Comparative Performance Analysis

By: Rasesh Desai, Brandon Rusinque, Graham Loughrey, Allana Nelson

Project Description:

- While working for a large equity-trading company, our team is tasked with researching our client's portfolio, specifically interested in the tech industry.

- Within the magnificent 7 stocks, Nvidia, Apple, Amazon and Tesla will be examined through statistical analysis techniques including
  - Aggregation - Calculated average daily returns over past year with each stock
  - Correlation - Determining correlations between daily returns of each stock
  - Comparison - Comparing Cumulative returns over the past year
  - Summary Statistics - Calculating summary statistics such as mean, standard deviation, and percentiles for daily returns.

- Final goal is to give data backed recommendations as to how our client should invest within the 4 companies, using data from the past year.

Overview:

- Data Collections
  - We gathered stock data from the NASDAQ by importing yahoo finance data.
- Clean Up
  - No clean up processes were necessary as the stock price data is highly regulated to ensure stability in the financial markets.
- Exploration Process
  - Inspected stock data of the 4 companies from the past year's performance.
  - Examined mean, standard deviations, cumulative average returns to understand relationships and patterns between the 4 companies.

Research Questions:

1. How do the returns of Nvidia, Apple, Amazon, and Tesla compare over the past year?

2. What are the trends and volatility differences among these stocks?

3. What investment recommendations can be made based on the comparative performance analysis?
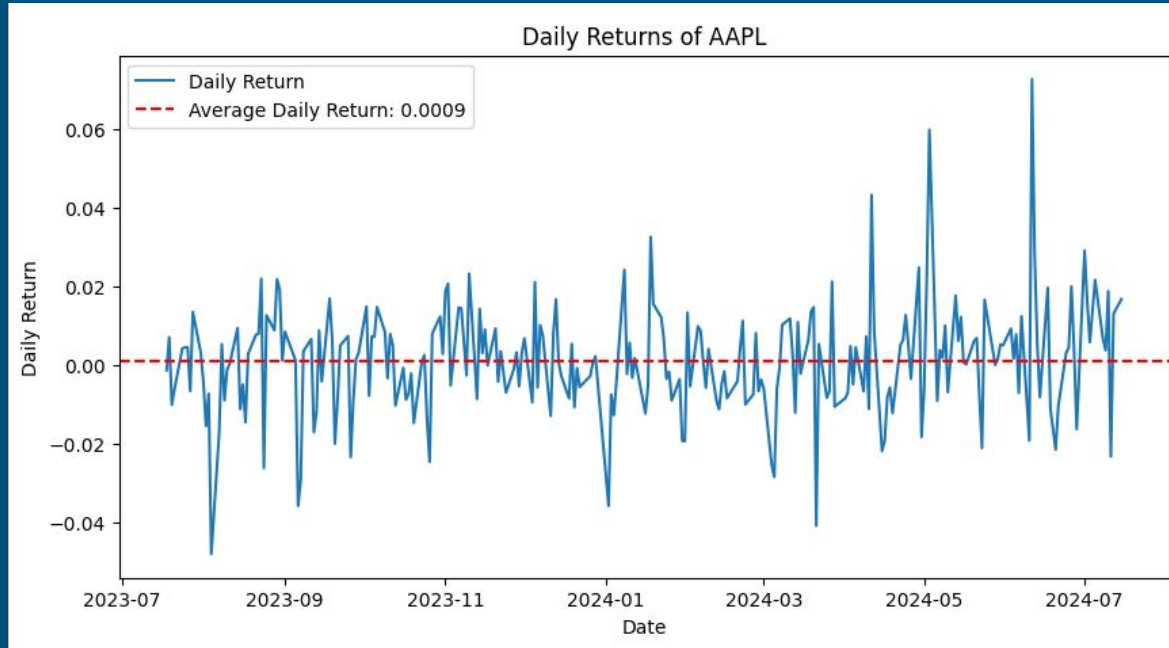
Research Question 1:

- How do the returns of Nvidia, Apple, Amazon, and Tesla compare over the past year?

