International Journal on Recent and Innovation Trends in Computing and Communication
ISSN: 2321-8169 Volume: 11 Issue: 6
Article Received: 25 April 2023 *Revised:* 12 May 2023 *Accepted:* 30 June 2023

Data Analytics as a Tool for Analysing Stock Price Trends

Manjula K A
Department of Computer Science
University of Calicut

Karthikeyan P
Department of Management Studies
Kannur University

Abstract—Data analysis plays a key role in making strategic decisions and driving business growth in today's world driven by data. The significance of time series-based data analysis cannot be ignored, particularly for the finance sector, as understanding trends and patterns over time is critical. In this study the focus is on how to perform stock price analysis on the actual data derived from Yahoo Finance using data analytics.We demonstrate the capabilities of time series analytics to enhance understanding trends, enhance investment strategy and enable data-based decision-making. Our findings also highlight data analytics capabilities as a major determinant of business performance and competitive strategies.

Keywords-Data Analysis, Data analytics, Stock price, Time series analysis, Prophet, Python, Finance, Business.

I. INTRODUCTION

Finance and business are two essential domains because they help organizations and individuals manage money sensibly, make investments, and increase wealth.They are essential for fostering innovation, boosting economic growth, and generating jobs.Businesses and economies remain robust and stable when sound financial decisions are made.

Data analytics is the process of collecting, organizing, and examining data to discover meaningful information, patterns, and trends. It helps businesses and individuals make better decisions by turning raw data into valuable insights [1]. Data analytics is used in many fields to improve performance, solve problems, and predict future outcomes.Whether in healthcare, engineering, environmental research, or finance, data analytics enables better understanding, prediction, and optimization of processes and outcomes.

Data analytics plays an increasingly important role in shaping business decision-making processes. The ability to collect, evaluate, and interpret data is central to maintaining competitive advantages, improving strategies, and driving innovation within the business ecosystem. Companies can make informed decisions based on past trends, patterns, and forecasts. The insights provided by data analytics, especially in the financial markets, are valuable [2].

This paper focuses on the application of data analytics in the financial sector, where stock market data plays a crucial role in decision-making. Specifically, we aim to investigate time series analysis using Python-based tools and stock price data sourced from Yahoo Finance. This article is structured with next section looking at the literature related to this domain, followed by sections on data and methodology, experimental results and conclusion.

II. REVIEW OF LITERATURE

The field of data analytics continues to evolve rapidly in the business ecosystem, particularly in financial markets, where quantitative methods play a key role in decision-making and market analysis. Research by Moyer et al. [2] and Chen et al. [3] highlights the importance of statistical models and machine learning in forecasting stock prices and identifying market patterns. Portfolio optimization, a fundamental concept in financial analysis introduced by Markowitz [4], remains a cornerstone of modern financial theory.

Time series analysis, a specialized branch of data analytics, has also gained significant attention in financial forecasting. Studies such as Box and Jenkins [5] introduced ARIMA models for time series forecasting, which continue to be widely used in financial data analysis. Studies by Hyndman and Athanasopoulos[6]explore modern approaches to time series forecasting, including exponential smoothing and state space models. Additionally, deep learning methods such as Long Short-Term Memory (LSTM) networks have shown strong

International Journal on Recent and Innovation Trends in Computing and Communication
ISSN: 2321-8169 Volume: 11 Issue: 6
Article Received: 25 April 2023 *Revised:* 12 May 2023 *Accepted:* 30 June 2023

potential in handling sequential financial data and improving prediction accuracy [7].

Research studies, including those of Guerini et al. [7], have shown that analytics enable companies to assess risk, identify profitable investment opportunities, and optimize portfolio performance. The rise of big data and the adoption of advanced analytical tools, such as R, Python, along with cutting-edge machine learning algorithms, have transformed the way organizations approach decision-making. In today's competitive business environment, data-driven trend analysis is increasingly vital, especially in sectors like finance [2][8].

Making sound investment decisions in the financial market requires the ability to forecast a stock's future price using historical data [3]. Investors and traders can create models to predict possible future price behaviour by examining patterns, trends, and historical price movements [6]. This procedure helps reduce risk, maximize profits, and develop successful trading plans.

