

Policymakers' Uncertainty

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Outline

1. Introduction

2. Data and Measurement

3. Balance of Risks and Policy Outcomes

4. Balance of Risks, Shocks, and Insurance

Monetary Policy and Uncertainty

Policymakers have long viewed uncertainty as central to decision-making

*“Uncertainty is not just an important feature of the **monetary policy** landscape; it is the defining characteristic of that landscape. . . As a consequence, the conduct of **monetary policy** in the United States has come to involve, at its core, crucial elements of **risk management**.”* (Greenspan 2004)

*“The **Governing Council** bases its monetary policy decisions, including the evaluation of the proportionality of its decisions and potential side effects, on an integrated assessment of all relevant factors. In particular, it **takes into account** not only the most likely path for inflation and the economy but also **surrounding risks and uncertainty**”* (ECB Strategy Statement 2025)

Uncertainty also discussed in 2025 **Fed's strategy review** (Bauer et al 2025, Garga et al 2025)

Research Questions

Do policymakers respond to risk/uncertainty?

⇒ how to measure risk/uncertainty?

⇒ What are its policy effects?

Research Questions

Do policymakers respond to risk/uncertainty?

⇒ how to measure risk/uncertainty?

⇒ What are its policy effects?

If so, why?

⇒ certainty equivalence / insurance

Contributions

1. Use FOMC transcripts to measure balance-of-risk (BoR) perceptions at individual level
2. Show that BoR perceptions have significant effect on:
 - 2.1 Policy decisions/preferences (in RR-style + panel regressions)
 - 2.2 Romer-Romer (RR) and Aruoba-Drechsel (AD) shocks
3. Meetings where the policy decision is motivated by “insurance” are associated with large shocks.
⇒ Insurance + BoR explain over 25% of variation in AD shocks.
4. Show that BoR perceptions also affect signals of future policy (results not shown today).

Policy Rule

Fed determines policy stance by solving $\min_{r_t} E[L(\pi_t, y_t)]$, given standard preferences

$$L(\pi_t, y_t) = (\pi_t(r_t) - \pi^*)^2 + \lambda(y_t(r_t) - y^*)^2$$

Let $\bar{\pi}_t(r_t)$ be expected inflation and $\bar{Y}_t(r_t)$ be expected output.

Solution is

$$\bar{\pi}'_t(\hat{r}_t) (\bar{\pi}_t(\hat{r}_t) - \pi^*) = -\lambda \bar{Y}'_t(\hat{r}_t) (\bar{Y}_t(\hat{r}_t) - y^*)$$

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For example, if $\bar{\pi}_t(r_t) = \bar{\pi}_t - ar_t$ and $\bar{Y}_t(r_t) = \bar{y}_t - br_t$, then

$$\hat{r}_t = \frac{a}{a^2 + \lambda b^2} (\bar{\pi}_t - \pi^*) + \frac{\lambda b}{a^2 + \lambda b^2} (\bar{y}_t - y^*)$$

Risk Management in Policy Rule

“What does risk management actually mean? It entails thinking about what could go wrong with the forecast and then judging if policy should be adjusted from the baseline one way or the other in light of the alternative scenarios.” (Evans 2019)

Let $\omega_t \in \{0, 1\}$ where $\omega_t = 1$ is an adverse outcome with probability $p_t < 0.5$. For example:

- $\bar{\Pi}_t(r_t) \mid \omega_t = \bar{\pi}_t - ar_t + \mathbb{1}(\omega_t = 1)\Delta_t \Rightarrow$ “upside” inflation risk
- $\bar{Y}_t(r_t) \mid \omega_t = \bar{y}_t - br_t - \mathbb{1}(\omega_t = 1)\Delta_t \Rightarrow$ “downside” growth risk

Case I: Certainty Equivalence

Suppose p_t is exogenous to policy, and consider upside inflation risk for concreteness.

