

Python II

Final Project

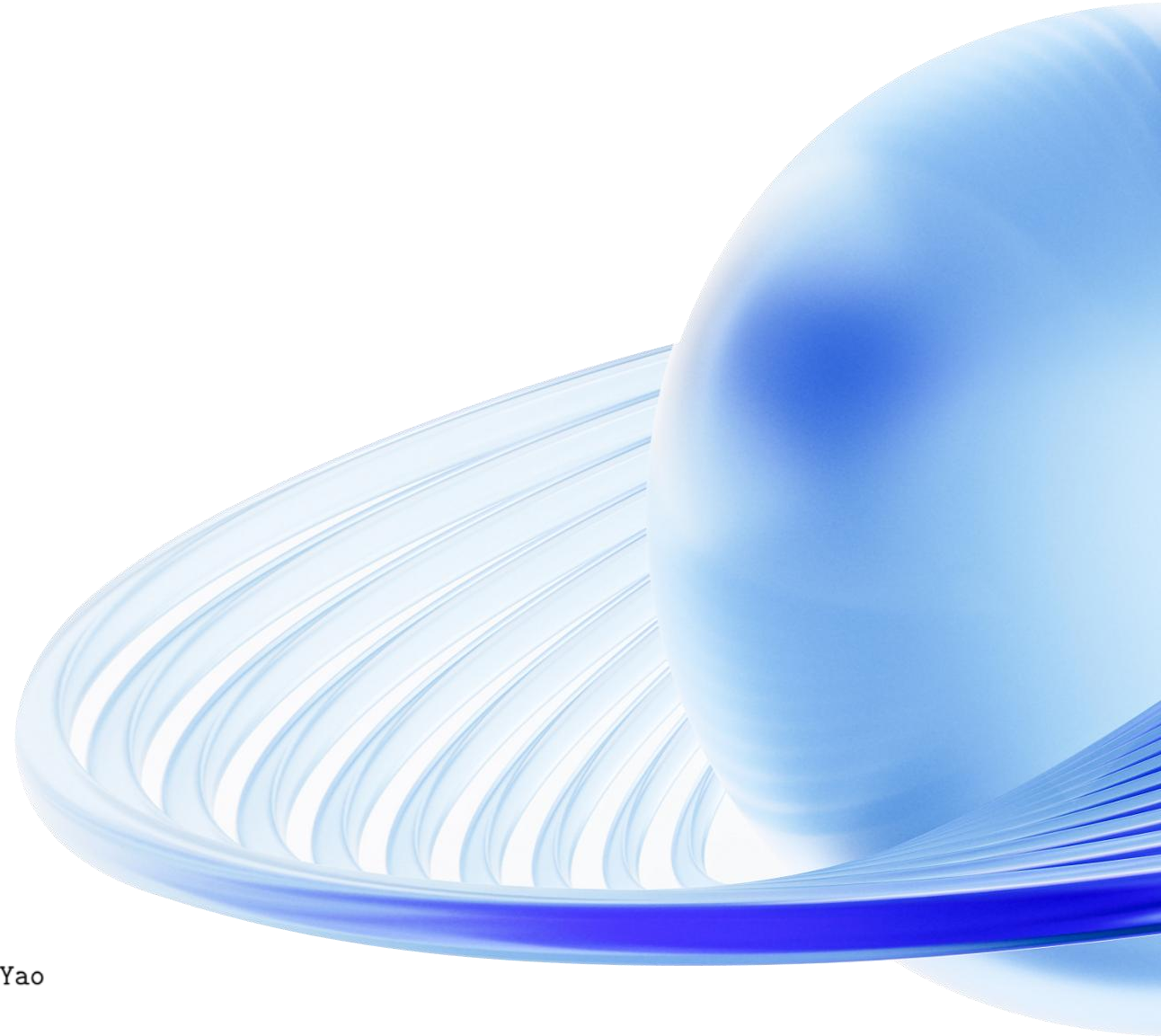
Presentation: Group 58

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Catalog

01 Research Introduction

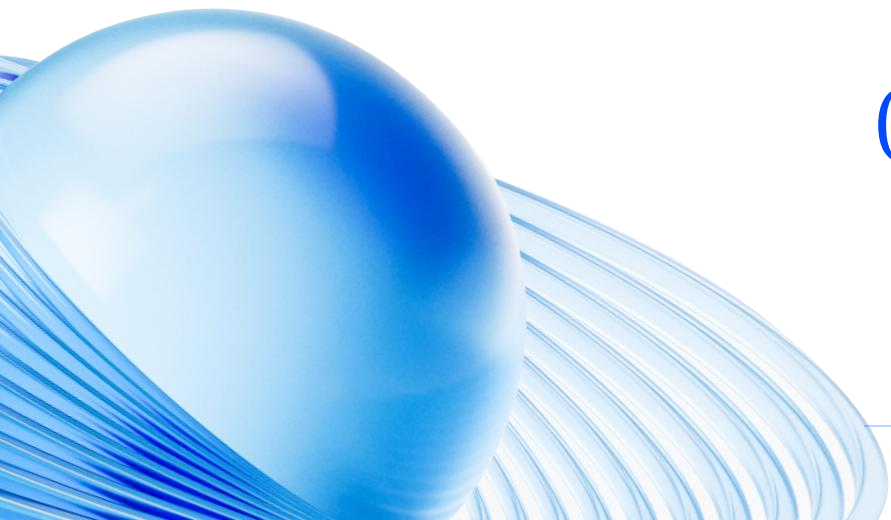
02 Unemployment rate
by geometric graphs

03 Consumer Price Index
analysis

04 NLP application on
official announcement

05 Shiny

06 Conclusion



01

Project Introduction



1.1 Research Question and Applied Methods

Research Question:

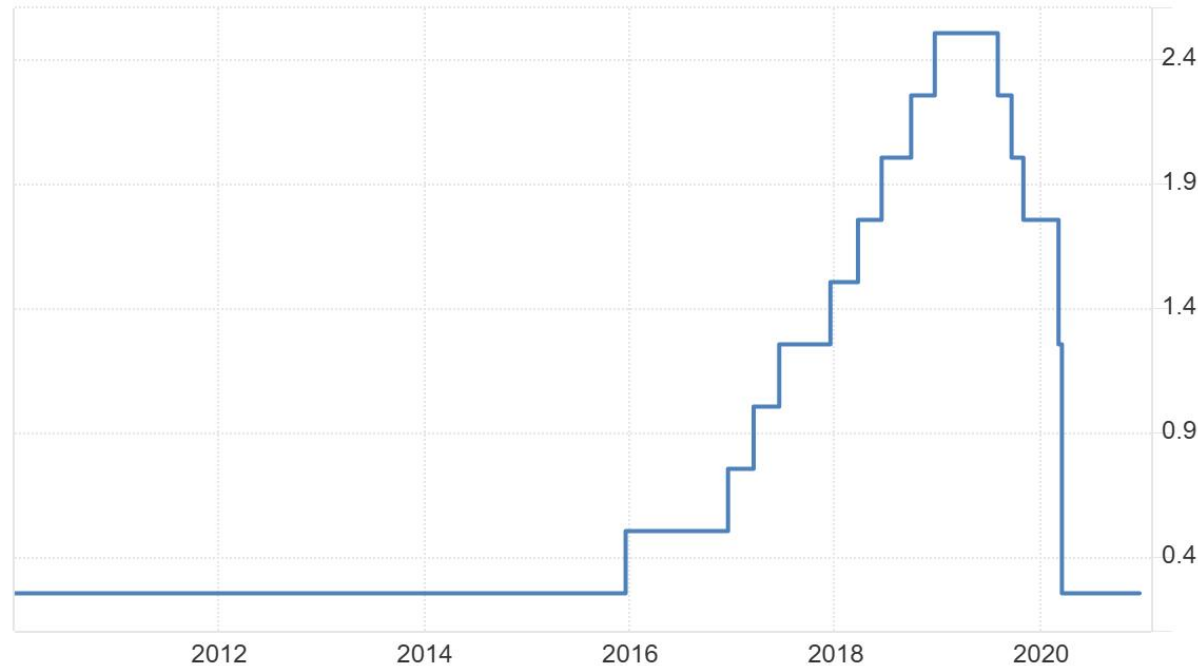
- The objective of this project is to analyze the **impacts of interest rate movements on unemployment** and **spending across different areas** in the United States.
- Examine the changes in the dataset across two distinct time periods: the **low-interest-rate period** and the **relatively high-interest-rate period**.

Applied Methods:

- First stage: **visualize the unemployment rate data by state**.
- Second stage: conduct a statistical analysis of the **Consumer Price Index (CPI) by different urban areas**.
- Last stage: employ a natural language processing (NLP) approach to analyze the **textual speech** and **official announcements** of the Federal Reserve's tone when announcing interest rate hikes.

