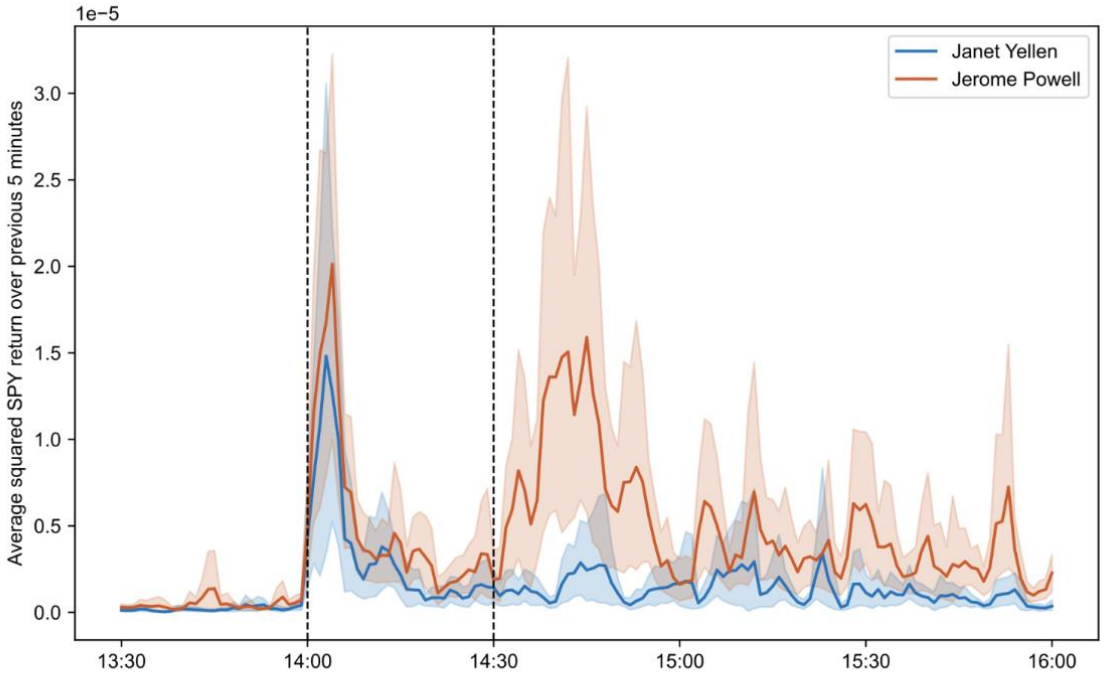
LLM-FOMC Ideation

FOMC statement and Pres Conf effects on market volatility in S&P 500



***Note*: The figure shows average squared returns of the S&P 500 index (proxied by the SPY ETF) over five-minute periods from 1:30 p.m. to 4:00 p.m. on FOMC press conference days. Dashed lines indicate the FOMC statement release time (2:00 p.m.) and the press conference start time (2:30 p.m.). Each line plots the average of squared returns for the previous five minutes across all press conferences given by the chair. The shaded area is a bootstrapped 95% confidence interval. We do not include Chair Bernanke in this figure, since the timing of statement releases and press conferences varied during his tenure.**

Source: https://cepr.org/voxeu/columns/market-impact-fed-press-conference

Observations:

1. **<u>Volatility increases</u>** with statements (2pm) and press conference (2:30pm)
2. Each chairman has different effect on this volatility

Correlation to other asset prices…

	All press conference meetings		With SEP release		Without SEP release		
	Statement	Press Conf	Statement	Press Conf	Statement	Press Conf	Only Statement
2-quarter eurodollar	2.48***	1.24**	2.44***	1.17**	2.58***	1.46**	0.75**
4-quarter eurodollar	3.39***	2.19**	3.74***	2.05**	2.42***	2.58***	1.27**
2-year Treasury	3.18***	2.14**	3.46***	2.02**	2.39***	2.47**	1.21**
5-year Treasury	3.86***	2.91**	4.62***	2.96**	1.78**	2.78**	1.72**
10-year Treasury	2.67***	2.30**	3.18***	2.35**	1.26*	2.14*	1.36**
5-year TIPS	4.90***	3.41**	5.79***	3.83***	2.44***	2.25**	1.90**
10-year TIPS	3.56***	2.60**	4.21***	2.90**	1.76***	1.77*	1.50**
S&P 500	0.32**	0.47*	0.36**	0.47*	0.20	0.48*	0.18
euro/dollar	0.31***	0.28**	0.36***	0.31***	0.18**	0.19**	0.22***
VIX	0.59**	0.74	0.64**	0.66	0.46*	0.94*	0.26
# meetings	45	45	33	33	12	12	23

Notes: Average absolute change in selected asset prices around the release of the FOMC statement, SEP, and the post-meeting press conference during event windows that run from 10 minutes before the release (start) of the statement (press conference) until 20 minutes after the release (end) of the statement (press conference). Changes in implied futures rates and rates are in basis points, changes in the S&P 500 index and the euro/dollar exchange are in percent, change in the VIX is in percentage points. *, **, *** indicates that a price movement is larger than the 90th, 95th, or 99th percentile of a bootstrapped sample of size 10,000 of asset price movements during the same event windows on non-FOMC days. The sample includes FOMC meetings between March 2013 and July 2021.

