International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 9 Sep. 2022, pp: 1481-1485 www.ijaem.net ISSN: 2395-5252

Tata Motors Stock Market Price Prediction using Artificial Neural Networks with MATLAB

Pranita Hosmani, Dr Supriya Shanbhag
Automotive Electronics, KLS Gogte Institute of Technology
Belagavi, India
Electronics and Communication, KLS Gogte Institute of Technology
Belagavi, India

Date of Submission: 20-09-2022 Date of Acceptance: 30-09-2022

ABSTRACT—Applying Neural networks in various domain has been proliferated in last decade because of its ability of pattern recognition and classification of the parameters. It is also used for predicting the values in various divisions. As investors are keen to understand the market for smart finance management, it is foremost for them to know the future value of various stocks. In this paper, the Tata Motor stock closing price is predicted using Backpropagation algorithm of Artificial Neural Network in MATLAB and the results are discussed.

Keywords—Artificial Neural Network (ANN), Back-Propagation Algorithm, Prediction, Modelling.

I. INTRODUCTION

Stock Markets are very volatile, the values keep changing every minute. They follow the non-linear pattern. And in recent times, the prediction of stock market price is gaining more popularity as it is showing successful results with minimal errors and guiding the investors in much better way by forecasting the closing price of the stock. There are various Artificial neural network algorithms for predicting the price more accurately. With the prediction of stock market closing value the investor can make appropriate decisions to gain the maximum profit by investing in the right stock at right time. Many scholars and practitioners have presented a wide range of models employing diverse fundamental, technical, and analytical methodologies to produce a more or less precise forecast.

In this paper we will discuss about the closing price prediction for the Tata Motor share price value. The historical data is collected of last 5 years to train the model in the MATLAB. The results of the 10 days are predicted and discussed.

II. ARTIFICIAL NEURAL NETWORK

Artificial Neural Networks is a computational model resembling the functions of Human Neural network. And it was proposed by Walter Pitts and Warren McCulloch in 1943.

The various nodes and connectors of the biological network are the references for the artificial neural networks. The Synapses represent the weights which evaluates the strength of the signal. The nodes represent the natural neurons.

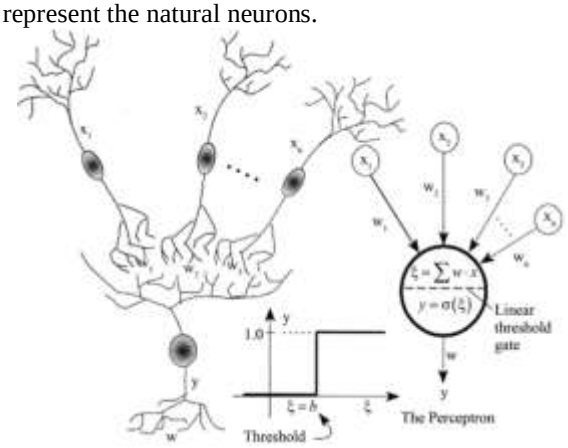

Fig1. The Neural Network analogous with Natural neurons

The Artificial Neural network architectures comprises of three main following layers:

- Input layer
- Output layer
- Hidden layer

The following variables significantly affect how well a neural network performs during training and testing:

- Initial value of weights
- Number of hidden neurons

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 9 Sep. 2022, pp: 1481-1485 www.ijaem.net ISSN: 2395-5252

- Number of training cycles
- Value of bias

The models need to be trained with numerous data before using them to solve a problem.

i. Back-Propagation Algorithm: Back propagation gains knowledge by continually analyzing the collection of data and contrasting each prediction made by the network with the final result. If the difference between the expected value and the actual output reaches a certain threshold, the weights of the connections between the predicted and actual values are adjusted to lower the mean square error. The weights are changed in the reverse manner, starting with the output layer and moving down through each hidden layer to the initial hidden layer. Back propagation is the name given to the procedure since changes to the connection's weights are made in a backwards direction.

ii. Levenberg–Marquardt algorithm: Early within the 1960s, the Levenberg-Marquardt method was created to handle nonlinear statistical procedure issues. By minimizing an objective stated because the sum of the squares of the errors between the model function and a collection of knowledge points, statistical method problems are created when fitting a parameterized mathematical model to a collection of information points. The least square's objective is quadratic within the parameters if a model is linear in its parameters. Through the resolution of a linear matrix equation, this objective is also minimized with relevancy the parameters in a very single step. An iterative solution strategy for the smallest amount squares issue is required if the fit function's parameter values aren't linear. Through a series of carefully considered modifications to the values of the model parameters, such algorithms lower the sum of the squares of the errors between the model function and the data points.

iii. Activation/Transfer Function: These are required to avoid the outputs reaching to a very high value where it could damage the entire model. In this modelling, the Purelin Activation function is used. In contrast to sigmoid functions, if linear output neurons are utilized in the last layer of the multilayer network, the network outputs can have any value. It can be expressed mathematically as f (x)=x.

