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Stock Market Price Prediction Using ARIMA Model

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Abstract: *Stock market price prediction involves forecasting future stock values using techniques like technical analysis, fundamental analysis, and machine learning. Technical analysis looks at historical price movements, while fundamental analysis evaluates a company's financial health. Machine learning models use large datasets to identify patterns. This paper introduces a vital approach to time series analysis and forecasting, emphasizing its widespread practical applications. Time series data consists of an ordered sequence of data points recorded at equal time intervals. The stock market, one of the most complex financial systems, experiences significant fluctuations in stock prices over time. Stock market forecasting aims to uncover market trends and help investors maximize returns while minimizing risks. Given the market's sensitivity to rapid changes, this research focuses on developing innovative approaches to forecast stocks for high profits. Specifically, this paper analyzes the time-series data of the Indian stock market and builds a statistical model to predict future stock prices efficiently.*

Keywords: ARIMA Model, Financial Forecasting, Indian Stock Market, Time Series Forecasting, Stock Market Prediction

I. INTRODUCTION

Predicting the future has always intrigued humanity, posing a challenging yet vital task across various domains such as business, industry, medicine, social sciences, politics, finance, government, and environmental sciences. Forecasting involves predicting future events by analyzing past and present data, akin to driving forward while observing the rear-view mirror. With the rise of social media, stock market forecasting has gained significant interest, essential for economic growth and stability. Despite market complexities, forecasting aids in resource allocation and cost planning, helping investors manage risks and maximize returns. This paper explores the ARIMA (Auto Regressive Integrated Moving Average) model, a powerful univariate forecasting method, for predicting stock market movements.

1.1 PROBLEM STATEMENT

To effectively anticipate and plan for future events, it is crucial to understand who needs these predictions, how the forecasts will be utilized, and how the forecasting function integrates within the organization. During this phase, an analyst must engage with all individuals involved in data collection, database maintenance, and those who will use the forecasts for planning purposes. This ensures that the forecasting process is tailored to meet the specific needs and objectives of the organization.

II. LITERATURE SURVEY

The system proposed by Fahim Faisal1 utilizes the Box-Jenkins time series forecasting method to identify the best model. While econometric models use relationships between variables, good forecasts can be made with simple extrapolations of a single data series. More studies on inflation forecasting in Bangladesh are needed for financial decision-making [1].

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The work by Al Wadia et.al, introduces a new method for forecasting financial time series data using Wavelet transforms and the ARIMA model. The data is first decomposed with Haar Wavelet transforms, and then future observations are forecasted using a well-fitted ARIMA model [2].

The work by Babu. C. N. et.al, examines and forecasts Average Global Temperature using three ARIMA model variants: Basic, Trend-based, and Wavelet-based. Results show that the Trend- based ARIMA outperforms the Basic, and the Wavelet-based ARIMA surpasses the Trend-based. Model comparisons used MAPE, MaxAPE, and MAE as performance metrics [3].

Forecasting stock market indices is challenging. This paper proposes a hybrid model combining Exponential Smoothing (ESM), ARIMA, and Back Propagation Neural Network (BPNN), optimized by a genetic algorithm (GA). Evaluated using Shenzhen Integrated Index (SZII) and Dow Jones Industrial Average Index (DJIAI), the proposed model outperforms traditional models, EWH, and RWM [4].

The work by Babu L.-Y. Wei Technical analysis helps predict stock prices, and selecting the right indicators is crucial. Traditional linear models struggle with nonlinear data. This paper presents a hybrid model using an adaptive genetic algorithm to optimize ANFIS, incorporating technical indicators, fuzzy inference, and clustering. Tested on TAIEX, it outperforms existing models in RMSE [5].

This introduction to time series and forecasting explains theories and applications for social science students. Professor Yaffee covers conceptualization, modeling, and evaluation, emphasizing programming techniques. Examples from various social sciences are explored using

SAS® and SPSS® syntax and data sets available online. The book highlights the power of time series analysis [6].

III. METHODOLOGY

3.1 Existing Method

A financial forecast predicts future business conditions that are expected to impact a company, organization, or country. It analyzes historical data trends to project future movements, aiding decision-makers by providing insights into the company's future financial status. Essentially, a financial forecast serves as a business plan or budget, estimating projected revenue and costs. Although predicting a company's financial state is challenging and often inaccurate, having an educated guess is more valuable for planning and budgeting than not forecasting at all. Well- informed predictions, even if imperfect, are crucial for effective planning and budgeting.

3.2 Proposed Method

We propose the application of time series analysis and forecasting within the context of the Indian economy. The recent significant depreciation of the Indian rupee has underscored the critical need for accurate stock market predictions to protect investors' interests. This study aims to develop an efficient ARIMA model to forecast Indian stock market volatility. Using publicly available time series data from the Indian stock market, we compare the predicted time series with the actual data, revealing an average mean percentage error of approximately 5% for both Nifty and Sensex indices.