Then tail risk shifts expected inflation up by $p_t\Delta$ but previous policy rule continues to hold, e.g.

$$\hat{r}_t = \frac{a}{a^2 + \lambda b^2}(\bar{\pi}_t + p_t\Delta - \pi^*) + \frac{\lambda b}{a^2 + \lambda b^2}(\bar{y}_t - y^*)$$

Modal forecasts no longer sufficient to describe policy (De Polis et. al. 2024) but variance/skew in outcome distributions do not play a direct role \Rightarrow **certainty equivalence**.

Case II: Non-Linearities in Policy Rule

Departing from linear-quadratic preferences can deliver direct effects of higher moments.

Non-quadratic curvature in loss function (Kilian and Manganelli 2008).

Robust control (Hansen and Sargent 2001, Onatski and Stock 2002, Levin and Williams 2003, Giannoni 2007)

But in these settings, **economic conditions are exogenous** to the actions of the policymaker.

Case III: Tail Risks Endogenous to Policy

Now suppose that p_t depends on r_t so that **policymaker can affect probability of tail event**:

- Upper inflation tail; prevent disanchoring (Goodfriend 1993)
- Low growth tail; prevent hitting ZLB constraint (Evans et. al. 2019)

For inflation upside risk:

$$2\bar{\pi}'_t(\hat{r}_t) (\bar{\pi}_t(\hat{r}_t) - \pi^*) + \underbrace{p'_t(\hat{r}_t)}_{<0} \underbrace{(1 - 2p_t(\hat{r}_t))}_{>0} \Delta_t^2 = -2\lambda \bar{Y}'_t(\hat{r}_t) (\bar{Y}_t(\hat{r}_t) - y^*)$$

Presence of tail risk gives additional **insurance motive** for hawkish stance.

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FOMC Transcripts

FOMC transcripts are publicly available from 1976 onwards, published with a five-year lag.

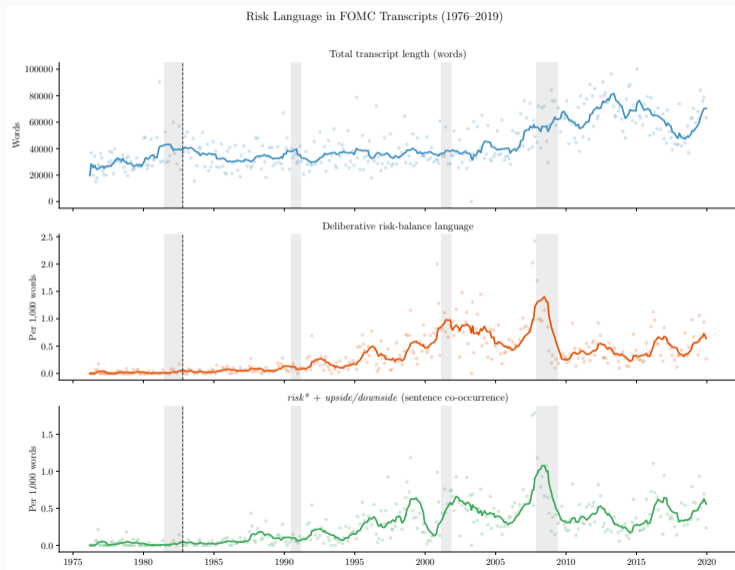
Verbatim, attributed, (nearly) complete record of policy deliberations.

We focus on scheduled meetings, not conference calls.

Main sample covers October 1982—December 2019, 299 meetings in total.

107 unique FOMC members.

Time Series of Risk Mentions



Meeting Structure

FOMC meetings follow a regular structure in much of our sample. Core parts:

Discussion of Economic/Financial Conditions (FOMC1)

- Staff presentation on economic conditions
- Q&A on staff presentation
- FOMC member presentations on economic conditions

Discussion of Policy Response (FOMC2)

- Staff presentation on policy alternatives
- Q&A on policy alternatives
- FOMC members sequentially state and justify preferred alternative

Measuring Risk Perceptions at the Individual Level

Feed each FOMC member's text (from FOMC1) into an LLM (Claude Sonnet 4) and ask for a risk assessment in each of two dimensions: **inflation** and **growth**.

