Policymakers' Uncertainty: Evidence from the FOMC

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March 2023

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Irish Fiscal Advisory Council - Usual Disclaimer Applies

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Motivation

Uncertainty is ubiquitous in monetary policymaking

- *"(...) uncertainty is not just a pervasive feature of the monetary policy landscape; it is the defining characteristic of that landscape."* – Alan Greenspan (2004)

- *"Most fundamentally, our discussions of the pervasive uncertainty that we face as policy-makers is a powerful reminder of the need for humility about our ability to forecast and manage the future course of the economy. "* – Ben Bernanke (2007)

- Lots of interest in the effects of (policy) uncertainty on the economy

Question

- *(How) does the <u>uncertainty that policymakers' perceive</u> affect their decision-making?*

- Challenges:
  - No canonical theoretical model - Ambiguous predictions
  - Unobservable/hard-to-measure

This paper: Impact of uncertainty on policy stance

	(1)	(2)	(3)	(4)	(5)
			Dependent variable: HD_t policy stance score		
$InfPMU_t$		0.281***	0.177***	0.181***	0.159**
		(3.89)	(2.79)	(2.74)	(2.32)
$EcoPMU_t$		-0.151***	-0.124*	-0.116	-0.105
		(-3.10)	(-1.69)	(-1.48)	(-1.46)
$MktPMU_t$					-0.120
					(-1.19)
$InfSent_t$	0.204**	0.085	0.066	0.084	0.063
	(2.54)	(1.17)	(1.16)	(1.40)	(1.07)
$EcoSent_t$	0.498***	0.471***	0.392***	0.378***	0.347***
	(5.71)	(5.91)	(4.38)	(3.43)	(3.91)
$MktSent_t$					0.038
					(0.54)
GB controls	No	No	Yes	Yes	Yes
Public uncertainty	No	No	No	Yes	No
Other PMUs	No	No	No	No	Yes
$\bar{R}^2$	0.30	0.38	0.43	0.43	0.45
N	227	227	227	226	227

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This paper

1. Measure policymakers' beliefs about higher moments of economic distributions from text
   - Identify policymakers' uncertainty (PMU index)
     - Uncertainty about inflation, output, financial markets, ...
   - Policymakers' directional language ("sentiment")

2. New results on how policymakers' uncertainty affects decision-making
   - Measure policymakers' policy stance

3. We emphasise the (tail) risk that the CB loses their inflation-fighting credibility as consistent with the empirics
   - Show narrative evidence of this concern in FOMC deliberations.

Uncertainty and Policymaking

A simple discrete choice optimal policy case I

- Policymakers' loss function:

$$L(\pi, y) = (\pi - \pi^*)^2 + \lambda(y - y^*)^2 \tag{1}$$

- Policymaker chooses r from $\{-1, 0, 1\}$
    - The policymaker will choose the 1 if $\overline{L}_1 < \overline{L}_0$

A simple discrete choice optimal policy case I

- Policymakers' loss function:

$$L(\pi, y) = (\pi - \pi^*)^2 + \lambda(y - y^*)^2 \tag{1}$$

- Environment
  - Perceive uncertainty in outcome distributions, $\pi \sim G_\pi(\cdot \mid r)$ and $y \sim G_y(\cdot \mid r)$
    - G need not be Gaussian
    - First moments exist
  - Interest rates affect economic activity
    - First moments are assumed to be decreasing in r
    - $\delta_\pi > 0$
    - $\delta_y > 0$

$r = 1$	$r = -1$
$\overline{\pi}_1 = \overline{\pi}_0 - \delta_\pi$	$\overline{\pi}_{-1} = \overline{\pi}_0 + \delta_\pi$
$\overline{y}_1 = \overline{y}_0 - \delta_y$	$\overline{y}_{-1} = \overline{y}_0 + \delta_y$

A simple discrete choice optimal policy case I

- Policymakers' loss function:

$$L(\pi, y) = (\pi - \pi^*)^2 + \lambda(y - y^*)^2 \tag{1}$$

- Environment
  - Let $\sigma_{x,r}^2$ be the variance of outcome $x \in \{\pi, y\}$ conditional on policy r
  - $\Delta\sigma_{\pi,0\to1}^2$ and $\Delta\sigma_{y,0\to1}^2$ are the changes in the variance of inflation and output, respectively, when the policymaker implements 1 instead of 0.
  - $\Delta\sigma_{\pi,-1\to0}^2$ and $\Delta\sigma_{y,-1\to0}^2$ are the changes in the variance of inflation and output, respectively, when the policymaker implements -1 instead of 0.

A simple discrete choice optimal policy case II

- Choose 1 over 0:

$$\overline{\delta}_\pi(\overline{\pi}_0 - \pi^*) + \lambda\overline{\delta}_y(\overline{y}_0 - y^*) > \frac{\overline{\delta}_\pi^2 + \lambda\overline{\delta}_y^2}{2} + \frac{\Delta\sigma_{\pi,0\to1}^2 + \lambda\Delta\sigma_{y,0\to1}^2}{2} \tag{2}$$

- "Burden of proof" can include policy-dependent uncertainty terms.

- Choice of -1 over 0 is similarly derived.

- Can consider a continuous policy variable with similar interpretation of the decision rule.

Does uncertainty can affect policymaking? Theoretical Channels

$$\overline{\delta}_\pi(\overline{\pi}_0 - \pi^*) + \lambda\overline{\delta}_y(\overline{y}_0 - y^*) > \frac{\overline{\delta}_\pi^2 + \lambda\overline{\delta}_y^2}{2} + \frac{\Delta\sigma_{\pi,0\to1}^2 + \lambda\Delta\sigma_{y,0\to1}^2}{2} \tag{2}$$

1. Baseline Case: Certainty equivalence
   - No uncertainty and $\overline{\delta}_\pi, \overline{\delta}_y$ are deterministic $\equiv$ uncertainty but $\Delta\sigma_{\pi,0\to1}^2 = \Delta\sigma_{y,0\to1}^2 = 0$
   - This is typically the case in monetary models