1.2 Data Selection

US Interest Rate - percent



Source: tradingeconomics.com | Federal Reserve

Federal Reserve (the Fed) announced in late December 2015 that it had commenced an increase in interest rates.

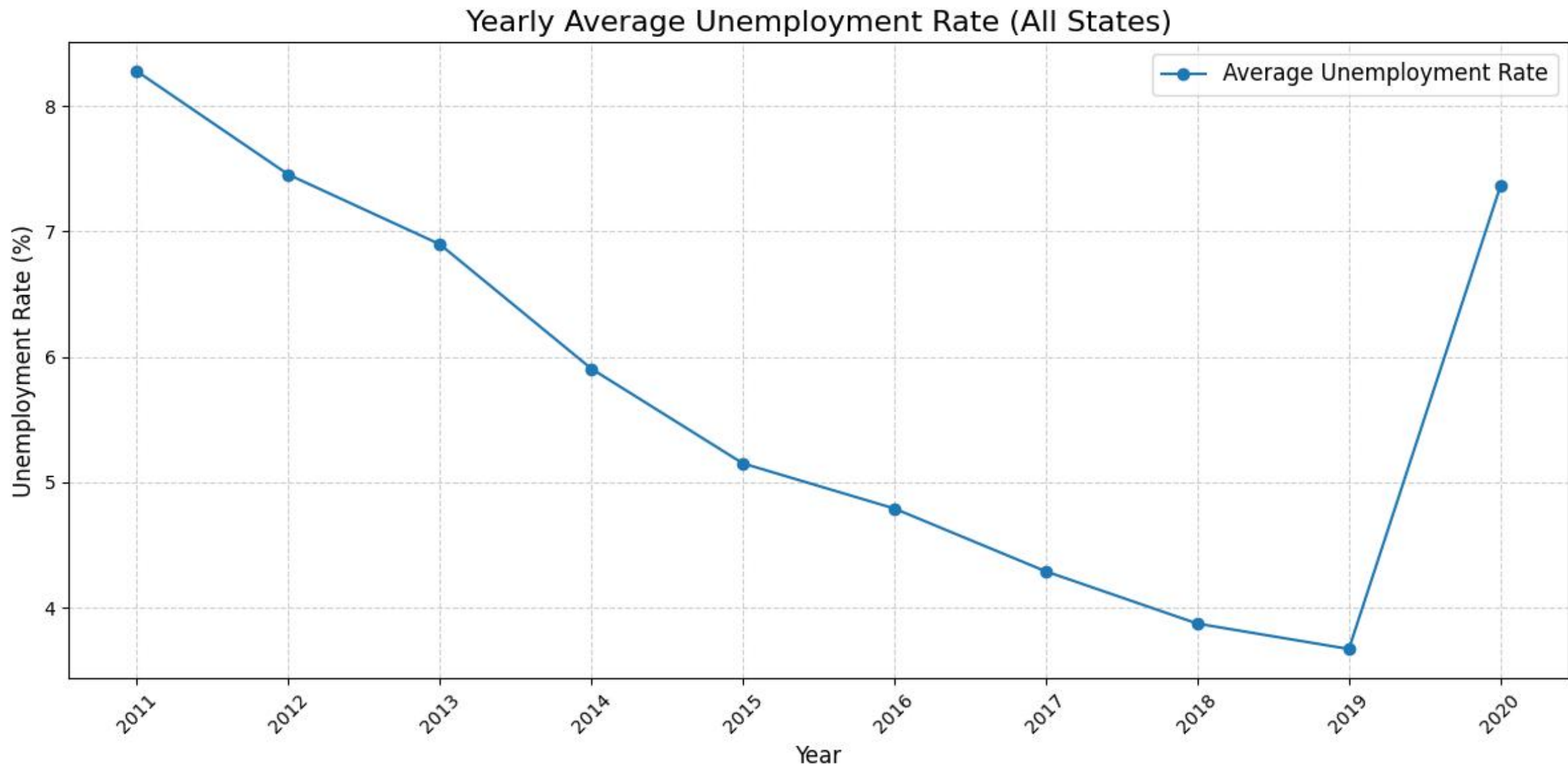
- The two time intervals under consideration are **2011-2015** and **2016-2019**.
- Most of the data are sourced from the **BLS (Bureau of Labor Statistics)** website. These include:
 - Mean annual unemployment rate for each county.
 - Mean annual CPI for each urban area.
- Wording documents of speeches and official announcements are downloaded from the **FED (Federal Reserve Board)** website.

