Python II

Final Project

Presentation: Group 58

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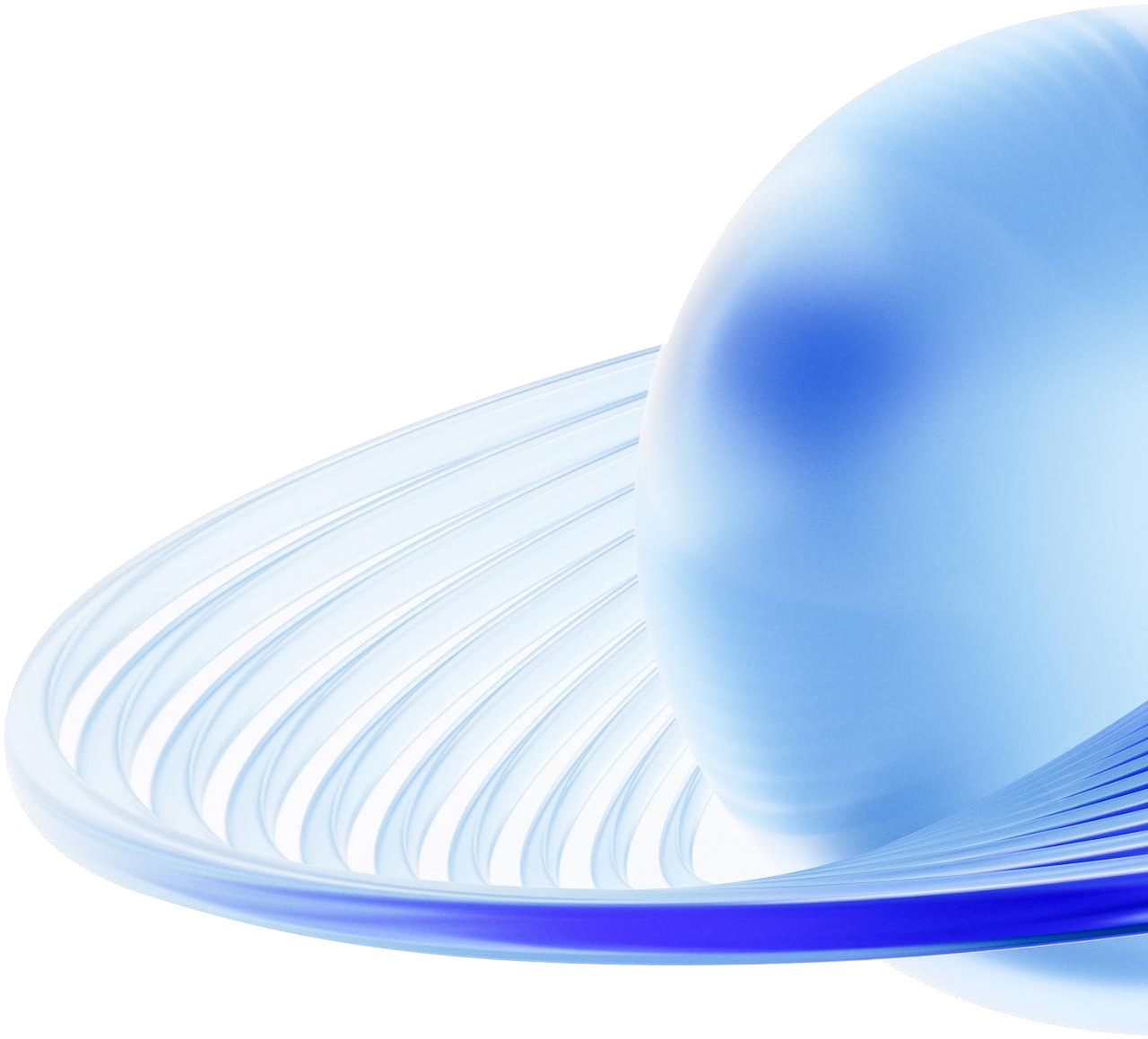
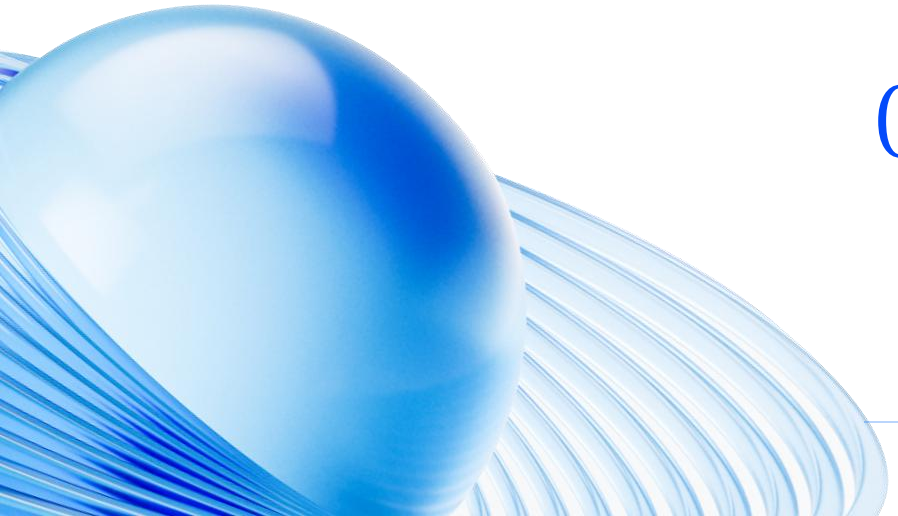


Catalog



01

Project Introduction

1.1 Research Question and Applied Methods

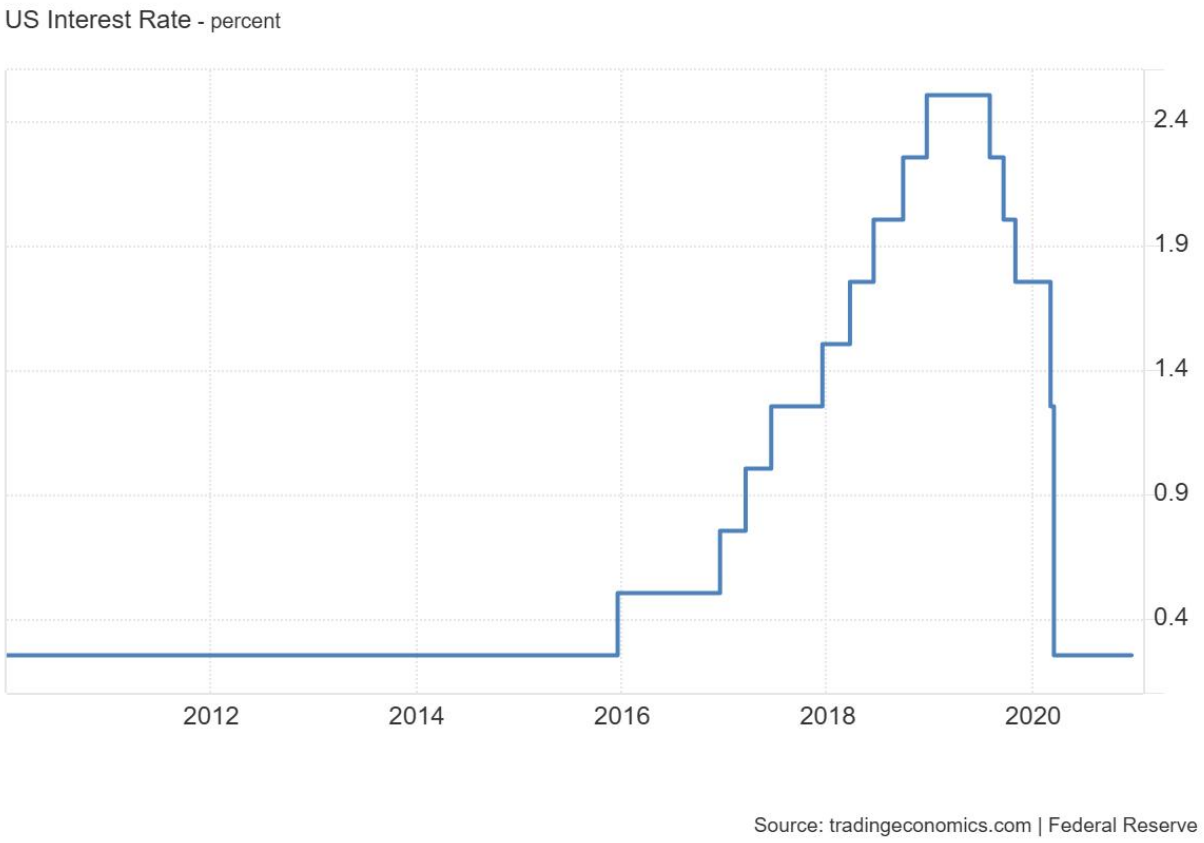
Research Question:

- 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



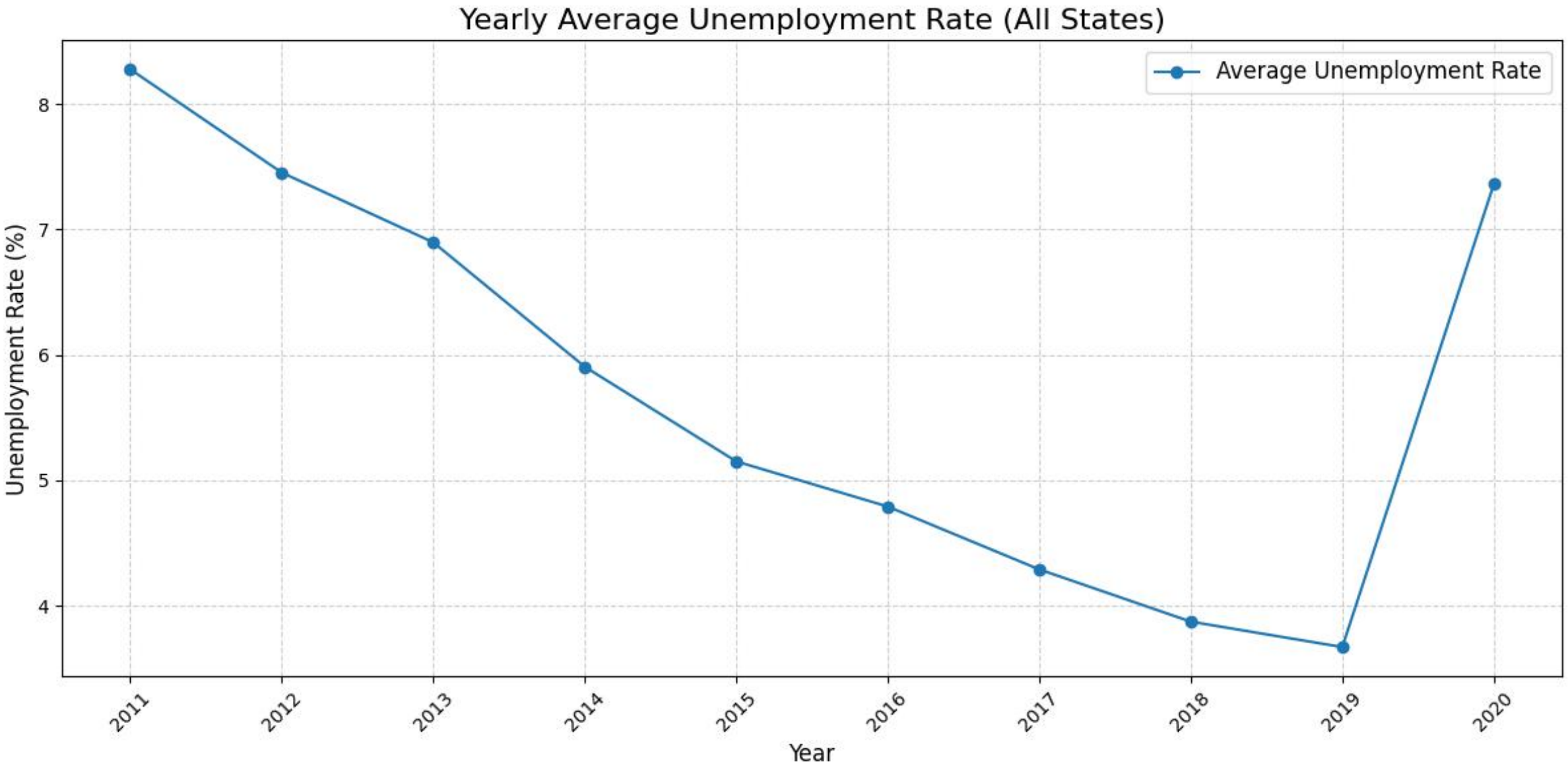
Federal Reserve (the Fed) announced in late December 2015 that it had commenced an increase in interest rates.

- 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.

