Brookings: Fed Framework Review

# Did I make myself clear? The Fed and the market in the post-2020 framework period

Anna Cieślak | Duke Fuqua, NBER, and CEPR
Michael McMahon | Oxford University, CEPR, CfM, and Irish Fiscal Advisory Council
Hao Pang | Duke Fuqua

June 14, 2024

# Communication and long-term rates in 2020 framework

- Statement on Longer-Run Goals and Monetary Policy Strategy, opening paragraph

  *"The Federal Open Market Committee (FOMC) is firmly committed to fulfilling its statutory mandate from the Congress of promoting maximum employment, stable prices, and moderate long-term interest rates. The Committee seeks to explain its monetary policy decisions to the public as clearly as possible. Such clarity facilitates well-informed decisionmaking by households and businesses, reduces economic and financial uncertainty, increases the effectiveness of monetary policy, and enhances transparency and accountability, which are essential in a democratic society.*

  *Employment, inflation, and long-term interest rates fluctuate over time in response to economic and financial disturbances. Monetary policy plays an important role in stabilizing the economy in response to these disturbances. (...)"*

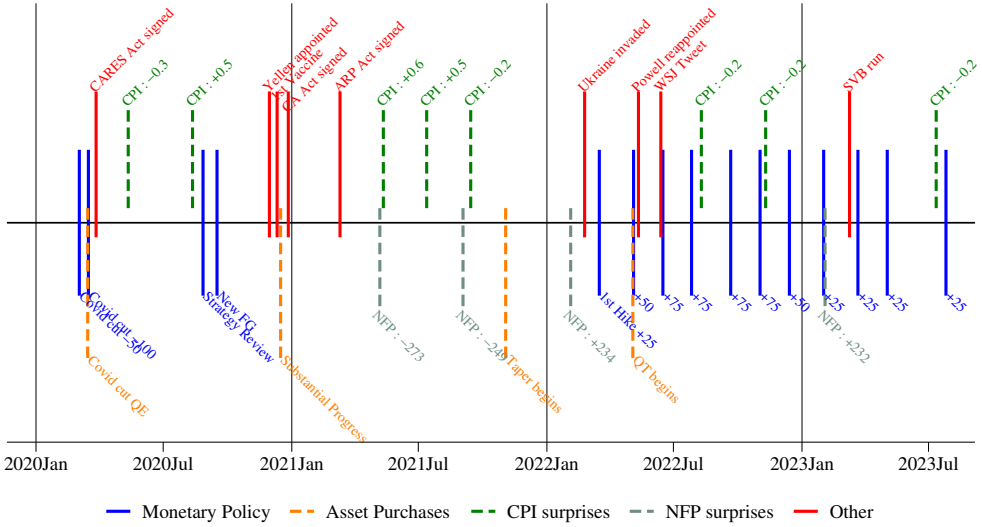
- Long-term rates and clear communication central in achieving Fed's objectives

# Why clear communication matters for long-term rates and Fed goals?

- Fed's *actions* + **words** → long-term rates → financial conditions → economic objectives
  - Models: Inflation and output gap as functions of expected future real interest rate gaps
  - Policy stance: current policy rate + market's expectations of future rates
- Long-term rates = short-rate expectations + term premia
- Fed-induced uncertainty channel:

  *Market perceptions of policy "mistakes" due to communication failures can raise term premia against policy intentions*

# Last five years have been rife with new unknowns



# Lessons

1. *Reaction function* as focal point of FOMC communication
2. Well-argued policymakers' *economic assessments* integral to reaction function
3. Framework and communication need to reflect *uncertainty* inherent in policymaking
4. Monetary policy requires *managing* inflation expectations, but *not micro*-managing
5. Explicit FG can be *constraining*; appearance of being constrained can undo intended policy

# Diagnosis of post-2020 period

**The Fed ...**

1. Framework focused on one dominant scenario
   - ELB, too low inflation, objectives' complementarity
2. But got tested on alternative scenario with ex-ante non-zero probability
   - "Unlucky" inflationary shocks: Covid supply, fiscal demand, Russia's Ukraine invasion
3. Attempt to establish credibility for the new framework + FG
   - Reduced risk management
   - Delayed inflation response

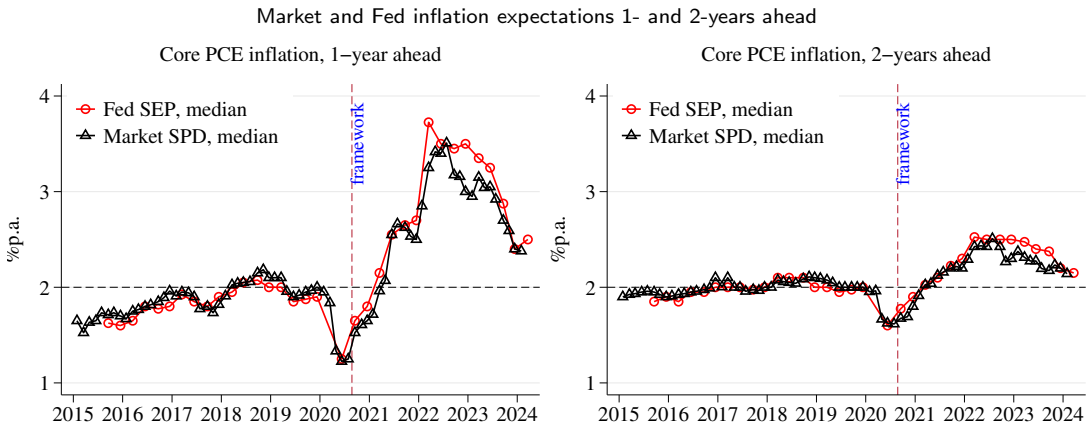
*"Though hard to imagine now, high inflation might one day be a problem again, and another revamp of its principles could be in order." – WSJ, Greg Ip, Aug 27, 2020*

# Diagnosis of post-2020 period

**... and the market**

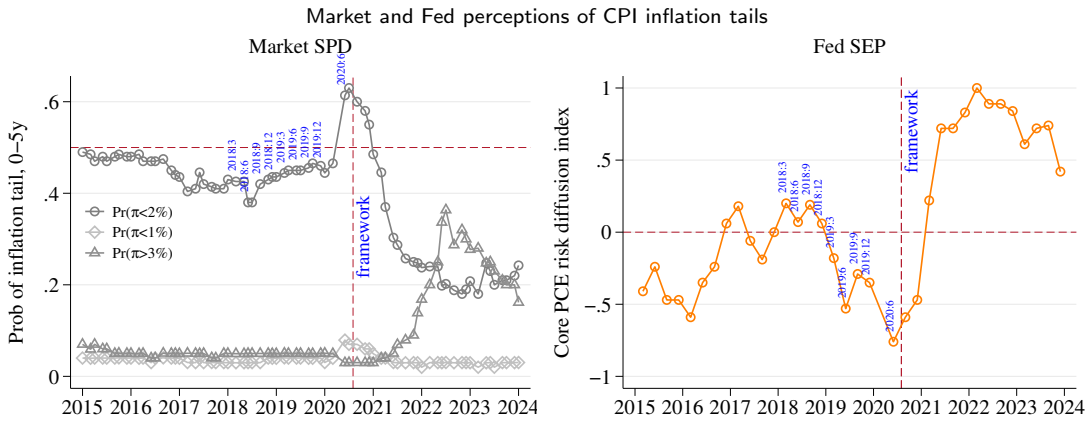
4. FOMC's post-framework communication sowed uncertainty about reaction function
5. Concerns about policy mistakes raised term premia undermining easy financial conditions Fed aimed for initially
6. Hawkish 2022 pivot prevented, in part, premium increases on disappointing macro news

# Fed and market inflation expectations broadly agreed




- Expectations broadly agreed, and so did forecast errors

# Market seemed less worried about undershoots pre-Covid




- Market SPD: Stable left inflation tail 2018–19

  Note: Pr(PCE infl <2%) = 56.5% in 2018:6; = 57.5% in 2019:4 (when available in SPD)

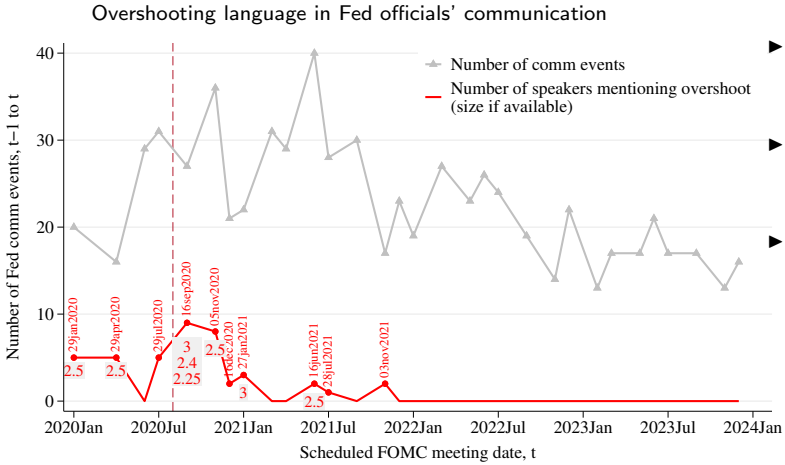
- Fed SEP: Shift from balanced to significant inflation downside risk assessment 2018:12–19:6

