# Macro Meets
# Microchips

Analyzing the correlation between NVIDIA stock price and US Unemployment Rate (With SPY as US Economy Benchmark)

Brandon Hong

# Data Sources
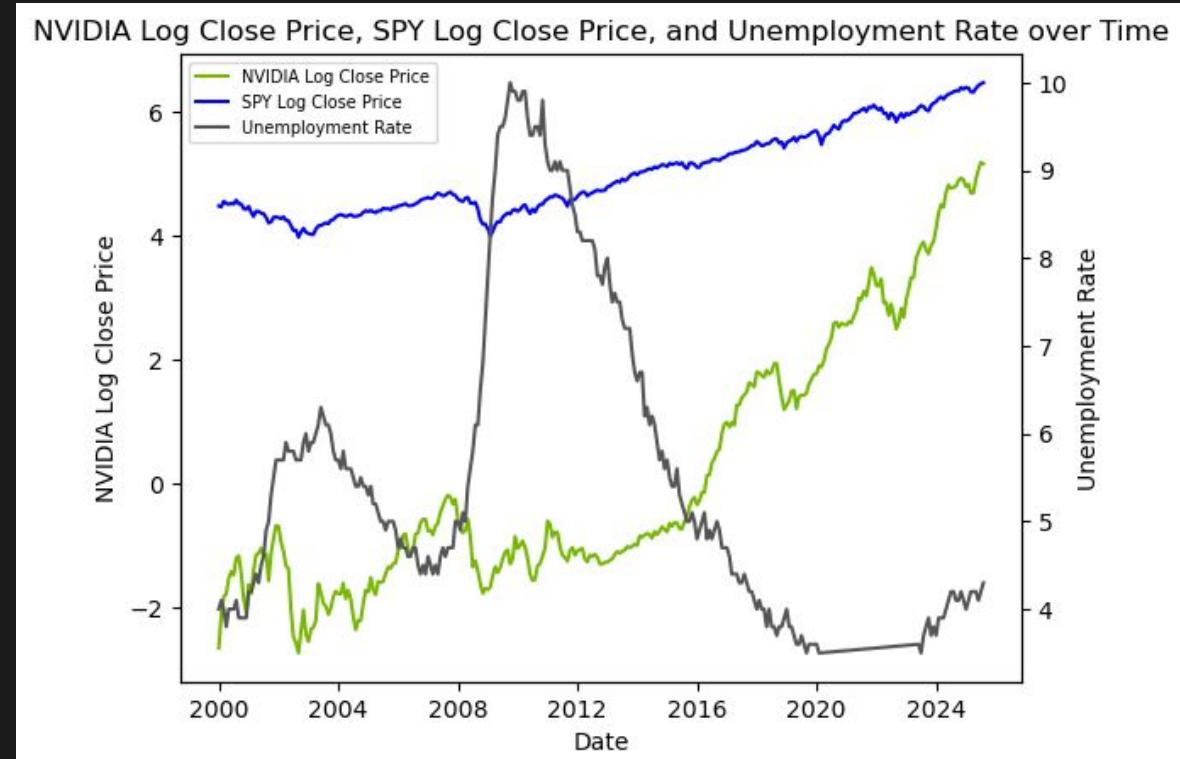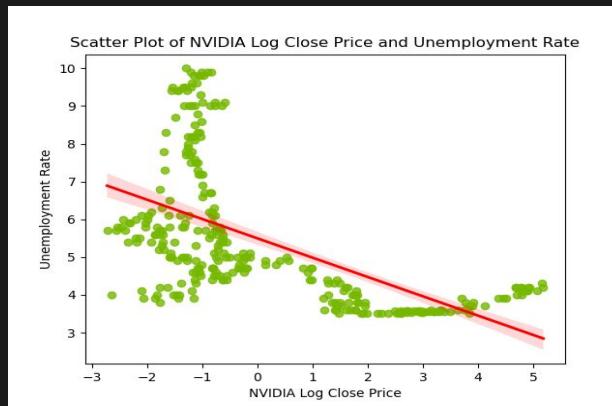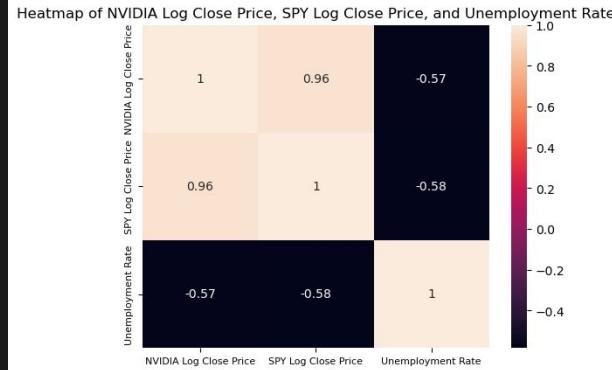
| Dataset | Description | Fields | Type | Data Size |
|---|---|---|---|---|
| **NVIDIA Historical Price (Yahoo Finance)** | ➜ Monthly NVIDIA price data from 2000-01-01 to 2025-09-01 | ➜ Date<br>➜ Open<br>➜ High<br>➜ Close<br>➜ Low | ➜ API Call to Yahoo Finance | ➜ 308 |
| **SPY Historical Price (Yahoo Finance)** | ➜ Monthly SPY price data from 2000-01-01 to 2025-09-01 | ➜ Date<br>➜ Open<br>➜ High<br>➜ Close<br>➜ Low | ➜ API Call to Yahoo Finance | ➜ 308 |
| **US Unemployment Rate (FRED)** | ➜ Monthly US Unemployment Rates from 2000-01-01 to 2025-09-01 | ➜ Date<br>➜ Unrate | ➜ API call to Federal Reserve Economic Data | ➜ 308 |

