IJCSE International Journal of Computer Sciences and Engineering Open Access
Research Paper Vol.-7, Issue-8, Aug 2019 E-ISSN: 2347-2693

The Application of Neural Network in Stock Market (TCS)

Priyanka Garg[1*], Sumit Sharma[2]

[1]Department of Computer Science, VITS, Bhopal, India
[2]Departments of Science and Technology, VITS, Bhopal, India

Corresponding Author: garg.priyanka1909@gmail.com, Tel.: +91-9407324554

DOI: https://doi.org/10.26438/ijcse/v7i8.254259 | Available online at: www.ijcseonline.org

Accepted: 08/Aug/2019, Published: 31/Aug/2019

***Abstract*—** A milestone discovery in the subject of computer science in field of "Artificial Intelligence" to predict the future using Neural Network of Small events or limited variable events having few floating variables plays's an essential role in our project. These variables can be economical as well as political or power shift in variable for predicting stock indices to have accurate prediction. This variable is used in hidden layer at multistage to iterate the value for best outcomes. To overcome such a huge calculation and trained our machine to operate individually to take such decision, we need to develop a neuron-like structure to look every possibility of outcome using "Neural Network". Current demands of rocket trend in stock market for the assessment of health of country market and consumer power along with trust-building on company. In this paper we had implemented our research on TCS-SET's (in Indian Stock Market) using Neural Network. This Research paper support Neural Network as it has fast computational advantage along with handling many variables at a time. The stock market closing is very important as it contributes to national growth, so a cat eye is needed on stock closing price. It also promotes the investor to invest or withdraw their share value from stock market before fall of its value. This unique quest of time and money in trade with computer knowledge help in forecasting of stock market along with Neural Network.

***Keywords*—**Artificial Neural Network, TCS, Stock Market

I. INTRODUCTION

The production of the financial market in stock market is even more challenging for current experience traders, as stock changes so drastically-that if someone see it first, can make huge financial benefit and rest have to face a financial disaster [1]. In this competitive world many formed variety of methods to protect losses from unpredictable stock market and earned lot of money. In a recent year Shanghai stock exchange market a small method backpropagation algorithm was used to predict the stock market using artificial neural network [2]. It's providing statistical information helps the trader to buy hold or sell their shares on a particular day of stock market.

However, the issue of prediction is still queried whether the system is providing an accurate result or deviated result. But neural network promising for future as it operates with multiple layers and hidden layers with large number of variables to solve at instance of time to achieve high accuracy in result with multiple iterations [3]. According to Dr Paul Werbos President of International neural network society at National Science Foundation believe that it is possible to predict the stock market by using variety of information, time frames, random patterns and thinking of behaviour can help traders to take a wise decision to have profit.

In another contrast, the people having knowledge of random walk hypothesis (RWT) have a different opinion [4]. The new belief is that it is not possible to predict random stock market but it is possible to predict the closing price of stock market which does not depend on past history of company only and some nearby value can be predicted. It is pointless to talk about techniques and fundamentals used by machine learning to evaluate correct protecting trends in the stock market.

The prediction of stock indices has been an interesting commercially significant and challenging issue for traders and academicians. The various techniques and concepts come in light of the stock market prediction. However, it depends on quality of information using different models of prediction [5]. There are many uncertain and interrelated factors which affect the stock price depending on time and current projects of stock company. Techniques for foreseeing the financial exchange can be portrayed in 4 gatherings:-

1) Fundamental analysis
2) Technical analysis
3) Time series analysis and
4) Machine learning

