

# Do Anecdotes Matter?: Exploring the Beige Book through Textual Analysis from 1970 to 2023

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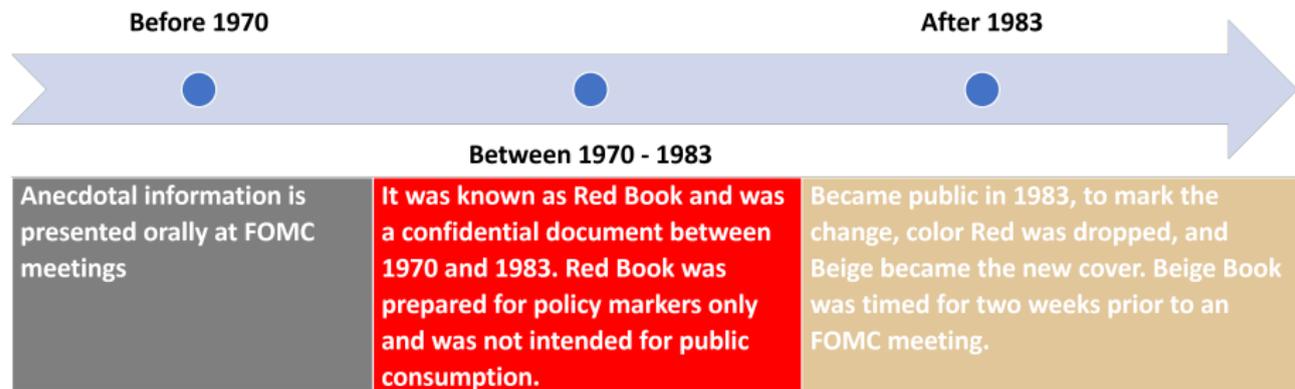
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# Overview

- 1 Motivation
- 2 Literature
- 3 Beige Book Modeling
- 4 Sentiment in Beige Books
- 5 Topics in Beige Books
- 6 Conclusion

## Beige Book History (1970-2022)



**Figure:** Roughly 40 years after it was made public, and nearly 50 years after it began as a document meant to mirror the condition of the economy, for some the Beige Book has become an important part of the FOMC process.

- Discussions in the Beige Book are useful to understand business sentiment in the US economy.
- **Mostly based on entire body of text/words and dictionary approach.**
- Machine learning approaches.
  - *Fettig, Rolnick, and Runkle (1999)*
  - *Balke and Petersen (2002)*
  - *Fulmer and Zhang (2017)*
  - *Gascon and Werner (2022)*
- **We use BERT-based sentiment and topic modeling.**