# Communication successes and failures

# Communication successes and failures in 2021/22

- Framework was, by flexible design, unspecific about implementation
- **FA**IT modifiers were challenging to explain, while public sought clarity
- FG was a communication success, initially: Anchored short-rate expectations
- But failure overall: FOMC appeared constrained
- Inconsistent communication induced public uncertainty about reaction function

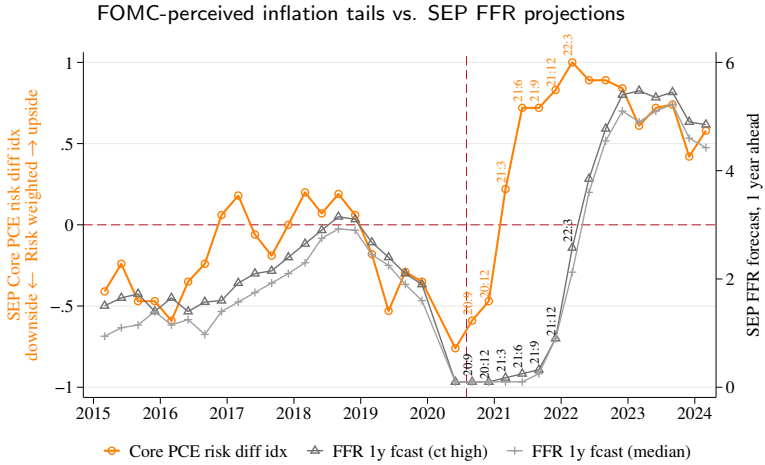
# Framework was by design unspecific about implementation




- Willingness to overshoot 2% and remove preemption was communicated well in advance
- Public sought clarity, but questions about FAIT modifiers turned out challenging
- No agreement among policymakers on key parameters

Note: Market noteworthy quotes; Goldman Sachs' Chatterbox (771 distinct intermeeting individual speaking events, 2019:12–2023:12); our coding of overshooting from Chatterbox quotes

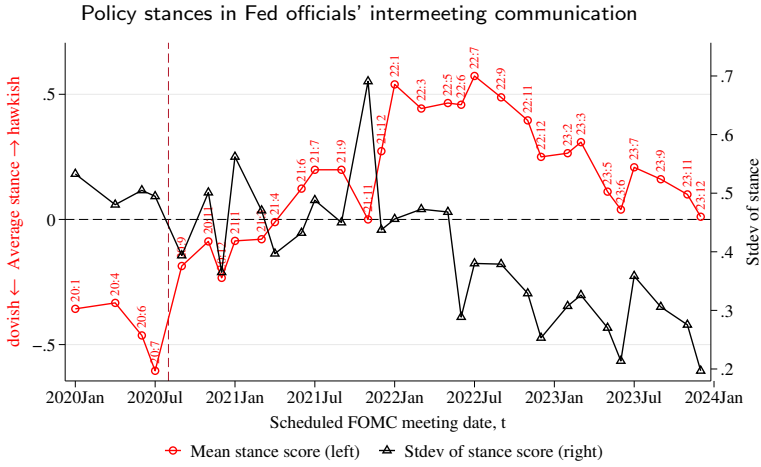
# FOMC appeared constrained by framework + FG in 2021




- Initial building of credibility for framework and FG Sep/Dec 2020
- Diminished sensitivity to upper inflation tails
- Removing preemption weakened risk management

Note: SEP risk diffusion index: (#participants judge risk to upside of their projections) − (#participants judge risk to downside of their projections)/total # of participants; Fed's own FFR forecasts (central tendency and median).

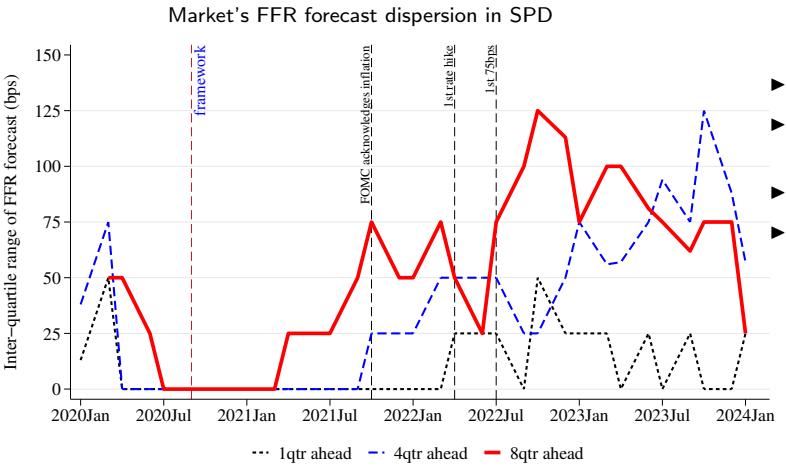
# Members communicated divergent policy stances until 2022 pivot




- Less dovish/more hawkish communication already mid-2021
- But high dispersion across individuals until mid-2022
- More uniform after June 2022 pivot

Note: Our coding of individual policy stances in GS Chatterbox quotes (1,278 quotes); Scores $\{-1, -.5, 0, +0.5, +1\}$; Average score and standard deviation over intermeeting period $t-1, t$

# Communication fostered market's confusion about reaction function




- Lower-for-longer clearly communicated
- 2020/21 little disagreement about immediate policy
- But more disagreement about future
- *Not* explained by macro disagreement

- Disagreement about FFR path comoves with public uncertainty about Fed's reaction function *(next)*

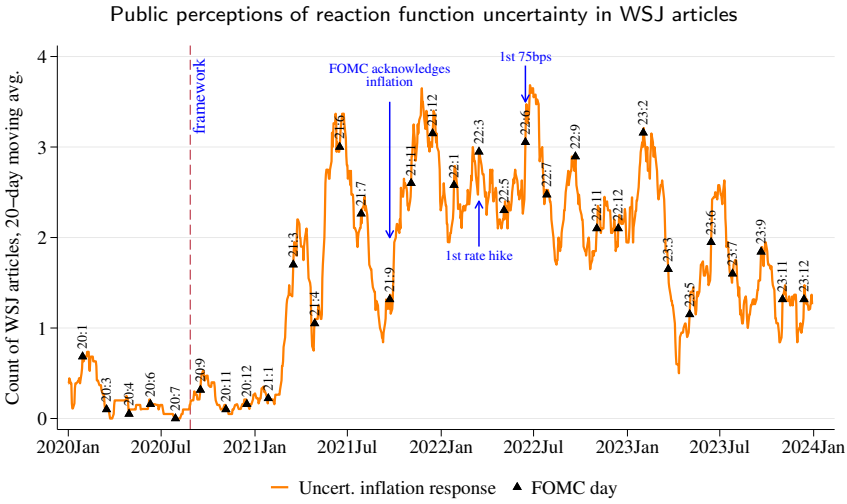
# Measure public uncertainty about Fed's reaction function from narratives

- Use WSJ articles to track public assessments of Fed's communication
  - Factiva: 7784 unique document ids
  - Sample: 2020:01–2023:12
- Elicit public perceptions of uncertainty (ChatGPT)

  *Q: Does the article suggest uncertainty about Fed's policy stance and what is the uncertainty about?*

  Write answer as: {Yes/No} {response to inflation /response to real economy /inflation targets /communication /Fed's macroeconomic projections /Fed policy framework /dot plots} {explanation less than 25 words}
- Articles indicating some form of Fed-driven uncertainty = 38% of all articles
  - Uncertainty about inflation response = 23%
  - Uncertainty about real economy response = 10%

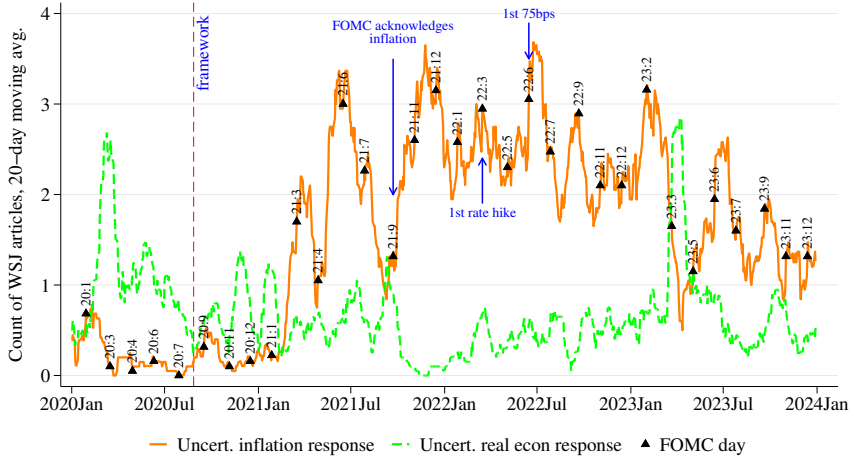
# Communication fostered market's confusion about reaction function