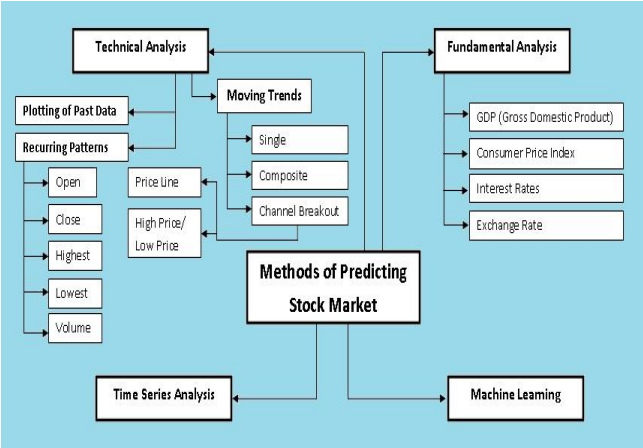


Figure 1: Methods of Predicting Stock Market

1.1 THE NATURE OF STOCK MARKET PREDICTION

The stock market is so complicated and many things can affect the change in a price. Not only financial factors can influence the price of the stock but also news or the general mood can affect the price in many ways, as positive or negative. For instance an adverse comment by Amazon has to look the face dropped stock price in India. If it was possible to model the stock market with a function it would be a complex function that lives in high-dimensional and maybe infinite-dimensional space. Imagine what would happen if someone knew a way to calculate that function, he would be able to make profit by taking advantage of it. However, the nature of the space is so complicated that finding that function is an impossible thing to do. The real challenge is to try and approximate that function using neural-networks in a way that we can earn profit by applying it in the stock market.

1.2 DATA COLLECTION

The first difficulty we had to face was lack of free and accessible data. Although through the internet someone can find numerous historical data that are limited today prices. In order to implement our work we needed the history of all the transactions each day. This type of data is available to public until midnight of each day. To overcome this, we decided to collect the transactions ourselves. We created a script that was collecting all the transactions at the end of each day.

II. RELATED WORK

2.1 Financial Forecasting

2.1.1 Carlos Bousono-Calzon and et.Al [6] had analyzed on the forecasting of a stock market return had become much more challenging nowadays. To overcome this issue we had done an expansion in the availability of advanced data sources, broad markets, financial aspects instrument and designed algorithms. At all condition, the questioning always came to an end on the prediction of the prices. And if it is resolved then the accuracy in prediction arises. Hence to solve this major issue the previous decade's data of some of the indices serving worldwide had been analyzed and then the trading strategies are formulated for the accurate prediction. The gap or free data sources provides an unexpected result. Thus to avoid this, the theoretical framework had been designed to result the better prediction in terms of economic sectors and regions.

2.1.2 Akhter Mohiuddin Rather and et.Al [7] had summarized about the robust and novel hybrid prototype for the prediction in stock returns. These prototypes consist of two linear prototypes and in the linear auto-regressive movable average model and exponential smoothing model and in non-linear recurrent neural network prototype. The non-linear prototype possesses satisfactory prediction as compared to linear prototype- for increasing the accuracy in prediction. The proposed prediction model merges with the prediction based model. Here in this prediction based model where data is non-linear and the patterns it is difficult to capture with the traditional models. In the proposed model the highest degree of accuracy is achieved because of uniqueness in regression model which computes the different data from the original one and also because of the selected regression neural network which is trained through different series. The most vital reason is due to optimization model which minimizes the prediction error. Hence the perfect prediction is seen if all the possible methods get constituted to each other. Thus there is a further research scope in this particular work.

2.1.3 Liang-Ying Wei [8] had demonstrated the hybrid model ANFIS based on empirical mode for stock time series forecasting which is widely used topic as part of research or by various other means. Based on the financial timeline series format the exact price forecasting is quite challenging one. The time series method is the most challenging task because few models cannot be applied to datasets due to absence of statistical assumptions. Another data recorded is consisting of some amount of noise which possesses the forecasting very bad. Then, the rules from the artificial neural networks are not easily understood by any means. As for measuring the forecasting performance the proposed model is compared with another such model. This model helps us to predict accurately from the fluctuating data from the stock market and making it as stable.

