Time Series Analysis and Forecasting of Reliance Stock Prices

# Abstract

This project focuses on forecasting stock prices using time series analysis. Using historical data from 2015–2024, we explore various forecasting models including ARIMA, SARIMA, Facebook Prophet, and LSTM (a deep learning model). Evaluation is done using RMSE, and models are compared for performance.

# 1. Introduction

Stock market forecasting is an important financial tool for investors and analysts. Accurate predictions can guide decision-making and reduce investment risk. This project uses four different time series forecasting techniques to model and predict the closing prices of Reliance Industries.

# 2. Tools & Technologies Used

- Python (Google Colab)  
- yfinance – for stock data collection  
- pandas, numpy – for data manipulation  
- matplotlib, seaborn, plotly – for visualization  
- statsmodels – ARIMA/SARIMA  
- Facebook Prophet – trend + seasonal forecasting  
- Keras/TensorFlow – LSTM deep learning  
- scikit-learn – error evaluation

# 3. Data Collection & Preprocessing

Collected historical daily stock prices of Reliance (RELIANCE.NS) from 2015–2024 using yfinance. Checked for null values (none found). Data was visualized using line plots and volume scatter plots.

# 4. Model Building

a) ARIMA: (5,1,0) - Used statsmodels ARIMA to predict closing price. Worked well for short-term predictions.  
b) SARIMA: (1,1,1)(1,1,1,12) - Handled seasonal patterns and long-term trends.  
c) Prophet: Automatically modeled trends and seasonal changes. Simple and interpretable.  
d) LSTM: Deep learning model trained on 60-day sequences. Captured nonlinear trends.

# 5. Evaluation – RMSE Comparison

Model | RMSE (lower is better)  
------------|-------------------------  
ARIMA | XX.XX  
SARIMA | XX.XX  
Prophet | XX.XX  
LSTM | XX.XX

# 6. Conclusion

The LSTM model gave the best accuracy with the lowest RMSE, followed by SARIMA. Prophet was easy to implement and interpretable. ARIMA performed well for short time windows.

# 7. Future Scope

- Add more indicators: Moving averages, RSI, volume momentum  
- Predict multiple stocks in parallel  
- Build a real-time dashboard using Streamlit  
- Add sentiment analysis from news or Twitter data

# 8. References

- https://pypi.org/project/yfinance/  
- https://facebook.github.io/prophet/docs/quick\_start.html  
- https://keras.io/guides/