Four categories: **Upside**, **Balanced**, **Downside**, **Not Discussed**

Coded view $BoR_{it}^v \in \{U, B, D, N\}$ for member i , variable $v \in \{I, G\}$, meeting t .

Query focuses on risk perceptions *around* individual forecasts, not disagreement with staff.

LLM reasoning must include direct quotations from the transcript.

Example Quotations (Inflation)

“We can’t dismiss the possibility that compensation growth will drift upward, raising core inflation”

Yellen, May 1996

“I would also judge the risk to the inflation outlook as being biased to the downside”

Lockhart, Sep 2010

“The risks to the inflation outlook remain balanced”

Bostic, May 2019

Example Quotations (Growth)

"I'm beginning to think our greatest problem may be an excessive increase in activity"

Partee, Feb 1985

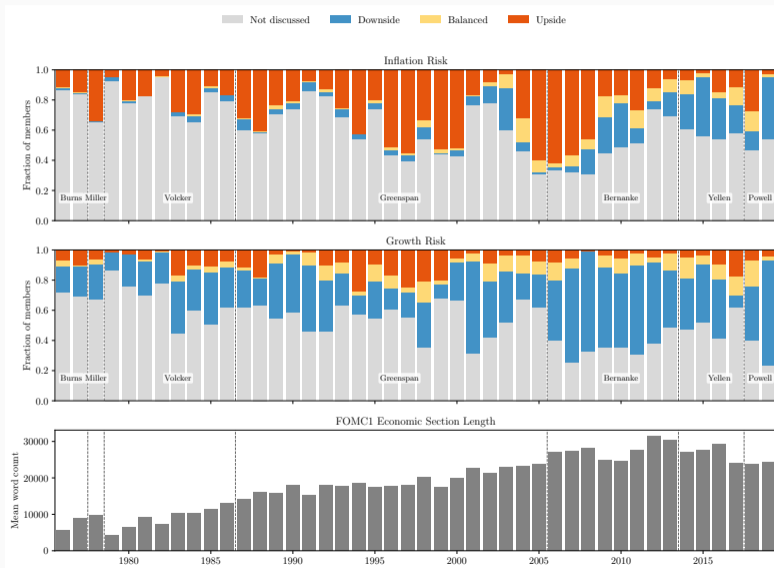
"The risk to satisfactory economic performance. . . will remain skewed very much to the downside"

Kohn, Mar 2008

"Considerable risks still in place to growth, including gasoline prices, Europe and the deleveraging of European banks, continued stresses and tight credit in the U.S. banking system. . ."

Bernanke, Mar 2012

Distribution of Speaker-Level Classifications over Time



Meeting-Level Balance-of-Risks Skew

Define counts of FOMC members classified as downside/upside:

$$R_{D,t}^v = \sum_i \mathbb{1}(BoR_{it}^v = D), \quad R_{U,t}^v = \sum_i \mathbb{1}(BoR_{it}^v = U)$$

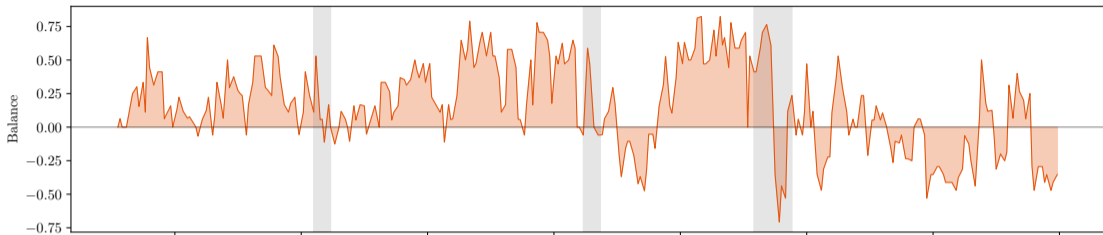
Aggregate risk measure for variable v :