2.2 Neural Networks

2.2.1 Konstandinos Chourmouziadis and Prodromos D. Chatzoglou [9] had disserted about the occurrence of complexities in the financial market to carry on the extra effort in the fields of research to exhibits the improved methods of forecasting. In this paper, some of the fuzzy subjective elements implant the previous trading strategy. A motive to identify, whether careful synthesis of a few long-term technical indicators, which have a different predictive

philosophy supporting a design stock trading. The preferred model is tested for multiple times for continuous period of 15 years. After the evaluation it is clear that it can provide better results.

2.2.2 Jigar Patel and et.Al [10] had briefly explained about the use of a fusion of machine learning techniques for predicting the stock index. In this paper the task for prediction of future values of stock market index. Here the two indices from the Indian stock market had been selected for the experimental purpose. The previous data up to a decade were summarized for further predictions. The prediction of the upcoming months was kept in front. It consists of two stages where the primary stage was single network stage and the second stage is all about the merge network stage. Such action results out the formation of prediction model. This result comprises and thus compares with the single network, where each indicator is placed for each prediction models. This entire prototype is possible with the machine learning techniques and due to this the identified gap is bridge out. These predictions will result in profit.

2.2.3 Ruibin Geng and et.Al [11] had abstracted about the prediction of financial risk by using data mining for the empirical study. The study is formulated so to avoid financial losses. Hence before any financial crisis occurrence there must be an appropriate option for the prediction in it so to warn us before the loss. Hence by using the data mining process we had obtained warning models to face the financial crisis. According to our observance we get that neural network is the most appropriate and suitable one as compared to others such networks. The neural network is the fortified network due to its accurate prediction. The research motive is to set up an indicator for the following warning to understand the financial margin. With the help of this prototype the risk is avoided and safety is preferred primarily.

2.2.4 Michel Ballings and et.Al [12] had disserted about the stock price direction prediction by evaluating a number of classifiers. The direction prediction in the stock world is the most critical financial issue. As if there is a minute change over here suddenly it will provide an effective profitable result. As per ensembling methods with a single classifier models shows the benchmark which results the predictions one year further which is totally profit for us. Hence the suitable algorithms must be considered at once and lead for further development. Hence if this will be carried then the financial domain will differ from other such domains.

2.3 Combining Neural Networks and Genetic Algorithms

2.3.1 Pei-Chann Chang and et.Al [13] had provided a Takagi–Sugeno fuzzy model constitute of support vector regression for forecasting the stock trade. The upcoming prediction is done on the basis of past and present performance analysis. In this model, the fluctuation and deflection point of a trading signal is presented. It can precisely predict the as usual stock trading with the help of technical indicators set. We came to understand that the desired prototype doesn't produce only the profit but also switches the stable dynamic identification of the complexities of the stock trade forecasting system. The need for making a decision is included without the human interfere process. Thus the better result is approached with this model as compared to other such models.

2.3.2 Shangkun Deng and et.Al [14] had narrated about the amalgam method of various Kernel Learning and Genetic Algorithm which is utilized for forecasting short-term foreign exchange rates. The designing of such a model is so because there is a need for the construction of trading rules. The model is worn to examine the effectiveness of a financial market price. Hence the forecasting will be profitable and risk-free without a single error while predicting. The trading strategy is assigned to be beneficial during actual trading.

III. METHODOLOGY

3.1 Architecture

We created a 5 layer feed-forward artificial neural network, with three hidden layers, an input layer and an output layer.

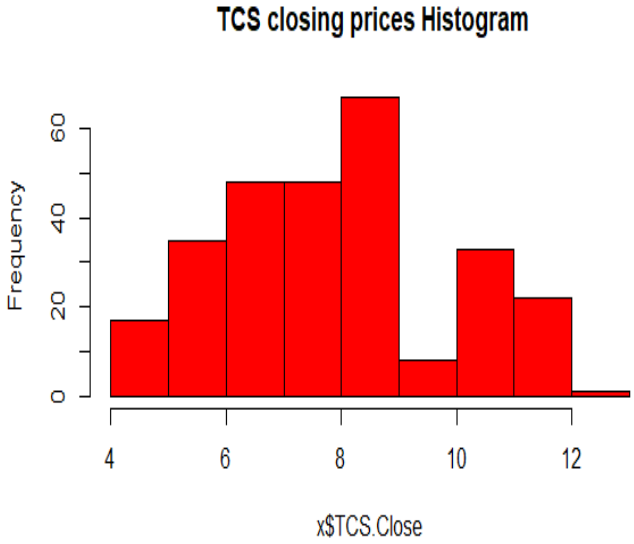
3.1.1 Input Layer

Input layer constitutes of eleven neurons, one for each data point. The input is a vector in the form.

