Spending the Anchor:
Modeling Monetary Policy Response to the Covid Inflation

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The views expressed herein are those of the authors and do not necessarily represent those of the Federal Reserve System, the Federal Reserve Bank of Philadelphia, or the International Monetary Fund.

The Episode

- Fed entered the post-COVID inflation with a **strong inflation-fighting record**
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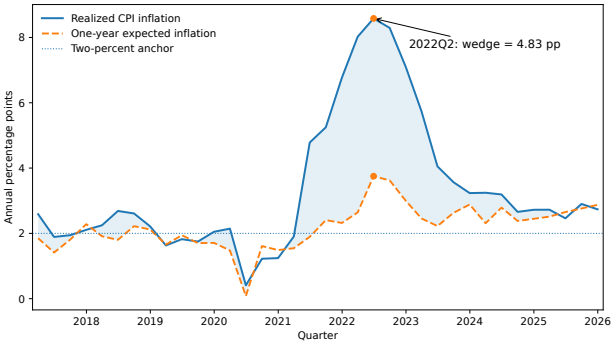
- …and communicated: inflation will **return toward 2%** as supply disruptions fade
- Premise of this paper: that communication was policy, not commentary
  - → it moved expectations — we model how

The Facts to Match



- CPI peak: 8.58 percent
- 1-year expectations: ≈ 3.75 percent
- and: FOMC-day news in inflation compensation collapsed during the surge (last block of the talk)

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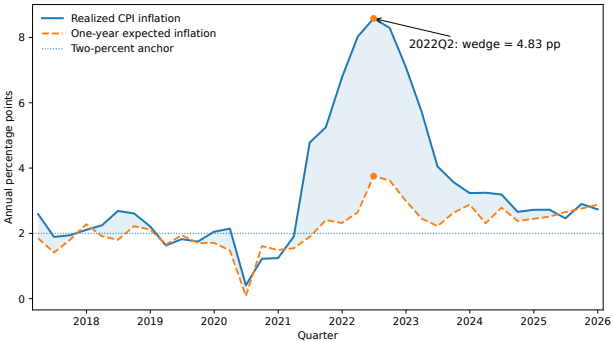

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Anchored level, dead margin — the model must deliver both, jointly.

Not One Bank's Gamble: A Common Path

Post-mortem literature: advanced-economy CBs followed a **remarkably similar path**

- initially communicated **low inflation risks** — downplaying persistence
- then **moved quickly**, assuring a brisk return to target
- achieved disinflation at historically low sacrifice ratios

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A shared playbook — and a shared puzzle: why did it work, and what were its limits?

Three Questions

1. Can **private information rationalize** communication that downplays the persistence of inflation?

2. Does such communication **meaningfully change the recovery path** — toward the data?

3. What **policy risks** does the strategy carry?

This Paper

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destroyed capacity

- COVID destroys workforce-embodied organizational capital
- convex rebuilding cost → *persistent cost-push*; recovery is an investment

The speech technology

promises against a rule

- target-constrained bank announces future inflation — a promise
- endogenous traction; shading priced by a graduated public audit

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- New here: the **delivery-consistent optimal policy problem**
  - → mode-blended delivery prices the promise in the planner's objective *and* in public expectations

Preview of Answers

1. **Yes** — an optimistic private signal supports the observed communication: a truthful, *elevated glide path* (not a mechanical 2%)
2. **Yes** — baseline reproduces the inflation–expectations wedge *and* the market traction footprint
3. Within the model, the risk is **priced and contained** — the bank knows where the cliff is
   → practical fragility: the strategy requires knowing *what the public knows* — misread that, and the same announcement collapses before delivery

The Shock: A Capacity Wall

What COVID Destroyed: Organizational Capital

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- Rebuilding a workforce is costly and **convex in speed**:
  - → one hire ≈16–22 weeks of wages, 80% non-wage
  - → rises with tightness (≈10–12%/SD) and own hiring intensity ($\eta \approx 1.3$)

Labor-economics estimates, outside the inflation episode (Linckh et al. 2025; Muehlemann et al. 2016, 2018); causal industry evidence in the companion paper.

