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An Analysis of the Performance of Artificial Neural Network Technique for Stock MarketForecasting

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Abstract— In this study, we demonstrated a technique for daily stock price forecasting using neural networks, and we compared the forecasting accuracy of the neural networks to that of statistical methods. Predicting stock prices using neural networks is a relatively new topic of forecasting. Daily Stock Market Price Predictions using Neural Networks is also presented in this research. Artificial neural networks are a common method for stock market forecasting, despite the fact that making accurate stock market predictions is notoriously difficult due to the wide variety of known and unknown elements at play. The Neural Network uses the 'Learn by Example' principle as its foundation. This study models and forecasts daily stock market values using both Neural Networks and statistical methodologies, and then compares the two sets of predictions. Using MAPE, MSE, and RMSE, we may evaluate the accuracy of these two models for making predictions. The findings demonstrate that Neural Networks may accurately anticipate stock market values after being trained with adequate data, appropriate inputs, and an appropriate design. Even while statistical methods are robust, their ability to predict future series degrades as complexity increases. So, instead of relying on traditional methods, Neural Networks may be utilized to make daily stock market price predictions**.**

Keywords
Terms Like "Foreign Investors Inflow," "Mean Absolute Error," "Root Mean Squared Error," "Sum of Square Error," and "Root Mean Squared Error" Broad Money, Narrow Money, the Exchange Rate,
Industrial Production, and the Total Money Supply.

INTRODUCTION

(TITLE 1) Neural Networks function similarly to the human brain by handling data in a parallel fashion. The biological brain's processing elements, called neurons (of which there are billions), are responsible for the transmission of information and become more robust with experience and training. Because of the way their processing portions are connected, Neural Networks can generate predictions, learn from experience, follow examples, identify patterns in noisy data, and operate with just a fraction of accessible information. By emulating the way the human brain functions, neural networks are an attempt to solve problems that traditional computers can't handle. An artificial neural network (ANN) is a model that uses simulated neurons. a network of densely linked "neurons" or "nodes" used for computing. Each node in the network processes an input, producing an output that is sent on to the next node. Data analysis benefits greatly from this simultaneous processing.

The ability of artificial neural networks to provide approximations to complicated and nonlinear equations makes them a valuable tool in econometric analysis. Artificial neural networks' nonlinear nonparametric adaptive-learning capabilities have been shown in prior studies to make them well-suited for pattern recognition and pattern categorization problems. These days, ANN is often used for the analysis of business data kept in a database or data warehouse. Predicting stock prices and identifying patterns in consumer behavior are two popular applications of neural networks. Network training is an important part of using neural networks in practice. Training data sets are often culled from and refined using information already available inside a company's database or data warehouse. Finally, a crucial challenge for Neural Network-based forecasting is the selection of the Neural Network Architecture and the training of input data.

Since financial data series are notoriously unstable, their study is vital to academics and the corporate sector. While highly well-built approaches like Multiple Regression Techniques (Hair, Anderson, Tatham, & Black, 1998)[1] and Time Series Analysis are used to forecast the series, their predictive power decreases as the series get more complicated. (2007) Kalyani Dacha[2]. Historically, fluctuations in the stock markets have been modeled using regression models. Finding the least squares prediction equation, performing model fit tests, and parameter estimation tests are all steps in multiple regression analysis, as defined by Mendenhall et al.[3] However, these models are limited to predicting straight lines. Stock market returns fluctuate in a nonlinear fashion, making neural networks a better fit for modeling these shifts in the market. Neural networks are useful because they can represent nonlinear processes without requiring any prior understanding of those processes.
In the field of forecasting, Neural Networks have gained traction as a result of its non-parametric nature.

