AI-Driven Financial Market Analysis and Volatility Forecasting

Project Overview

This project is a comprehensive data science and machine learning portfolio piece focused on the analysis and forecasting of financial market data. It demonstrates a full data science workflow, from data acquisition and exploratory analysis to advanced time-series modeling and result interpretation.

The project's goal is to analyze the historical performance of a publicly traded stock, quantify its risk through volatility analysis, and build predictive models to forecast future price movements. Two different approaches are implemented and compared: a classical statistical model (ARIMA) and a deep learning model (LSTM).

Key Skills Demonstrated

- **Data Acquisition & Cleaning:** Sourcing financial data via APIs and preparing it for analysis.
- **Time Series Analysis:** Working with time-dependent data, stationarity testing, and decomposition.
- **Feature Engineering:** Creating technical indicators like Moving Averages.
- **Forecasting Models:** Implementing and comparing ARIMA and LSTM models.
- **Model Evaluation:** Using relevant metrics (RMSE, MAE) to assess and compare model performance.
- **Data Visualization:** Creating clear and informative plots to present findings.
- **Professional Documentation:** Summarizing complex findings in a clear, non-technical executive summary.
- **Version Control:** Managing project code and documentation using Git.

Project Structure

This repository contains the following files and directories:

- `Financial_Analysis.ipynb`: The main Jupyter Notebook containing all the code for the project, from data acquisition to model evaluation.
- `README.md`: This file, which provides an overview of the project.

Getting Started

To run this project locally, you will need to have Python installed.

1. Clone the repository:

git clone https://github.com/YourUsername/your-repo-name.git
cd your-repo-name

2. Install dependencies:

This project relies on several key Python libraries. You can install them all at once using `pip`:

pip install pandas numpy matplotlib seaborn yfinance statsmodels scikit-learn tensorflow

3. Run the analysis:

Open the `Advanced_financial_market_analysis.ipynb` notebook in Jupyter or Google Colab and run the cells in order. The notebook is well-commented and will guide you through each step of the analysis and modeling process.

Final Results

The results of the analysis, including the model performance comparison and the executive summary, are detailed within the Jupyter Notebook. The notebook's visualizations and conclusions provide a clear picture of the project's findings.