

Spread the Word: International Spillovers from Central Bank Communication

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Research Question

**Does Central Bank Communication
Generate International Spillovers?**

Introduction

- ▶ **Conventional monetary policy generates international spillovers.**

- ▶ Ehrmann & Fratzscher (2007), Dedola et al. (2017), Rey (2015), and Miranda-Agrippino & Rey (2015).

- ▶ **Unconventional policy generated international spillovers during and after the Great Recession.**

- ▶ Berge & Cao (2014), Chen et al. (2014), Neely (2014), Eichengreen & Gupta (2015), Fratzscher et al. (2016), and Dedola et al. (2017).

Introduction

- ▶ **Increase in degree and scope of central bank communication since 1990s.**
 - ▶ Woodford (2005), and Blinder et al. (2008).
- ▶ **Central bank communication predicts policy rate changes and affects domestic macrovariables.**
 - ▶ Bernanke and Sack (2004), Gurkaynak et al. (2005), Apel and Grimaldi (2014), Hansen and McMahon (2015), and Carvalho et al. (2016).
- ▶ **Central bank communication predicts exchange rate movements.**
 - ▶ Fratzscher (2006), Fratzscher (2008), and Burkhard (2010).

Results Preview

- ▶ Comovement in central bank communication sentiment is not reducible to trade or financial flow exposure.
- ▶ Sentiment shocks generate cross-country spillovers in sentiment, policy rates, and macroeconomic variables.
- ▶ The Fed plays a uniquely influential role in generating sentiment spillovers.
- ▶ Geographic distance is an economically significant determinant of central bank sentiment comovement.

Overview

- ▶ **Compile dataset of central bank speeches for 23 countries.**
 - ▶ Scraped from BIS archive.
- ▶ **Collect meta data from site and documents.**
 - ▶ Institution name, speaker, speaker title, speech title, and date.
- ▶ **Process text to compute sentiment scores.**
 - ▶ Positive, negative, and net.

Sentiment Measurement

- ▶ **All documents converted to text format and cleaned.**
 - ▶ Special characters and punctuation removed.
 - ▶ Stopwords removed.
 - ▶ No stemming or lemmatization.
- ▶ **Measure sentiment using Loughran-McDonald (2011).**
 - ▶ Dictionary-based method for 10-K financial statements.
 - ▶ Captures “negativity” or “positivity” in text based on frequency of word use.

Speech: “Navigating cautiously,” Lael Brainard, Fed Board, 2019-03-07

suggest increase downside risks warrants modest downward revision modal path policy downside risks realized could weigh economic activity heightened downside risks output employment would argue softer federal funds rate path even modal outlook economy unchanged see board governors see instance bernanke bernanke kiley roberts limited amount conventional policy space reinforces importance guarding materialization downside risks time modal outlook appears softened bit risks appear weighted downside upside best way safeguard gains made jobs inflation navigate cautiously rates risk management environment low long run neutral rate attenuated relationship resource utilization overall inflation supports approach watchful waiting allow us gather information domestic momentum foreign growth well policy risks weighing sentiment balance sheet normalization let turn second tool used federal reserve recent years asset purchases recall

Sentiment Measurement

$$P = \frac{\text{\# of Positive Words}}{\text{\# of Total Words}} \quad (1)$$

$$N = \frac{\text{\# of Negative Words}}{\text{\# of Total Words}} \quad (2)$$

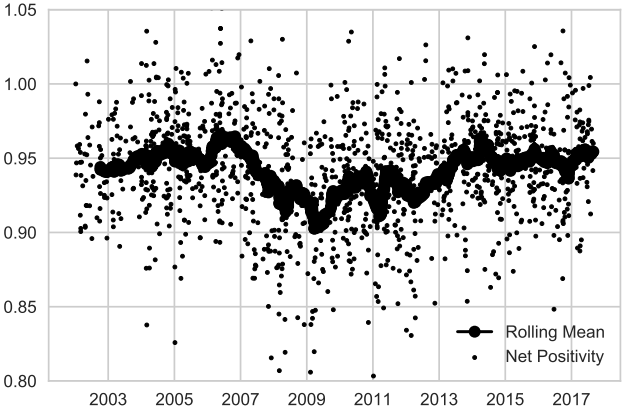
$$NET = P - N \quad (3)$$

Sentiment Measurement

- ▶ **Average over documents to compute a quarterly measure.**
 - ▶ Focus on low frequency component of sentiment.
 - ▶ Include more countries.

