

## Application of Artificial Neural Network for stock market predictions: A review of literature

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**Abstract-** The prevailing Nation in society is that wealth brings comfort and luxury , so it is a challenging and daunting task to find out which is more effective and accurate method for stock rate prediction so that a buy or sell signal can be generated for given stocks. Predicting stock index with traditional time series analysis has proven to be difficult an Artificial Neural network may be suitable for the task. A Neural Network has the ability to extract useful information from large set of data. This paper presents a review of literature application of Artificial Neural Network for stock market predictions and from this literature found that Artificial Neural Network is very useful for predicting world stock markets.

**Key words:** Artificial Neural Network, Stock Index, Prediction

### Introduction

The size of world stock market was estimated at about \$36.6 trillion, US at the beginning of October 2008. The total world derivatives market has been estimated at about \$791 trillion face or nominal value, 11 times the size of the entire world's economy. Bombay Stock Exchange is the oldest stock exchange in Asia with a rich heritage, now spanning three centuries in its 135 years of existence. What is now popularly known as BSE was established as "The Native Share & Stock Brokers' Association" in 1875. BSE is the first stock exchange in the country which obtained permanent recognition (in 1956) from the Government of India under the Securities Contracts (Regulation) Act 1956. BSE is the World's number one exchange in the term of listed companies and the world's numbers 5th in transaction. Stock market is a public market for the trading of company stock & derivatives at an agreed price; these are securities listed on stock exchanges as well as those only traded privately. Predicting the stock market is not a simple task. Different techniques are being used in the trading community for prediction task. In recent years the new concept of the neural networks has emerged one of them. An Artificial Neural Network (ANN) is able to work parallel with input variables and consequently handle large sets of data swiftly. The principal strength with a neural network is its ability to find patterns and irregularities as well as detecting multi-dimensional non-linear connections in data. The latter quality is extremely useful for modeling dynamical systems e.g., stock market.

### History of Neural network

In 1943, W.S.McCulloch and W.Pitts established Neural Network and its mathematical model, which was called MP model then they used MP model to put forward the neuron's formalization mathematical description and network construction method and proved that each single neuron can perform logic function, thereby started a new time of Neural Network research.

During more than 60 years development history, the research of Neural Network can be roughly divided into the following three stages. The initial stage is form the MP model proposed to the 1960s, the main characteristic of this period was to produce the network model and conform the learning algorithm, then in the developing process people met the essence difficulties which resulted from the electronic circuit overlapping limit, the development of neural network entering a low ebb period, since the beginning of the 1980s. Neural Network theory development has entered a golden period. At present Neural Network has several hundreds of network model, as an active , marginal and cross subject , Neural Network has been widely used in stock predictions, pattern recognition , economic management, control and decision making, health and medical community, agriculture and many other fields .

### Neural Network

The foundation of neural networks in a sense begins with biology. The human brain consist of an estimated 10 billion neurons(nerve cells) and 6000 times as many synapses (connections) between them [Haykin 94].14All information taken in by a human is processed and assessed in this part of the body. A Neural Network (NN) is an information processing paradigm that is inspired by the way biological nervous systems, such as the brain, process information. The key element of this paradigm is the novel structure of the information processing system. It is composed of a large number of highly interconnected processing elements (neurons) working in unison to solve specific problems.

### Review of Literature

Youngohc Yoon and George Swales (33) in1991 demonstrated that the neural network approach is capable of learning a function that maps inputs to output and encoding it in magnitudes of the weights in the network connection. And compared Neural Network technique with

