Stock Price Prediction for TCS vs ICICI BANK

Abstract

The aim of this project is to build and compare time series forecasting models to predict the closing stock prices of **ICICI Bank** and **Tata Consultancy Services (TCS)**. The analysis involves classical and deep learning methods — ARIMA, Prophet and LSTM — to understand their performance and effectiveness on real-world stock data. Moreover, this project concludes which will be better place to invest – IT Sector or Banking Sector.

Introduction

- **Source**: Yahoo Finance (yfinance)
- **Stocks Analyzed**: ICICI Bank (ICICIBANK.NS) and TCS (TCS.NS)
- **Date Range**: Approximately last 20 years (2004-2024)
- **Frequency**: Monthly (240 datapoints)
- **Features Used**: Date (Index), Close (Target)

Data Splitting

Split the dataset - 80% with training data and 20% with testing data.

Modelling

- **ARIMA (Autoregressive Integrated Moving Average) Model:**
  ARIMA model needs to check whether the series is stationary or not. **Augmented-Dickey Fuller** test is useful for checking stationarity. We take Null Hypothesis as the series has a unit root (non-stationary). We check the p-value and if p-value < 0.05, we reject the null hypothesis with 95% confidence. We came with the result for both TCS and ICICI dataset that the series are non-stationary. Hence, we apply 1^{st} order differencing and apply ADF test again which results the series as stationary.
  We plot ACF & PACF to check the order of MA and AR respectively which came out as 1 both. Thus the ARIMA(1,1,1) model we need to apply on the training data.

- **Prophet Model:** Flexible model developed by Meta, great for trend & seasonality decomposition. It is robust to missing data and sudden outliers. Moreover, it is useful in case of short-term forecasts.
- **LSTM (Long Short Term Memory) Model:** It is a deep learning model designed for sequential data. It uses MinMaxScaler() which normalizes the data by scaling features to a specific range — typically between 0 and 1. This improves model performance and faster convergence.

Hence, used MAE and RMSE to compare the models.

Result

Model	TCS_MAE	ICICI_MAE	TCS_RMSE	ICICI_RMSE
ARIMA	161.01	38.51	12.71	45.80
Prophet	677.43	389.54	735.45	431.66
LSTM	438.81	119.17	505.90	141.57

ARIMA clearly outperforms both Prophet and LSTM for both TCS and ICICI, in terms of both MAE and RMSE. These results suggest that the stock prices in this dataset exhibit relatively linear and predictable trends, which are well-captured by the ARIMA model. Despite LSTM's capacity to handle complex non-linear dependencies, it did not outperform ARIMA in this case, likely due to the data's structure or size. Therefore, **ARIMA is the most suitable model for forecasting both TCS and ICICI stock prices in this project**.

Conclusion

Based on the stock price forecasting and performance analysis conducted in this project, **ICICI Bank** shows **greater predictability and lower volatility** compared to TCS. The error metrics (MAE and RMSE) for ICICI were significantly lower across all models — especially for ARIMA — suggesting that ICICI's price movements are more stable and easier to model. This reflects **consistency in its market behavior**, which is a favorable trait for risk-averse investors.

- If the goal is **steady and reliable growth**, **investing in the banking sector (ICICI)** appears to be more prudent based on current data.
- If the investor has a **higher risk appetite** and seeks **long-term growth with higher fluctuations**, TCS and the IT sector might offer better upside potential — but with more uncertainty.

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