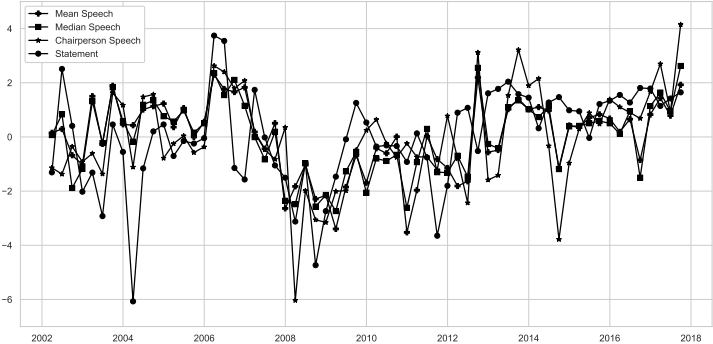
Data

Figure: Net Sentiment Scores for Federal Reserve Speeches



► ECB result

Figure: Alternative measurements of sentiment scores



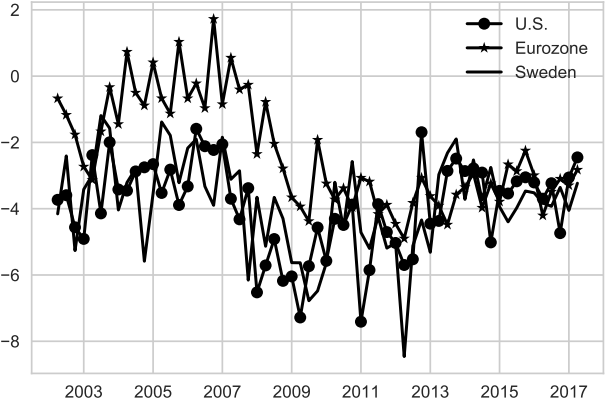
► Word Clouds

Table: Cross-Country Correlations: Sentiment and Output

	Eurozone	U.S.	Japan	U.K.	Sweden
<i>Real GDP Growth</i>					
Eurozone	1.00	0.61	0.63	0.79	0.72
U.S.	-	1.00	0.43	0.62	0.61
Japan	-	-	1.00	0.53	0.51
U.K.	-	-	-	1.00	0.58
Sweden	-	-	-	-	1.00
<i>Central Bank Speech Sentiment</i>					
Eurozone	1.00	0.38	0.37	0.38	0.34
U.S.	-	1.00	0.49	0.47	0.54
Japan	-	-	1.00	0.21	0.45
U.K.	-	-	-	1.00	0.37
Sweden	-	-	-	-	1.00

Data

Figure: Net Sentiment Scores for the U.S., Eurozone, and Sweden



Directed Networks

- ▶ **Constructed directed networks.**
 - ▶ Trade, financial flows, sentiment
- ▶ **Trade and financial flows are bilateral.**
 - ▶ No obvious way to identify “direction.”
- ▶ **Sentiment is defined for each central bank.**
 - ▶ Direction identified via Granger causality.

Directed Trade and Financial Flow Networks

- ▶ **Direction of “trade” or “financial flows” is determined by the importance of the relationship.**
 - ▶ Germany \Rightarrow Luxembourg
 - ▶ Luxembourg \nRightarrow Germany
- ▶ **The directed networks should capture this concept of exposure.**
 - ▶ Edges connect countries with at least one top trading or finance partner relationship.
 - ▶ Arrows point to the exposed country.

Directed Trade and Financial Flow Networks

- ▶ **Trade data taken from the WITS database.**
 - ▶ Bilateral trade flows.
 - ▶ Largest importer and exporter partners.

- ▶ **Financial flows data taken from BIS's LBS database.**
 - ▶ Private financial flows.
 - ▶ Largest sources and destinations for funds.

Directed Sentiment Network

- ▶ **Construct networks in style of Billio et al. (2012).**
 1. Perform sentiment VARs for each country pair.
 2. Identify edges using Granger-causality tests.
 3. Use arrows to indicate direction of causality.

Granger Causality Tests

- ▶ Billio et al. (2012):

$$R_{t+1}^i = a^i R_t^i + b^{ij} R_t^j + e_{t+1}^i \quad (4)$$

$$R_{t+1}^j = a^j R_t^j + b^{ji} R_t^i + e_{t+1}^j \quad (5)$$

- ▶ Country j Granger-causes country i when $b^{ji} \neq 0$.

