

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

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The views expressed herein are those of the authors' and do not necessarily reflect the opinions of the Board of Governors of the Federal Reserve System or anyone else in the Federal Reserve System.

Overview

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

Motivation - History of Beige Book

Beige Book History (1970-2022)

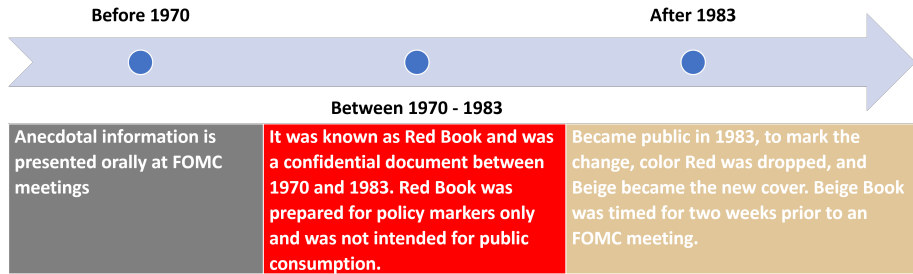


Figure: Roughly 40 years after it was made public, and nearly 50 years after it began as a document meant to mirror the condition of the economy, for some the Beige Book has become an important part of the FOMC process.

- 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

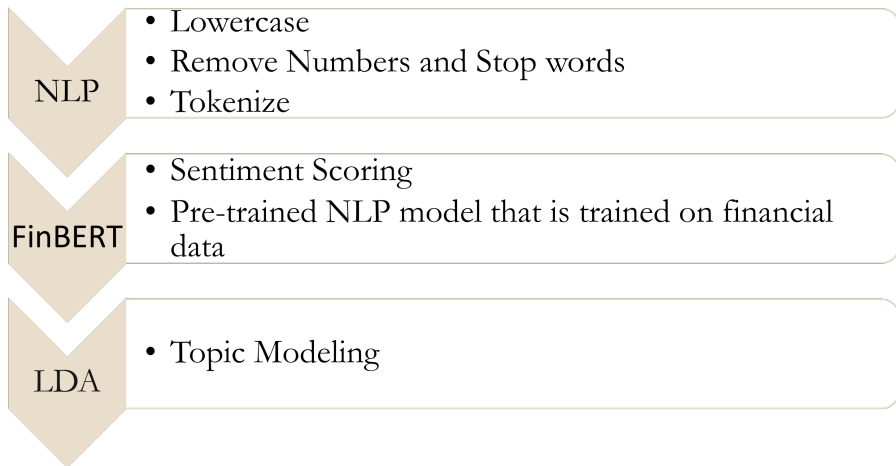
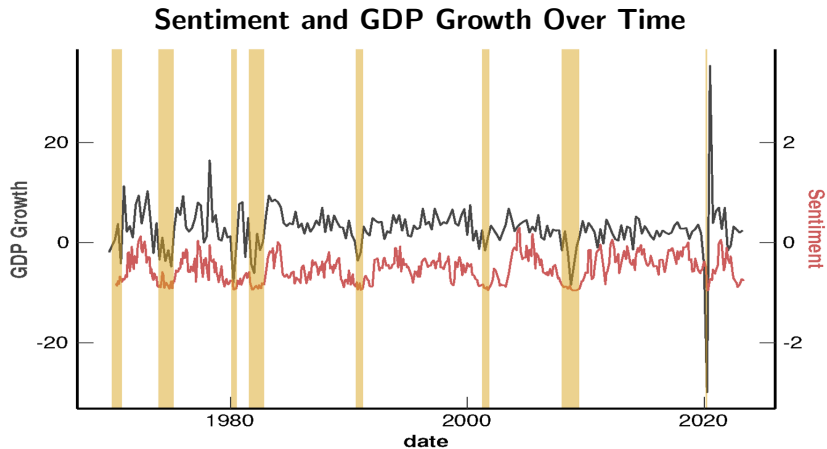