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A destroyed workforce is a wall, not a speed bump.

The Supply Block: Shortfalls, Rebuilding, and the Wall

Shortfall q_{jt}, rebuilding h_{jt}, warm-pool share ψ (2021 recalls, free):

$$q_{j1} = (1-\psi)\, q_{j0} - h_{j1}, \qquad q_{jt} = q_{j,t-1} - h_{jt}, \qquad \text{rebuilding cost } \tfrac{\Gamma}{3} h_{jt}^3$$

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$$\mathcal{W}_t = \textstyle\sum_j \omega_j\, \Gamma h_{jt}^2 \quad \longrightarrow \quad u_t$$

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- The shock is a **state, not an impulse**: the shortfall decays only as rebuilding closes it — it *cannot be waited out*

Rebuilding Optimality: Why Policy Should Partly Look Through

Producers minimize $\sum_t \beta^t \left[\frac{\Gamma}{3} h_{jt}^3 + L(q_{jt}, x_t)\right]$ with $L_q = -\xi(q + bx)$:

$$\underbrace{\Gamma h_{jt}^2 - \beta \Gamma h_{j,t+1}^2}_{\text{net marginal rebuild cost}} \quad \geq \quad \underbrace{\xi \left(q_{jt} + b\, x_t\right)}_{\text{marginal gain, rises with activity}} \quad , \qquad h_{jt} \geq 0$$

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- Fighting the inflation head-on **prolongs its cause** — the structural motive to partly look through

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Disinflate now vs. rebuild faster: the tension communication is asked to relax.

The Speech Technology

The Policy Problem

Phillips curve with the wall inside supply pressure:

$$\pi_t = \beta\, e_t + \kappa x_t + u_t, \qquad e_t \equiv \widetilde{\mathbb{E}}_t \pi_{t+1}$$

Quadratic loss in $(\pi_t,\ x_t - \bar{x}_t)$; two instruments:

- conventional: the output gap x_t (rates)
- **speech**: announce $a_t =$ the conditional *center* of inflation at $t{+}1$

  → a **promise, not a forecast** — accountable ex post

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What is the promise worth in expectations — and what does it cost in the objective?

The Inherited Rule and the Guidance Wedge

- Inherited targeting regime — itself a **standing message**:

$$\bar{a}_t = \phi_{\mathrm{IT}}\, \widehat{u}^{CB}_{t+1|t} \qquad \text{(default future center, rule-based state contingency)}$$

- It cannot rewrite the rule; its message is **one number**: $a_t = \bar{a}_t + g_t$, the guidance wedge

  → $g_t < 0$: promises a *faster* return to target than the rule — the "transitory" message

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  - → $g_t < 0$: promises a *faster* return to target than the rule — the "transitory" message
- No opting out: silence $\equiv g_t = 0$ reaffirms the rule — and is priced accordingly

Why Promises Are Discounted: Hidden Enforcement Exposure

- Commitment is imperfect *and* **hidden**: delivery is disciplined by a **graduated, bounded public audit** of shading the announced letter
- Persistent mode $j \in \{\mathrm{G}, \mathrm{R}\}$, ordinary vs. override — same target, objective, information; differ *only* in exposure to the same audit:

$$\mathcal{K}_j(w) = \chi_j \bar{F}\left[1 - \frac{\tau}{\sqrt{V}} e^{-w^2/2V}\right] + \frac{\bar{\varrho}}{2} w^2, \qquad \chi_{\mathrm{G}} > \chi_{\mathrm{R}} > 0$$

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- Public belief $\lambda_t = \Pr(\text{override}) =$ the **credibility state** — moves with everything the bank *says* and *does*

Words Are Screened Against the Rule

- Message densities, locally Gaussian in the wedge: $g_t \mid j \sim \mathcal{N}(0, \sigma_j^2),\ \sigma_{\mathrm{R}} > \sigma_{\mathrm{G}}$
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- Bayes after words — increasing in $|g_t|$:

$$q_t = \frac{\lambda_t f_{\mathrm{R}}(g_t)}{(1-\lambda_t) f_{\mathrm{G}}(g_t) + \lambda_t f_{\mathrm{R}}(g_t)}$$

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The inherited rule is a message filter: distance from it is evidence about who is speaking.