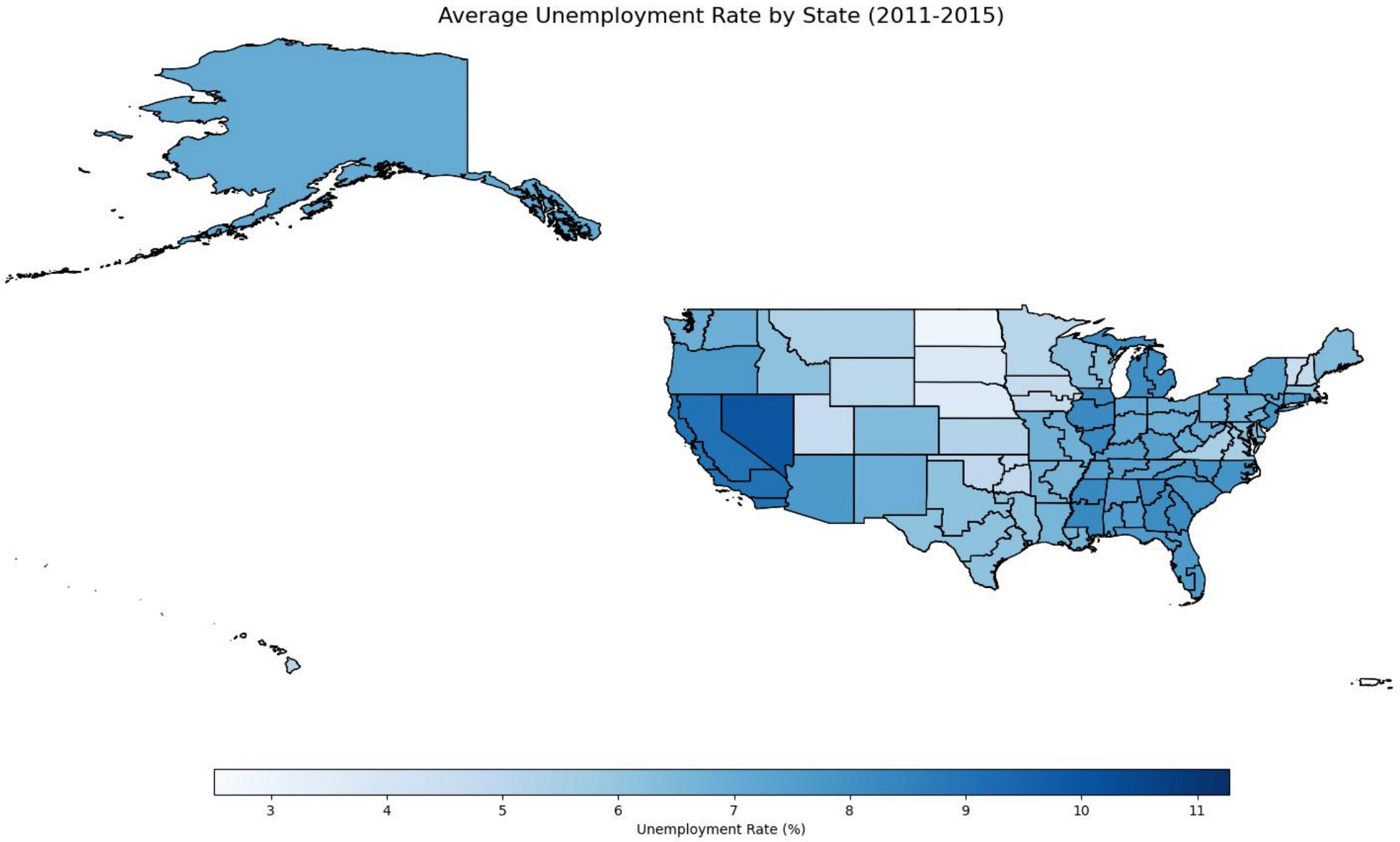
02

Unemployment rate by states

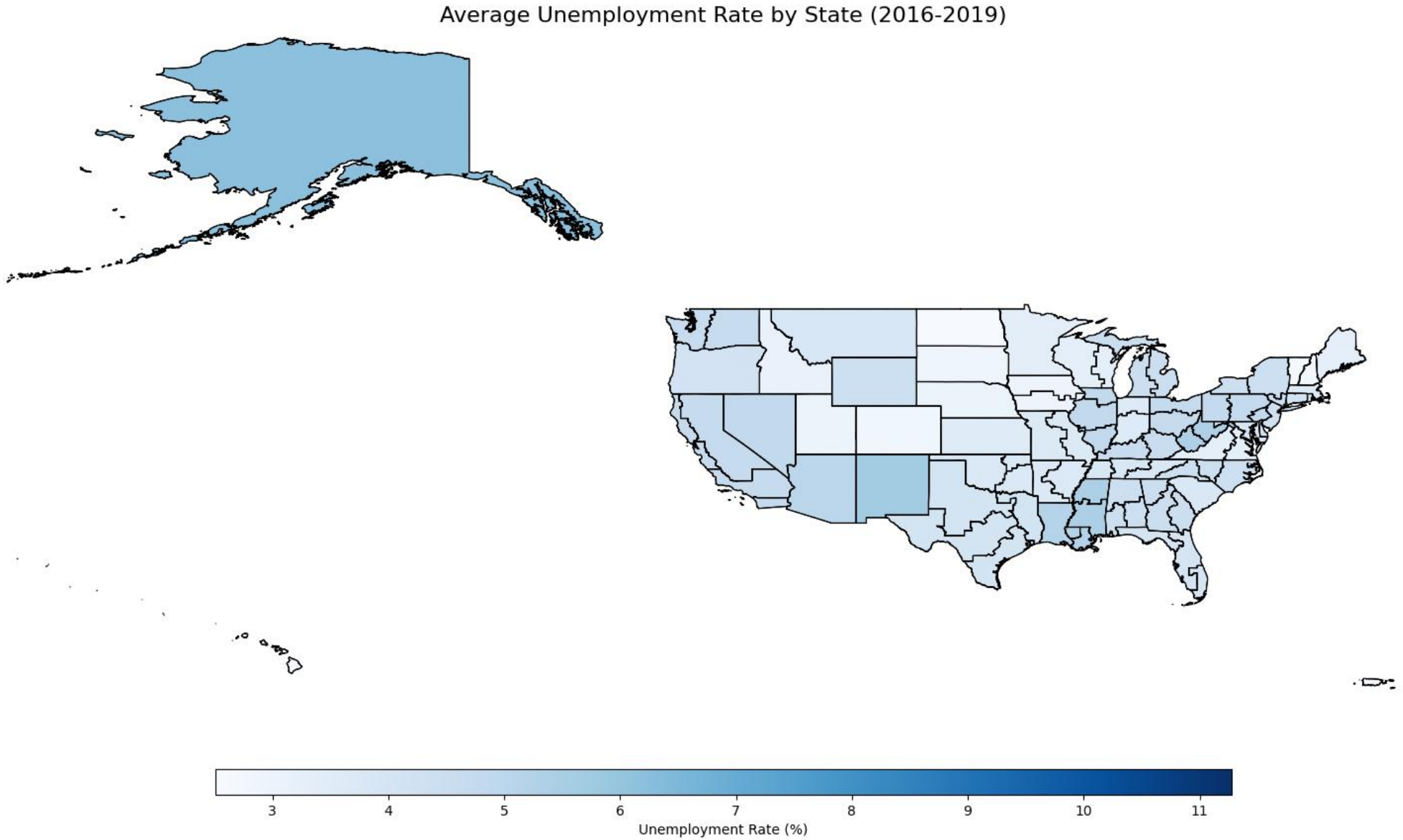
2.1 Outlook of Yearly Average Unemployment Rate Trend



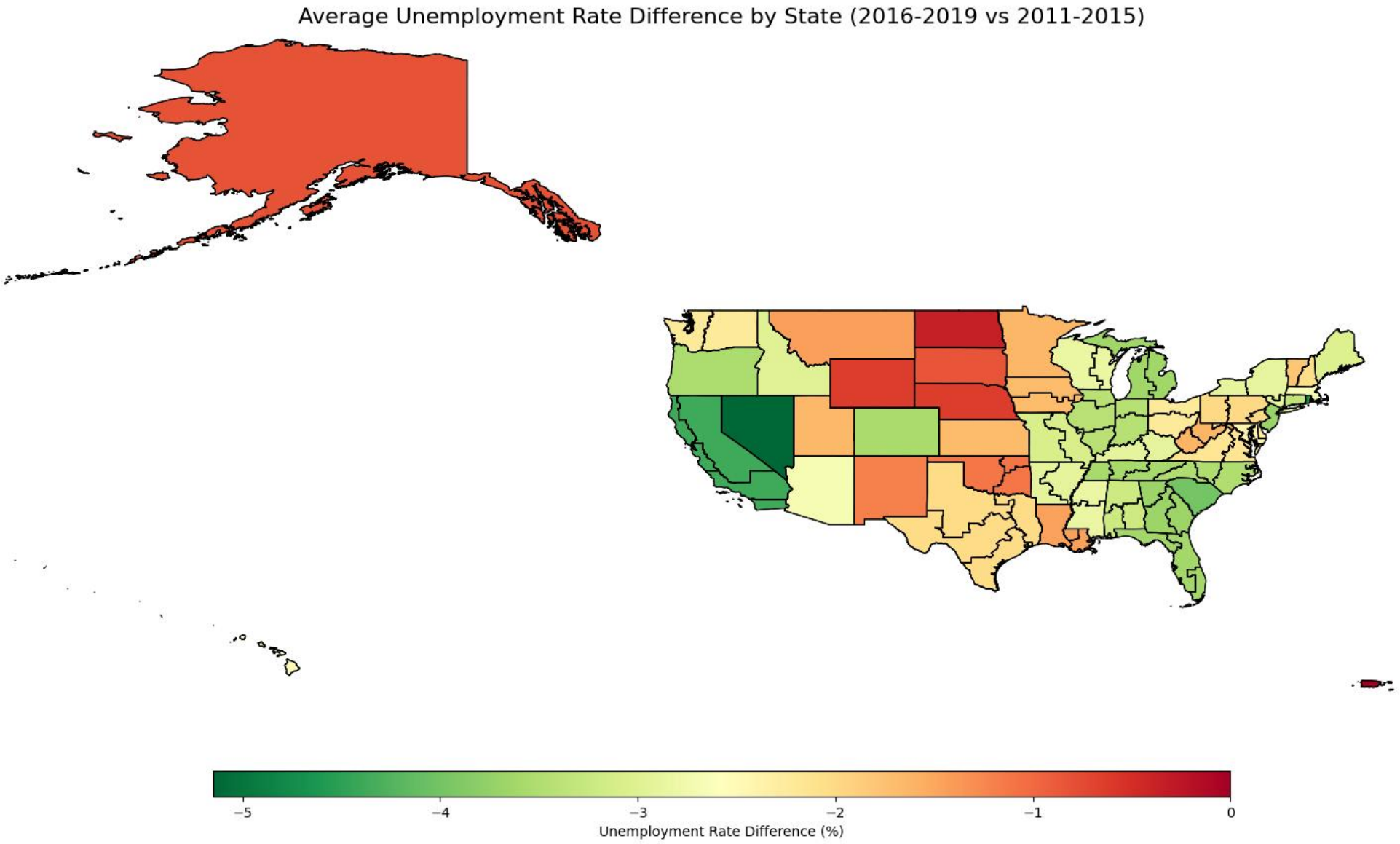
2.2 Average Yearly Unemployment rate by States (2011-2015)



