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EFFICIENT METHOD FOR STOCK MARKET PRICE BY USING ANN MODEL

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Abstract: In the current scenario stock market prediction is an emerging field that in future the stock price will be increased or decreased. Therefore we can predict the stock market variations such that which companies share value in next time will go high or low. The proposed method can determine unseen pattern from the historic data that have likely predictive ability in their investment decisions. The forecast of stock markets is a demanding task of financial time series prediction. Many researchers provided various method of time series forecasting but the neural network is better solution from others. Because it is depends on learn by example. For this forecasting a huge amount of historical data is used better prediction. There are four indicators (Relative Strength Index (RSI), Rate of Change (ROC), Simple Moving Average (SMA), Linear Regression Indicator (LRI)) were combined in this methods for better performance with the neural network back propagation algorithm. When MLP is trained sufficient data and parameters with optimal Architecture .it can forecast better stock price very well. This model helps to predict next day open price of SBI stock price with less error and good accuracy. The performance is considered by minimum mean square error such as MAE, M.S.E, and RMSE.it compares the result with other model. To predict stock market data we are using Neural Networkwith backpropogation. It supports numerically and graphically.

Keywords: Simple Moving average (SMA), Linear Regression Indicator (LRI), Relative Strength Index (RSI), Rate of Change (ROC),NN (Neural Network), Back Propagation (BP).

I. INTRODUCTION

A Share Market can be a place of high interest to the investors because it presents them with a chance to learn financially by finance their recourse on shares and derivatives of different firms. It is a chaos system that means the activity traits of share cots area unit unpredictable and unsure. To create some style of sense of this chaotic behaviour, researchers were enforced to search out way which may estimate the result of this uncertainty to the flow of share costs. From the analysis of dissimilar useful math model, Artificial Neural Network is a small analogous to non- parametric, nonlinear and regression model. So Artificial Neural Network has the potential power to get apart unknown and unseen patterns in information which may be valuable for stock market prediction. If successful, this might be useful for investors and finance which can completely cooperate to the economy. There are a variety of different strategies that are applied so as to predict share market returns. Multi Layer Neural Network:Mirza Cilimkovic[20] "Neural Networks and Back Propagation Algorithm" ANN is able to perform classification and discover new trends or pattern in data. Simple neural network is composed of three layer, input layer, output layer and hidden layer. Each layer has number of processing elements like neurons they take input from input layer. Input layer is connected to hidden layer and hidden layer is connected to output layer. The connection between two layers is called weights. In the neural network information is passed from neurons to other neurons.Each of single information to the network is duplicated and transmits down to the node in hidden layer. Hidden layer receive data from input layer and modified these information using some weights. The output of hidden layer is than send to the output layer but it will also be modified by some weight between hidden and output. The output of hidden layer is processed by output layer and produce actual output by processing activation function. Neural network works on two learning techniques. It may be supervised and unsupervised .In the supervised learning target (teacher) is presented in learning. But in unsupervised learning target output are not present. In the neural network information is passed from neurons to other neurons.

Autoregressive integrated moving average (ARIMA):

Model was proposed by Box-Jenkins for time-series modelling .it is a generalization part of an autoregressive and moving average. This model is mostly used in time series data and fit for good prediction. Arima model predict future point in time series prediction. This can be divided in two parts first is based on non-seasonal and second is based on seasonal.DebadritBanerjee[5] Non – seasonal model is denoted by $ARIMA(p,d,q)$. Where p, d and q are the list of parameters are non-negative. Which are given bellow p indicates order of Autoregressive model and d indicates the degree of differencing and q represent order of the Moving-average of model. Seasonal model is the combination of both non-seasonal and seasonal model is indicated by $ARIMA(p,d,q)(P,D,Q)_m$. Where m represents the number of periods in every season and P,D,Q represents to the autoregressive, differencing, and moving average terms for the seasonal part of the ARIMA model. Seasonality in a time series prediction is an ordinary pattern of changes that repeats over m time periods, where m defines the number of time periods until the pattern repeats again. Due to price variation in stock market such as in monthly data for which high values tend and low values tends occur in particular months in seasonality .[24]In this case, m = 12 (months per year) is the duration of the periodic seasonal behaviour. . In a seasonal ARIMA model, seasonal AR and MA terms predict

xtusing data values and errors at times with lags that are multiples of S (the span of the seasonality).

Forecast Multiplicative ARIMA Model

In this research paper we are using ARIMA (0, 1, 1) model with integrated d seasonality MA (12), is the base model international airline passenger model [23]of time series prediction. For theprediction of stock market price, this model takes the input as historical open price of SBI..... and predicts the next day open price.There are various parameters are estimated for prediction which are given bellow.