# Beige Book Cleaning and Modeling

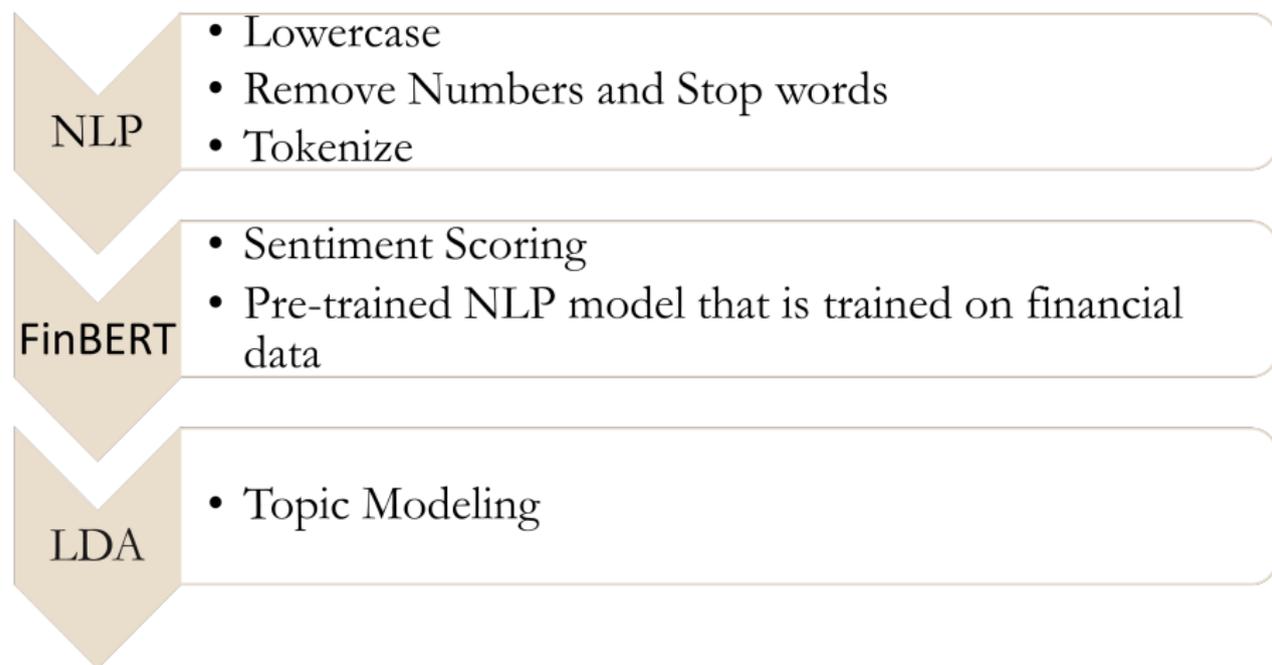
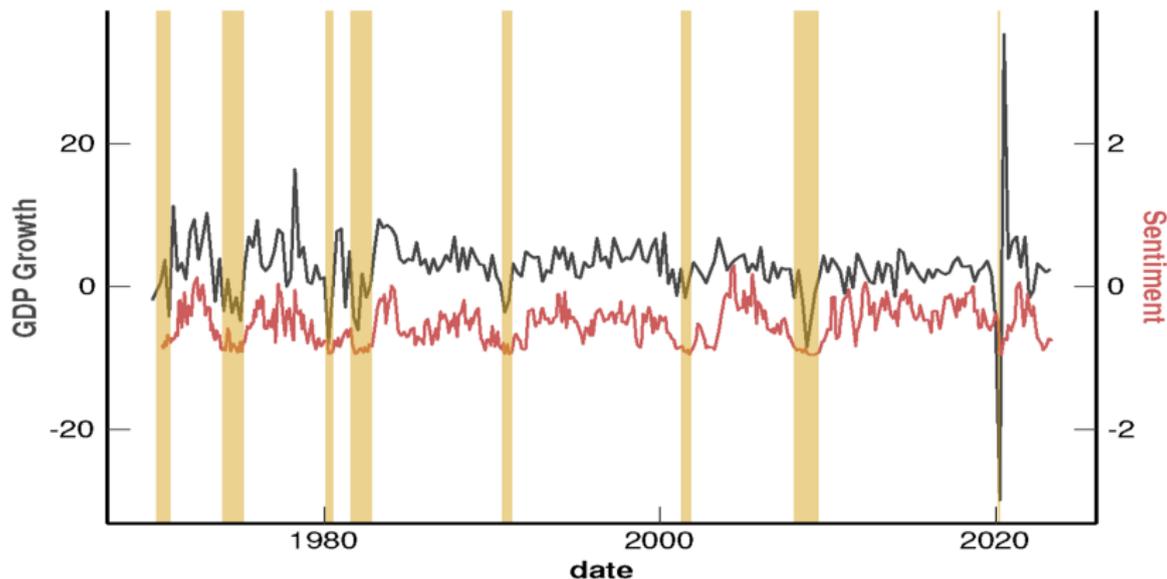


