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Estimize Bull speed using Back propagation

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Abstract: *Now knowledge pre-processing, model and reasoning issues, power metrics, quality issues, post-processing of discovered structures, visualization, and on-line change is best challenge. In this paper Neural Network based forecasting of stock prices of selected sectors under Bombay Stock Exchange show that neural networks have the power to predict prices albeit the volatility in the markets[9]. The motivation for the development of neural network technology stemmed from the desire to develop an artificial system that could perform "intelligent" tasks similar to those performed by the human brain. Artificial Neural Networks are being counted as the wave of the future in computing. They are indeed self-learning mechanisms which don't require the traditional skills of a programmer. Back propagation is one of the approaches to implement concept of neural networks. Back propagation is a form of supervised learning for multi-layer nets. Error data at the output layer is back propagated to earlier ones, allowing incoming weights to these layers to be updated. It is most often used as training algorithm in current neural network applications. In this paper, we apply data mining technology to stock market in order to research the trend of price; it aims to predict the future trend of the stock market and the fluctuation of price. This paper points out the shortage that exists in current traditional statistical analysis in the stock, then makes use of BP neural network algorithm to predict the stock market by establishing a three-tier structure of the neural network, namely input layer, hidden layer and output layer. Finally, we get a better predictive model to improve forecast accuracy.*

Keywords: *Artificial Neural Network, Back propagation, Data mining*

I. Introduction

In recent years, monetary markets became additional reticular. The elemental factors have become additional essential for the analysis of monetary market. The analysis in recent past shows that the nonlinear domain with computing technologies may be sculptured additional exactly compared to single market and linear applied math strategies that are the mainstay for technical analysis for past decade.

Prediction of stock price level movement is thought to be a difficult task of monetary statistic prediction.

Associate degree correct prediction of stock worth movement might yield profits for investors. As a result of the quality of exchange information, development of Economical models for predicting is incredibly troublesome. Statistical strategies and neural networks are usually used for statistic prediction. Since stock markets are complicated, nonlinear, dynamic and chaotic.

Neural networks among varied computing tools are more and more accustomed the monetary prognostication as neural nets are found to be technologically versatile and powerful, ideally suited to perform monetary market research. Many studies have shown that artificial neural networks have the capability to be told the underlying mechanics of stock markets. In fact, artificial neural networks are wide used for prognostication monetary markets.

Artificial neural network is a mathematical model. It has capability to machine learning and pattern matching. Neuron is basic unit of nervous system such as brain. ANN is borrowed from central nervous system. It is inspired by biological technology. Biological neuron stores knowledge in memory bank, while in an artificial neuron the data or information is distributed through the network and stored in the form of weighted interconnection.