ARIMA (0, 1, 1) Model Seasonally Integrated with Seasonal MA (12):

Conditional Probability Distribution: Gaussian

Parameter	Value	Standard Error	t Statistic
Constant	0	Fixed	Fixed
MA {1}	-0.0974981	0.0324621	-3.00344
SMA {12}	-0.915507	0.0163181	-56.1037
Variance	0.00931124	0.000331525	28.0861

The stock index indicator is the financial formula, e.g., Relative Strength Index (RSI), Rate of Change (ROC), Simple Moving Average(SMA), Linear Regression Indicator(LRI) , Traders make a technical analysis by using these indicators which the contiguous of indicator values are used to predict the trend of market prices. This paper considers the relation among the stock index indicators, trading volume, and the market price. The market data are retrieved from the [17].The remainder of this paper is organized as follows. Section II discusses related works for applying the various techniques for stock index. Section III provides stock index indicator formulation. Section IV shows the SBI index data set before and after pre-process. Section V discusses the proposed solution VI discusses the obtained neural network results, Section VII concludes our research work and describes our contributions.

II. RELATED WORKS

Sunil Kumar Khatri1, Himanshu Singhal2, Prashant Johri:[1] proposed "Sentiment Analysis to Predict Bombay Stock Exchange Using Artificial Neural Network" According to their procedure, State that sentiment analysis he take data from different sites and classified these data into different four class such as happy, hope, sad, disappoint. The performance of their model is analyzed on 1 hidden layer at 5 epoch and 9 neurons with mean squared error 0.004.

Mayankkumar B Patel , Sunil R Yalamalle:[2] proposed "Stock Price Prediction Using Artificial Neural Network" In their paper, State the normalize M.S.E is better from M.S.E for analysis of perfect prediction of stock market average index. M.S.E is computed by of squaring the different between actual output and desire output and normalize M.S.E is obtained by dividing M.S.E with stock price. The performance result show that normalize M.S.E 0.055995 with correct direct % 51.06 and normal standard deviation 6.9825 the predict L11x15 indexes of N.S.E.

Gholap Rahul Mansing , Kale DevidasBhausaheb:[3] proposed "Indian stock market prediction using neural network technique" . According to their procedure, Predict the index of NSE/BSE used the back propagation technique with moving average such as sequential moving average and exponential moving average back propagate the used to minimize the error adjusting wait and bias. Past historical data are used the prediction of stock index. They input historical data 1-9-40 to 31-10-2010 with 5 inputs are tried to predict stock values future 8 days of November. Their predict average error was 1.60%

D. Ashok kumar S.Murugan:[7]proposed "Performance Analysis of Indaian Stock Market Index Using Neural Network Time Series Model". In their paper, Forecasting index of Bombay Stock Exchange and Nifty are discussed in this research. This research are based on different – different factor on for casting like as epoch 2960, learning, rate 0.28, and moment M 0.5, and provide various experiments on this parameters. There are five experimented are conducted on BSE 100 stock market measuring forecasting accuracy with different factor such as MAPE, PMAD, MSE, RSME. These factors are analysis on different years of data sets of stock exchange. And show that error rate is slightly decrease its model on predict time series accuracy with less noise term their result are best on optional factor learning 0.28 and momentum 0.5 and epoch 2960 with lower error prediction.

GitanshKhirbat, Rahul Gupta and Sanjay Singh:[10]proposed published "Optimal Neural Network Architecture for Stock Market Forecasting". their procedure, Focus on various performance analysis of artificial neural network. For stock prediction price they provide optimal parameter in term of neurons and epoch with best forecasting accuracy on different – different epoch 50,500,500 and gave neural network architecture [m-m/2-m/10], where m shows number of neuron in each layer. Their system futures are correctly predicted with less error.

YauheniyaShynkevich, T.M. McGinnity, Sonya Coleman, Yuhua Li, Ammar Belatreche:[11] proposed "Forecasting stock price directional movements usingtechnical indicators: investigating window size effectson one-step-ahead forecasting". In their paper, they provide research on exponential moving average with day. They provide a technical or model for time series with support vector machine with exponential moving average. They state various parts of data pre-processing in form of interpolation, smoothing and transformation and normalization.

K. Senthamarai Kannan, P. SailapathiSekar, M.MohamedSathik and P. Arumugam:[12] proposed "Financial Stock Market Forecast using Data Mining Techniques" . According to their procedure, State are five techniques of analyzing stock these techniques are combined to predict the closing price of that days by this prediction they analysis that following closing price would be increased of decreased. There techniques were typical price, Bollinger Bands and relative strength trade, CMI and moving average their system was able to predict following day closing price increased or decreased bottom them charge of 50%. The performances analysis on a profitable signal for moving

average as 52.62% and they compare it to BSRCTS having profitable signal of 58.25%

Mahezabin Shaikh & Mrs. G. J. Chhajed:[14]proposed "Financial Forecasting using Neural Network". their procedure, State about neural network using back propagation using various indicator such as moving are KD indicator, MACD, Relative stray in show the output graphically and statically. Their reason analysis provides absolute error less than 1% comparing predicted and actual value.

