

**Submitted By:**

**Karishma Mathur (13A)**

**MBA (BA)**

## **REPORT**

### **Analysis of Wipro Ltd Stock Data**

#### **Introduction**

In this comprehensive report, we delve into the analysis of Wipro Ltd's stock data, listed on the Bombay Stock Exchange (BSE), covering the period from January 1, 2019, to December 31, 2023. Our objective is to provide a thorough understanding of the stock's behavior through statistical tests and modeling techniques. By examining stationarity, autocorrelation, and volatility clustering patterns, we aim to equip investors with insights essential for decision-making.

#### **Data Description**

The dataset comprises daily closing prices of Wipro Ltd stock retrieved from Yahoo Finance. We meticulously clean the data to eliminate any missing values, ensuring the integrity of our analysis. Throughout this report, we focus on discerning the stationarity, autocorrelation, and volatility clustering characteristics inherent in the stock's time series data.

#### **Trends Observed**

1. Overall Upward Trend:

One prominent trend observed in the data is an overall upward trajectory in the stock's closing prices over the five-year period. This suggests that, on average, the stock has experienced long-term appreciation in value. This trend may indicate positive market sentiment towards Wipro Ltd, driven by factors such as company performance, industry trends, or broader market conditions.

2. Short-Term Fluctuations:

Despite the overall upward trend, the data also exhibit short-term fluctuations and volatility. These fluctuations manifest as periodic spikes and dips in the stock's closing prices, reflecting short-term changes in investor sentiment, market news, or macroeconomic factors. These fluctuations may present opportunities for traders to

capitalize on short-term price movements through tactical trading strategies.

### 3. Seasonal Patterns:

Additionally, seasonal patterns may be present in the data, characterized by recurring trends or cycles that occur at specific intervals throughout the year. Seasonality in stock prices can be influenced by various factors, including earnings announcements, dividend payments, or market seasonality effects. Identifying and understanding these seasonal patterns can help investors anticipate future price movements and adjust their investment strategies accordingly.

## **Analysis**

### Stationarity Analysis:

The Augmented Dickey-Fuller (ADF) test indicates a p-value of 0.4087, which exceeds the conventional significance level of 0.05. Therefore, we fail to reject the null hypothesis, suggesting that the Wipro Ltd stock's time series data is non-stationary. This non-stationarity could stem from various factors, including trends, seasonality, or structural breaks within the data. Further investigation into these components may provide additional insights into the underlying dynamics driving the stock's price movements.

### Autocorrelation Analysis:

The Ljung-Box test for autocorrelation yields a significantly small p-value ( $4.294 \times 10^{-5}$ ), indicating the presence of significant autocorrelation in the time series. This implies that past values of the stock's returns influence future returns, highlighting serial dependence. Understanding the autocorrelation structure is crucial for developing robust forecasting models and trading strategies. Additionally, identifying the lag orders with the most significant autocorrelation can aid in model selection and parameter estimation, enhancing the accuracy of predictions.

### Modeling Volatility:

- **ARMA-GARCH Model:**

The ARMA-GARCH model estimation provides insights into the volatility dynamics of the differenced time series data. By capturing both autocorrelation and volatility clustering, the model enables accurate predictions of future volatility levels. However, it is essential to assess the adequacy of the model's fit and evaluate its performance against alternative specifications, such as EGARCH or TGARCH models, to ensure robustness

and reliability in forecasting.

- **Box Test:**

The Box test confirms the presence of volatility clustering, indicating periods of heightened and subdued volatility over time. These clusters of volatility can significantly impact investment decisions and risk management strategies, necessitating the use of dynamic hedging techniques or adaptive trading strategies to mitigate potential losses during turbulent market conditions.

- **ARCH Test:**

The ARCH test further validates the heteroskedastic nature of the stock's returns, indicating the presence of volatility clustering. This finding underscores the importance of incorporating time-varying volatility in risk assessments and portfolio optimization processes. Utilizing volatility forecasts from ARCH models can aid in determining optimal asset allocations and designing portfolios with desirable risk-return profiles.

## **Risk Assessment**

- *Value at Risk (VaR) modelling:*

We calculated the VaR using the historical method. With a confidence level of 95% and a time horizon of 1 day .The VaR calculated represents the maximum potential loss that could occur with a certain probability (confidence level) over the specified time horizon. For example, if the calculated VaR is -0.0267 (or -2.1%), it means that there is a 5% chance that the stock's return will be worse than -0.0267 (or -2.1%) on any given day.

## **Conclusion**

### *Summary of Findings:*

- The Wipro Ltd stock's time series data exhibits non-stationarity, with no significant evidence to reject the null hypothesis of a unit root.
- Significant autocorrelation is observed in the stock's returns, indicating serial dependence between past and future values.
- The presence of volatility clustering suggests periods of varying volatility levels, which can impact investment decisions and risk management strategies.

### Implications for Investors:

- Non-stationarity implies that traditional time series analysis techniques may not be directly applicable. Alternative approaches, such as differencing or transformation, may be necessary to uncover underlying patterns.
- Understanding the autocorrelation structure enables investors to anticipate future price movements more accurately, potentially enhancing trading strategies and portfolio management.
- Modeling volatility dynamics using ARMA-GARCH models provides insights into risk management and forecasting future volatility levels, aiding in investment decision-making.

### Future Directions:

- Further exploration could involve advanced time series modeling techniques to capture complex dependencies and improve forecasting accuracy.
- Deeper analysis of volatility clustering patterns could uncover additional insights into market dynamics and inform more sophisticated risk management strategies.
- Incorporating external factors such as economic indicators or industry-specific trends could enhance the predictive power of the models and provide a more comprehensive understanding of the stock's behaviour.

In conclusion, the analysis of Wipro Ltd's stock data provides valuable insights into its behaviour, aiding investors in making informed decisions and navigating the complexities of the market with confidence.