IV. (Rimpley,1996)[4] and their trainability with respect to the series' behavior. There have been several studies comparing Neural Networks to statistical methods, such as those conducted by Shard & Patil (1990)[5] and Tany & Fishwick, (1993)[6]. There are several challenging pattern recognition issues that have been solved with the help of Neural Networks (Kalyani Dacha, 2007; Bishop, 1995; Rimpley, 1996; Sharda & Patil, 1990; and Tany & Fishwick, 1993)[7-8]. Stock market movements may be learnt via the use of neural networks if stock market return variations are influenced by their recent history behavior, as shown by Tang(1991)[9]. OBJECTIVE OF STUDYThis research aims to model daily Stock Prices data using both the statistical methodology and neural networks, and then compare the performance of the two

V. NERVOUS SYSTEMS

The goal of an artificial neural network is to mimic the learning capabilities of the human brain. An objective function must be specified before a network can be trained and its performance evaluated. The sum of squares error function is often used as a performance measure. enhanced by leveraging feedback-based networks to induce sequence learning.

Prediction methods for the stock market are, in general
could be classified into two classes, fundamental analysis and technical analysis. Fundamental analysis is based on macroeconomic data and the basic financial status of companies like money supply, interest rate, inflationary rates, dividend yields, earnings yield, cash flow yield, book to market ratio, price-earnings ratio, lagged returns (Fama and French, 1988; Lakonishok, 1994). Technical analysis is based on the rationale that history will repeat itself and that and the correlation between price and volume reveals market behavior.Prediction is made by exploiting implications hidden in past trading activities and by analyzing patterns and trends shownin price and volume charts (Smirlock and Starks, 1985; Brush 1986). The Neural Network based forecasting seems to be better predicture than the other approaches to predict stock market. In this paper, we showed a method to forecast thedaily stock price using neural networks and the result of the Neural Network forecast is compared with the Statistical forecasting result.

IV. REVIEW OF THE MARKETING RESEARCH Chiang et al. (1996) predicted the year-end NAV of mutual funds using an FFNN trained using backpropagation (BP) [10]. Since the late 1980s (Swales and Yoon, 1992; Azoff,1994; Yao and Tan,2001; Pan, 2003a; Pan, 2003b)[11-14], the use of neural networks to anticipate financial markets has been an active study topic in both approaches.

The majority of these books are aimed towards the global financial markets, particularly the US stock market. This article's forecast is based on an analysis of daily stock price patterns, as well as Industrial Production, Wholesale Price Index, Exchange Rate, Net Investment by FIIs, Export, Import, Narrow Money Supply, and Broad Money Supply data.

Neuronal network training We utilized NeuralWare, NeuralWorks Predict (http://www.neuralware.com)[15], which offers the tools to create and test different neural network and learning algorithm configurations, to conduct our neural network experiments. The patterns in the training set are denoted by p, the output vector is yp (which is derived from the hidden layer's output), and tp is the training goal. Target and actual network output for the ith output unit on the pth pattern are denoted by tpi and ypi, respectively, in the above equation, where stands for the output nodes. By changing the weights, the network is trained to solve the current challenge. Training or learning a Neural Network entails altering its weights so that it can make sense of the connection between its inputs and its outputs. Finding the weights may be done in a number of ways, the most popular of which is the gradient descent approach. METHODS OF STATISTICS The purpose of the Multivariate Statistical method known as several Regression Analysis is to investigate the association between a single dependent variable and several independent variables. The purpose of a multiple regression analysis is to make predictions about a single dependent variable by using a set of independent variables whose values are already known. There might be more than one independent factor.DATA AND METHODOLOGY

Set A of Applied Data.NSE (www.nseindia.com), RBI (www.rbi.org.in), and SEBI (www.sebi.gov.in) websites are mined for information[16-17]. We have daily NIFTY data starting on April 1, 2005, and ending on March 30, 2007.
Different currencies, FII Flow, etc., may cause the stock market to behave in different ways. Therefore, a model for forecasting the daily return of NIFTY stocks is required. From 1 April 2005 to 30 March 2007 (daily data), researchers compiled a series of 500 observations based on information found on the websites of the Reserve Bank of India (www.rbi.org.in), the National Stock Exchange of India (www.nseindia.com), and the Securities and Exchange Board of India (www.sebi.gov.in)[16-17].
Neural network forecasting models are constructed using 500 observations per day's worth of data. Determining whether or not the series is stationary is a crucial initial step in the analysis, since stationarity is assumed for all further computations of invariants (linear and nonlinear).