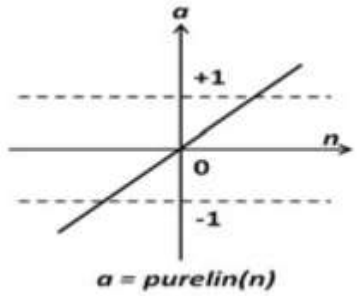

Fig2. Graphical representation of log-sigmoid function

iv. Performance function: Mean squared error function is used in this modelling. Lower the values of the MSE better is the performance of the model.

v. Dataset: For modelling the data is taken from the Tata Motors stock price website. For training the model the last 10 years data is used and the closing price of the 10 days is predicted and compared with actual value to evaluate the model performance.

III. MATLAB MODELLING

ANNs are frequently used to train networks. Network training is the phrase used to describe the process of teaching a network. Fitting a network to our training data set is the literal definition of training a network. The goal of this approach, which was influenced by algebraic equations, is to fit data to a mathematical model or time series line. A training set is a collection of sample data that is thought to be sufficiently representative for a network to infer or learn from. Task refers to network learning performed by the model. Training ANNs entails programming the model to effectively handle the tasks that are assigned depending on unpredictable circumstances. Underfitting, which suggests that a network has not properly learned that specific training set, is a term used to describe when an artificial network has not been properly trained.

To simulate in MATLAB following steps need to be followed:

1. Add the input, sample and target data in workspace and take a transpose of it.
2. Type "nntool" in the command window.

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 9 Sep. 2022, pp: 1481-1485 www.ijaem.net ISSN: 2395-5252

