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Survey of Stock Price Volatility and Forecasting using Neural Network Technique

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Abstract: -*In finance, a technique for analyzing securities is known as technical analysis. It looks at previous market facts, primarily cost and amount, to forecast price fluctuations. This strategy makes use of charts as well as a number of procedures for identifying samples that direct further action. Technical analysts use this phenomenon to predict future market outcomes based on previous share and market behavior. However, since technical analysis is subjective, it is possible for our own prejudices to show up in the analysis. Statistical approaches are applied, such as the exponential moving average. By examining the fundamental aspects that take into account a country's wealth, trade, and organizations, fundamental analysis is used to determine the essential value of securities. Fundamental analysts strive to gain a great deal of knowledge in order to appraise securities, which include macro financial factors (similar to the overall financial system and industry situations) and company-specific aspects (similar to financial state and organization).The early stage of the share market was very familiar for average investor. Now the markets are wide enough to invest. There are different markets like bond market, forex market, derivative market and other specialty markets.Analysis of the stock price we take the price. By using the artificial neural network, we develop a model within the neural network, we use a recurrent neural network that remembers each and each information through time.*

Keywords: -Neural Network, Stock Market, Price Volatility

I. INTRODUCTION

One indicator of a nation's economic success is stock market growth. Because of the potential investment returns, accurate share market prediction is a crucial topic in the fields of commerce, mathematics, engineering, finance, and science [1]. On the other side, it gives shareholders a helping hand in making pertinent, wise decisions. Particularly, those directly involved in the stock market may avoid unpleasant surprises. In order to achieve financial stability in India, proper and acceptable speculative activity may offer significant and valuable information. Due to its greater level of volatility and uncertainty, the stock market is infamously difficult to forecast. Compared to other speculating regions, it is riskier. This is the reason why it is so difficult to get accurate predictions the share prices. To predict the stock market accurately, artificial neural networks, a soft computing technology, can be used. Neural networks offer a variety of capabilities as a tool for data analysis and a comparatively effective implementation approach in relation to computation speed and memory usage. An ANN model reveals non-linear and complex correlations without putting certain assumptions in place about sample distribution, and it is capable of recognizing new samples even though they weren't part of the training set [2, 3]. Because of their distinctive characteristics, artificial neural networks hold great promise for use in prediction problems. Since ANNare general function approximations, they may determine how the inputs and outputs of an arrangement are connected, even if the relationship appears to be exceedingly complicated.

- Multilayered Perceptron Neural Networks have been shown to be able to approximate any complicated continuous function, It enables them to receive training on any intricate relationship between system input and production. This characteristic of ANNs is referred to as generic function approximation.
- Even if fresh samples are not in the training set, ANN can nevertheless recognize them. This is regarded as a neural network's capacity for generalization.

The main uses of ANN also known as artificial neural networks are pattern recognition, classification, and differentiation from the vast amount of available data. Share market forecasting has long been a popular subject of study. The “Efficient Market Hypothesis” and the “Random Walk Hypothesis” are two of the most prevalent ideas. According to the Random Walk Hypothesis, stock prices are determined independently of previous prices. According to the Efficient Market Hypothesis, prices are fully and instantly changed as soon as new information becomes available, and the market accurately reflects all freely available information. If this is the case, then there should be no value in making predictions because the market will respond and make up for any decisions made based on the information available.

II. RELATED WORK

ShravanRaviraj et al. [1], protections trades structure the greatest streets of interest in India essentially through two stock exchanges: BSE and NSE. Analysts and monetary patrons examine various factors and endeavor to expect the examples in stock costs in these exchanges. Being unquestionably flighty in nature, share esteem gauge is a truly muddled task. No matter what the flood of data, development has not had the choice to finish right assumptions up to an ideal precision as a rule. The new upgrades in significant learning development have exhibited to be a useful resource in dealing with the accuracy of conjectures. The proposed significant learning based assumption computations use Intermittent Brain Organization, Long Momentary Memory and Gated Repetitive Unit over an extended time series data gained on the web. The made computations anticipate the examples five days early. The results of the assumption on stocks from various endeavors are explored to decide significant encounters.