Adjusted Granger Causality Tests

Use Toda and Yamamoto (1995) to deal with potential non-stationarity:

1. Compute $m = \max\{m_i, m_j\}$, where m_j is the order of integration of R_t^j .
2. Recover the maximum lag length, p , for model variables using the Akaike Information Criterion (AIC).
3. Take the specification determined in step 2 and add m lags to each variable.
4. Apply a Wald test for Granger non-causality on the first p coefficients for the foreign entity in each equation.

Adjusted Granger Causality Tests

$$R_{t+1}^i = a_0^i + \sum_{s=0}^{p+m} a_s^i R_{t-1-s}^i + \sum_{s=0}^{p+m} b^{ij} R_{t-1-s}^j + e_{t+1}^i \quad (6)$$

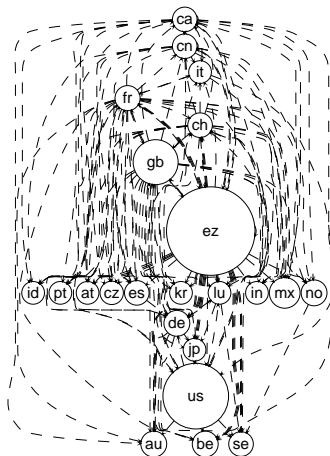
$$R_{t+1}^j = a_0^j + \sum_{s=0}^{p+m} a_s^j R_{t-1-s}^j + \sum_{s=0}^{p+m} b^{ji} R_{t-1-s}^i + e_{t+1}^j \quad (7)$$

Adjusted Granger Causality Tests

1. Each country pair with at least one Granger causal link in either direction is connected by an edge.
2. If the Granger causal connection runs from country j to country i , then the arrow on the edge connecting j and i will point to i .