The Promise Comes Due I: The Letter Is an Allocation

Enforcing the letter of the announced center a_t at $t{+}1$, from the Phillips curve:

$$a_t = \beta e_{t+1} + \kappa x_{t+1} + u_{t+1} \qquad \Longrightarrow \qquad x^{H}_{t+1} = \frac{a_t - \beta e_{t+1} - u_{t+1}}{\kappa}$$

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- If supply pressure stayed high, x^H is severe: delivering a low promise in a bad state means engineering a contraction
- This formula is the paper's **fragility arithmetic** — we will evaluate it on the forecast path and on the realized path

The Promise Comes Due II: Delivery Is a Dial with a Cliff

- No all-or-nothing choice: mode j **shades**, settling the letter a_t against its **desire** d_{t+1} (discretion, no promise outstanding):

$$\theta^{j}_{t+1} = \operatorname*{argmin}_{\theta} \ \tfrac{\Psi}{2}\big(\theta - d_{t+1}\big)^2 + \mathcal{K}_j\big(\theta - a_t\big) \ = \ d_{t+1} + \operatorname{sign}(a_t - d_{t+1})\, P_j\big(|a_t - d_{t+1}|\big)$$

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The escape hatch is a continuous dial — with a cliff in it.

How Much of the Promise Arrives: Delivered Shares

Mode-specific **delivered share** of the letter–desire gap, and the priced blend:

$$s_{j,t} = \frac{P_j\big(|a_t - d_{t+1}|\big)}{|a_t - d_{t+1}|}, \qquad s_t = (1 - q_t)\, s_{\mathrm{G},t} + q_t\, s_{\mathrm{R},t}$$

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Two ways a promise dies:

- the **gap** grows — the promise is expensive in the realized state, and past the enforcement threshold the shares collapse
- q_t grows — the words themselves **revealed the override mode**

Delivery Consistency: No Free Lunch

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In welfare (same posterior, same centers, plus the shading cost):

$$\mathcal{J}_{t+1} \;=\; (1-q_t)\,L^{\mathrm{G}}_{t+1} + q_t\,L^{\mathrm{R}}_{t+1} \;+\; \mathcal{K}^{\mathrm{net}}_{t+1}$$

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No expectations benefit without bearing the cost of what each mode will actually deliver

—

and no undeliverable letter to neutralize your own communication.

The Planner's Problem

Choose the announcement path $\{a_t\}$ and activity $\{x_t\}$ to minimize

$$\mathcal{L} = \sum_{t=0}^{T} \beta^t \Big[\underbrace{(1-q_{t-1})L_t^{\mathrm{G}} + q_{t-1}L_t^{\mathrm{R}}}_{\text{posterior-weighted delivered loss}} + \underbrace{\mathcal{K}_t^{\mathrm{net}}}_{\text{shading cost}} + \underbrace{s_N\,\mathcal{R}_t}_{\text{rebuilding}} + \underbrace{\tfrac{\varphi_g}{2}\,g_t^2}_{\text{authorization}} \Big]$$

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- Yesterday's promise arrives as **what each mode delivers**: strong-delivered with weight $1-q_{t-1}$, weak-delivered with q_{t-1} ($q_{-1}=0$)
- The planner internalizes that activity **speeds or slows the rebuild** ($\mathcal{R}_t$); speech is **not free** (φ_g); shading is **not free** either ($\mathcal{K}^{\mathrm{net}}$)
- The nominal rate: recovered from the IS curve — *implementation, not a constraint*