Figure: The Beige Book Model

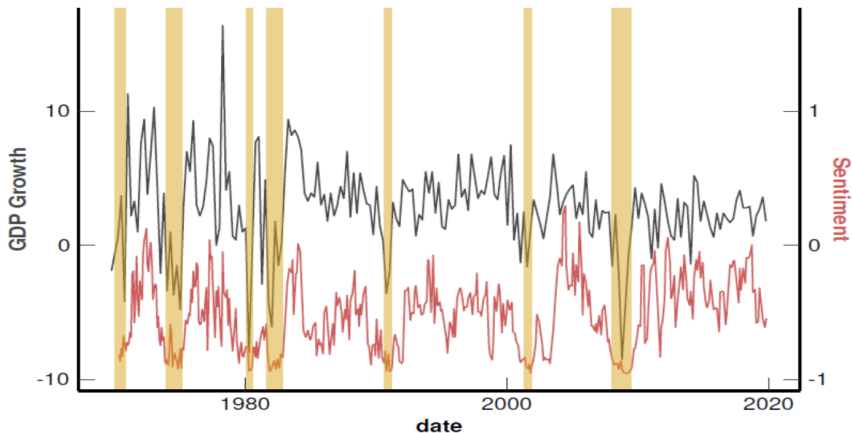
Sentiment and GDP Growth Over Time



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 ² | 0.159 | 0.232 | 0.236 | 0.275 |
| Adjusted R ² | 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 <i>0.159</i> | 0.975 0.078 | 0.958 0.057 | 0.878 0.112 |
| Spec. 3 vs Spec. 3 (without BeigeBook) | 0.943 <i>0.042</i> | 0.941 <i>0.038</i> | 0.927 <i>0.049</i> | 0.768 0.098 |
| Spec. 4 vs Spec. 3 (without BeigeBook) | 0.902 <i>0.025</i> | 0.903 <i>0.032</i> | 0.887 <i>0.050</i> | 0.636 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 |

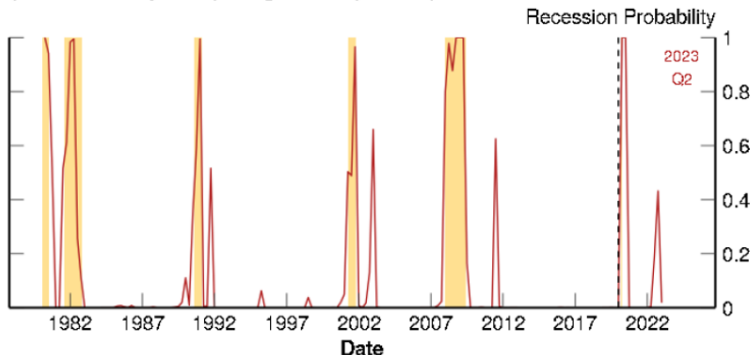
Note:

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

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

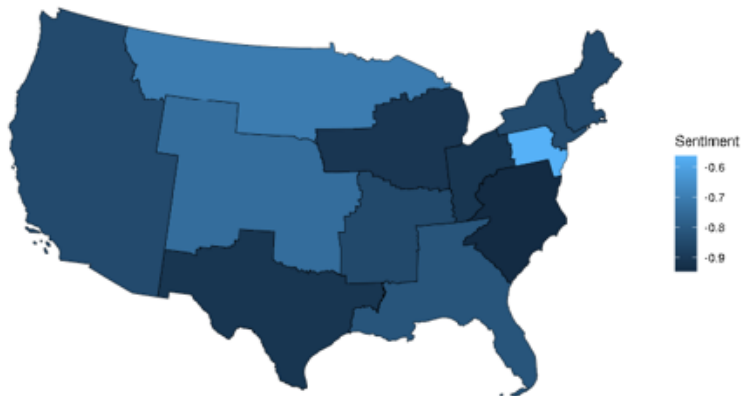
| | Recession | | | |
|--|----------------------|-----------------------|-----------------------|-----------------------|
| | (1) | (2) | (3) | (4) |
| (Twice) Lagged Real GDP Growth | -0.367*** (0.095) | -0.144 (0.104) | -0.083 (0.109) | 0.104 (0.143) |
| Lagged Yield Spread | -0.414 (0.286) | | | -1.151** (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:

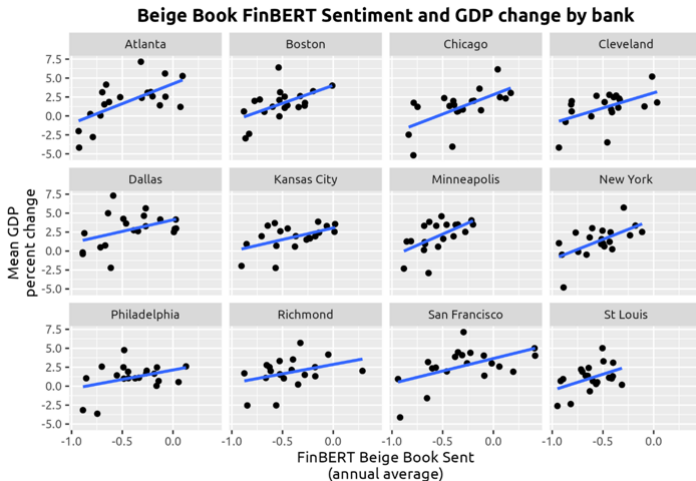
*p<0.1; **p<0.05; ***p<0.01
Regressions based on 159 observations from 1980:Q2 to 2019:Q4.