Figure: The Beige Book Model

# Sentiment and GDP Growth Over Time

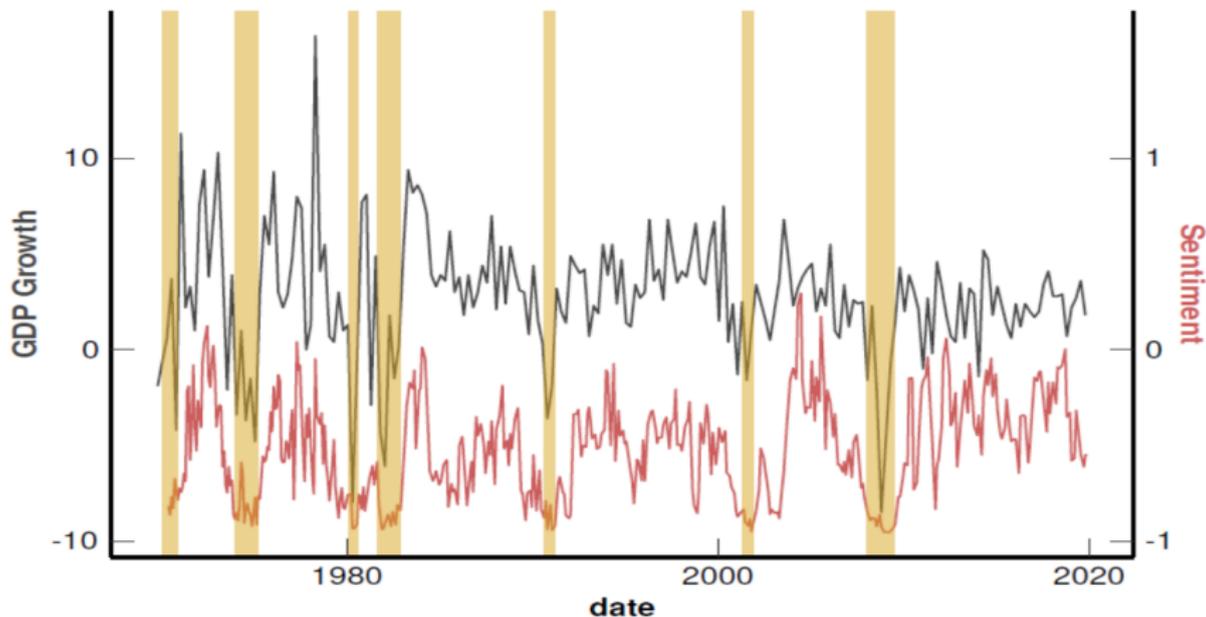
## Sentiment and GDP Growth Over Time



Correlation is 0.34

# Sentiment and GDP Over Time

## Sentiment and GDP Growth Over Time (COVID omitted)



Correlation is 0.44 prior to COVID

# Some Regressions

- Nowcast Real GDP Growth.
  - OLS regression on (lagged) GDP growth, yield spread (2 year – 10 year yield on US Treasuries), Beige Book sentiment, and SF-Fed News sentiment (Shapiro, Sudhof, and Wilson, 2020), separately and together.
- Nowcast Recessions.
  - Logit regression on (lagged) GDP growth, yield spread, Beige Book sentiment, and SF-Fed News sentiment, separately and together.
- Can also forecast.

# Nowcast: BB Sentiment and Real Activity

## Sentiment and GDP Growth Over Time

	Real GDP Growth (seasonally adjusted annual rate)			
	(1)	(2)	(3)	(4)
Lagged Real GDP Growth	0.387*** (0.074)	0.271*** (0.077)	0.289*** (0.074)	0.223*** (0.077)
Yield Spread	-0.206 (0.236)			-0.248 (0.237)
News Sentiment		4.926*** (1.240)		3.070** (1.380)
FinBERT Beige Book (text concatenated)			3.380*** (0.831)	2.778*** (0.927)
Observations	159	159	159	159
R <sup>2</sup>	0.159	0.232	0.236	0.275
Adjusted R <sup>2</sup>	0.148	0.223	0.226	0.256

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Regressions based on 159 observations from 1980:Q2 to 2019:Q4.