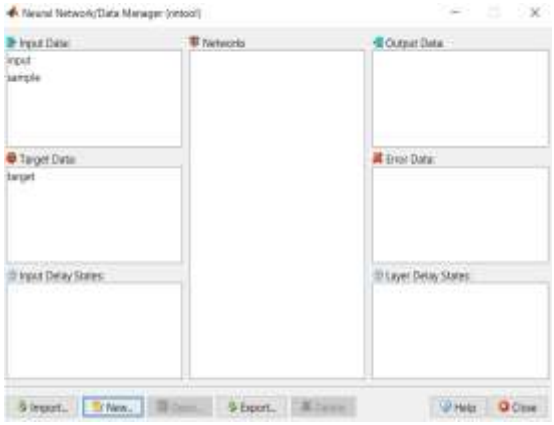

Fig3. Screenshot of command window

3. Click on new to create network and select the parameters as shown in the fig below.

Fig4. Screenshot of Create network window

4. After network is created the model will appear as shown below.

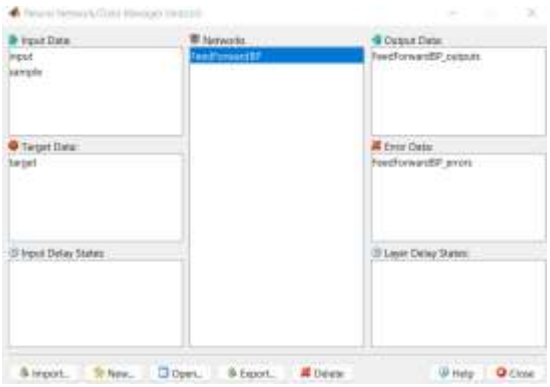

Fig5. Screenshot of Data manager window

5. To train the model, click on the model name and select input and target and train

Fig6. Screenshot of network created

6. After training is completed, you can check the performance and regression plot from the fig shown below.

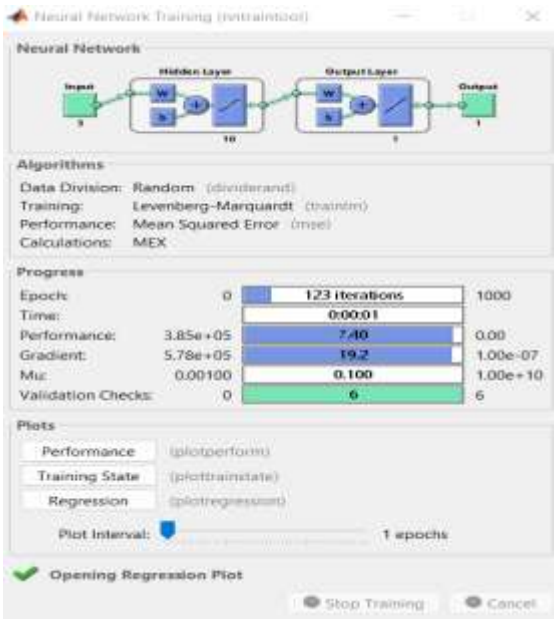

Fig7. Screenshot of NN tool

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 9 Sep. 2022, pp: 1481-1485 www.ijaem.net ISSN: 2395-5252

IV. RESULTS AND DISCUSSION

After training the model, the sample data is simulated by selecting the values as shown below.

Fig8 Screenshot to simulate sample data

The best validation is obtained at 117 epoch.

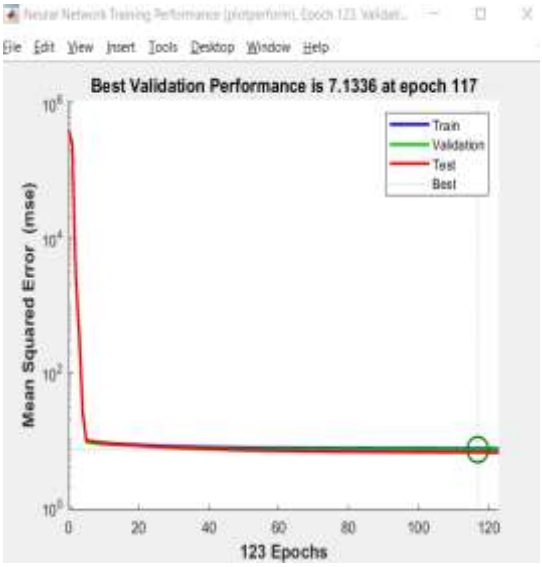

Fig9. Performance graphs of epoch values.

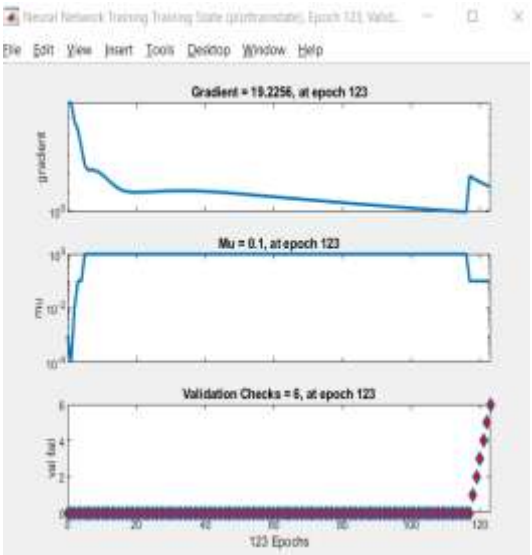

Fig10. Training phase of the input signal.

The regression value obtained is almost near to 1, Which means it has been trained to its best and the errors in model will be minimized.

