

DRW TIME RAG CHALLENGE

https://docs.google.com/document/d/1PKuJvB-cjvOp6UWk_643CDkK92Au42KH-TD2oSwA/cd/tt=tab=t.0

The goal of this project is to create an LLM agent / RAG with robust temporal reasoning,

- What time periods in the past are most similar to the current Fed policy outlook?

SECTION OF PROJECT GOALS:

Here is an example comparison of the economic regimes for: 2005-2006 and 2018-2019:
Similarities

- Economic expansion and strong consumer spending: Both periods saw moderate economic growth across most Federal Reserve Districts.
- Tight Labor Markets and modest wage growth: Employers reported difficulties finding qualified workers due to labor shortages.
- Rising Input Costs: Businesses faced higher costs for materials but had limited ability to raise prices.

Dissimilarities:

- 2004-2006: Booming housing market with rapid price increases and strong construction activity. However, 2018-2019 showed a slowdown in housing due to higher interest rates and elevated home prices.

Data

The data provided for this project will be FOMC and Beige book releases. The FOMC press releases describe the Fed's decision about interest rates, and the Beige book describes the current state of the economy.

1. FOMC press release: [here](#)
2. Beige book: [here](#)

About the Fed

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Monetary Policy

Supervision & Regulation

Financial Stability

Payment Systems

Economic Research

Data

Consumers & Communities

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Beige Book - January 2025

About This Publication

National Summary

Federal Reserve Bank of Boston

Federal Reserve Bank of New York

Federal Reserve Bank of Philadelphia

Federal Reserve Bank of Cleveland

Federal Reserve Bank of Richmond

Federal Reserve Bank of Atlanta

Federal Reserve Bank of Chicago

Federal Reserve Bank of St. Louis

Federal Reserve Bank of Minneapolis

National Summary

Overall Economic Activity

Economic activity increased slightly to moderately across the twelve Federal Reserve Districts in late November and December. Consumer spending moved up moderately, with most Districts reporting strong holiday sales that exceeded expectations. Vehicle sales grew modestly. Construction activity decreased overall, with several Districts indicating that high costs for materials and financing were weighing on growth. Manufacturing decreased slightly on net, and a number of Districts said manufacturers were stockpiling inventories in anticipation of higher tariffs. Residential real estate activity was unchanged on balance, as high mortgage rates continued to hold back demand. Commercial real estate sales edged up. The nonfinancial services sector grew slightly overall, with Districts highlighting growth in leisure and hospitality and transportation, notably air travel. Truck freight volumes, however, were down. Financial service providers reported modest growth in lending and little change in asset quality overall, though lenders and community organizations voiced concerns about delinquencies among small businesses and lower-income households. Nonprofit social service agencies faced high demand amidst uncertainty about future funding levels. Agricultural conditions remained weak overall, with generally lower farm incomes and weather-related struggles in some areas. The spread of avian flu reduced egg supplies and pushed up prices. Energy activity was mixed. More contacts were optimistic about the outlook for 2025 than were pessimistic about it, though contacts in several Districts expressed concerns that changes in immigration and tariff policy could negatively affect the economy.

Labor Markets

Employment ticked up on balance, with six Districts reporting a slight increase and six reporting no change. Contacts in several service industries, notably healthcare, continued to see job growth. Construction employment increased slightly, while manufacturing employment was flat. Contacts across multiple sectors noted difficulty finding skilled workers, and reports of layoffs remained rare. However, contacts in some Districts expressed greater uncertainty about their future

Orders on Banking Applications

1/14/2025 Minutes of the Board's discount rate meetings on November 18, December 9, and December 18, 2024

Monetary Policy

1/14/2025 Federal and state financial regulatory agencies issue interagency statement on supervisory practices regarding financial institutions affected by the California wildfires and straight-line winds

Other Announcements

1/13/2025 Federal Reserve Board announces the designation of the Chairs and Deputy Chairs of the 12 Federal Reserve Banks for 2025

Other Announcements

1/10/2025 Federal Reserve Board announces approval of application by UMB Financial Corporation

Orders on Banking Applications

1/8/2025 Minutes of the Federal Open Market Committee, December 17-18, 2024

Monetary Policy

1/6/2025 Federal Reserve Board announces Michael S. Barr will step down from his position as Federal Reserve Board Vice Chair for Supervision, effective February 28, 2025, and will continue to serve as governor

Other Announcements

12/23/2024 Due to evolving legal landscape & changes in the framework of administrative law,

bruh moment dataset lol

fomc statements
<https://github.com/vtasca/fed-statement-scraping>

beige book
<https://github.com/oscarsuen/beige-book>

```
raw_fomc = pl.read_csv('./data/raw/communications.csv')
raw_fomc
```

shape: (442, 4)