- Longer-horizon FFR dispersion in SPD comoves positively with WSJ-based inflation-response uncertainty index

# Communication fostered market's confusion about reaction function

Public perceptions of reaction function uncertainty in WSJ articles




- Longer-horizon FFR dispersion in SPD comoves positively with WSJ-based inflation-response uncertainty index

# Implications for interest rates

# High-frequency event study

- Study yield changes at high-frequency within narrow windows
- Assess contribution of Fed communication vs. macro news

| FOMC events | | |
|---|---|---|
| Type | Count† | Window (min) |
| Monetary policy decisions (MPD) | 24 | −10,+20 |
| Chair Press conferences (PC) | 24 | −10,+120 |
| Minutes | 25 | −10,+20 |
| Speeches and other intermeeting comms (FOMC speak)* | 480 | 0,+120 |

| Macro events | | |
|---|---|---|
| Type | Count† | Window (min) |
| CPI | 37 | −10,+20 |
| PPI final demand | 37 | −10,+20 |
| Nonfarm payroll | 37 | −10,+20 |
| GDP | 37 | −10,+20 |
| Initial jobless claims | 161 | −10,+20 |
| ISM manufacturing | 37 | −10,+20 |
| Consumer confidence | 37 | −10,+20 |
| Advance retail sales | 37 | −10,+20 |

† Counts are for the 2020:08–2023:08 sample, when FOMC speak ends

* The following filters are applied to the individual communication events over the intermeeting period: (1) Event window: 0 to +120min trading window; (2) Drop non-trading day entries (12 events happened on non-trading days, weekends, etc.); (3) Speakers included are Barkin, Bostic, Brainard, Bullard, Clarida, Daly, Evans, George, Harker, Kaplan, Kashkari, Mester, Powell, Waller, Williams; (4) Keep events when the speakers' name was mentioned by WSJ on day 0, +1, or +2 of the event; (5) Manually check big moves (e.g., exclude Nov 9, 2020 vaccine announcement; include Jun 13, 2022 WSJ Timiraos' tweet).

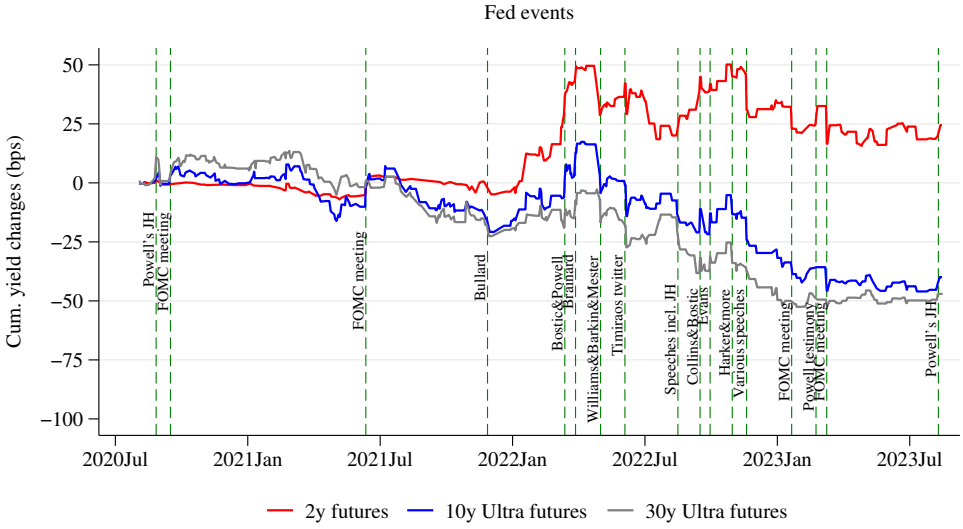
# Cumulative yield changes around Fed and macro events

Cumulative yield changes (bps) from 2020:08 to 2023:08

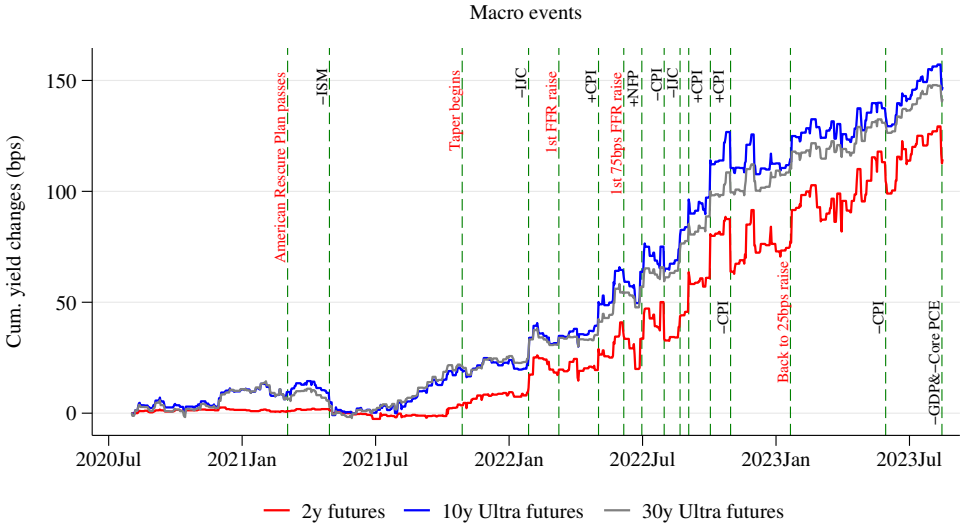
| Sample | Asset | **Total yld chng (bps)** | Fed events | | | | | Macro | Resid. |
|---|---|---|---|---|---|---|---|---|---|
| | | | MPD | PC | Min. | Speak. | All | | |
| 2020:8-2023:8 | 2y | **423** | 31 | -61 | 2 | 49 | 24 | 115 | 285 |
| | 10y | **359** | 28 | -49 | -3 | -16 | -40 | 147 | 252 |
| | 30y | **325** | 24 | -28 | -1 | -42 | -46 | 142 | 230 |
| Total count | | **959 (days)** | 24 | 24 | 25 | 480 | 553 | 357 | |

- 10y yield rose **360 bps** (2020:08–2023:08)
  - 30-minute macro windows: **150 bps** (41% of total)
  - Fed communication windows: **−40 bps** (−11% of total)
  - Residual outside macro and Fed windows: **250 bps** (70% of total)
- Markets revise beliefs about appropriate policy stance in response to macroeconomic events
- Revisions in short-rate expectations and/or market's changing risk perceptions?

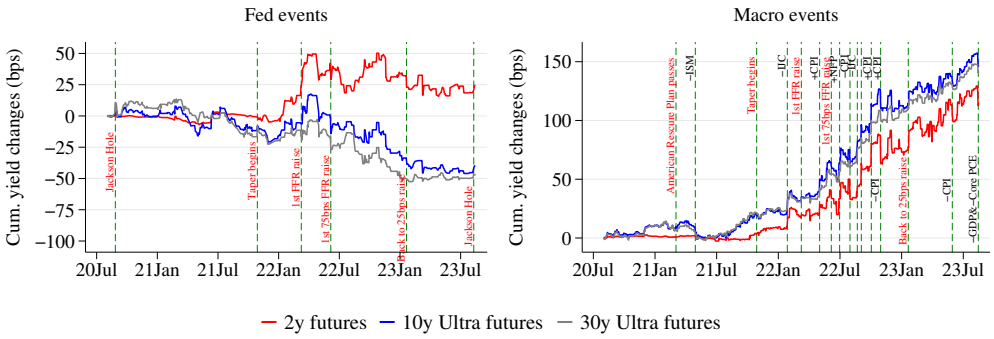
# Cumulative yield changes around Fed communication events