$$BoR_t^v = \frac{R_{U,t}^v - R_{D,t}^v}{N_t}$$

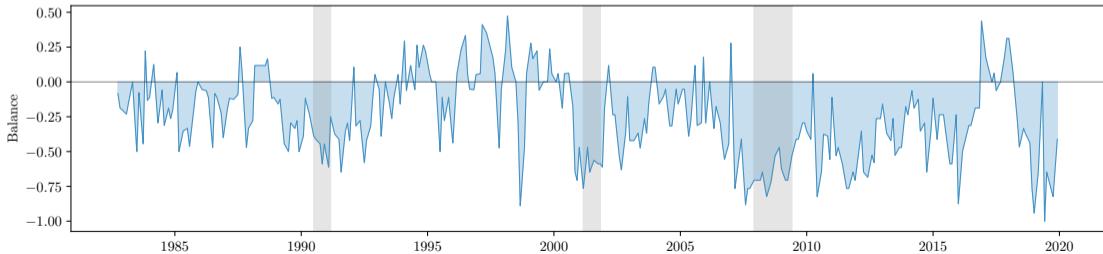
where N_t is the number of FOMC members at meeting t .

Captures skewness in the distribution of individual risk perceptions in any given meeting.

Inflation Risk Balance



Growth Risk Balance



Validation I: Dictionary Methods

We also build dictionaries to measuring members' uncertainty/risk perceptions.

Policymakers' Uncertainty (PMU) indices for inflation/disinflation and growth, respectively, tabulate the frequency of risk/uncertainty-related terms in sentences with topical keywords.

Sentiment indices tabulate directional terms in sentences with topical keywords.

Advantage is simplicity, transparency, replicability.

Disadvantage is less sophisticated understanding of context.

Validation I: BoR Skew and Dictionary Measures

	BoR Infl Skew				BoR Growth Skew		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
PMU: Inflation	0.214*** (0.015)			0.175*** (0.021)			
PMU: Deflation		-0.161*** (0.016)		-0.124*** (0.015)			
PMU: Growth					-0.131*** (0.019)		-0.116*** (0.017)
Sent: Inflation			0.205*** (0.018)	0.060*** (0.022)			
Sent: Growth						0.166*** (0.015)	0.155*** (0.014)
R2	0.396	0.226	0.369	0.606	0.176	0.289	0.428
Num.Obs.	258	258	258	258	258	258	258

Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Validation II: Summary of Economic Projections

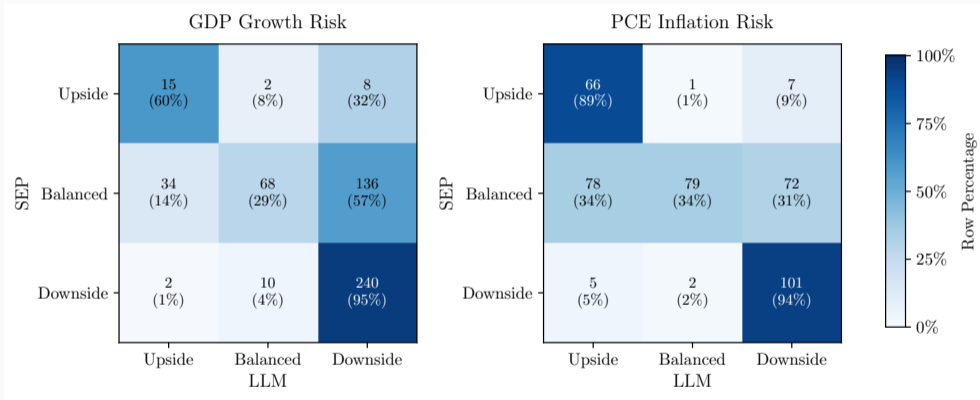
From Oct 2007, and four times a year from 2008 onwards, FOMC members respond to a survey about economic conditions collated in the [Summary of Economic Projections](#).

