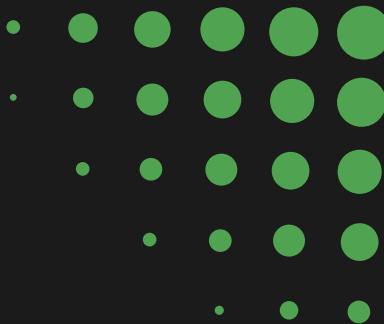


# Macro Meets Microchips

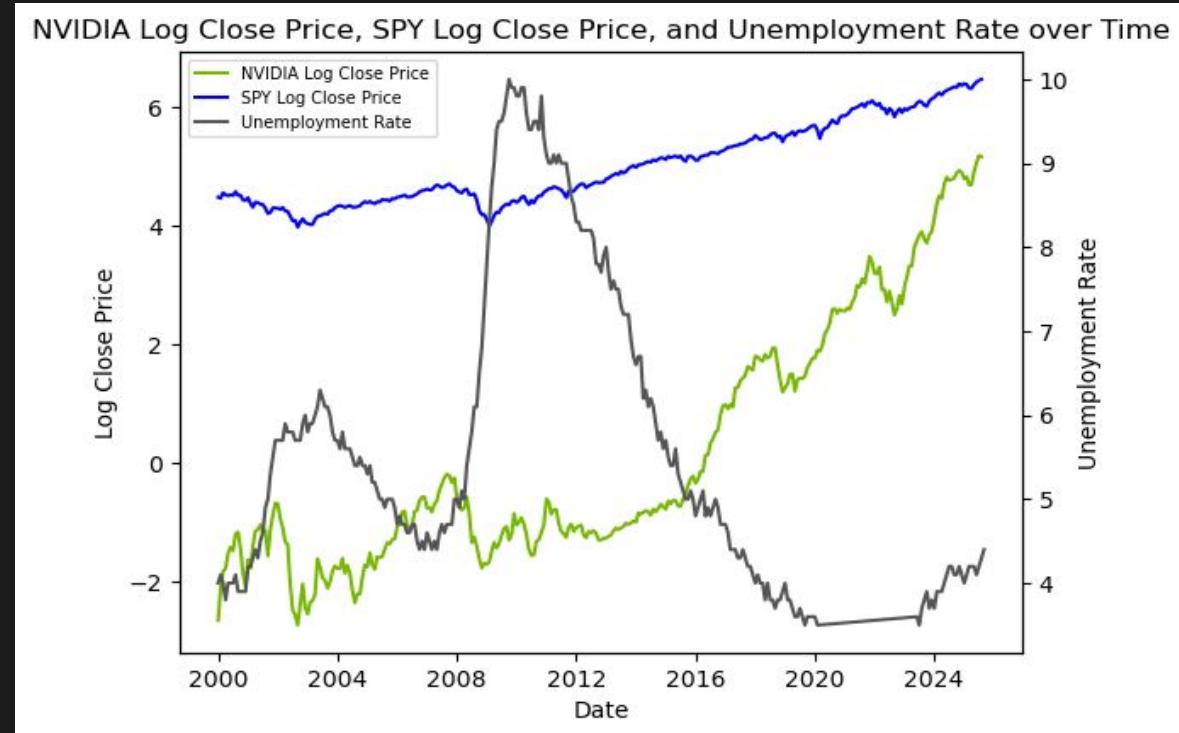
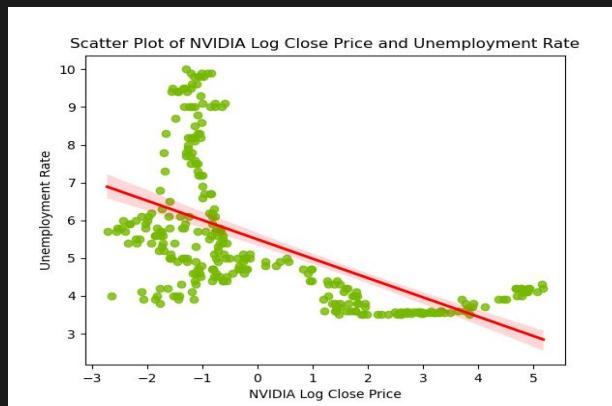
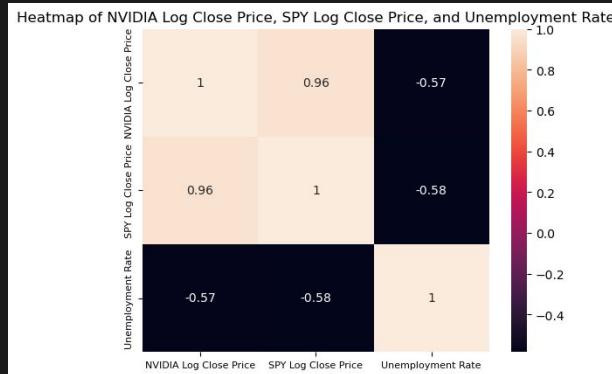
Analyzing the correlation between NVIDIA stock price and US Unemployment Rate (With SPY as US Economy Benchmark)