# Cumulative yield changes around macro events

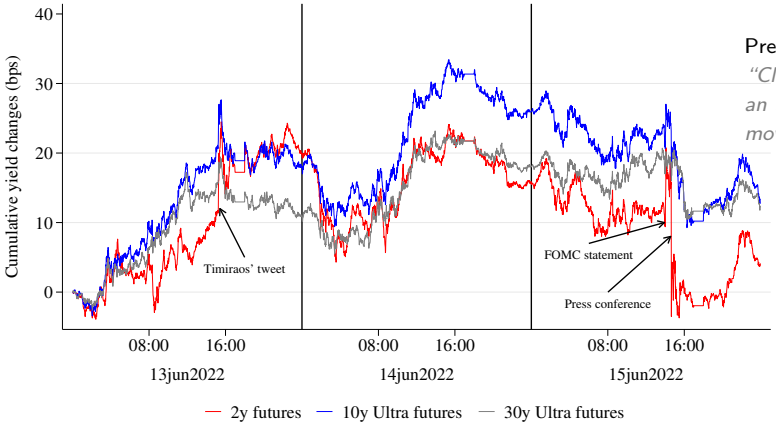


# Fed and macro events side by side




- 2020 framework - mid-2021: Short yields fixed, some long yields increase
- Mid-2021 - early-2022: Short yields fixed, long yields fall on less dovish Fed comm (taper and rates)
- Mid-2022+: Fed communication, in part, countervails long yield increases occurring around macro announcements

# Communication can create large market volatility: June 2022 75 bps move




Press conference:

*"Clearly, today's 75 basis point increase is an unusually large one, and I do not expect moves of this size to be common."*

- Market: 75 bps as shift in timing, no fundamental change in stance or terminal rate
- Benefit: Signal ability to move faster than expected
- Cost: Fed seen as "overreacting to news"; "panicking"; "confusing investors"

# Term premia or short-rate expectations?

- *Main idea:* [Model ↷]

  *Fed-induced uncertainty affects term premia via market-perceived probability of policy mistakes*

$$\text{Yield}^n = \text{Short-rate expectations } (\mathbf{EH})^n + \text{Term premium } (\mathbf{TP})^n$$

# Term premia or short-rate expectations?

- *Main idea:* [Model ↷]
  *Fed-induced uncertainty affects term premia via market-perceived probability of policy mistakes*

$$\text{Yield}^n = \text{Short-rate expectations } (\mathbf{EH})^n + \text{Term premium } (\mathbf{TP})^n$$

- Kim-Wright (KW) decomposition
  - **EH** vs. **TP**
- Cieslak-Pang (CP) decomposition:
  - **EH** = monetary news (**MP**) and growth news (**G**)
  - **TP** = common premium news (**CRP**) and hedging premium news (**HRP**)

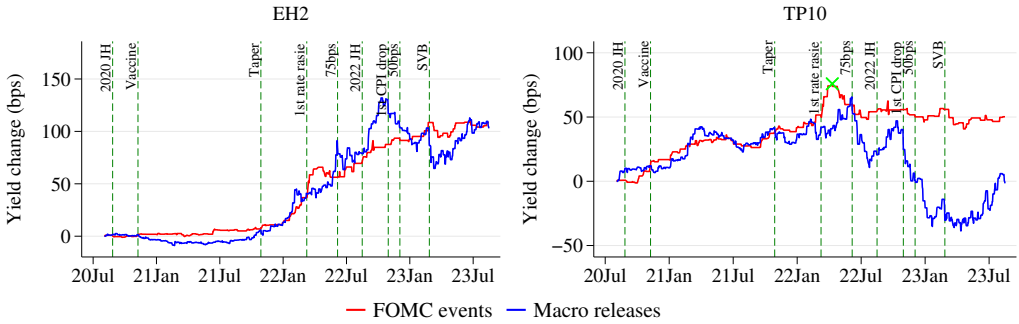
# Term premia or short-rate expectations?

- *Main idea:* [Model ↷]
  *Fed-induced uncertainty affects term premia via market-perceived probability of policy mistakes*

$$\text{Yield}^n = \text{Short-rate expectations } (\mathbf{EH})^n + \text{Term premium } (\mathbf{TP})^n$$

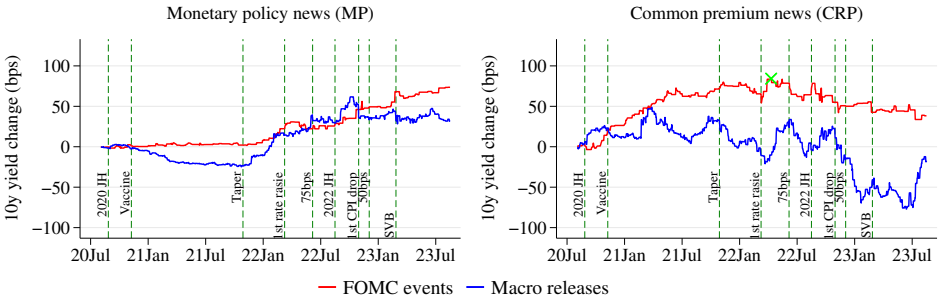
- Kim-Wright (KW) decomposition
  - **EH** vs. **TP**
- Cieslak-Pang (CP) decomposition:
  - **EH** = monetary news (**MP**) and growth news (**G**)
  - **TP** = common premium news (**CRP**) and hedging premium news (**HRP**)
- Identifying Fed-induced uncertainty $\sim$ **CRP**
  - Moves risk premium in stocks and bonds in same direction
  - Affects long-maturity yields more than short-maturity yields

# Term premia or short-rate expectations? KW decomposition



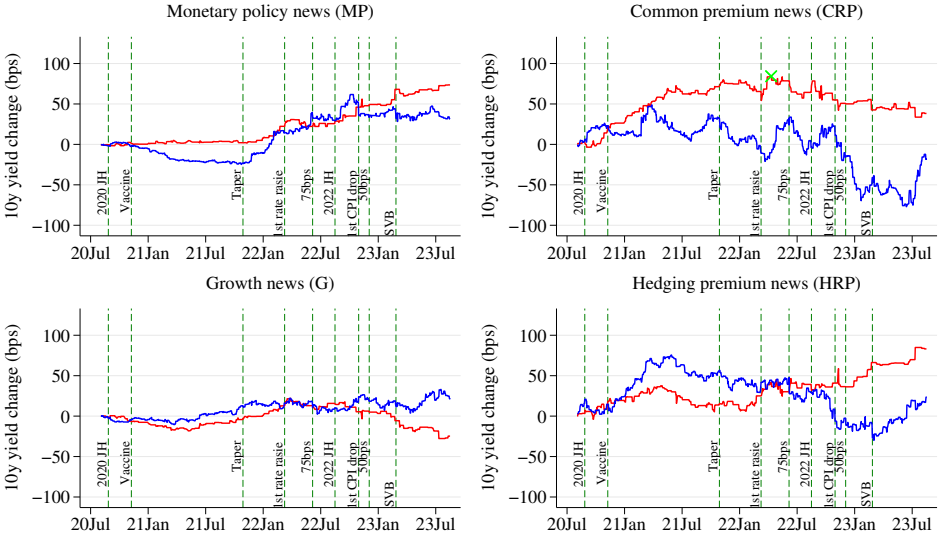

- EH (left): 2y short-rate expectations stable through late 2021, as Fed intended
- TP (right): 10y term premia cumulatively increased up to 144bps until Jun 2022
  - Fed events = 60bps↑ (× peak at 76bps on Apr 19, 2022)
  - Macro days = 66bps↑

# Term premia or short-rate expectations? CP decomposition




- MP (left): No updating on monetary policy short-rate news, as Fed intended
- CRP (right): Common risk premium peaks at 84 bps on Apr 19, 2022 ($\times$)
  - Coincides with Fed officials' communication shift from dovish to consistently hawkish
  - Fed-induced uncertainty channel

# Term premia or short-rate expectations? CP decomposition



# Yield sensitivity to core CPI inflation surprises

Regression of yield changes on core CPI yoy inflation surprises, 2016–2023

| | Yields, $\Delta y^{(n)}$ | | KW decomposition | | CP decomposition, $\Delta y^{10}(\text{news}_i)$ | | | |
|---|---|---|---|---|---|---|---|---|
| | 2y | 10y | *EH2* | *TP10* | *MP* | *G* | *CRP* | *HRP* |
| $D_{16:01,20:02} \times$ CPICsurp | 0.098** | 0.088 | | | | | | |
| | (2.27) | (1.60) | | | | | | |
| $D_{20:03,20:12} \times$ CPICsurp | 0.025* | 0.13*** | | | | | | |
| | (1.98) | (3.95) | | | | | | |
| $D_{21:01,22:02} \times$ CPICsurp | 0.076* | 0.13*** | | | | | | |
| | (1.72) | (3.59) | | | | | | |
| $D_{22:03,23:12} \times$ CPICsurp | 0.86*** | 0.49** | | | | | | |
| | (4.31) | (2.14) | | | | | | |
| $\overline{R}^2$ | 0.41 | 0.20 | | | | | | |
| N | 96 | 96 | | | | | | |

Dummies: $D_{16:01,20:02}$: pre-Covid; $D_{20:03,20:12}$: Covid shock, early recovery, framework review; $D_{21:01,22:02}$: large inflationary surprises, no rate hikes; $D_{22:03,23:12}$: active rate hikes; constant not shown; robust standard errors; CPICsurp stdev = 0.15pp, max=0.7pp