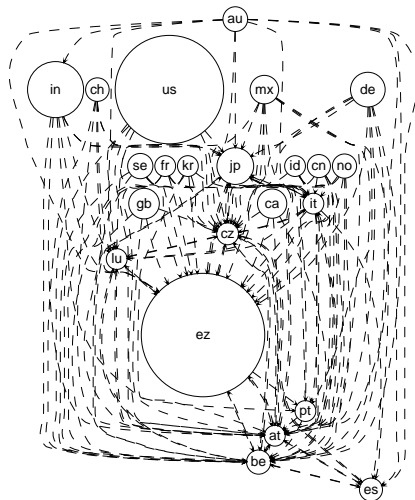
Network Analysis

Figure: Directed Network for Financial Flow Exposures



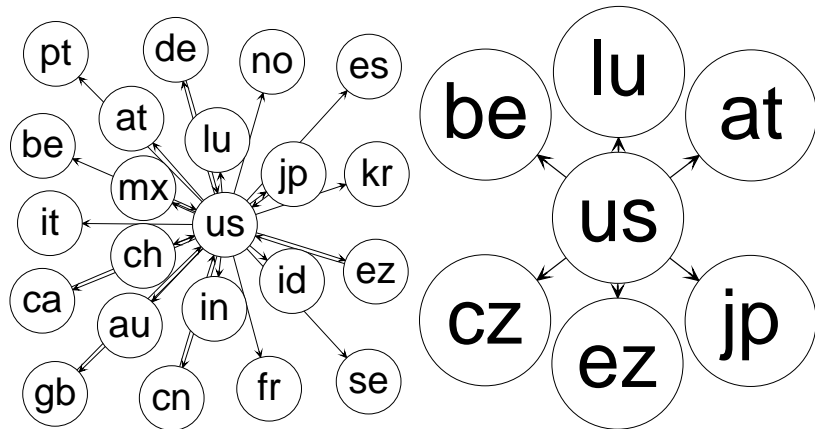
Network Analysis

Figure: Granger Causality Network for Sentiment



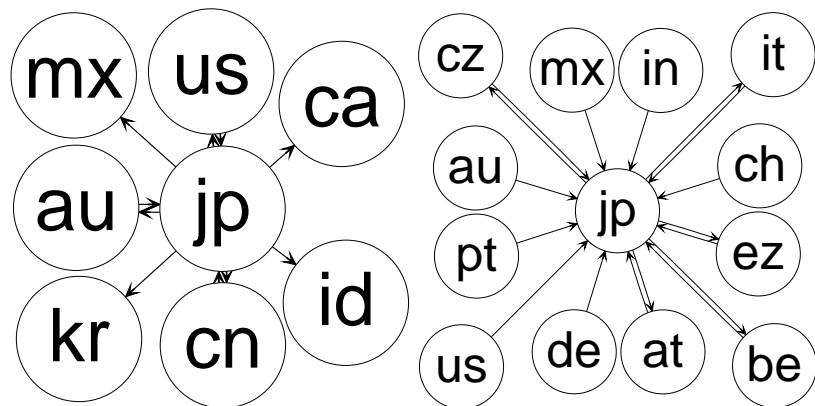
Network Analysis

Figure: Trade and Sentiment Networks: United States



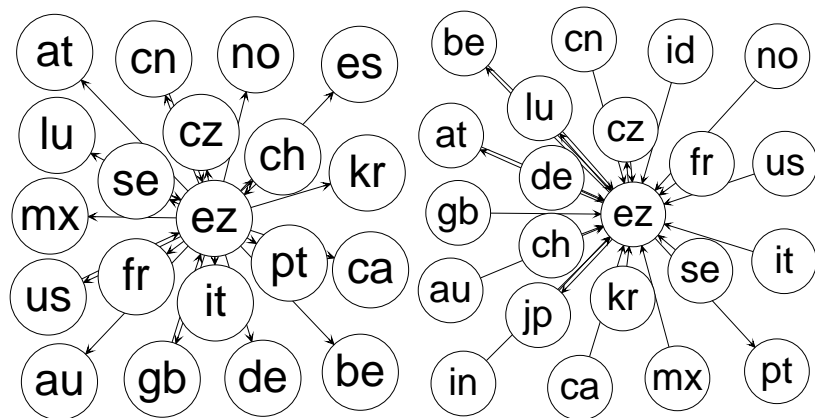
Network Analysis

Figure: Trade and Sentiment Networks: Japan



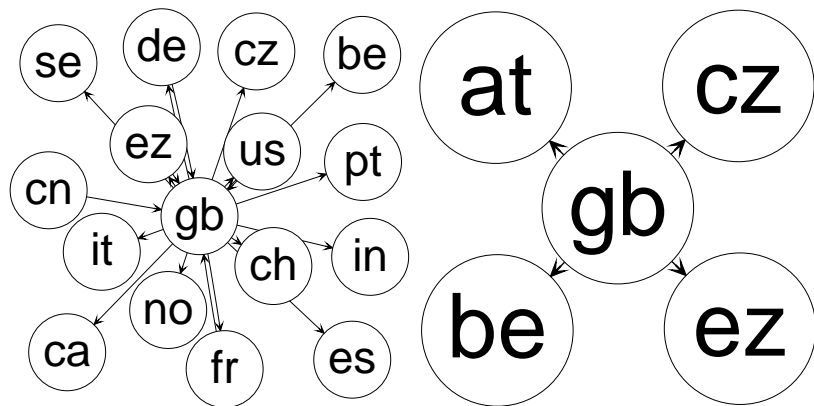
Network Analysis

Figure: Trade and Sentiment Networks: Eurozone



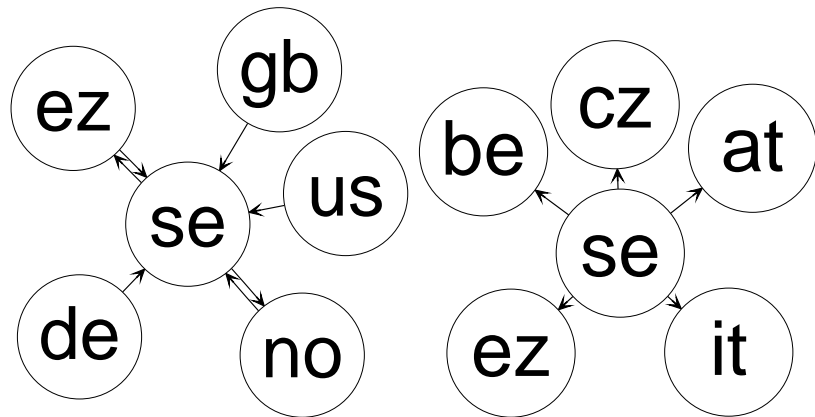
Network Analysis

Figure: Trade and Sentiment: United Kingdom



Network Analysis

Figure: Trade and Sentiment Networks: Sweden



Sign-Restricted VARs

- ▶ **Use sign-restricted VARs (Rubio-Ramirez, 2010).**
 - ▶ Partial identification of sentiment shock IRFs.
 - ▶ Domestic and two-country VARs.
 - ▶ Make assumptions about domestic impact of sentiment.
 - ▶ Make weakest possible assumptions on sign and duration.