$X_t = (o_t, c_t, h_t, l_t, rsi_t, macd_t, stoc_t, hc_t, lc_t, avg_{tht}, avg_{3ht})$

where,

- o is the opening price
- c is the closing price
- h is the highest price during the time period
- l is the lowest price during the time period
- rsi is the strength relative index
- macd is the mean average convergence divergence
- stoc is the stochastic oscillator
- h_c is the channel of the highest prices
- l_c is the channel of the lowest prices
- avg_{lh} is the last hour average
- avg_{3h} is the last three-hour average
- t is any given 5-min interval



Graph 1: TCS closing price in the stock market

The input is normalized in the interval (-1, 1). The only neuron that can be negative is the MACD data-point.

3.1.2 Hidden Layers

We have three hidden layers. Each hidden layer has various neurons and actuation work. The quantity of neurons in each layer is a hyper-parameter that ought to be enhanced. We utilized comprehensive inquiry utilizing an alternate number of neurons in each layer and concocted an arrangement that gives great outcomes [15]. It is critical to take note of that with likelihood one there is another arrangement that can give better outcomes.

3.1.2.1 First Hidden layer

The first hidden layer consists of 20 neurons and has a hyperbolic tangent (tan h) activation function. The weights that connect the input layer with the first hidden layer are initialized using a random normal distribution. Let x be the input vector and, are the weight matrix and the bias vector respectively. Then the values of the first hidden layer are given by

$$h_1=\tan h\ (\omega'_1.x + b_2)$$

3.1.2.2 Second Hidden layer

The second hidden layer comprises of 8 neurons and has a hyperbolic digression (tan h) enactment work. The loads that associate the info layer with the principal shrouded layer are introduced utilizing an arbitrary typical circulation. Give x a chance to be the information vector and ω1, b1 are the weight lattice and the inclination vector separately. At that point, the estimations of the principal shrouded layer h1 are given by

$$h_2 =\tan h\ (\omega'_2.h_1 + b_2)$$

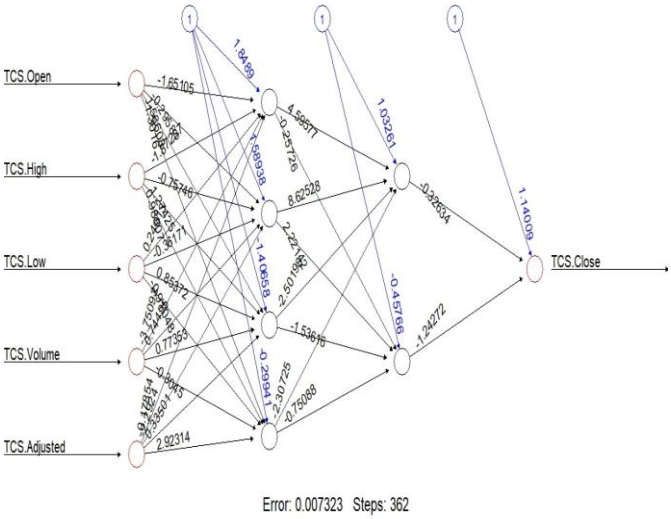


Figure 2: 2 layers of Neural Network

3.1.2.3 Third Hidden layer

The third hidden layer consists of 2 neurons and has a hyperbolic tangent (tan h) activation function. The weights that connect the input layer with the first hidden layer are initialized using a random normal distribution. Let h_2 be the second hidden layer vector and ω_3, b_3 are the weight matrix and the bias vector respectively. Then the values of the third hidden layer are given by