also nonlinear. If there is no trend or systematic fluctuation in the mean or variance of a time series, then the series is considered stable, and periodic changes do not need to be adjusted for. The unit root test (Augmented Dickey Fuller and Philip Perron) is used as a stationary test to identify nonstationarity in the data. "The series is non-stationary" is the null hypothesis being tested. The null hypothesis is rejected and the series is stationary if and only if the absolute value of the statistic is larger than the critical Value.

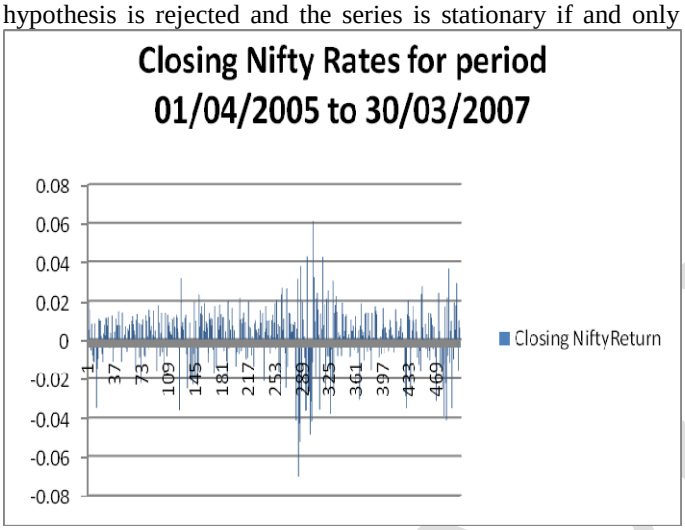


Figure 1. closing nifty rates for period 01-04-2005 to 30-03-2007

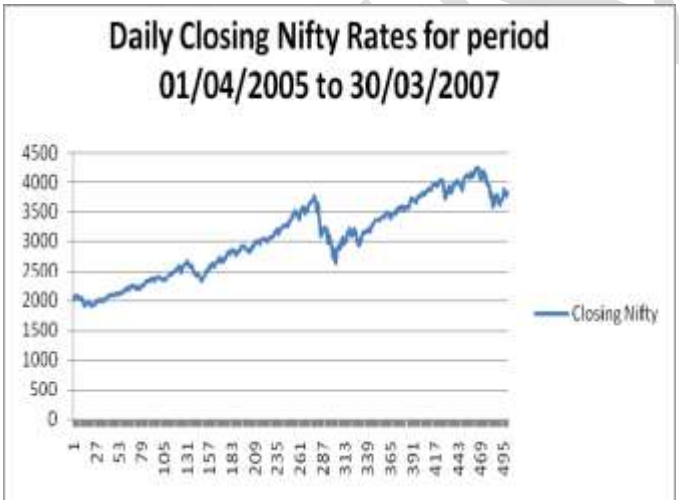


Figure 2. daily closing nifty rates for period 01-04-2005 to 30-03-2007

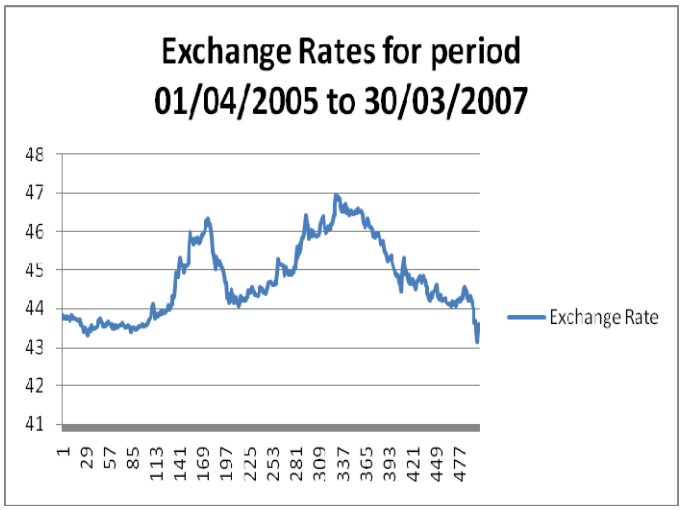


Figure 3. exchange rates for period 01-04-2005 to 30-03-2007

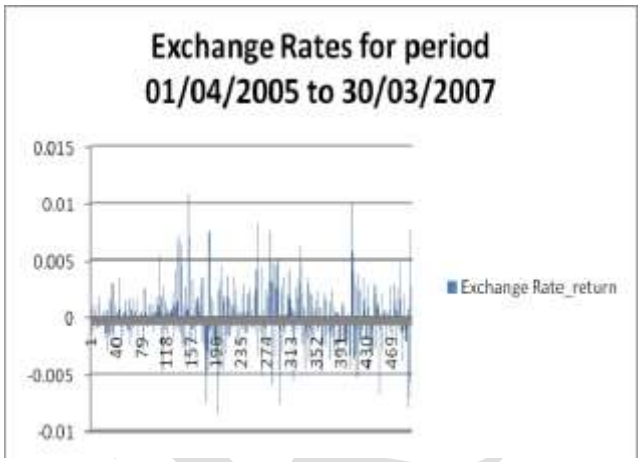


Figure 4. exchange rates for period 01-04-2005 to 30-03-2007

Attempt at Stationarity: Stationarity tests have been performed on both the input and output series. The following table displays the results of the Augmented Dickey Fuller test and the Philip Perron test.

Least-Squares (Both Ordinary and Robust MANOVA) Convergence in 100 Iterations Max 0.001 Type of Residue: Common

TABLE I. UNIT ROOT TEST OF TWO SERIES

Series	Augmented Dickey Fuller Test		Philip Perron Test	
	Statistic	Critical Value (5% Critical Value)	Statistic	Critical Value (5% Critical Value)
Daily Closing Nifty	-9.563573	-2.8677	-20.91897	-2.8676
Exchange Rate	-9.106490	-2.8677	-21.35800	-2.8676
fiip	-4.298148	-2.8677	-11.24999	-2.8676
fiis	-4.414005	-2.8677	-9.641936	-2.8676

A. Techniques of Design Neural Network Models are useful for predicting, but it is challenging to create one for a specific situation. Because of their impact on ANN performance, modeling difficulties need careful consideration. Determining the proper architecture, including the number of layers and the number of nodes in each layer, is an important consideration. Other choices in network architecture include: metrics for training efficacy and effectiveness, activation functions for both hidden and output nodes, and so forth. In this research, the design phase includes choosing the performance measures, determining the input and output nodes, and so on. The amount of variables utilized to make predictions about future values is represented by the size of the input vector, which is the number of input nodes. However, there is presently no proposed method for systematically calculating this figure. The network's capacity to learn and make predictions might be hindered by having too few or too many input nodes. The exchange rate, FII purchases, and FII sales are all considered independent variables, while the closing NIFTY is the dependent variable. The results of this analysis are the expected daily stock return.RESULTS

Neural Network, Part A Attempting to Predict OutcomesThe actual Nifty closing prices for each day are shown in the following figure. The following figure depicts the Neural Network forecastingversus Actual Monthly Closing Nifty values.