Date	Release Date	Type	Text
str	str	str	str
"2024-12-18"	"2025-01-08"	"Minute"	"Minutes of the Federal Open Ma..."
"2024-12-18"	"2024-12-18"	"Statement"	"Recent indicators suggest that..."
"2024-11-07"	"2024-11-26"	"Minute"	"Minutes of the Federal Open Ma..."
"2024-11-07"	"2024-11-07"	"Statement"	"Recent indicators suggest that..."
"2024-09-18"	"2024-09-18"	"Statement"	"Recent indicators suggest that..."
...
"2000-05-16"	"2000-05-16"	"Statement"	"The Federal Open Market Commit..."
"2000-03-21"	"2000-05-18"	"Minute"	"Minutes of the Federal Open Ma..."
"2000-03-21"	"2000-03-21"	"Statement"	"The Federal Open Market Commit..."
"2000-02-02"	"2000-03-23"	"Minute"	"Minutes of the Federal Open Ma..."
"2000-02-02"	"2000-02-02"	"Statement"	"The Federal Open Market Commit..."

```
# Get all summary files
beige_book_files = glob.glob("./data/raw/beige-book/**/*-su.txt", recursive=True)
```

shape: (164, 3)

date	text	filename
datetime[μs]	str	str
2000-01-01 00:00:00	"Reports from most Federal Rese..."	"./data/raw/beige-book/2000/01/..."
2000-03-01 00:00:00	"Reports from the twelve Federa..."	"./data/raw/beige-book/2000/03/..."
2000-05-01 00:00:00	"Reports from the twelve Federa..."	"./data/raw/beige-book/2000/05/..."
2000-06-01 00:00:00	"Reports from the Federal Reser..."	"./data/raw/beige-book/2000/06/..."
2000-08-01 00:00:00	"The information collected for ..."	"./data/raw/beige-book/2000/08/..."
...
2019-11-01 00:00:00	"This report was prepared at th..."	"./data/raw/beige-book/2019/11/..."
2020-01-01 00:00:00	"This report was prepared at th..."	"./data/raw/beige-book/2020/01/..."
2020-03-01 00:00:00	"This report was prepared at th..."	"./data/raw/beige-book/2020/03/..."
2020-04-01 00:00:00	"This report was prepared at th..."	"./data/raw/beige-book/2020/04/..."
2020-05-01 00:00:00	"Overall Economic Activity Econ..."	"./data/raw/beige-book/2020/05/..."

I need atomic observations for nice properties in embedding space

The screenshot displays the Federal Reserve's Beige Book for January 2025. The top navigation bar includes links for About the Fed, News & Events, Monetary Policy, Supervision & Regulation, Financial Stability, Payment Systems, Economic Research, Data, and Consumers & Communities. The breadcrumb trail reads: Home > Monetary Policy > Beige Book > January 15, 2025. A PDF download icon is located in the top right corner. On the left, a sidebar lists the publication's contents: About This Publication, National Summary (highlighted), and a list of Federal Reserve Banks from Boston to Minneapolis. The main content area features the 'National Summary' section, which includes a sub-section for 'Overall Economic Activity'. This section provides a detailed overview of economic conditions across the twelve Federal Reserve Districts, noting that activity increased slightly to moderately in late November and December. It covers various sectors including consumer spending, vehicle sales, construction, manufacturing, real estate, nonfinancial services, financial services, and nonprofit social services. The 'Labor Markets' section follows, reporting that employment ticked up on balance, with six districts reporting a slight increase and six reporting no change. It also notes challenges in finding skilled workers and reports of layoffs in some districts.



create atomic observations from each report

<https://app.graphprompt.ai/vicarious-amaranth-tick/executions/0194a1e1-81ef-77dd-960d-df02cc68bb61>

text

You are an expert in Federal Reserve communications and monetary policy analysis working for a trading firm. You will analyze documents to extract key economic observations and their communication patterns.

Start by doing an analysis of the document.

prompt

text

text

document

{{text}}

{{prompt}}

llm | temp: 0

sonnet 3.5

I'll analyze this Beige Book report from January 2020 by focusing on key themes, economic trends, and communication patterns.