Source: https://www.federalreserve.gov/econres/notes/feds-notes/questions-and-answers-the-information-content-of-the-post-fomc-meeting-press-conference-20211012.html

2:00 pm EST: Cosine similarity in **FOMC statements**

Snippet FOMC June 2023 vs Apr 2023:

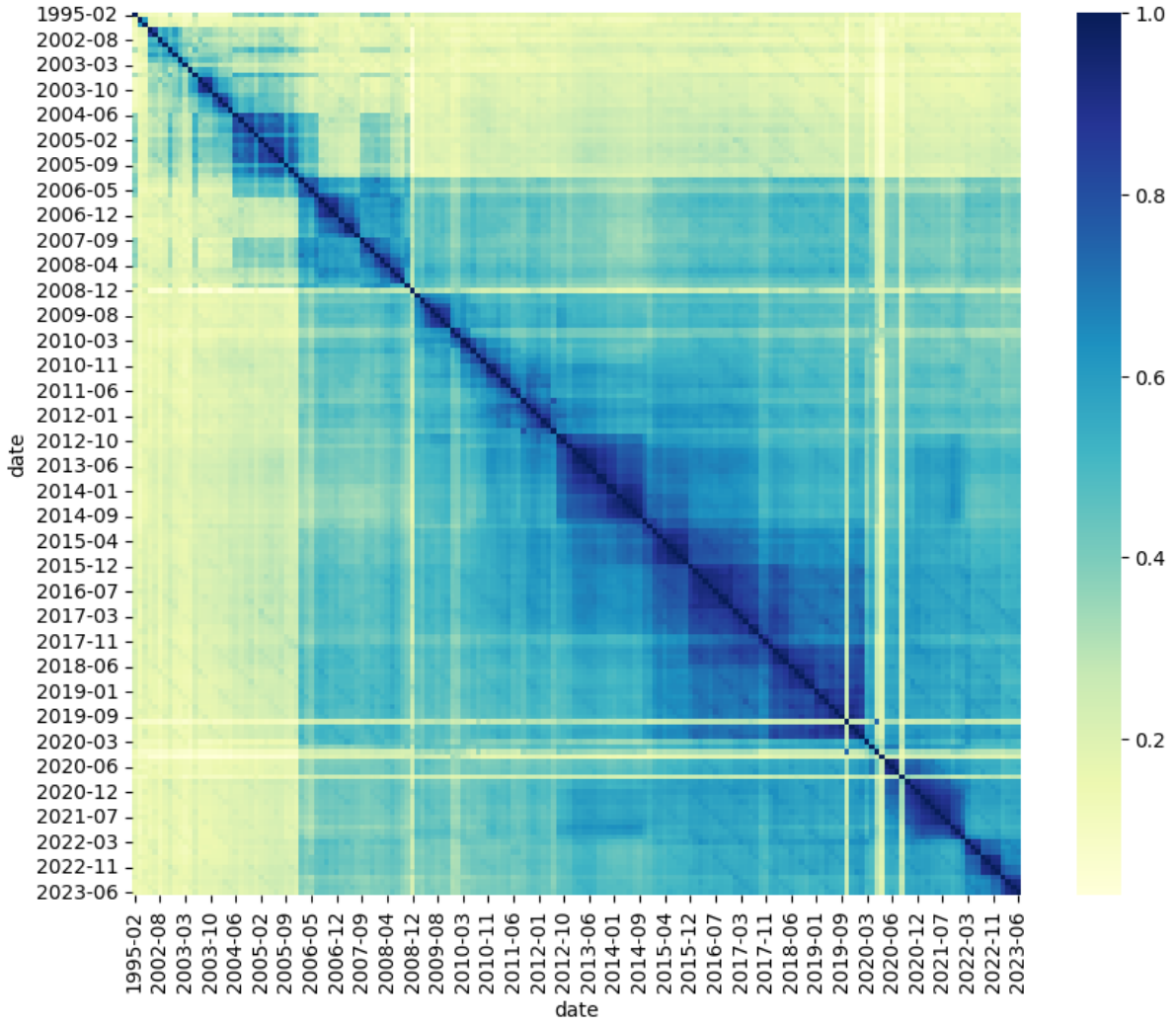
~~Economic~~Recent indicators suggest that economic activity ~~expanded~~has continued to expand at a modest pace ~~in the first quarter~~. Job gains have been robust in recent months, and the unemployment rate has remained low. Inflation remains elevated.

The U.S. banking system is sound and resilient. Tighter credit conditions for households and businesses are likely to weigh on economic activity, hiring, and inflation. The extent of these effects remains uncertain. The Committee remains highly attentive to inflation risks.

The Committee seeks to achieve maximum employment and inflation at the rate of 2 percent over the longer run. In support of these goals, the Committee decided to ~~raise~~maintain the target range for the federal funds rate ~~to~~at 5 to 5-1/4 percent. ~~The~~ Holding the target range steady at this meeting allows the Committee ~~will closely monitor incoming~~ to assess additional information and ~~assess the~~its implications for monetary policy. In determining the extent ~~to which~~of additional policy firming that may be appropriate to return inflation to 2 percent over time, the Committee will take into account the cumulative tightening of monetary policy, the lags with which monetary policy affects economic activity and inflation, and economic and financial developments. In addition, the Committee will continue reducing its holdings of Treasury securities and agency debt and agency mortgage-backed securities, as described in its previously announced plans. The Committee is strongly committed to returning inflation to its 2 percent objective.