Domestic VARs: Sign-Restrictions

- ▶ **Positive structural shock to central bank sentiment.**
 1. Sentiment: ≥ 0
 2. Policy rate: ≥ 0
 3. Unemployment: ≤ 0
 4. Equity price growth: ≥ 0
 5. Real exchange rate: ≥ 0
 6. Imports: ≥ 0

Empirical Results

Table: VAR Summary: Domestic Impact

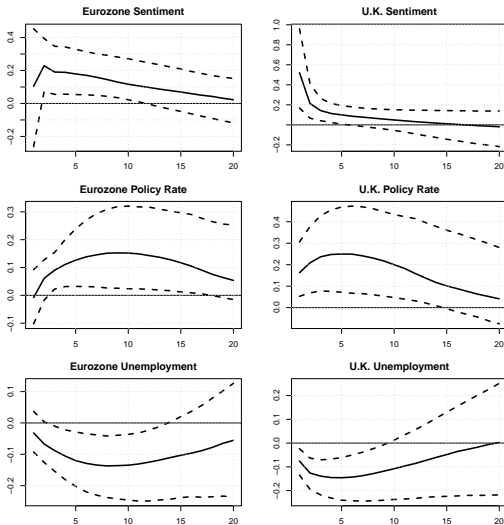
	Sentiment	Policy Rate	Unemployment	Equity Price Growth	Exchange Rate	Imports
Eurozone	+1	+5	-4	+1	+1	+1
U.S.	+1	+4	-4	+1	+1	+1
Japan	+1	+3	-2	+1	+1	+1
U.K.	+1	+4	-4	+1	+1	+1
Sweden	+1	+3	-4	+1	+1	+1

Two-Country VARs: Sign-Restrictions

- ▶ **Positive structural shock to domestic central bank sentiment.**
 1. Domestic sentiment: ≥ 0
 2. Domestic policy rate: ≥ 0
 3. Domestic unemployment: ≤ 0
- ▶ **No restrictions placed on response of foreign variables.**

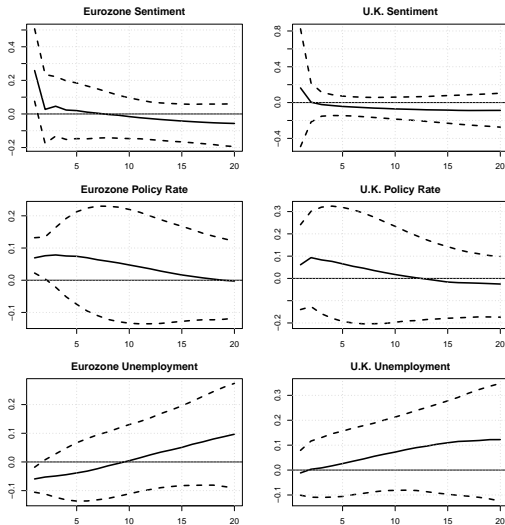
Empirical Results

Figure: Shock to U.K. Sentiment on U.K. and Eurozone



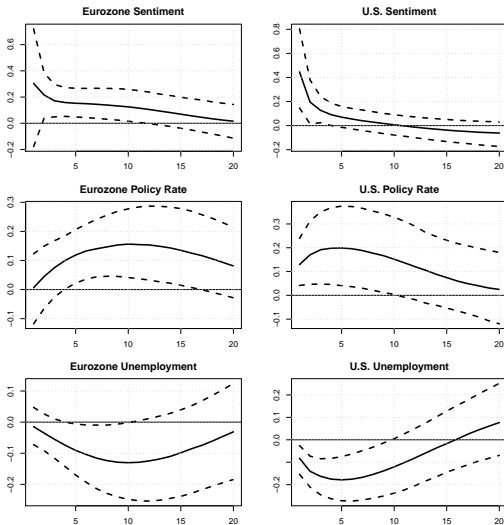
Empirical Results

Figure: Shock to Eurozone Sentiment on Eurozone and U.K.



