

STOCK MARKET PREDICTION USING ARIMA AND MACHINE LEARNING

¹Sakshi G. Gade, ²Dr. S. F. Sayyad

¹Student, ²Associate Professor

AISSM College of Engineering, Pune (Affiliated to Savitribai Phule Pune University)

Abstract- Forecasting the stock market using ML and ARIMA. In the dynamic and intricate system (Creation of complex system) of financial markets, and the process of selling and buying is done through the brokers, derivatives, currencies, and stocks. This market offers investors the chance to earn money and live a happy life with a small initial investment, compared to the risks of starting a new business or the need for a high-paying career. However, human-assessed risk strategies and security measures are necessary for evaluating and controlling machine learning performance. Predicting stock prices using ARIMA and machine learning methods is necessary for this project. Stock prices can be predicted with the ARIMA ease and with the help of machine learning. This paper contains a variety of work done on the review paper using various learning strategies. ARIMA and the built-in machine learning stand out the most. Information that does not match the algorithm is erased by Oblivion Gate, leaving only information that does. Rules make it possible to select information as soon as it enters the network. A singular network structure is formed by three gate structures.

Keywords: ARIMA, Machine learning, Stock exchange analysis, Money exchange,

INTRODUCTION:

The paper is on stock market prediction through ML and ARIMA. People can buy and sell stocks, currencies, derivatives, and stocks through broker-supported virtual platforms on financial markets, which are dynamic and complex systems. Compared to new business risk or needing a high-paying career, this market offers investors the chance to make money and live a happy life with a low initial investment. But evaluating and controlling machine learning performance necessitates applying human-judged risk strategies and security measures. Time series forecasting is a common method used in real-world applications, like forecasting the weather and the financial market. Utilization of the information present in the paper is to introduce the forecasting of the stock market. Numerous factors contribute to high volatility and uncertainty in stock markets. ARIMA and machine learning methods are used to predict stock prices in this project. The goal is to make accurate and more informed investment decisions by making stock price predictions. This paper contains various works that are done in the review paper with different learning methods. Mainly involvement of machine learning and ARIMA will be noticed.

LITERATURE REVIEW:

Prediction of the stock market using Machine Learning

According to Poongodi, *et al.* (2020), an attempt to estimate the value of stocks or financial instruments traded on an exchange of finance in the future is known as a stock market forecast. Python is the programming language used to use machine learning to predict over stock market. How to use machine learning to predict stocks is explained in this article. In this regard, this study makes use of a ML technique known as “Support Vector Machines (SVM)” to predict the daily and latest frequency prices of stocks with large and small market caps in three distinct markets [7]. The majority of stockbrokers use time series analysis, also known as technical and fundamental analysis when forecasting stock prices. This whitepaper proposes an AI (ML) move that trains and concentrates data from accessible stock information and utilizes the obtained information to make exact forecasts.

Forecasting the Index of stock market Using AI

According to Sudha, *et al.* (2022) Predicting the financial systems is a difficult task because of its fundamental complexities. This effort employed Artificial Intelligence techniques to model and forecast the aim of modeling and forecasting prospective values of financial industry indexes. Three artificial intelligence (AI) techniques “neural networks (NN)”, and support vector machines—are purposefully utilized to forecast future values of financial industry indicators depending on previous price information. [9]. As a result, the market is unpredictable because it behaves like a random walk. Two of his methods are used to evaluate AI strategies: the random walk (RW) method and the linear modeling technique known as the autoregressive moving average (ARMA). The data used in this experiment came from “Johannesburg Stock Exchange”. Linear models were outperformed by all three artificial intelligence methods. Nevertheless, a random walk method performed better than any other method. Rare data used in this experiment came from the “Johannesburg Stock Exchange”. An assortment of “Share Index” closing prices serves as the basis for the raw data. The demonstrated outcomes are the way that the three strategies could anticipate the future cost of the list with sensible exactness.

Stock market prediction in India, using ANN

According to Hiransha, *et al.* (2018), many individuals are by implication or straightforwardly engaged in this field. Consequently, it is essential to comprehend market trends. As a result, stock price forecasting has grown in popularity as the stock market has grown. An online platform for trading stocks of the company and derivatives at agreed-upon prices is known as an exchange [8].