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Does uncertainty can affect policymaking? Theoretical Channels

$$\overline{\delta}_\pi(\overline{\pi}_0 - \pi^*) + \lambda\overline{\delta}_y(\overline{y}_0 - y^*) > \frac{\overline{\delta}_\pi^2 + \lambda\overline{\delta}_y^2}{2} + \frac{\Delta\sigma_{\pi,0\to1}^2 + \lambda\Delta\sigma_{y,0\to1}^2}{2} \qquad (2)$$

1. Baseline Case: Certainty equivalence
2. Economic uncertainty as a negative demand shock
   - Uncertainty shifter ζ: Variance of output conditional on r is $\sigma_{y,r}^2 + \zeta$
   - $\overline{y}_0$ decreasing in ζ: Higher uncertainty affects baseline ($\downarrow$ hiring, investment, inflation)
     [Bloom (2009); Basu and Bundick (2017); Leduc and Liu (2016)]
   - Central bank eases in response $\to$ No additional effect as ζ common to policy choices

Does uncertainty can affect policymaking? Theoretical Channels

$$\overline{\delta}_\pi(\overline{\pi}_0 - \pi^*) + \lambda\overline{\delta}_y(\overline{y}_0 - y^*) > \frac{\overline{\delta}_\pi^2 + \lambda\overline{\delta}_y^2}{2} + \frac{\Delta\sigma_{\pi,0\to1}^2 + \lambda\Delta\sigma_{y,0\to1}^2}{2} \qquad (2)$$

1. Baseline Case: Certainty equivalence

2. Economic uncertainty as a negative demand shock

3. Fed-Driven Uncertainty
   - Suppose $\Delta\sigma_{\pi,i}^2, \Delta\sigma_{y,i}^2 \geq (\leq)0$ with one inequality strict: certainty equivalence does not hold.
   - e.g. when interest rate 1 generates less volatility in inflation or output relative to 0, 1 becomes more attractive.

Textual Measures

FOMC setting

- ▶ Wealth of information
  - Manually labelled FOMC transcripts
  - Granularity: Speaker-sentence level
  - Sample: 1987:07–2015:12 (227 meetings)
  - Controls for staff Greenbook/Tealbook forecasts
- ▶ Allows to construct proxies for policymakers' beliefs and decisions in a consistent way
  - Rarely feasible in other contexts

Textual measures

Two main types of textual proxies to capture hard-to-measure factors in decision-making:

1. Topic-specific PMU_t indices: policymakers' perceptions of uncertainties
   - Word embeddings approach

2. Policy stance HD_t: relative hawkisness/dovishness
   - Language measure to deal with ZLB and Alternative B selection

Textual Measures

PMU

Word embeddings for risk and uncertainty

Risk embeddings			**Uncertainty** embeddings		
Term	Similarity	# in Eco round	Term	Similarity	# in Eco round
risks	0.69	3183	uncertainties	0.66	505
downside risk*	0.60	1118	anxiety	0.52	70
threat	0.59	135	angst	0.43	24
upside risk*	0.52	585	skepticism	0.43	68
danger	0.50	121	tension	0.43	101
probability	0.48	524	uncertain	0.43	399
possibility	0.48	1010	downside risk*	0.42	1118
likelihood	0.47	224	pessimism	0.41	179
vulnerability	0.44	72	fragility	0.40	106
chances	0.39	65	gloom	0.38	65
fragility	0.37	106	risks	0.36	3183
sensitivity	0.34	82	volatility	0.36	360
probabilities	0.34	87	concerns	0.36	628
uncertainty	0.34	2317	!clarity	0.35	89
odds	0.33	190	sensitivity	0.35	82
concern	0.33	1047	worries	0.34	132
potentially	0.32	275	!certainty	0.33	91
tension	0.31	101	doubts	0.33	65
possibly	0.31	290	concern	0.33	1047
unease	0.30	25	optimism	0.32	498
vulnerabilities	0.30	59	ambiguity	0.32	18
fear	0.30	194	error	0.32	234
skew	0.29	29	nervousness	0.32	31
worries	0.29	132	unknown	0.32	32
skewed	0.29	101	tensions	0.31	51
volatility	0.28	360	upside risk*	0.31	585
doubts	0.28	65	worry	0.29	402
...			...		

Distribution of phrases in topic-specific PMU

Inflation PMU   Economy PMU   Market PMU

Topic-specific PMU

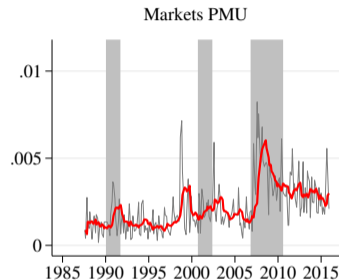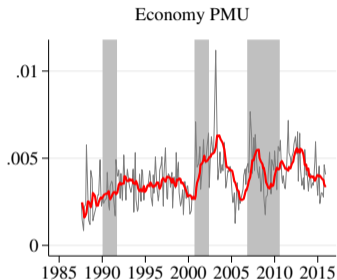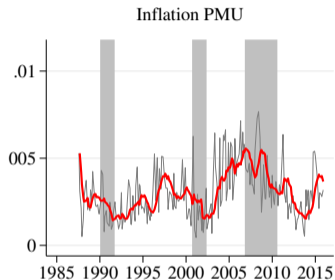Inflation PMU   Economy PMU   Markets PMU

- ▶ Classify on average 84% of uncertainty mentions in $\mathcal{U}$
- ▶ Inflation, real economy and markets PMU capture bulk of uncertainty-related discussions
- ▶ Correlations: $(InfPMU, EcoPMU) = 0.07$; $(InfPMU, MktPMU) = 0.12$; $(EcoPMU, MktPMU) = 0.38$.