# Yield sensitivity to core CPI inflation surprises

Regression of yield changes on core CPI yoy inflation surprises, 2016–2023

| | Yields, $\Delta y^{(n)}$ | | KW decomposition | | CP decomposition, $\Delta y^{10}(\text{news}_i)$ | | | |
|---|---|---|---|---|---|---|---|---|
| | 2y | 10y | *EH2* | *TP10* | *MP* | *G* | *CRP* | *HRP* |
| $D_{16:01,20:02} \times$ CPICsurp | 0.098** | 0.088 | 0.044** | 0.054* | | | | |
| | (2.27) | (1.60) | (2.30) | (1.86) | | | | |
| $D_{20:03,20:12} \times$ CPICsurp | 0.025* | 0.13*** | 0.014* | 0.055*** | | | | |
| | (1.98) | (3.95) | (1.73) | (3.72) | | | | |
| $D_{21:01,22:02} \times$ CPICsurp | 0.076* | 0.13*** | 0.038* | 0.057*** | | | | |
| | (1.72) | (3.59) | (1.88) | (3.35) | | | | |
| $D_{22:03,23:12} \times$ CPICsurp | 0.86*** | 0.49** | 0.42*** | 0.22** | | | | |
| | (4.31) | (2.14) | (4.56) | (2.02) | | | | |
| $\overline{R}^2$ | 0.41 | 0.20 | 0.44 | 0.18 | | | | |
| N | 96 | 96 | 96 | 96 | | | | |

Dummies: $D_{16:01,20:02}$: pre-Covid; $D_{20:03,20:12}$: Covid shock, early recovery, framework review; $D_{21:01,22:02}$: large inflationary surprises, no rate hikes; $D_{22:03,23:12}$: active rate hikes; constant not shown; robust standard errors;
CPICsurp stdev = 0.15pp, max=0.7pp

# Yield sensitivity to core CPI inflation surprises

Regression of yield changes on core CPI yoy inflation surprises, 2016–2023

| | Yields, $\Delta y^{(n)}$ | | KW decomposition | | CP decomposition, $\Delta y^{10}(\text{news}_i)$ | | | |
|---|---|---|---|---|---|---|---|---|
| | 2y | 10y | *EH2* | *TP10* | *MP* | *G* | *CRP* | *HRP* |
| $D_{16:01,20:02} \times$ CPICsurp | 0.098** | 0.088 | 0.044** | 0.054* | 0.011 | 0.034* | 0.049 | -0.0053 |
| | (2.27) | (1.60) | (2.30) | (1.86) | (0.98) | (1.79) | (1.08) | (-0.12) |
| $D_{20:03,20:12} \times$ CPICsurp | 0.025* | 0.13*** | 0.014* | 0.055*** | -0.039*** | 0.016 | 0.015 | 0.14*** |
| | (1.98) | (3.95) | (1.73) | (3.72) | (-4.80) | (1.57) | (0.45) | (4.54) |
| $D_{21:01,22:02} \times$ CPICsurp | 0.076* | 0.13*** | 0.038* | 0.057*** | 0.015 | 0.0051 | 0.12*** | -0.012 |
| | (1.72) | (3.59) | (1.88) | (3.35) | (1.26) | (0.30) | (3.63) | (-0.83) |
| $D_{22:03,23:12} \times$ CPICsurp | 0.86*** | 0.49** | 0.42*** | 0.22** | 0.34*** | 0.092 | 0.15 | -0.094 |
| | (4.31) | (2.14) | (4.56) | (2.02) | (3.74) | (1.28) | (1.46) | (-0.73) |
| $\overline{R}^2$ | 0.41 | 0.20 | 0.44 | 0.18 | 0.44 | 0.044 | 0.095 | 0.041 |
| N | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 |

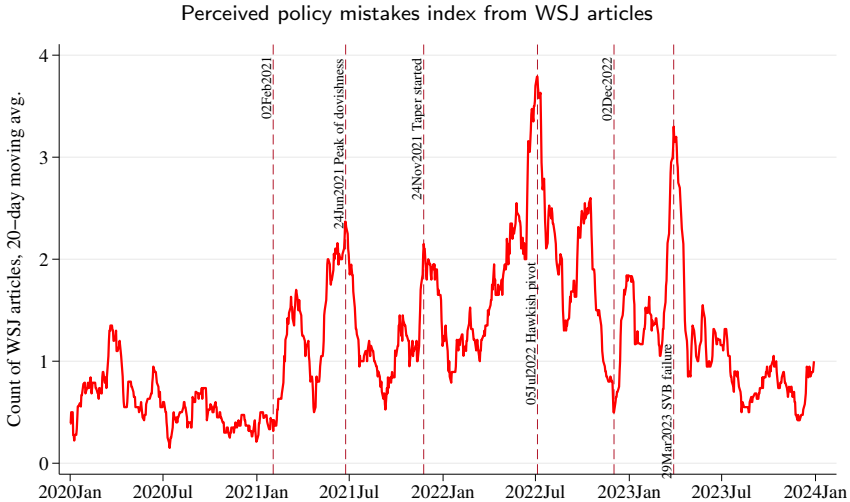
Dummies: $D_{16:01,20:02}$: pre-Covid; $D_{20:03,20:12}$: Covid shock, early recovery, framework review; $D_{21:01,22:02}$: large inflationary surprises, no rate hikes; $D_{22:03,23:12}$: active rate hikes; constant not shown; robust standard errors;
CPICsurp stdev = 0.15pp, max=0.7pp

- Pre-pivot: increased sensitivity of long yields to inflation surprises via term premium (CRP)
- Post-pivot: response via short-rate expectations updates

# Link yield curve movements to public perceptions of policy mistakes

- Measure time-varying public perceptions of policy mistakes from WSJ articles
  - ChatGPT: *Q: Does the article suggest that the public is concerned about possible Fed's policy mistake, error, incorrect decision?* {*Yes/No/not possible to determine*}
  - "Yes" = 17.5% of 7784 articles
- Newspaper narratives are ex-post reports of events that occurred; hence, we predict media perceptions with lagged asset prices

# Link yield curve movements to public perceptions of policy mistakes




Note: vertical lines mark selected major turning points

# Term premia comove with public perceptions of policy mistakes

Dependent variable: $\Delta$WSJ mistakes index $(t, t-20)$ days, regressed on 20-day $\Delta$ yield $(t-5, t-25)$ days

| | KW decomposition | | | CP decomposition | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| $\Delta EH2$ | -0.053<br>(-0.33) | | -0.162<br>(-0.85) | | | | | |
| $\Delta TP10$ | | 0.206**<br>(2.12) | 0.271***<br>(2.82) | | | | | |
| $\Delta y^{(10)}(MP)$ | | | | 0.018<br>(0.11) | | | | 0.070<br>(0.58) |
| $\Delta y^{(10)}(G)$ | | | | | -0.131<br>(-1.28) | | | -0.107<br>(-0.99) |
| $\Delta y^{(10)}(CRP)$ | | | | | | 0.371***<br>(4.28) | | 0.382***<br>(4.56) |
| $\Delta y^{(10)}(HRP)$ | | | | | | | -0.231<br>(-1.64) | -0.296**<br>(-2.46) |
| $R^2$ | 0.00 | 0.04 | 0.06 | 0.00 | 0.02 | 0.14 | 0.05 | 0.23 |
| N | 890 | 890 | 890 | 890 | 890 | 890 | 890 | 890 |

Sample: 2020:07–2023:12; $\Delta TP10^{\perp}$ TP change orthogonal to EH change;
Standardized coefficients, HAC standard errors with 36 lags; Robustness ↷

- Term premium (CRP) comoves positively with perceptions of policy mistakes

# Term premia decline on Fed's hawkish stance in speeches

Dependent variable: $\Delta$ yield components ($t-1$ to $t+3$), regressed on policy stance in speeches on day $t$

| | KW decomposition | | | | CP decomposition, $\Delta y^{10}(\text{news}_i)$ | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) $\Delta EH2$ | (2) $\Delta TP10$ | (3) $\Delta TP10^{\perp}$ | (4) $\Delta TP10$ | (5) *MP* | (6) *G* | (7) *CRP* | (8) *HRP* |
| Speeches-$HD_t$ | 0.118 | -0.097 | -0.203*** | -0.174*** | 0.201* | -0.020 | -0.199*** | 0.103 |
| | (1.06) | (-1.25) | (-3.36) | (-3.60) | (1.76) | (-0.22) | (-3.19) | (1.14) |
| $\Delta EH2$ | | | | 0.650*** | | | | |
| | | | | (5.89) | | | | |
| Sentiment$_t$ | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| PC-$HD_{t-}$ | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $R^2$ | 0.09 | 0.01 | 0.10 | 0.40 | 0.06 | 0.01 | 0.04 | 0.04 |
| N | 187 | 187 | 187 | 187 | 187 | 187 | 187 | 187 |