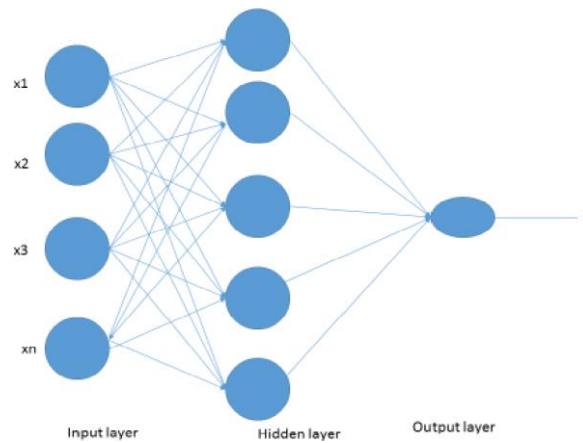


Figure 1: Prediction of Indian stock market

(Source: <https://d3i71xaburhd42.cloudfront.net>)

The figure is about stock price forecasting is challenging due to the dynamic nature of the market and its susceptibility to sudden changes. Stock m's previous work has shown that effective methods for learning event representations that can capture semantic and syntactic information about text corpora are possible and that these methods can be used for tasks like script event prediction in the future [4]. The stock market is determined by stock demand and supply. One of the most rapidly developing sectors in any nation is the stock market. Today, a lot of people are involved in this field either indirectly or directly.

Stock marketing analysis using ARIMA

According to Dhyani, *et al.* (2020), RNNs have the ability to comprehend temporal dependencies. Cells further enhance long-term predictive properties. Optimizing a portfolio necessitates knowing how two assets' price correlations will change over time. Additionally, ARIMA models are utilized to incorporate nonlinearity and linearity into the model. The ARIMA model channels out straight patterns in the information and passes the residuals to the model [1]. The ARIMA model outperforms all other financial models in our empirical study in terms of predictive power. Traditional predictive financial models like full history models, constant correlation models, single index models, and multi-group models are contrasted with ARIMA hybrid models [10]. According to research, the author ought to take into account the ARIMA model for portfolio optimization correlation coefficient prediction.

METHODOLOGY:

Multilayer perceptron's, convolutional neural networks, naive Bayes networks, backpropagation networks, single-layer LSTMs, support vector machines, and recurrent neural networks are all examples of artificial intelligence techniques. Author's two main categories of forecasting methods are as follows: techniques for artificial intelligence and statistics (Ghosh, *et al.* 2019). Models such as ARCH and logistic regression are examples of statistical techniques. Oblivion Gate forgets information that does not match the algorithm, leaving behind only information that does. Rules allow information to be selected once it enters the network. Three "gate" structures make up the unique network structure [6]. The forget gate, input gate, and the output gate are the three gates in the LSTM unit. This document's experimental data are actual historical records downloaded from the Internet.

Algorithm 1: LMS

Input:
 x : input vector
 d : desired vector
 μ : learning rate
 N : filter order

Output:
 y : filter response
 e : filter error

begin
 $M = size(x)$;
 $x_n(0) = w_n(0) = [0 \ 0 \ \dots \ 0]^T$;
while $n < M$ **do**
 $x_{n+1} = [x(n); x_n(1 : N)]$;
 $y(n) = w_n^H * x_n$;
 $e(n) = d(n) - y(n)$;
 $w_{n+1} = w_n + 2\mu e(n)x_n$;
end
end

Figure 2: Algorithm of LMS

(Source: Dhyani, *et al.* 2020)

LMS is used to demonstrate that linear algorithms can be used to make accurate stock market predictions because the internet always presents nonlinear approaches [11]. The typical test on both linear and nonlinear algorithms because it is not always possible if a problem can be effectively solved using a linear approach [referred to Appendix 1].