02

Unemployment rate by states

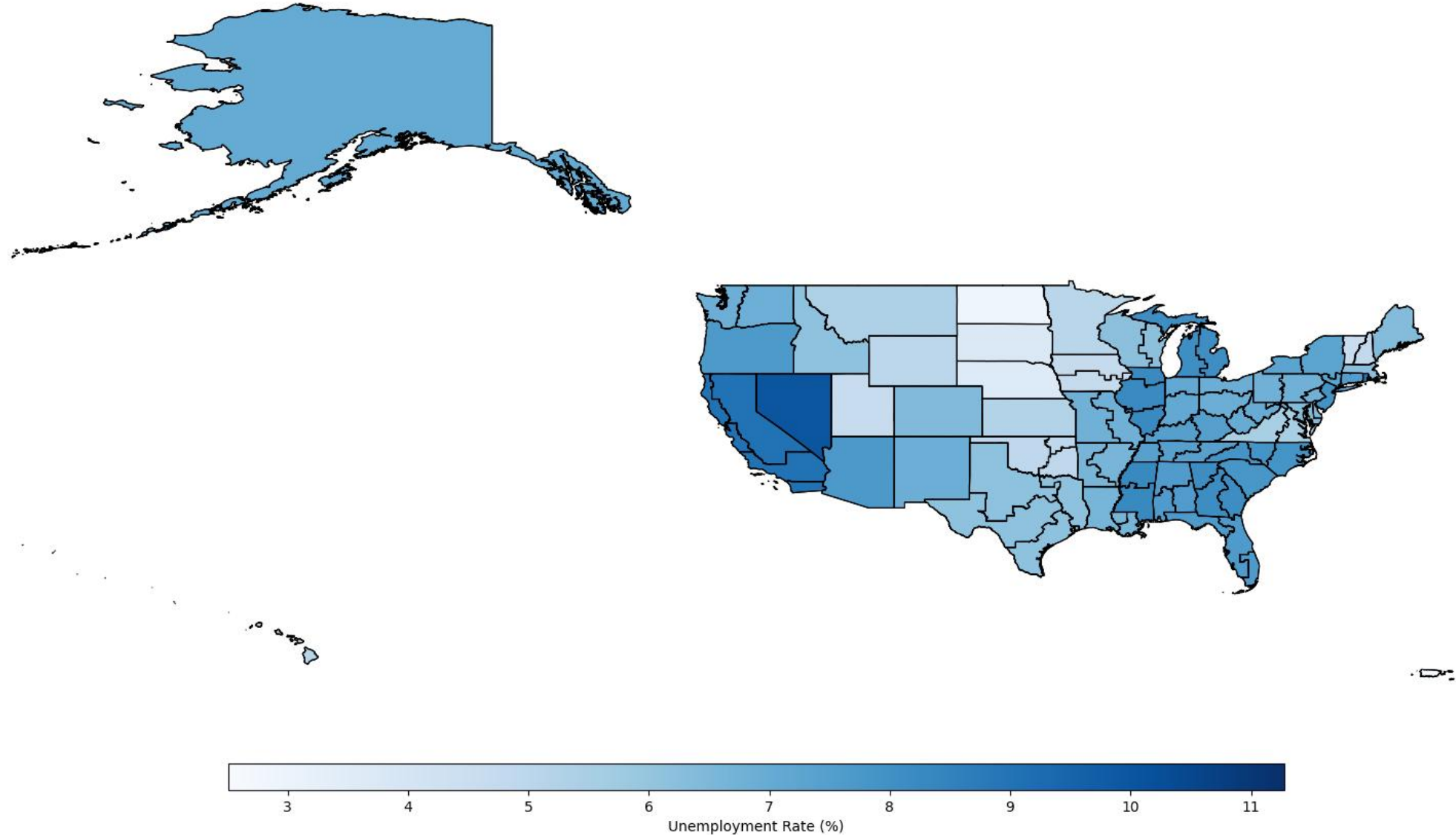


2.1 Outlook of Yearly Average Unemployment Rate Trend



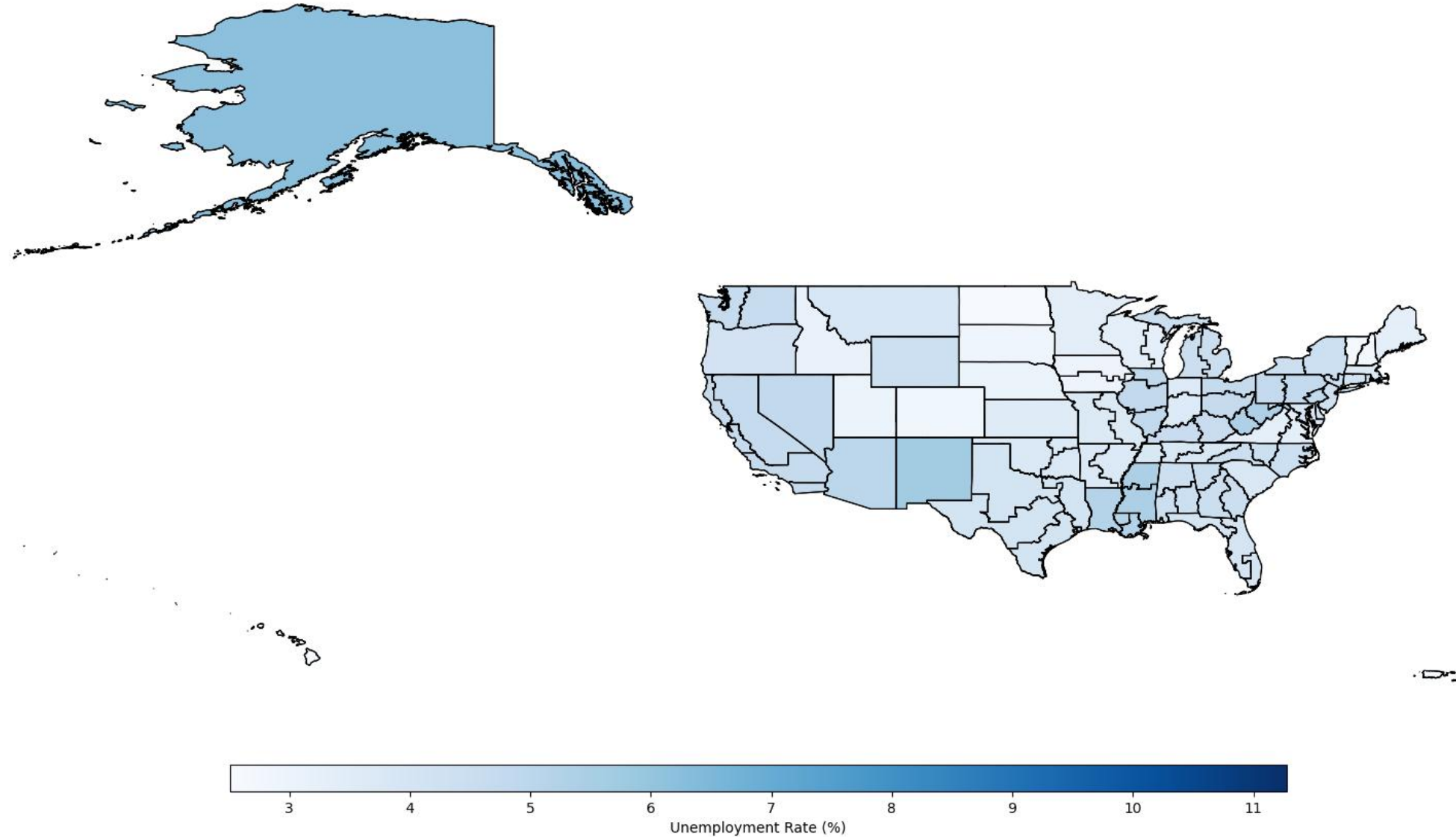
2.2 Average Yearly Unemployment rate by States (2011-2015)

Average Unemployment Rate by State (2011-2015)

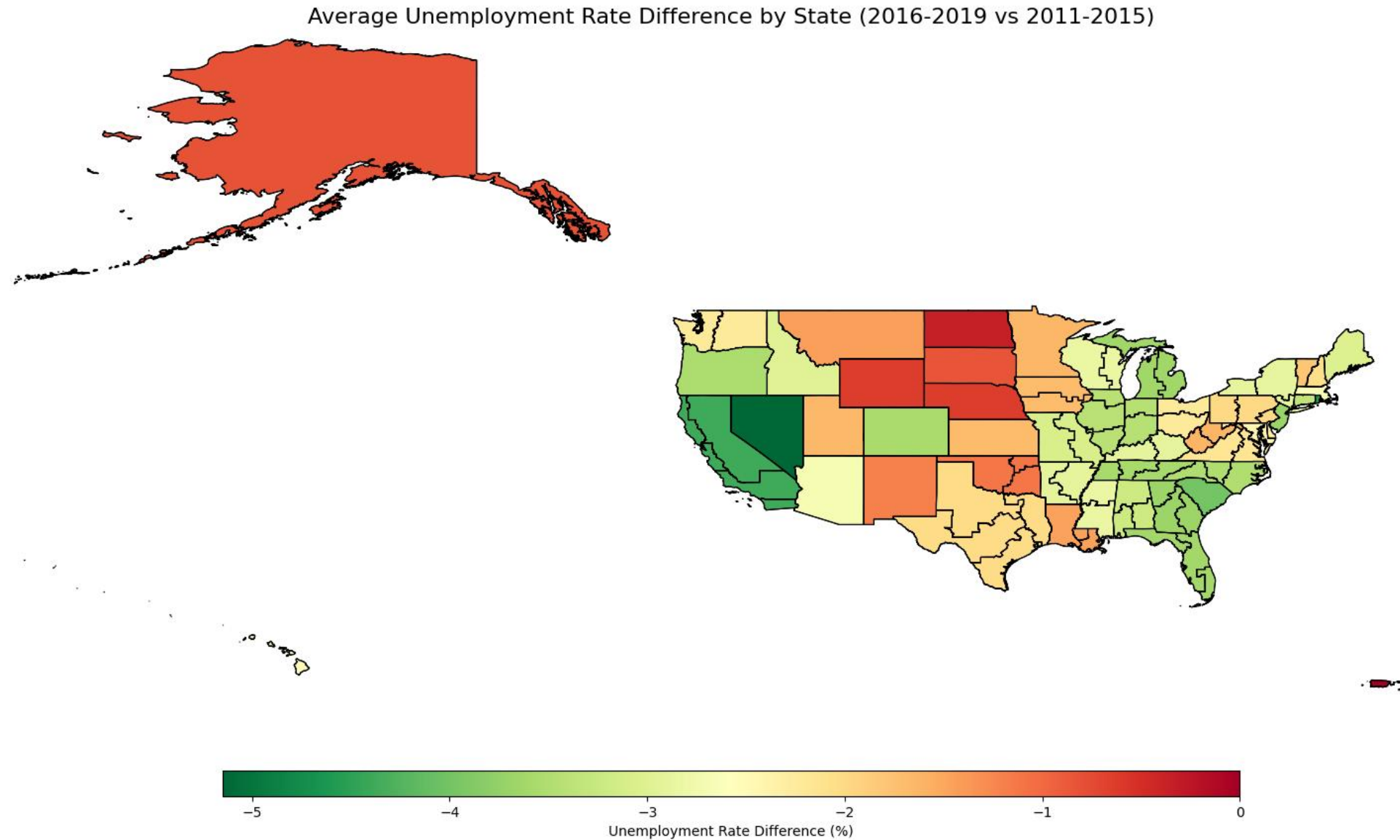


2.3 Average Yearly Unemployment rate by States (2016-2019)

Average Unemployment Rate by State (2016-2019)