# Summary Overview (2000/01/01 – 2025/09/01)
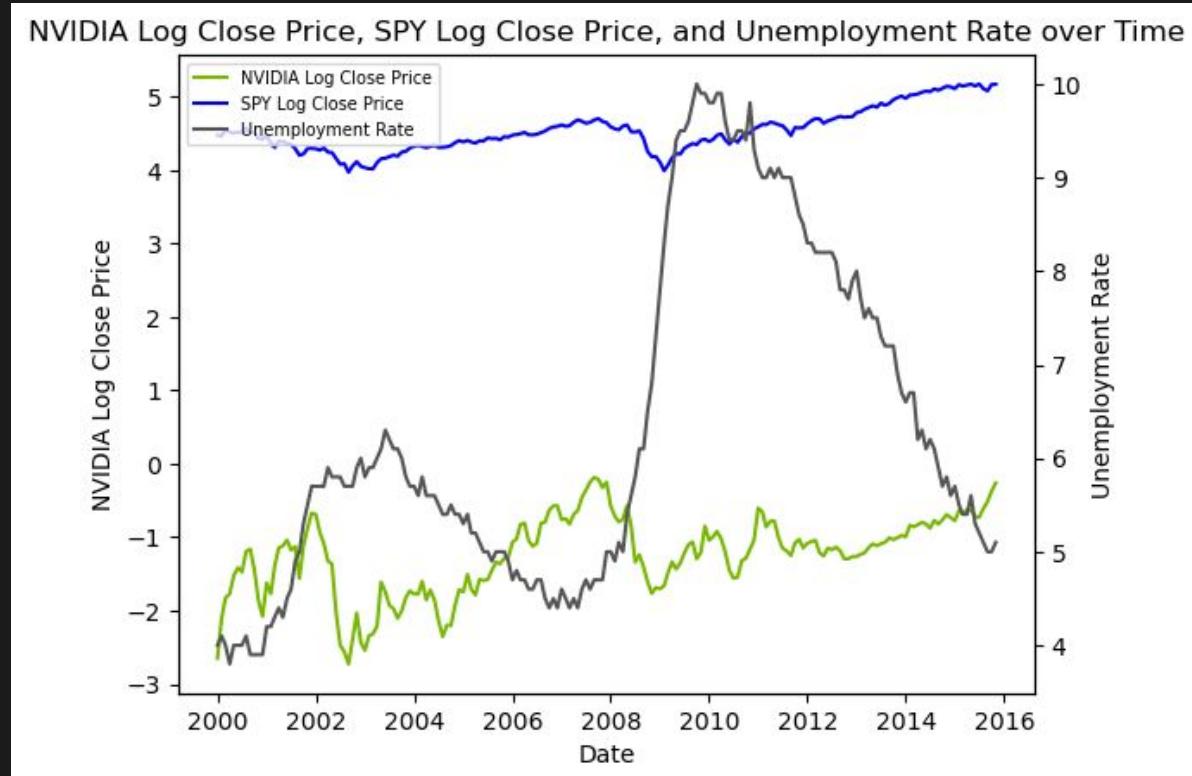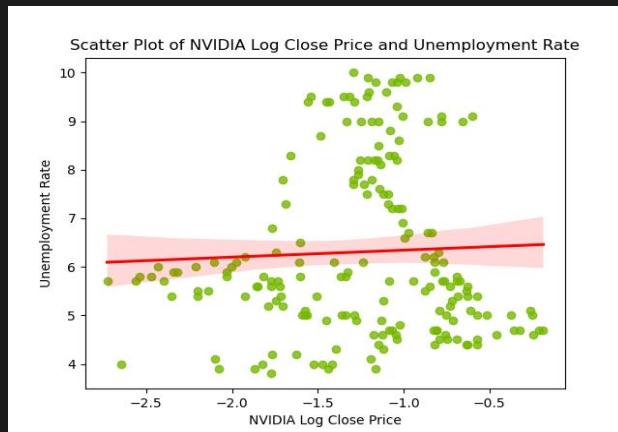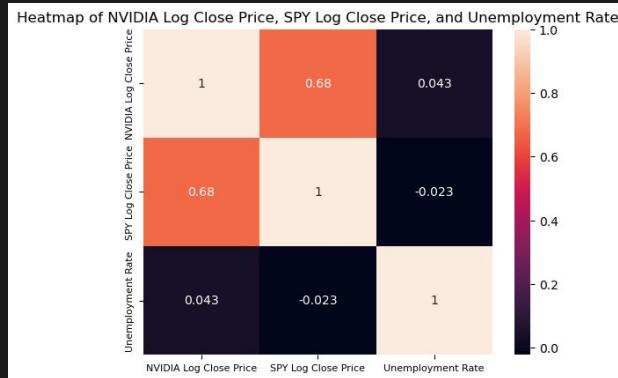