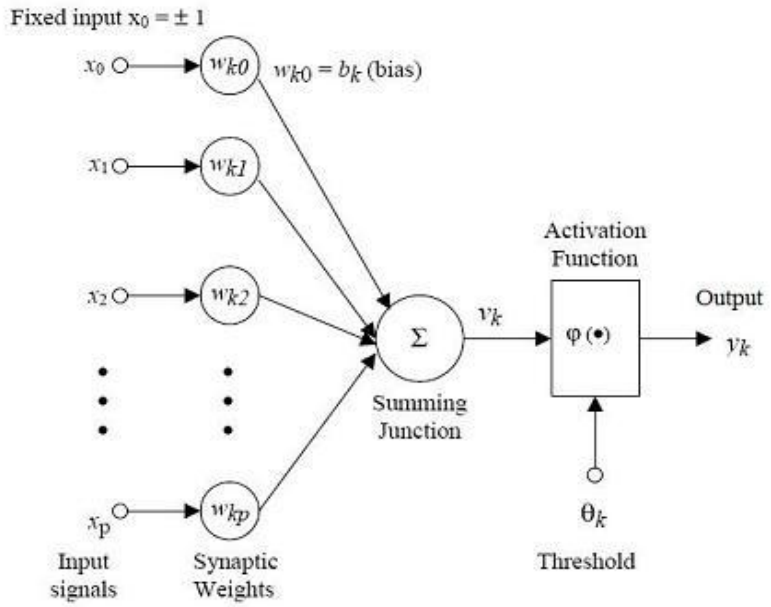


Figure 1: Graphical representation of artificial neurons

II. Literature Review

A share market could be a place of high interest to the investors because it presents them with a chance to learn financially by finance their resources on shares and derivatives of varied firms. it's a chaos system; that means the activity traits of share costs area unit unpredictable and unsure. to create some style of sense of this chaotic behavior, researchers were forced to search out a way which may estimate the result of this uncertainty to the flow of share costs. From the analyses of varied applied math models, Artificial Neural Networks area unit analogous to non-parametric, nonlinear, regression models.

So, Artificial Neural Networks (ANN) actually has the potential to tell apart unknown and hidden patterns in information which may be terribly effective for share market prediction. If successful, will this will this could this may} be useful for investors and finances which can completely contribute to the economy. There are unit totally different strategies that are applied so as to predict Share Market returns.

The securities market reflects the fluctuation of the economy, and receives 10 million investors' attention since its initial development. The securities market is characterized by bad, high-yield, thus investors are involved concerning the analysis of the securities market and making an attempt to forecast the trend of the securities market. However, securities market is wedged by the politics, economy and plenty of different factors, let alone the quality of its internal law, like value (stock index) changes within the non-linear, and shares knowledge with high noise characteristics, so the normal mathematical

Applied mathematics techniques to forecast the securities market has not yielded satisfactory results. Neural networks will approximate any advanced non-linear relations and has hardiness and fault-tolerant options. Therefore, it's terribly appropriate for the analysis of stock knowledge. In dozens of neural network models that were suggests, researchers usually use the hop garden network. hop garden network is that the commonest feedback network model, it's one among the models that almost typically studied currently. The hop garden network is that the mono layer recognized by an equivalent vegetative cell, and is additionally a symmetrically connected associative network while not learning operates.

III. Methods Used For Forecasting

Let us enumerate some available forecasting methods in predicting the stock prices.

A. Fundamental analysis

Fundamental analysis is a type of investment analysis adopted by investors for taking investment decisions an the investors who follow this approach are called 'fundamentalists'. They try to estimate the intrinsic worth of a company's share, by studying its sales, earnings, profits, dividends, management proficiency, and a host of other economic factors that have a bearing on the company's profitability and business prospects. The objective is to estimate what the price of a particular company's share out to be and consider this price to be its intrinsic or true value of the share as it reflects the inherent worth and value. With

the help of intrinsic price one can judge whether the shares are currently over-priced or under priced in the stock market. The fundamentalist makes his money by buying under priced shares and later selling them when they become over- priced. Fundamental analysis is more useful for long-term investors.

B. Technical analysis

The technical analysis is characterized by a large number of rules and indicators committed to identify and explain the regularity of historical price dynamics. Technical analysis uses patterns of the price history of a financial instrument in order to provide indications on the future behavior of prices [9]. Technical analysts argue that prices gradually adjust to new information. The Moving Average method (MA) is one of the most used methods of technical analysis. This method involves a comparison of the market prices or index with the long MA. The MA method is easy to use and apply in investment decision-making or empirical tests [10]. The research [11] showed that MA method can generate significant forecast value errors and deviations from real prices and is not successful in price movement trend generation.

Technical analysis is commonly used for taking 'buying' and 'selling' decisions in the stock market. This analysis attempts to predict the future price of a particular share on the basis of a study of its price movements in the past. Technical analysts are also called as 'chartists' as they use charts and graphs for keeping a record of share price movements. They believe that an elaborate study of share price charts and graphs will reveal regular and recurrent patterns of price behavior which are likely to be repeated in the future. Technical variables most frequently cited are shown [12]. They usually ignore all fundamental data like sales, earnings, profits, dividends, business prospects of the company, etc. and believe that these factors have already been taken into account by the market and are fully reflected in the current market price of a share. Technical analysis by the very nature of its approach is suitable for speculators and short-term traders in shares

IV. Proposed Solution

BP network is that the back-propagation network. It's a multi-layer forward network, learning by minimum mean sq. error. It may be employed in the sphere of language integration, identification and adaptation management, etc. BP network is semi supervised learning. Initial of all, artificial neural network has to learn an exact learning criteria, so it will work. Tips for e-learning (Electronic Learning) may be listed as below. If the result yielded by network is wrong, then the network ought to scale back the chance of creating identical mistake next time through learning. This project uses data processing technique to check historical information concerning share market in order that it will predict the desired values a lot of accurately.