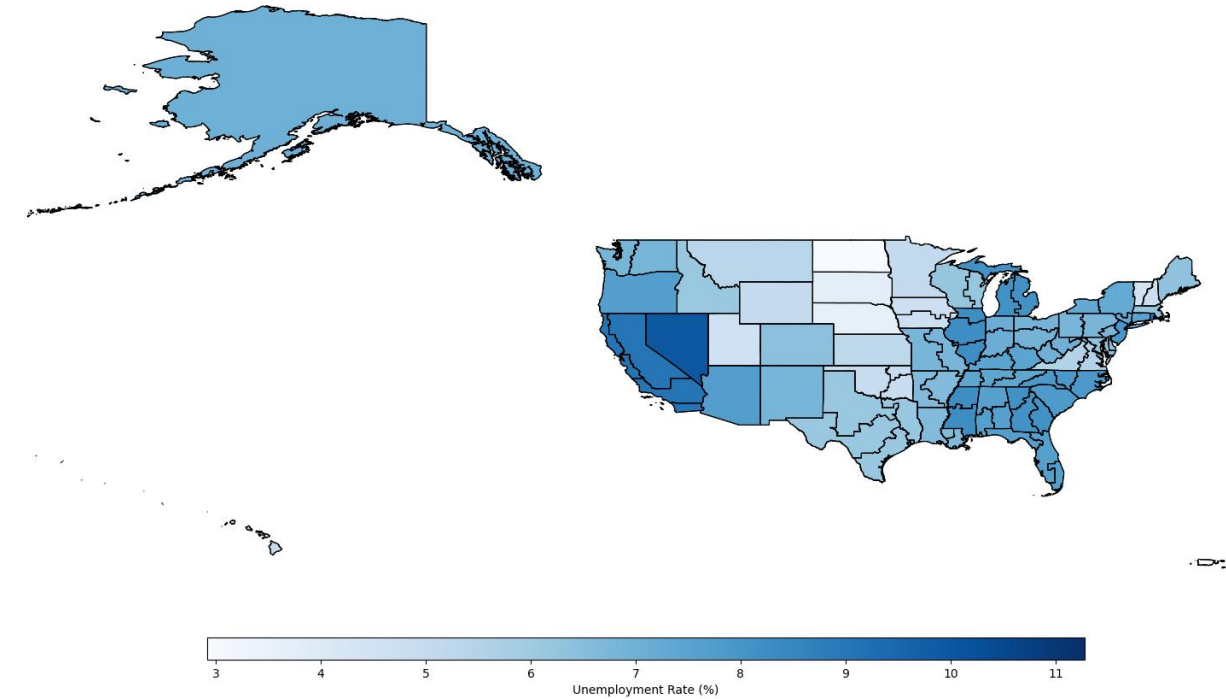


2.4 Average Yearly Unemployment Rate Difference by States (2016-2019 vs 2011-2015)

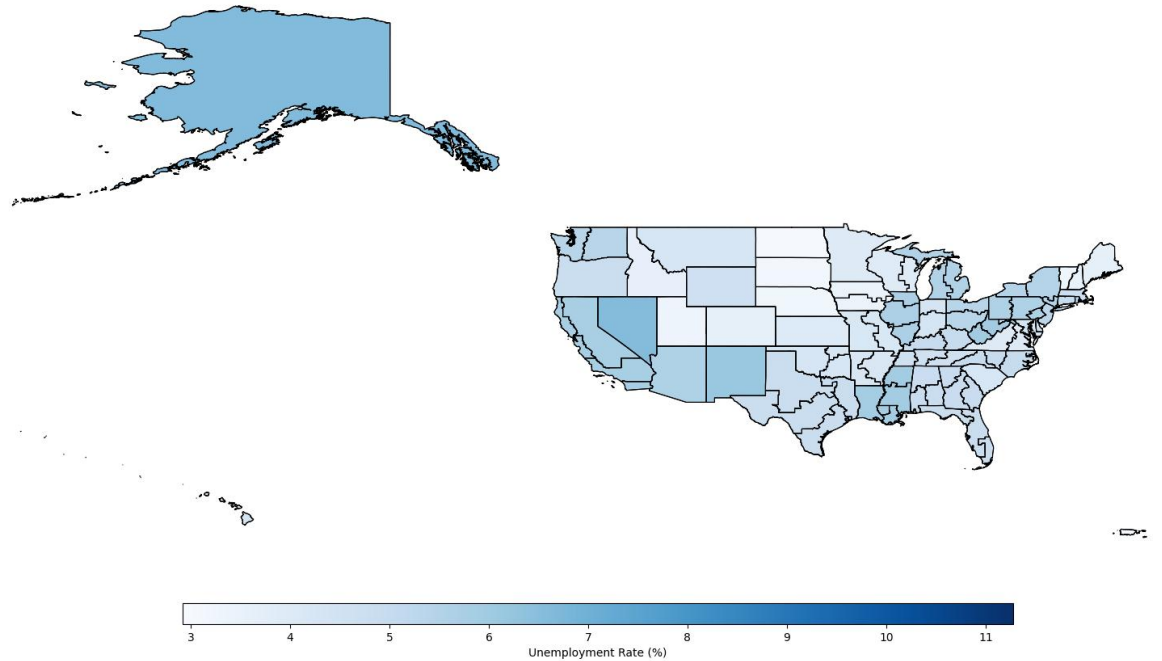


2.5 What if we include the effect of pandemic? (Year of 2020)

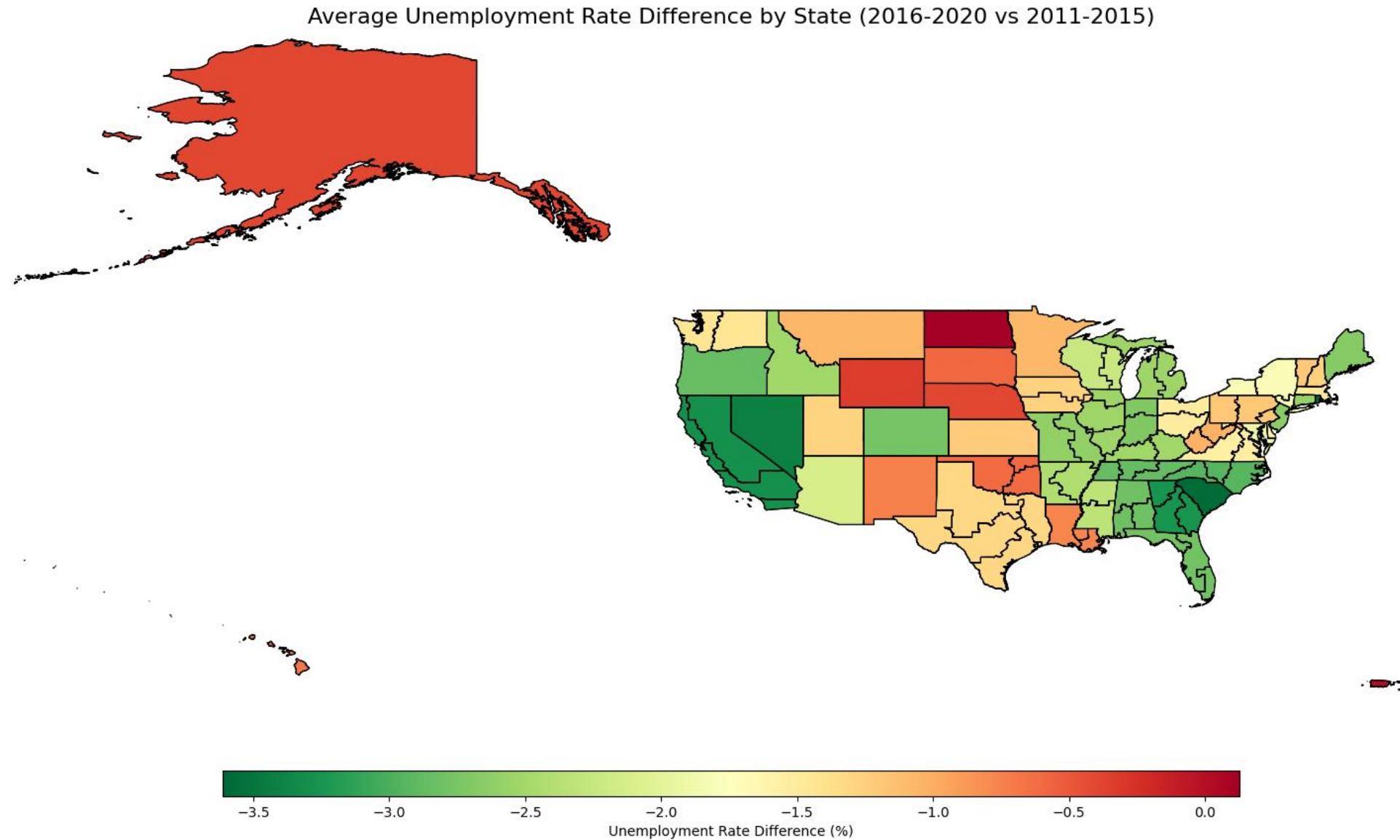
Average Unemployment Rate by State (2011-2015)



Average Unemployment Rate by State (2016-2020)