In assessing the appropriate stance of monetary policy, the Committee will continue to monitor the implications of incoming information for the economic outlook. The Committee would be prepared to adjust the stance of monetary policy as appropriate if risks emerge that could impede the attainment of the Committee's goals. The Committee's assessments will take into account a wide range of information, including readings on labor market conditions, inflation pressures and inflation expectations, and financial and international developments.

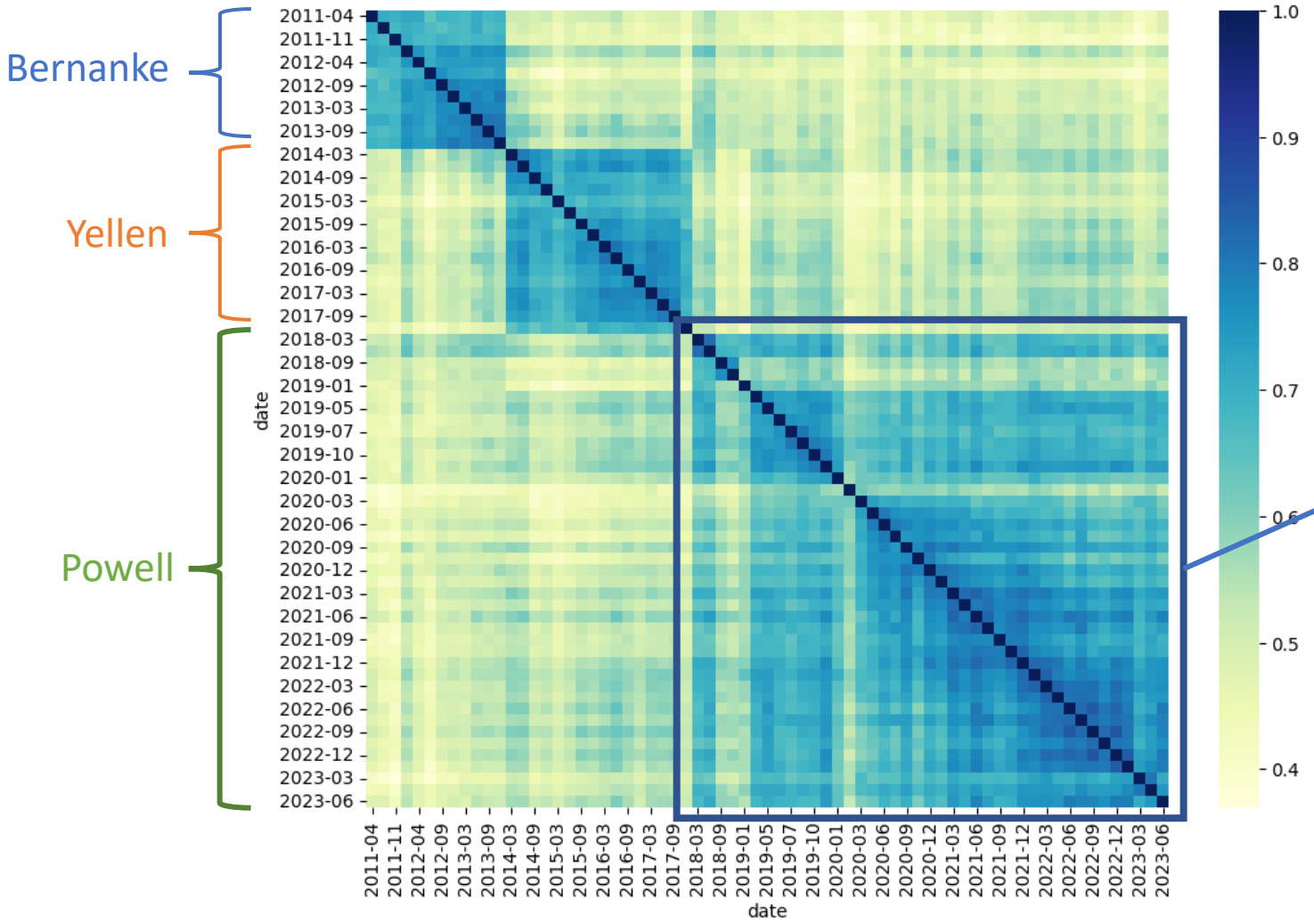
Voting for the monetary policy action were Jerome H. Powell, Chair; John C. Williams, Vice Chair; Michael S. Barr; Michelle W. Bowman; Lisa D. Cook; Austan D. Goolsbee; Patrick Harker; Philip N. Jefferson; Neel Kashkari; Lorie K. Logan; and Christopher J. Waller.