Multivariate Discriminant Analysis approach indicated that the Neural Network approach can significantly improve the predictability of stock price performance. F.S.Wong, P.Z.Wang, T.H.Goh, and B.K.Quek(11) in 1992 tried to apply neural gates to forecasting stock market returns, assessing country risk and rating stocks based on fuzzy rules and probabilistic and Boolean data. Lawrence Kryzanowski, Michael Galler, David W, Wright (20) in 1993 determines the Artificial Neural Networks accuracy in predicting future return performance as either positive or negative or as negative neutral or positive. The Artificial neural Network correctly classifies 72% of positive or negative returns. Its accuracy in predicting the three-state outcomes was below this level that could be attained by chance alone. R.Glen Donaldson and Mark Kamstra (28) in 1996 investigate the use of Artificial Neural Networks (ANNs) to combine time series forecasts of stock market volatility from the USA also demonstrate the combining with nonlinear ANNs generally produces forecasts which on the basis of out-of-sample. Ramon Lawrence (27) in 1997 surveyed the application of neural network to financial systems. It demonstrated how neural networks have been used to test the Efficient market Hypothesis and how they outperform statistical and regression techniques in forecasting share prices. Saeed Moshiri and Norman Cameron (29) in 2000 compared the performance of Backpropagation Artificial Neural network (BPN) model with the traditional economic approaches to forecasting the inflation rate and shows that the hybrid BPN models are able to forecast as well as the traditional econometric methods. Angelos Kanas (1) in 2003 extends recent research on non-linear present value models by exploring the relative out-of-sample forecast performance of two parametric models and two nonparametric non-linear models of stock returns. The parametric models considered using the standard regime switching and Markov regime switching, whereas the non-parametric nearest-neighbors and the artificial neural network models. Jeo Jasic and Douglas Wood (17) in 2004 studied the statistical significance and potential profitability of one step ahead forecasts of stock market index returns provided by univariate neural network model is examined. Donn S.Fishbein (6) in 2004, timing the market increases profit potential by avoiding the majority of price action opposite in direction held. Using neural networks with genetic optimization offer a tool that can produce mechanical trading systems that are adaptable to changing market timing. Kyoung-Jae Kim and Won Boo Lee (19) in 2004 studied the Genetic Algorithm based future transformation model (GMT) for Artificial Neural Networks to predict the patterns of the stock market. The GMT discretizes the original continuous data according to optimal or near-

optimal thresholds and calculated that the GMT reduces the dimensionality of feature space and then enhances the generalizability of the classifier from the empirical results. Erdinc Altay and M. Hakan Satman ESQ(9) in 2005, studied the Istanbul Stock exchange can be forecasted through the learning procedure of Artificial Neural Network and compared the forecasting performance of artificial neural network with linear regression and buy and hold strategies'. G.Armano, M.Marchesi and A. Murru (12) in 2005 studied a novel approach to perform stock market forecasting has been presented and described from the conceptual and perspectives using a hybrid genetic neural architecture. Heping Pan, Chandima Tilakaratne and John Yearwood(15) in 2005, investigated several aspects of input feature selection and number of hidden neurons for a practical neural network for predicting Australian stock market index AORD. A basic neural network with limited optimality on these has developed and achieved correctness in directional prediction of 80%. Hyun-Jung Kim, Kyung-shin, and Kyungdo Park (16) in 2005 investigate the effectiveness of a hybrid approach with the time delay neural network (TDNNs) and genetic Algorithm (GAs) in detecting temporal patterns for stock market prediction task and showed that the integrated GA-TDNNs approach proposed for this study performs better than the standard TDNNs and Recurrent Neural Network to reflect temporal pattern. Qing Cao, Karyl B Leggio, Marc J.Schniederjans (26) in 2005 used Artificial Neural Networks to predict stock price movement (i.e. price return) for firms traded on the Shanghai Stock Exchange and compared the predictive power of univariate and multivariate neural network models and results show that Neural Network outperform the linear models compared and these results are statistically significant across our sample firms and indicated neural networks are useful tool for stock price Prediction in emerging markets like China. Takashi Yamashita, Kotaro Hirasawa and Jinglu Hu (31) in 2005 utilized Multi-branch neural networks (MBNNs) for prediction of stock prices and simulation were carried out in order to investigate the accuracy of prediction. The results found that MBNNs with fewer parameters could have better accuracy than conventional NNs when predicting Nikkei-225 at time  $(t + 1)$ . Niall O'Connor and Michael G.Madden (23) in 2006 evaluates the effectiveness of using external indicators such as commodity prices and currency exchange rate in predicting movements in the Dow Jones Industrial Average index and also the performance of each technique is evaluated using different domain specific matrices. Goutam Datta, Pankaj Jha, Arnab Kumar Laha & Neeraj Mohan (13) in 2006, discusses the modeling of the Indian stock market data using Artificial Neural Network and