Predictive regression:
$$F_{t+h}(\pi_0) = \beta_0 + \beta_1 InfPMU_t + \beta_2 \overline{F}_t(\pi) + \varepsilon_{t+h}$$

A. Dependent variable: Greenbook CPI inflation nowcast h meetings ahead, $E_{t+h}(CPI)$

	$h=1$	$h=2$	$h=3$	$h=4$	$h=5$	$h=6$	$h=7$	$h=8$
$InfPMU_t$	0.029	-0.035	-0.063	-0.083	-0.181	-0.173	-0.109	-0.073
	(0.33)	(-0.38)	(-0.63)	(-0.63)	(-1.27)	(-1.16)	(-0.91)	(-0.87)
$\bar{R}^2$	-0.0036	-0.0033	-0.00051	0.0024	0.028	0.025	0.0073	0.00081
N	226	225	224	223	222	221	220	219

PMU as measure of expectations? ↶

Predictive regression:
$$F_{t+h}(g_0) = \beta_0 + \beta_1 EcoPMU_t + \beta_2 \overline{F}_t(g) + \varepsilon_{t+h}$$

Dependent variable: Greenbook real GDP growth nowcast h meetings ahead

	$h=1$	$h=2$	$h=3$	$h=4$	$h=5$	$h=6$	$h=7$	$h=8$
$EcoPMU_t$	-0.073	-0.059	-0.002	0.008	-0.050	-0.056	0.023	0.047
	(-0.92)	(-0.76)	(-0.03)	(0.09)	(-0.50)	(-0.52)	(0.21)	(0.39)
$\bar{R}^2$	0.00088	-0.00093	-0.0045	-0.0045	-0.0021	-0.0015	-0.0041	-0.0024
N	226	225	224	223	222	221	220	219

PMU and Public Measures of Uncertainty?

	(1) BBD EPU	(2) HRS MPU	(3) VXO	(4) Infl disp	(5) Growth disp
$InfPMU_t$	-0.397***	-0.062	-0.169*	0.050	-0.171
	(-5.83)	(-0.86)	(-1.91)	(0.60)	(-1.53)
$EcoPMU_t$	0.211*	0.276*	-0.037	-0.330***	-0.199
	(1.75)	(1.93)	(-0.22)	(-2.67)	(-1.64)
$MktPMU_t$	0.183*	0.097	0.323**	0.345***	0.001
	(1.66)	(1.02)	(2.53)	(2.60)	(0.01)
$\bar{R}^2$	0.22	0.093	0.10	0.14	0.061
N	227	227	227	226	226

Textual Measures

HD_t

Identifying policy stance from language in the policy round

A. Hawk and Dove scores — B. HD = Hawk−Dove
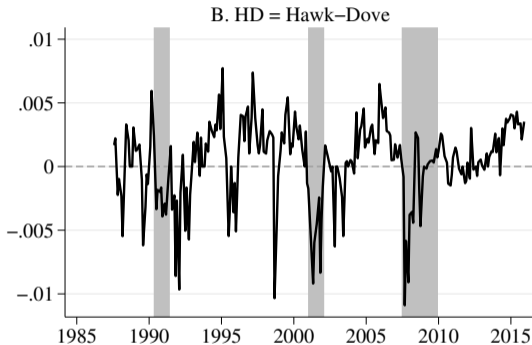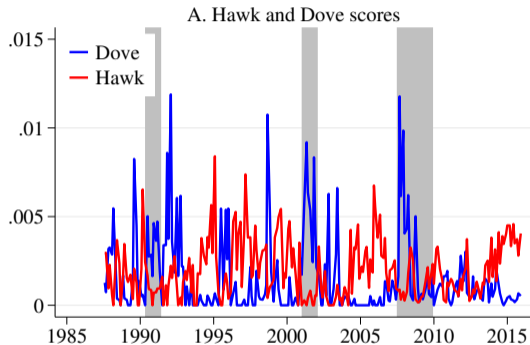
- ▶ Business cycle properties: Dove score elevated around recessions and during financial crises; Hawk score elevated in expansions
- ▶ Substantial variation post-2008 during the ZLB

Predicting FFR target changes with policy language HD_t

	(1) HD_t	(2) ΔFFR_t	(3) ΔFFR_t	(4) ΔFFR_t
HD_t			0.14***	0.096***
			(6.83)	(5.30)
$F_t(\pi_4)$	0.62***	0.23***		0.18***
	(3.64)	(3.79)		(2.97)
$F_t(g_0)$	0.38***	0.18***		0.15***
	(2.99)	(6.60)		(5.75)
τ_t	-0.70***	-0.13***		-0.078**
	(-3.81)	(-3.30)		(-2.06)
$FR_t(\pi_3)$	0.073	0.015		0.0067
	(1.43)	(0.86)		(0.39)
$FR_t(g_1)$	0.15***	0.039**		0.026
	(2.79)	(2.30)		(1.32)
L.FFR_t		0.087	0.26***	-0.013
		(1.14)	(3.18)	(-0.15)
L2.FFR_t		-0.13*	-0.27***	-0.024
		(-1.84)	(-3.40)	(-0.29)
Constant	-0.000086	0.14**	0.0088	0.11**
	(-0.00)	(2.54)	(0.20)	(2.23)
$\bar{R}^2$	0.29	0.52	0.45	0.59
N	227	169	169	169

HD measure of policy preferences vs. Romer-Romer shocks
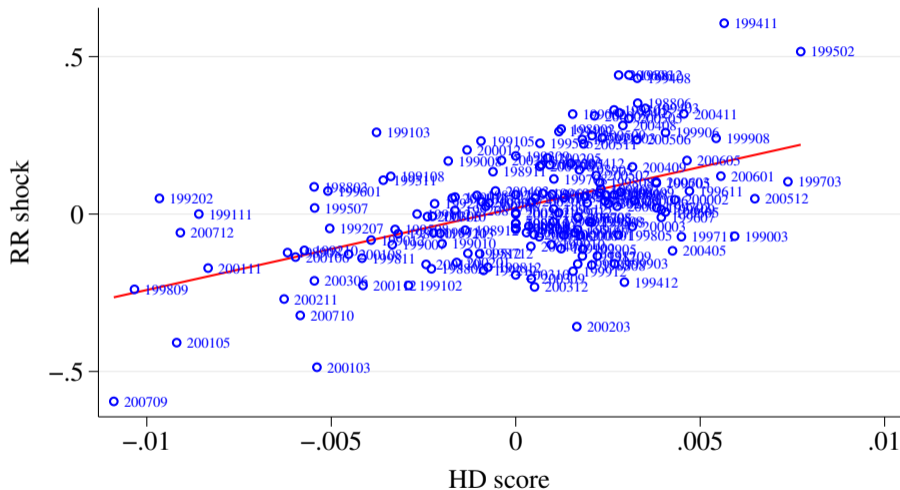
Information content of HD policy stance score

- And forecasts policy path several quarters ahead

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$	(6) $h=6$	(7) $h=7$	(8) $h=8$
HD_t	0.087***	0.14***	0.20***	0.27***	0.28***	0.24**	0.22*	0.25*
	(4.10)	(3.18)	(2.62)	(2.84)	(2.88)	(2.46)	(1.88)	(1.83)
GB controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
$\bar{R}^2$	0.43	0.41	0.43	0.46	0.51	0.52	0.53	0.53
$\Delta\bar{R}^2$	0.033	0.026	0.028	0.034	0.026	0.010	0.0045	0.0064
N	169	168	167	166	165	164	163	162

Dependent variable: ΔFFR_{t+h} (1987:08–2008:12)

- Forward-looking content of policy round deliberations
- *HD* predicts the policy path up to eight meetings ahead

(How) does uncertainty affect policy stance?