# Out-of-Sample RMSE Comparison for Nowcasting

	2020 Q1	2020 Q2	2020 Q3	2020 Q4
Spec. 4 vs Spec. 4 (without BeigeBook)	0.977	<b>0.975</b>	<b>0.958</b>	0.878
	<i>0.159</i>	0.078	0.057	0.112
Spec. 3 vs Spec. 3 (without BeigeBook)	<b>0.943</b>	<b>0.941</b>	<b>0.927</b>	<b>0.768</b>
	<i>0.042</i>	<i>0.038</i>	<i>0.049</i>	0.098
Spec. 4 vs Spec. 3 (without BeigeBook)	<b>0.902</b>	<b>0.903</b>	<b>0.887</b>	<b>0.636</b>
	<i>0.025</i>	<i>0.032</i>	<i>0.050</i>	0.099
Observations	14	13	12	11

## Sentiment and GDP Over Time

	Recession			
	(1)	(2)	(3)	(4)
Lagged Real GDP Growth	-0.685*** (0.145)	-0.489*** (0.168)	-0.491*** (0.187)	-0.552** (0.273)
Yield Spread	0.188 (0.343)			-0.039 (0.540)
News Sentiment		-11.877*** (3.403)		-11.669** (5.221)
FinBERT Beige Book (text concatenated)			-28.823*** (9.531)	-29.295** (11.625)
Observations	159	159	159	159
Akaike Inf. Crit.	75.614	53.509	37.704	33.762

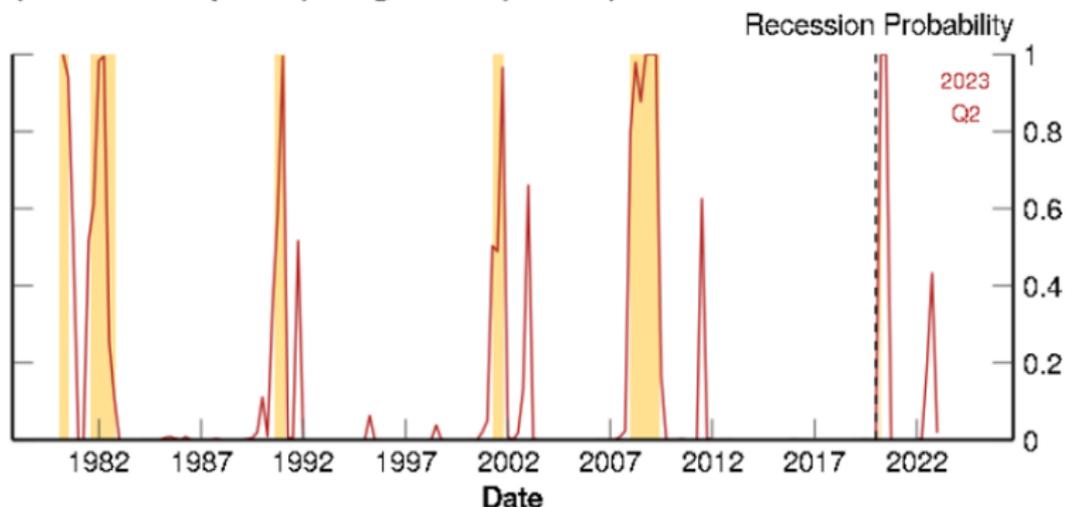
Note:

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Regressions based on 159 observations from 1980:Q2 to 2019:Q4.

# Out-of-Sample Comparison Recession

## Recession: Actual vs Forecast (with Yield Spread, Beige Book, News)



Dashed line marks when our model's out-of-sample forecasts begin, highlighted periods are NBER recessions.