[1]https://github.com/bwhong/bwhong-dsci510_fall2025_final_project/blob/main/src/results.ipynb

# Summary Overview (2000/01/01 – 2025/09/01)
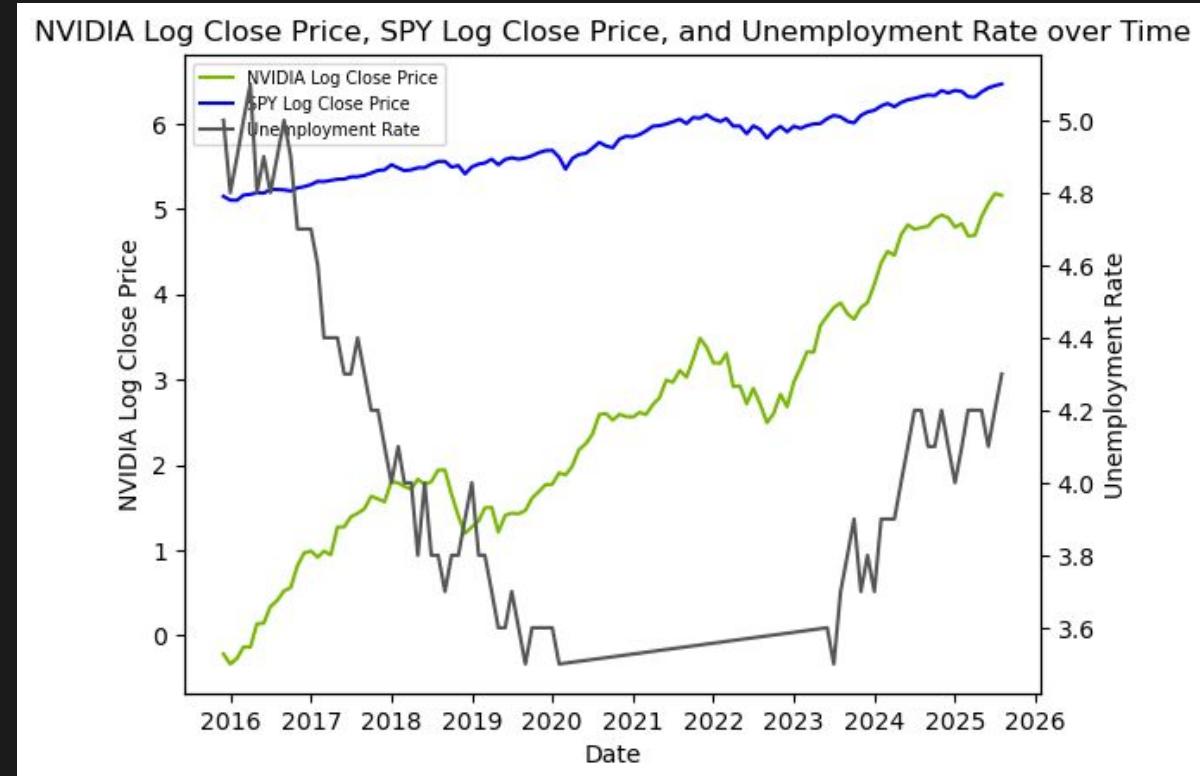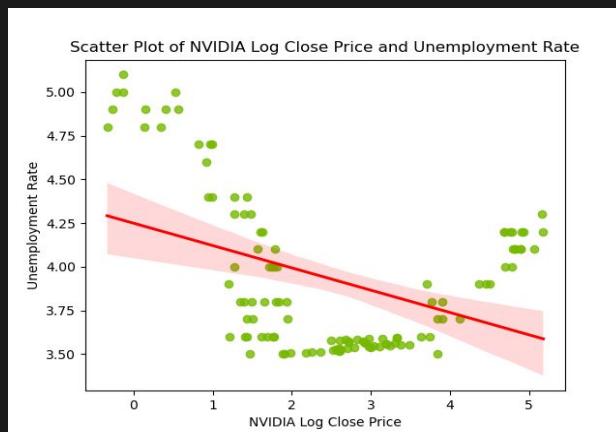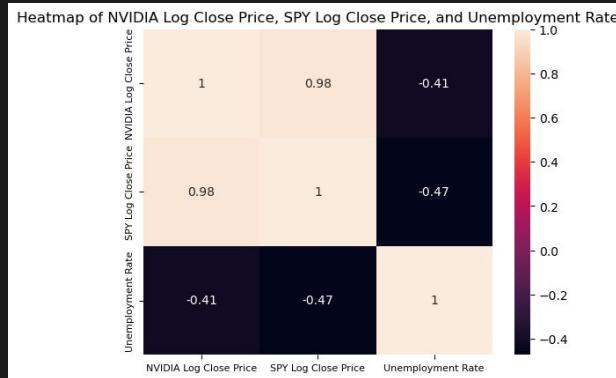
- Unlike expectations, we see a moderately negative correlation between Unemployment Rate and NVIDIA Log Stock Close Price.

- The correlation between NVIDIA and SPY is extremely positive.
  - When NVIDIA performs well, SPY also performs well.
  - NVIDIA makes up 7.5% of the S&P 500, so this makes sense.

- The time chart portrays interesting relationships even during Economic Crises
  - During the Global Financial Recession, Unemployment soars to record highs.
  - Meanwhile, stocks fall and take a longer time to recover.

- We also see the start of the AI boom in stocks.
  - As stocks soar, unemployment slowly starts to creep upwards.

# Pre AI–Boom Summary Overview (2000/01/01 – 2015/12/01)

# Post AI-Boom Summary Overview (2015/12/01 – 2025/12/01)

# Pre and Post AI Boom Summary Overview

- When we split the data by the start of Open AI, we begin to see even more interesting relationships
    - Pre AI Boom, there is little to no correlation between NVIDIA and Unemployment Rate
    - Post AI Boom, we see a weak negative correlation between NVIDIA and Unemployment Rate
- NVIDIA and SPY do not have as strong as a correlation Pre AI Boom because NVIDIA was a smaller fraction of the S&P 500
- At the creation of ChatGPT (2022), we can actually begin to see a positive correlation between NVIDIA and Unemployment Rate

# Challenges

- The most difficult portion of the project was determining the best method to normalize the data.

- If I standardized the Unemployment Rate data for every major economic event, the data would be unrealistic. Instead, I focused on removing any outliers.

- For the stock data, I initially tried to use raw stock prices, standardized the stock prices, and used monthly percent changes but quickly found that these approaches were not a good fit for my analysis. I found log transformations to be the most effective method for normalization.

THANK YOU