Algorithm:-

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

V. Mathematical Model

Error calculation

Calculating Root Mean Square, Let RMS is denoted as Root Mean Square, E is denoted as Error of difference between actual value and predicted value GE means Global Error.

Root mean square error (RMSE)

The Root Mean Square Error (**RMSE**) (also called the root mean square deviation, RMSD) is a frequently used measure of the difference between values predicted by a model and the values actually observed from the environment that is being modelled. These individual differences are also called residuals, and the RMSE serves to aggregate them into a single measure of predictive power. The RMSE of a model prediction with respect to the estimated variable X_{model} is defined as the square root of the mean squared error:

$$RMSE = \sqrt{\frac{\sum_{i=1}^{n} (X_{obsi} - X_{model,i})^2}{n}}$$

where X_{obs} is observed values and X_{model} is modelled values at time/place *i*.

The calculated RMSE values will have units, and RMSE for phosphorus concentrations can for this reason not be directly compared to RMSE values for chlorophyll *a* concentrations etc. However, the RMSE values can be used to distinguish model performance in a calibration period with that of a validation period as well as to compare the individual model performance to that of other predictive models.

Normalized root mean square error (NRMSE)

Non-dimensional forms of the RMSE are useful because often one wants to compare RMSE with different units. There are two approaches: normalize the RMSE to the range of the observed data, or normalize to the mean of the observed data.

1: $$NRMSE = \frac{RMSE}{X_{obs,\max} - X_{obs,\min}}$$

2: $$NRMSE = \frac{RMSE}{\overline{X_{obs}}}$$

(the latter one is also called C_V,RMSE for the resemblance with calculating the coefficient of variance).

Pearson correlation coefficient (r)

Correlation – often measured as a correlation coefficient – indicates the strength and direction of a linear relationship between two variables (for example model output and observed values). A number of different coefficients are used for different situations. The best known is the Pearson product-moment correlation coefficient (also called Pearson correlation coefficient or the sample correlation coefficient), which is obtained by dividing the covariance of the two variables by the product of their standard deviations. If we have a series n observations and n model values, then the Pearson product-moment correlation coefficient can be used to estimate the correlation between model and observations.

$$r = \frac{\sum_{i=1}^{n}(x_i - \overline{x}) \cdot (y_i - \overline{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \overline{x})^2 \cdot \sum_{i=1}^{n}(y_i - \overline{y})^2}}$$ The correlation is +1 in the case of a perfect increasing linear relationship, and -1 in case of a decreasing linear relationship, and the values in between indicates the degree of linear relationship between for example model and observations. A correlation coefficient of 0 means the there is no linear relationship between the variables.

The square of the Pearson correlation coefficient ($\mathbf{r^2}$), known as the coefficient of determination, describes how much of the variance between the two variables is described by the linear fit.

Nash-Sutcliffe coefficient (E)

The Nash-Sutcliffe model efficiency coefficient (E) is commonly used to assess the predictive power of hydrological discharge models. However, it can also be used to quantitatively describe the accuracy of model outputs for other things than discharge (such as nutrient loadings, temperature, concentrations etc.). It is defined as:

$$E = 1 - \frac{\sum_{i=1}^{n}(X_{obs,i} - X_{model})^2}{\sum_{i=1}^{n}(X_{obs,i} - \overline{X_{obs}})^2}$$

where X_{obs} is observed values and X_{model} is modeled values at time/place *i*.

Nash-Sutcliffe efficiencies can range from -∞ to 1. An efficiency of 1 (E = 1) corresponds to a perfect match between model and observations. An efficiency of 0 indicates that the model predictions are as accurate as the mean of the observed data, whereas an efficiency less than zero (-∞ < E < 0) occurs when the observed mean is a better predictor than the model. Essentially, the closer the model efficiency is to 1, the more accurate the model is.