Regional Differences in Beige Book Sentiment

Beige Book Sentiment in May 2023



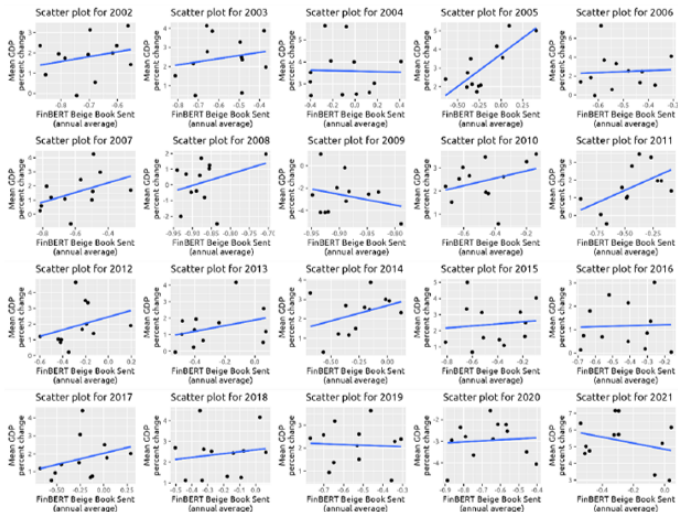
Regional Differences in Sentiment, by District



Data from 2001 to 2021.

Regional Differences in Sentiment, by Year

Beige Book FinBERT Sentiment and GDP change by year



Regional Differences in Sentiment

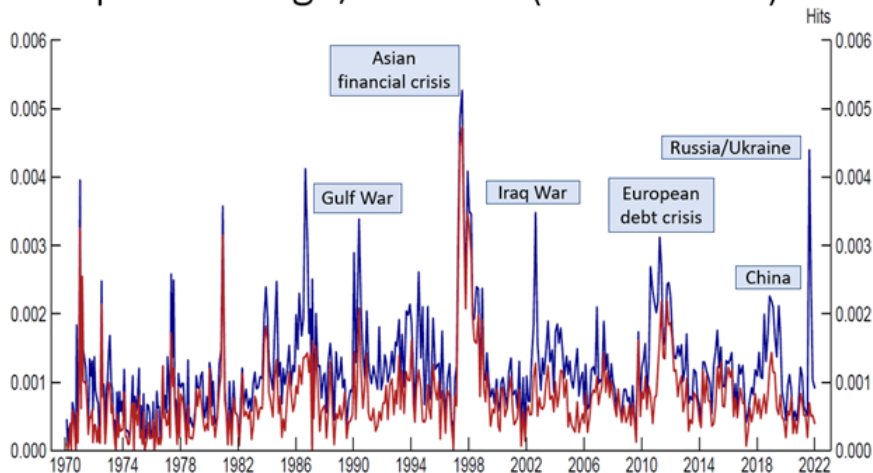
| | Real GDP Growth (percent change) | |
|--|----------------------------------|--------------------------|
| | (1) | (2) |
| FinBERT Sentiment (District level) | 3.611*** (0.622) | 1.490** (0.638) |
| FinBERT Sentiment (combined excl. District) | | 3.852*** (0.761) |
| Constant | 3.296*** (0.529) | 4.906*** (0.460) |
| District FE | Yes | Yes |
| Year FE | Yes | Yes |
| Observations | 240 | 240 |
| R ² | 0.482 | 0.384 |
| Adjusted R ² | 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:

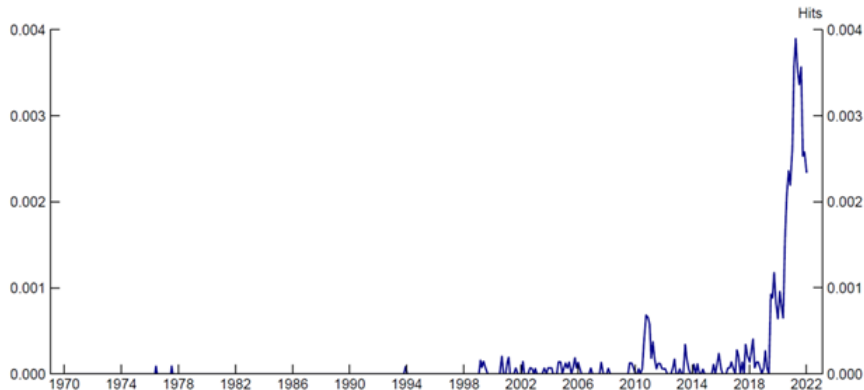
*p<0.1; **p<0.05; ***p<0.01

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

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!