Impact of uncertainty on policy stance: meeting level

$$HD_t = \beta_0 + \boldsymbol{PMU}_t^T \boldsymbol{\beta_1} + \mathbf{x}_t^T \boldsymbol{\beta_2} + \varepsilon_t \qquad (3)$$

Dependent variable: HD_t policy stance score

|	(1)	(2)	(3)	(4)	(5)
$InfPMU_t$	0.341***	0.184**	0.182***	0.183***	0.163**
	(3.39)	(2.54)	(2.61)	(2.60)	(2.40)
$EcoPMU_t$	-0.238***	-0.221***	-0.196**	-0.142**	-0.137**
	(-3.97)	(-3.21)	(-2.35)	(-2.04)	(-1.97)
$MktPMU_t$				-0.227*	-0.209*
				(-1.77)	(-1.66)
GB controls	No	Yes	Yes	Yes	Yes
Public uncertainty	No	No	Yes	Yes	Yes
Other PMUs	No	No	No	No	Yes
$\bar{R}^2$	0.15	0.34	0.35	0.38	0.39
N	227	227	226	226	226

Staff modal forecasts vs FOMC mean expectations

- Modal forecasts $(\hat{\pi}_0, \hat{y}_0)$:
  - Bernanke: "SEP projections are explicitly of the 'most likely' or modal outcomes rather than the range of possible scenarios."
  - The New York Fed forecast "is referred to as the 'modal' forecast in that it is intended to be the most likely of a wide range of potential outcomes" (Alessi et al, 2014).

- And Greenbook/Tealbook is a *staff* forecast

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- And Greenbook/Tealbook is a *staff* forecast

- Topic-specific sentiment: directional views about the economy
  - Measured away from uncertainty words

Impact of uncertainty on policy stance: meeting level

	(1)	(2)	(3)	(4)	(5)
			Dependent variable: HD_t policy stance score		
$InfPMU_t$		0.281***	0.177***	0.181***	0.159**
		(3.89)	(2.79)	(2.74)	(2.32)
$EcoPMU_t$		-0.151***	-0.124*	-0.116	-0.105
		(-3.10)	(-1.69)	(-1.48)	(-1.46)
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$InfSent_t$	0.204**	0.085	0.066	0.084	0.063
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$EcoSent_t$	0.498***	0.471***	0.392***	0.378***	0.347***
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$MktSent_t$					0.038
					(0.54)
GB controls	No	No	Yes	Yes	Yes
Public uncertainty	No	No	No	Yes	No
Other PMUs	No	No	No	No	Yes
$\bar{R}^2$	0.30	0.38	0.43	0.43	0.45
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FOMC Members drive the effects

A. Inflation PMU

FOMC members — — Staff

B. Real economy PMU

FOMC members — — Staff
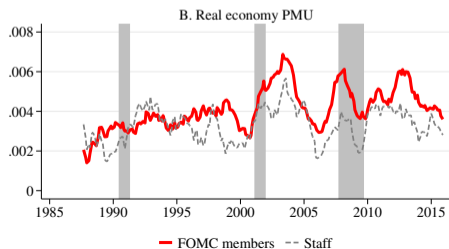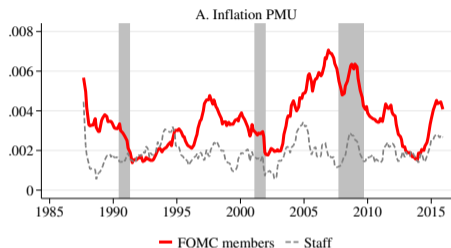
Dependent variable: HD_t policy stance score			
	(1)	(2)	(3)
$InfPMU_t$ (FOMC)	0.180***		0.183***
	(2.84)		(3.18)
$EcoPMU_t$ (FOMC)	-0.093		-0.087
	(-1.48)		(-1.36)
$InfPMU_t$ (Staff)		0.109*	0.011
		(1.81)	(0.23)
$EcoPMU_t$ (Staff)		-0.137*	-0.038
		(-1.93)	(-0.65)
GB controls	Yes	Yes	Yes
Sentiment	Yes	Yes	Yes
$\bar{R}^2$	0.43	0.33	0.43
N	227	227	227

Impact of uncertainty on policy stance: member-meeting level

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable: Individual member HD_{it} policy stance score					
$InfPMU_{it}$ (ind)	0.12***	0.12***	0.00014	-0.011	0.11**	-0.0097
	(2.86)	(2.82)	(0.00)	(-0.30)	(2.62)	(-0.25)
$EcoPMU_{it}$ (ind)	-0.074	-0.058	0.018	0.012	-0.041	0.011
	(-1.65)	(-1.43)	(0.45)	(0.30)	(-1.03)	(0.29)
$InfPMU_t$ (agg)			0.93***			
			(4.97)			
$EcoPMU_t$ (agg)			-0.74***			
			(-3.63)			
$MktPMU_{it}$ (ind)					-0.16***	0.011
					(-2.70)	(0.25)
$ModPMU_{it}$ (ind)					-0.071	-0.15
					(-0.64)	(-1.38)
$OthPMU_{it}$ (ind)					-0.19***	-0.11**
					(-4.20)	(-2.40)
Sentiment	No	Yes	Yes	Yes	Yes	Yes
Meeting FE	No	No	No	Yes	No	Yes
Member FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.028	0.048	0.070	0.26	0.059	0.26
N	3925	3925	3925	3925	3925	3925