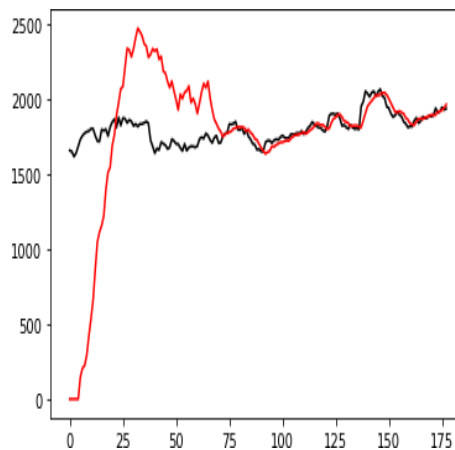


Figure 3: Result of LMS
(Source: Hiransha, et al 2018)

DESIGN

This section includes many designs (sequence diagram, collaboration diagram) that are used in this assignment. Some of the design and structure are discussed with their designs.

Sequence Diagram

Software developers and Business professionals have used this type of design or diagrams. These diagrams are used by the developers to understand the basic requirements of the system that is new and the documents that are existing, procedures [12]. Because Figure 4 shows how a group of objects interact with one another and in a diagram of the sequence. This diagram is under the type of diagram that is integrated.

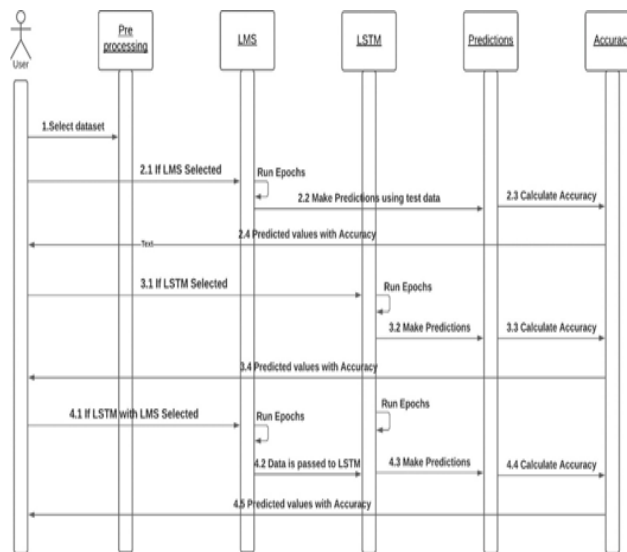


Figure 4: Execution based on model selection
(Source: Sudha, et al. 2022)

Collaboration Diagram

Specific Indian stock market cases have their own behavior, these kinds of behaviors or a portion of the case that is used can be depicted using collaboration diagrams, which show the nature of what is carried out by the objects. These are the essential wellsprings of data for deciding class liabilities and connection points [5]. Coordinated efforts are utilized when showing connections between objects is fundamental. Designer collaboration is used to clarify the importance of the aspects that also need to define the roles that drive the specific event flow of the case that is used, along with sequence diagrams. The information is represented in very different ways in collaboration diagrams and sequence diagrams, respectively [referred to Appendix 2].

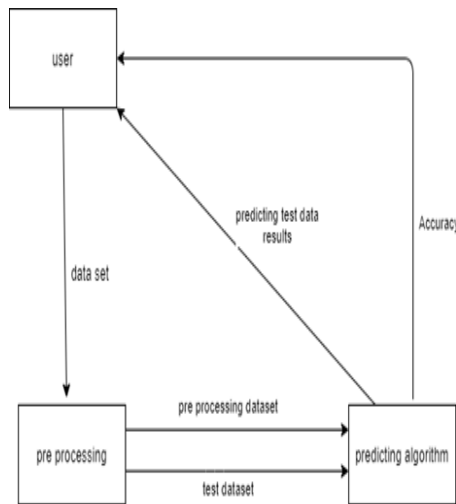


Figure 5: Data transfer between modules (Source: provided)

EXPERIMENT ANALYSIS

The testing portion of the first portion of the training phase takes about 10 to 15 minutes [7]. The process of making a prediction and determining its accuracy only takes a few seconds.

