Stock Price Volatility Modeling using GARCH 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 the volatility of stock prices using a **Generalized Autoregressive Conditional Heteroskedasticity (GARCH) Model**. Investigate the presence of heteroskedasticity and fit an appropriate GARCH model to capture volatility clustering.

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.
- Compute the **log returns** to analyze volatility.
- Perform exploratory data analysis (EDA) to check for volatility clustering.

2.2 Modeling Volatility

- Fit a **GARCH model** to the log returns.
- Use **Maximum Likelihood Estimation (MLE)** to estimate the model parameters.

2.3 Model Evaluation and Forecasting

- Evaluate model performance using statistical tests and diagnostic plots.
- Forecast volatility for the next 30 days.