# Forecast: BB Sentiment and Real Recessions

## Sentiment and GDP Over Time

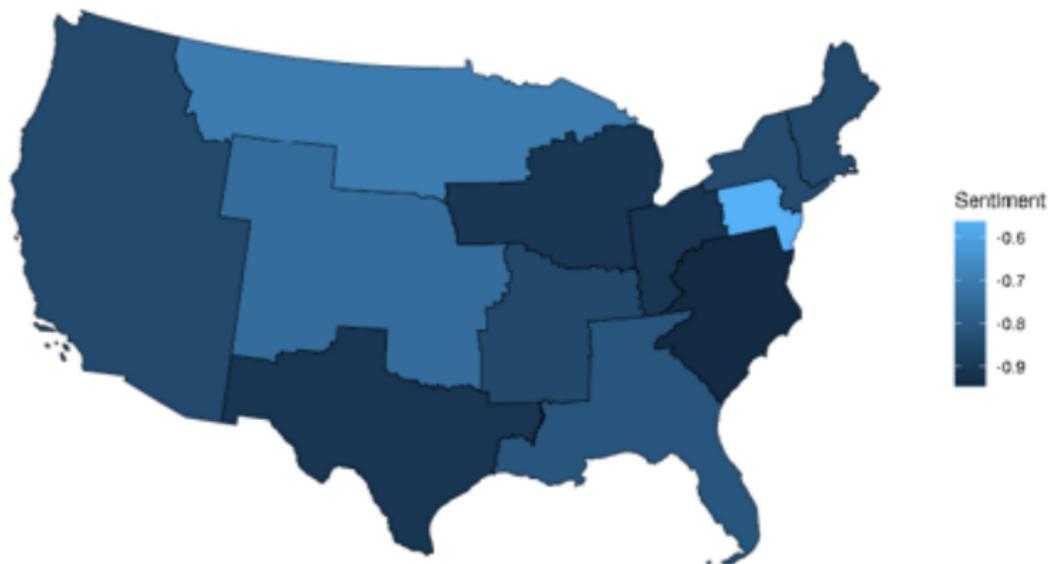
	Recession			
	(1)	(2)	(3)	(4)
(Twice) Lagged Real GDP Growth	-0.367*** (0.095)	-0.144 (0.104)	-0.083 (0.109)	0.104 (0.143)
Lagged Yield Spread	-0.414 (0.286)			-1.151** (0.526)
Lagged News Sentiment		-10.071*** (2.623)		-9.159** (3.752)
Lagged FinBERT Beige Book Sentiment (text concatenated)			-17.326*** (4.777)	-21.073*** (7.990)
Observations	159	159	159	159
Akaike Inf. Crit.	97.696	75.748	60.906	51.764

Note:

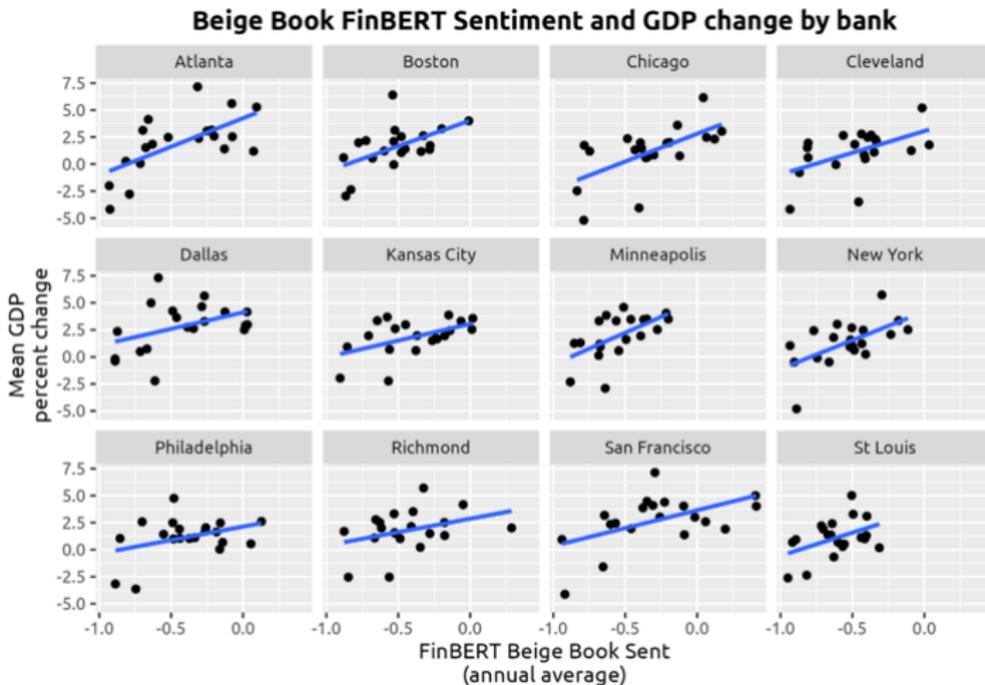
\*p<0.1; \*\*p<0.05; \*\*\*p<0.01  
Regressions based on 159 observations from 1980:Q2 to 2019:Q4.