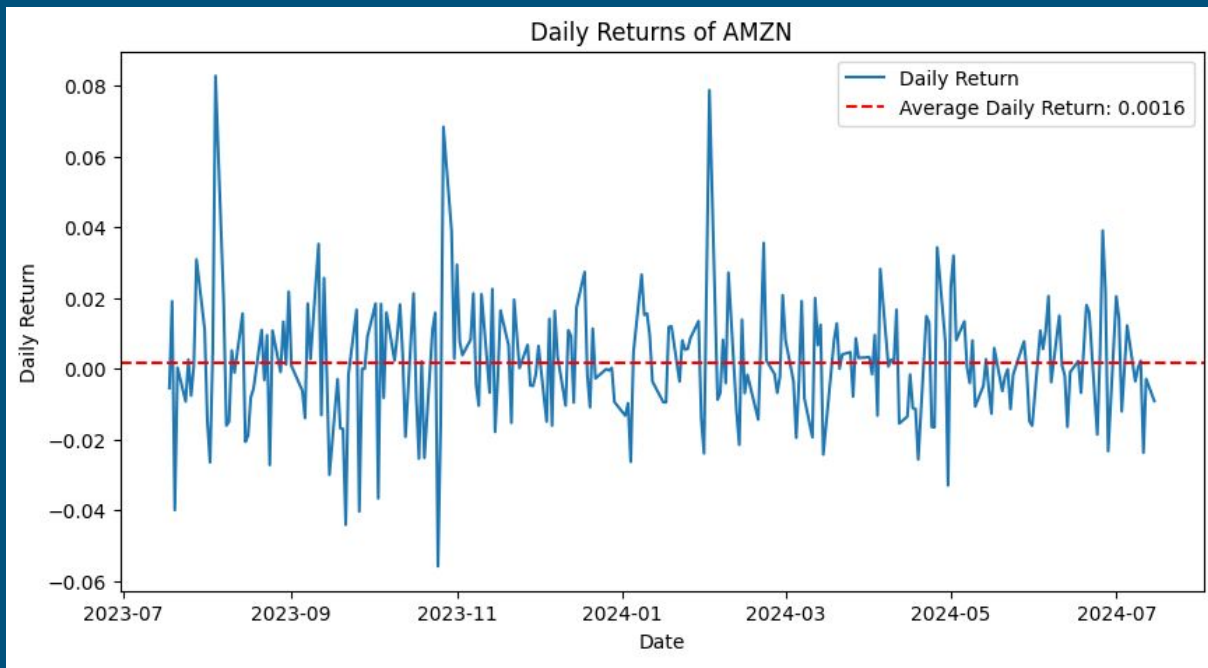# NVIDIA DAILY RETURNS:

Daily Returns of NVDA
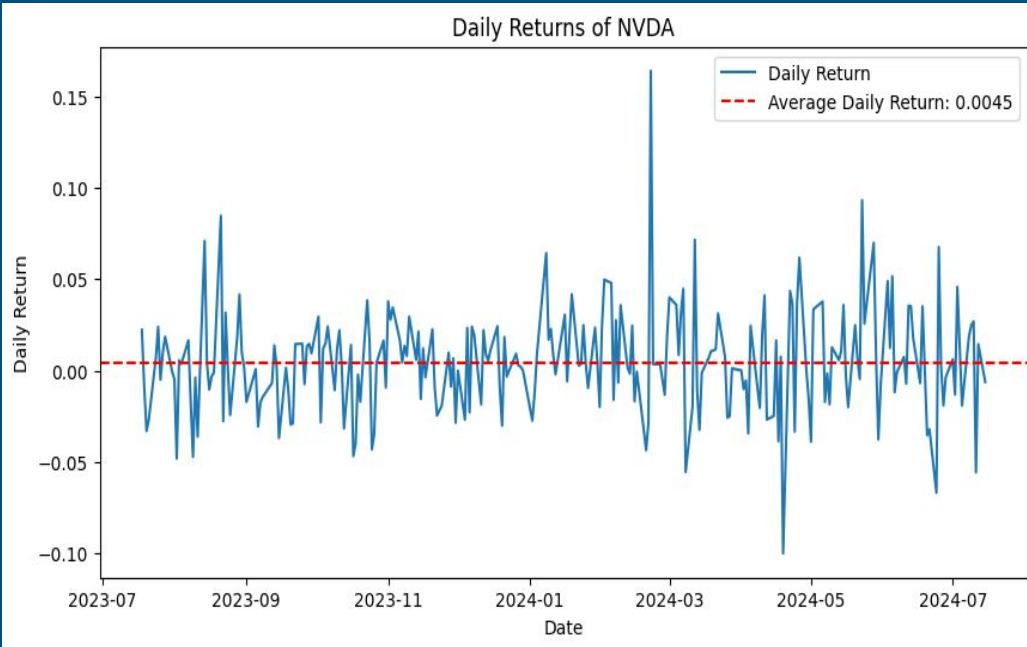
- The Following data will allow us to see the returns of NVIDIA to compare the returns over the past year with the other stock data.
- The average daily return for NVDA is 0.0045
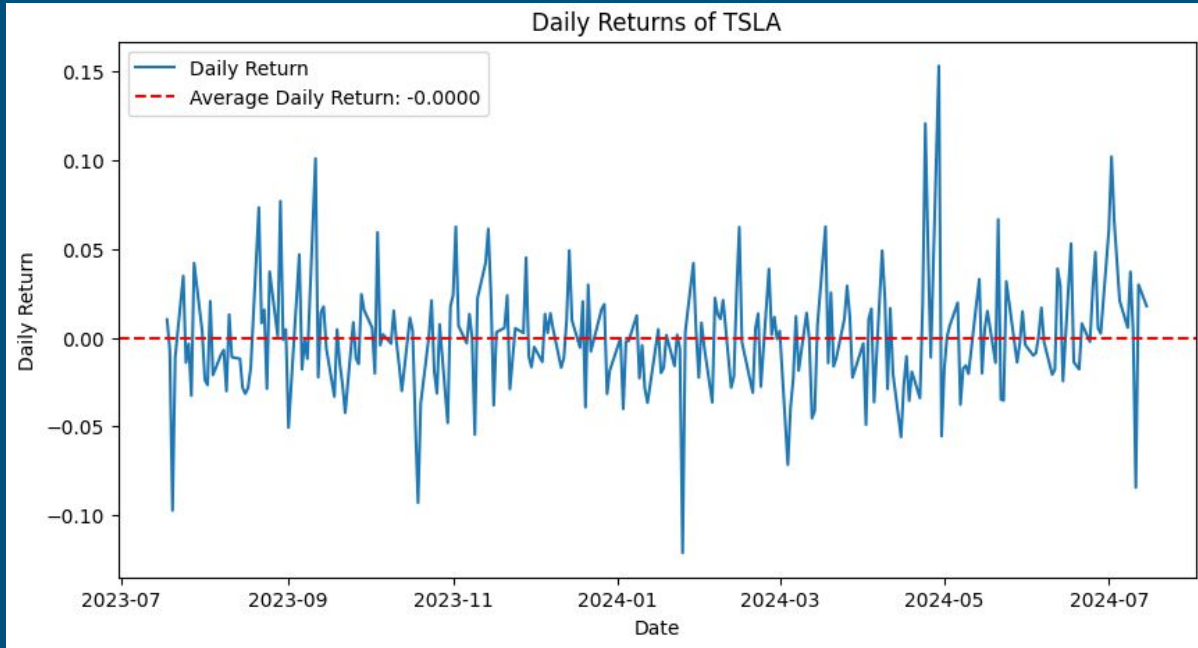
Apple Daily Returns:

Daily Returns of AAPL

- The Following data will allow us to see the returns of APPLE to compare the returns over the past year with the other stock data.
- The average daily return for AAPL is 0.0009
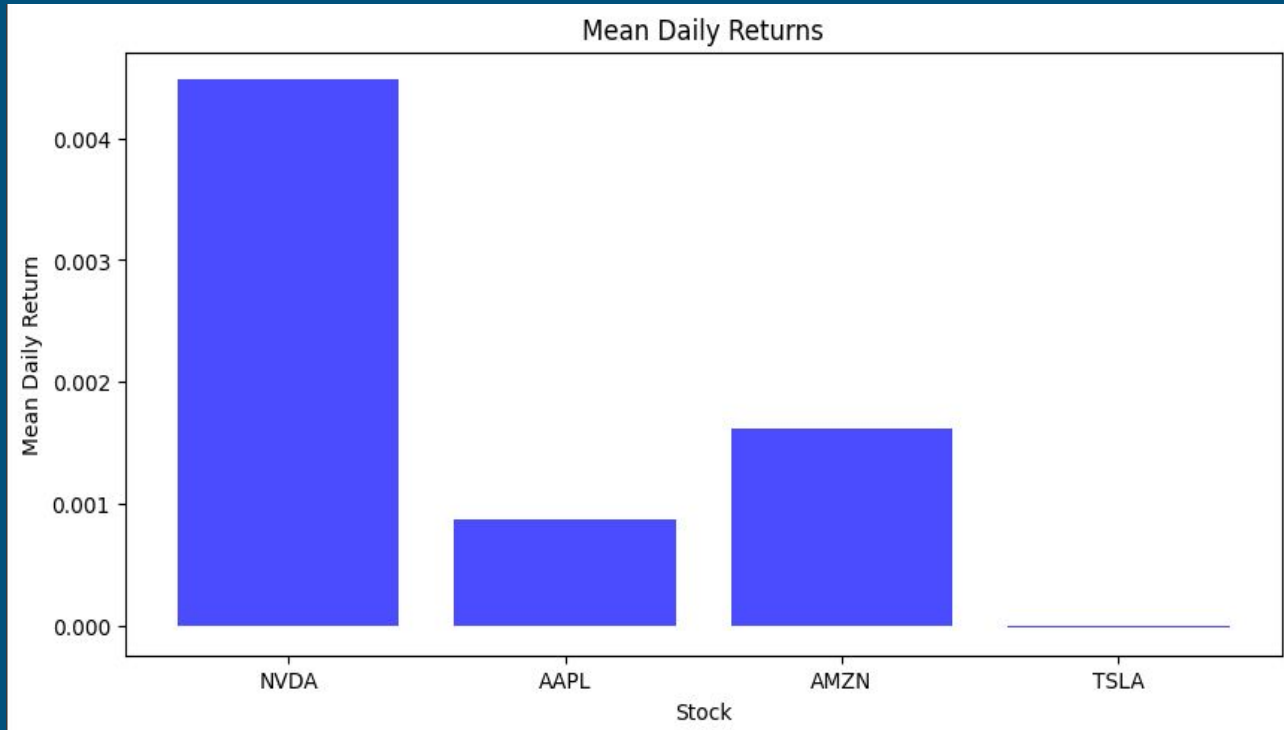
AMZN Daily Returns:

Daily Returns of AMZN

- The Following data will allow us to see the returns of AMAZON to compare the returns over the past year with the other stock data.
- The average daily return for AMZN is 0.0016
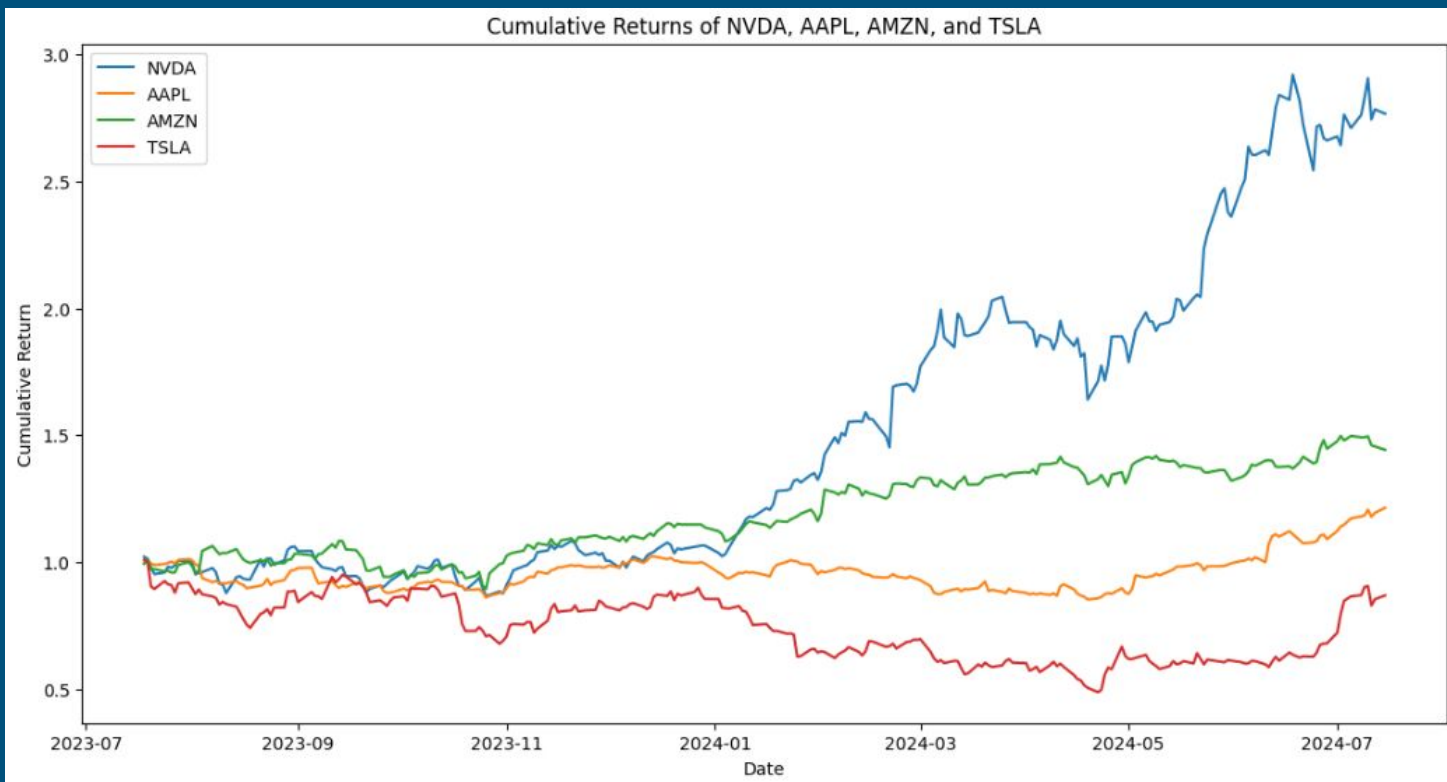
TSLA Daily Returns:

Daily Returns of TSLA

- The Following data will allow us to see the returns of TESLA to compare the returns over the past year with the other stock data.
- The average daily return for TSLA is 0.0000

MEAN DAILY RETURNS

Mean Daily Returns

From the means daily returns it looks like NVDA has the highest daily return from the past year.

Cumulative Returns of all the stocks:

Cumulative Returns of NVDA, AAPL, AMZN, and TSLA

The data for the cumulative returns for all the stocks show us that NVIDIA led with the highest cumulative returns followed by AMAZON and then APPLE and last TESLA.

Conclusions based on current visualizations

- Comparing daily returns for all four tech stocks
  - Nvidia gave the highest average daily return of 0.0045.
  - Amazon gave the second highest average daily return of 0.0016.
  - Apple gave the third highest average daily return of 0.0009.
  - Tesla came with the lowest average daily return of 0.0000.
- The highest average daily return to least average daily return data gives insight on which stocks are most to least promising for investing and aiming for best returns.

Research Question 2:

