Module Code: CS3AM

Assignment Report Title: Stock Analysis of Apple, with timeseries forecasting

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Abstract

The stock market is a complex and dynamic system influenced by many factors from economic conditions (Chen, 2024) such as GDP growth, inflation and interest rates to investor sentiment (Bajaj Broking, 2024), which is largely emotional and can have impacts on share prices. Accurately predicting stock prices and market trends has been at the forefront of many investors, financial institutes to optimize investment strategies and manage risk which when done correctly can yield substantial rewards.

Time series analysis has been a powerful technique to uncover hidden patterns and trends in stock market data (Kaniugu, 2023). By analysing historical patterns and identifying recurring patterns such as seasonality it provides valuable insights that can inform us about short-term future price movements. Hence this approach is well suited for capturing the sequential nature of financial data an account for temporal dependencies in the stock market.

However, stock price forecasting remains a challenge due to the inherent volatility and non-linear nature of the financial markets even among immense asset managers and hedge funds such as BlackRock even with complex and power full systems such as Aladdin. Traditional statistical, machine learning algorithms, and deep learning models have been applied with varying degrees of success.

This project aims to develop accurate and reliable time series models using deep learning and machine learning algorithms for stock price prediction.

Exploratory data analysis

In this section we will analyse and show findings of our stock dataset, we go into details about descriptive statistics as well as an in-dept look at abnormal events with our dataset and what we can infer from them.

Our dataset consists of historical stock price data for Apple (ticker symbol: AAPL), the data was sourced through yfinance (Aroussi, n.d.) which is an open-source tool that uses Yahoo’s publicly available API. It allows you to fetch historical stock data using python by importing it as a module and passing the ticker symbol as a parameter and start and end date. This assignment analyses the daily resolution data from December 1980 to November 2024 excluding bank holidays and weekends as there are no trades during these days. The dataset contains approximately 11,000 rows with features such as date, closing price of the stock, adjusted close which is the main metric we will be focusing on as it provides a more accurate representation of a stock’s value over time. Unlike the regular closing price, which simply reflects the last traded price of a stock on a given day, the adjusted closing price considers the various corporation actions that can affect a stock price such as dividend or corporate adjustments, other features the opening price the high and low price during the day. Our target variable for this assignment will be the ‘Adjusted Close’ as this is more representative of the stock after actions like stock splits.

The first step was to generate new features from existing ones which would help our stock analysis, from the existing features above we generated percentage daily returns but normalising the difference between day and day+1

The figure below shows the

References:

Chen, J. (2024, October 10). Forces That Move Stock Prices. Investopedia. <https://www.investopedia.com/articles/basics/04/100804.asp>

Bajaj Broking. (2024, November 28). What are the Factors Affecting Share Prices? <https://www.bajajbroking.in/blog/factors-affecting-share-prices>

Kaniugu, H. (2023, June 24). The power of time series analysis in stock prediction. LinkedIn. <https://www.linkedin.com/pulse/power-time-series-analysis-stock-prediction-heri-kaniugu/>

Aroussi, R. (n.d.). yfinance: Download market data from Yahoo! Finance's API. GitHub. <https://github.com/ranaroussi/yfinance>