Sample input and outputs

Google

Attribute Name	Min	Max
Open	87.74	1005.49
Low	86.37	996.62
High	89.29	1008.61
Close	87.58	1004.28

Table 1: Google Dataset

Nifty50

Attribute Name	Min	Max
Open	7735.15	12932.5
Low	7511.1	12819.35
High	8036.95	12948.85
Close	7610.25	12938.25

Table 2: Nifty50 Dataset

Reliance

Attribute Name	Min	Max
Open	205.5	3298.0
Low	197.15	3141.3
High	219.5	3298.0
Close	203.2	3220.85

Table 3: Reliance Dataset

Sample Input:

	Trade High	Trade Low	Trade Open	Trade Volume	Trade Count
0	214.23	214.14	214.15	1022241	2274
1	214.38	214.14	214.15	582984	1902
2	214.37	214.18	214.37	705964	1943
3	214.30	214.16	214.29	430066	1321
4	214.20	214.09	214.18	444761	1599

Table 4: Sample input

Time series forecasting is a common technique that is utilized in numerous real-world applications, such as weather and financial market forecasting. To anticipate the subsequent unit time result, make use of constant information over some unspecified time period [2]. Stock markets' high volatility and uncertainty are caused by a variety of factors. Automated trading systems that make use of computer programs can do a better job of submitting orders than humans, but humans can still take orders and send them to the market. In this project, it is necessary to use ARIMA and machine learning techniques to forecast stock prices [1]. Machine learning makes it simple to make stock price predictions.

CONCLUSION:

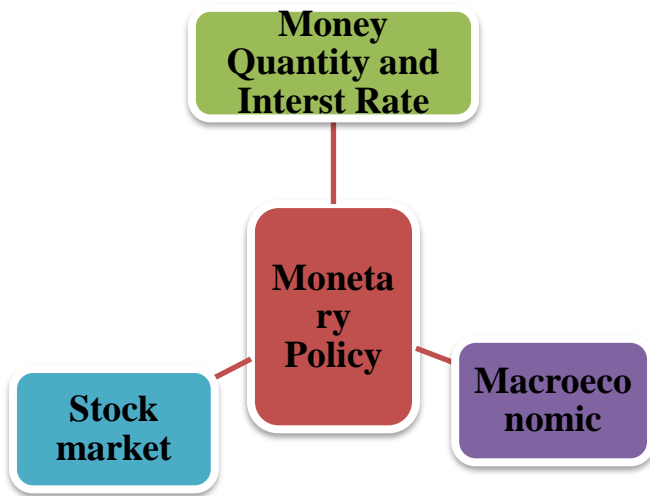
Analysis and experiments are easier after the involvement of machine learning and ARIMA. This learning and analytical tool will help the Review paper. Implementation of methods makes the analysis effective. This review paper contains the main fundamentals of stock pricing. After discussing the effective and important aspects of this investigation it can be concluded that the pricing analysis of the stock market will be improved using machine learning and ARIMA.

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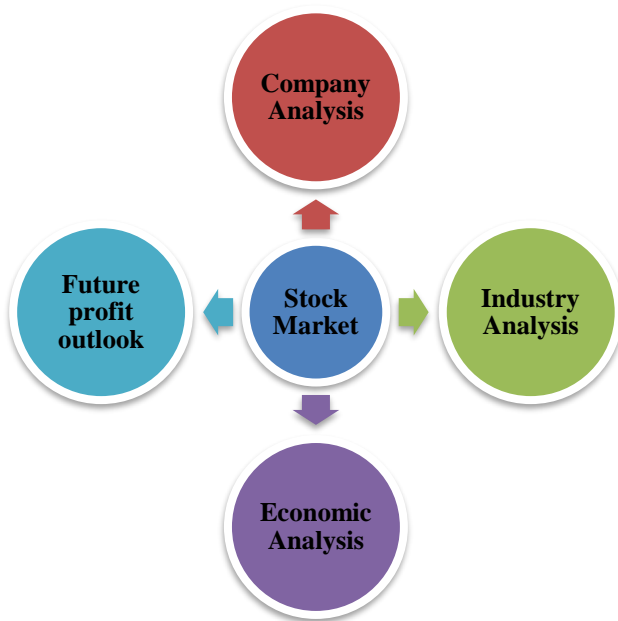
Appendices

Appendix 1: Relationship with stock market



(Source: self-created in MS word)

Appendix 2: Fundamental of Stock market



(Source: self-created in MS word)