- What trends can we find, as well as the difference in volatility among Nvidia, Amazon, Apple and Tesla?
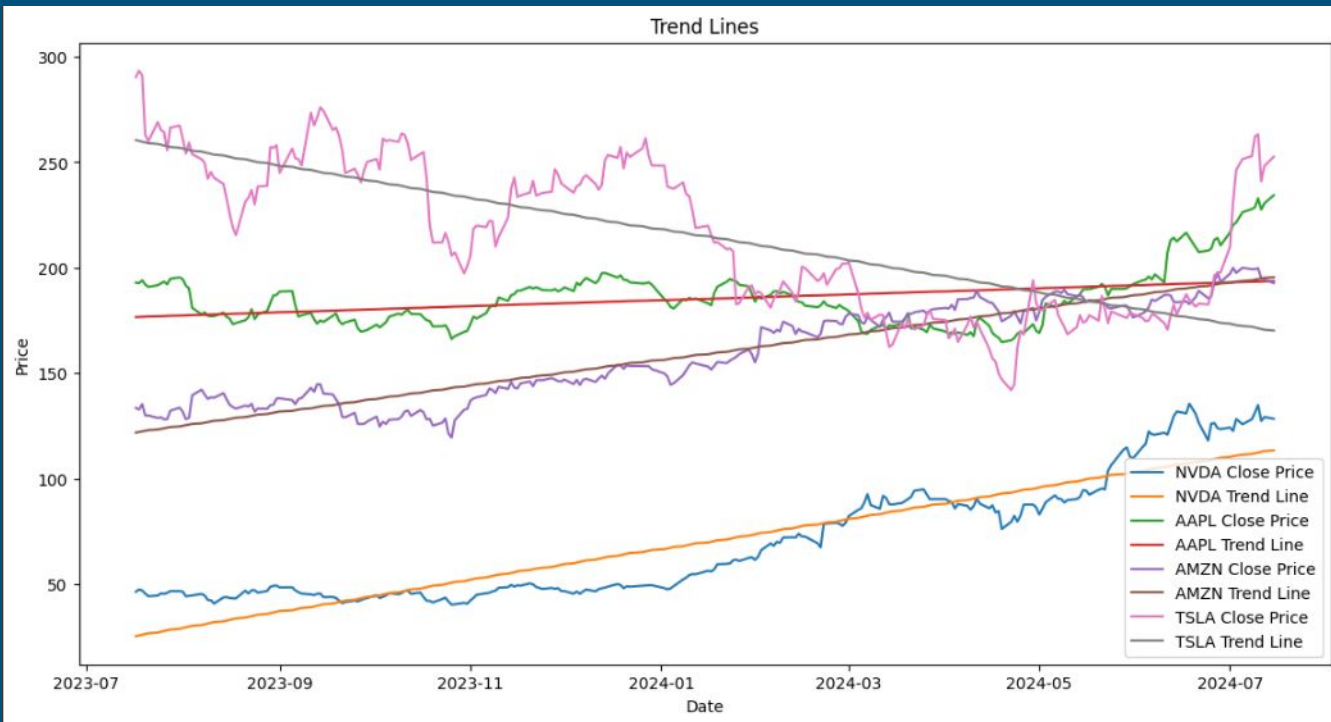
STANDARD DEVIATION OF CUMULATIVE RETURNS:
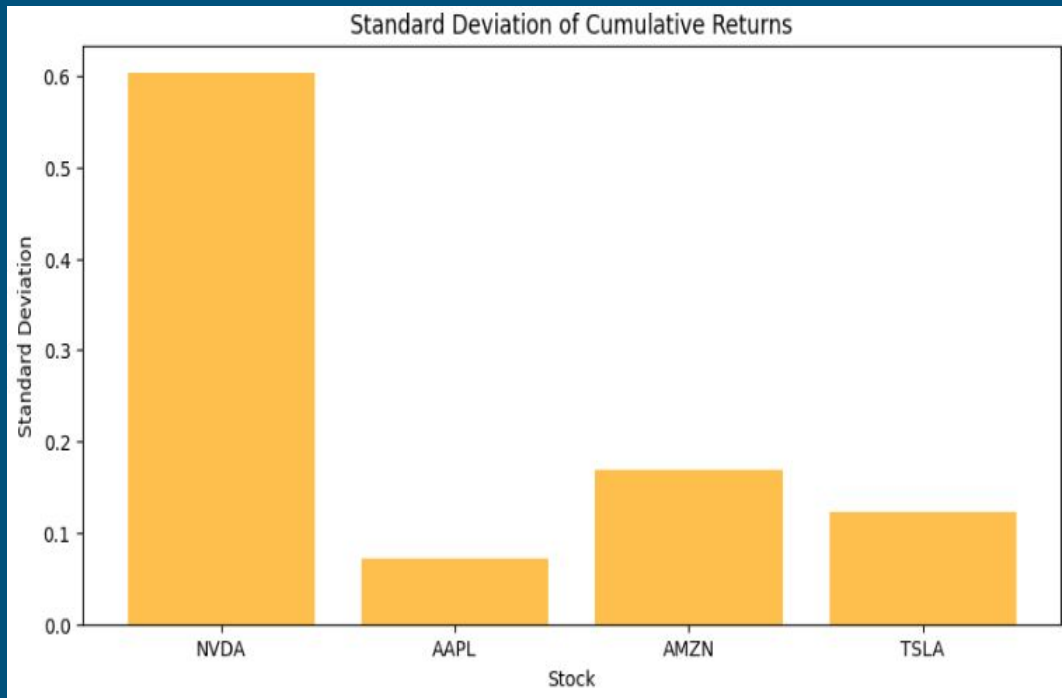
The data for standard deviation of cumulative returns for all the stocks show us that NVIDIA led with the highest cumulative returns followed by AMAZON, Tesla and AAPL at lowest.