$$h_3 =\tan h\ (\omega'_3.h_2 + b_3)$$

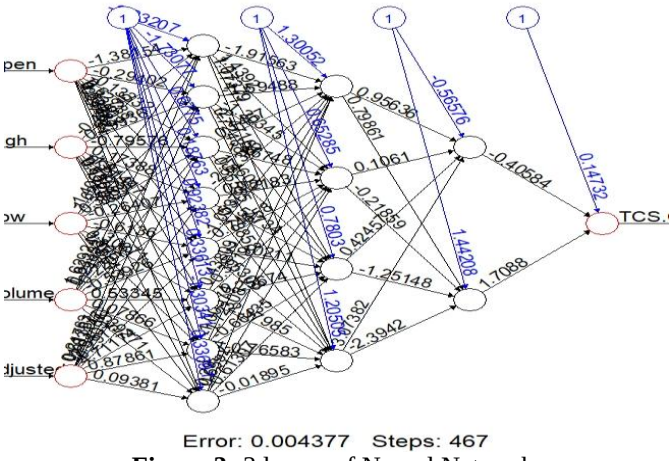


Figure 3: 3 layers of Neural Network

3.3 Output Layer

The output layer has three neurons and each one represents a class. The result is a three-dimensional vector and the dominating dimension is selected to be the class of the data input. Let be the third layer vector and, the weight matrix and bias vector respectively. Then the output neuron value is given by

$$y =\text{sigmoid}\ (\omega'_4.h_3 + b_4)$$

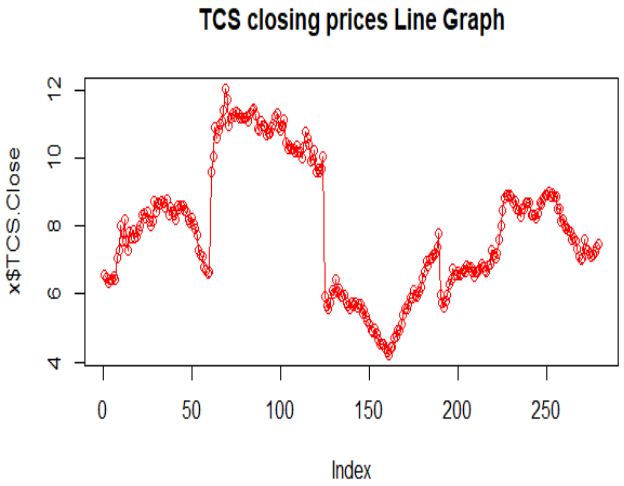
3.3.1 Loss Function
3.3.2 Cross entropy error

Cross Entropy error between two probability distributions is defined in the book "Deep Learning" as follows:
If the distributions p and q are discrete,

$$E(p, q) = -\Sigma (p(x) \log q(x))$$

3.3.3 Train Batches

We input data into the neural network in train batches in order to speed up the training process. The size of the training batch is a hyperparameter we had to optimize [16]. Feeding each data point separately and applying corrections on the neuron connectors every single time is really time-consuming. We can achieve almost the same result many times faster if we apply corrections based on the average error when we pass trough whole batch of data.



Graph 2: TCS closing price in the stock market with a trend

3.3.4 Accuracy

To calculate the accuracy, *A* of our neural network we used the following method [17]. If the class of the data point was the same as the dominating dimension of the out vector then the prediction was correct and the accuracy was set to 1. If the class of the data point was different from the dominating dimension the prediction was wrong and the accuracy was set to 0. The training accuracy is defined as the sums of all the partial accuracy multiply it by 100 to get the percentage and divide it by the total number of data points.