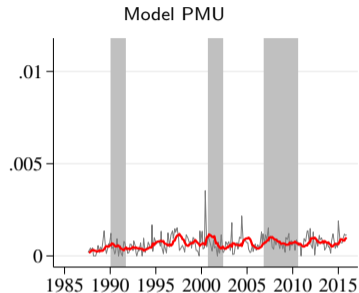# Quantifying the impact of uncertainty on policy stance

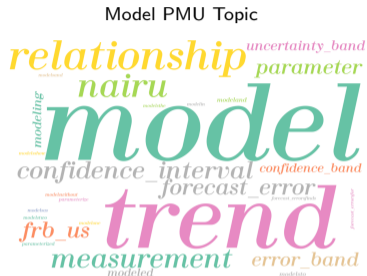March 2004 → June 2006 = 3.18 Std Devs
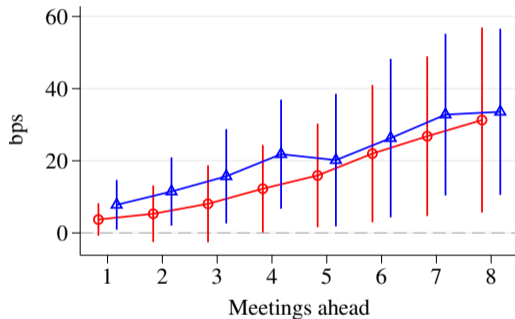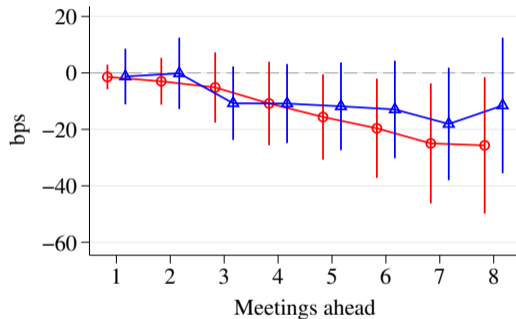
Inflation PMU and the policy rate
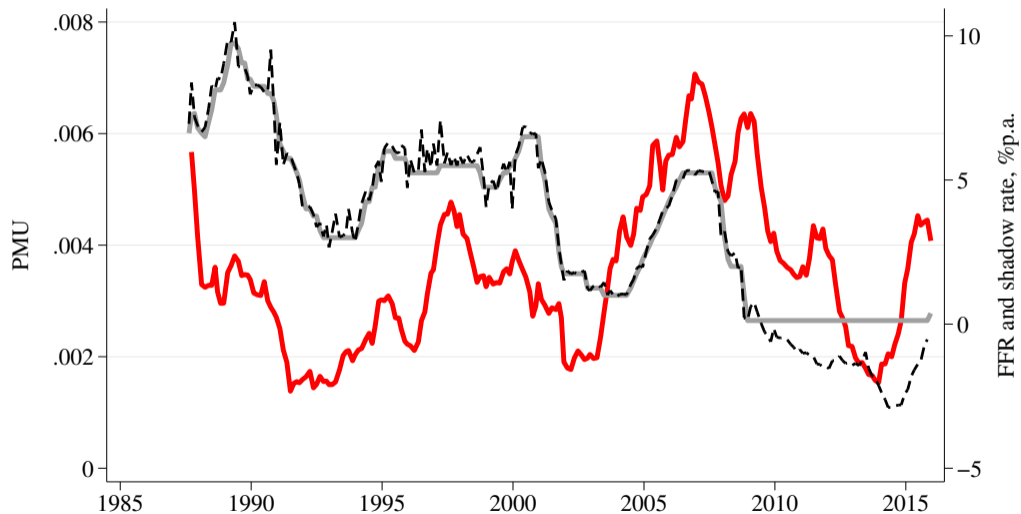
What drives the effect?

FOMC Not Talking About Model Uncertainty

Model PMU Topic

Model PMU

Correlations of topic-specific PMU indices

	InfPMU	EcoPMU	MktPMU
EcoPMU	0.0735		
MktPMU	0.1218	0.3754	
ModPMU	0.2218	0.1131	0.0957

Regime-specific results

	(1) Base	(2) Cut	(3) Hike	(4) Neither	(5) BB-Cut	(6) BB-Hike	(7) BB-Neither
$InfPMU_t$	0.202***	0.082	0.047	0.360**	-0.044	0.031	0.381***
	(3.09)	(0.97)	(0.28)	(2.27)	(-0.25)	(0.22)	(4.48)
$EcoPMU_t$	-0.084	-0.095	0.087	0.021	0.207	-0.006	-0.256**
	(-1.22)	(-0.87)	(0.52)	(0.16)	(1.13)	(-0.05)	(-2.17)
GB	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sentiment	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Public uncertainty	Yes	Yes	Yes	Yes	Yes	Yes	Yes
$\overline{R}^2$	0.42	0.30	0.31	0.22	0.11	0.29	0.26
N	221	97	65	59	43	68	116

PMU and sentiment: Asymmetry

A. Inflation

B. Real economy

PMU — Positive sentiment - - Negative sentiment
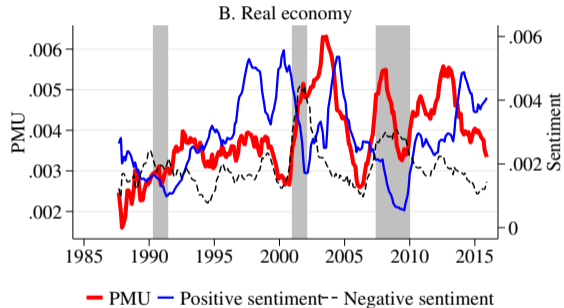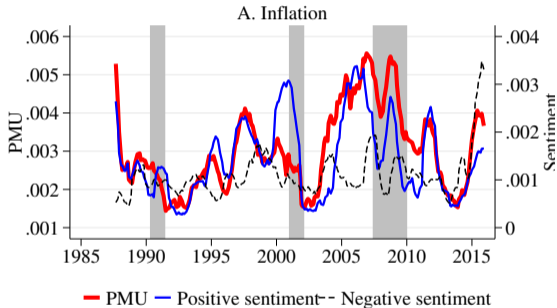
Managing Risks to Credibility

- ▶ Monetary policy as an exercise in risk management
  - "a judgment about the probabilities, costs, and benefits of the various possible outcomes under alternative choices for policy" (Greenspan, 2004)

- ▶ Credibility via well-anchored inflation expectations $\Rightarrow$ better policy trade-offs

- ▶ Loss of nominal anchor is damaging - see Great Inflation Episode.
  - Re-anchoring without a deep recession is difficult

- ▶ Powell at Jackson Hole (2022):
  - "We are taking forceful and rapid steps to moderate demand so that it comes into better alignment with supply, and to keep inflation expectations anchored. We will keep at it until we are confident the job is done."