Akintola K.G., Alese B.K. & 2Thompson A.F:[13] proposed "Series Forcasting With Neural Network a Case Studey Of Stock Price Of Intercontinental Bank Nigeria". In their paper, Used back propagation above 75% in state price index with 500 epochs.this neural network is teach to forecast one period ahead so far the data 0.043870 the forecast is 0.032756 error in forecast is 25% therefore the accuracy is 75% and in the next data 0.026320 the forecast 0.032799 Error 24.61 the forecast accuracy is 75.49%. The accuracy of the forecast can be enhanced further by training with more data with momentum of 0.5 and learning rate 0.3.

Qasem A. Al- Radaideh, Adel Abu AssafEmanAlnagi: [18]proposedpublished a "Predicting Stock Prices using data Mining Techniques". their procedure, State about a prediction method that help the investors in the stock market to decide the Correct timing for buying or selling stocks based on the knowledge extraction that extract knowledge from the historical prices of such stocks. This model provides a decision making system using data mining techniques. The decision taken was based on decision tree classifier. To build the proposed model, methodology as CRISP-DM is used to build the prediction model over real historical data on three major companies listed in Amman Stock Exchange (ASE).The classification was done in 6 attributes like Previous, Open, Min, Max, Last,Action. For classification, a decision tree was built following algorithms such as ID3 and C4.5 algorithms and the pruning technique was used in the C4.5 algorithm to reduce the size of the produced decision trees.

Debadrit Banerjee [5] proposed "Forcasting of Indian stock market using time- series ARIMA model" . According to their procedure, provide an stock prediction statically method such as ARIMA (1, 0, 1). Their model were best fitted to describe the observe time series and forecast. This was the linear model in forecasting. Performance factor measured in case RMSE, MAE and MSE. In this proposed model, they were assumed that data set was linear in beast performance .in case of non linearity his was less power full in forecasting price of stock.

III. STOCK INDEX INDICATORS

Financial instruments called *indicators* are popularly usedby trader for predicting the trends of stock prices. TheIndicator is calculated from the historical data sets. Theexamples of stock index indicators are Moving Average (MA),linear regression Indicators (LRI), and etc. In this paper,we provide the formulation of five indicators such as Relative Strength Index (RSI), Rate of Change (ROC), Simple Moving Average (SMA).Linear regression Indicators (LRI), These indicators are described as follows.

A. Relative Strength Index (RSI):

RSI is proposed by j well wider, it is moment oscillators and measure speed. It changes in price moments. This oscillates between 0 and 100. And measure the overbought and oversold condition. It is consider as above 70 it will be overbought and bellow 30 it will be oversold. [16]RSI be capable of also used to discover general trends. It is calculated for N days by given formula:

$$RSI(N) = 100 - \frac{100}{1+RS(N)}$$

$$\text{Relative strength } RS(N) = \frac{(\text{Average gain in perivious N days})}{(\text{Average loss in previous N days})}$$

Gain and Losses are calculated as simply:

If Gain = (closed (today)-closed (previous) Then loss =0 Otherwise

Loss = (closed (previous)-closed (today)) Then Gain=0

$$\text{Average gain} = \frac{(\text{Total number all gain during last N periods})}{N}$$

$$\text{Average loss} = \frac{(\text{Total number all loses during last N periods})}{N}$$

B. Rate of Change (ROC):-

The rates of change is pure oscillator indicator and measure the percentage changes of the present close price as compared to the close price a definite number of periods before. Its calculation is used to compare the present price with the price n period ago. The graph plot from oscillator that show the fluctuation below and above the 0 line as the rate moves negatives and positive. It confirms price progress or detects divergence. It is also used for find overbought and oversold condition. Generally, the rate of change is calculated based on 14 periods for input.[16]ROC indicator is an Oscillator that calculates the movement of price between the present time price and the one of n periods of time before. Roc indicators are helpful technical analysis tool for confirming price movements. It detects divergence, and determines level of overbought and oversold. A similar indicator that should be investigated is the movement indicators.

$$ROC\% = \frac{p_t - p_{t-n}}{p_{t-n}} * 100$$

Where t is the present time and n is the quantity of periods of time in the back.

The roc signals when certain stock is overbought or oversold, trading signal happening when a divergence emerge against the present price evolution.

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$\text{ROC} = \text{price}_t - \text{price}_{t-n}$

$\text{ROC\%} = \frac{p_t - p_{t-n}}{p_{t-n}} * 100$

D. Simple Moving Average (MA):

MA is proposed by Gerald Appel in the past seventies .Simple moving is used to calculate the average price of security over a particular number of time phase. It shows the average the price over a period of time it is mostly depend on closing prices. [16] For 15 day moving average, we have to add the closing price for each of the 15 days and divided by15. As its name implies a moving average is a average that moves. The most regular average is based on 15, 20, 30, 50, 100 and 200 days time period are used for computation. Longer time period are less precious by daily price variation. According to price changes the moving average graph is indicated as a line. When prices reduce below the moving average M.A has the tendency to go on falling conversely, incase price rise higher than the moving average it have the tendency to go on rising. It calculated by formula:

$$SMA(n) = = \frac{1}{n}\sum_{n=1}^{n} close_n$$

Where t is the present time and n is the quantity of periods of time in the back. The roc signals when certain stock is overbought or oversold, trading signal happening when a divergence emerge against the present price evolution.