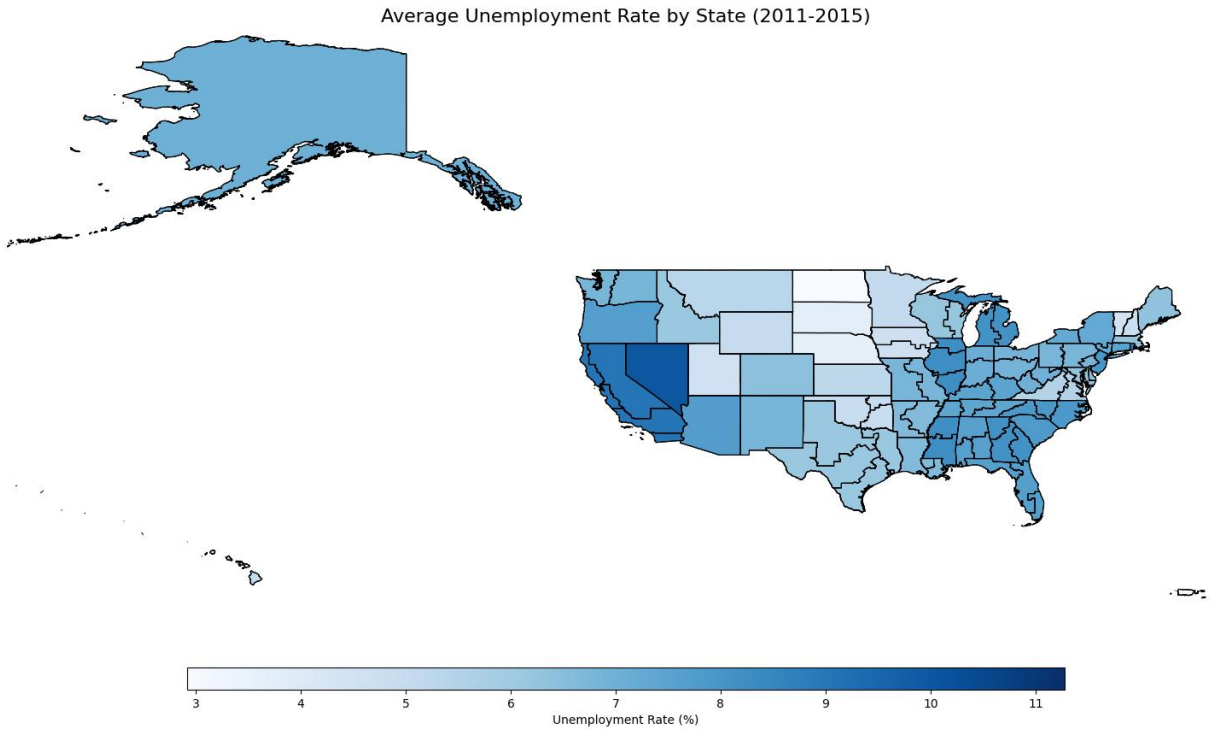
2.3 Average Yearly Unemployment rate by States (2016-2019)