# Regional Differences in Beige Book Sentiment

Beige Book Sentiment In May 2023



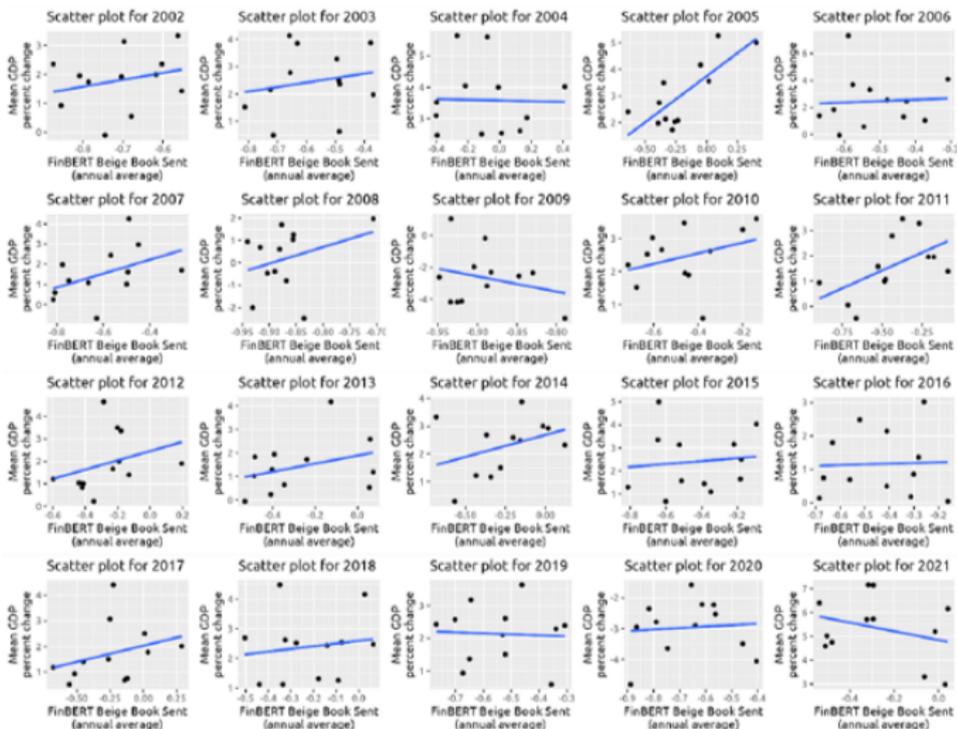
# Regional Differences in Sentiment, by District



Data from 2001 to 2021.