E. Linear Regression Indicators (LRI):

The LRI an indicator fits a linear regression line over the value for the given periods of time for obtains the current value for that line. In this situation the line is not necessary linear. It would be straight line fitting as close as possible to all of given values. [15]The most important indication of LRI indicators to forecast the tomorrow's price plotted to day.

LRI mostly used the least square method it can be calculated by this formula:

$y = a + bx$ Where

$$a = \frac{\sum y - b * \sum x}{n} \quad b = \frac{n \sum xy - (\sum x)(\sum y)}{n \sum x^2 - (\sum x)^2}$$

x = the current time period

n = the number of time periods chosen

y =the LRI value we wish to calculate (the data series, usually the close price)

b =linear regression slope

In this case

$$\text{LRI} = a + b * n$$

Linear Regression is statistical method used to forecast upcoming values from past value. By using the least square method, straight line can be plotted that minimize the distance between the resulting line and data set in order to relative trend.The linear regression indicator plots the end values of a linear regression line at each data point. A variation on the same idea is the time series forecast which is found by totalling the linear regression slop to the linear regression line.

IV. DATA PROCESSING

A. Data Set

The data set was captured from the site that is usually www.finanaceyahoo.com. We captured the data every day in the period of historical stock data of SBI from 01/01/2012 to 04/05/2015. Each record of the data set consists oftrading date, trading, opening, high, low, closing price. The currency of the price is Thai Baht. The example of the data set is showed in Table I.

TABLE I: THE EXAMPLE OF THE DATA SET

Date	Open	High	Low	Close
03-01-2012	9.79	9.87	9.77	9.79
04-01-2012	9.86	9.86	9.75	9.81
05-01-2012	9.8	9.87	9.78	9.85
06-01-2012	9.81	9.83	9.63	9.79
09-01-2012	9.82	9.83	9.8	9.83
10-01-2012	9.83	9.83	9.77	9.79
11-01-2012	9.77	9.84	9.77	9.82
12-01-2012	9.8	9.84	9.8	9.83
13-01-2012	9.84	9.87	9.82	9.82
17-01-2012	9.82	9.83	9.73	9.81
18-01-2012	9.8	9.86	9.78	9.85
19-01-2012	9.8	9.87	9.78	9.79
20-01-2012	9.8	9.83	9.79	9.83
23-01-2012	9.85	9.85	9.8	9.81
24-01-2012	9.81	9.89	9.78	9.87
25-01-2012	9.89	9.89	9.8	9.86
26-01-2012	9.87	9.95	9.87	9.92
27-01-2012	9.96	9.98	9.94	9.97
30-01-2012	9.98	10.06	9.95	9.95
31-01-2012	9.92	10	9.92	9.94
01-02-2012	9.98	10.05	9.98	9.98
02-02-2012	10	10.06	10	10.05
03-02-2012	10.06	10.1	10.01	10.06
06-02-2012	10.06	10.22	9.99	10.06

B. Data Pre-processing

The indicator values (e.g., RSI, ROC, LRI, and SMA) are calculated from the original data set by using the formulas that are described in Section II. The dataset with indicators is showed in Table II.

TABLE II: THE DATA SET WITH INDICATORS

Date	15-MA	15-LRI	14-RSI	14-ROC
24-01-2012	9.81933333333333	9.83333333333334	58.3333333333333	0.817160367722166
25-01-2012	9.82400000000000	9.83925000000000	57.0532915360502	0.509683995922517
26-01-2012	9.83133333333333	9.86058333333334	62.3864836325238	0.710659898477160
27-01-2012	9.83933333333333	9.89658333333334	66.1580062851714	1.83861082737489
30-01-2012	9.85000000000000	9.91675000000000	63.4187350656544	1.22075279755849
31-01-2012	9.85733333333334	9.93583333333334	62.0356507525472	1.53217568947906
01-02-2012	9.87000000000000	9.95650000000000	65.2959393735406	1.62932790224033
02-02-2012	9.88533333333333	9.99333333333334	70.1302486170331	2.23804679552391
03-02-2012	9.90066666666667	10.0281666666667	70.7589539442321	2.44399185336049
06-02-2012	9.91666666666667	10.0559166666667	70.7589539442321	2.54841997961264
07-02-2012	9.94000000000000	10.1005000000000	76.4801189388966	3.14720812182742
08-02-2012	9.96133333333333	10.1440833333333	76.9656032333002	3.88151174668029

V. PROPOSED SOLUTION

We have employed our 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 incorporation, recognition and adaptation management, etc. Our network is semi supervised learning. Initial of all, artificial neural network has to be trained exact learning criteria..This research paper uses data processing technique to check historical information concerning share market in order that it will predict the desired values a lot of accurately. Below is the description of the proposed Methodology.