Includes question “Please indicate your judgment of the risk weighting around your projections” with three responses:

- Weighted to downside
- Broadly balanced
- Weighted to upside

Additional questions on member-specific point estimates of macro variables and optimal policy used as controls in regression analysis.

Comparison to SEP



Examples of Mismatch

Kocherlakota Apr 2012, Inflation, LLM: Upside, SEP: Balanced

“In this scenario, we might well see rapid increases in inflation and inflation expectations when labor markets seem weak by historical standards. . . This does not strike me as a risk that we should ignore.”

Yellen Dec 2013, Growth, LLM: Balanced, SEP: Downside

“I now see appreciably diminished downside risks to the outlook for the labor market and more balanced risks to growth than in September.”

Bullard Sep 2016, Inflation, LLM: Downside, SEP: Upside

“I do remain concerned that market-based measures of inflation expectations remain too low to be consistent with the 2 percent inflation forecast. This is a risk to the outlook that I have described.”

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Policy Outcomes and Balance-of-Risks

We initially run RR-style regressions using **FFRT** spliced with **Krippner SSR**:

$$\Delta i_t = \alpha + \beta i_{t-1} + \gamma^T \mathbf{BoR}_t + \delta^T \mathbf{X}_t + \varepsilon_t$$

Greenbook forecast controls: GDP (nowcast, change in one-quarter-ahead forecast); CPI (one-quarter-ahead forecast, change in one-quarter-ahead forecast)

Policy Outcome: Δ FFR/SSR splice (1982–2019)

	(1)	(2)	(3)	(4)	(5)	(6)
BoR Infl Up	0.283*** (0.059)		0.234*** (0.057)	0.130*** (0.047)		0.117** (0.047)
BoR Infl Down	-0.006 (0.118)		0.128 (0.127)	0.043 (0.083)		0.093 (0.084)
BoR Growth Up		0.234* (0.121)	0.113 (0.118)		0.045 (0.111)	-0.012 (0.113)
BoR Growth Down		-0.294*** (0.062)	-0.295*** (0.063)		-0.166*** (0.050)	-0.171*** (0.051)
GB Controls	N	N	N	Y	Y	Y
R^2 (GB only)	—	—	—	0.391	0.391	0.391
R2	0.098	0.160	0.207	0.407	0.421	0.432
Num.Obs.	296	296	296	295	295	295

Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Panel Regression Model

Member-level analysis: y_{it} is a preference measure for member i at meeting t .

$$y_{it} = \alpha_i + \delta_t + \sum_{x \in \{U, B, N\}} \gamma_x^I \mathbb{1}(BoR_{it}^I = x) + \sum_{x \in \{U, B, N\}} \gamma_x^G \mathbb{1}(BoR_{it}^G = x) + \varepsilon_{it}$$

Meeting fixed effects δ_t absorb time trends and unobserved aggregate shocks.

Member fixed effects α_i control for fixed preferences (hawk/dove heterogeneity).

Errors clustered at meeting level.

Preference Variables

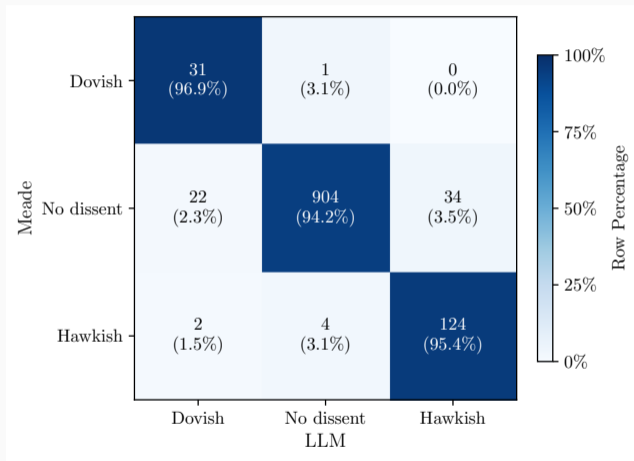
Official voting record of the FOMC has little heterogeneity.