- ▶ Literature including on inflation scares
  - Small chance of large inflation and high losses (credibility)
  - Goodfriend (1993), Orphanides and Williams (2005), King & Lu (2022)

Narrative Evidence: Yellen Through the Ages

1. September 1996

   "the risk of an increase in inflation has definitely risen, and I would characterize the economy as operating in an inflationary danger zone" ... "a failure to shift policy just modestly in response to shifting inflationary risks could undermine the assumptions on which the markets' own stabilizing responses are based."

Narrative Evidence: Yellen Through the Ages

1. September 1996

2. November 2005
   "Overall, I judge our credibility to be very much intact. Of course, our credibility going forward does depend on continued vigilance. The economy now appears to be close to full employment, with a good deal of momentum. And annual core inflation, at least as judged by the core PCE measure, remains near the upper end of my comfort zone and, arguably, inflation risks are tilted somewhat to the upside. So with respect to policy, I support at a minimum the removal of any remaining policy accommodation...So a few more increases, including one today, seem to me likely to be required."

Narrative Evidence: Yellen Through the Ages

1. September 1996

2. November 2005

3. October 2014
   "In all, while most of you see these recent developments as largely transitory, and thus continue to expect that inflation will move gradually back toward 2 percent, some of you are concerned that we may be seeing the beginning of a worrisome downward adjustment in inflation expectations. As President Kocherlakota emphasized, a failure on our part to take decisive action could exacerbate this risk by diminishing the credibility of our commitment to our 2 percent inflation objective."

Narrative Evidence: Yellen Through the Ages

1. September 1996

2. November 2005

3. October 2014

4. September 2014
   "In addition, the risk of disinflation of the kind that we've seen in Japan and other places has abated. Nor have we experienced the takeoff in inflation that many feared. Instead, wage growth has been inching up, and price inflation still remains somewhat below our longrun target By keeping longer-run inflation expectations well anchored, the credibility that we've gained over the past 35 years has allowed us to address the extraordinary amount of slack and downward price pressures with extraordinarily accommodative policies without fueling an inflationary wildfire. So I view that, in terms of the upside and the downside risks, we've actually navigated that pretty well, and those risks seem lower.

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   without fueling an inflationary wildfire. So I view that, in terms of the upside and the
   downside risks, we've actually navigated that pretty well, and those risks seem lower.
   John Williams

Conclusions

- Analyze impact policymakers' higher-moment beliefs on policy stance
  - New text-based measures of policymakers' uncertainty (PMUs), sentiment, and policy stance (1987–2015)
- Inflation PMU leads to a more hawkish response ($\neq$ Brainard's conservatism)

Why?

- *My* preferred explanation: Policymakers pursuing a risk management approach facing tail risk, especially inflation concerns about loss of credibility if they lose the nominal anchor.

Related question

- How does this affect how we understand monetary shocks and surprises, especially the role of external communication?

Information content of HD policy stance score

	Market-based measures of monetary policy surprises				
	(1) GSS target	(2) GSS path	(3) GK MP0	(4) GK ED12m	(5) NS news
HD_t	0.169	0.178***	0.382***	0.409***	0.290**
	(1.33)	(2.74)	(4.00)	(4.92)	(2.33)
R^2	0.028	0.032	0.15	0.17	0.084
N	196	196	190	199	154

GSS: Gurkaynak, Sack, Swanson (2005) and Swanson (2017); GK: Gertler, Karadi (2015); NS: Nakamura, Steinsson (2018)

▶ *HD* predicts market-based measures of monetary surprises

Amplification of policy response with PMU

"Indeed, intuition suggests that <u>stronger action</u> by the central bank may be warranted to prevent particularly <u>costly outcomes</u>." – Ben Bernanke (2007)

"A <u>more aggressive</u> monetary policy response (...) is warranted when there is clear evidence of heightened risks to price stability, i.e. when it is established that the degree of <u>inflation persistence</u> is likely to be high and <u>risks disanchoring</u> inflation expectations. In this case, a forceful, frontloaded monetary policy response to weak or excess inflation may become necessary <u>to signal</u> the central bank's commitment to its objective, and thus nudge inflation expectations towards that objective and make them less backward-looking." – Peter Praet (2018)

Risk vs. uncertainty

"The term "uncertainty" is meant here to encompass <u>both "Knightian uncertainty,"</u> in which the probability distribution of outcomes is unknown, <u>and "risk,"</u> in which uncertainty of outcomes is delimited by a known probability distribution. In practice, one is <u>never quite sure what type of uncertainty</u> one is dealing with in real time, and it may be best to think of a continuum ranging from well-defined risks to the truly unknown." – Alan Greenspan (2004)
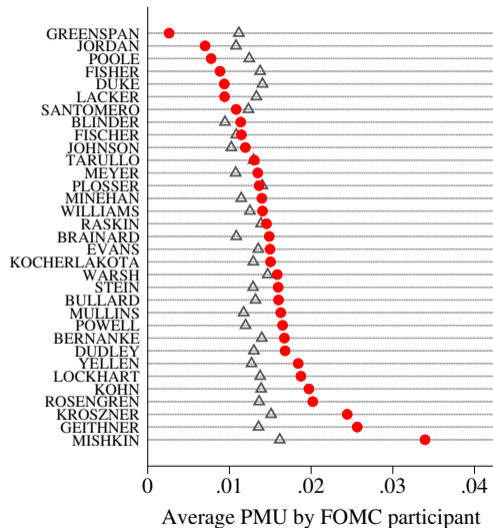
Comovement between perceived risk and uncertainty

