Time Series Forecasting using ARMA Model on NSE Data

PMDS610P- Financial Analytics lab - LO

1 Problem Statement

You are given historical **daily closing prices** of the **NIFTY 50 index** from the **National Stock Exchange of India (NSE)**. Your task is to analyze and forecast stock prices using an **AutoRegressive Moving Average (ARMA) model**.

2 Tasks

2.1 Data Preprocessing

- Load the NIFTY 50 dataset from **Yahoo Finance** for the past **5 years** (from **January 1, 2019, to January 1, 2024**).
- Retain only the **closing price** column.
- Convert the date column to a **datetime format** and set it as the index.
- Check for missing values and handle them if necessary.

2.2 Stationarity Check

- Perform an **Augmented Dickey-Fuller (ADF) test** on the closing price data.
- If the series is **non-stationary**, apply **first-order differencing** and re-run the ADF test.

2.3 Model Selection & Training

- Plot the **Autocorrelation Function (ACF)** and **Partial Autocorrelation Function (PACF)** to determine optimal **p (AR order)** and **q (MA order)**.
- Split the dataset into **80% training data** and **20% test data**.
- Fit an **ARMA(p, q) model** using the training data.

2.4 Model Evaluation

- Use the trained ARMA model to **predict the test set values**.
- Compute **Mean Squared Error (MSE)** and **Mean Absolute Percentage Error (MAPE)** to evaluate the model.

2.5 Forecasting Future Prices

- Use the trained model to **forecast the next 30 days of NIFTY 50 closing prices**.
- Plot the actual prices and predicted prices for better visualization.