This work aims to apply data driven trend analysis on the stock prices of a few major Indian companies applying data analytics techniques.

III. Methodology

The methodology and data analysis techniques used in this study to investigate the trend in stock prices and the application of data analytics in doing so are presented in this section. Yahoo Finance has been used as the source for collecting data for this study [9].Since Yahoo Finance offers real-time stock quotes, historical market data, financial reports, and news, it is considered to be a valuable resource for investors and analysts. The data used for this study consists of historical stock prices of selected stocks.

This study uses data on the historical stock prices from January 2015 to January 2023 for five major Indian companies (Reliance, ITC, Infosys, Sun Pharma and ICICI Bank). These five companies represent major sector of the economy. The required data is sourced from Yahoo Finance using the yfinance library. Program based on Python is used for data scraping and data analysis. Python, which is a versatile high level programming language that is nowadays widely used in various fields such as web development, data science, artificial intelligence, automation, and scientific computing. This work employs pandas for data processing and Prophet for time series analysis. Pandas is a powerful open-source Python library used for data manipulation and analysis[9].It provides easy-to-use data structures like DataFrames and Series, allowing users to clean, organize, and process data efficiently. Prophet is a popular Python package well-suited for analyzing time series data. The results of the analysis are discussed in the next section.

IV. Experimental Results

This section presents the results of data analysis and trend modeling using a time series approach. The collected prices of the selected stocksis analyzed, and the price movements over the study period are visualized through graphs. Additionally, the underlying trend in stock prices during this period is illustrated separately.

The historical stock price analysis with respect to the Reliance is shown in Figure 1, ITC in Figure 2, Infosys in Figure 3, Sun Pharma in Figure 4, and ICICI Bank in Figure 5. Each plot (Figures 1 to 5) shows the historical stock price of each selected company from 2015 to 2023, where the black dots represent the actual closing prices, and the blue line represent the line fitted for the corresponding historical prices using Prophet model. This captures both long-term trends and seasonal patterns. The shaded blue area shows the model's 95% confidence interval, highlighting the uncertainty in how well the model fits the historical data. The model successfully captures key movements, including the notable decline during the 2020 COVID-19 market crash and the strong upward trend that followed in subsequent years, while also incorporating underlying seasonal effects within the overall trend structure.

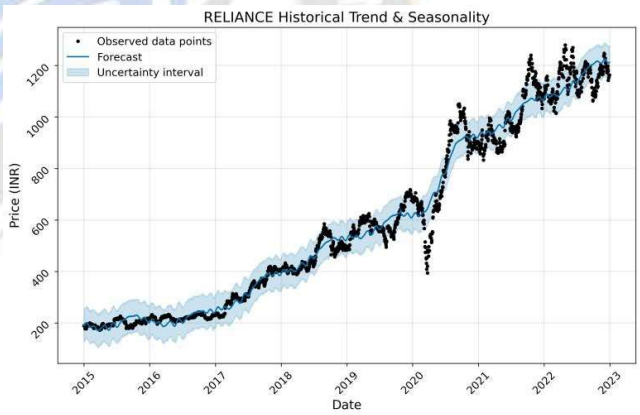

Figure 1: Stock price analysis of Reliance Industries

From Figure 1 is can be seen that the stock price of Reliance is showing an increasing trend during the period of this study. The sharp fall during 2020 is due to the onset of COVID 19 pandemic and after this a sharp increase in prices is noted. At the same time, it is also seen that the volatility has increased during the latter period of this study.

International Journal on Recent and Innovation Trends in Computing and Communication
ISSN: 2321-8169 Volume: 11 Issue: 6
Article Received: 25 April 2023 *Revised:* 12 May 2023 *Accepted:* 30 June 2023

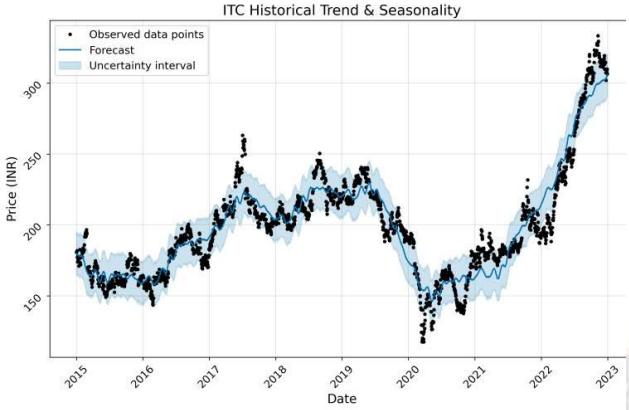

Figure 2: Stock price analysis of ITC Ltd.