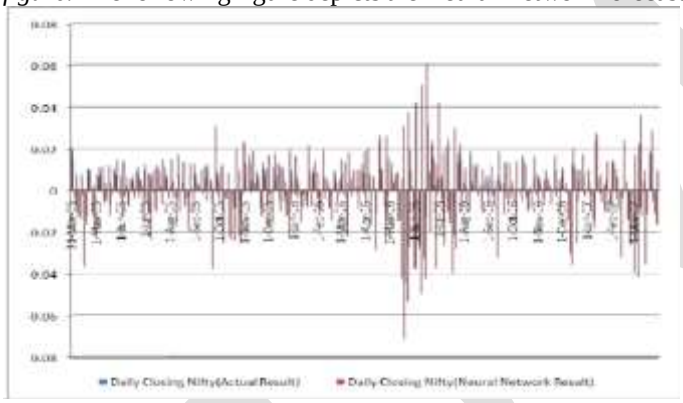


Figure 5. Fig 18.Actual Closing Nifty v/s Neural Network Forecasting

A. Multiple Regression Technique for Modeling and Predictive Analysis:- The closing nifty was used as the dependent variable, while the exchange rate between the Indian rupee and the American dollar, FII purchases, and FII sales served as the independent factors. The natural log was used to normalize and linearly convert the variables (closing nifty, exchange rate Rupee/US Dollar, FII purchase, FII sales).

Dependent Variable: CLR Method: Least Squares Date: 09/23/08 Time: 13:24Sample(adjusted): 4 502

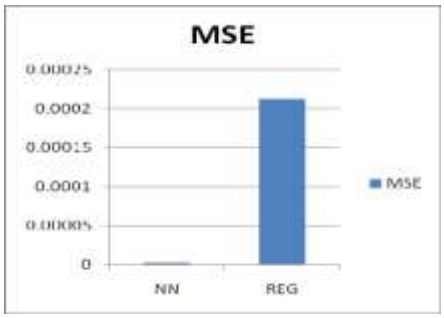
TABLE I. ACTUAL CLOSING NIFTY DAILY PRICES

	No of Obs.	SSE	MAE	MSE	RMSE
Neural Network	500	0.0011374585	0.0013799828	0.0000022795	0.001509793

TABLE II. FORECASTING RESULTS USING REGRESSION MODEL.

	No	SSE	MAE	MSE	RMSE
Regressio	15	0.105770460	0.010517453168303800	0.000211964	0.014559012

Figure 6. Fig 19.Actual Closing v/s Statistical forecasting result



The following table gives the table of comparison:-

TABLE IV. COMPARISON

	SSE	MAE	MSE	RMSE
NN	0.001137459	0.00138	2.28E-06	0.00151
REG	0.105770461	0.010517	0.000212	0.014559

Where formulae for the statistics are:

MAE = abs(Actual –Forecast)/n. MSE = 1/n * [Actual –Forecast]2.RMSE = SQRT(MSE).

From the above Table, Neural Networks performswell than compared to Statistical forecasting of daily closing Nifty values because the error in Neural Network is very less than the Statistical method.

The following figures shows the MAE, MSE andRMSE calculated for the forecast period using the above two forecasting techniques