studied the efficiency of ANN in Bombay stock exchange. Eleni Constantinou, Robert Georgiades, Avo Kazandjian, and Georgios P.Kouretas (7) in 2006, analyses regime switching and Artificial Neural Network in volatility and out-of-sample forecasting of the Cyprus Stock Exchange by using daily data. Lev Blynski and Alex Faseruk (21) in 2006 studied and forecast option prices with simple backpropagation neural network and to compare the results between conventional Black-Scholes model, the Black-Scholes model with pure implied volatility and neural network models over a seven year period. Chakaradhara panda and V.Narasimahan (5) in 2006 used the Artificial Neural Network for the forecasting of daily Bombay Stock Exchange (BSE) Sensitive Index (Sensex) returns and compare the performance of the neural network with performances of random walk and linear autoregressive models by using six performance measures. Xun Liang (32) in 2006 studied the complicated association of stock information stream with stock price movement and based on the stock information entropy, the intensity for stock information stream was measured and applied to associating with the stock price movement with the aid of neural networks. Olivier Coupelon (24) in 2007 proposes the modeling process of artificial neural Network in stock movement prediction and studied the problems that can be encountered have been dealt with, which should lead to a good financial forecast. Jinyuan Shen, Huaiyu Fan, and Shengjiang Chang (18) in 2007, tapped delay neural network (TDNN) with an adaptive learning and pruning algorithm was proposed to predict the nonlinear time serial stock indexes, The Simulation and comparison shows that this optimized neuron network model can not only reduce the calculating complexity greatly but also improved the prediction precision. Asif Ullah Khan, T.K.Bandopadhyaya and Sudhir Sharma (2) in 2008, compared a Backpropagation neural network and Genetic algorithm based backpropagation neural network and showed that for stock rate prediction Genetic algorithm based backpropagation neural network gives more accurate prediction. Birol Yildiz, Abdullah Yalama & Metin Coskun (3) in 2008 developed an efficient three layer Neural Network with revised Back propagation Algorithm to predict the direction of Istanbul Stock Exchange National-100 Indices (ISE National -100) and as a result, the model forecast and direction of ISE National -100 to an accuracy of 74.51%. S.D.Bekiros and D.A.Georgoutsos (30) in 2008, investigates the profitability of a trading strategy based on recurrent neural network that attempts to predict the direction of change of the market in the case of the NASDAQ composite index. Erkam Guresen and Gulgun Kayakutlu (10) in 2008 evaluated the effectiveness of neural network

models, Recurrent Neural Network (RNN), Dynamic Artificial Neural Network (DANN), and the hybrid neural networks which use Generalized Autoregressive Conditional Heteroscedasticity (GRACH) and Exponential Generalized Autoregressive Conditional Heteroscedasticity (EGRACH) to extract new input variables and the comparison of each model was done in two viewpoints MSE and MAD using real exchange daily rate values of Istanbul Stock Exchange (ISE) index XU10. C.D.TilaKaratne, M.A.Mammadov and S.A.Morris (4) in 2009 studied modified neural network algorithms to predict whether it is best to buy, hold or sell shares of stock market indices. E.L. de Faria, Marcelo P. Albuquerque, J.L. Gonzalez, J.T.P. Cavalcante and Marcio P. Albuquerque (8) in 2009 performs a predictive study of the principal index of the Brazilian stock market through artificial neural networks and the adaptive exponential smoothing method, respectively and compare the forecasting performance of both methods on this market index, and in particular, to evaluate the accuracy of both methods to predict the sign of the market returns. Also the influence on the results of some parameters associated to both methods is studied. Qing Cao, Mark E. Parry and Karyl B. Leggio (25) in 2009 examined the predictive ability of several well-established forecasting models, including dynamic versions of a single factor CAPM – based model and Fama and French's three-factor model, compared these models with artificial neural network (ANN) models that contains the same predictor variables but relaxes the assumptions of model linearity. And find no statistical difference in the forecasting accuracy of CAPM and three factor model and also found that neural networks may be a useful tool for stock price prediction in emerging markets. Monica Isfan, Rui Menezes and Diana A.Mendes (22) in 2010 shows that the Neural Network can be used to uncover the nonlinearity that exists in the financial data, And compared the artificial neural network model with a traditional approach by analyzing the discriministic /stochastic characteristics of the Portuguese Stock market data.

### Conclusion

In this review of literature tried to sum up the application of Artificial Neural Network for predicting stock market. In the World Predicting stock market index is a difficult task. But Artificial Neural Network having ability to predict stock index. This is new emerging field there is considerably large scope to use Artificial Neural Network for predicting more accurate stock index as well as predict whether it is best to buy or hold or sell shares of stock market.

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