Inference:

1. The document has monetary decisions and related changes (numerical)
2. And the hawkish/dovish signal
   For ex. raise -> maintain -> lower (hawkish -> neutral -> dovish)

2:30pm EST: Cosine similarity in **Press Conf** transcripts



Inference:

1. Each chairman has a **different tone**
2. For each chairman, the **dissimilarity of words (tone) is causing the amplitude of volatility**

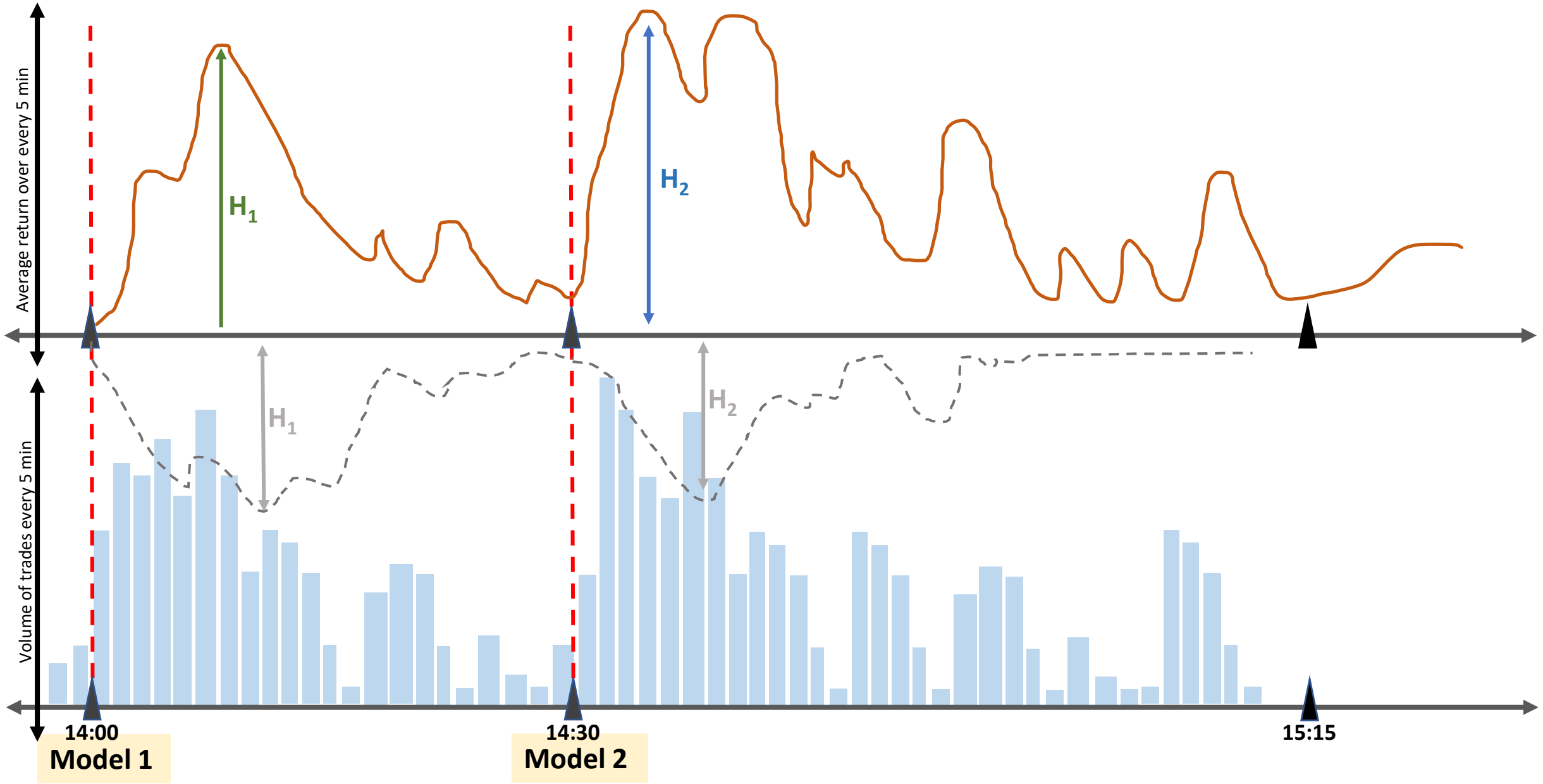
Breaking down Press conf:

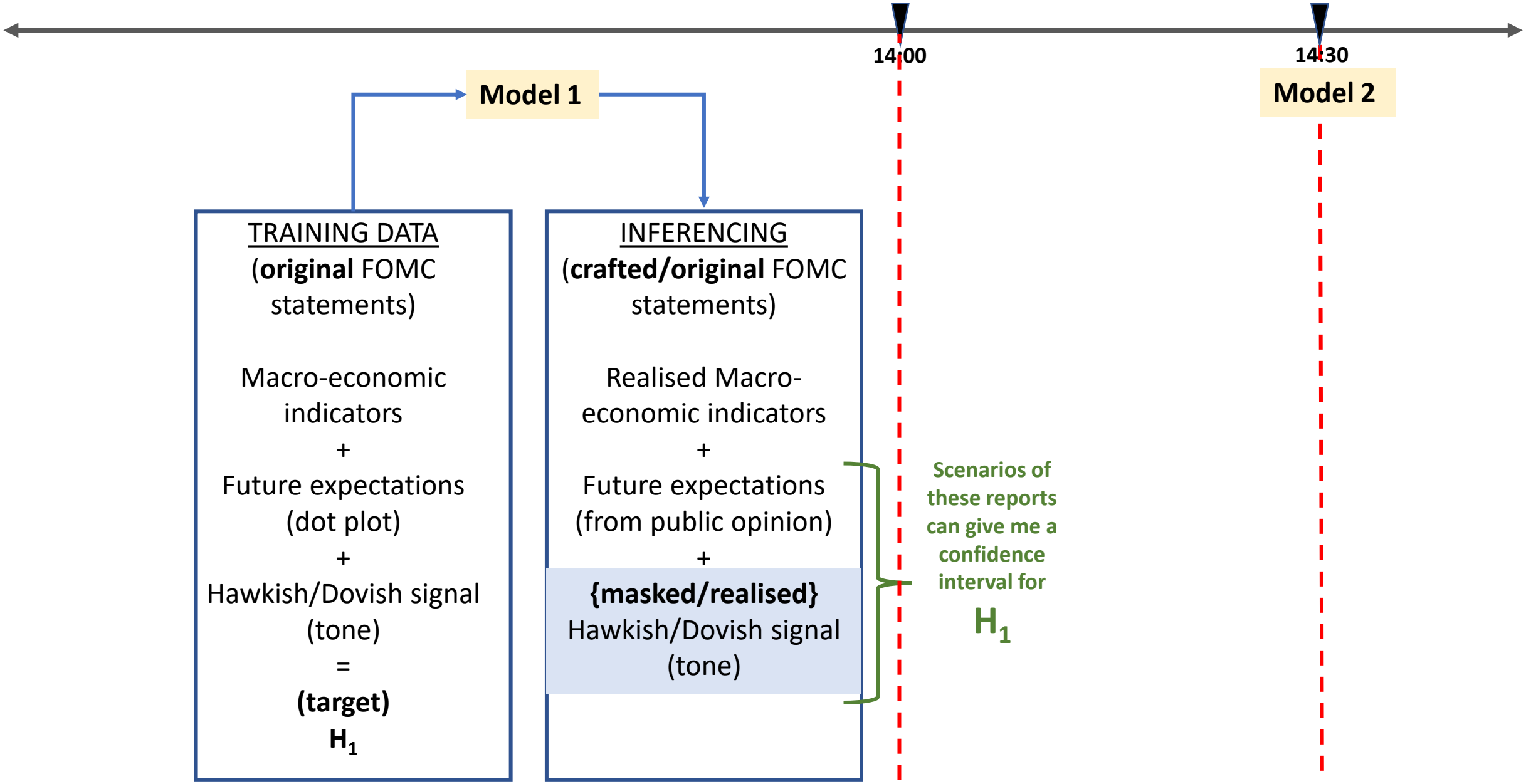
- Opening remarks (~10min):
  - Economic situation (GDP, unemployment, demand & supply, interest rates, inflation etc) (and their respective **realised values**)
  - Projections of these macro-economic indicators and goals (**expected values**)
  - Hawkish/dovish signal for each indicator (**Tone in speech**)

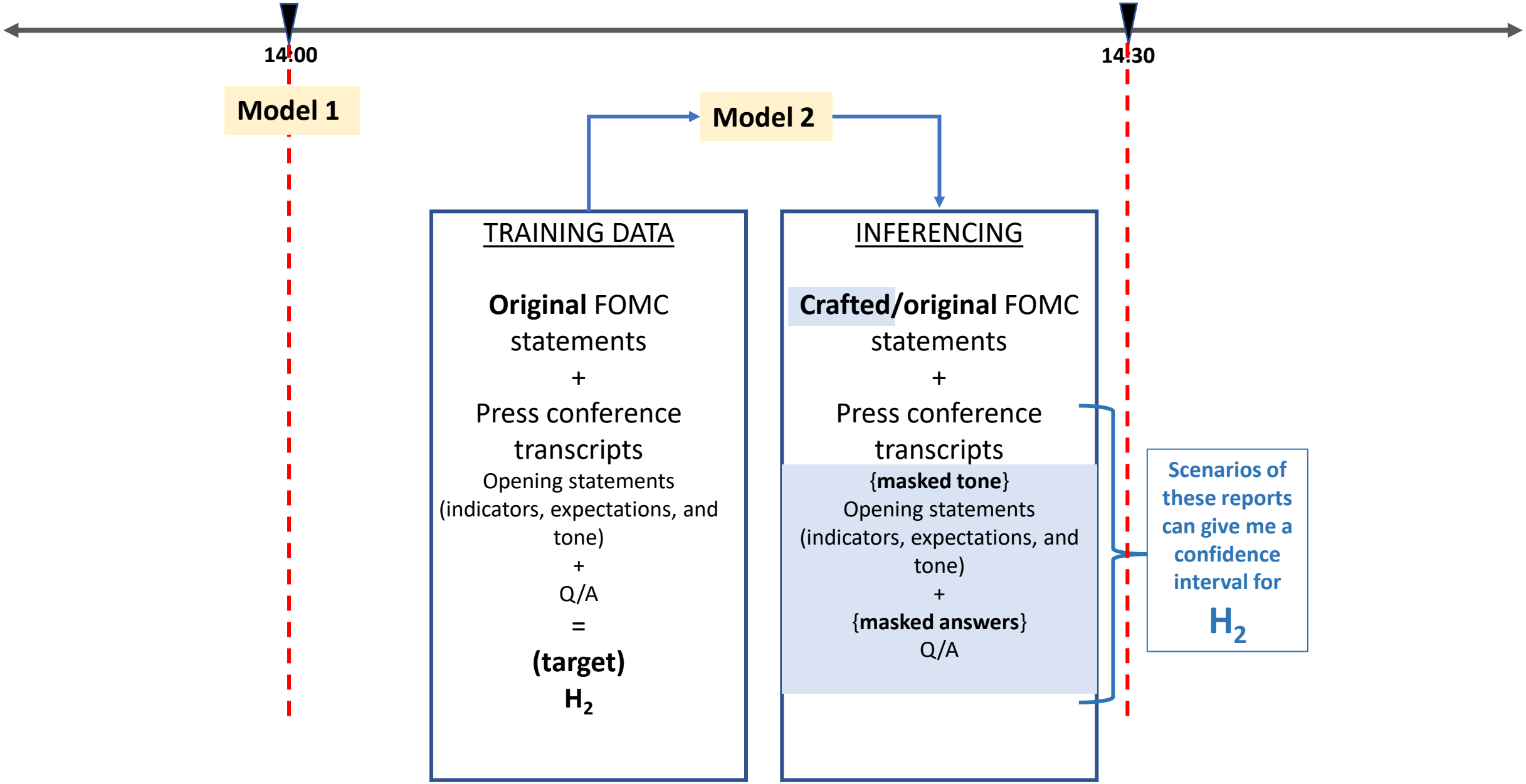
- Question/Answer pattern (~30min):
  - How are you combating {inflation/unemployment/etc.} despite _____ ?
  - Expected co-movements of macro indicators given ____ ?
  - Has your expectation for {indicator} changed since ____ ?