VI. Artificial Neural Networks

An important application of neural networks is pattern recognition. Pattern recognition can be implemented by using a feed-forward neural network that has been trained accordingly. During training, the network is trained to associate outputs with input patterns. When the network is used, it identifies the input pattern and tries to output the associated output pattern. The power of neural networks comes to life when a pattern that has no output associated with it, is given as an input. In this case, the network gives the output that corresponds to a taught input pattern that is least different from the given pattern.

The study of artificial neural networks has been inspired by the biological learning systems [13] which consist of very complex webs of interconnected neurons. ANNs are built out of densely interconnected units (neurons) where each unit takes a number of real-valued inputs which produces a single real-valued output that may in turn be an input to other units. ANNs have the ability to learn and thereby acquire knowledge and make it available for use. ANNs are among the most effective learning methods to learn and interpret complex real-world sensor data [14].We just recall the notion of neural network called the Weighted Multi Expert Neural Network (Wt.M.E.N.N) constructed using the fuzzy neural networks. This Wt.M.E.N.N. Guarantees equal representation of opinion of each expert; hence this method has an advantage over the Fuzzy Neural Networks. Neural Network learning can be either supervised one or an unsupervised one. In a supervised learning algorithm, learning is guided by specifying, for each training input pattern the class to which the pattern is supposed to belong. In an unsupervised one, the network forms its own classification of patterns. The classification is based on commonalties in certain features of input pattern. Since the data is an unsupervised one,we make use of Wt.M.E.N.N. In any supervised learning, a training set of correct input-output pairs is given so as to minimize the error, but in an unsupervised one the output is purely based on the input data. We just recall the definition of Neural Network.