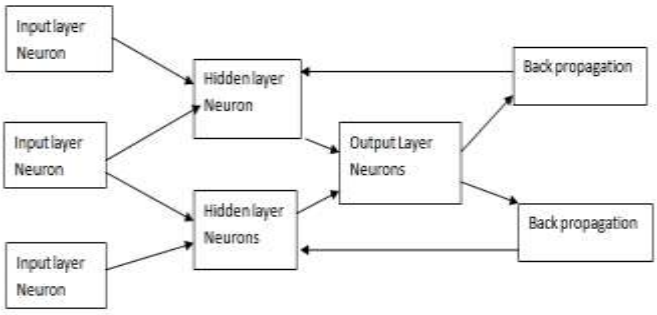


Figure 3.1: Block diagram of the proposed system

Back propagation Algorithms:-

The concept behind BP algorithms is very simple. The output of network is evaluated against target output. In this case result is not satisfactory, weights are modified or adjusted and process is repeated again and again until error is minimizing enough. Neural network consist of two steps, Forward pass and backwardpass. In the forward pass information is processed one layer to another layer. Output are calculated and compared with desire output. After it error is calculated by differencing the desire and actual. In the back word pass weight and biases are adjusted or updated to minimize the error.

Step-1 Initialize all weight and biases with initial value.

Step-2 Compute step 3-8 for all training pair.

Step-3 every input unit receives input signal x_i and sends it to the hidden unit $i = 1$ to$n$.

Step-4 each hidden unitZ_j ,j =1 to$p$, sums its weighted input w_{ij} signal to calculate net input.

$z_{inj} = b_{0j} + \sum_{i=1}^{n}(x_i * w_{ij})$

Calculate output of the hidden unit applying its activation function.

$z_j = f(z_{inj})$ and send the output signal from the hidden unit to the input of output layer units.

Step-5 for each output unity_k, y_k = 1 to$m$, calculate the net input

$y_{ink} = b_{ok} + \sum_{j=1}^{p}(z_j * w_{jk})$ And apply the activation function to compute out signal.

$$y_k = f(y_{ink})$$

Step-6 each output unit y_k= 1 to$m$, receive a target pattern regarding to the input training pattern after it computes the error correction term.

$\delta_k = (t_k - y_k) * f'(y_{ink})$, on the basis of error correction term, updates the change in weight $\Delta w_{jk} = \alpha\delta_k z_j$ and biases are $\Delta b_{ok} = \alpha\delta_k$ also send to the hidden layer backword.

Step-7 each hidden unit z_j , j =1 to$p$, sums its delta input from the output unit.

$\delta_{inj} = b_{ok} + \sum_{k=1}^{m}(\delta_k * w_{jk})$ The term δ_{inj} gets multiliped with the derivative of $f(z_{inj})$

To calculate the error term

$\delta_j = \delta_{inj} * f'^{(z_{inj})}$ On the basis of the calculation δ_j.

Update the change in weight and biases.

$\Delta w_{ij} = \alpha\delta_j x_i$ and $\Delta b_{oj} = \alpha\delta_j$

Step -8 each output unity_k, k = 1 to$m$, update the biases and weight:

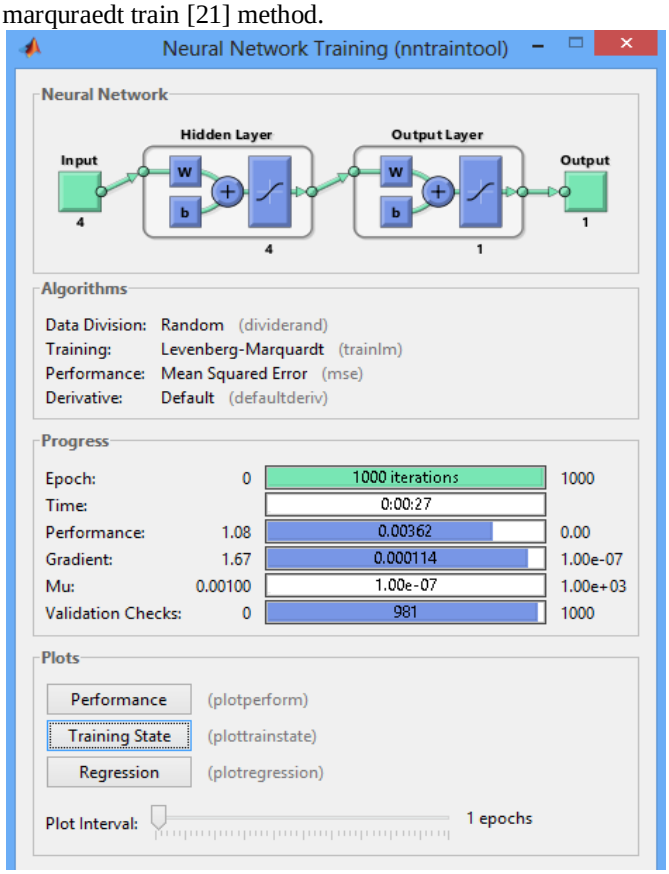
$w_{jk}(new) = w_{ik}(old) + \Delta w_{jk}$ and $b_{ok}(new) = b_{ok}(\text{old}) + \Delta w_{ok}$