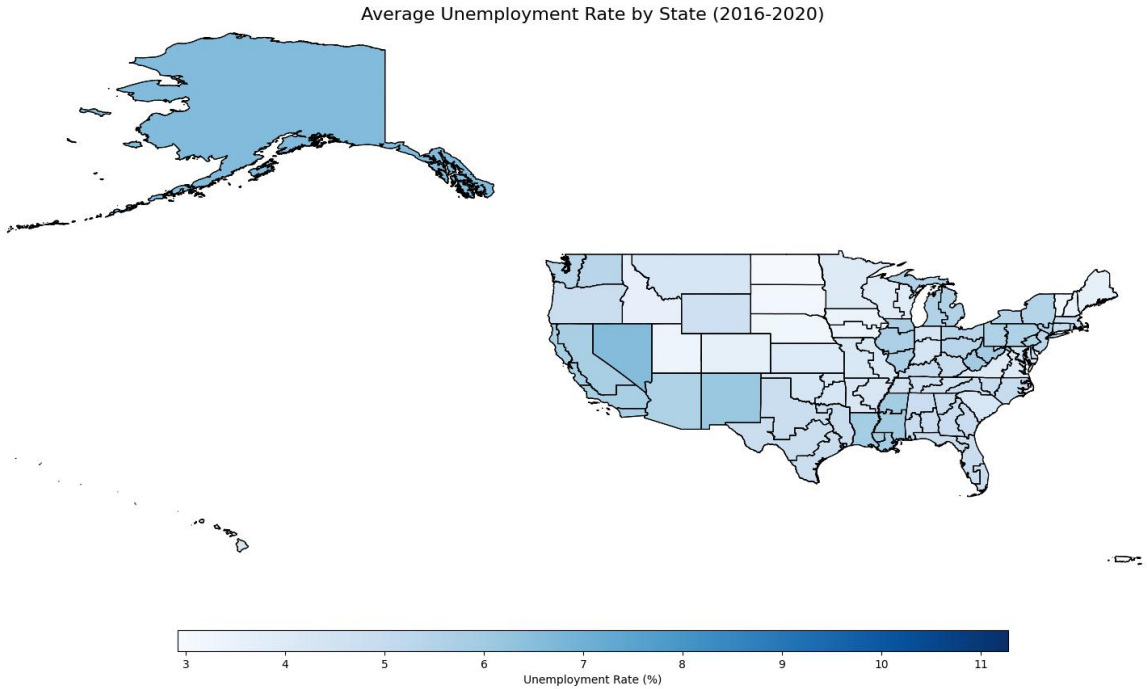


2.4 Average Yearly Unemployment Rate Difference by States (2016-2019 vs 2011-2015)

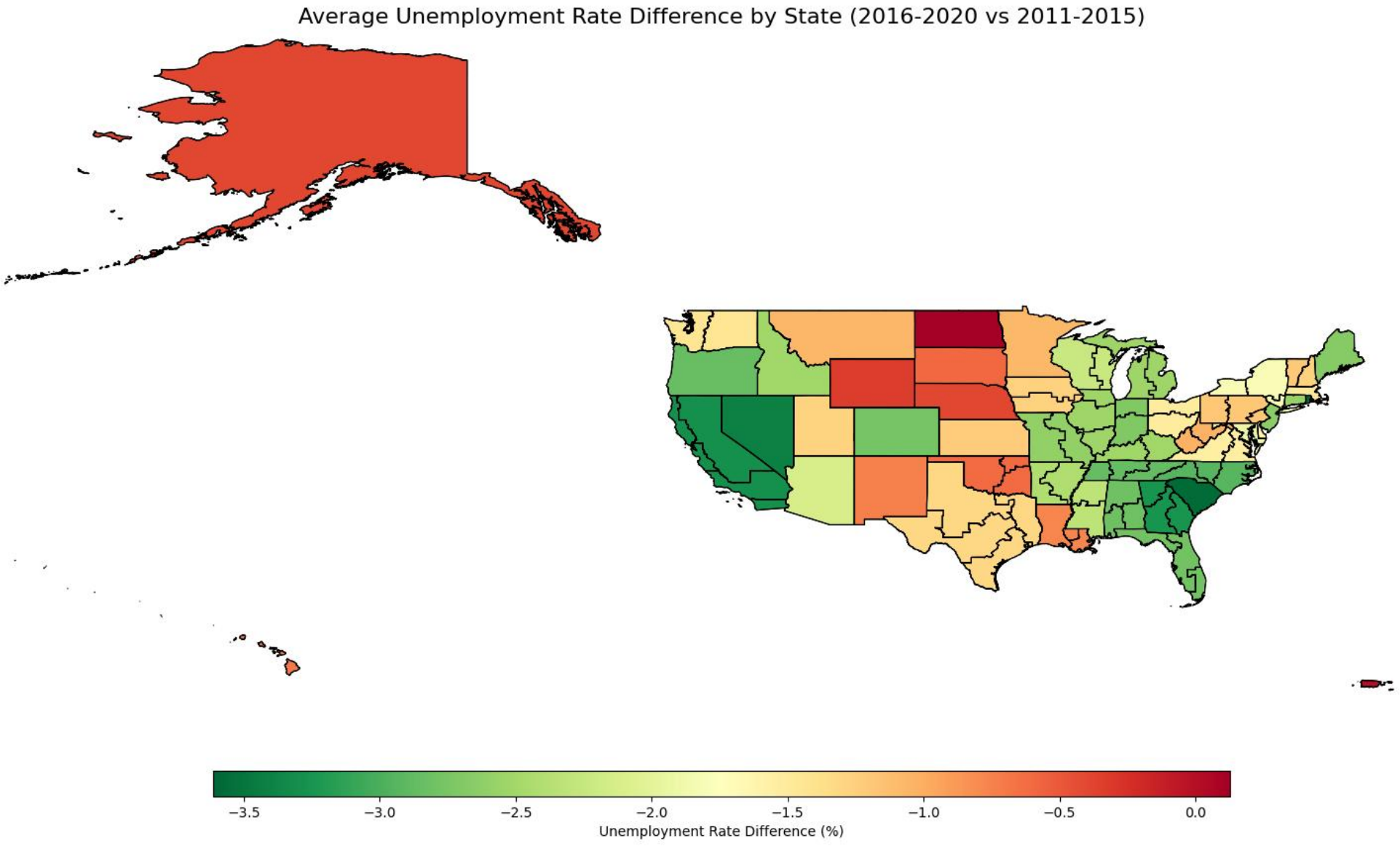


2.5 What if we include the effect of pandemic? (Year of 2020)





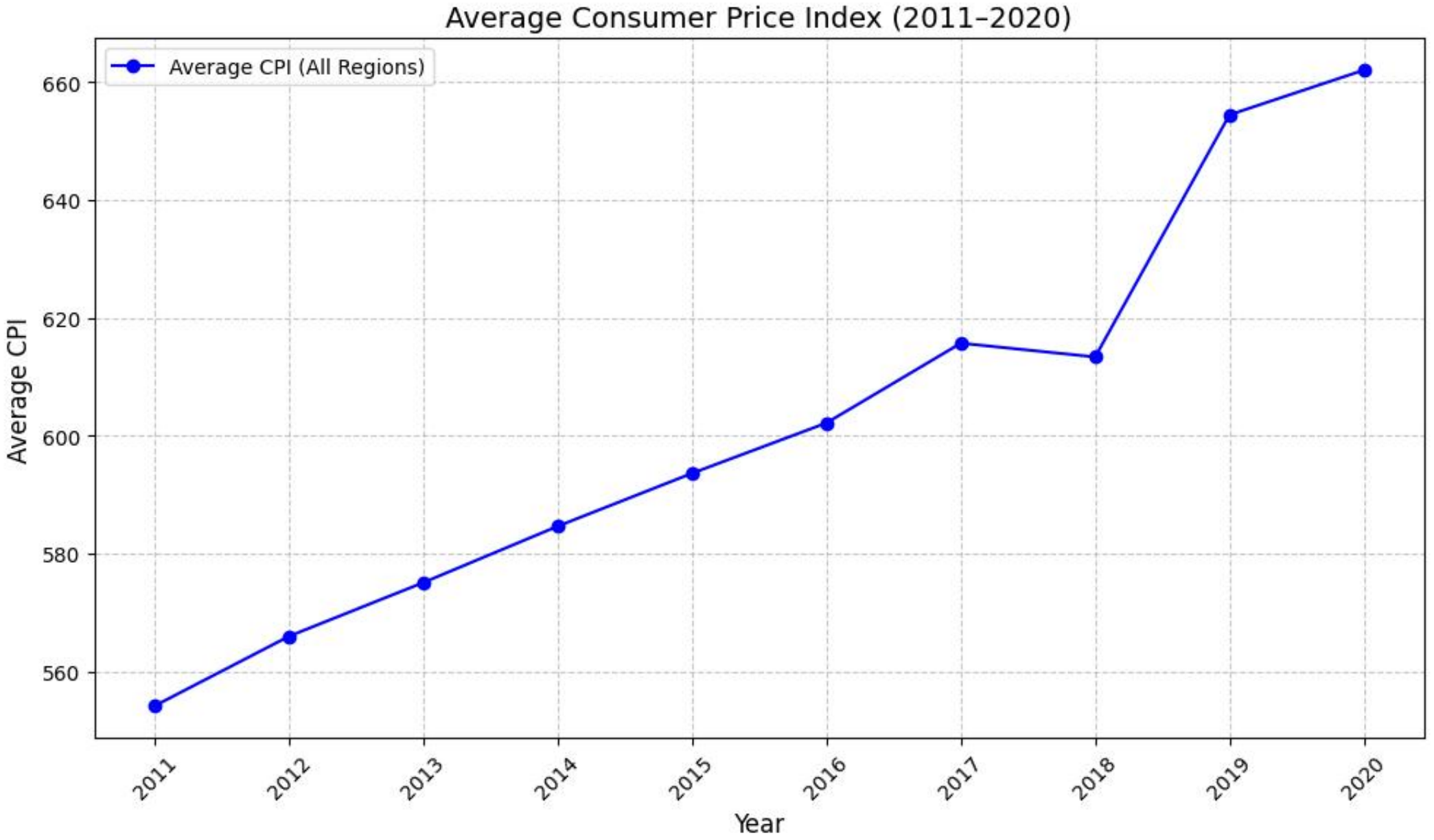
2.6 Following effect of including pandemic data



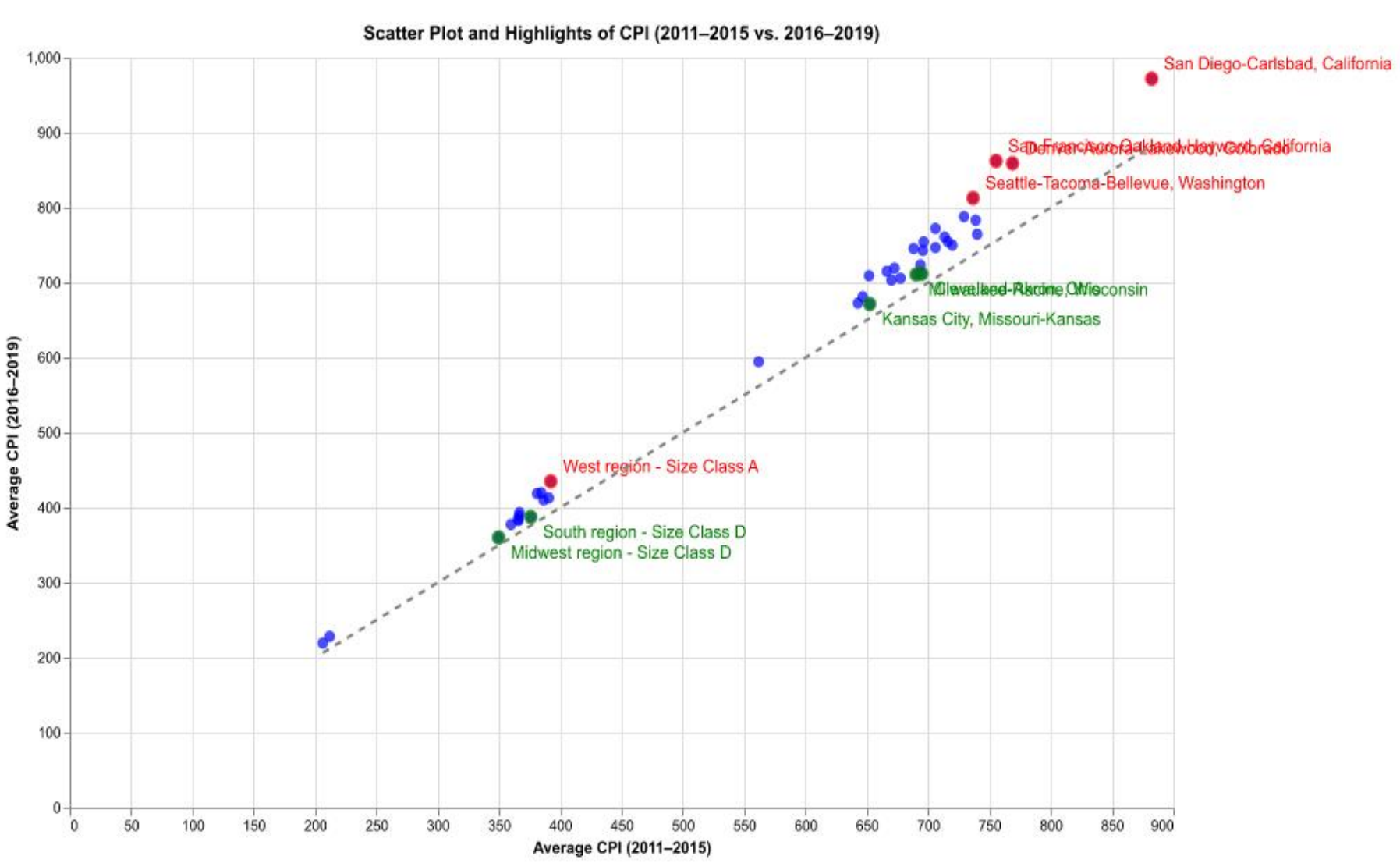
03

Consumer Price Index by Urban Areas

3.1 Outlook of CPI trend



3.2 Analysis of Consumer Price Index



Top and Bottom 5 Areas (Colored)

Top 5 Areas by Percentage Change

- San Francisco-Oakland-Hayward, California
- Denver-Aurora-Lakewood, Colorado
- West region - Size Class A
- Seattle-Tacoma-Bellevue, Washington
- San Diego-Carlsbad, California