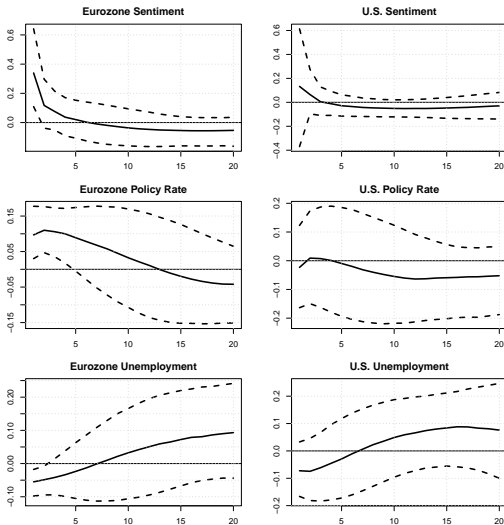
Empirical Results

Figure: Shock to U.S. Sentiment on U.S. and Eurozone



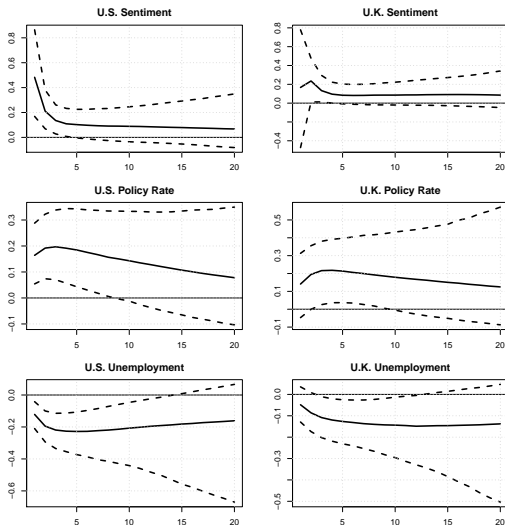
Empirical Results

Figure: Shock to Eurozone Sentiment on Eurozone and U.S.



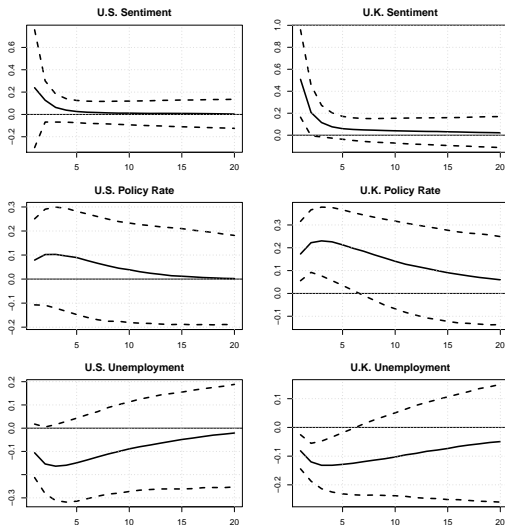
Empirical Results

Figure: Shock to U.S. Sentiment on U.S. and U.K.



Empirical Results

Figure: Shock to U.K. Sentiment on U.K. and U.S.



Empirical Results

Table: VAR Summary: Cross-Country Spillovers

	Sentiment	Policy Rate	Unemployment
<i>Eurozone</i>			
Eurozone → U.S.	-	-	-
Eurozone → U.K.	-	-	-
Eurozone → Japan	-	-	-
Eurozone → Sweden	+1	+5	-4
<i>U.S.</i>			
U.S. → Eurozone	+1	+5	-5
U.S. → Japan	-	-	-
U.S. → U.K.	+2	+3	-6
U.S. → Sweden	+2	+5	-
<i>Japan</i>			
Japan → Eurozone	-	+5	-
Japan → U.S.	-	-	-
Japan → U.K.	-	+2	-
Japan → Sweden	-	+2	-
<i>U.K.</i>			
U.K. → Eurozone	+2	+7	-6
U.K. → U.S.	-	-	-
U.K. → Japan	-	-	-
U.K. → Sweden	-	+2	-

Long-Run Sentiment Comovement

- ▶ Compute cross-country comovement in sentiment over the 2001-2018 period.
- ▶ Estimate determinants of cross-country sentiment comovement.
- ▶ Consider economic and non-economic determinants.

