A Survey on Stock Market Prediction Techniques

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Abstract: *Different techniques are available for the prediction of stock market. Very popular some of these are Neural Network, Data Mining, Hidden Markov Model(HMM) And Neuro-Fuzzy system. From these Neural Network and Neuro-Fuzzy Systems are the most leading machine learning techniques in stock market index prediction area. Other traditional methods do not cover all possible relation of stock price movements. Neural Network and Markov Model can be used exclusively in the financial markets and forecasting of stock price. Neural Networks discovers the non linear relationship in the input data set without knowing the relation between input and output. For the sample data which contain noisy information with least principle ANN can generalize and correctly infer the unseen part of data. Hence ANN suits well than any other models in the prediction of stock markets.*

Keywords: Artificial Neural Network(ANN), Data Mining, Hidden Markov Model(HMM), Neuro-Fuzzy system

1. Introduction

In general the prediction is to know about the future. So, for the investment of equity or money the prediction of stock market is very important. The similar terms for prediction markets are decision markets, future idea, virtual markets, informative markets and predictive markets. We know that the market is changing, ahead, difficult to predict and disorganize in nature. Hence by using normal analytical methods the prediction of stock is difficult like time series analysis. For beginning conditions confusing systems are sensitive. So the relatively neural networks are effective to deal with such a non-linear system [1].

Financial market every time undergoes to changing behaviour. The area of selection for investors to development of powerful trading facilities and communication has enlarged. Due to this traditional capital market theory has also changed and methods of financial analysis have greatly improved. From many years researchers trying to predict stock return or stock index which is an important financial subject. From this one assumptions is made that the fundamental information such as high price, low price, previous close, open price, close price, last price, average price of any equity past values publicly available which is related with future stock indices or returns[3]. Industry specific information like industrial production and growth rate of consumer price, economic variables such as interest rates and exchange rates and divided yields of company is necessary for the prediction of stock. The survey of recent techniques such as Artificial Neural Network Hidden Markov Model, Data Mining and Neuro-Fuzzy system offer useful tools for forecasting noisy environments like stock market. This study aims to provide intelligent techniques to forecast stock market indexes and stock market prices. A stock market index represents movement of comany stock which shows prices of stock going up or down. For forecasting process Firm characteristics are not taken into consideratio.The researchers could trying to develop a model to forecast individual stock prices to overcome this limitation.

A. Stock Market

Organized and regulated financial market where securities such as bonds, notes and shares are bought and sold at price governed by the forces of demand and supply. Stock Market basically serves as.

1) Primary market where corporations, governments, municipolities and other incorporated bodies can raise capital by channeling saving of the investors into productive venture.
2) Secondary market where investors can sell their securities to other investors for cash, thus reducing the risk of investment and maintaining liquidity in the system.

The Indian stock market is worlds third largest stock market on the basis of investors base and has collection pool of about 20 million investors. Stock is basically a share in the ownership of a company. Stocks are partial ownership of businesses instead of stock tickers piece of paper, which can be traded in stock market. If company ownership is divides in 100 parts and we are the investor purchase one part which is equal to one share then we own one percent of that company. Stock exchange uses a trading system which is order driven automated matching system. Stock prices are defined on the basis of at any time how many buyers and sellers available for same stock in the market. If no. of buyers are more than sellers then stock price becomes high and if no. of sellers higher than buyers then stock price becomes low. If order does not find the match then it remains in the system and waiting for the fresh orders or updation of the previous orders which are already present.

The buy order and sell order are actually categorized in to best buy order and best sell order. These best buy and sell order looked in to counter party angle. The best buy order is which is highest price and best sell order is which is lowest price. Logic behind this is the best buy order with highest price meaning the seller counterparty will like to sell it in highest possible price thats why it is highest price. And best sell order with lowest price meaning the counterparty buyer Will buy that with lowest security price. With this logic system will match the orders and executes in to the traders system. Stock market is

regulated by SEBI (Security and Exchange Board of India). In stock markets customers requirements and preferences are different. Due to this market is divided in to different parts called market segmentation. From this segmentation we have to choose best segment and apply our different strategies for profit. At the beginning of October 2008 the size of world stock market was estimated at about $36.6 trillion. The total world derivatives market has been estimated at about $791 trillion face or nominal value, 11 times the size of the entire worlds economy[2].

2. Literature Survey

For stock market prediction K. Senthamarai Kannan, P. Sailapathi Sekar, M.Mohamed Sathik and P. Arumugam [5] used diffrent data mining techniques. In the data mining the main thing is historic data that holds the essential memory for predicting the future direction. From the historic stock market data investors discovers the hidden pattern of the data that have predictive capability in the investment decisions. using data mining technology. In financial time series prediction the prediction of stock market is regarded as challenging task. We can estimate future stock price increase or decrease by the data analysis. Data analysis is also one way of prediction. Five methods of analyzing stocks were combined to predict. Typical Price (TP), Relative Strength Index (RSI), Bollinger Bands, Moving Average (MA) and CMI are the proposed five methods. Combing these methods would be useful for predicting days closing price would increase or decrease.