A. Inflation

B. Economy

C. Market
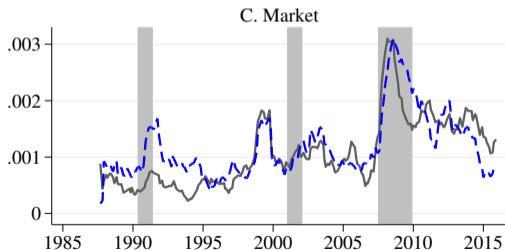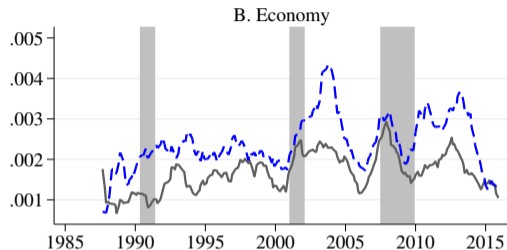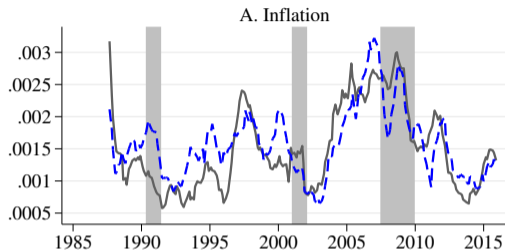
- ▶ Risk and uncertainty indices are highly correlated (using disjoint set of phrases)
- ▶ Similar frequency in policy deliberations
- ▶ Consistent with Greenspan (2004)

—— PMU−Risk - - PMU−Uncertainty

Individual-level PMU

Average PMU by FOMC participant

● Speaker average △ Meeting average

- ▶ Graph: Average speaker-level PMU compared to the meeting-level average overall PMU, by speaker
- ▶ Concern: The results driven by disagreement on FOMC
- ▶ Substantial heterogeneity in expressed uncertainty

Measurement: Details

Measurement: Details

Measuring PMU

Construction of policymakers' uncertainty (PMU) indices

- ▶ Assumption:
  PMU correlates with the frequency of policymakers' expression of uncertainty

- ▶ Approach:
  Word embeddings for risk and uncertainty in the economy round

Dictionary $\mathcal{U}$

- Word embeddings:
  - Neighbors for 'risk(s)' contain terms associated with the quantification of known probability
    (e.g., 'probability', 'likelihood', 'odds')
  - Neighbors for 'uncertain(ty)' suggest unquantifiable uncertainty and associated concerns
    (e.g., 'angst', 'unclear', 'skepticism', 'ambiguity')
- Treatment of word "risk":
  - Exclude phrases like "risk spread", "balance of risks," ...
- Deal with negations:
  - Not, no, don't, never, less, ...
  - Neutralises rather than reduces uncertainty

Measuring topic-specific PMU

- ▶ Different uncertainty types can induce different policy behavior ⌒[Channels]
- ▶ Isolate three types of uncertainty to construct topic-specific PMUs
    - Inflation: *InfPMU*
    - Real economy: *EcoPMU*
    - Financial markets: *MktPMU*

Measuring topic-specific PMU: Steps

1. Identify (non-negated) uncertainty sentence according $\mathcal{U}$ phrases from *word embeddings*
   - Sentence-level count of uncertainty terms:

$$u_{t,s} = \sum_n \mathbb{1}(\mathbf{w}_{t,s,n} \in \mathcal{U}) \tag{4}$$

2. Search this sentence for topic phrases:
   - If an inflation phrase appears in the window $\Rightarrow u_{t,Inf,s} \uparrow$ by $u_{t,s}$
   - If a real economy phrase appears in the window $\Rightarrow u_{t,Eco,s} \uparrow$ by $u_{t,s}$
   - If a financial markets phrase appears in the window $\Rightarrow u_{t,Mkt,s} \uparrow$ by $u_{t,s}$

3. If no topic phrase identified, expand to a 3-sentence window around identified uncertainty word and repeat search

4. If no topic phrase in the 3-sentence window, $Oth \uparrow +1$

5. Uncertainty indices - zzz captures the 3 topics:

$$zzzPMU_t = \frac{\sum_s \mathbf{u}_{t,z,s}}{\sum_s |\mathbf{w}_{t,s}|} \tag{5}$$

where $|\mathbf{w}_{t,s}|$ is sentence length after standard pre-processing steps.

Structure of FOMC meetings reflected in transcripts

- ▶ Exploit regular structure of the FOMC meetings

1. **[Market round]** Discussion of financial market conditions
   1.1 Staff presentation on market conditions and OMO
   1.2 Q & A on staff presentation
   1.3 FOMC member discussions
2. **[Economy round]** Discussion of economic conditions → PMU and sentiment
   2.1 Staff presentation on economic conditions
   2.2 Q & A on staff presentation
   2.3 FOMC member presentations on economic conditions
3. **[Policy round]** Discussion of appropriate monetary policy
   3.1 Staff presentation on policy alternatives
   3.2 Q & A on policy alternatives
   3.3 FOMC members state and justify preferred alternative → Policy stance
4. Other sections include pleasantries, post elections, special topics, etc.

Measurement: Details

Measuring Stance

Identifying policy stance from language in the policy round

- Rules to classify a sentence as referring to monetary policy

Identifying policy stance from language in the policy round

- Rules to classify a sentence as referring to monetary policy
  - A. If any of **['federal funds rate', 'funds rate', 'target rate', 'policy rate', 'interest rate', 'taylor rule', 'alternative a', 'alternative b', 'alternative c', 'directive', 'language', 'statement', 'symmetry', 'asymmetry', 'hawkish', 'dovish']** found in sentence
  - B. If **'policy'** found in sentence *but not* any of ['fiscal policy', 'supervisory policy', 'public policy', 'budget* policy', 'tax policy', 'housing policy','regulatory policy', 'ecb policy', 'economic policy', 'government policy', 'inventory policy', 'health care policy', 'macro policy', 'macroeconomic policy', 'spending policy'] or ['legislation', 'law', 'regulation']
  - C. If **'basis point'** is in sentence with any of **['cut*', 'hik*', 'eas*', 'tighten*', 'action*', 'mov*', 'firming', 'recom-mendation', 'reduction', 'increase']** but *not* when 'increase' occurs with ['cpi', 'inflation', 'yield*', 'treasury']
  - D. If **'purchase*'** is in sentence and immediately preceded by {mortgage backed securities, mbs, asset, treasur*, agency debt}, starting from 2009