IV. RESULTS AND DISCUSSIONS

Figure 1 depicts the left graph shows the predicted stock prices (orange line) for the first ten days of January 2022 using an ARIMA model. The right graph displays the actual stock prices (blue line) for the same period. The model predicts a downward trend, aligning with the actual observed decline.

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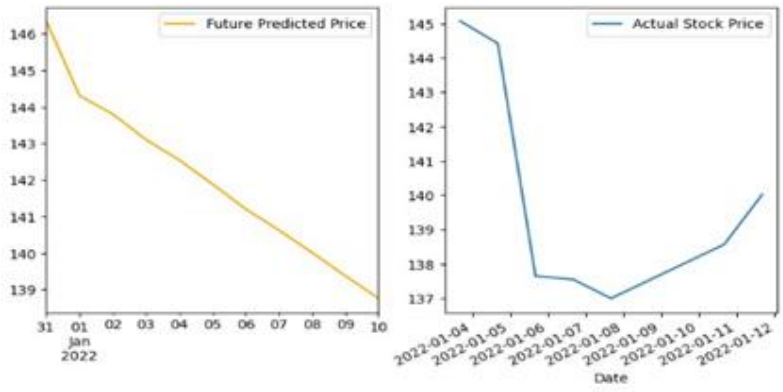

Figure 1

Figure 2

Figure 2 depicts this graph shows the actual stock prices (blue line) from April 2021 to January 2022 and the predicted future stock prices (orange line) using an ARIMA model. The prediction indicates a slight decline in stock prices in early January 2022.

Feature	ARIMA
Accuracy	96%
Model	Autoregressive Integrated Moving Average
Scalability	Moderate
Complexity	Moderate to High

The ARIMA (Autoregressive Integrated Moving Average) model offers moderate accuracy for stock price prediction by handling linear, time series data. It combines autoregressive, differencing, and moving average components and requires stationary data, often achieved through differencing. The complexity of ARIMA models can range from moderate to high, depending on the parameters (p, d, q), which must be selected carefully. Despite this complexity, ARIMA models are highly interpretable, providing clear insights into the time series structure. Training these models typically takes a moderate amount of time, influenced by the length of the time series and the need for parameter tuning. Once trained, predictions are generated quickly and efficiently.

However, ARIMA models do not handle seasonality well without the SARIMA extension. They are best suited for short to medium-term forecasts, as long-term predictions can be less reliable due to the model's assumptions and the inherent unpredictability of stock prices. ARIMA models can be combined with other statistical or machine learning models for enhanced performance. They are sensitive to outliers and sudden market changes, which can significantly impact predictions. ARIMA models work best with linear data and may struggle with non-linear relationships, limiting their effectiveness for complex stock price movements. They require moderate computational resources, increasing with larger datasets and more complex models but remaining manageable for most applications.

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V. CONCLUSION

This project introduces time series analysis and forecasting techniques within the Indian economy and stock market, addressing the need for accurate stock market predictions following the recent rupee depreciation. It develops an ARIMA model to predict Indian stock market volatility using publicly available data. The model's performance, evaluated by comparing predicted and actual time series, shows an average mean percentage error of about 5% for Nifty and Sensex.

REFERENCES

[1]. Fahim Faisal1, May 2012. Pp. 100 – 117, "Forecasting Bangladesh's Inflation Using Time Series ARIMA Models", World Review of Business Research Vol. 2. No. 3.

[2]. Al Wadia, et.al, "Selecting Wavelet Transforms Model in Forecasting Financial Time Series Data Based on ARIMA Model", Applied Mathematical Sciences, Vol. 5, 2011, no. 7, 315 – 326.

[3]. Babu. C. N., et.al, "Predictive data processing on average global temperature using variants of ARIMA models." In IEEE-International Conference on Advances in Engineering, Science and Management (ICAESM-2012) (pp. 256-260). IEEE.

[4]. J.-J. Wang, J.-Z. et.al, 'Stock index forecasting based on a hybrid model,''Omega, vol. 40, pp. 758–766, Dec. 2012

[5]. L.-Y. Wei, ''A hybrid model based on ANFIS and adaptive expectation genetic algorithm toforecast TAIEX,'' Econ. Model., vol.33, pp. 893–899, Jul. 2013.

[6]. An Introduction to Indian Stock Market. Accessed: Jul. 2018. [Online]. Available: https://www.investopedia.com/articles/stocks/09/indian-stockmarket.asp

[7]. A. M. Ashik et.al, ''Time series model for stock price forecasting in India,'' inLogistics, Supply Chain and Financial Predictive Analytics. Singapore: Springer, 2019, pp. 221– 231.

[8]. An Introduction to Indian Stock Market. Accessed: Jul. 2018. [Online]. Available: https://www.selfgrowth.com/articles/an-introduction-to-theindian-stock-market