Each hidden unitZ_j ,j =1 to$p$ update its biases and weights:

$w_{ij}(new) = w_{ij}(old) + \Delta w_{ij}$ and $b_{oj}(new) = b_{ok}(old) + \Delta w_{oj}$

Training of Network:-

In the training our network takes a set of four input and one target output. Initially network was created by initial values and this network is trained by back propagations technique. In this phase weight and biases are adjusted to improve the performance of network. The artificial neural network is trained a large amount of historical data using 70% of data classification. The network is train with Levenberg-marquraedt train [21] method.



Neural Network Training

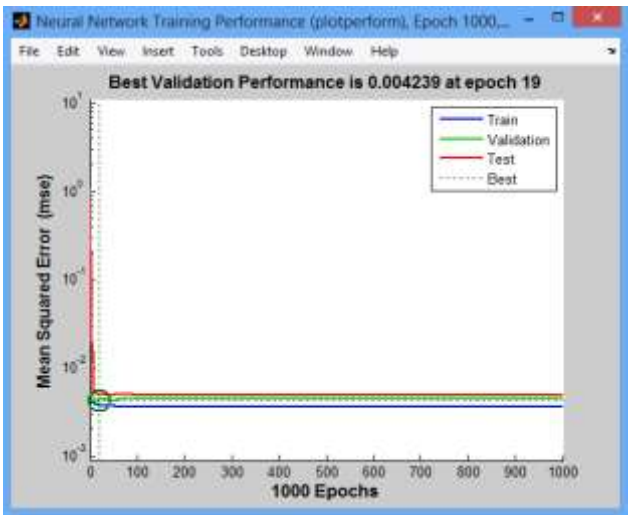
VI. EXPERIMENT RESULT

The dataset of SBI daily stock price has been used for an experiment [17]. We used four input variables for ANN such as SMA, LRI, RSI, and ROC of close price in the day to get the output at next day open price of the day. This observation is taken when other parameters are:

Neurons: 04
Learning Rate (alpha):0.001
Hidden layer: 01
Max Epochs (epochs): 1000

Table 1: Predicting price, Actual price and Error using ANN

Date	Actual	Predicted	Error
25/01/2012	9.89	9.8774	0.012646
26/01/2012	9.87	9.8693	0.00072029
27/01/2012	9.96	9.9029	0.057054
30/01/2012	9.98	9.9428	0.037212
31/01/2012	9.92	9.9346	-0.014608
01/02/2012	9.98	9.9447	0.035257
02/02/2012	10	9.9679	0.032117
03/02/2012	10.06	10.0031	0.056864
06/02/2012	10.06	10.0255	0.034542
07/02/2012	10.04	10.0467	-0.0066609
08/02/2012	10.16	10.1062	0.053846
09/02/2012	10.12	10.1617	-0.041705
10/02/2012	10.12	10.0997	0.020317
13/02/2012	10.17	10.1592	0.010766
14/02/2012	10.18	10.2052	-0.025167
15/02/2012	10.24	10.2269	0.013072
16/02/2012	10.18	10.23	-0.049956
17/02/2012	10.16	10.1704	-0.10418
21/02/2012	10.16	10.2032	-0.04315
22/02/2012	10.17	10.2667	-0.09672



Performance curve for training

Mean Square Error (MSE) means that average MSE is different between outputs and targets (Fig-8). Lower values are better. Zero means that there is no error. The best validation performance (MSE) is 0.004239 that represent error between between predicted output and actual output.

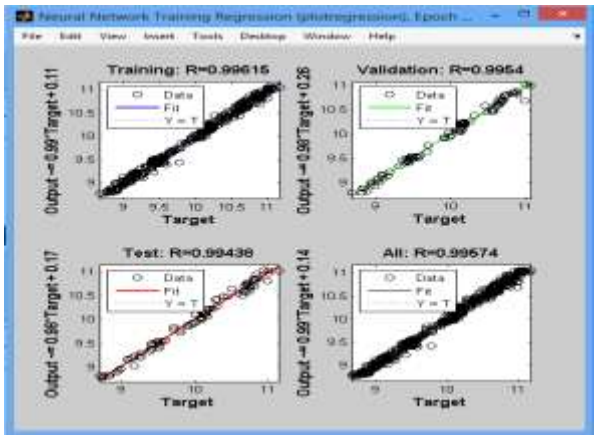


Fig-9: Regression plot for training

The regression plot, show the relationship between the output of the network and the target. If the training is perfect the neural network output and the target output would be exactly equal, although the relationship is rarely perfect in practice. The R values represent an indication of the relationship between the output and targets. The R = 1, pointed that there is an exact linear relationship presented between network output and targets output. If R is nearly to zero, in this case then there is no linear relationship is presented between network output and targets output. The training data indicates a good fit. In this case the outcome of validation and test show R values with greater than 0.9. From the figure (9) the performance of the proposed network recorded was 99% in case of training with four inputs, 4 neurons in the input layer and one in the output layer.