From Figure 2, with respect to ITC Ltd., it is seen that the stock price is within a range during majority of the period of this study. Similar to other stocks and the market a sharp fall is seen during early period of 2020 and this can be attributed to the onset of COVID 19 pandemic. After this the stock price is seen increase sharply reaching the peak during late 2022. So it can be said that this stock has been trading in a range for large part of this study period and has increased substantially during the latter part of the study period.

Figure 3, shows the movements in stock price of Infosys Ltd. It can be seen from this chart that the price of Infosys stock is increasing gradually from 2015 to 2020. Then like other stocks and market this stock price is also seen to fall during early 2020 as a result of the onset of COVID 19 pandemic. After that it is seen this the stock price increases very steeply unto 2022 and then it is within a range till the end of the period considered for this study. It is seen that the stock price of Infosys has increased sharply during the two-year period 2020 and 2021 which are post COVID 19 period.

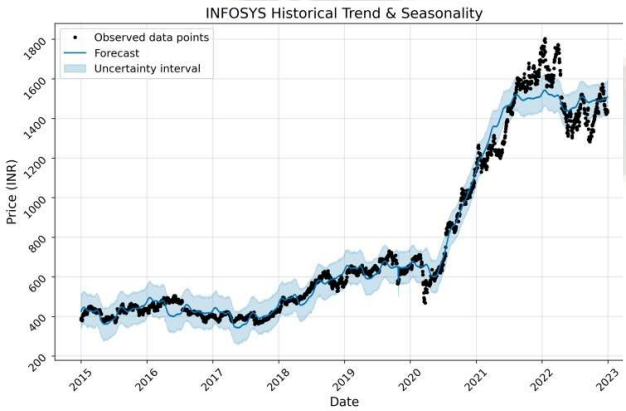

Figure 3: Stock price analysis of INFOSYS Ltd.

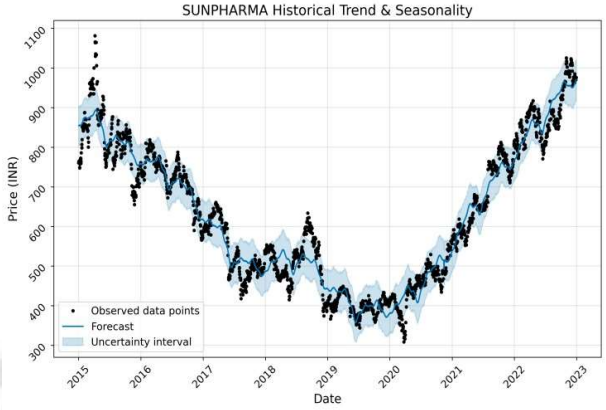

Figure 4: Stock price analysis of SUN PHARMA

The stock price movements of Sun Pharmaceutical Industries Ltd. (Sun Pharma) is depicted in Figure 4. It is seen that the price of this stock has been declining during the early period of this study until 2020. It is seen to reach the lowest rate in early 2020, which is similar to others stocks and market. After this the stock price is seen to raise sharply till the end of the period considered for this study. Compared to other stock considered for this study, the volatility in price of this stock is seen to be high, indicating higher risk.

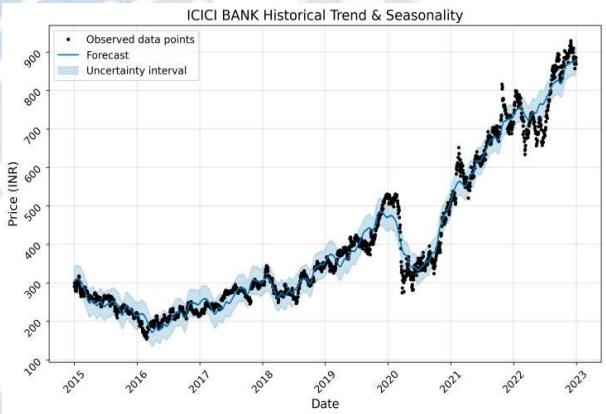

Figure 5: Stock price analysis of ICICI BANK Ltd.