# HEATMAP SUMMARY OF CUMULATIVE RETURNS:
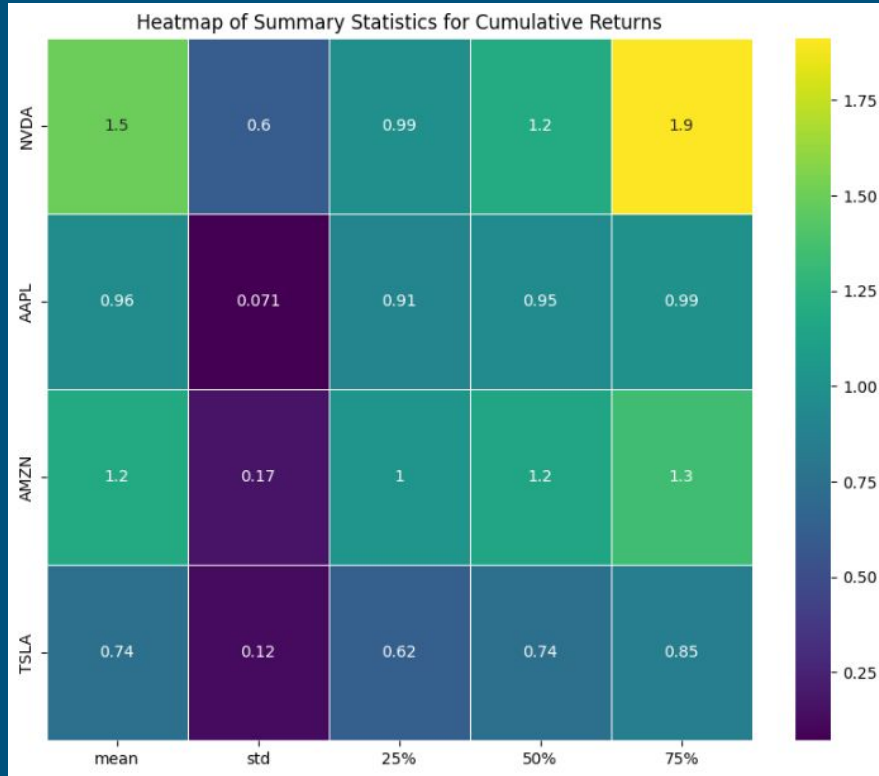
Heatmap of Summary Statistics the heatmaps visualization shows us the summary statistics for each stock, showing mean, standard deviation, and different percentiles for all the stocks.
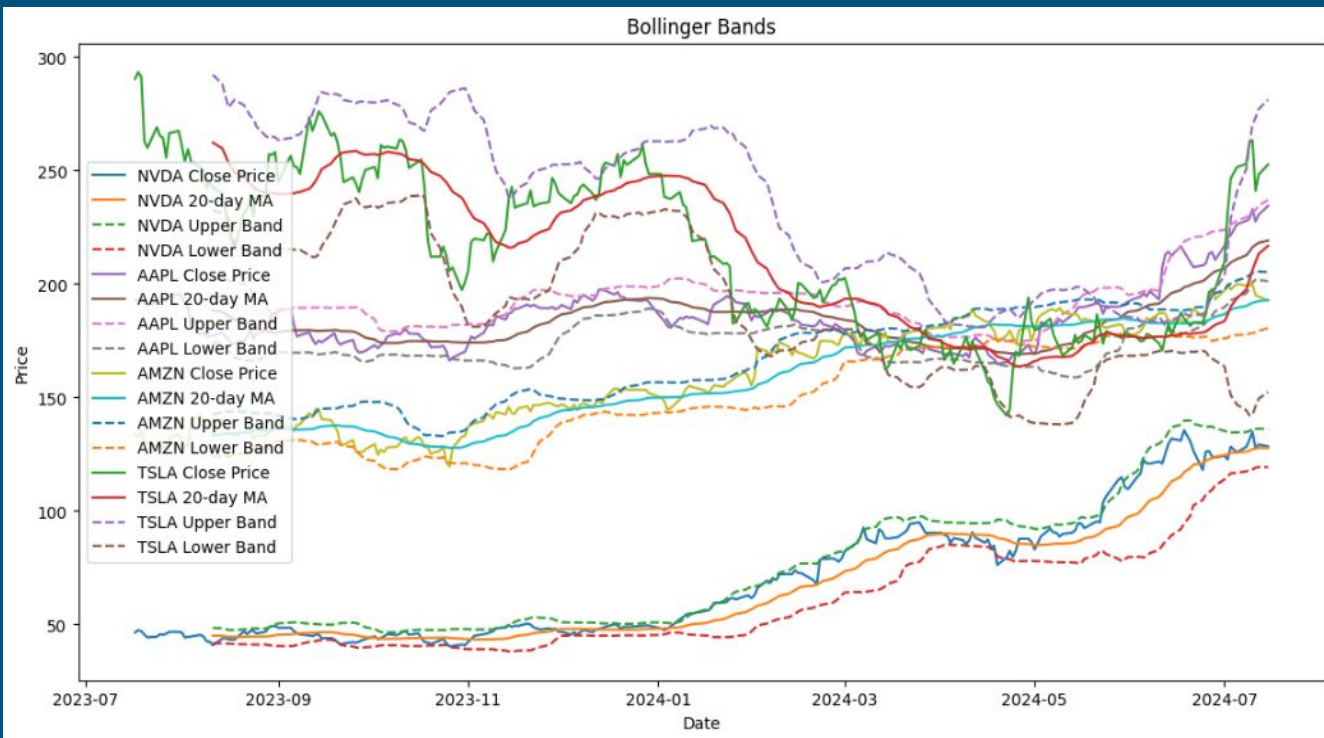
TREND LINES:

The trend lines data shows us the plots trend lines to the closing prices of the stocks.