2.6 Following effect of including pandemic data

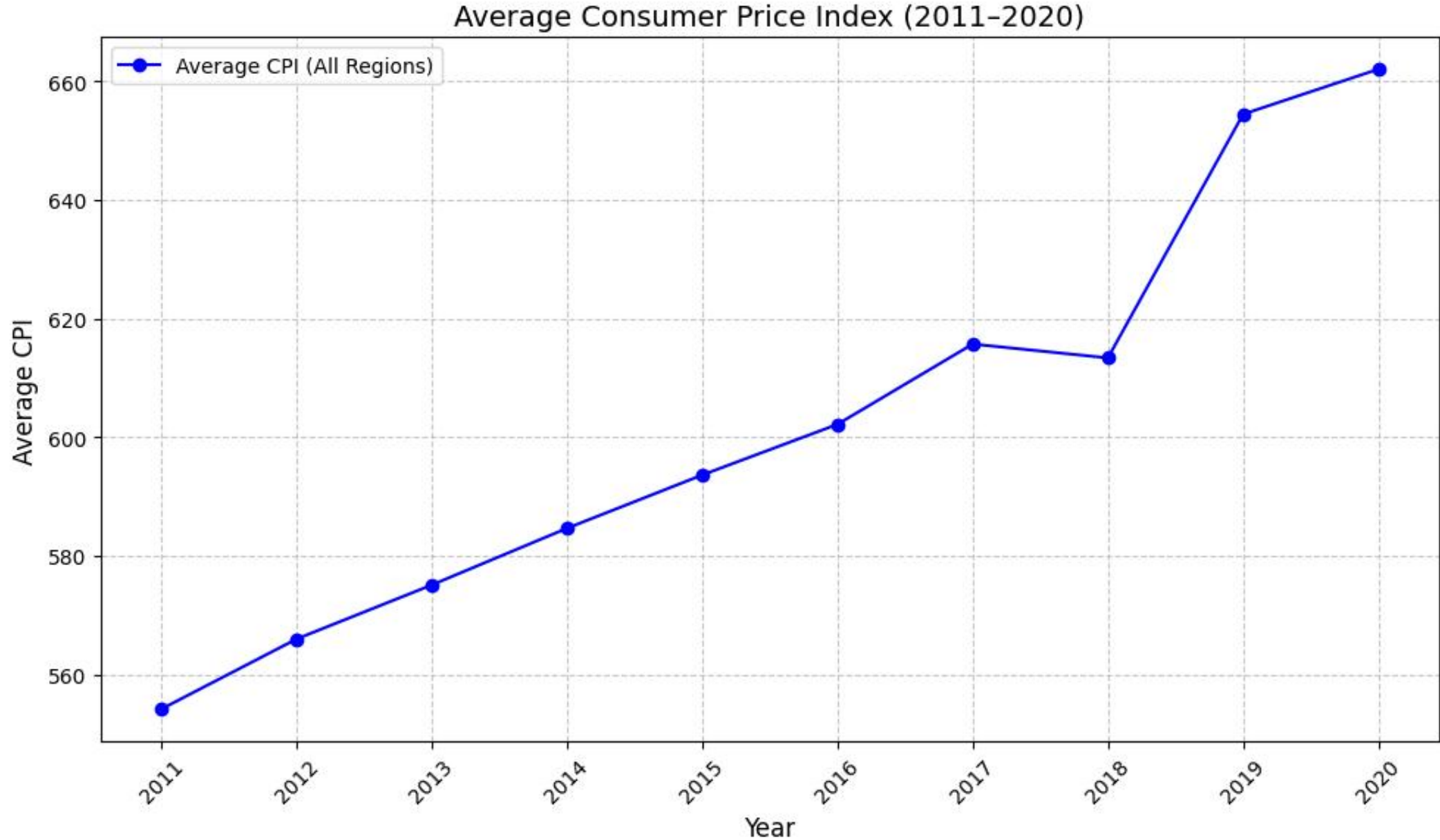


03

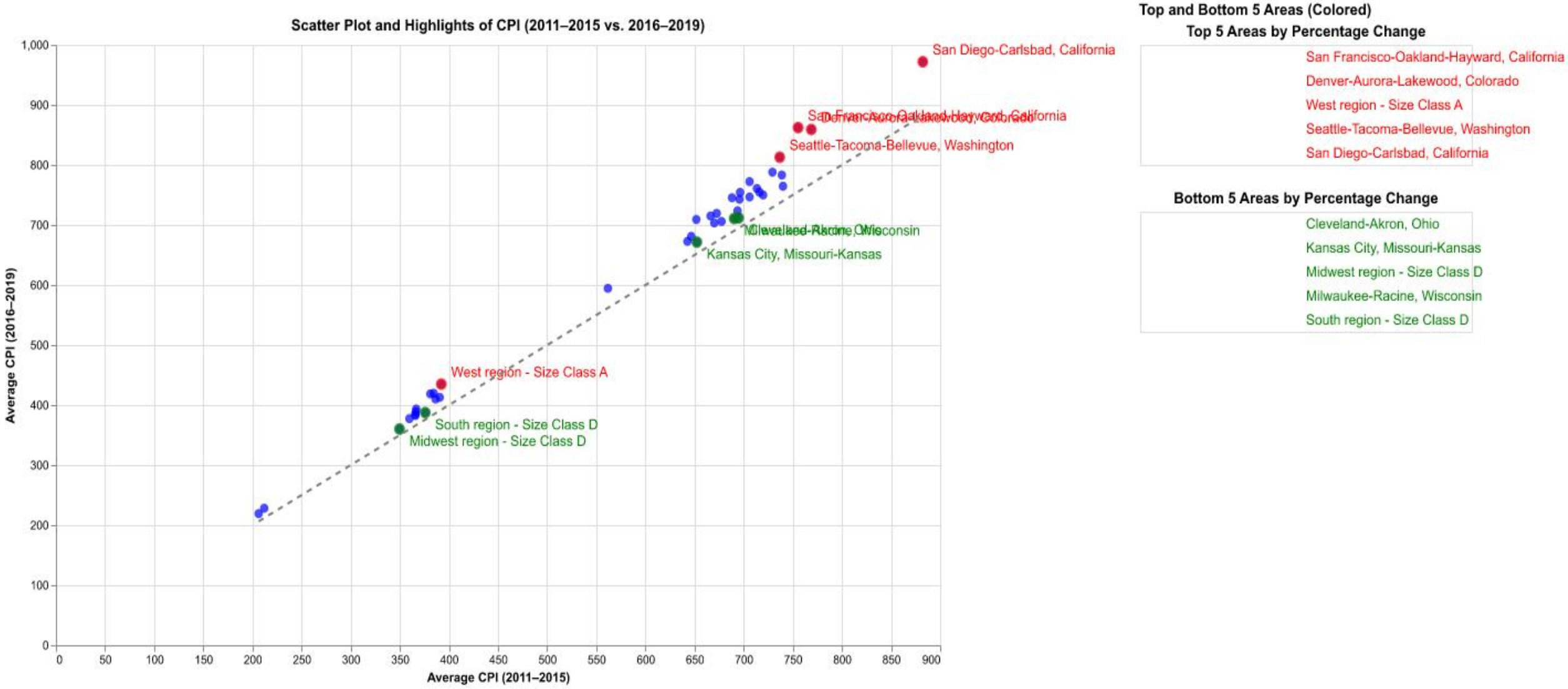
Consumer Price Index by Urban Areas



3.1 Outlook of CPI trend



3.2 Analysis of Consumer Price Index

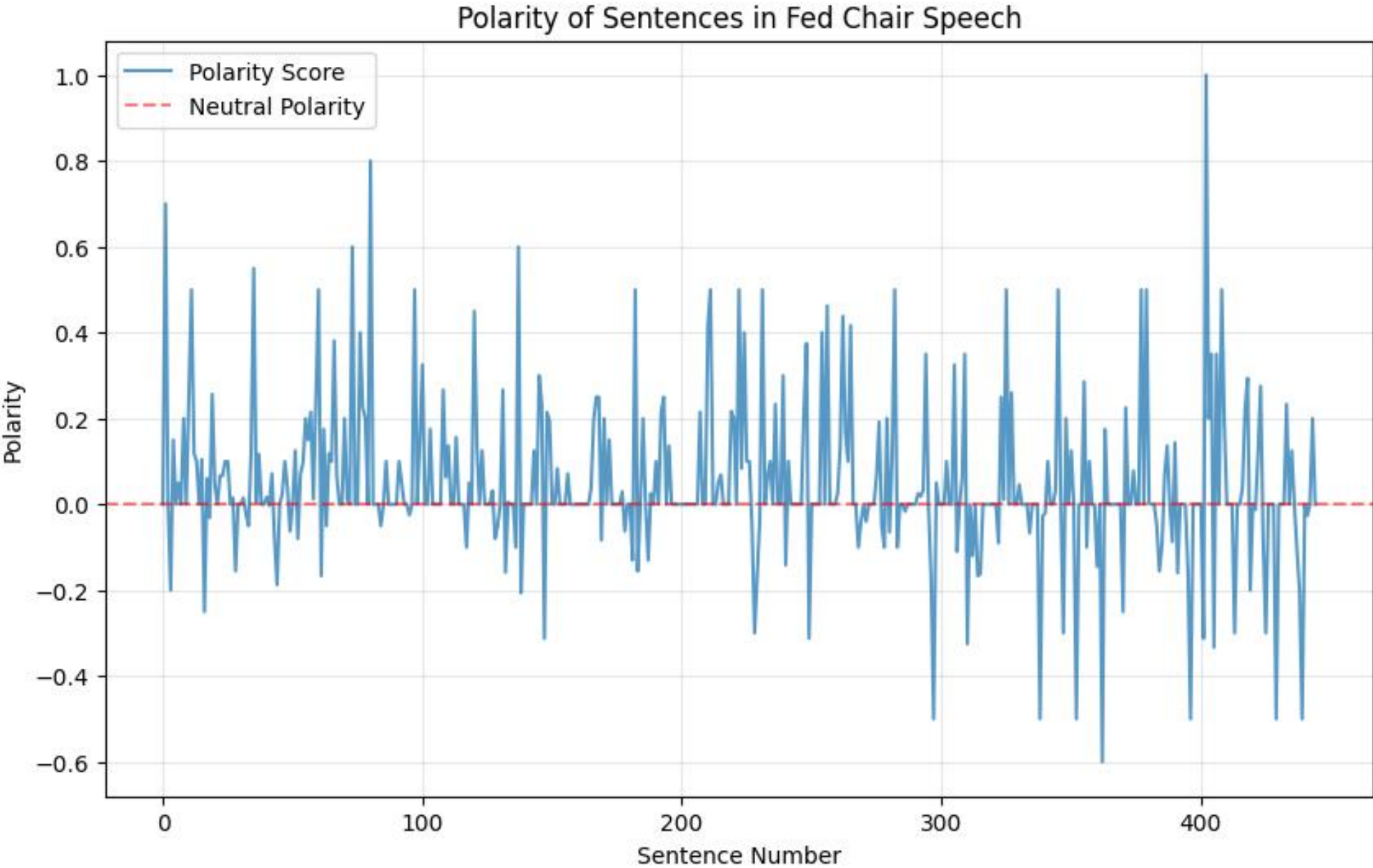


04

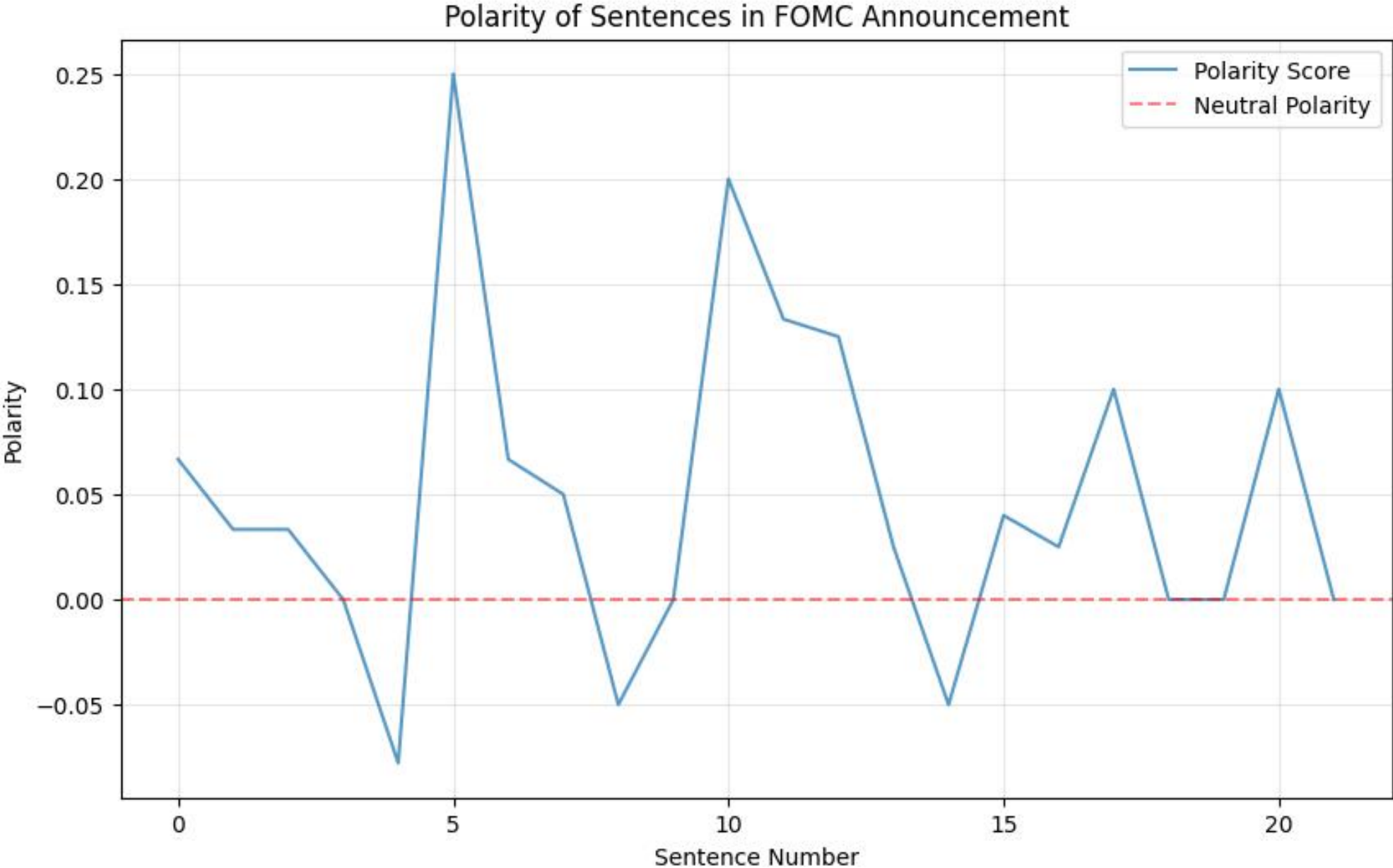
Natural Language Processing



4.1 Polarity Analysis of FED Speech



4.2 Polarity Analysis of FED Announcement



4.3 Specific Wording Counting

Announcement:

Announcement Adjective Counts: [('economic', 8), ('federal', 6), ('FOMC', 4), ('longer', 4), ('monetary', 3), ('moderate', 2), ('recent', 2), ('further', 2), ('maximum', 2), ('gradual', 2)]

Adjectives Percentage: 8.61% of total words

Announcement Modal Counts: [('will', 9), ('should', 1)], **Modals Percentage: 1.29% of total words**

Announcement Adverb Counts: [('further', 2), ('however', 1), ('appreciably', 1), ('early', 1), ('partly', 1), ('currently', 1), ('Overall', 1), ('as', 1), ('closely', 1), ('reasonably', 1)]