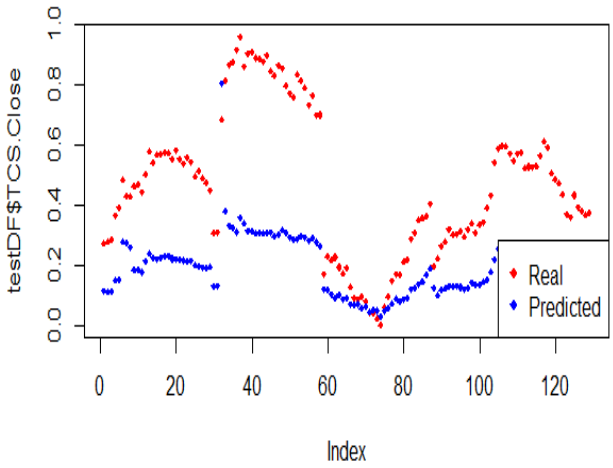
3.4 Regression Feed Forward Artificial Neural Network

We decided to go with a feed-forward artificial neural network solving a regression problem. The basic hypothesis is that the stock price prediction is a high dimensional non-linear function and we tried to approximate it using a simple feed-forward artificial neural network. The details are explained below.

IV. RESULTS AND DISCUSSION

To comprehend the one of a kind normal for the Trend Data, these investigation segments were chosen pointers into gatherings; one gathering that comprises of just global/outer elements (esteem to be factors outside the ability to control of India). In conclusion, this examination additionally explored the utilization of a gating system as a group component which consolidates the aftereffects of the three best neural systems for anticipating the development of the Data SETs. This investigation has tended to the accompanying points:

- To examine the way toward creating NNs that can be utilized to foresee the bearing of developments of the Variable.
- To contrast and with assessing the exhibitions of a neural system prepared to utilize a hereditary calculation with one prepared to utilize a back-proliferation calculation for anticipating the course of developments of the Equation.
- To examine utilizing just worldwide/outer markers, just inside pointers or both limited sets to prepare NNs and to assess and think about the subsequent NNs.
- To accomplish the exactness of more than75% progressively information recreation.



Graph 3: Grouped Data of real vs. Predicted

V. CONCLUSION AND FUTURE SCOPE

We had the option to accompany an approach to effectively anticipate the financial exchange and in the blend, with a decent exchanging procedure we had the option to benefit from stock exchanging utilizing recorded information. The reason we utilized authentic information and not constant information for testing was time proficiency yet additionally the capacity to analyze models and exchanging methodologies utilizing similar testing information. We regarded our chronicled information as ongoing information. We can utilize similar strategies and have the option to

anticipate the stock cost progressively. We can accomplish this by gathering the exchanges progressively and changing over them into 1-Day interims and simply passing them forward to our system, point by point. One of the objectives of this theory was that we ought to have the option to use the securities exchange on constant and every one of the reenactments were done in a way that would make it simple to progress from authentic to ongoing information.

Future Scope

This work is just one endeavour of utilizing a neural system in the expectation of the developments of the obscure variable. More endeavours ought to be done prompting enhancements and fortifications for the consequences of this exploration. A few that perhaps lead to further works include:

1. Stock markets are now and then. This examination utilizes everyday information from July 2018 to June 2019, making out of 250 information focuses which utilize the most punctual 52% for preparing, the 24% for approving and the most recent 24% for testing. To reinforce the arrangement of markers impacting the SET list, applying the distinctive time spans ought to be examined. Likewise, applying various sizes of the information focuses on preparing, approving and testing ought to have occurred.

2. This examination has explored the tuning of a subset of all parameters related to back-spread and hereditary calculation. Further investigation to improve the presentation of neural systems in the SET forecast may include tuning those parameters that have not been researched beforehand.

3. Findings in Chapter 5 are the after-effects of utilizing straightforward gating rules; further examination may concentrate on the utilization complex guidelines just as to investigate different methodologies, for example, utilizing a mix of certain principles and hereditary calculation for improving the presentation of outfit neural systems in the SET forecast.

REFERENCES

[1] S. Lee, D. Enke, and Y. Kim, "A relative value trading system based on a correlation and rough set analysis for the foreign exchange futures market," *Eng. Appl. Artif. Intell.*, vol. 61, no. February, pp. 47–56, 2017.