Key Economic Observations:

1. Overall Growth Pattern:

- Generally "modest" expansion across regions
- Notable geographic divergence: Dallas/Richmond showing above-average growth while Philadelphia/St. Louis/Kansas City reporting sub-par growth
- Language suggests a steady but not robust economy

2. Sector-Specific Trends:

Strong Areas:

- Consumer spending: "modest to moderate" with "solid" holiday sales
- Online retail: Growing importance highlighted
- Residential real estate: Strengthening rental markets

compute

api input (document) | text

This report was prepared at the Federal Reserve Bank of New York based on information collected on or before January 6, 2020. This document summarizes comments received from contacts outside the Federal Reserve System and is not a commentary on the views of Federal Reserve officials. Overall Economic Activity Economic activity generally continued to expand modestly in the final six weeks of 2019. The Dallas and Richmond Districts noted above-average growth, while Philadelphia, St. Louis, and Kansas City reported sub-par

text

Now that you've analysed, make atomic observations from the document:

1. WHAT: Extract the core economic observation in clear, direct language. Focus on:

- Current conditions
- Changes from previous conditions
- Notable trends
- Key economic variables

2. HOW: Analyze the communication approach in 1-2 sentences. Consider:

- Choice of words and qualifiers
- Balance and hedging
- Temporal comparisons
- Strength of conviction
- Market signaling
- Notable rhetorical devices

3. SOURCE: Note the specific text that

prompt

text

document

analysis

You are an expert in Federal Reserve communications and monetary policy analysis working for a trading firm. You will analyze documents to extract key economic observations and their communication patterns.

{{prompt}}

document:

{{document}}

your analysis:

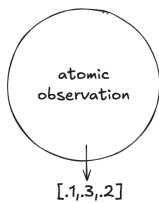
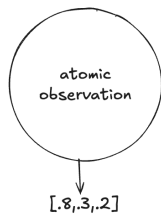
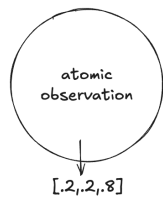
{{analysis}}

api output | llm | temp: 0

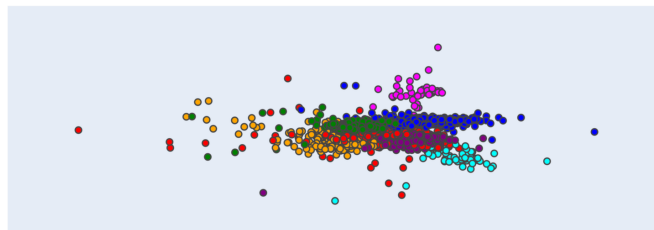
sonnet 3.5

{
 "month": 1,
 "day": 6,
 "year": 2020,
 "observations": [
 {
 "what": "Economic growth showed significant regional divergence, with Dallas and Richmond reporting above-average growth while Philadelphia, St. Louis, and Kansas City reported below-par growth",
 "citations": ["[The Dallas and Richmond Districts noted above-average growth, while Philadelphia, St. Louis, and Kansas City reported sub-par growth](#)"],
 "how": "The Fed explicitly highlights regional divergences using direct comparative language, suggesting careful attention to growing economic disparities across regions"
 },
 {
 "what": "Manufacturing activity remained stagnant across most districts, continuing the trend from previous report",
 "citations": ["[Manufacturing activity was essentially flat in most Districts, as in the previous report](#)"],
 "how": "Uses clear temporal comparison to previous period and deliberately neutral term 'essentially flat' to describe manufacturing weakness without raising alarm"
 },
 {
 "what": "Labor markets remained tight nationwide with widespread shortages constraining both job growth and business expansion"

compute



edge weights = similarity
then cluster



dynamic number of groups and each relate to a theme

QUERY ALGO

- group node by time period (eg 2020)
- for target time period for each cluster calculate mean of all embedding
- for each 2020 cluster
- for all other time periods (eg 2000-2019)
- get top 90% of statements to the 2020 centroid by similarity
-> creates (2000) cluster 1 top 90%
- get top 90% clusters of top 90% statements
- see which time periods are closest averaging distances of those clusters

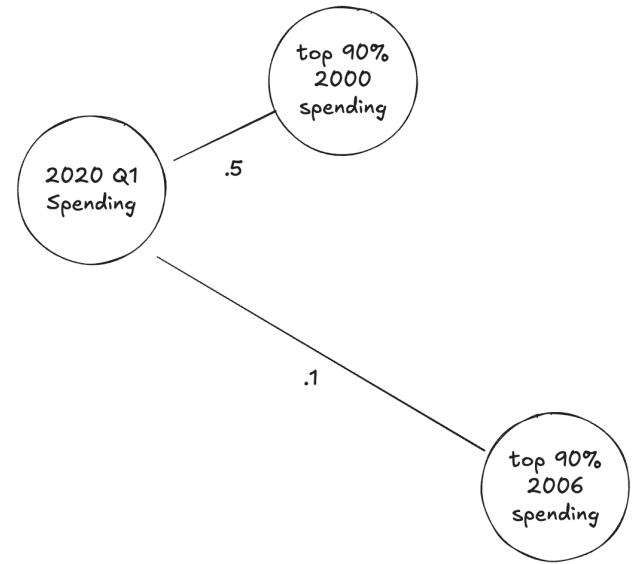
- ex:
Analyzing periods similar to 2020-01-01