What Constrains the Planner: One Loop, Five Links

- **Phillips curve**: $\theta_t = \beta e_t + \kappa x_t + u_t$, capacity adjusts the benchmark: $\bar{x}_t = (1-\gamma)Q_t$
- **Screening**: posterior $q_t(g_t)$ reads the wedge against the rule
- **Pricing**: delivered shares from the delivery map and q_t; expectations

  $e_t = s_t a_t + (1-s_t)d_{t+1}$

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- **Delivery**: realized inflation updates beliefs — *words and deeds, both on the ledger*: $\operatorname{logit} q_t^D = \operatorname{logit} \lambda_t + \underbrace{\log \frac{f_{\mathrm{R}}(g_t)}{f_{\mathrm{G}}(g_t)}}_{\text{words}} + \underbrace{\log \frac{L_{\mathrm{R}}(\pi_{t+1})}{L_{\mathrm{G}}(\pi_{t+1})}}_{\text{outcomes}}$
- **Memory**: $\lambda_{t+1} = (1-\rho_\lambda)\bar{\lambda} + \rho_\lambda q_t^D$

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The anchor λ is a state variable the planner spends and rebuilds.

The Private Signal: Where “Transitory” Lives

- Supply pressure u_t public; the bank privately observes $v_t = \rho_v v_{t-1} + \varepsilon_t^v$, mapped into perceived persistence:

$$\rho_t^u = \Lambda(\alpha_v + \gamma_v v_t), \qquad \widehat{u}_{t+1|t}^{CB} = \rho_t^u \, u_t$$

- Forecast **disclosed** with the announcement (a published projection): Delphic content observed; the wedge is the remaining **Odyssean** message

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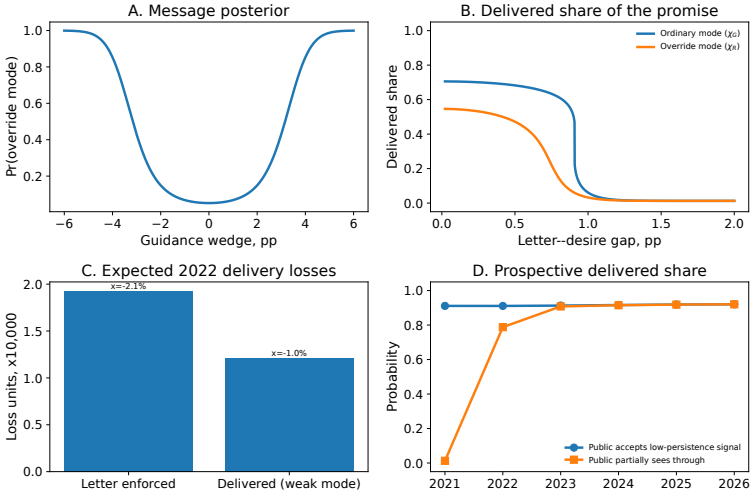
- 2021: signal-implied persistence 0.344 vs. realized $u_{2022}/u_{2021} = 0.883$
  - → the gap: an innovation dated *after* the announcement — the signal informs the distribution, not the draw; a bad draw $\neq$ dishonesty

The Mechanism at a Glance



Calibration

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Inherited

- supply path, rebuilding series: the calibrated capacity-wall transition (nothing refit)

Communication block

- messages: $\sigma_{\mathrm{G}} = 1.2$, $\sigma_{\mathrm{R}} = 3.0$ pp
- audit: $\bar{F} = 4.5$; $\chi_{\mathrm{G}} = 1$, $\chi_{\mathrm{R}} = 0.5$; $\tau = \sigma_{\pi} = 0.24$ pp; $\Psi = 11.6$; $\bar{\varrho} = 0.15$
- $\bar{\lambda} = 0.05$, $\rho_{\lambda} = 0.87$; $\phi_{\mathrm{IT}} = 0.35$

Targets

- peak inflation ≈ 7
- 1-yr expectations ≈ 3

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No target on the announcement

- free to be an elevated glide path — its delivery cost is priced
- where it lands is a *result*

The 2021 Signal: Optimism, Not Deception

- One new object: $v_0 = -0.28 \Rightarrow$ signal-implied persistence 0.344
- Realized $u_{2022}/u_{2021} = 0.883$ — a new adverse innovation, dated *after* the announcement