J. J. Duarte et al. [2], market individuals use a wide game plan of information before they decide to place assets into risk assets, similar to stocks. Monetary sponsor consistently follow the news to accumulate the information that will help them with picking which methodology to follow. In this survey, we analyze how public news and recorded expenses can be used together to expect and hinder financial setbacks on the Brazilian protections trade. We recall a wide plan of 64 insurances for our assessment, which address various region of the Brazilian economy. Our assessment takes a gander at the standard Purchase and Hold and the moving ordinary frameworks to a couple of preliminaries arranged with 11 computer based intelligence computations. We explore everyday, step by step and month to month time horizons for both dissemination and bring windows back. With this approach we had the choice to review the main game plan of data for monetary benefactor's decision, and to choose for how long the information stays appropriate to the market. We noticed a strong association between news conveyances and stock expense changes in Brazil, suggesting even transient trade astounding entryways. The survey shows that it is plausible to expect stock expense falls including a lot of data in Portuguese, and that text mining-based approaches can overcome regular procedures while deciding hardships.

Andrea Bucci et al. [3], accurately determining multivariate volatility plays a key role for the financial industry. The Cholesky geometric brain network presented here offers a double advantage in this respect: on the one hand, the use of Cholesky damping guarantees a positive unique number. On the other hand, running an artificial brain network can determine nonlinear relationships without specific distribution assumptions. Tests outside the field have shown that the artificial brain network cannot clearly win against competing models. However, compared to existing econometric models, long-term memory-based cognitive networks such as nonlinear autoregressive model processes with exogenous inputs and long short-term memory show improved prediction accuracy.

Sarat Chandra Nayak et al. [4], extreme Learning Machine (ELM) considers faster learning and preferential speculative execution than traditional bias-based learning. However**,** irregular selection and the need for additional secret neurons can lead to non-ideal weights and slopes being considered, negatively impacting the usability of the network. Moreover, determining the ideal number of hidden nodes in the network typically requires extensive human intervention, which can lead to suboptimal situations. In this unique case, Composite Response Optimization (CRO) is a metaheuristic worldview that has achieved scalable results in a vast number of application fields. This is explained by its faster assembly capabilities, which require fewer customizable bounds. This work advances a learning structure that combines the advantages of ELM and CRO, called Extreme Learning with Composite Response Optimization (ELCRO). ELCRO simultaneously improves the weights and predisposition vectors, as well as the number of stored neurons in a single-layer feedforward brain network, without compromising the prediction accuracy. We evaluate its performance by predicting daily volatility and closing cost for the BSE dataset. Furthermore, its performance is compared with three other similarly developed models (ELM based on molecular swarm evolution, genetic algorithm, and gradient descent), and we find that the proposed algorithm outperforms. We then perform Wilcoxon labeling and Diebold-Mariano test to confirm the statistical significance of the proposed model. Therefore, this model can be used as a promising financial evaluation tool.

Andres Vidal et al. [5], forecasting the volatility of different types of funds is one of the more mathematically complex tasks in time series forecasting, mainly due to their noisy, non-stationary and heteroscedastic structure. On the other hand, gold is a particularly important commodity to support and enhance investment portfolios, so forecasting the future volatility of this asset is crucial. By combining two deep learning approaches, the goal of this paper is to significantly improve gold volatility forecasting. A LSTM is added to a convolutional brain system (specifically, a pre-built VGG16 system). It is important to note that these hybrid architectures have never been used for time series forecasting, so they are a completely new way to solve such problems. The CNN-LSTM mixture model is able to incorporate images as data, providing a wide range of data related to both static and dynamic characteristics of the series. In parallel, different lags in the productivity of the series are given as input, allowing it to learn from the time structure. When comparing this mixture model with GARCH and LSTM models, the results show significant

improvements: the MSE is reduced by 37% compared to the traditional GARCH model and 18% compared to the LSTM model. Finally, the model certainty model (MCS) shows a significant improvement in the predictions of the mixture model. The central importance of this study is the use of different types of designs suitable for handling different data sources in any time series forecasting task.

Jia Zhai, Yi Cao et al. [6], volatility forecasting, a central topic in financial econometrics, has been attracting increasing attention in the data science literature as advances in computing allow the development of models with greater measurement accuracy. In this article, we draw on two strands of literature to develop a new two-part volatility model: known volatility is divided into long-term and short-term parts by a nonparametric channel, which are represented by an artificial brain organization and an ARMA cycle, respectively. An out-of-sample evaluation of volatility forecasts generated by our model and proven alternatives is performed using intraday data of four major exchange rates and the Chinese stock price index. Experimental results show that our model outperforms alternative models across all measurable dimensions and various forecasting periods. Moreover, the volatility figures of the model proposal increase up to the mean difference utility investors with higher portfolio returns and Sharpe ratios.