Meade (2005) shows that dissent in voice is more common than dissent in voting and builds a human-coded dataset of individual FFR preferences dataset covering 1989–1997.

We extend the dataset to 1982–2008 using an LLM prompt applied to member statements from FOMC2 that classifies dissent in voice from the FFR decision:

- Dovish dissent
- No dissent
- Hawkish dissent

Dissent in Voice: LLM vs Meade on Comparable Sample



Preferences: Voiced FFR preference from Meade (1989–1997)

	(1)	(2)	(3)	(4)	(5)	(6)
Infl Risk: Upside	6.366*** (1.276)		5.470*** (1.264)	3.448** (1.413)		3.247** (1.420)
Growth Risk: Upside		4.157*** (1.386)	3.213** (1.336)		1.024 (1.185)	0.578 (1.160)
Balanced/ND dummies	Y	Y	Y	Y	Y	Y
Meeting FE	Y	Y	Y	Y	Y	Y
Speaker FE	N	N	N	Y	Y	Y
Num.Obs.	1119	1119	1119	1119	1119	1119

Cluster-robust SEs (by meeting) in parentheses. Omitted category: downside risk. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Preferences: LLM Dissent Direction (1982–2008)

	(1)	(2)	(3)	(4)	(5)	(6)
Infl Risk: Upside	0.267*** (0.037)		0.212*** (0.037)	0.177*** (0.036)		0.148*** (0.036)
Growth Risk: Upside		0.252*** (0.029)	0.219*** (0.029)		0.151*** (0.026)	0.132*** (0.027)
Balanced/ND dummies	Y	Y	Y	Y	Y	Y
Meeting FE	Y	Y	Y	Y	Y	Y
Speaker FE	N	N	N	Y	Y	Y
Num.Obs.	3437	3437	3437	3432	3432	3432

Cluster-robust SEs (by meeting) in parentheses. Dissent direction: +1 hawkish, 0 no dissent, -1 dovish. Omitted category: downside risk. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

SEP Fed Funds Rate Forecast

Starting in 2012, the SEP added members' preferences on the path of future interest rates.

Match coded views BoR_{it}^v to SEP responses at the meeting–speaker level.

Dependent variable y_{it} : member i 's preferred FFR_{it}^h at horizon h .

Control for individual growth/inflation forecasts (one-year-ahead GDP and core PCE) and individual uncertainty relative to last 20 years.

Helps isolate perceptions about higher moments from those about first moments.

Preferences: SEP Future FFR Preferences (2012–2019)

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: FFR Forecast $t + 1$ (pp)						
Infl Risk: Upside	0.746*** (0.103)		0.698*** (0.104)	0.353*** (0.088)		0.346*** (0.091)
Growth Risk: Upside		0.384*** (0.136)	0.205 (0.131)		0.107 (0.089)	0.034 (0.091)
Num.Obs.	555	555	555	552	552	552
Panel B: FFR Forecast $t + 2$ (pp)						
Infl Risk: Upside	0.973*** (0.139)		0.883*** (0.138)	0.462*** (0.132)		0.444*** (0.134)
Growth Risk: Upside		0.592*** (0.195)	0.371* (0.205)		0.166 (0.145)	0.085 (0.152)
Num.Obs.	555	555	555	552	552	552
Balanced/ND dummies	Y	Y	Y	Y	Y	Y
Meeting FE	Y	Y	Y	Y	Y	Y
Speaker FE	N	N	N	Y	Y	Y

Cluster-robust SEs (by meeting) in parentheses. Omitted category: downside risk. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Preferences: SEP Future FFR Preferences (2012–2019), with SEP Controls