# 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 → Open → High → Close → 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 → Open → High → Close → Low	→ API Call to Yahoo Finance	→ 308
US Unemployment Rate (FRED)	→ Monthly US Unemployment Rates from 2000-01-01 to 2025-09-01	→ Date → Unrate	→ API call to Federal Reserve Bank	→ 308

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

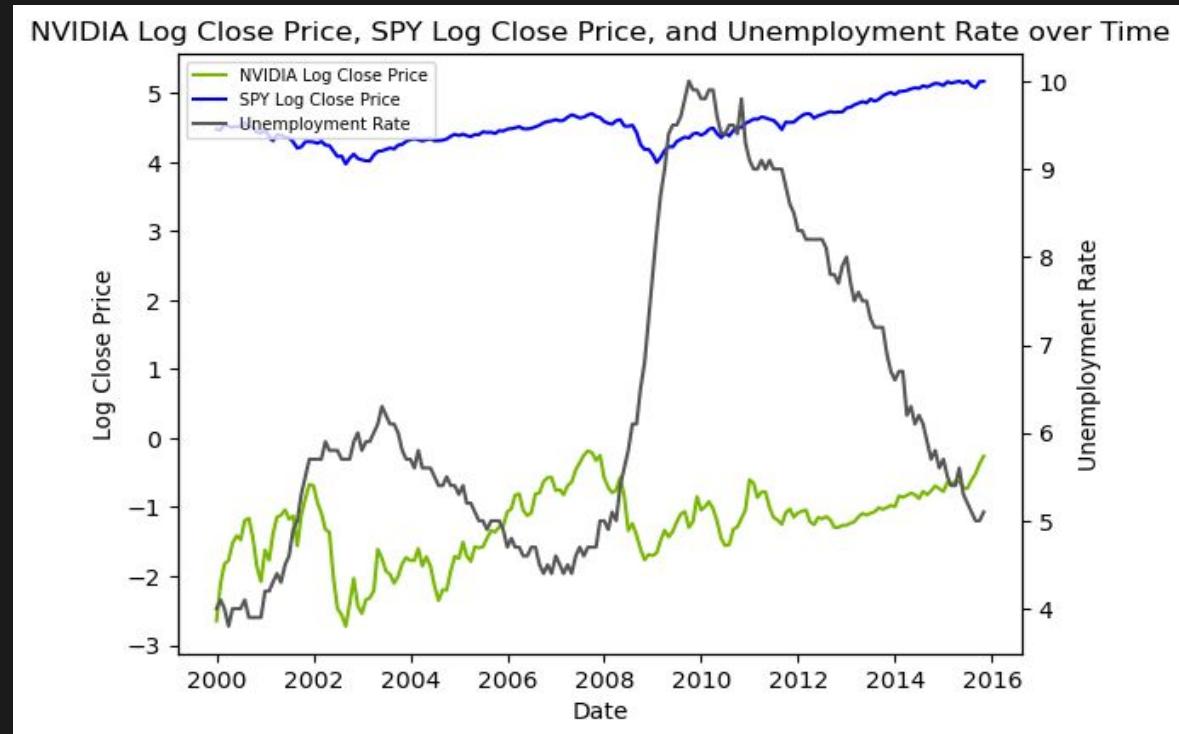
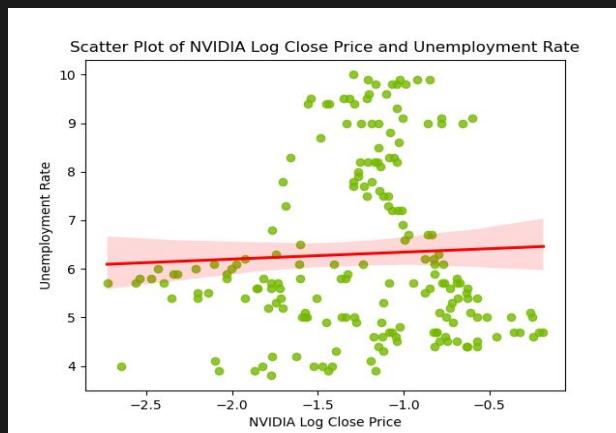
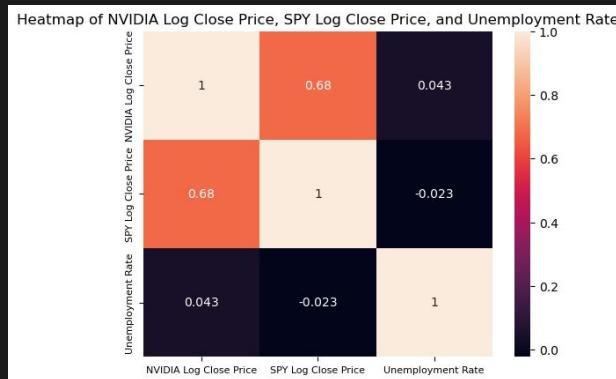


