007-01-24	28.75	29.36	28.40	29.16	3521200
16	2007-01-25	29.18	29.25	28.28	28.40	2403000
17	2007-01-26	28.46	28.68	28.14	28.50	1529600
18	2007-01-29	28.78	28.90	28.38	28.66	1733200
19	2007-01-30	28.67	28.85	28.52	28.78	1521200
20	2007-01-31	28.75	29.11	28.66	29.00	2537400
21	2007-02-01	29.28	29.50	29.12	29.36	2704800
22	2007-02-02	29.25	29.51	29.01	29.47	2993800
23	2007-02-05	29.58	29.58	29.16	29.50	3618600
24	2007-02-06	29.60	29.60	29.16	29.39	1532400

Fig.4 - Intra-day INFY data from Google finance - 2007 to 2015

Fig. 5 - Chart series graph for INFY data - 2007 to 2015

Fig.6 - Line chart graph for INFY data – 2014 to 2015

Fig. 7 - Re-chart graph for INFY Data - First 16 Weeks of 2007

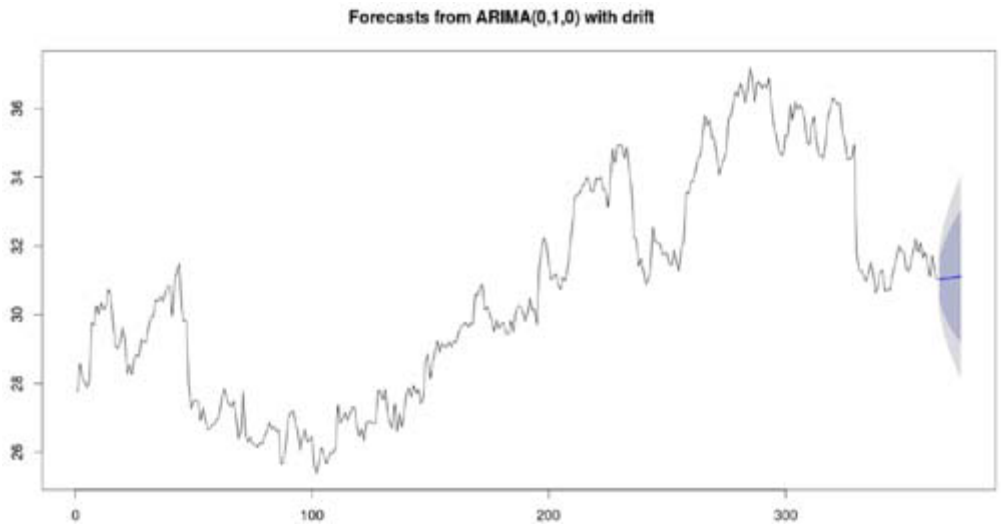

Fig. 8 - Forecasted INFY Trends – Line chart graph 2014 to 2015

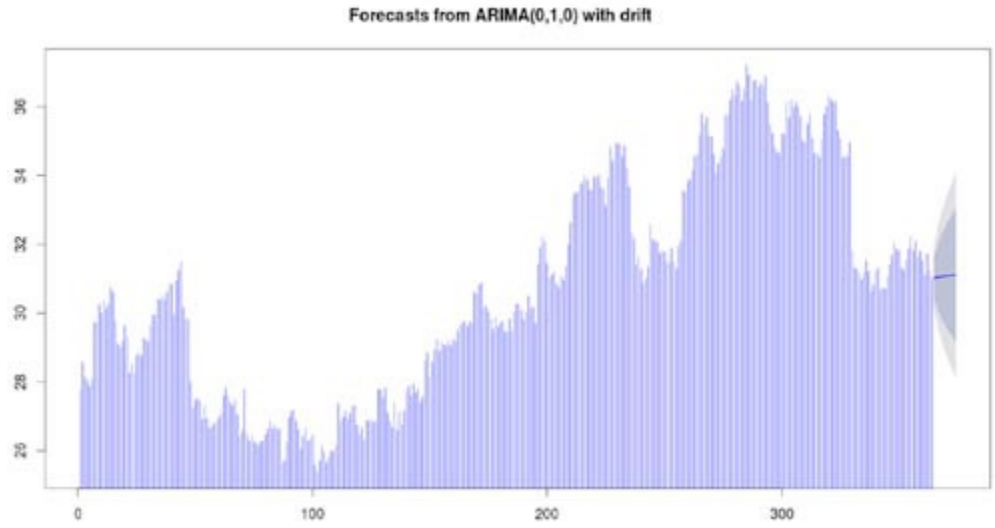

Fig. 9 - Forecasted INFY Trends – Histogram graph 2014 to 2015

CONCLUSION

In this paper we have studied different methodologies for Stock Market Prediction which will help the investor for making the correct decision for buy or sell the stocks. Each method is having some limitation and some disadvantage. The limitations can be overcome by selecting suitable prediction techniques for specific domains. In future one can combine the two method and get proper result and output. We made an attempt to evaluate different methods of forecasting the stock market trends by which any invester can find the best method by which they can predict the stock market much more accurately then previously done methods. Based on the technical analysis using historical time series stock market data data mining techniques. The experimental results obtained demonstrated the potential of ARIMA model to predict the stock price indices on short-term basis. This could guide the investors in the stock market to make profitable investment decisions whether to buy/sell/hold a share. With the results obtained ARIMA model can compete reasonably well with emerging forecasting techniques in short-term prediction. Here we examined and applied multilayer perceptron model by using the Neural Networks Predict tool. The results from analysis shows that Neural Networks Predict offer the ability to predict the stock prices more accurately than the other existing tools and techniques. The accuracy of the predicted output values that lie within 20% of their corresponding target output value. By using this tool one can have the ability to forecast the stock price of NSE more accurately. This analysis can be used to reduce the error percentage in predicting the future stock prices. It increases the chances for the investors to predict the prices more accurately by reducing the error percentage and hence increase their profit in share markets. Utilizing neural network models together with other forecasting tools and techniques can be considered yet another valuable advancement in the age of technology.

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