Adverbs Percentage: 2.19% of total words

Speech:

Speech Adjective Counts: [('federal', 24), ('economic', 24), ('financial', 20), ('median', 15), ('appropriate', 12), ('low', 11), ('further', 10), ('longer', 10), ('monetary', 10), ('transitory', 10)], **Adjectives Percentage: 6.22% of total words**

Speech Modal Counts: [('will', 56), ('would', 53), ('could', 11), ('should', 8), ('might', 8), ('may', 7), ('ca', 4), (''d', 4), ('Could', 3), ('ould', 2)], **Modals Percentage: 1.41% of total words**

Speech Adverb Counts: [('So', 33), ('very', 24), ('well', 20), ('so', 18), ('also', 16), ('carefully', 13), ('n', 11), ('longer', 9), ('more', 9), ('as', 8)], **Adverbs Percentage: 3.86% of total words**

05

Shiny



Select a Time Period:

✓ 2011-2015

2016-2020

Select visualization type:

Plots



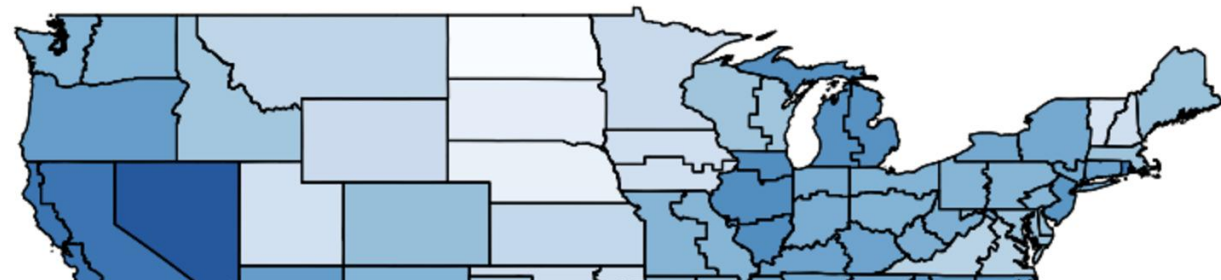
Select Data Type:

☒ Unemployment rate

☐ CPI

☐ Differences

Average Unemployment Rate by State (2011-2015)



Select Time Period:

2011-2015

✓ 2016-2020

Select Visualization Type:

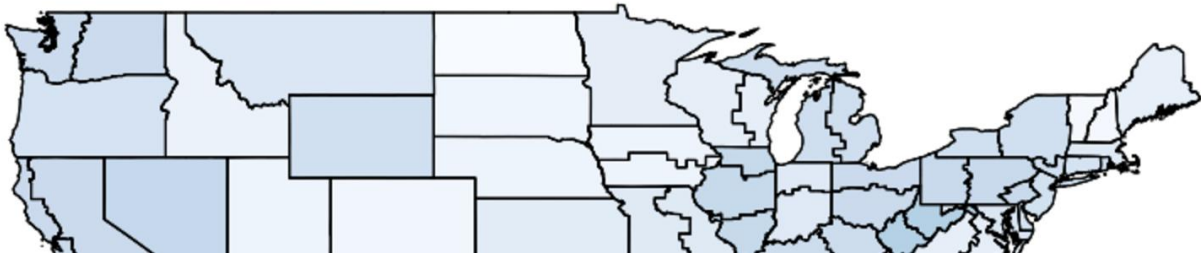
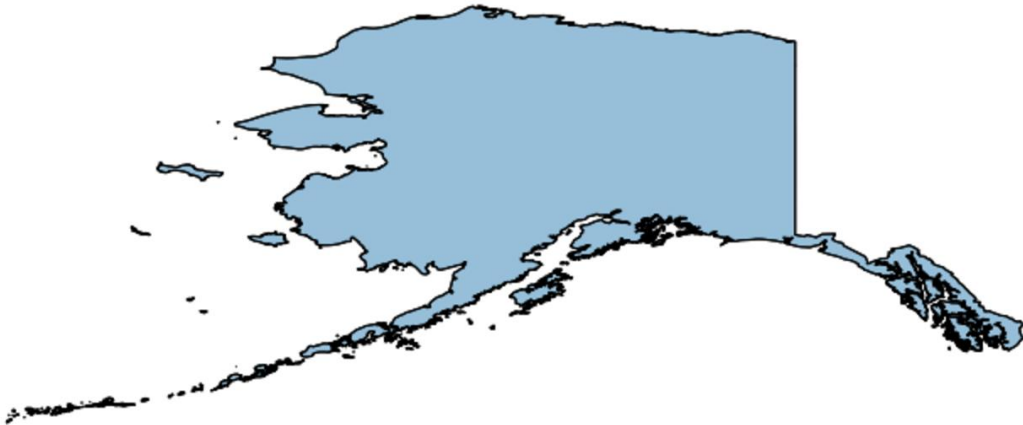
Plots

▼

Select Data Type:

- ☒ Unemployment rate
- ☐ CPI
- ☐ Differences

Average Unemployment Rate by State (2016-2019)



Select a Time Period:

2011-2015

▼

Select Visualization Type:

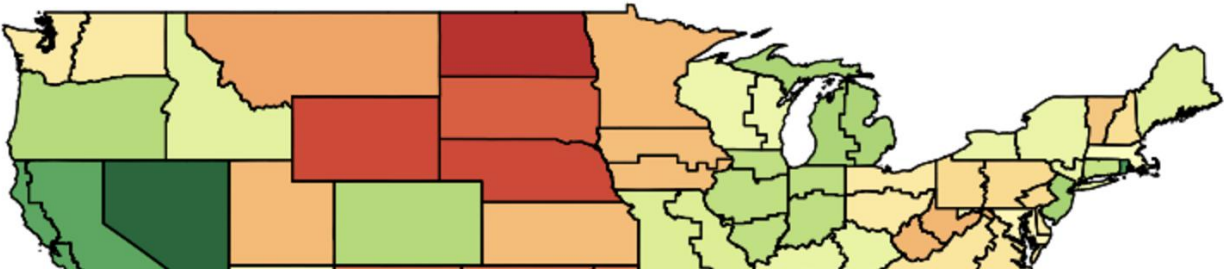
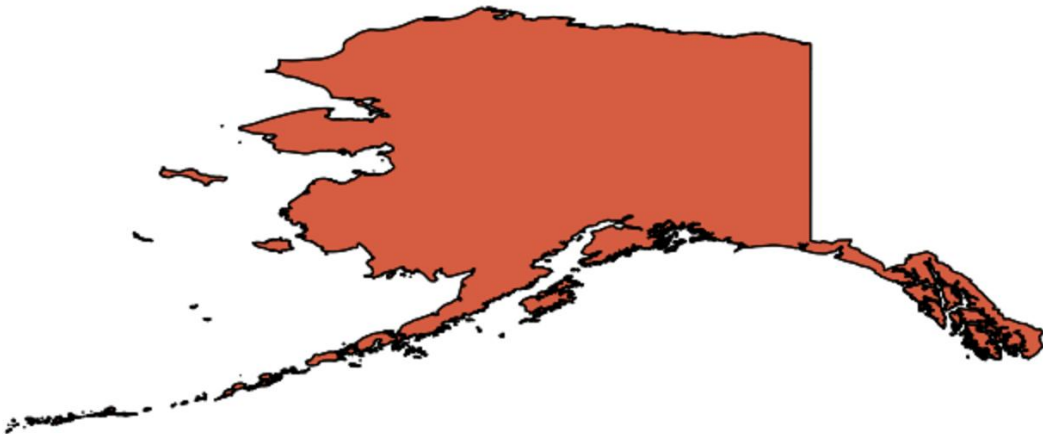
Plots

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Select Data Type:

- ☐ Unemployment rate
- ☐ CPI
- ☒ Differences

Average Unemployment Rate Difference by State (2016-2019 vs 2011-2015)



Select a Time Period:

2011-2015

▼

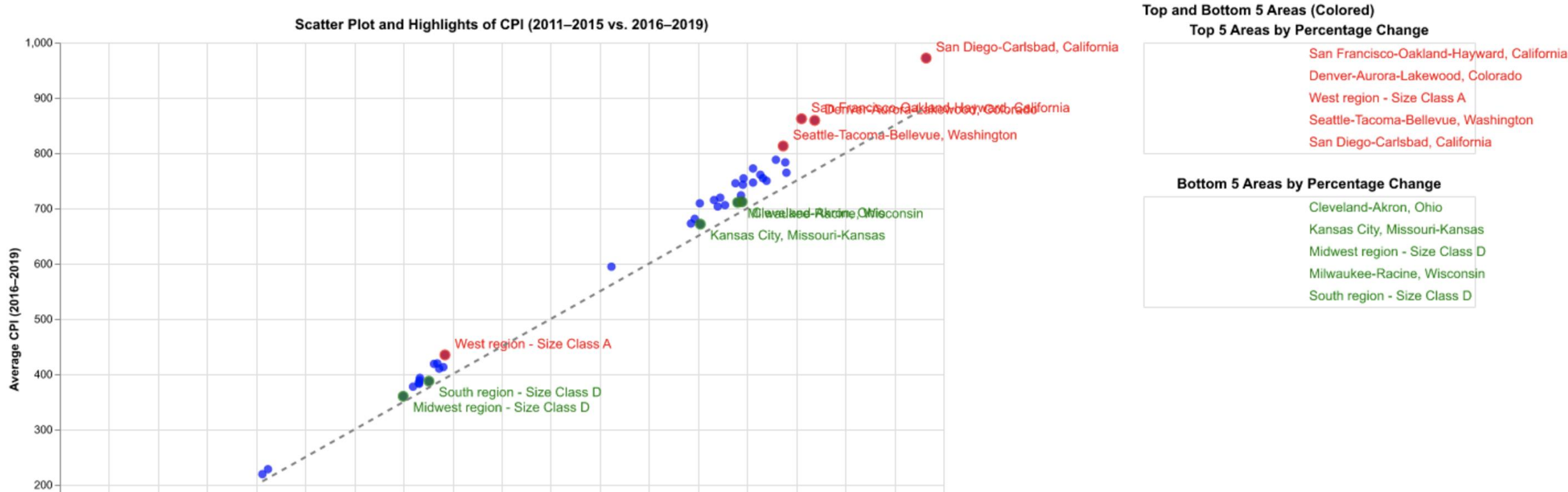
Select Visualization Type:

Plots

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Select Data Type:

- ☐ Unemployment rate
- ☒ CPI
- ☐ Differences



Select a Time Period:

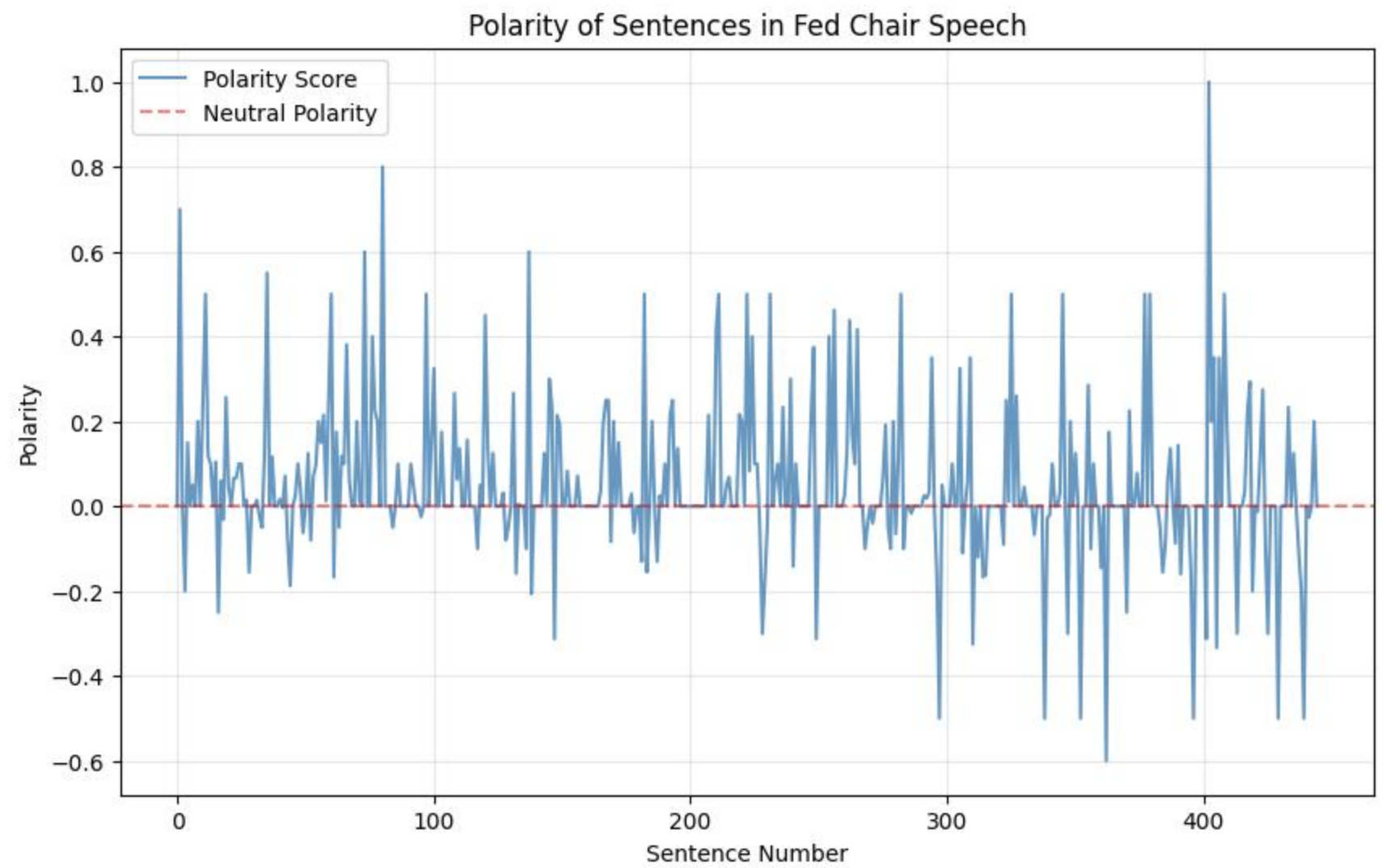
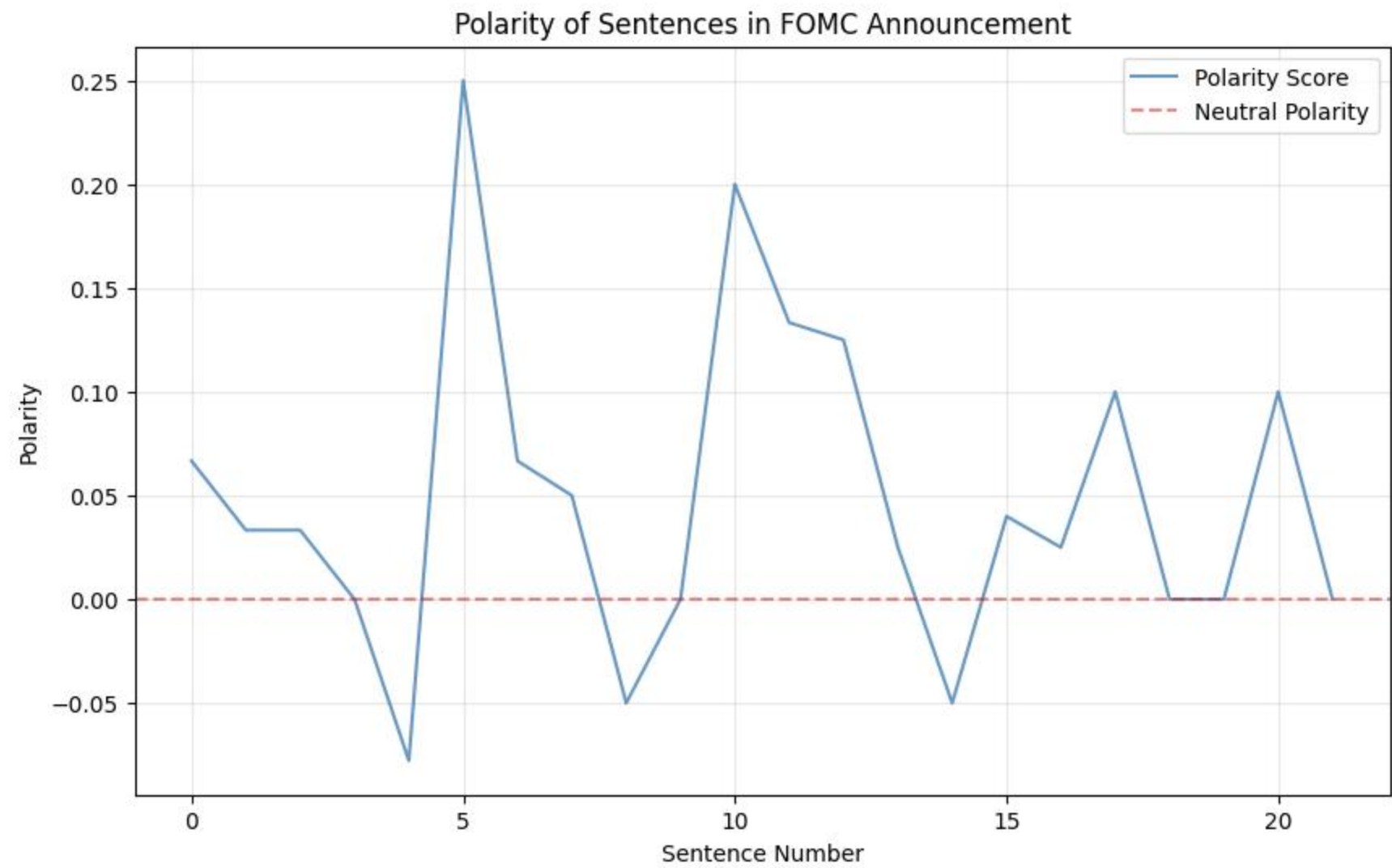
2011-2015

▼

Select Visualization Type:

NLP Analysis

▼



You selected: 2011-2015

Visualization Type: NLP Analysis

06

Conclusion



6. Conclusion

- 1. How interest rate changes behave differently across states and urban areas.
- 2. How speech and Announcement analysis reveals the Fed's nuanced communications strategy.
- Unemployment: The rise in the unemployment rate was accompanied by a **decline in unemployment rates across all states**.
- Most: the West, the Center, and the Southeast (Nevada, California, and North Carolina).
- CPI in all Urban areas maintains a **continuous upward trend** (California and Colorado).
- **Higher interest rates lead to less unemployment and more spending in all regions!**
- **Unemployment and spending vary obviously from region to region!**
- Fed Chair speech: more emotional variability and descriptive language, **reflecting engagement and flexibility in addressing diverse audiences!**
- FOMC statement: more concise and neutral, **emphasizing policy clarity and formal communication!**



Thank you for your
patience while listening

Presentation: Group 58

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