Most similar periods:

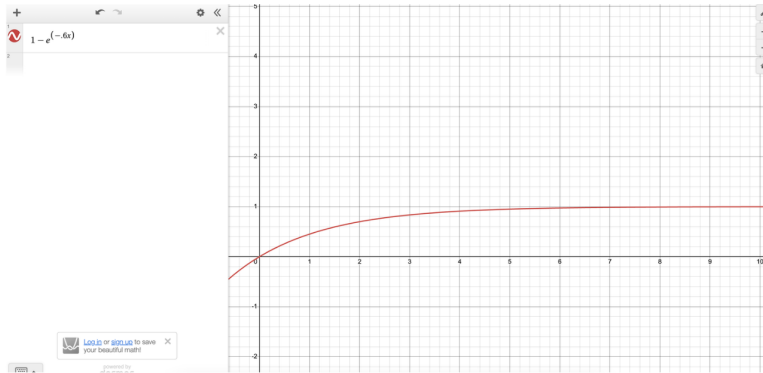
2009: 0.877 (time penalty: 0.1%)

2001: 0.859 (time penalty: 0.0%)

2012: 0.859 (time penalty: 0.8%)



exponential time decay so 2016 != 2017
x is years distance



get top 90% similarities so we can see major differences between similar periods

Chunk processing

<https://app.graphprompt.ai/reason/executions/0194a5d7-46b2-719c-b29d-707893d5b3f3>

Top level report from chunks:

<https://app.graphprompt.ai/reason-top/executions/0194a5df-d1d1-7b8e-b47b-a95bd8dea2b4>

api output | llm | temp: 0

sonnet 3.5

system
(optional)

user

The 2009 and 2020 economic crises exhibited fundamentally different characteristics in their onset and progression, with 2020 showing an abrupt, pandemic-driven collapse [910, "[sharp declines in economic activity and a surge in job losses](#)"] versus 2009's gradual financial deterioration [472, "[the economy has continued to contract, though the pace of contraction appears to be somewhat slower](#)"]. While both periods featured significant uncertainty, 2020's path was explicitly tied to virus developments [921, "[The path of the economy will depend significantly on the course of the virus](#)"], whereas 2009's recovery hinged on financial market conditions [475, "[economic outlook has improved modestly since the March meeting, partly reflecting some easing of financial market conditions](#)"]. The recovery patterns also differed markedly, with 2020 showing rapid but uneven sectoral rebounds [918, "[economic activity and employment have picked up somewhat in recent months but remain well below their levels](#)"] compared to 2009's more uniform but gradual stabilization [482, "[economic activity is leveling out](#)"].

compute

\$ \$0.0460

api input (analysis) | text

Reasoning Analysis:
Both 2009 and 2020 experienced significant deflationary pressures, but while 2009 focused primarily on economic slack and commodity prices [42, "declines in the prices of energy and other commodities in recent

text

given all the anlaysis comparing the two time periods give the final report. your are a finance expert making an important a report to top financial experts. make sure to add the ids of the statements. the report should be narrative style with citing [id, "quote"], make it clear how they were similar and different

prompt | text

analysis | {{prompt}}

analysis | {{analysis}}

| {{prompt}}

api output | llm | temp: 0

sonnet 3.5

system (optional)

COMPARATIVE ANALYSIS: 2009 VS 2020 ECONOMIC CRISES
Financial Market Expert Report

Executive Summary:
This analysis compares the economic crises of 2009 and 2020, revealing distinct characteristics in their onset, progression, and policy responses. While both periods experienced significant economic distress, their fundamental nature and recovery patterns differed substantially.

Crisis Onset and Progression:
The 2020 crisis emerged as an abrupt, pandemic-driven collapse [910, "sharp declines in economic activity and a surge in job losses"], contrasting sharply with 2009's gradual financial deterioration [472, "the economy has continued to contract, though the pace of contraction appears to be somewhat slower"]. The 2020 downturn was uniquely tied to viral developments [921, "The path of the economy will depend significantly on the course of the virus"], whereas 2009's trajectory was primarily linked to financial market conditions [475, "economic outlook has improved modestly since the March meeting, partly reflecting some easing of financial market conditions"].

Labor Market Dynamics:
The labor market situations differed markedly between the two periods. The 2020 crisis showed an unprecedented shift from extreme tightness [1000, "Most Districts cited widespread labor shortages as a factor constraining job growth"] to sudden

compute