Figure 5 shows movement in stock price of ICICI Bank Ltd. The price of this stock is found to increase gradually during the early half of the period of this study. Then similar to the market and other stocks there is a deep fall in prices during early 2020 due to the COVID 19 pandemic. After that the price of this stock is found to increase rapidly since middle of 2020.

Thus it can be seen that all the companies selected for this study are exhibiting varying trends in the movement of their stock prices. All stocks shoe a sharp decline in early 2020 due to the COVID 19 Pandemic and subsequent lockdown.

International Journal on Recent and Innovation Trends in Computing and Communication
ISSN: 2321-8169 Volume: 11 Issue: 6
Article Received: 25 April 2023 Revised: 12 May 2023 Accepted: 30 June 2023

The models that fit the share price movement in these five companies is developed using the program and these are shown in Figure 6.

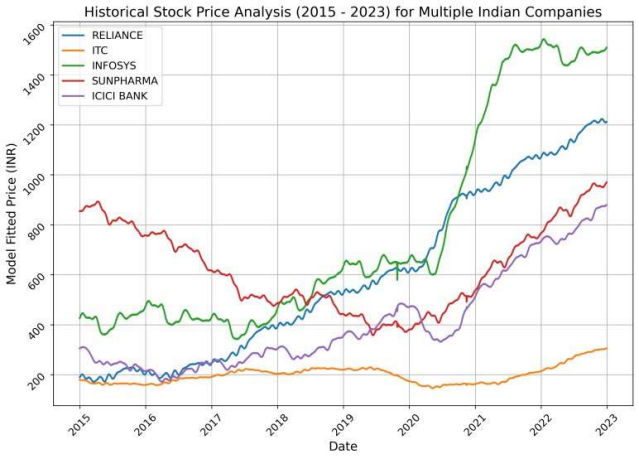

Figure 6: Models developed for stock price movements of selected companies.

The lines in this graph represent model that has been developed to fit the movement in prices of stock of each selected companies during the study period. The sharp rises stock price of in Infosys followed by that of Reliance post 2020 are notable. ITC Ltd. shows a more stable and slight upward trend. At the same time Sun Pharma and ICICI Bank display steady growth in their prices during the period considered for this study.

Overall, the graph shows that while some companies like Infosys and Reliance experienced strong and rapid growth, others like ITC grew more slowly but steadily over the years. The noticeable dip and subsequent recovery in Sun Pharma and ICICI Bank highlight how certain sectors faced short-term challenges but managed to bounce back. The sharp rise in stock prices after 2020 may reflect the market's recovery after the COVID-19 impact and increased investor confidence. This comparison also shows how different industries—such as technology, banking, pharmaceuticals, and FMCG—reacted differently to market cycles, global events, and economic conditions in India over the past decade.

Figure 7 shows the trend in the stock prices of the selected companies considered for this study. The trend filters out the seasonal variations in stock prices and shows the tendency of the data to increase or decrease over a long period of time.

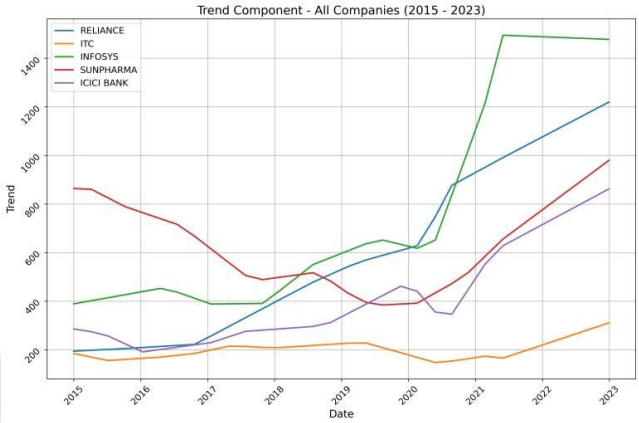

Figure 7:Trend Analysis for selected Indian companies.