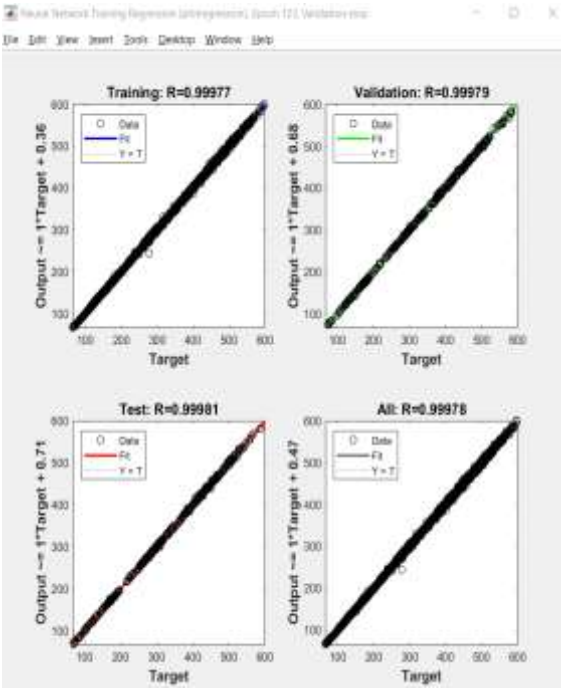

Fig11. Regression plot

After training the network by considering the last 10 years data, the accuracy of the model is checked by predicting closing value for the below dates. The error in the prediction is also tabulated. Hence, we can say that, the model is trained sufficient and the error rate is also minimal and model can be used for predicting the closing rate of Tata motors in future.

Date	Closing Price	Predicted closing Price	Error
01-09-2022	466.899994	471.278729	-4.378735046
02-09-2022	461.75	463.2342689	-1.484268949
05-09-2022	459	460.2973205	-1.297320496
06-09-2022	457.75	458.2487483	-0.498748334
07-09-2022	445.850006	448.5739933	-2.723987339
08-09-2022	442.200012	443.0698663	-0.869854308
09-09-2022	445.899994	443.6355867	2.264407312
12-09-2022	451	450.6310999	0.368900143
13-09-	456.799988	456.5733987	0.226589262

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 9 Sep. 2022, pp: 1481-1485 www.ijaem.net ISSN: 2395-5252

2022			
14-09-2022	450.200012	452.1876102	-1.98759817

Fig12. Comparison of predicted and actual closing rate of Tata Motor stock using ANN

V. CONCLUSION

Neural Network is interconnected network that resembles human brain network. Its ability to learn makes it more unique. Neural Network model could be created to help with classifying new data, when presented with training set (form of supervised learning where input and output values are known). From the above obtained results, it is quite obvious that these models are reasonably efficient in recognizing the patterns that exist in the domain of stock market.

REFERENCES

[1] Padmaja Dhenuvakonda1, R. Anandan2, N. Kumar3 "STOCK PRICE PREDICTION USING ARTIFICIAL NEURAL NETWORKS", Journal of Critical Reviews, Vol 7, Issue 11, 2020

[2] Selvamuthu, Dharmaraja, Vineet Kumar, and Abhishek Mishra. "Indian Stock Market Prediction Using Artificial Neural Networks on Tick Data." Financial Innovation 5, no. 1 (2019). https://doi.org/10.1186/s40854-019-0131-7.

[3] Hongping Hu a , Li Tang b , Shuhua Zhang b , Haiyan Wang c, "Predicting the direction of stock markets using optimized neural networks with Google Trends", Elsevier, Neurocomputing, [m5G; January 30, 2018;13:42]

[4] Shashank Tiwari, Akshay Bharadwaj, Dr. Sudha Gupta, "Stock Price Prediction Using Data Analytics" 978-1-5386-3852-1/17/$31.00 ©2017 IEEE

[5] Edwin Sin, Lipo Wang, "Bitcoin Price Prediction Using Ensembles of Neural Networks", International Conference on Natural Computation, Fuzzy Systems and Knowledge Discovery, 2017

[6] Özgür İcan1 & Taha Buğra Çelik1, "Stock Market Prediction Performance of Neural Networks: A Literature Review", International Journal of Economics and Finance; Vol. 9, No. 11; 2017.

[7] Parth Bhasin, Vaishali, "Back Propogation Algorithm: An Artificial Neural Network Approach", International Journal of Engineering Research & Technology (IJERT), Special Issue – 2017

[8] Introduction to soft computing textbook, Samir Roy and Udit Chakraborty.

[9] Shital Solanki, H.B.Jethva , "A review on back propagation algorithms for Feedforward Networks", Global Research Analysis, Volume : 2 | Issue : 1 | Jan 2013 • ISSN No 2277 – 8160

[10] A. Victor Devadoss, T. Antony Alphonnse Ligori, "Forecasting of Stock Prices Using Multi Layer Perceptron", International Journal of Computing Algorithm , Volume: 02, December 2013, Pages: 440-449

[11] A, Adebiyi, Ayodele;, Ayo; K, Charles, Adebiyi; O, Marion, and Otokiti O, Sunday. "Stock Price Prediction Using Neural Network with Hybridized Market Indicators." Journal of Emerging Trends in Computing and Information Sciences 3, no. 1 (2012): 1–9.