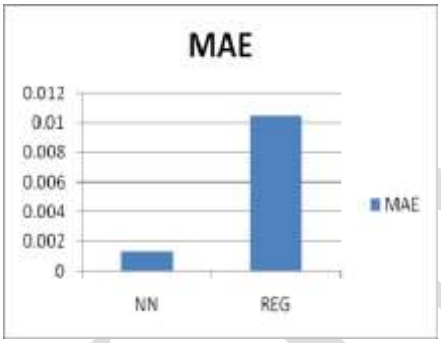


Figure 7. MAE of Neural Network and Statistical Method

Figure 8. MSE of Neural Network and Statistical Method

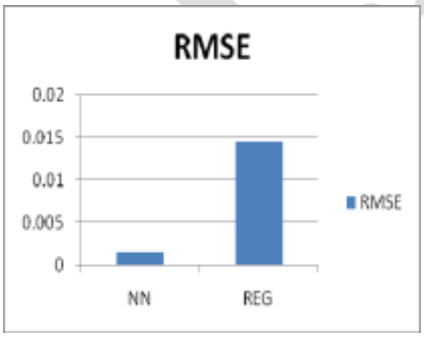


Figure 9. RMSE of Neural Network and Statistical Method

Monthly stock returns are shown to have varied degrees of predictability among studies. Using values for MSE, MAE, RMSE, and other statistics, here is an example. Clearly, the error in prediction of Neural Network is much less than that of the Statistical model, making Neural Networks more accurate prediction tools than Statistics. SUMMARY AND FUTURE STUDIES This article illustrates how Neural Networks do better at predicting stock market values than statistical methods. In this research, we provide two methods for modeling and predicting stock market prices: Statistical Learning Networks

Concusion

Technique. MSE, MAE, and RMSE are used to evaluate the predictive power of models.
Hit rate, in addition to more conventional metrics like root-mean-squared error (RMSE), standard deviation (SDE), and mean squared error (MSE), may be used to evaluate the performance of a neural network. There is a lot of room for growth in the subject of neural networks, and potential areas of study include everything from data preparation and representation to design choice and practical applications. The next natural step in the study would be to find ways to further boost NNs' performance for this application, whether that be via improved training techniques, architecture choices, or input. There are many scientific and technological applications for artificial neural networks.

REFERENCES

"Multivariate Data Analysis," by Hair, Anderson, Tatham, and Black (1998), Pearson Education Press.
According to Finance India, Vol. xxi, No.3,p.923-930, "Causal Modeling of Stock Market Prices using Neural Networks and Multiple Regression: A Comparison Report" by Kalyani Dacha (2007).
In their 1994 book "Introduction to Probability and Statistics," Mendenhall and Beaver cited the ninth edition of their classic text.

Cambridge University Press; Ripley, B.D., "Pattern Recognition and Neural Networks," 1996.
"Neural Networks as forecasting experts: an empirical test," Sharda and Patil (1990) published in the Proceedings of the 1990 International Joint Conference on Neural Networks, Volume 1, pages 491–494, Washington, DC, USA.
Time series forecasting using neural networks against the Box-Jenkins technique (Simulation) (Tang, Almeida, & Fishwick, November 1991, pp303-310).
Reference: Bishop, C.M. (1995), "Neural Networks for Pattern Recognition," Oxford University Press.
"Neural Networks as forecasting experts: an empirical test," Sharda and Patil (1990) published in the Proceedings of the 1990 International Joint Conference on Neural Networks, Volume 1, pages 491–494, Washington, DC, USA.
Time series forecasting using neural networks vs. the Box-Jenkins technique, simulation, November 1991, pages 303–310 by Tang, Almeida, and Fishwick.
According to "A Neural Network Approach to Mutual Fund Net Asset Value Forecasting" (Chiang, W.-C., T.L. Urban, & G.W. Baldridge, 1996). Omega, International Journal of Management Sciences, 24(2), pp. 205-215.
Investment analysis using artificial neural networks. [15] SWALES, G.S., and YOON, Y. The Journal of Financial Analysts, 1992, 48(5).
Financial market time series forecasting using neural networks. 1994. JohnWiley & Sons, Ltd.John Yearwood, Heping Pan, and Chaudima Tilakarame. Neural Networks for Index Prediction in Australia's Stock Market

Volatility and market-to-market interaction. 37, 1 (February 2005), pp. 43–55 in the Journal of Research and Practice in Information Technology.
The unification of technical and quantitative analysis of financial markets into a single science: PAN, H.P.Statistics and Related Fields: Proceedings of the 2003 Hawaii International Conference, June 5-9, 2003, Honolulu, Hawaii, USA.
To learn more about NeuralWare and NeuralWorks Predict, visit http://www.neuralware.com.
For the NSE, see www.nse-india.com. [20]
RBI (Reserve Bank of India), rbi.org.in.
Tao Lu, Yijun Li, and Qiang Ye. Ignoring the ANN and the BP algorithm it uses. Mathematics and Computers, 2003, (1 1).