📄 SARIMA Model Forecasting Report

Internship Project – Time Series Stock Market Forecasting

Platform: Zidio.in | Duration: 1 Month

**🧑‍💻 Intern Details:**

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* **Department**: B.E. CSE – Artificial Intelligence and Machine Learning
* **Project**: Time Series Stock Forecasting
* **Model Focus**: Model 4 – **SARIMA Forecasting**

**🔍 Objective:**

To build and evaluate a **SARIMA model** to forecast future stock prices of TCS by capturing both **trend** and **seasonality** in the historical closing prices (2018–2024).

**📦 Tools Used**

* Google Colab (Python 3.11)
* Libraries: yfinance, pandas, matplotlib, statsmodels
* Dataset: TCS stock price data (Jan 2018 – Dec 2024) from Yahoo Finance

**📅 Dataset:**

* **Stock**: TCS (Ticker: TCS.NS)
* **Source**: Yahoo Finance
* **Time Period**: 1st January 2018 to 31st December 2024
* **Variable Used**: 'Close' price of the stock

**📊 Data Visualization:**

* The historical TCS Close Price was plotted to visually inspect:
  + Upward long-term trend
  + Clear **repeating seasonal patterns** (yearly)
* These observations justified the use of a **SARIMA model**.

**🔧 Model Used:**

**SARIMA (Seasonal Autoregressive Integrated Moving Average)**  
Model notation used: **SARIMA (1,1,1) × (1,1,1,12)**

* p=1, d=1, q=1: Non-seasonal ARIMA parameters
* P=1, D=1, Q=1, s=12: Seasonal order (12-month seasonality)

**🧾 Model Summary:**

Model: SARIMAX(1, 1, 1)x(1, 1, 1, 12)

AIC: 17478.633

BIC: 17505.822

Log Likelihood: -8734.316

ar.L1: -0.8501

ma.L1: 0.8742

ar.S.L12: -0.8023

ma.S.L12: -1.0000

sigma2: 1658.3111

* **Jarque-Bera (JB)** test: 877.50 → Normality of residuals is not perfect, but acceptable.
* **Heteroskedasticity (H)**: 1.94 (mild heteroskedasticity)
* **P-Values** for AR and MA terms: < 0.05 → Statistically significant.

**🔮 Forecast:**

* **30-Day Forecast** was generated from the trained model.
* The forecast starts from the next business day after the last date in the dataset.
* **Forecast is plotted in green**, overlaid on the historical data in blue.

**📉 Final Visualization:**

The SARIMA plot shows a **realistic continuation of the trend** with seasonal dynamics incorporated. It closely aligns with historical price behavior and is a **strong model** for short-term predictions where seasonality is present.

**✅ Conclusion:**

The SARIMA model successfully captures both the trend and the seasonal components in the TCS stock price data. It performs well in producing stable, seasonally-aware forecasts. This strengthens the robustness of our time series modeling pipeline by introducing seasonal learning.

**📂 Attachments**

* Notebook: model4\_sarima.ipynb
* Forecast Plot: sarima\_forecast\_plots
* Report PDF: SARIMA\_Report\_Yashwanth
* GitHub Link: <https://github.com/Yashwahthmc/Time-Series-Stock-Forecasting-Zidio.git>
* Google Colab Link: <https://colab.research.google.com/drive/1eXpEkQxownmvTnUwCf19tXminN2KRXeY?usp=sharing>

**✍️ Signature:**

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