[2] S. Pyo, J. Lee, M. Cha, and H. Jang, "Predictability of machine learning techniques to forecast the trends of market index prices: Hypothesis testing for the Korean stock markets," *PLoS One*, vol. 12, no. 11, pp. 1–17, 2017.

[3] F. Wang, Y. Zhang, Q. Rao, K. Li, and H. Zhang, "Exploring mutual information-based sentimental analysis with kernel-based extreme learning machine for stock prediction," *Soft Comput.*, vol. 21, no. 12, pp. 3193–3205, 2017.

[4] C. M. Anish and B. Majhi, "Hybrid nonlinear adaptive scheme for stock market prediction using feedback FLANN and factor analysis," *J. Korean Stat. Soc.*, vol. 45, no. 1, pp. 64–76, 2016.

[5] F. Ye, L. Zhang, D. Zhang, H. Fujita, and Z. Gong, "A novel forecasting method based on multi-order fuzzy time series and technical analysis," *Inf. Sci. (Ny).*, vol. 367–368, pp. 41–57, 2016.

[6] C. Bousono-Calzon, J. Bustarviejo-Munoz, P. Aceituno-Aceituno, and J. J. Escudero-Garzas, "On the Economic Significance of Stock Market Prediction and the No Free Lunch Theorem," *IEEE Access*, vol. 7, pp. 75177–75188, 2019.

[7] A. M. Rather, A. Agarwal, and V. N. Sastry, "Recurrent neural network and a hybrid model for prediction of stock returns," *Expert Syst. Appl.*, vol. 42, no. 6, pp. 3234–3241, 2015.

[8] L. Y. Wei, "A hybrid ANFIS model based on empirical mode decomposition for stock time series forecasting," *Appl. Soft Comput. J.*, vol. 42, pp. 368–376, 2016.

[9] K. Chourmouziadis and P. D. Chatzoglou, "An intelligent short term stock trading fuzzy system for assisting investors in portfolio management," *Expert Syst. Appl.*, vol. 43, pp. 298–311, 2016.

[10] J. Patel, S. Shah, P. Thakkar, and K. Kotecha, "Predicting stock and stock price index movement using Trend Deterministic Data Preparation and machine learning techniques," *Expert Syst. Appl.*, vol. 42, no. 1, pp. 259–268, 2015.

[11] R. Geng, I. Bose, and X. Chen, *Prediction of financial distress: An empirical study of listed Chinese companies using data mining*, vol. 241, no. 1. Elsevier B.V., 2015.

[12] M. Ballings, D. Van Den Poel, N. Hespeels, and R. Gryp, "Evaluating multiple classifiers for stock price direction prediction," *Expert Syst. Appl.*, vol. 42, no. 20, pp. 7046–7056, 2015.

[13] P. C. Chang, J. L. Wu, and J. J. Lin, "A Takagi-Sugeno fuzzy model combined with a support vector regression for stock trading forecasting," *Appl. Soft Comput. J.*, vol. 38, pp. 831–842, 2016.

[14] S. Deng, K. Yoshiyama, T. Mitsubuchi, and A. Sakurai, "Hybrid Method of Multiple Kernel Learning and Genetic Algorithm for Forecasting Short-Term Foreign Exchange Rates," *Comput. Econ.*, vol. 45, no. 1, pp. 49–89, 2013.

[15] E. Chong, C. Han, and F. C. Park, "Deep learning networks for stock market analysis and prediction: Methodology, data representations, and case studies," *Expert Syst. Appl.*, vol. 83, pp. 187–205, 2017.

[16] M. Thenmozhi and G. Sarath Chand, "Forecasting stock returns based on information transmission across global markets using support vector machines," *Neural Comput. Appl.*, vol. 27, no. 4, pp. 805–824, 2016.

[17] R. Dash and P. K. Dash, "Efficient stock price prediction using a Self Evolving Recurrent Neuro-Fuzzy Inference System optimized through a Modified technique," *Expert Syst. Appl.*, vol. 52, pp. 75–90, 2016.