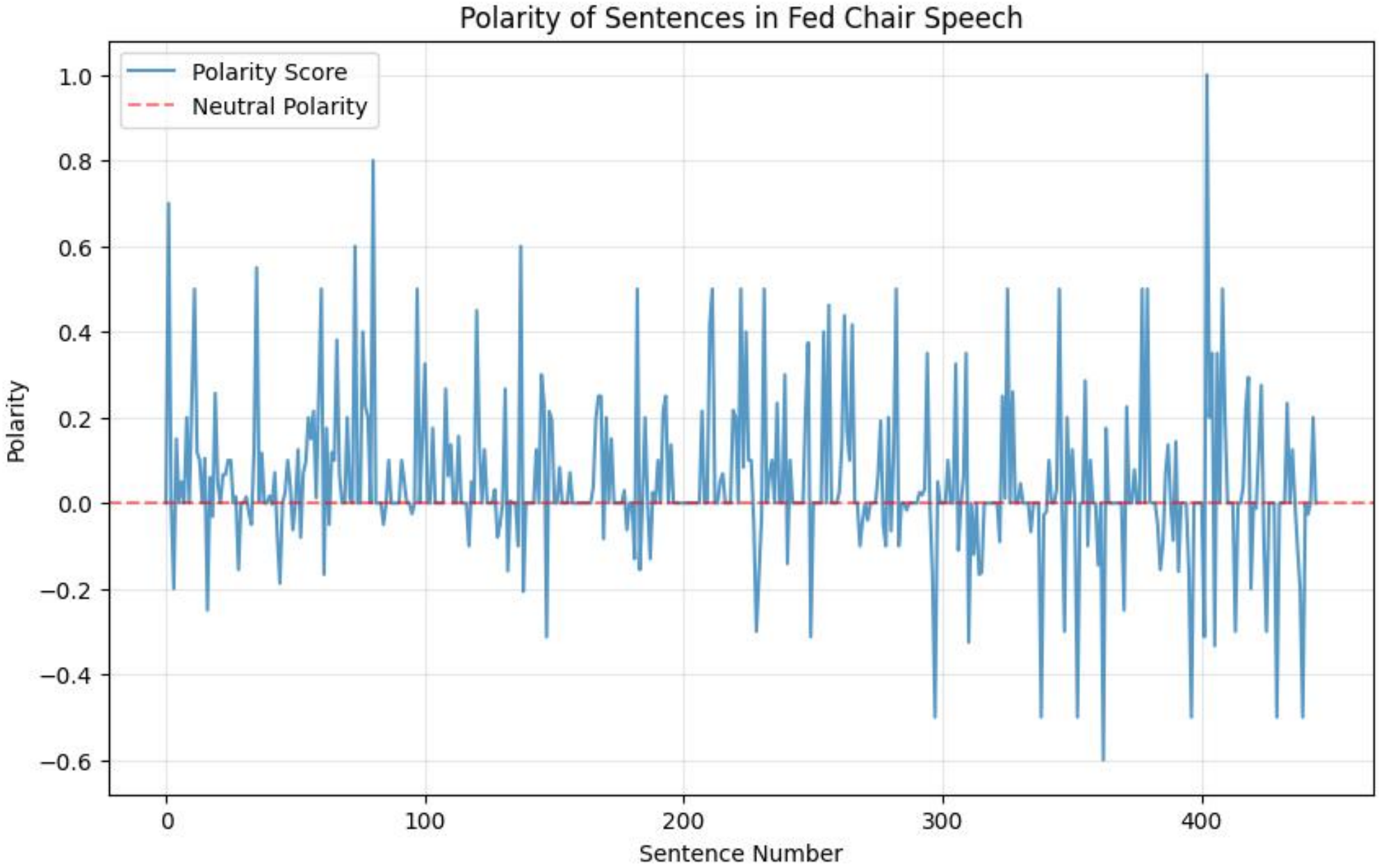
Bottom 5 Areas by Percentage Change

- Cleveland-Akron, Ohio
- Kansas City, Missouri-Kansas
- Midwest region - Size Class D
- Milwaukee-Racine, Wisconsin
- South region - Size Class D

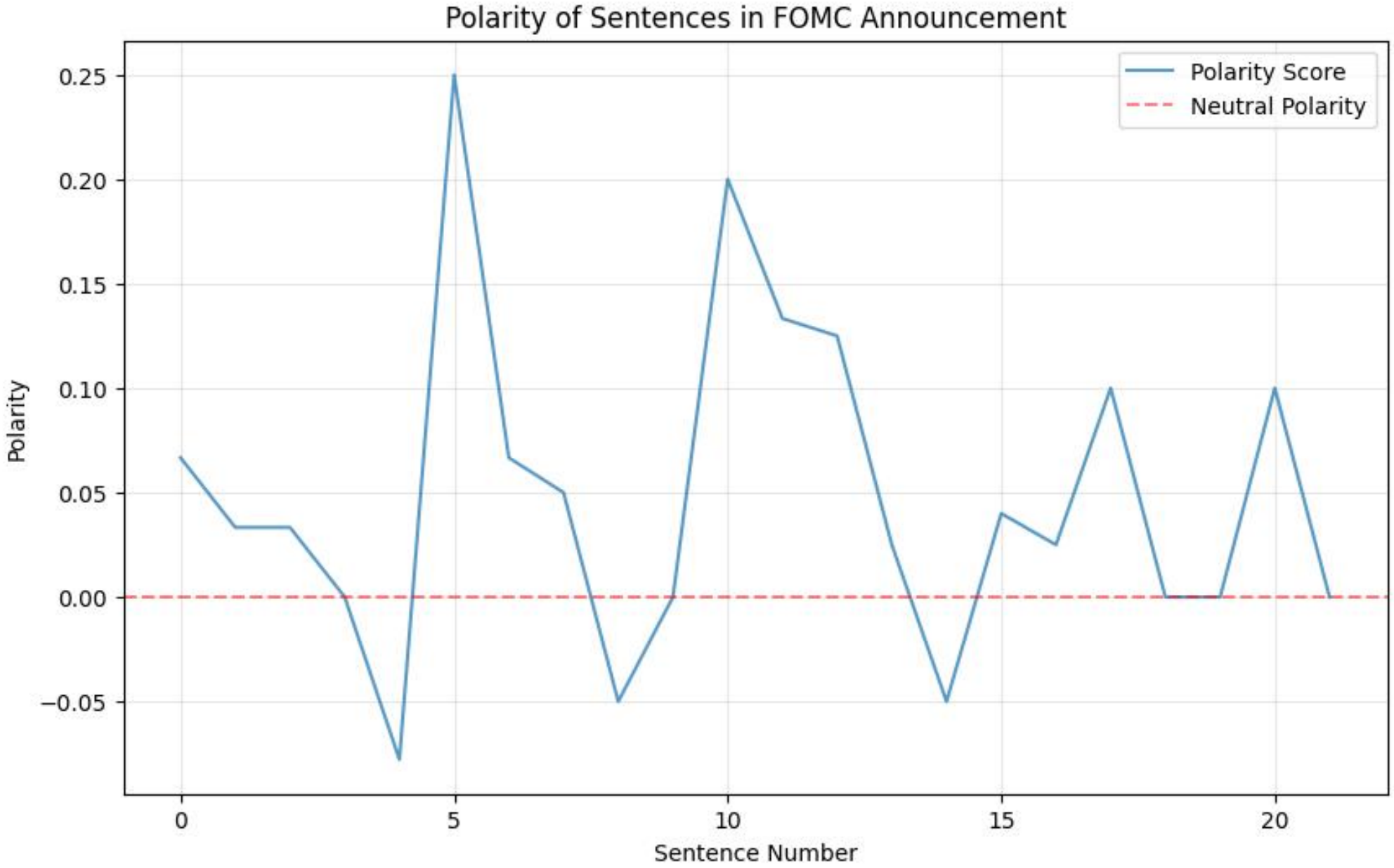
04

Natural Language Processing

4.1 Polarity Analysis of FED Speech



4.2 Polarity Analysis of FED Annoucement



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:

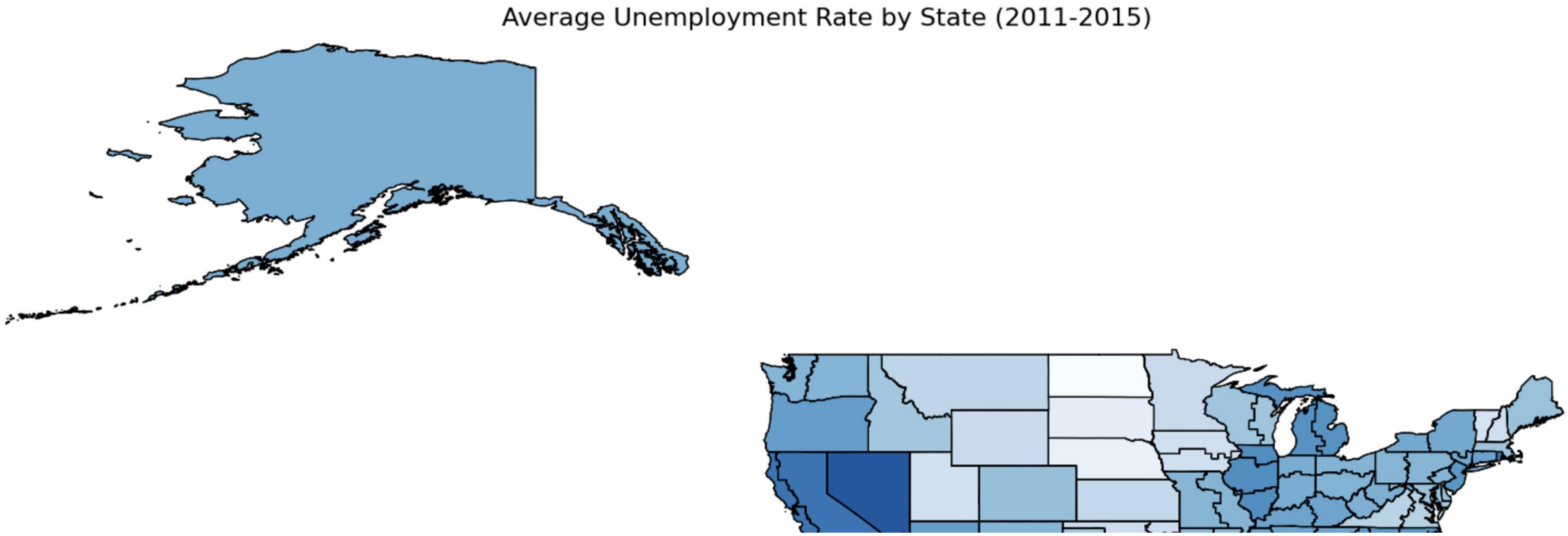
✓ 2011-2015
2016-2020

Select Visualization Type:

Plots

Select Data Type:

- (●) Unemployment rate
- ( ) CPI
- ( ) Differences



2011-2015
✓ 2016-2020

Select Visualization Type:

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Select a Time Period:

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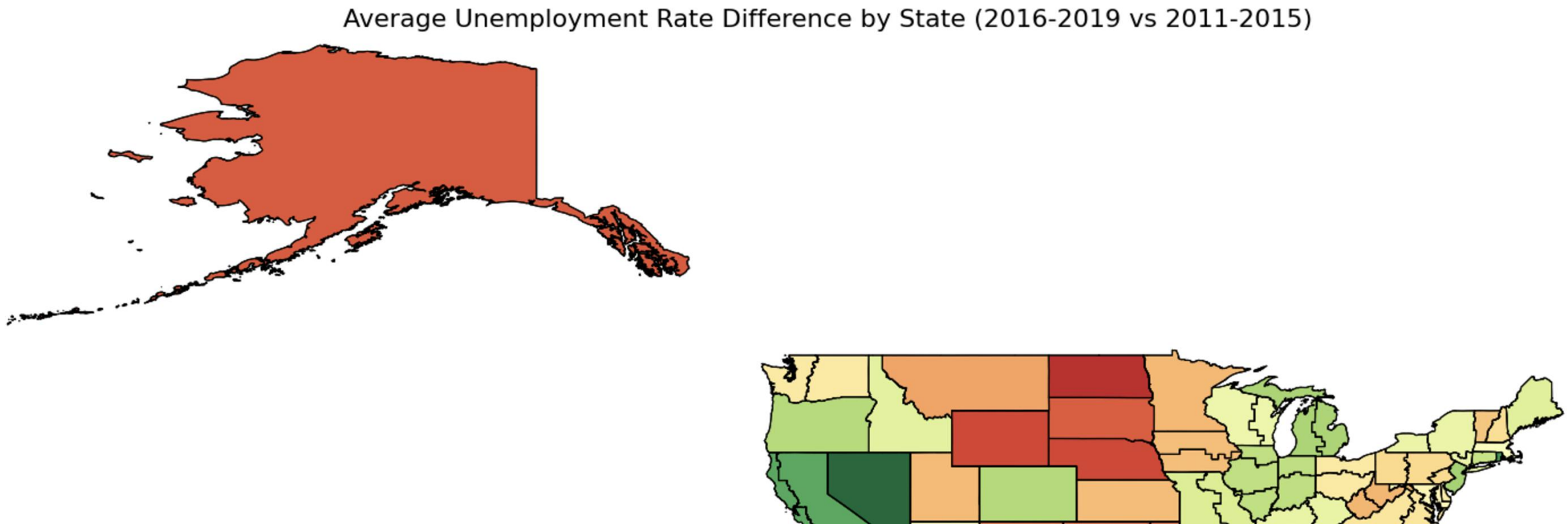

Select a Time Period:

2011-2015

Select Visualization Type:

Plots

Select Data Type:

- ○ Unemployment rate
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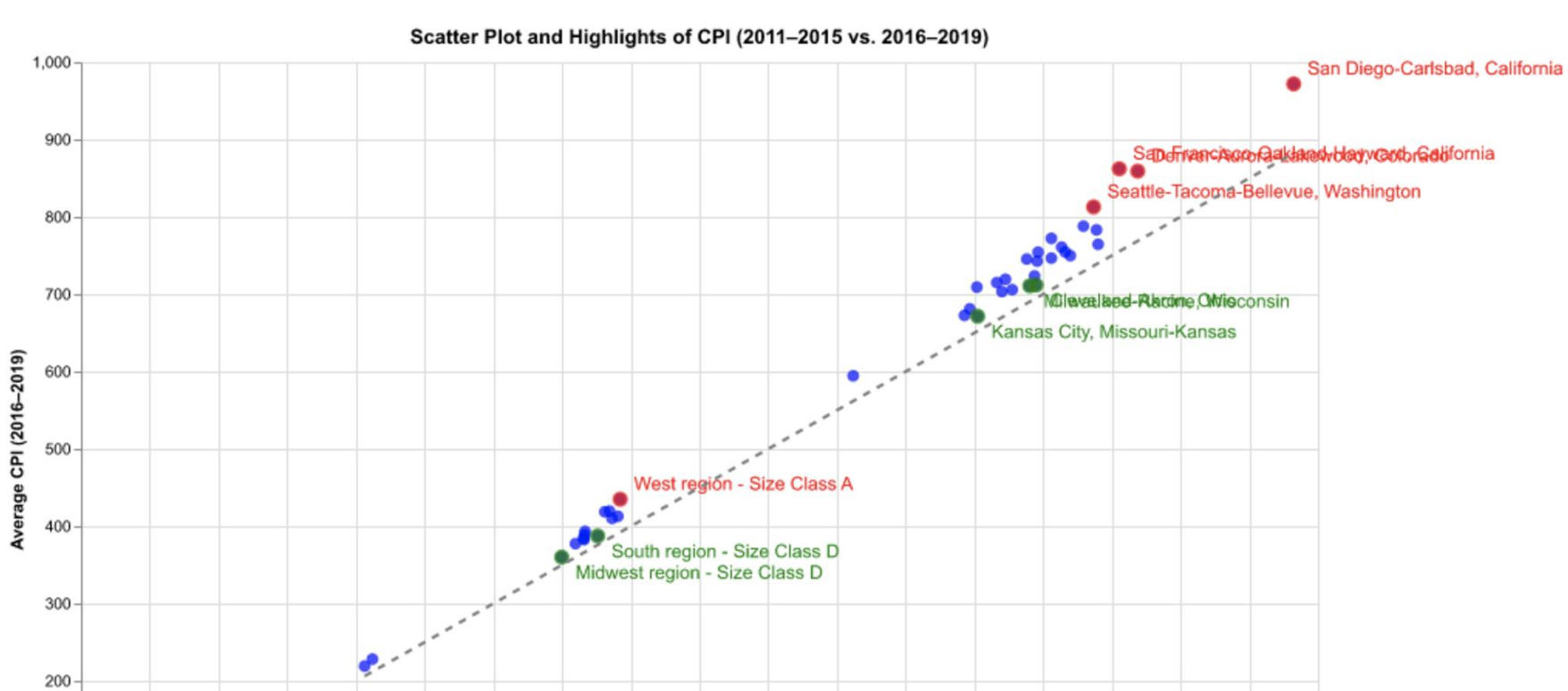
- ○ Differences