Phichhang Ou and Hengshan Wang [6] applied ten different data mining techniques to predict price movement of Hang Seng index of Hong Kong stock market. Quadratic discriminant analysis (QDA), Linear discriminant analysis (LDA), NaveBayes based on kernal estimation, K-nearest neighbour classification, neural network, Tree based classification, Support vector machine (SVM), Bayesian classification with Gaussian process, Logic model and Least squares support vector machine (LS-SVM) are these ten methods. Among all these methods LS-SVM and SVM generate superior predictive performance. Mostly, SVM is better as compared to LS-SVM for in sample prediction. But in term of hit rate and error rate criteria LS-SVM is in turn better than SVM for out sample forecast.

Aditya Gupta and Bhuvan Dhingra[7] used Hidden Markov Model(HMM's) for the predicting the stock market. By using historical stock prices they present he Maximum a Posteriori HMM approach for forecasting stock values for the next day. For training the continuous HMM they consider the intra day high and low values of the stock and fractional change in stock values. Over all the possible stock values for the next day this HMM is used to make a maximum posteriori decisions. By using some of the existing methods like HMMs and Artificial Neural Networks using Mean Absolute Percentage error (MAPE). They test their approach on several stocks, and compare the performance. Finally they present an HMM based Maximum a Posteriori (MAP) estimator for stock predictions. The model uses a latency of days to predict the stock value for the $(d + 1)$st day. Using a previously trained continuous HMM MAP decision is made over all the possible values of stock. They

assume four underlying hidden states which emit the visible observations (fractional change, fractional high, fractional low). George S. Atsalakis and Kimon P. Valavanis[8] predicts the stock market in short term trends using a neuro-fuzzy based methodology. Basically neuro-fuzzy system composed of an Adaptive Neuro Fuzzy Inference System (ANFIS) controller which is used to control the stock market process model. Also variety of stocks is derived and evaluated by using an adaptive neuro-fuzzy technique. Obtained results challenge the weak form of the Efficient Market Hypothesis (EMH) by demonstrating much improved and better predictions, compared to other approaches, of shortterm stock market trends, and in particular the next days trend of chosen stocks. The ANFIS controller and the stock marke process model inputs are chosen based on a comparative study of fifteen different combinations of past stock prices performed to determine the stock market process model inputs that return the best stock trend prediction for the next day in terms of the minimum Root Mean Square Error (RMSE). Gaussian 2 shaped membership functions are chosen over bell shaped Gaussian and triangular ones to fuzzify the system inputs due to the lowest RMSE. Real case studies using data from emerging and well developed stock markets the Athens and the New York Stock Exchange (NYSE) to train and evaluate the proposed system illustrate that compared to the buy and hold strategy and several other reported methods, the proposed approach and the forecasting trade accuracy are by far superior.

Binoy B. Nair, N.Mohana Dharini and V.P. Mohandas [9] they proposed hybrid decision tree-neuro-fuzzy system for prediction of stock market. Automated stock market trend prediction system is proposed by using decision tree adaptive neuro-fuzzy hybrid system. They used diffrent techniques like technical analysis and decision tree. First technical analysis which is generally used by stock traders for feature extraction and second decision tree for feature selection. By using technical analysis and decision tree which is used for the reduced dataset is then applied to the adaptive neuro- fuzzy system for next day stock prediction. The tested their proposed system on four major international stock market. Their experimental results shows the proposed hybrid system produces much higher accuracy when compared to stand- alone decision tree based system and ANFIS based system without feature selection and dimensionality reduction. They propose above neuro-fuzzy system shown in fig1.

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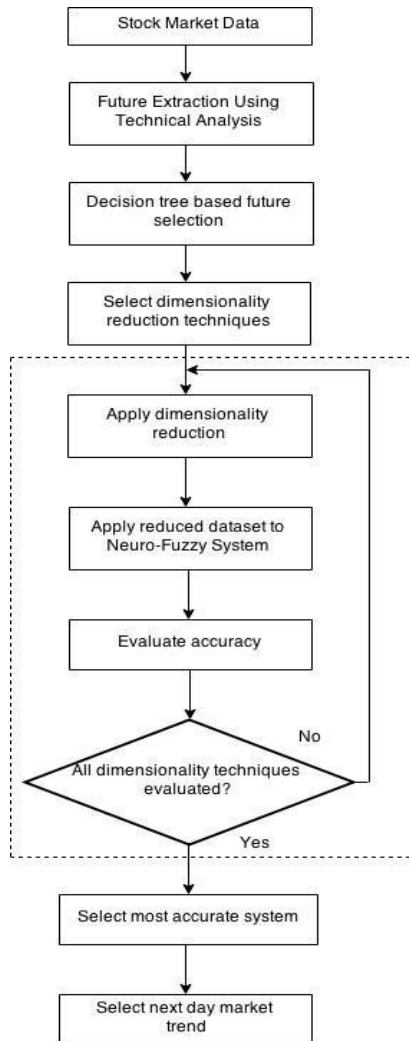
Figure 1: Block Diagram of Proposed Neuro-Fuzzy System