From the analysis in trend in the stock prices of the companies, it is seen that Reliance and Infosys show strong upward trends, especially after 2020, with Infosys peaking around 2022 before slightly declining later but still maintaining a high level. Reliance, on the other hand, continues its steady rise with minimal flattening. ICICI Bank and Sun Pharma both exhibit a recovery trend after 2020, showing a clear shift from stagnation to strong upward momentum. ITC presents the slowest growth, with a relatively flat trend up to 2020, followed by a gradual increase post-2021. This trend analysis highlights how the tech (Infosys), energy (Reliance), and banking (ICICI Bank) sectors gained significant momentum in the last few years of the study, while FMCG (ITC) and pharma (Sun Pharma) showed more moderate but consistent raise in prices.

Data analysis with the help of data analytics will be helpful for investors and others for gaining useful insights for making informed investment and policy decisions[10][11][12][13]. The experiments and results presented here highlight the significance of data analytics in providing valuable information for decision making in real-world business applications, particularly in finance.

V. Conclusion

In this study, we analyzed the stock price trends of five prominent Indian companies Reliance, ITC, Infosys, Sun Pharma, and ICICI Bankusing historical data from 2015 to early 2023 by applying latest data analytics techniques. By focusing on the trend components, we are able to identify long-term patterns and shifts in stock performance across these companies. This trend-based analysis enables investors and analysts to better understand the historical behaviour of these stocks and assess their comparative performance within the Indian market. Time series analysis techniques, as part of data analytics, play a crucial role in helping businesses make

informed decisions and gain valuable insights. Companies can enhance performance, reduce costs, and create more effective strategies for growth and profitability with the help of Data analytics.

REFERENCES

[1] R. C. Moyer, J. R. McGuigan, and W. J. Kretlow, Contemporary Financial Management. Cengage Learning, 2020.

[2] Y. Chen, X. Gan, and Y. Wang, "Financial time series forecasting using machine learning techniques," Appl. Econ. Finance, vol. 5, no. 1, pp. 25–35, 2018.

[3] H. Markowitz, "Modern portfolio theory," J. Finance, vol. 7, no. 11, pp. 77–91, 1952.

[4] G. E. P. Box, G. M. Jenkins, G. C. Reinsel, and G. M. Ljung, Time Series Analysis: Forecasting and Control. San Francisco: Holden Bay, 1976.

[5] R. J. Hyndman and G. Athanasopoulos, Forecasting: Principles and Practice, 2nd ed. OTexts, 2018.

[6] T. Fischer and C. Krauss, "Deep learning with long short-term memory networks for financial market predictions," Eur. J. Oper. Res., vol. 270, no. 2, pp. 654–669, 2018.

[7] M. Guerini, F. Lillo, and S. Marmi, "A machine learning approach for stock market price forecasting," J. Financial Data Sci., vol. 1, no. 3, pp. 19–36, 2019.

[8] Python Software Foundation, "Python Programming Language," 2023. [Online]. Available: https://www.python.org/. [Accessed: 02-01-2023].

[9] Yahoo Finance, "Yahoo! Finance – Business Finance, Stock Market, Quotes, News," 2023. [Online]. Available: https://finance.yahoo.com/. [Accessed: 02-01-2023].

[10] T. H. Davenport, J. G. Harris, and R. Morison, Analytics at Work: Smarter Decisions, Better Results. Boston, MA: Harvard Business Press, 2010.

[11] H. Alsghaier, M. Akour, I. Shehabat, and S. Aldiabat, "The importance of big data analytics in business: a case study," Amer. J. Softw. Eng. Appl., vol. 6, no. 4, pp. 111–115, 2017.

[12] R. Akerkar, "Advanced data analytics for business," Big Data Comput., vol. 377, no. 9, 2013.

[13] Manjula K A and Karthikeyan P, "A Study of Relationship Between Indian and Asian Stock Marksts using Machine Learning Techniques," *J. Emerging. Technologies and Innovative. Research.*, vol. 4, no. 2, pp. 222–234, 2017.

.