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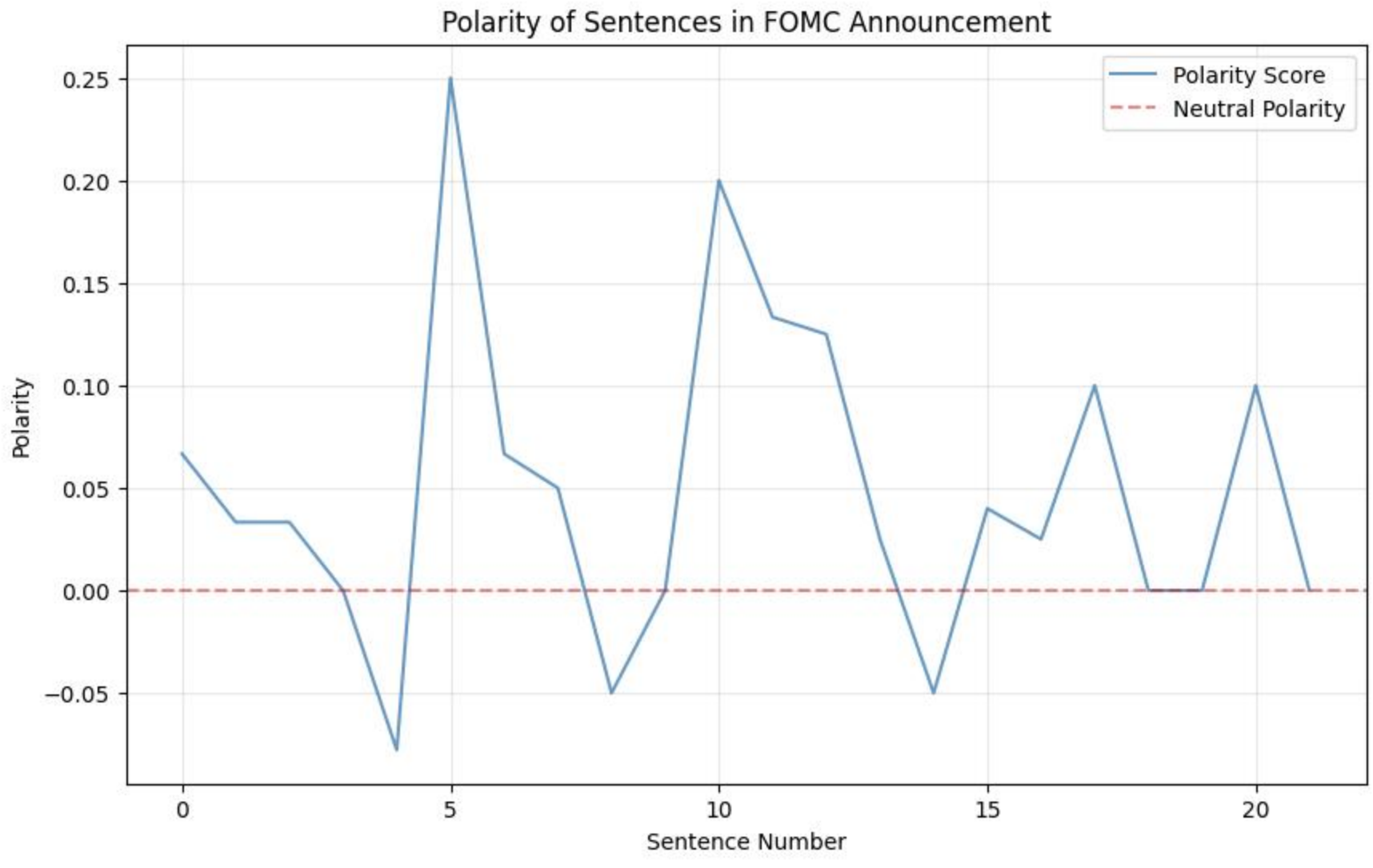
- Cleveland-Akron, Ohio
- Kansas City, Missouri-Kansas
- Midwest region - Size Class D
- Milwaukee-Racine, Wisconsin
- South region - Size Class D

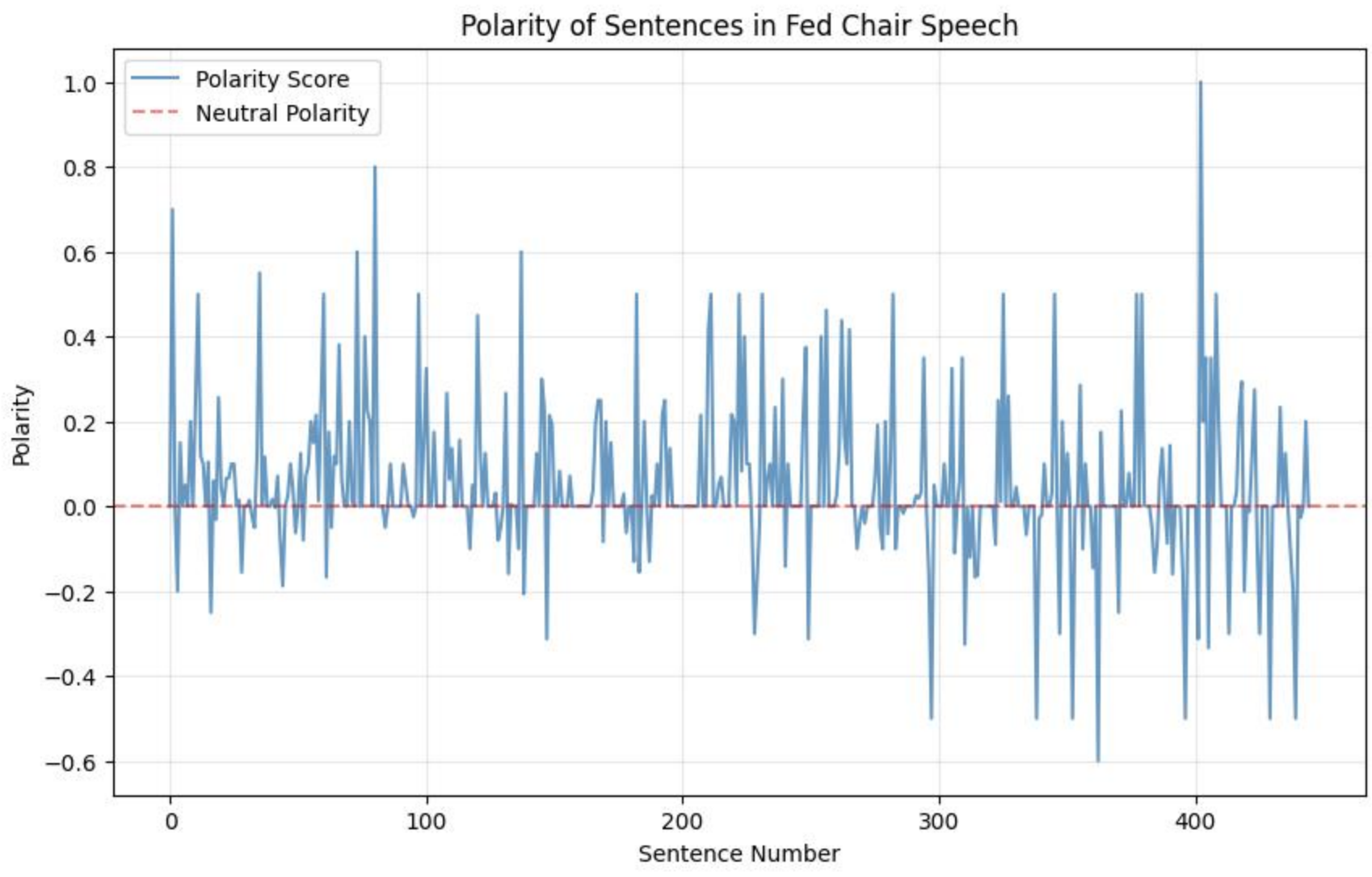
Select a Time Period:

2011-2015

Select Visualization Type:

NLP Analysis



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You selected: 2011-2015
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Visualization Type: NLP Analysis
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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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