Sample: 2020:07–2023:12; Chair, Vice Chair, governors' speeches;
Controls: economic sentiments and latest press-conference policy stance; standardized coefficients

- Tougher policy language (Speeches-$HD_t \uparrow$) successfully countered term premium increases (post pivot)
- Effect independent of short-rate expectation movements

# Conclusions and recommendations for next review

# Conclusions

- Monetary policy is *"98% talk and only 2% action"* but *"cost of sending the wrong message can be high"* (Bernanke, 2015)
- With term premia involved, policymakers' *"grip on the steering wheel is not as tight as it otherwise might be"* (Stein, 2013)

- Effective communication reduces likelihood of market outcomes that are inconsistent with Fed's intentions and goals
- Despite progress, much more research is needed on
  - Optimal design of communication
  - Quantitative evaluation of communication successes and failures

# Conclusions

- Monetary policy is *"98% talk and only 2% action"* but *"cost of sending the wrong message can be high"* (Bernanke, 2015)
- With term premia involved, policymakers' *"grip on the steering wheel is not as tight as it otherwise might be"* (Stein, 2013)

- Effective communication reduces likelihood of market outcomes that are inconsistent with Fed's intentions and goals
- Despite progress, much more research is needed on
  - Optimal design of communication
  - Quantitative evaluation of communication successes and failures

# Risk management

> *[T]he conduct of monetary policy in the United States has come to involve, at its core, crucial elements of risk management. This conceptual framework emphasizes understanding as much as possible the many sources of risk and uncertainty that policymakers face, quantifying those risks when possible, and assessing the costs associated with each of the risks. In essence, the risk-management approach to monetary policymaking is an application of Bayesian decision-making.*
>
> *This framework also entails devising, in light of those risks, a strategy for policy directed at maximizing the probabilities of achieving over time our goals of price stability and the maximum sustainable economic growth that we associate with it. – Greenspan (2004)*

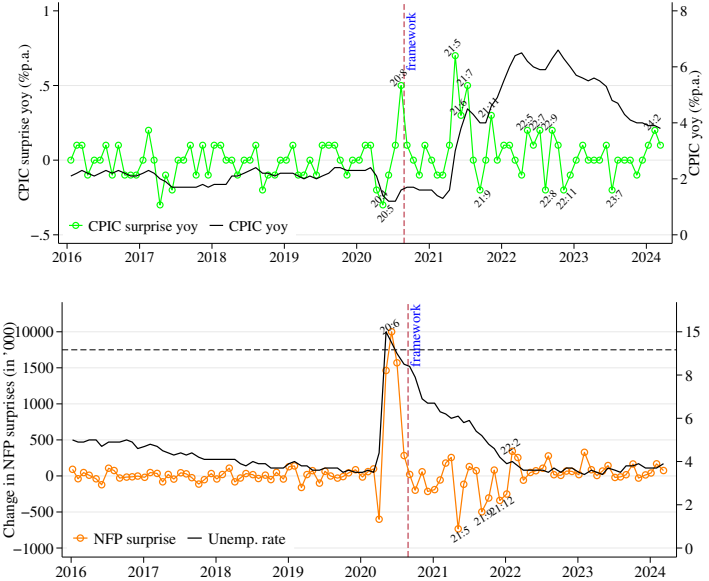
- Hallmark of Fed's policy deliberations 1987–2015 (Cieslak, Hansen, McMahon, Xiao, 2023)
- "Verbal" scenarios: Communication of forward-looking views that different-from-current policy may be needed reduces term premia (Cieslak, McMahon, 2024)
- Remains sensible guiding strategy today

# Specific recommendations

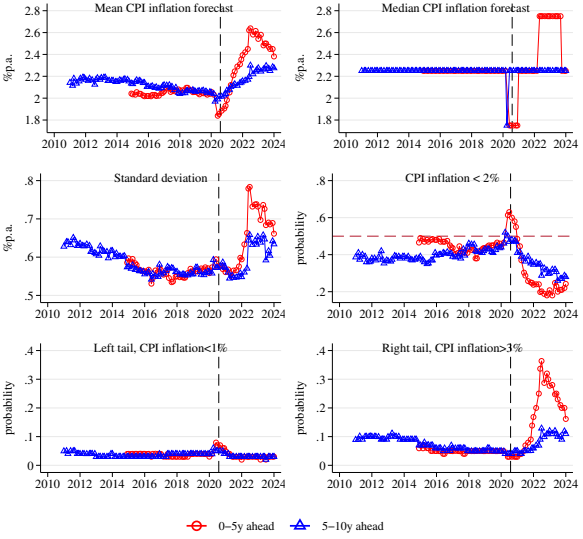
1. *Objective-oriented communication*
   - Communicate by tying decisions and actions to objectives, rather than fixed rules
   - Simpler: Cast in terms of "maximizing the probabilities of achieving"
2. *Inflation target with tolerance bands*
   - Worry less about relatively small under-/overshoots, learn shocks, smooth policy transitions
   - Tested by other CBs, easier to explain, less risk of inconsistent communications
3. *Scenario analysis*
   - Explain current economic assessment and circumstances that can change it
   - Helps communicate reaction function, uncertainty, and range of views held
4. *More direct communication of outlook and its rationalization*
   - Release connected SEP matrix (speeches likely to reveal dots, but releasing staff forecast harder)
   - Unconnected dots can add to market's uncertainty about reaction function
5. *Learning about public concerns to tailor communication in real time*

# Appendix

# Inflation and NFP surprises



# SPD inflation distributions

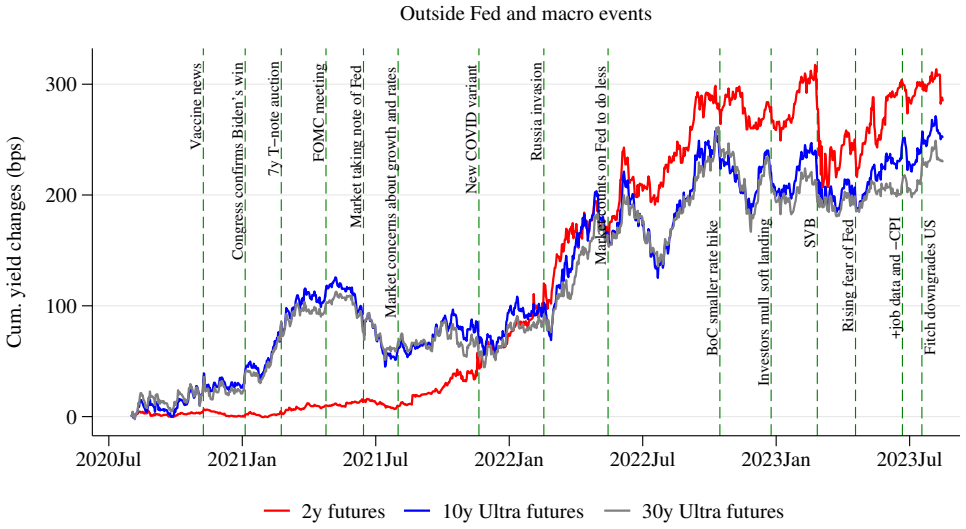



- NY Fed Survey of Primary Dealers (SPD)
- Subjective CPI inflation distributions
- Forecasters provide probabilities of CPI inflation falling in a given bin over 0-5y and 5-10y horizons

# Cumulative yield changes around Fed and macro events

| Sample | Asset | Total yld chng (bps) | Fed events | | | | | Macro | Resid. |
|---|---|---|---|---|---|---|---|---|---|
| | | | MPD | PC | Min. | Speak. | All | | |
| 2020:8-2023:8 | 2y | **423** | 31 | -61 | 2 | 49 | 24 | 115 | 285 |
| | 10y | **359** | 28 | -49 | -3 | -16 | -40 | 147 | 252 |
| | 30y | **325** | 24 | -28 | -1 | -42 | -46 | 142 | 230 |
| Total count | | **959 (days)** | 24 | 24 | 25 | 480 | 553 | 357 | |
| 2020:8-2020:12 | 2y | **1** | 0 | 0 | 1 | -2 | -1 | 2 | 0 |
| | 10y | **36** | 4 | -2 | 2 | -5 | 0 | 11 | 26 |
| | 30y | **38** | 5 | -3 | 3 | 1 | 6 | 11 | 21 |
| Count | | **130** | 3 | 3 | 3 | 98 | 107 | 51 | |
| 2021 | 2y | **67** | 6 | -5 | 1 | -6 | -3 | 8 | 63 |
| | 10y | **41** | 10 | -5 | 1 | -23 | -18 | 12 | 47 |
| | 30y | **30** | 8 | -3 | 0 | -31 | -26 | 13 | 43 |
| Count | | **311** | 8 | 8 | 8 | 206 | 230 | 115 | |
| 2022 | 2y | **322** | 19 | -20 | 0 | 34 | 35 | 67 | 221 |
| | 10y | **243** | 8 | -20 | -4 | 5 | -12 | 87 | 167 |
| | 30y | **224** | 4 | -13 | -4 | -13 | -24 | 78 | 170 |
| Count | | **310** | 8 | 8 | 8 | 128 | 152 | 116 | |
| 2023:1-2023:8 | 2y | **33** | 6 | -36 | 0 | 23 | -7 | 39 | 1 |
| | 10y | **39** | 6 | -23 | -1 | 6 | -10 | 37 | 12 |
| | 30y | **34** | 7 | -9 | -1 | 1 | -2 | 40 | -4 |
| Count | | **208** | 5 | 5 | 6 | 48 | 64 | 75 | |