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: FFR Forecast $t + 1$ (pp)						
Infl Risk: Upside	0.543*** (0.089)		0.533*** (0.090)	0.201** (0.086)		0.201** (0.089)
Growth Risk: Upside		0.382*** (0.133)	0.017 (0.100)		0.103 (0.089)	-0.007 (0.077)
Num.Obs.	554	554	554	551	551	551
Panel B: FFR Forecast $t + 2$ (pp)						
Infl Risk: Upside	0.680*** (0.135)		0.690*** (0.133)	0.278** (0.127)		0.300** (0.130)
Growth Risk: Upside		0.560*** (0.188)	0.060 (0.159)		0.135 (0.136)	0.002 (0.120)
Num.Obs.	554	554	554	551	551	551
Balanced/ND dummies	Y	Y	Y	Y	Y	Y
Point forecast controls	Y	Y	Y	Y	Y	Y
SEP uncertainty controls	Y	Y	Y	Y	Y	Y
Meeting FE	Y	Y	Y	Y	Y	Y
Speaker FE	N	N	N	Y	Y	Y

Cluster-robust SEs (by meeting) in parentheses. Omitted category: downside risk. Point forecast controls: member's own SEP forecast ($t + 1$). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

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Monetary Policy Shocks

Romer and Romer shocks orthogonalize Fed Funds Rate with respect to Greenbook controls.

Aruoba and **Drechsel** shocks: further orthogonalize with respect to textual sentiment indicators extracted from staff materials (color books).

⇒ explicitly motivated by potential divergence between modal numeric Greenbook forecasts and conditional mean forecast, driven by asymmetric balance of risks.

Balance of Risks and Monetary Policy Shocks

	RR Shock			AD Shock		
	(1)	(2)	(3)	(4)	(5)	(6)
BoR Inflation	0.200*** (0.043)		0.178*** (0.045)	0.051*** (0.013)		0.046*** (0.013)
BoR Growth		0.124** (0.052)	0.064 (0.054)		0.032** (0.015)	0.020 (0.014)
R2	0.085	0.033	0.093	0.064	0.026	0.073
Num.Obs.	201	201	201	207	207	207

Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Insurance at the Fed

Recall that BoR can affect policy via shifting expected economic conditions or insurance.

Insurance used by Blinder and Reis (2004) to characterize elements of Greenspan era.

*“By cutting interest rates to offset the negative effects of financial turmoil on aggregate economic activity, monetary policy can **reduce the likelihood** that a financial disruption might set off an adverse feedback loop. . . monetary policy cannot—and should not—aim at minimizing valuation risk, but policy should aim at reducing macroeconomic risk.”* (Mishkin 2008)

*“Liquidity provision by the central bank **reduces systemic risk** by assuring market participants that, should short-term investors begin to lose confidence, financial institutions will be able to meet the resulting demands for cash without resorting to potentially destabilizing fire sales of assets.”* (Bernanke 2009)

Measuring Insurance Reasoning

To separate meetings by the presence of insurance motives, we design a new LLM query for all meetings that cover our shock measures (Oct 1982 – Dec 2008).

Collect FOMC2 statements of non-dissenters and require two conditions:

1. Members invoke insurance motive: “explicitly argue for taking action to hedge against uncertain future risks even if not the most likely scenario.”
2. Explicit evidence that insurance used as direct motivation for policy choice.

95/206 meetings (46%) have insurance reasoning as motivation for policy.

Insurance and Monetary Policy Shocks

$$2\bar{\pi}'_t(\hat{r}_t) (\bar{\pi}_t(\hat{r}_t) - \pi^*) + \underbrace{p'_t(\hat{r}_t)}_{<0} \underbrace{(1 - 2p_t(\hat{r}_t))}_{>0} \Delta_t^2 = -2\lambda \bar{Y}'_t(\hat{r}_t) (\bar{Y}_t(\hat{r}_t) - y^*)$$

Recall the policy rule with endogenous tail risk probability.