Mean vs. Standard Deviation of Cumulative Returns:
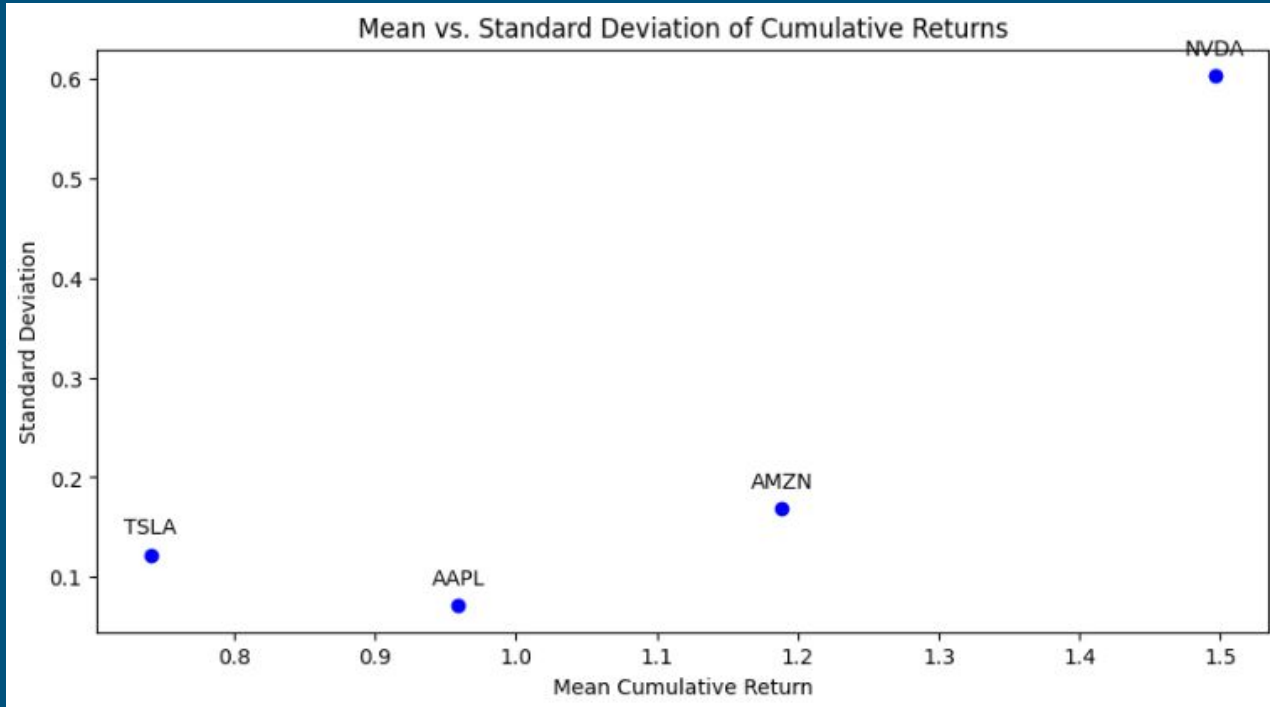
Scatter Plot of Mean vs. Standard Deviation Summary Visualization
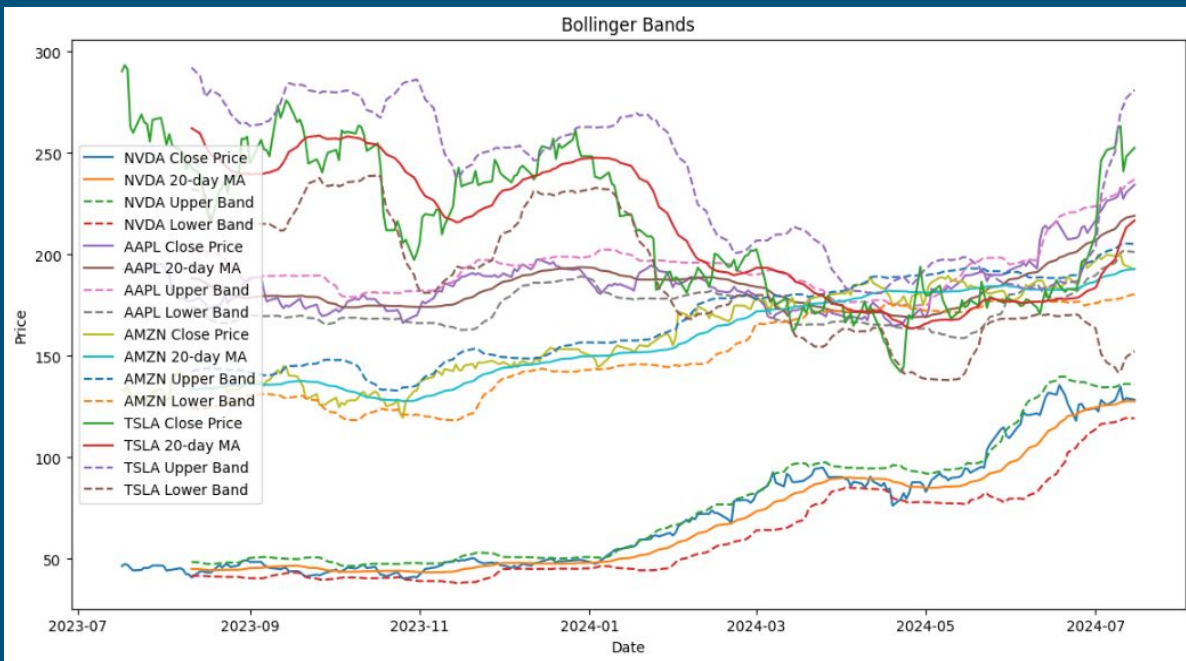
Calculating the Bollinger Bands:

The bollinger bands data shows is that they are used to measure market volatility and identify overbought or oversold conditions.