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- Realized $u_{2022}/u_{2021} = 0.883$ — a new adverse innovation, dated *after* the announcement
- Deliberate design: separates a **truthful low-persistence assessment** from *ex-post forecast error*

  → the bank is not endowed with the truth and asked to lie — it is endowed with an optimistic read and tells it straight

Results

Baseline: A Truthful Glide Path Under a Strong Anchor

Peak inflation (2021)	7.40
One-year expected inflation	3.12
Announced future center	3.01
inherited default $\bar{a}$	2.54
guidance wedge g	0.47
Prospective delivered share s	0.687

Baseline: A Truthful Glide Path Under a Strong Anchor

Peak inflation (2021)	7.40
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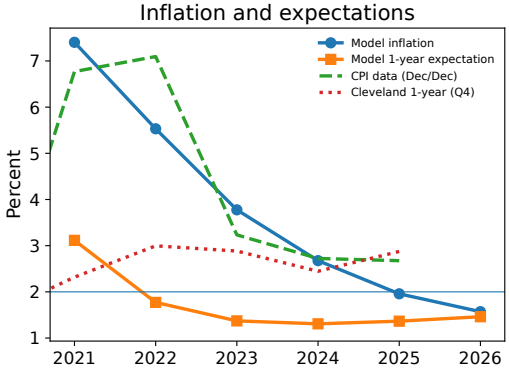
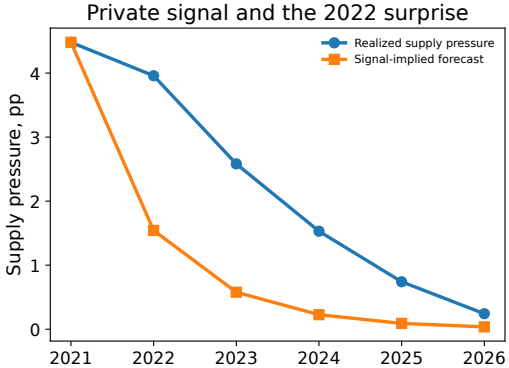
- The promise is an **elevated glide path** — neither a mechanical 2% forecast nor cheap talk: the bank promises what it can afford to deliver

Baseline vs. Data: An Implementation Surprise, Not a Broken Promise





What the 2021 Planner Pays: The Letter and the Delivered Centers

- On the *signal-implied* 2022 path, enforcing the letter of the 3.01 center requires an output gap of -2.1 percent
- The weak-mode delivered center is far less contractionary — most of the adjustment is shaded away
- The posterior weights price *both delivered centers in the objective*, plus the shading cost $\mathcal{K}^{\text{net}}$

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$\sim$70% of the letter is priced to bind — priced, honest, and on the bank's information set, good odds.

In Equilibrium, the Risk Is Contained

Within the model — the bank correctly reads the public — fragility is **priced**:

- Sharpen the audit, public still accepts the signal: the delivered share **rises** to 0.911
  - → predictability alone $\neq$ instability — the bank promises what the sharper audit will deliver
- Weak inherited anchor: the planner **endogenously raises** its glide path (peak 7.64, expectations 3.37)
  - → no bold promises a weak institution cannot carry — worse, but *no collapse*

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In equilibrium the bank sees the cliff on its own map — and walks around it.

What Rational Expectations Quietly Assumed

- In equilibrium the bank **knows the public's information set** — it knows exactly how the promise will be read
- In practice that is a second-order inference — a forecast of what markets and households currently believe about the shock's persistence — and the strategy's viability rests on it

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- The real experiment is a **misread**: the bank issues the robust 2021 policy believing its assessment is accepted…
  - → …but the public *partly expects the shock to persist*
  - → announcement and conventional policy held *exactly fixed*

The Collapse: Same Words, Misread Public

	Delivered share s	Expected π	Inflation
Baseline (assessment accepted)	0.687	3.12	7.40
Public partly sees through	0.013	3.87	8.12