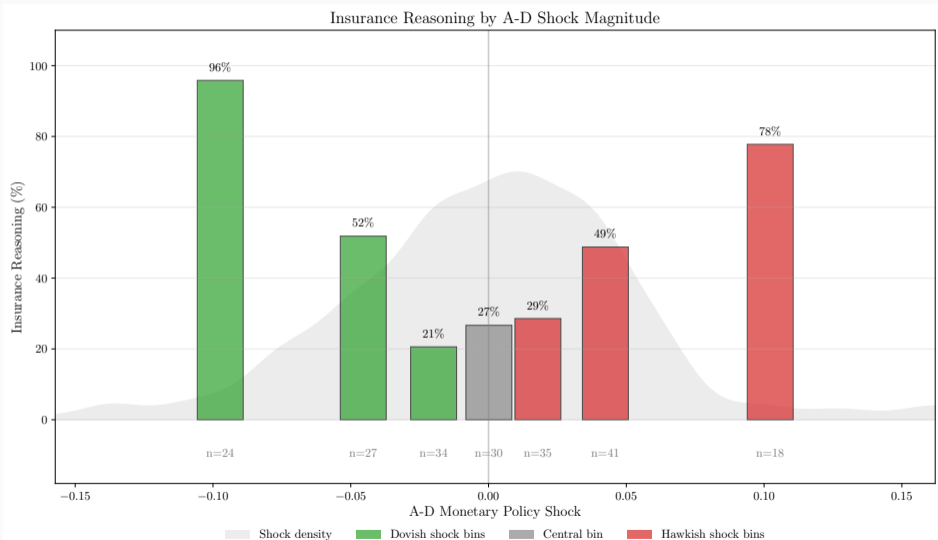
Without insurance ($p'_t = 0$), expected economic conditions perfectly explain policy

⇒ smaller monetary policy shocks. (AD shocks control for effect of BoR on conditional mean).

With insurance ($p'_t \neq 0$), expected conditions insufficient to pin down policy

⇒ larger monetary policy shocks.

Insurance Associated with Larger Shocks



Strength of Tail Risk Concerns

$$2\bar{\pi}'_t(\hat{r}_t) (\bar{\pi}_t(\hat{r}_t) - \pi^*) + \underbrace{p'_t(\hat{r}_t)}_{<0} \underbrace{(1 - 2p_t(\hat{r}_t))}_{>0} \Delta_t^2 = -2\lambda \bar{Y}'_t(\hat{r}_t) (\bar{Y}_t(\hat{r}_t) - y^*)$$

Δ_t is a measure of the **strength** of tail risk concerns.

We show that $d\hat{r}_t/d\Delta_t > 0$ if inflation not too far below target.

Suppose (1) insurance meetings have the policy rule above and (2) BoR captures variation in Δ_t .

\implies effect of BoR on AD shocks should come primarily via insurance meetings.

BoR Affects Shocks Primarily in Insurance Meetings

	AD Shock			
	(1)	(2)	(3)	(4)
BoR Inflation	0.046*** (0.013)		0.048*** (0.013)	-0.002 (0.010)
BoR Growth	0.019 (0.014)		0.017 (0.015)	-0.048*** (0.010)
Insurance Reasoning		-0.008 (0.008)	-0.008 (0.008)	-0.007 (0.012)
BoR Inflation \times Insurance				0.095*** (0.025)
BoR Growth \times Insurance				0.129*** (0.024)
R2	0.074	0.005	0.079	0.281
Num.Obs.	206	206	206	206

Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Conclusion

Do policymakers respond to risk/uncertainty?

⇒ **Yes** (both at committee and individual levels)

If so, why?

⇒ certainty equivalence AND **insurance**

Omitted results: out-of-sample results on policy, effects on policy signals, VAR/LP results on BoR