- Since 1994, there are 69 press conferences with 25 questions each at an average. So we have approximately for Powell : 1000 Q/A pairs, Yelen : 400 Q/A pairs and Bernanke: 300 Q/A pairs.

Timeline of model steps:

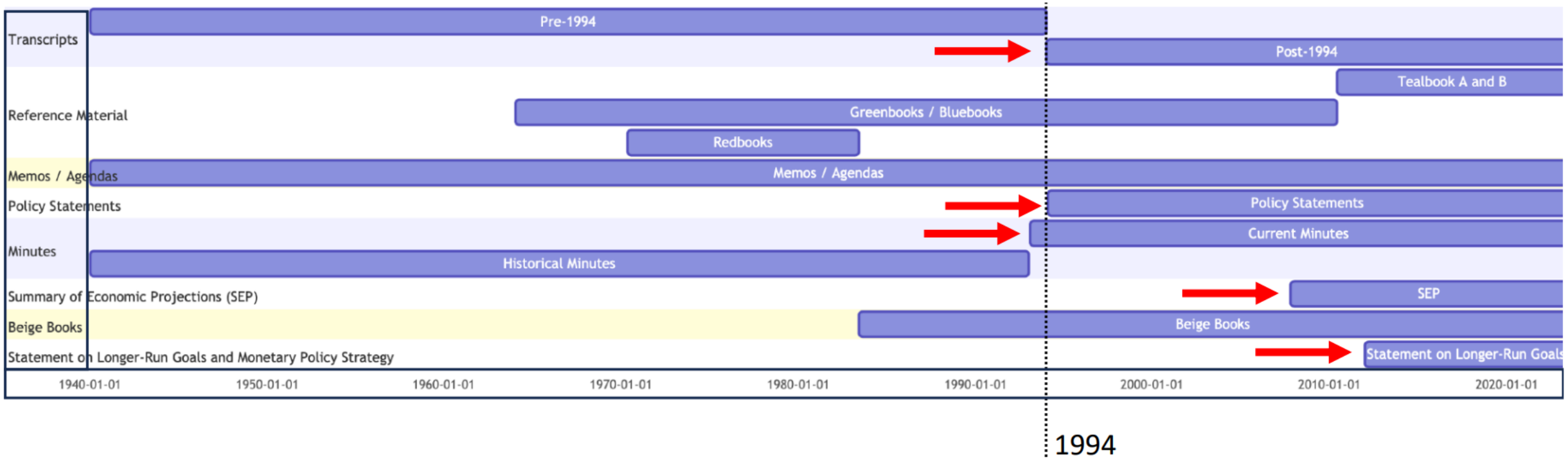



14:00
14:30
Model 1
Model 2
TRAINING DATA
(**original** FOMC statements)
Macro-economic indicators
+
Future expectations (dot plot)
+
Hawkish/Dovish signal (tone)
=
(target)
H_1
INFERENCING
(**crafted/original** FOMC statements)
Realised Macro-economic indicators
+
Future expectations (from public opinion)
+
{masked/realised} Hawkish/Dovish signal (tone)
Scenarios of these reports can give me a confidence interval for
H_1


14:00
14:30
Model 1
Model 2
TRAINING DATA
Original FOMC statements
+
Press conference transcripts
Opening statements (indicators, expectations, and tone)
+
Q/A
=
(target)
H2
INFERENCING
Crafted/original FOMC statements
+
Press conference transcripts
{masked tone}
Opening statements (indicators, expectations, and tone)
+
{masked answers}
Q/A
Scenarios of these reports can give me a confidence interval for
H2