# Regional Differences in Sentiment, by Year

## Beige Book FinBERT Sentiment and GDP change by year



# Regional Differences in Sentiment

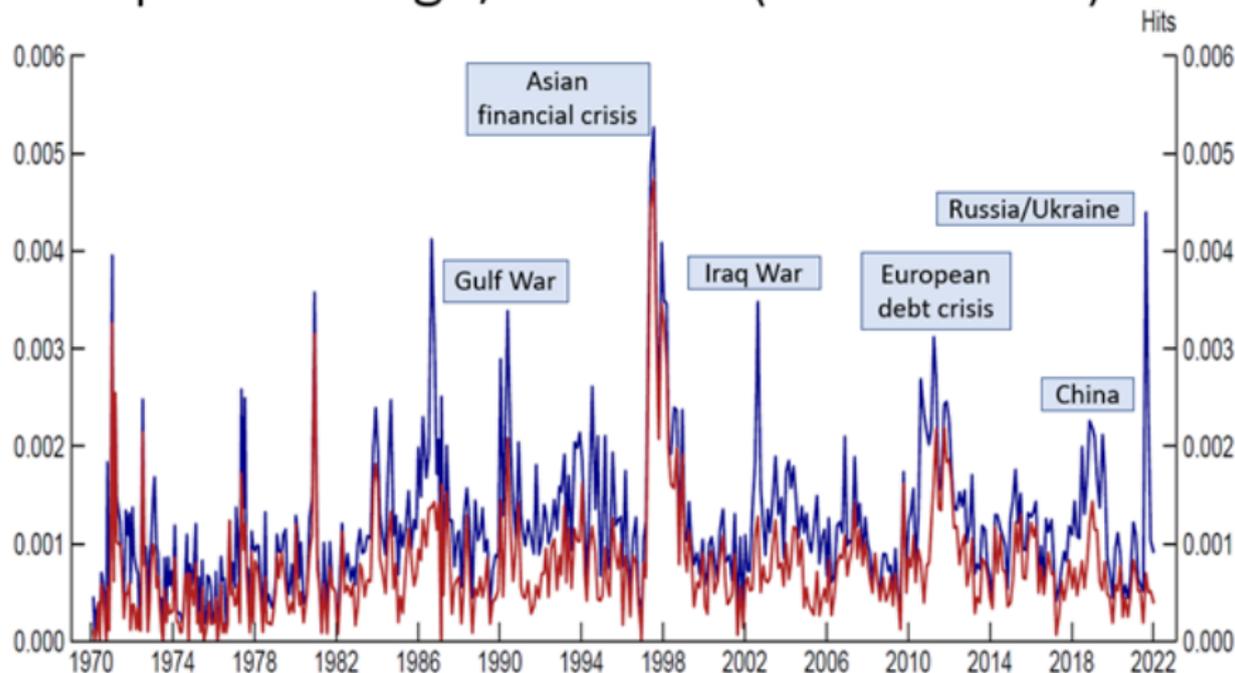
	Real GDP Growth (percent change)	
	(1)	(2)
FinBERT Sentiment (District level)	3.611*** (0.622)	1.490** (0.638)
FinBERT Sentiment (combined excl. District)		3.852*** (0.761)
Constant	3.296*** (0.529)	4.906*** (0.460)
District FE	Yes	Yes
Year FE	Yes	Yes
Observations	240	240
R <sup>2</sup>	0.482	0.384
Adjusted R <sup>2</sup>	0.408	0.349
Residual Std. Error	1.668 (df = 209)	1.749 (df = 226)
F Statistic	6.483*** (df = 30; 209)	10.852*** (df = 13; 226)

Note:

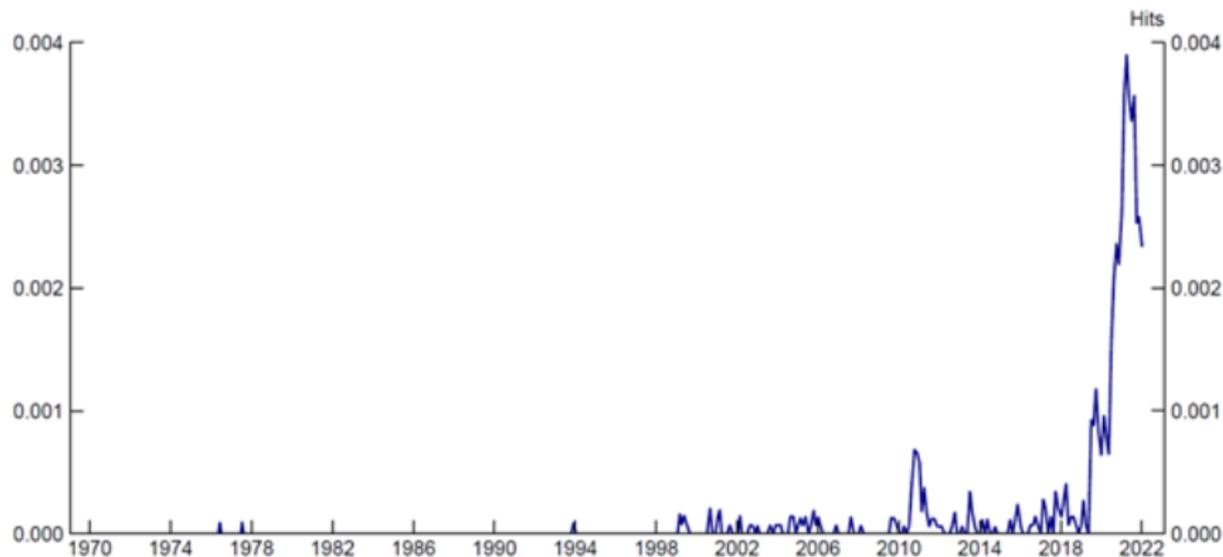
\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Regressions based on 240 from 2002 to 2021. Method: Concatenated text average.

## Topics: Foreign/Int'l Hits (Normalized)



## Topics: Supply Chain Hits (Normalized)



- LDA: ML algorithm that identifies main topics in a group of documents
  - Views each document as a distribution of topics and each topic as as a distribution of words
  - Number of topics chosen via coherence scores
- LDAvis: Visualization tool for LDA output
  - Displays topics and associated words (or words and associated topics) by prevalence

# Beige Book LDA Results

Recessionary Period	Topics (Negative Sentiment)	Topics (Positive Sentiment)
1972-1974	<ul style="list-style-type: none"><li>• Savings, credit, and loans (1)</li><li>• Raw materials and prices (2, 5)</li><li>• Construction (4, 7)</li><li>• <b>Fuel and energy prices (8)</b></li></ul>	<ul style="list-style-type: none"><li>• Agriculture and food prices (1, 7, 8)</li><li>• Consumer and business confidence (2)</li><li>• Supply chain (3)</li><li>• Employment and labor market (4, 6)</li><li>• Construction and loans (5)</li></ul>
2007-2008	<ul style="list-style-type: none"><li>• Commercial real estate and construction (1, 5)</li><li>• Wages, prices, and costs (2)</li><li>• <b>Real estate, loans, and credit quality (3)</b></li><li>• Business activity and employment (4)</li><li>• Cars, inventories, and sales (6)</li></ul>	<ul style="list-style-type: none"><li>• Prices and raw materials (1, 2)</li><li>• Real estate and construction (3, 5, 6)</li><li>• Business activity and employment (4)</li></ul>
2022	<ul style="list-style-type: none"><li>• Real estate (1)</li><li>• <b>Higher prices (2, 4)</b></li><li>• Cars and loans (3)</li><li>• Wages and labor (5)</li><li>• Mortgages and credit quality (6)</li><li>• <b>Supply chain (7, 8)</b></li></ul>	<ul style="list-style-type: none"><li>• Real estate (1)</li><li>• <b>Travel and consumer activity (4)</b></li></ul>

# Conclusion

- Anecdotes seem to matter
- Sentiment in Beige Books sheds light on macro activity, both in the time series and in the cross-section
- Topics are relatively easy to extract; large language models (LLMs) can help with more nuanced topical analysis going forward

# Thank You!