Comparison with Existing Model:

Mean absolute Error:MA.E= $\frac{1}{N}\sum_{t=0}^{n}$ abslute$(X_t - F_t)$

Mean Square Error:M.S.E= $\frac{1}{N}\sum_{t=0}^{n}(X_t - F_t)^2$

Root Mean Square error: R.M.E

$=\sqrt[2]{M.S.E}=\sqrt[2]{\frac{1}{N}\sum_{t=0}^{n}(X_t - F_t)^2}$

Where X_t is the actual data at period t .F_t is the forecast (using this model) at period t. e_t Is the forecast error at period$t$. While n is the number of methods (or observations) used in computing the Error

Table 7: Prediction error result using NN and ARMIA Model

Model	No Of Observation.	MAE	MSE	RMS
Neural Network model	20	0.03264	0.001577589	0.039718871
ARIMA(0, 1,1) model	20	0.083824767	0.009218793	0.096014545

From the result table, the performance of neural network is better than compared to other time series method of forecasting of daily opening stock values. Because the result shows error in neural network is very less.

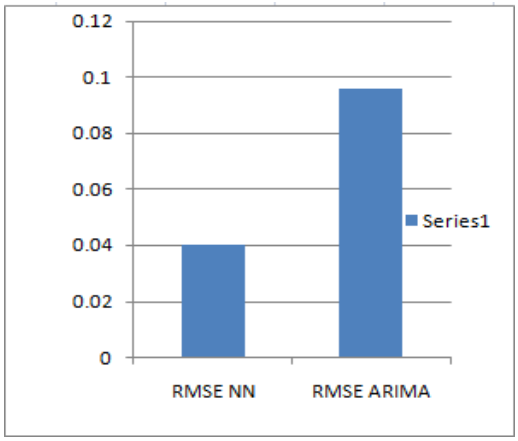


Figure4.1: RMSE between Neural Network and ARIMA Model

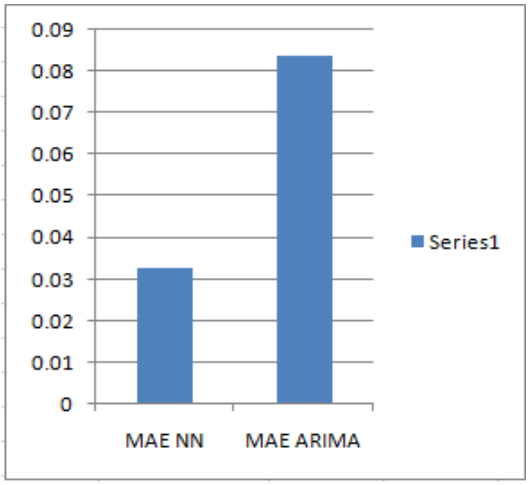


Figure4.2: MAE between Neural Network and ARIMA model

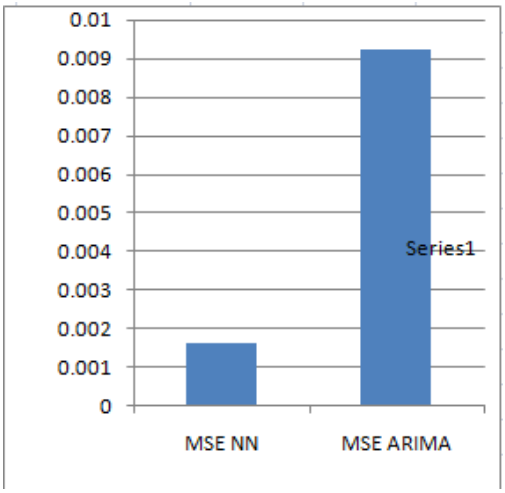


Figure4.3: MSE between Neural Network and ARIMA model

The following figure show the MAE, MSE and RMSE calculate for the forecasting using the above two forecasting method.The experiments result illustrates a varying degree of prediction of monthly stock return. For example based on the values of MSE, MAE and RMSE, The above compression of neural network and Arima model clearly shows that the error in prediction of neural network is very less than the other method. Therefore the neural network prediction is better than the ARIMA technique.

VII. CONCLUSION

In this research paper we completed several attempts before we got the architecture that was suitable for this network. We tried several combinations of layers, momentum, learning rate, epochs and so on. Due to the nature of time series forecast, we need past data to predict future. From Our predictions, in proposed model it is realized we might need more data to train the network to be able to give a better prediction. Also time series data of stock can be erratic at times and give a sudden increase or decrease in price. So at time of predictions could be further from the actual prices experienced in the market. The output result of analysis shows that neural network is a powerful method for predicting stock time series data.As researchers and investors struggle to outperform the market, the use of neural networks to forecast stock market prices will be a continuing area of research. So in our proposed model there are 537 data points are used for training purpose. Our model may give far better result if distributed data will be used during training. Our Model gives less percentage of error with better prediction. We are still working on this model for get 100% prediction result outcome.