Empirical Results

Long-Run Sentiment Comovement

$$\rho_{i,j} = \beta_0 + \beta_1 D_{i,j} + \beta_2 L_{i,j} + \beta_3 C_{i,j} + \beta_4 X_{i,j} + \gamma_{i,j} + \zeta_{i,j} + e_{i,j} \quad (8)$$

- ▶ $\rho_{i,j}$ = cross-country correlation in central bank sentiment
- ▶ $D_{i,j}$ = distance between central bank pair
- ▶ $L_{i,j}$ = shared language dummy
- ▶ $C_{i,j}$ = dummy for colonial relationship
- ▶ $X_{i,j}$ = vector of controls
- ▶ $\gamma_{i,j}$ = country fixed effect
- ▶ $\zeta_{i,j}$ = shared continent dummy

Empirical Results

Table: Impact of Distance, Shared Language, and Colonial-Ties on Central Bank Sentiment Correlation

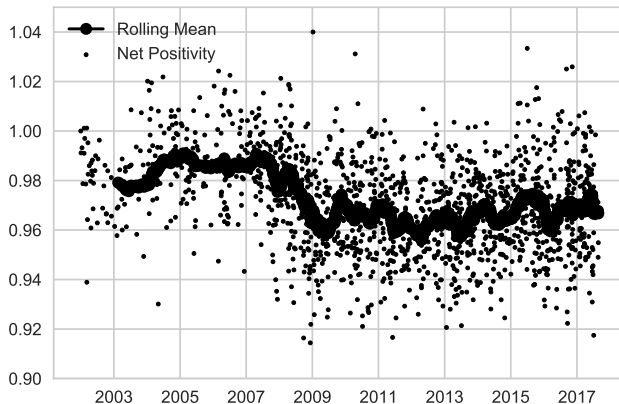
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(OLS)	(OLS)	(OLS)	(OLS)	(OLS)	(OLS)	(OLS)	(OLS)
Distance	-0.0115*** (0.0026)	-0.0112*** (0.0026)	-0.0086*** (0.0028)	-0.0064** (0.0030)	-0.0082*** (0.0030)	-0.0084*** (0.0032)	-0.0131*** (0.0032)	-0.0150*** (0.0048)
Language		0.0730** (0.0332)	0.0592* (0.0325)	0.0124 (0.0352)	0.0333 (0.0378)	0.0342 (0.0375)	-0.0180 (0.0358)	-0.0178 (0.0361)
Colonial Ties		0.0896* (0.0537)	0.0988** (0.0500)	0.1335** (0.0608)	0.1306** (0.0617)	0.1295** (0.0614)	0.0490 (0.0586)	0.0475 (0.0609)
Real GDP Correlation			0.1916*** (0.0615)	0.1464** (0.0589)	0.1464** (0.0582)	0.1447** (0.0572)	-0.0140 (0.0838)	-0.0230 (0.0839)
Inflation Correlation				0.2098*** (0.0632)	0.2196*** (0.0650)	0.2182*** (0.0641)	0.0943 (0.0648)	0.0999 (0.0644)
Trade Flows					-0.0029 (0.0022)	-0.0030 (0.0023)	0.0006 (0.0014)	0.0009 (0.0014)
Private Financial Flows					-0.0416 (0.0299)	-0.0427 (0.0306)	-0.0033 (0.0263)	-0.0017 (0.0264)
Log(Speeches)						0.0042 (0.0178)	-0.0087 (0.0251)	-0.0119 (0.0251)
Country FE	NO	NO	NO	NO	NO	NO	YES	YES
Shared Continent FE	NO	NO	NO	NO	NO	NO	NO	YES
Adj. R-squared	0.058	0.072	0.112	0.152	0.166	0.163	0.567	0.566
N	231	231	231	231	231	231	231	231

Conclusion

1. Comovement in central bank sentiment is not reducible to comovement in trade, financial flows, or output.
2. Large central banks are not necessarily the most influential.
3. Sentiment shocks generate spillovers to sentiment, interest rates, and macrovariables.
4. Geographic distance, shared language, and colonial ties important determinants of sentiment comovement.

Appendix: ECB sentiment

Figure: Net Sentiment Scores for European Central Bank Speeches



▶ [jump back](#)

Appendix: US-EU-UK comparison

Figure: Net Sentiment Scores for U.S., Eurozone, and U.K.