<sup>1</sup>[https://github.com/bwhong/bwhong-dsci510\\_fall2025\\_final\\_project/blob/main/src/results.ipynb](https://github.com/bwhong/bwhong-dsci510_fall2025_final_project/blob/main/src/results.ipynb)

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

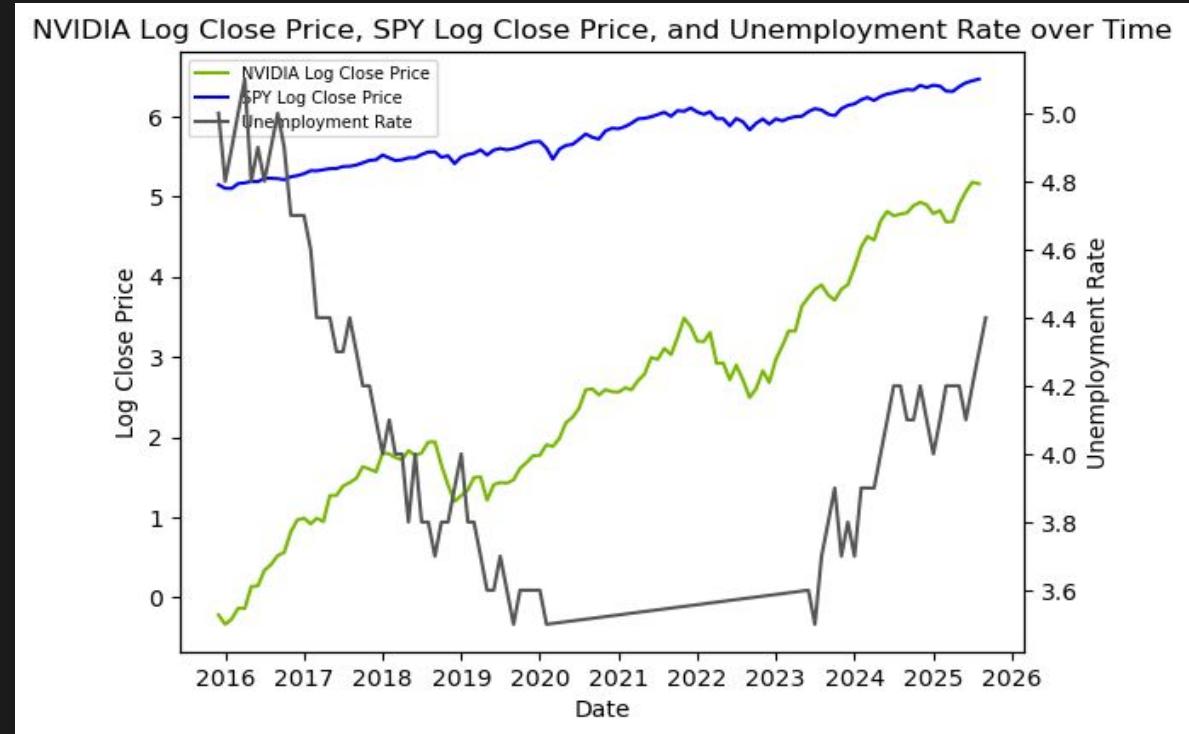
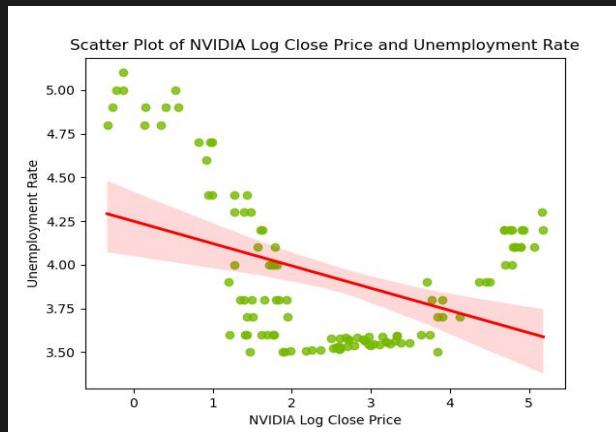
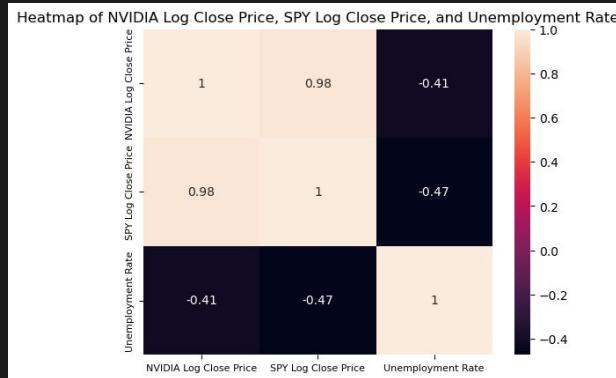
- Unlike expectations, we see a moderately negative correlation between NVIDIA Log Stock Close Price and Unemployment Rate.
- The correlation between NVIDIA and SPY is extremely positive.
  - When NVIDIA performs well, SPY also performs well.
  - NVIDIA makes up 7.5% of the S&P 500, so this makes sense.
- The time-series 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 - 2015/11/01)



<sup>1</sup>[https://github.com/bwhong/bwhong-dsci510\\_fall2025\\_final\\_project/blob/main/src/results.ipynb](https://github.com/bwhong/bwhong-dsci510_fall2025_final_project/blob/main/src/results.ipynb)

# Post-AI Boom Summary Overview (2015/12/01 - 2025/09/01)



<sup>1</sup>[https://github.com/bwhong/bwhong-dsci510\\_fall2025\\_final\\_project/blob/main/src/results.ipynb](https://github.com/bwhong/bwhong-dsci510_fall2025_final_project/blob/main/src/results.ipynb)

## Pre and Post-AI Boom Summary Overview

- When we split the data by the start of OpenAI, 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

# Potential Future Work

- Although we see an overall moderate negative correlation between NVIDIA and Unemployment Rate, we begin to see a positive correlation after 2022
- If we gathered data for another decade and repeated this analysis, we may discover another era with different results
- It may also be interesting to note that if the “AI Bubble” in the stock market bursts, we may observe unpredictable shifts in the correlations between the variables

# 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