Identifying policy stance from language in the policy round

- Rules to classify a sentence as referring to monetary policy
- Focus on statements by the FOMC members (not staff) in the policy round
- Separate hawk/dove leaning by matching policy terms with directional language
  - Match within subsentence for precision
  - Deal with negations
  - Measure frequency of hawk/dove language scaled by number of words in the policy round

Identifying policy stance from language in the policy round

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  - Match within subsentence for precision
  - Deal with negations
  - Measure frequency of hawk/dove language scaled by number of words in the policy round
- ▶ Summarize policy stance with a balance variable at each meeting

$$HD_t = Hawk_t - Dove_t \tag{6}$$

Measurement: Details

Measuring Sentiment

Sentiment / Directional Language

- ▶ Measure higher-order-moments and disagreement using directional language
  - Directional concerns should proxy for the worries attached to tail risks.
- ▶ Build these sentiment measures using our own Fed-specific dictionary
  - Dictionary method also employed in Hassan et al (2019) and Shapiro & Wilson (2022)
- ▶ Extract sentiment in the economy round (scaled by word count):
  - Falling (rising) inflation $\rightarrow$ *InfNeg* (*InfPos*)
  - Weakening (strengthening) economic activity $\rightarrow$ *EcoNeg* (*EcoPos*)
  - Deteriorating (improving) financial conditions $\rightarrow$ *MktNeg* (*MktPos*)
- ▶ Exclude all sentences that we use to obtain the PMU indices.
- ▶ Balance measures as the difference between the positive and negative sentiment,
  - e.g., $InfSent_t = InfPos_t - InfNeg_t$.
  - Increases in the balance indicate a positive tilt in views about a given variable.

'Credibility matters in theory, and it is certainly believed to matter in practice'

- ▶ Standard DSGE models: discretion vs commitment.
  - Commitment technology $\Rightarrow$ set and forget
    - Debortoli and Nunes (2014) - loose commitment
  - Central bankers: earned "by building a track record for honesty and inflation aversion"

- ▶ Older literature on signalling
  - Cukierman (1986), Backus & Driffill (1985 x 2), Hansen & McMahon (2016),

- ▶ Carvalho, Eusepi, Moench & Preston (2022) and Gati (2022)
  - Optimal policy is to be aggressive in the response to movements in LR π^e

- ▶ Bianchi & Melosi (2018)
  - Constrained discretion in monetary policy.
  - CB can deviate from active inflation stabilisation temporarily
  - The cost is deanchoring inflation expectations

- ▶ Inflation scares
  - Goodfriend (1993), King & Lu (2022), Orphanides and Williams (2005)

Past Greenbook forecast errors predict PMU

| | A. Absolute forecast errors | | | B. Forecast errors | |
	(1) $InfPMU_t$	(2) $EcoPMU_t$		(1) $InfPMU_t$	(2) $EcoPMU_t$
$\lvert\overline{FE}_t(g)\rvert$	-0.308***	-0.013	$\overline{FE}_t(g)$	0.058	-0.205**
	(-4.56)	(-0.15)		(0.54)	(-2.14)
$\lvert\overline{FE}_t(\pi)\rvert$	0.382***	-0.038	$\overline{FE}_t(\pi)$	0.150	0.144
	(4.82)	(-0.53)		(1.26)	(1.60)
$\bar{R}^2$	0.15	-0.0069	$\bar{R}^2$	0.021	0.041
N	227	227	N	227	227

▶ Policymakers are more uncertain about inflation after large inflation surprises (in either direction)

▶ Less evidence of systematic relationship between forecast errors and uncertainty about real economy

Private sector forecast dispersion

A. Inflation

B. Real economy

InfPMU — CPI infl forecast dispersion

EcoPMU — RGDP growth forecast dispersion
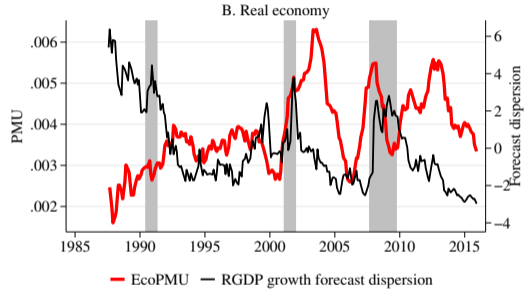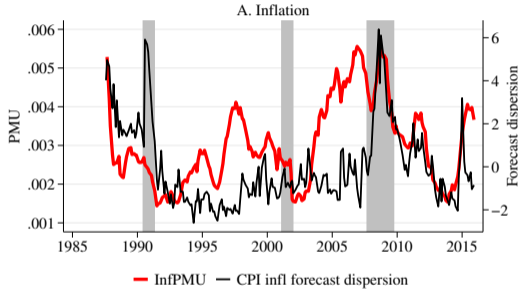
▶ PMU $\neq$ measures of private sector uncertainty and/or disagreement

Narrative Evidence: Bernanke

1. May 2004

   "From a risk-management perspective, as we begin to raise rates we should weigh the risk of significantly impeding the labor market recovery against the risk of having to scramble to adjust to unexpectedly adverse inflation developments."

Narrative Evidence: Bernanke

1. May 2004

2. March 2006
   "I took from the group some sense of at least a slight upside risk to inflation, reflecting the increasing resource utilization; the fact that inflation is somewhat on the high side of what many people describe as their comfort zone; and the fact that, if inflation does rise, there will be costs to bringing it back down and maintaining our credibility."

1. Melzer (St Louis, 1997)
   "My reading of the economy supports the conclusion that we are at risk of losing the hard-won credibility of our commitment to hold inflation at 3 percent."

Narrative Evidence: Others

1. Melzer (St Louis, 1997)

2. Guynn (Atlanta, May 1997)
   "a unique opportunity with little downside risk to lean a bit more against the expected upward creep in inflation that most of us are forecasting and, in doing so, to underscore our resolve and credibility in the minds of financial market participants, business decisionmakers, and the general public."

Narrative Evidence: Others

1. Melzer (St Louis, 1997)

2. Guynn (Atlanta, May 1997)

3. Ferguson (Board, December 1999)
   The FOMC "should not be afraid to act in a well-modulated fashion in order to maintain our hard fought victory over inflation and also our credibility."