# Cumulative yield changes outside Fed and macro events



# Illustrative framework

- Backward-looking macro block + "simple" Fed rule (as seen by the market)

$$
\begin{aligned}
x_t &= \rho_x x_{t-1} - \theta(i_t - \delta\pi_t) + \eta_t && \text{[IS, } \eta = \text{demand shock]} \\
\pi_t &= \rho_\pi \pi_{t-1} + \kappa x_t && \text{[PC, assume no cost-push shocks]} \\
i_t &= \phi_x x_t + \phi_\pi \pi_t + \varepsilon_t && \text{[}\varepsilon = \text{mp shock, perceived "mistake"]}
\end{aligned}
$$

- Real SDF innovations: $\tilde{m}_{t+1} = -\gamma \tilde{x}_{t+1}, \gamma > 0$

# Illustrative framework

- Backward-looking macro block + "simple" Fed rule (as seen by the market)

$$
\begin{aligned}
x_t &= \rho_x x_{t-1} - \theta(i_t - \delta\pi_t) + \eta_t && \text{[IS, } \eta = \text{demand shock]} \\
\pi_t &= \rho_\pi \pi_{t-1} + \kappa x_t && \text{[PC, assume no cost-push shocks]} \\
i_t &= \phi_x x_t + \phi_\pi \pi_t + \varepsilon_t && \text{[}\varepsilon = \text{mp shock, perceived "mistake"]}
\end{aligned}
$$

- Real SDF innovations: $\tilde{m}_{t+1} = -\gamma \tilde{x}_{t+1}, \gamma > 0$
- Risk premia

$$
\begin{aligned}
rp_t^{stock} &= \overbrace{(+)\sigma_\eta^2}^{\text{demand}} + \overbrace{(+)\sigma_\varepsilon^2}^{\text{mon. pol.}} \\
rp_t^{bond} &= \overbrace{(-)\sigma_\eta^2}^{\text{demand}} + \overbrace{(+)\sigma_\varepsilon^2}^{\text{mon. pol.}}
\end{aligned}
$$

# Illustrative framework

- Backward-looking macro block + "simple" Fed rule (as seen by the market)

$$
\begin{aligned}
x_t &= \rho_x x_{t-1} - \theta(i_t - \delta\pi_t) + \eta_t && \text{[IS, } \eta = \text{demand shock]} \\
\pi_t &= \rho_\pi \pi_{t-1} + \kappa x_t && \text{[PC, assume no cost-push shocks]} \\
i_t &= \phi_x x_t + \phi_\pi \pi_t + \varepsilon_t && \text{[}\varepsilon = \text{mp shock, perceived "mistake"]}
\end{aligned}
$$

- Real SDF innovations: $\tilde{m}_{t+1} = -\gamma \tilde{x}_{t+1}, \gamma > 0$
- Risk premia

$$
\begin{aligned}
rp_t^{stock} &= \overbrace{(+)\sigma_\eta^2}^{\text{demand}} + \overbrace{(+)\sigma_\varepsilon^2}^{\text{mon. pol.}} \\
rp_t^{bond} &= \overbrace{(-)\sigma_\eta^2}^{\text{demand}} + \overbrace{(+)\sigma_\varepsilon^2}^{\text{mon. pol.}}
\end{aligned}
$$

- Fed-induced uncertainty ($\sigma_\varepsilon^2$): "Common" premium effect on stocks and bonds (CRP)

# Risk premia on stocks and bonds

- Real SDF innovations: $\tilde{m}_{t+1} = -\gamma \tilde{x}_{t+1}, \gamma > 0$
- Risk premia on stock and bond:

$$rp_t^{stock} = -Cov_t(\tilde{m}_{t+1}, \tilde{x}_{t+1}) \quad \text{(1-period consumption claim)}$$
$$rp_t^{bond} = -Cov_t(\tilde{m}_{t+1}, -\tilde{i}_{t+1} - \tilde{\pi}_{t+1}) \quad \text{(2-period nominal bond)}$$

# Channels through which Fed could affect risk premium

$$rp_t^{stock} = \gamma\Big(\overbrace{\tfrac{1}{\Omega^2}\sigma_\eta^2}^{\text{demand}} + \overbrace{\tfrac{\theta^2}{\Omega^2}\sigma_\varepsilon^2}^{\text{mon. pol.}}\Big)$$

$$rp_t^{bond} = \gamma\Big(\overbrace{-\tfrac{\phi_x+\kappa(1+\delta)}{\Omega^2}\sigma_\eta^2}^{\text{demand}} + \overbrace{\tfrac{\theta[1-\kappa\theta(1+\delta)]}{\Omega^2}\sigma_\varepsilon^2}^{\text{mon. pol.}}\Big)$$

where $\Omega = 1 + \phi_x\theta + (\phi_\pi - \delta)\kappa\theta$

1. Primary channel: Fed-induced uncertainty $(\sigma_\varepsilon^2)$
   - Changing $\sigma_\varepsilon^2$: "Common" premium effect on stocks and bonds
2. Secondary channel: Reaction function parameters $(\phi_x, \phi_\pi \to \Omega)$
   - Changing $\phi_x, \phi_\pi$: More Fed activism should reduce risk premia

# Linking monetary policy shocks and Fed-induced uncertainty

- Perceived policy rule

$$i_t = \phi_x x_t + \phi_\pi \pi_t + \varepsilon_t$$

- What is $\varepsilon$? *"[T]he stochastic component (.) in the policy rule (.) is referred to as a monetary policy shock. It should be interpreted as a random, transitory deviation from the "usual" conduct of monetary policy as anticipated by the public, due to a change in the policymaker's preferences, a response to an unusual unanticipated event, or, simply, an error in the implementation of monetary policy."* — Gali (2015)

- Link $\varepsilon$ and $\sigma_\varepsilon$?

# Monetary policy shocks as disagreements

1. Disagreement over realization of demand shock, $\eta_t$

$$\eta_t^{cb} = \eta_t + \breve{\eta}_t$$

2. Disagreement over inflation reaction coefficient (assume $\phi_x = \phi_{x,t}^{cb}$)

$$\phi_{\pi,t}^{cb} = \phi_\pi + \breve{\phi}_{\pi,t}$$

- Perceived monetary policy shock

$$\varepsilon_t = \underbrace{\phi_x \breve{\eta}_t}_{\substack{\text{shock assessment} \\ \text{error}}} + \underbrace{\breve{\phi}_{\pi,t} \pi_t}_{\substack{\text{reaction function} \\ \text{error}}}$$

# Monetary policy shocks as disagreements

1. Disagreement over realization of demand shock, $\eta_t$

$$\eta_t^{cb} = \eta_t + \breve{\eta}_t$$

2. Disagreement over inflation reaction coefficient (assume $\phi_x = \phi_{x,t}^{cb}$)

$$\phi_{\pi,t}^{cb} = \phi_\pi + \breve{\phi}_{\pi,t}$$

- Perceived monetary policy shock

$$\varepsilon_t = \underbrace{\phi_x \breve{\eta}_t}_{\substack{\text{shock assessment} \\ \text{error}}} + \underbrace{\breve{\phi}_{\pi,t}\pi_t}_{\substack{\text{reaction function} \\ \text{error}}}$$

- Sources of market-perceived policy uncertainty, $\sigma_{\varepsilon,t}^2$

$$\sigma_{\varepsilon,t}^2 \equiv V_t(\varepsilon_{t+1}) = (\phi_x)^2 V_t(\breve{\eta}_{t+1}) + \left(V_t(\breve{\phi}_{\pi,t+1}) + E_t^2(\breve{\phi}_{\pi,t+1})\right) V_t(\pi_{t+1})$$

Assume: $\breve{\phi}_{\pi,t}, \breve{\eta}_t$ uncorrelated with each other and econ conditions

# Market doubts Fed's $\breve{\phi}_\pi$

$$\sigma^2_{\varepsilon,t} \equiv V_t(\varepsilon_{t+1}) = (\phi_x)^2 V_t(\breve{\eta}_{t+1}) + \left( V_t(\breve{\phi}_{\pi,t+1}) + E^2_t(\breve{\phi}_{\pi,t+1}) \right) V_t(\pi_{t+1})$$

