Memo: AAPL Stock Feature Analysis

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Prepared for: Homework
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Problem Setup

The objective is to analyze Apple Inc. (AAPL) stock performance by engineering financial features from historical daily price data. This allows identification of market trends, volatility patterns, and signals useful for predictive modeling.

Methods

- **Data Source:** AAPL daily prices (April–August 2025).

- **Feature Engineering:**

    o   Daily returns (percent change in closing prices).

    o   Moving averages (smoothing trend over time).

- **Analysis Tools:** Python (pandas, matplotlib) with Jupyter notebooks for reproducibility. Linear regression for prediction. Confidence Intervals, boxplots, histograms, heatmaps, and scenario analysis for evaluation.
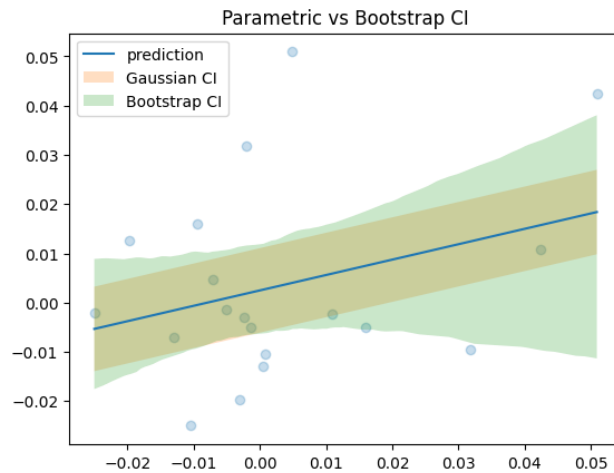

Results

1. **Closing Price Trend**
   AAPL prices declined sharply in early April, followed by stabilization and minor recovery.

2. **Confidence Intervals for predicted returns**
   There exists large differences between gaussian and bootstrapped CI

Parametric vs Bootstrap CI

3. **Outliers**

There are not a large amount of outliers and the impact of outliers on the financial data is minimal

Boxplot: Outliers
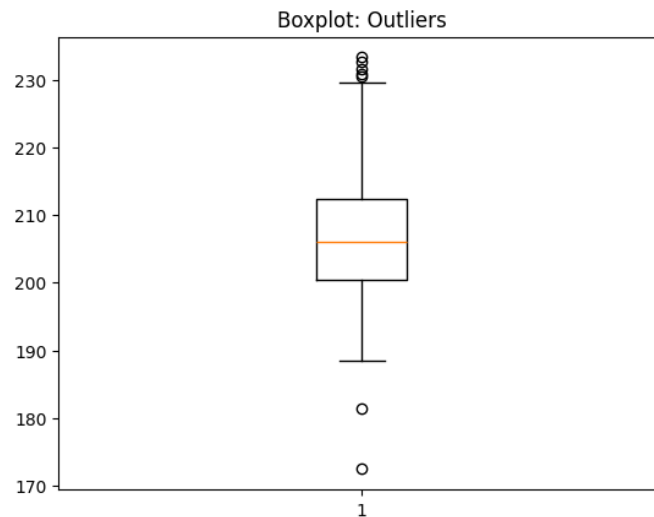
Assumptions & Risks

- **Assumptions:** Data is accurate and complete; moving averages sufficiently capture trends. The data follows normal distribution and are independent of each other

- **Risks:**

  o Market shocks not reflected in historical data.

  o Model over-reliance on limited features (may miss macroeconomic signals).

  o Data covers only a short timeframe (April–August 2025).

Appendix (Optional)

- Additional volatility metrics (e.g., rolling standard deviation).

- Outlier detection and sensitivity analysis.

- Extended feature engineering (e.g., RSI, Bollinger Bands).