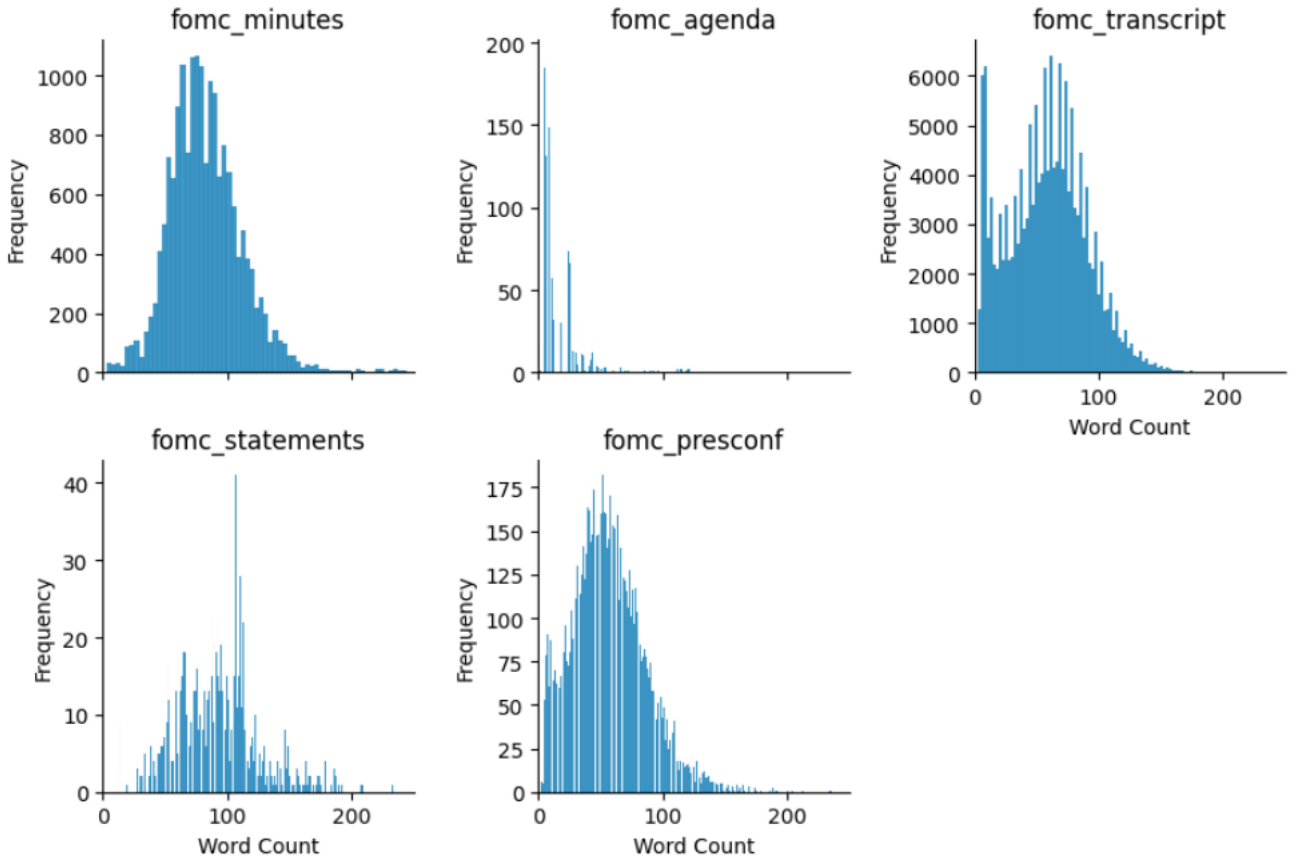
Appendix

Data timeline

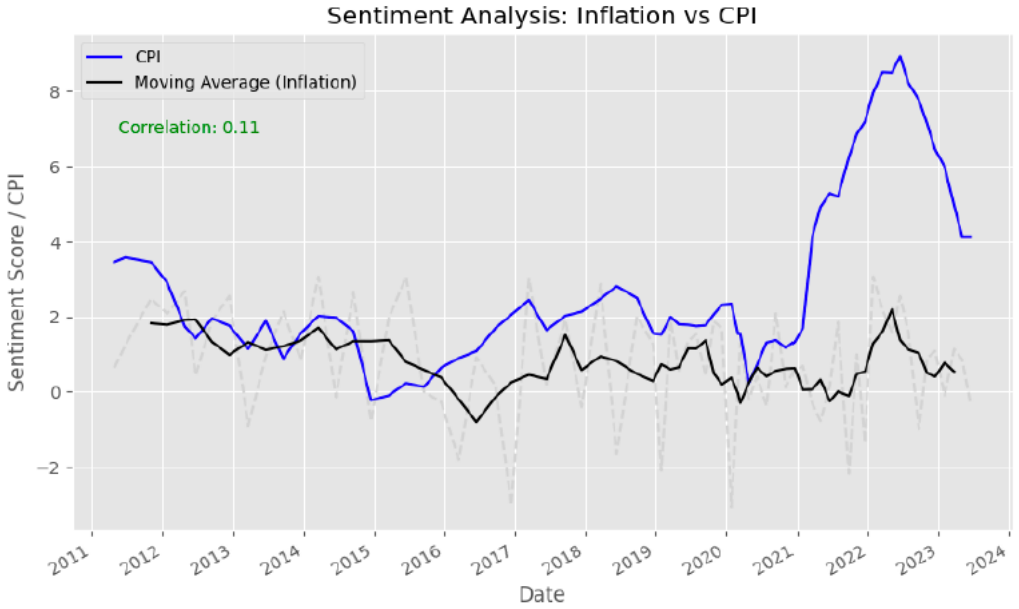


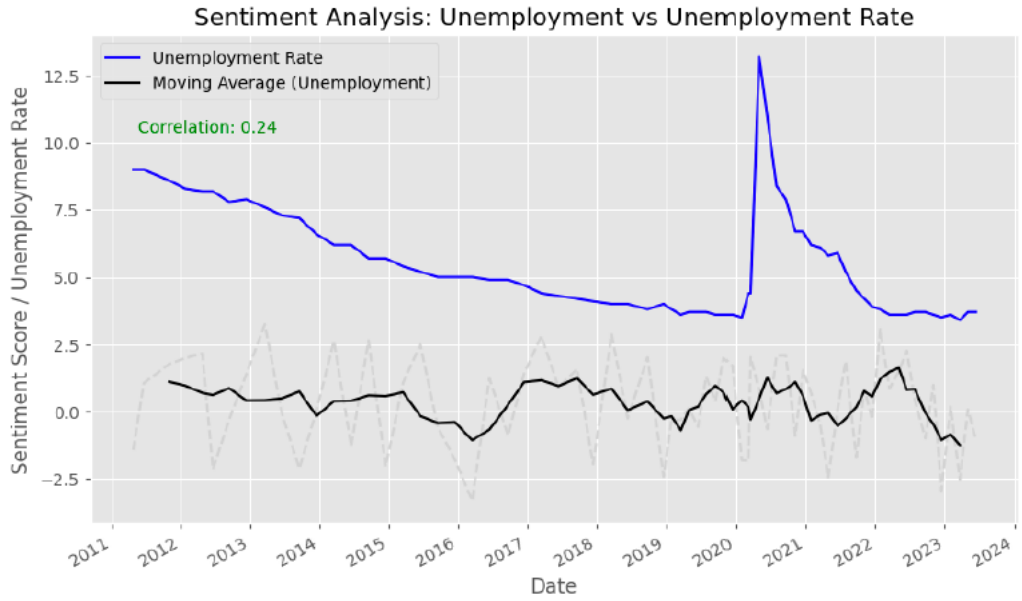
Data downloaded (1994-2023)

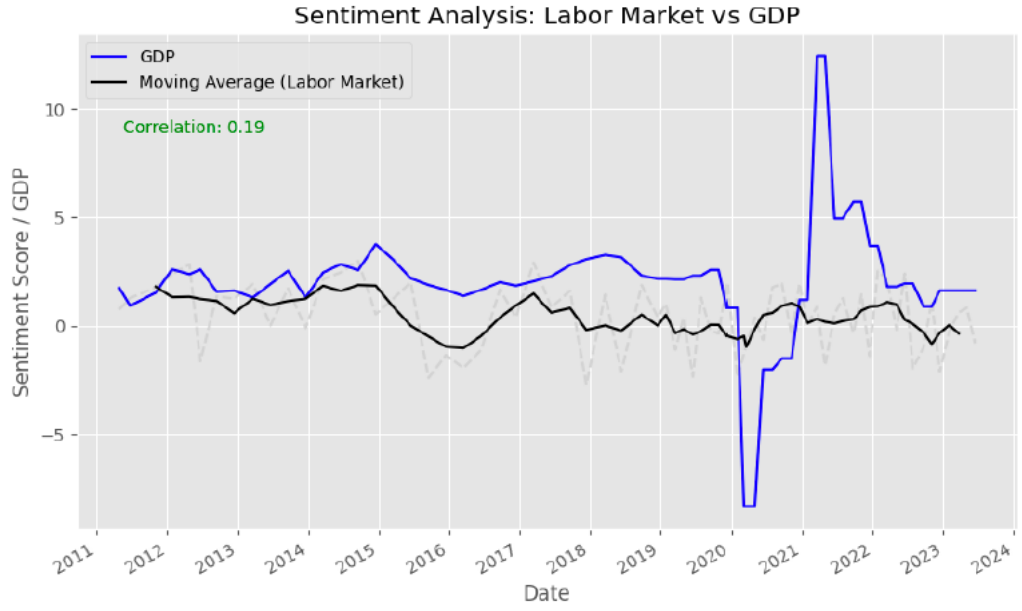
- Agenda – 190 docs
- Transcripts – 190 docs
- Minute – 227 docs
- Statements – 176 docs
- Press Conference – 69 docs



Sentiment analysis – (crudely)







BERTopic modelling

Basic Idea: LLM enacting a Fed chair

Instruct tuned LLM trained on financial data, mainly FOMC material, and fine tuned for these capabilities:

- Economic outlook summarization
- Aspect based sentiment recognition
- Q/A bot – more like talk to your FOMC documents
  - This will be trained using Q/A from press conference for it to learn to think and talk as a fed chairman

- Llama / Alpaca are good options. But we can also leverage Langchains.
- Initial data usage: Limited to only after 1994

Future Extensions:

- Expand to bigger and older corpus (Consider beige books and preparatory material)
- Feedback reinforcement for the fine-tuned model
- Expansion to Global Central banks