A. Victor Devadoss, T. Antony Alphonnse Ligori[10] proposed stock prediction using Artificial Neural Networks. By using ANN they trying to predict the closing prices Bombay Stock Exchange (BSE). In ANN network developed by them consist of an input layer for input of values for operation, one hidden layer for performing operation and an output layer for desired output. Each neuron in neural network take input as diffrent stock values as input for the processing. Neuron takes input like previous close, open price, high price, last price, close price, average price, low price, etc. For performance of networks Mean Absolute Deviation, Mean Absolute Percentage Error and Root Mean Square Error are used as indicators. ANN can able to discover nonlinear relationship in the data without a priori assumption of knowledge of relation between the input and the output For that reason ANN suits well than any other models in predicting stock prices. ANN contains the following features which make them valuable and attractive for a forecasting task.

1) In ANN traditional model based methods are eliminated and method of learn from example or historical data are used for prediction. It captures subtle functional relationships among the data even if the underlying relationships are unknown or hard to describe. Neural network model is trained in such a way that it learn from

experience and provides a practical feasible way to solve real world problems.
2) ANN has the ability to generalize and correctly infer the unseen part of the data even if the sample data contain noisy information with least principle.
3) For desired accuracy outputs ANN provides continuous function and also the ANN are universal functional approximators.
4) ANN gives the desired accuracy outputs with nonlinear data and the real world system are often nonlinear. Hence the ANN are nonlinear and existing nonlinear models are limited in exploiting the explicit relationship for the data series with the little knowledge of underlying law.

Due to this ANNs are a more general and flexible modeling tool for forecasting

Md. Rafiul Hassan , Baikunth Nath and Michael Kirley [11] propose and implement a fusion model by combining the Fig.2. Block diagram of fusion model Hidden Markov Model (HMM), Artificial Neural Networks (ANN) and Genetic Algorithms (GA) to forecast financial market prediction. In the proposed fusion model, an ANN is employed as a black- box to introduce noise to the observation sequences so that they may be better fitted with the HMM. The GA then is used to find out the optimal initial parameters for the HMM given the transformed observation sequences. By using this fusion model there are lot of option to find number of alternative data items from historical data. That data item is responsible for the stock market behaviour to that of current day. Then a weighted average of the price differences for the identified data items is calculated. This weighted average is added to the current day price. The value obtained is the forecast value of one day. This model consist of two phases
1) Optimisation of HMM in HiMMI
2) Using weighted average obtaine the forecast
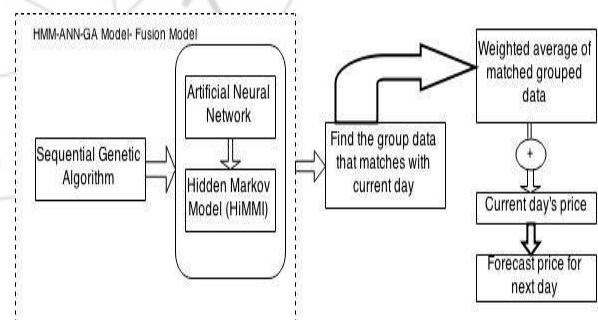
Figure 2: Block Diagram Of Fusion Model

3. Conclusion

This paper surveyed the different techniques for stock market prediction such as Neuro-Fuzzy system, Data mining, Neural Network and Markov Model . We also studied fusion model by combining the Hidden Markov Model (HMM), Artificial Neural Networks (ANN) and Genetic Algorithms (GA) to forecast financial market prediction. The NN and Markov model has ability to extract useful information from the data set so it is widely play very important role in stock market prediction. These approaches are used to control and monitor the entire the stock market

price behaviour and fluctuation. ANN has the ability to generalize and correctly infer the unseen part of the data even if the sample data contain noisy information with least principle. Neural Networks captures subtle functional relationships among the data even if the underlying relationships are unknown or hard to describe. Neural network model is trained in such a way that it learn from experience and provides a practical feasible way to solve real world problems. Hence more stock traders use ANNs for predicting of stock prices.

4. Acknowledgement

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