Omer Berat Sezer et al. [7], financial time series forecasting is undoubtedly the first choice of computational information technology for financial scholars both in academia and finance due to its wide performance range and large impact. AI (ML) researchers have created numerous models and numerous studies have been published in this regard. In this regard, there are many reviews covering the focus of ML in financial time series forecasting. Recently, deep learning (DL) models have emerged in this field, achieving results far beyond traditional ML models. Although there is a growing interest in developing financial time series forecasting models, there is a lack of reviews focusing only on DL for finance. Therefore, the aim of this work is to provide a comprehensive literature review of DL studies for implementing financial time series forecasting. We sorted the studies by expected forecasting execution domain, such as files, foreign exchange, and product ratings, as well as based on the choice of DL model, such as convolutional brain organization (CNN), deep belief organization (DBN), and long-term temporal memory (LSTM) were collected. We also tried to predict the future of the field by highlighting potential challenges and valuable opportunities for interested scientists.

G. Ding et al. [8], the securities market have attracted a great deal of attention from investors. It has always been a problem for investors and investment companies to understand the frequency of changes in the securities market and predict their trends. Currently, there are many strategies for predicting stock prices. There are basically two types of prediction methods: fact-based strategies and artificial thinking methods. Fact-based strategies include computed iterative models, curve models, etc. Artificial thinking techniques include multi-faceted perceptrons, convolutional brain systems, Gabriel Bayesian systems, backspread systems, single-layer LSTMs, support vector machines, iterative brain systems, etc. However, these analyses only predict a single value. To predict different values with a single model, it is necessary to develop a model that can handle multiple data sources while providing different related outcome values. For this purpose, an associated intermittent deep brain network model is proposed with different outcomes based on multiple data sources and long-term temporary\ memory configurations. The associated organization model can simultaneously predict the initial value, minimum price, and maximum price of a stock. The associated organization model was compared with the LSTM network model and the deep intermittent brain network model. Experimental results show that the associated model is more accurate than the other two models in predicting multiple values simultaneously with an accuracy of over 95%.

Problem Formulation

Shares market prediction is the technique of attempting to anticipate the future value of a company's shares or similar financial instrument traded on an exchange, according to Wikipedia. Huge profits could be made by accurately predicting how the price index of security market would change. To predict future price trends, investors need be aware of their present investment expenses, acquisition goals, and potential future selling prices. Despite this, shareholders constantly monitor share prices throughout time to form their next investing opinions. While some investors avoid falling shares out of concern that they will continue to deteriorate, many investors avoid buying shares that are growing quickly because they are expected to alter quickly.

III. NEURAL NETWORK

The MP model, a mathematical representation of the neural network, was developed in 1943 by W. Pitts and W. S. Mcculloch. A mathematical model called an artificial neural network that replicates how the human brain learns and makes decisions. Networks of synthetic neurons called ANNs work together to solve certain problems. A neuron is the essential unit of a neurological system like the brain. Any neuron operates by receiving impulses from other neurons during these connections, known as synapses. An arrangement pertaining to such signals will take effect when the neuron fires, which implies transfer a signal to other neurons associated to it, when an ensured threshold or activation degree is exceptionally high. Every neuron has a soma, which is its physical structure. The cell nucleus, a number of biochemical components and other elements that support current motion are all included in this soma. Dendrites

encircle the soma, and different neurons are linked to one another by these dendrites. The purpose of these dendrites is to receive messages from other neurons. Every time a neuron fires, it produces an electrical pulse. The aforementioned pulse begins at the base, or hillock, of an extensive cellular growth known as an axon. An axon eventually splits into a number of button-like stubs. Artificial neural networks are based on the biological neural network seen in the human brain. While a non-natural neuron disperses information or data over a network and retains it as weighted interconnections, a biological neuron retains knowledge in a memory bank.

IV. METHODOLOGY

There are several advantages to artificial neural networks. The first is the "capability of learning," which refers to the system's ability to learn from examples and the potential for generalization—that is, to produce an output that is adequate for previously hidden input data, which is essential for forecasting tasks like currency exchange rates, weather, stock prices, and medical research findings, among other things. The input sequence contains missing or low-quality data, which causes the network to continuously sustain [122]. The non-linear property of neural networks is another valuable attribute. Since neural networks are currently a very useful tool in many fields of science and industry, understanding their architecture, methods of use, and functioning is unquestionably beneficial. Neural networks also have the capacity to extract definition from complicated or ambiguous data. This may be used to detect directions and infer patterns that are extremely difficult for computers and people to discover. Additionally, ANNs are capable of processing large amounts of data at once. Fault tolerance is one more benefit of neural networks.