Key insights from bollinger bands:

1. Volatility measurements
2. Overbought and oversold conditions
3. Trend continuation or reversal

Calculating the Bollinger Bands:

1. Volatility measurement:
   a. the distance between the upper and lower bands represents volatility.
2. Overbought/Oversold Conditions:
   a. When a stock price touches or moves above the upper band, the stock is considered overbought- suggesting potential selling opportunity
   b. When the stock price touches or moves below the lower band, the stock is considered oversold, suggesting in a potential buying opportunity

Calculating the Bollinger Bands:

3. Trend Continuation or reversal:

- Trend Continuation:
  - If prices consistently touch the upper band during uptrend, it indicates strong buying pressure and trend is likely to continue.
- Trend Reversal
  - Similarly, if prices move from one band to another, it can signal a potential reversal. For example, moving from the upper band to lower band can indicate a shift from uptrend and downtrend
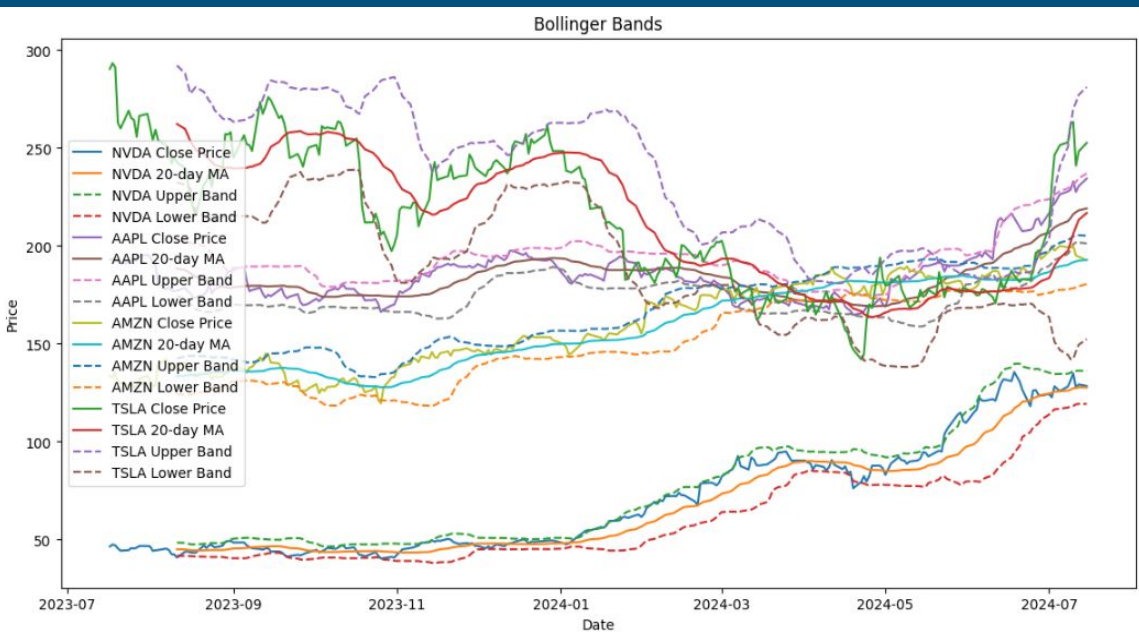
Research Question 3:

- What investment recommendations can be made on the comparative performance analysis?

Comparative Performance Analysis Conclusions

1. Mean Daily Return Data displayed Nvidia was the best performing tech stock, followed by Amazon, Apple and Tesla within the past year.
2. Cumulative returns displayed Nvidia was highest, followed by Amazon, Apple and Tesla.
3. Our standard deviation data (statistical measure that quantifies the amount of variation or dispersion in a set of values) displayed Nvidia with the highest, followed by Amazon, Tesla, and lastly, Apple. This measurement was interesting as it did not follow the exact pattern of daily return and cumulative return, as Tesla was the third highest, followed by Apple.

Overall Conclusion:

- According to the data pulled from NASDAQ, analyzing the past year of daily performance, we conclude that Nvidia seems like the highest & strongest return recommendation, if all trends continue according to the past year's data.
- We would recommend allocating a strong/large position in Nvidia.
- Moderate positions in Amazon and Apple.
- Consider placing a smaller position in Tesla, as the returns from the past year was least favorable and promising.
- The client is free to position accordingly, to match their risk tolerance and time horizon.

Additional Questions

- Would the recommendations remain the same if the past 5 years worth of data was analyzed and compared?
- How would the other 3 tech companies (Microsoft, Alphabet, Meta Platforms) in the magnificent compare to the current stocks being investigate?