REFERENCES

[1] Sunil Kumar Khatri, HimanshuSinghal, Prashant Johri“ Sentiment Analysis to Predict Bombay Stock Exchange Using Artificial Neural Network” 978-1-4799-6896-1/14/$31.00 ©2014 IEEE

[2] Mayankkumar B Patel , Sunil R Yalamalle “Stock Price Prediction Using ArtificialNeural Network” International Journal of Innovative Research in Science, Engineering and Technology- Vol. 3, Issue 6, June 2014

[3] Gholap Rahul Mansing , Kale DevidasBhausaheb“ Indian stock market prediction using neural network technique” International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 3 Issue 3, March 2014

[4] Gagandeepkaur “Evolution of stock markets and role of stock exchange” IRACST – International Journal of Commerce, Business and Management (IJCBM), ISSN: 2319–2828 Vol. 3, No. 4, August 2014

[5] Debadrit Banerjee “Forcasting of Indian stock market using time- series ARIMA model”978-1-4799-3264-1/14 2014 IEEE

[6] Hindayati Mustafidah , Sri Hartati , Retantyo Wardoyo, AgusHarjoko “Selection of Most Appropriate Back propagation Training Algorithm in Data Pattern Recognition”International Journal of Computer Trends and Technology (IJCTT) – volume 14 number 2 – Aug 2014

[7] D. Ashok kumar , S. Murugan “Performance Analysis of Indaian Stock Market Index Using

Neural Network Time Series Model" Proceedings of the 2013 International Conference onPattern Recognition, Informatics and Mobile Engineering (PRIME) February 21-22

[8] Bruno Amzic, Leonidas Spinoulas, Rafael Molina and Aggelos K. Katsaggelos, "Compressive Blind Image Deconvolution", IEEE Transactions on Image Processing', Vol.22, No.10, October 2013

[9] Yuqinq He, KamaladdinFataliyev, and Lipo Wang " M. Lee et al. (Eds.): ICONIP 2013, Part II, LNCS 8227, pp. 737–744, 2013. © Springer-Verlag Berlin Heidelberg 2013"

[10] GitanshKhirbat, Rahul Gupta and Sanjay Singh " Optimal Neural Network Architecture for Stock Market Forecasting" 2013 International Conference on Communication Systems and Network Technologies Department of Information & Communication Technology

[11] YauheniyaShynkevich, T.M. McGinnity, Sonya Coleman, Yuhua Li, Ammar Belatreche "Forecasting stock price directional movements usingtechnical indicators: investigating window size effectson one-step-ahead forecasting"

[12] K. Senthamarai Kannan, P. SailapathiSekar, M.MohamedSathik and P. Arumugam" Financial Stock Market Forecast using Data Mining Techniques"

[13] Akintola K.G., Alese B.K. & Thompson A.F. "Time Series Forcasting With Neural Network a Case Studey Of Stock Price Of Intercontinental Bank Nigeria"9December2011Volumes/Vol9Issue3/IJRRAS

[14] Mahezabin Shaikh Mrs. G. J. Chhajed" Financial Forecasting using Neural Network "International Journal of Advanced Research in Computer Science and Software Engineering

[15] Linear Regression Technical indicators . [Online]. http://www.netdania.com/downloads/guides/financechart/Print/LinearRegressionIndicator-p.html

[16] Technical indicators and overlays. [Online]. Available:http://www.stockcharts.com/school/doku.php?id=chart_school:technical_indicators:chaikin_oscillator

[17] http://finance.yahoo.com/q/hp?s=SBI&a=00&b=01&c=2012&d=03&e=3&f=2016&g=d

[18] QAasem A, Al-Radaideh, Adel Abu Assaf,EmanAlnagi" Predicting Stock Prices using data Mining Techniques" The International Arab Conference on Information Technology (ACIT'2013)

[19] Ozgurkisi , ErdalUncuoglu" Comparison of three back- propagation training algorithims for two case studies "Indian Journal of Engineering & Material Science Vol.12, October 2005,

[20] Mirza Cilimkovic "Neural Networks and Back Propagation Algorithm"

[21] http://in.mathworks.com/help/nnet/ref/trainlm.html?requestedDomain=www.mathworks.com

[22] Bhagwant Chauhan, UmeshBidave, AjitGangathade, Sachin Kale"Stock Market Prediction Using Artificial Neural Networks" (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 5 (1) , 2014, 904-907

[23] http://in.mathworks.com/help/econ/forecast-airline-passenger-counts.html

[24] https://onlinecourses.science.psu.edu/stat510/node/67