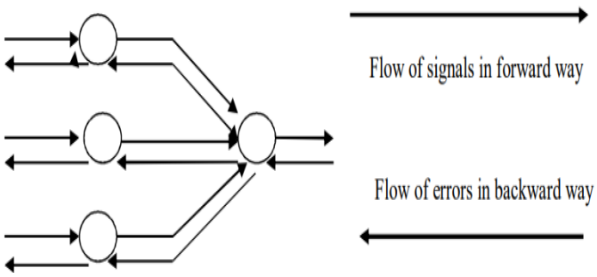

Fig. 1: ML ANN

The main advantage of a neural network is that it may be adjusted to compensate for abnormalities in the input variables and their latent learning potential. An ANN's parallel structure, which is advantageous for fast calculation and response times, makes it suitable for real-time systems.

V. CONCLUSION

Regarding business and industry, the stock market holds significant importance. The stock market can provide financial support for a company looking to expand. It's a well-known exchange where buyers and sellers may exchange publicly listed company stocks. Anyone may always put their shares for sale on the stock market and make money off of their investments. As a result, stocks are referred to as liquid assets and encourage buyers to visit the stock market. The stock market's success is a reflection of the general mood. Uncertainty at the national level, such as political shifts, natural disasters, conflicts, or uncertainty at the international level, may limit stock market values. Lastly, the stock market and the various businesses that are associated with it provide a large number of employments. Because the stock market is so vital to the country's economy, regulation of it is quite significant.

REFERENCES

[1] ShravanRaviraj, ManoharaPai M M. and Krithika M Pai, “Share price prediction of Indian Stock Markets using time series data - A Deep Learning Approach”, IEEE Mysore Sub Section International Conference (MysuruCon), IEEE 2021.

[2] J. J. Duarte S. M. Gonzalez and J. C. Cruz "Predicting stock price falls using news data: Evidence from the brazilian market" Computational Economics vol. 57 no. 1 pp. 311-340 2021.

[3] G. Ding and L. Qin "Study on the prediction of stock price based on the associated network model of lstm" International Journal of Machine Learning and Cybernetics vol. 11 no. 6 pp. 1307-1317 2020.

[4] S. T. Z. De Pauli M. Kleina and W. H. Bonat "Comparing artificial neural network architectures for brazilian stock market prediction" Annals of Data Science vol. 7 no. 4 pp. 613-628 2020.

[5] L. Qi M. Khushi and J. Poon "Event-driven lstm for forex price prediction" 2020 IEEE Asia-Pacific Conference on Computer Science and Data Engineering (CSDE) pp. 1-6 2020.

[6] D. Wu X. Wang J. Su B. Tang and S. Wu "A labeling method for financial time series prediction based on trends" Entropy vol. 22 no. 10 pp. 1162 2020.

[7] Zhihao PENG, “Stocks Analysis and Prediction Using Big Data Analytics”, International Conference on Intelligent Transportation, Big Data & Smart City (ICITBS), IEEE 2019.

[8] A. Site D. Birant and Z. Isik "Stock market forecasting using machine learning models" 2019 Innovations in Intelligent Systems and Applications Conference (ASYU) pp. 1-6 2019.

[9] A. Dingli and K. S. Fournier "Financial time series forecasting-a machine learning approach" Machine Learning and Applications: An International Journal vol. 4 no. 1/2 pp. 3 2017.

[10] L. Qi M. Khushi and J. Poon "Event-driven lstm for forex price prediction" 2020 IEEE Asia-Pacific Conference on Computer Science and Data Engineering (CSDE) pp. 1-6 2020.

[11] A. J. Balaji D. H. Ram and B. B. Nair "Applicability of deep learning models for stock price forecasting an empirical study on bankex data" Procedia computer science vol. 143 pp. 947-953 2018.

[12] D. Wu X. Wang J. Su B. Tang and S. Wu "A labeling method for financial time series prediction based on trends" Entropy vol. 22 no. 10 pp. 1162 2020.

[13] M. Vijh D. Chandola V. A. Tikkiwal and A. Kumar "Stock closing price prediction using machine learning techniques" Procedia Computer Science vol. 167 pp. 599-606 2020.
[14] M. Suzgun Y. Belinkov and S. M. ShieberOn evaluating the generalization of lstm models in formal languages 2018.