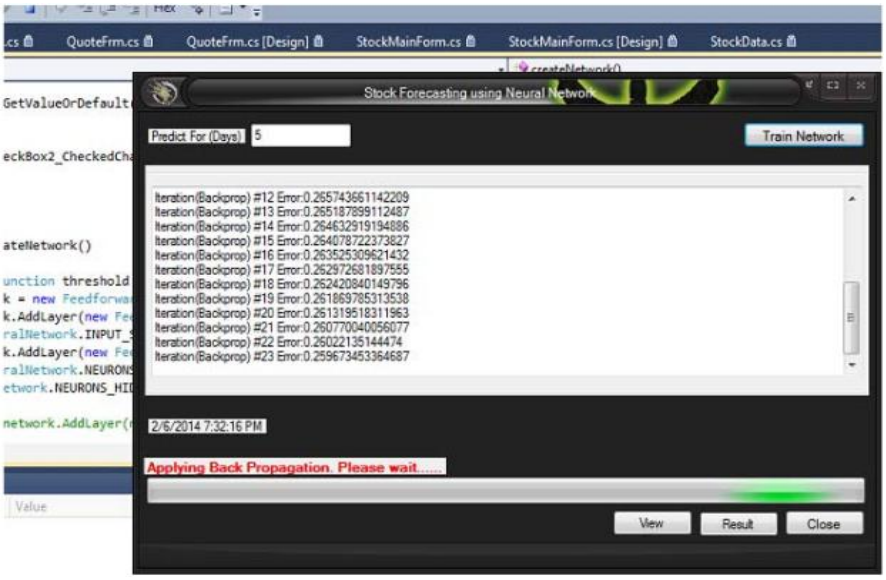
VII. Result

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

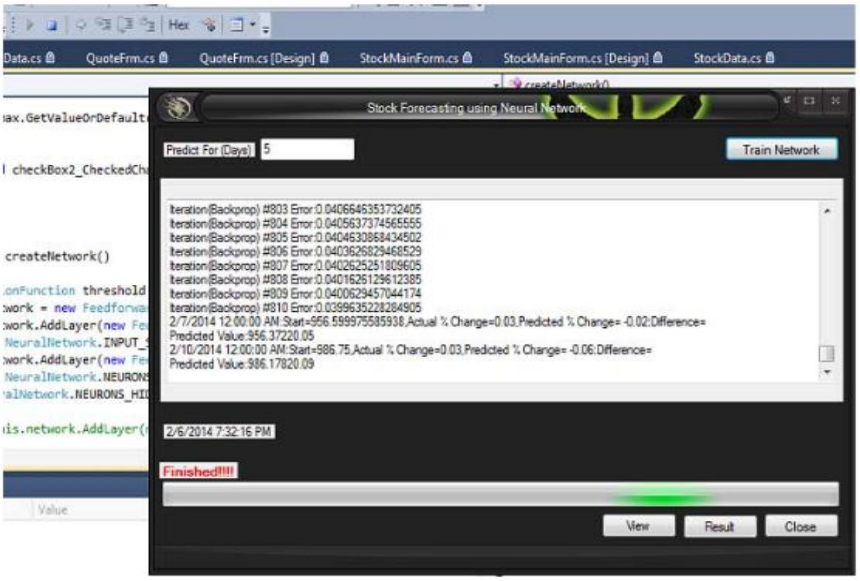
Previous Results:

Date	Forecast				Actual			
	Open	High	Low	Close	Open	High	Low	Close
2012-12-07	1,413.93	1,420.53	1,407.21	1,414.65	1,413.95	1,420.34	1,410.90	1,418.07
2012-12-06	1,409.27	1,417.30	1,402.61	1,410.59	1,409.43	1,413.95	1,405.93	1,413.94
2012-12-05	1,407.05	1,413.65	1,400.23	1,407.67	1,407.05	1,415.56	1,398.23	1,409.28
2012-12-04	1,409.45	1,416.05	1,402.05	1,408.67	1,409.46	1,413.14	1,403.65	1,407.05
2012-12-03	1,416.18	1,422.19	1,408.98	1,415.61	1,416.34	1,423.73	1,408.46	1,409.46

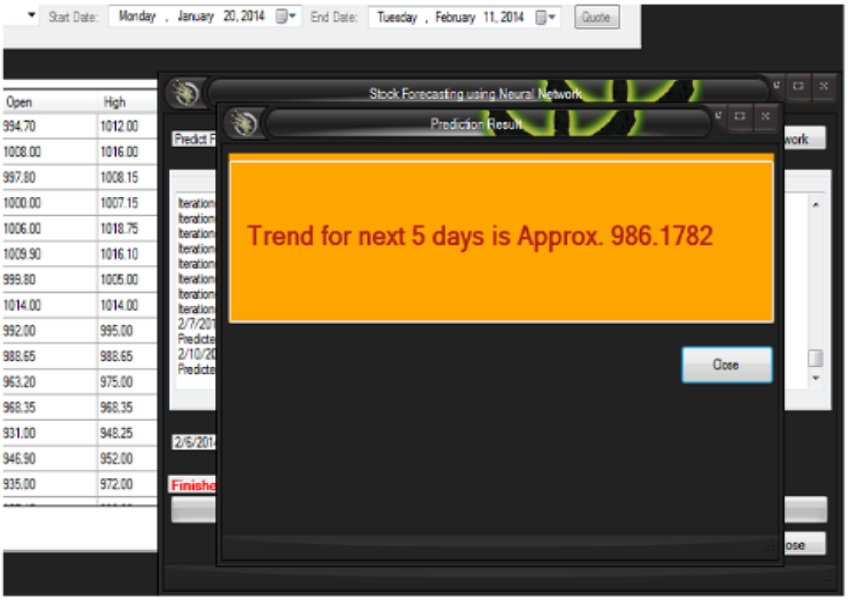
Showing the past stock price



Showing the process of a algorithm



Showing the actual price and predicted price



Showing the actual prediction result of next 5 days

VIII. Conclusion

In this paper, we tried to sum up the application of Artificial Neural Networks (ANN) for predicting stock market. ANN have shown to be an effective, general purpose approach for pattern recognition, classification, clustering and especially time series prediction with a great degree of accuracy. Nevertheless, their performance is not always satisfactory. Back propagation algorithm is the best algorithm to be used in Feed forward neural network because it reduces an error between the actual output and desired output in a gradient descent manner.

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