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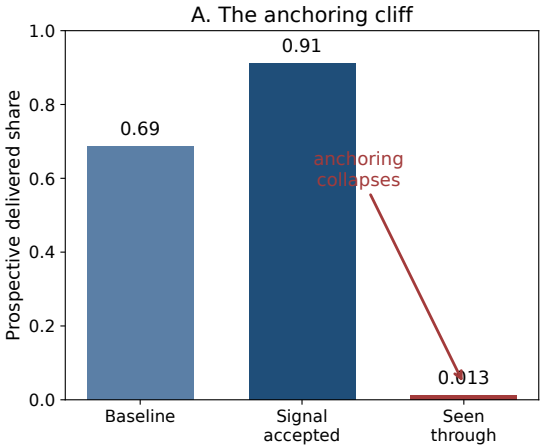
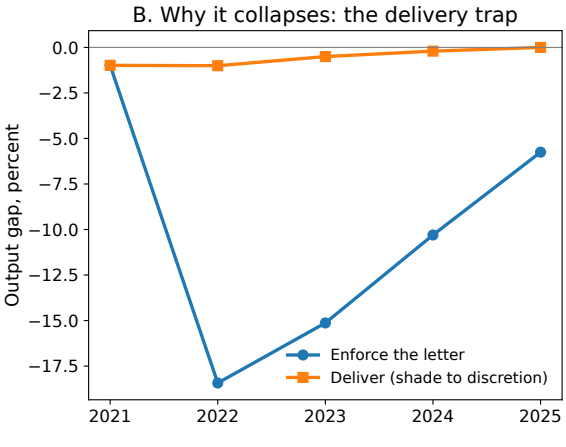
Past the enforcement threshold, the promise dies before delivery.

The Collapse in Pictures





The Same Robust Policy, Four Readings of Persistence

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Robust baseline	0.687	3.12
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What the strategy cannot survive is being wrong about what the public knows.

The Market Footprint of Traction

A Market Diagnostic for Marginal Traction

Meeting-day vs. ordinary-day volatility of series z, era by era:

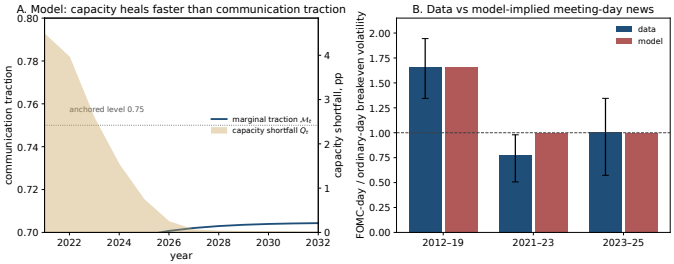
$$R_z(E) = \frac{\mathrm{sd}(\Delta z_t \mid \text{FOMC day}, E)}{\mathrm{sd}(\Delta z_t \mid \text{ordinary day}, E)}.$$

A meeting-day surprise moves expectations by the marginal traction M_E, adding $M_E^2 V_E$ to the meeting-day variance *only*:

$$R^2(E) = \frac{\sigma_0^2(E) + M_E^2 V_E}{\sigma_0^2(E)} \implies R^2(E) - 1 = \frac{M_E^2 V_E}{\sigma_0^2(E)} \xrightarrow[\text{normalize on } E_0]{} \kappa \left(\frac{M_E}{M_0}\right)^2 \frac{V_E}{V_0}.$$

- $\kappa \equiv R^2(E_0) - 1$ pinned on the anchored 2012–19 era — that bar is a *normalization*, not a prediction
- M_E nearly **flat** across eras; what collapses is V_E, the meeting-day surprise