# Market doubts Fed's $\breve{\phi}_\pi$

$$\sigma^2_{\varepsilon,t} \equiv V_t(\varepsilon_{t+1}) = (\phi_x)^2 V_t(\breve{\eta}_{t+1}) + \left(V_t(\breve{\phi}_{\pi,t+1}) + E_t^2(\breve{\phi}_{\pi,t+1})\right) V_t(\pi_{t+1})$$

- Suppose the market perceives

$$\breve{\phi}_{\pi,t+1} \sim \begin{cases} +\Delta & \text{w.p.} \quad q_t \quad \text{(small prob of too hawkish Fed)} \\ 0 & \text{w.p.} \quad 1 - p_t - q_t \\ -\Delta & \text{w.p.} \quad p_t \quad \text{(small prob of too dovish Fed)} \end{cases}$$

Note: $\Delta > 0$, $q_t, p_t < 0.5$; unlikely that $p_t > 0$ and $q_t > 0$ at the same time

$$E_t(\breve{\phi}_{\pi,t+1}) = (q_t - p_t)\Delta \tag{1}$$

$$V_t(\breve{\phi}_{\pi,t+1}) = \Delta^2 \left(p_t(1-p_t) + q_t(1-q_t) + 2q_t p_t\right) \tag{2}$$

# Market doubts Fed's $\breve{\phi}_\pi$

$$\sigma^2_{\varepsilon,t} \equiv V_t(\varepsilon_{t+1}) = (\phi_x)^2 V_t(\breve{\eta}_{t+1}) + \underbrace{\left(V_t(\breve{\phi}_{\pi,t+1}) + E_t^2(\breve{\phi}_{\pi,t+1})\right)}_{\text{increases in } q_t, p_t} V_t(\pi_{t+1})$$

- Suppose the market perceives

$$\breve{\phi}_{\pi,t+1} \sim \begin{cases} +\Delta & \text{w.p. } q_t \quad \text{(small prob of too hawkish Fed)} \\ 0 & \text{w.p. } 1 - p_t - q_t \\ -\Delta & \text{w.p. } p_t \quad \text{(small prob of too dovish Fed)} \end{cases}$$

Note: $\Delta > 0$, $q_t, p_t < 0.5$; unlikely that $p_t > 0$ and $q_t > 0$ at the same time

$$E_t(\breve{\phi}_{\pi,t+1}) = (q_t - p_t)\Delta \tag{1}$$

$$V_t(\breve{\phi}_{\pi,t+1}) = \Delta^2 \left(p_t(1-p_t) + q_t(1-q_t) + 2q_t p_t\right) \tag{2}$$

- $\frac{\partial \sigma^2_{\varepsilon,t}}{\partial p_t} > 0$ and $\frac{\partial \sigma^2_{\varepsilon,t}}{\partial q_t} > 0$ via $V(\breve{\phi}_\pi)$ and $E^2(\breve{\phi}_\pi)$

# Fed-induced uncertainty

$$\sigma^2_{\varepsilon,t} \equiv V_t(\varepsilon_{t+1}) = (\phi_x)^2 \underbrace{V_t(\breve{\eta}_{t+1})}_{\substack{\text{Concern about} \\ \text{econ assessment}}} + \underbrace{\left( V_t(\breve{\phi}_{\pi,t+1}) + \left[ E_t(\breve{\phi}_{\pi,t+1}) \right]^2 \right)}_{\substack{\text{Concern about} \\ \text{Fed type}}} V_t(\pi_{t+1}) \tag{3}$$

1. Concern about economic assessment: $V_t(\breve{\eta}_{t+1}) \uparrow \rightarrow \sigma^2_{\varepsilon} \uparrow$ and CRP$\uparrow$
2. Concern about Fed's type: $p_t \uparrow$ or $q_t \uparrow \rightarrow \sigma^2_{\varepsilon} \uparrow$ and CRP$\uparrow$

# Fed-induced uncertainty

$$\sigma^2_{\varepsilon,t} \equiv V_t(\varepsilon_{t+1}) = (\phi_x)^2 \underbrace{V_t(\breve{\eta}_{t+1})}_{\substack{\text{Concern about} \\ \text{econ assessment}}} + \underbrace{\left( V_t(\breve{\phi}_{\pi,t+1}) + \left[ E_t(\breve{\phi}_{\pi,t+1}) \right]^2 \right)}_{\substack{\text{Concern about} \\ \text{Fed type}}} V_t(\pi_{t+1}) \tag{3}$$

1. Concern about economic assessment: $V_t(\breve{\eta}_{t+1}) \uparrow \rightarrow \sigma^2_{\varepsilon} \uparrow$ and CRP$\uparrow$
2. Concern about Fed's type: $p_t \uparrow$ or $q_t \uparrow \rightarrow \sigma^2_{\varepsilon} \uparrow$ and CRP$\uparrow$

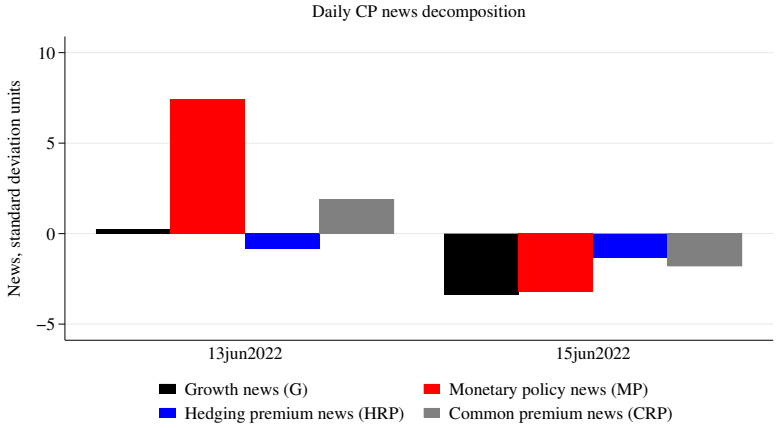
- Hawkish signals ($p_t \downarrow$ or $q_t \uparrow$) lower premium if market concerned about too dovish Fed ($p_t > 0$), but they raise premium if market concerned about too hawkish Fed ($q_t > 0$)

# Remark: CP news decomposition

- Identification via sign-restricted VAR on daily stock and bond returns (yield changes)
- Two types of restrictions
  - Sign restrictions on stock-bond comovement
  - Monotonicity restrictions along yield curve

| | News | | | |
|---|---|---|---|---|
| | Short-rate expectations, *EH* | | Risk premium, *RP* | |
| Impact on LT vs. ST yields | $\lvert ST\rvert > \lvert LT\rvert$ | | $\lvert ST\rvert < \lvert LT\rvert$ | |
| | Growth $G\uparrow$ | Monetary $MP\uparrow$ | Hedging $HRP\uparrow$ | Common $CRP\uparrow$ |
| Bond returns | $(-)$ | $(-)$ | $(+)$ | $(-)$ |
| Stock returns | $(+)$ | $(-)$ | $(-)$ | $(-)$ |
| Stock-bond comovement | $(-)$ | $(+)$ | $(-)$ | $(+)$ |

# Jun 2022: The 75 bps move decomposed




Press Conference, Jun 15, 2022

- *"FOMC participants have marked down their projections for economic activity."*
- *"Clearly, today's 75 basis point increase is an unusually large one, and I do not expect moves of this size to be common."*

# Robustness: Perceived policy mistakes and yield changes

Regressions of 'Yes' WSJ article count, 20-day change, $(t, t-20)$, on 20-day change in yield components $(t, t-20)$

| | KW decomposition | | | CP decomposition | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| $\Delta EH2$ | -0.053 | | -0.160 | | | | | |
| | (-0.34) | | (-0.84) | | | | | |
| $\Delta TP10$ | | 0.195* | 0.261** | | | | | |
| | | (1.71) | (2.04) | | | | | |
| $\Delta y^{(10)}(MP)$ | | | | 0.001 | | | | 0.044 |
| | | | | (0.01) | | | | (0.34) |
| $\Delta y^{(10)}(G)$ | | | | | -0.152 | | | -0.122 |
| | | | | | (-1.28) | | | (-0.96) |
| $\Delta y^{(10)}(CRP)$ | | | | | | 0.346*** | | 0.347*** |
| | | | | | | (3.68) | | (3.38) |
| $\Delta y^{(10)}(HRP)$ | | | | | | | -0.155 | -0.219** |
| | | | | | | | (-1.42) | (-2.47) |
| $R^2$ | 0.00 | 0.04 | 0.06 | 0.00 | 0.02 | 0.12 | 0.02 | 0.17 |
| N | 890 | 890 | 890 | 890 | 890 | 890 | 890 | 890 |

Sample 2020:07–2023:12; standardized coefficients, HAC standard errors with 36 lags