Meeting-Day News: The Margin Died



- Panel A: marginal traction $\mathcal{M}_t$ nearly **flat**; capacity Q_t heals beneath it
- Panel B: **data vs model**, by era — anchored 1.66 (normalization); surge data 0.78, disinflation ≈ 1
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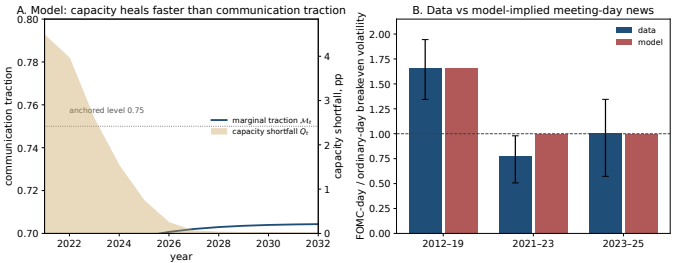

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Marginal traction is flat — what dies is the surprise: constant optimal guidance $\Rightarrow$ no fresh meeting-day news.

Takeaways

1. Private information **rationalizes** the communication: a truthful elevated glide path; the 2022 miss is a bad draw, not a broken promise
2. It **mattered**: baseline reproduces the inflation–expectations wedge and the collapse of meeting-day news
3. The risk: **priced in equilibrium** — but in practice the strategy stands on a second-order inference (knowing what the public knows); misread it and the words die before delivery ($x^{\text{letter}} \approx -18\%$ vs. $x^{\text{delivered}} \approx -1\%$)

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Policy risk: spending the anchor is sound policy on the bank's own map — but the public may be holding a different one.

Backup

Backup: The Discretionary Benchmark

$$x^{d}_{t+1} = \frac{\vartheta \bar{x}_{t+1} - \kappa(\beta e_{t+1} + u_{t+1})}{\kappa^2 + \vartheta}, \qquad d_{t+1} = \beta e_{t+1} + \kappa x^{d}_{t+1} + u_{t+1}$$

- the delivered center θ^j is d_{t+1} plus the enforced pull $P_j(|a_t - d_{t+1}|)$ toward the letter, from the graduated-audit delivery map

Backup: The Delivery Technology

$$\mathcal{K}_j(w) = \chi_j \bar{F}\Big[1 - \tfrac{\tau}{\sqrt{V}} e^{-w^2/2V}\Big] + \tfrac{\bar{\varrho}}{2} w^2, \qquad V = \tau^2 + \sigma_\pi^2$$

$$\theta^j_{t+1} = \operatorname*{argmin}_{\theta} \ \tfrac{\Psi}{2}(\theta - d_{t+1})^2 + \mathcal{K}_j(\theta - a_t), \qquad L^j_{t+1} = \tfrac{1}{2}(\theta^j_{t+1})^2 + \tfrac{\vartheta}{2}(x^j_{t+1} - \bar{x}_{t+1})^2$$

- bounded formal sanction ⇒ global-minimum switch: the enforcement cliff of the fragility block

Backup: Baseline Delivery-Consistent Transition

Year	Supply	Forecast	Announcement	$\widetilde{E}_t \pi_{t+1}$	Inflation	Del. share
2021	4.48	4.48	3.01	3.12	7.40	0.687
2022	3.96	1.54	1.65	1.77	5.53	0.689
2023	2.58	0.58	1.26	1.37	3.78	0.693
2024	1.53	0.23	1.21	1.31	2.68	0.696
2025	0.74	0.09	1.29	1.37	1.96	0.699
2026	0.24	0.04	1.40	1.46	1.57	0.701

Backup: The Letter and the Delivered Center Priced in 2021

	Letter enforced	Delivered (weak mode)
2022 inflation center (percent)	3.01	3.17
2022 output gap (percent)	-2.07	-1.03
Delivery loss ($\times 10^4$)	1.93	1.21

Backup: Fragility Table

Environment	Del. share	Expected inflation	Inflation	x_{2022}, letter	x_{2022}, delivered
Robust optimum	0.687	3.12	7.40	-2.1	-1.0
Sharp audit; public accepts v_0	0.911	3.04	7.33	-17.6	-1.0
Partial see-through; hidden switch	0.0128	3.87	8.12	-18.4	-1.0
Full see-through (polar)	0.0128	9.24	13.28	-44.2	-2.7