The Impact of Monetary Surprises on Different Asset Classes

Candidate Number: 1091070, 1736443, 1089115

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Contents

Literature Review

Kuttner (2001) - Monetary policy surprises and interest rates: Evidence from the Fed funds futures market

Methodology	● Changes in market interest rates are regressed on both the anticipated and unanticipated components of target rate changes ● Difference between the actual rate change and the futures-implied expectation is interpreted as the monetary policy surprise
Implications	**Only unanticipated policy shocks move markets.** ● Anticipated rate changes are fully priced in, so regressions must isolate the surprise component to uncover true policy effects **Futures-based surprise extraction is essential.** ● Using Fed funds futures to decompose target moves into “expected” vs. “surprise” lays the groundwork for clean identification of causal impacts
Relevance	● Establishes the method to construct the Target Surprise (TS) ● Provides empirical foundation to focus on unanticipated policy shocks when analyzing market reactions (e.g., intraday S&P 500 moves).

Gürkaynak, Sack, and Swanson (2005) - Do Actions Speak Louder Than Words?

Methodology	● Intraday event-study w/ 30-min windows around FOMC announcements ● Principal Component Analysis (PCA) to extract two orthogonal components: ○ Target Surprise (TS) ○ Path Surprise (PS)
Implications	● Path surprises explain 75–90% of movements in 5- and 10-year Treasury yields ● Target surprises influence short-term interest rates. ● FOMC statements (forward guidance) significantly impact long-term yields, especially when TS is small (e.g., ZLB periods)
Relevance	● Establishes the two-factor decomposition (TS & PS) used in our regression framework ● Highlights the role of forward guidance in driving market expectations beyond immediate rate changes

Hausman & Wongswan (2011) - Global Asset Prices and FOMC Announcements

Methodology	• Panel regressions with corrected SEs to account for heteroskedasticity & cross-country correlation • Interaction terms to assess heterogeneity across countries
Implications	• Equities respond mainly to TS, and exchange rates mainly to PS; short-term yields react to both surprises, while long-term yields load primarily on PS • **Spillover intensity** is higher in countries with less flexible exchange regimes and greater US financial linkages
Relevance	• Global validation of the TS/PS approach • Regression blueprint for daily data • Analysis of different asset classes

Theoretical Rationale

Monetary policy affects asset prices through at least two channels:

- **Current-rate channel** (“what the Fed did”): an unanticipated change in today’s policy rate directly shifts short-term rates and immediate discount factors.

- **Expectations/term-premium channel** (“what the Fed said about tomorrow”): forward guidance or statement language revises expected future short rates (and can also alter term premia), transmitting mainly to medium- and longer-term yields and to assets sensitive to the yield curve’s slope.

Target Surprise (TS): the unanticipated component of the central bank’s current policy rate decision, measured as the high-frequency change in front-month fed-funds futures around the announcement.

Path Surprise (PS): the unexpected revision to the future trajectory of policy rates (and term premia), captured by orthogonalized high-frequency moves in longer-horizon interest-rate futures.

Our Focus - How does monetary policy surprise affect different asset classes Post-Crisis?

Our Focus - How does monetary policy surprise affect different asset classes Post-Crisis?

Post-crisis, especially after 2008, we entered a new environment:

- Interest rates frequently hit the zero lower bound (ZLB)
- The Fed increasingly relied on forward guidance and other unconventional tools
- This raised questions about whether the traditional effects of target and path surprises still hold under these new conditions

We focus on the post-crisis era, using daily data and high-frequency intraday data to examine how monetary policy surprises—both target and path—affect asset prices in more recent periods when ZLB is present.

Research Objectives

- Quantify the response of different asset classes to FOMC announcements
- Separate Target Rate Surprises from Path Surprises (Forward Guidance)
- Measure their effects at both daily and intraday frequencies
- Identify reactions uncontaminated by other macroeconomic events
- Analyse different asset sensitivity to Surprise after the Financial Crisis

Methodology

Data Overview

Assets Covered
S&P500
5-Yr US T-Note
10-Yr US T-Note
US Gold Futures
US Dollar Index
Bitcoin

Macroeconomic Events Considered
Consumer Price Index (CPI)
Unemployment Rate
Purchasing Managers' Indices (PMI)
Non-Farm Payrolls
Producer Price Index (PPI)
Personal Consumption Expenditures (PCE)

Timeframe
89 dates, 2008 - 2025

Data Filtering
FOMC-only dates used: announcement days overlapping with other macro releases (left) are excluded

[KEY] No Concurrent News:
We do our best to ensure no other major macroeconomic announcements coincide with FOMC decisions, so TS and PS are the primary drivers of returns

Assumptions

Surprise Exogeneity	Assume FOMC decisions are made before markets trade on announcement days, so that changes in Fed Funds Futures capture only unanticipated policy shocks
Linear, Time-Invariant Response	Assume that asset returns respond linearly to Target Surprise and Path Surprise, with a steady relationship throughout our sample
No Omitted Confounders	Assume that any other shocks on announcement days are uncorrelated with Target Surprise and Path Surprise and are absorbed in the regression error
Market Efficiency	Assume Fed Fund Futures and all other asset markets are liquid and efficient, such that prices change accurately to reflect revisions to expectations
Negligible Change to Risk Premium	Risk premiums cancel out before and after FOMC announcement, so there is no distortion of expectations signals despite not explicitly calculating risk premium

Framework

Daily Event Study	Intraday Event Study
Extract daily returns on FOMC-only announcement days. Construct surprises using Fed Funds Futures (ZQ). Regress asset returns on Target and Path Surprises.	Use high-frequency (minute-level) data around FOMC announcement time. Measure 30-minute window returns ([-5 min, +25 min]). Visualize normalized price paths and estimate regressions.

Surprise Decomposition

- **Target Surprise**
- **Path Surprise**

Decomposing Monetary Policy Surprise

Target Surprise:

Daily: $$TS_d = \frac{D}{D-d}(-\Delta ff_d) = \frac{D}{D-d}(-(ff_d - ff_{d-1}))$$

Intraday: $$TS_d = \frac{D}{D-d}(-\Delta ff_\tau) = \frac{D}{D-d}(-(ff_{\tau+\Delta\tau} - ff_{\tau-\Delta\tau}))$$

TS>0: Policy more contractionary than expected
TS<0: Policy more expansionary than expected

Path Surprise:

$$\Delta i_t^{(2yr)} = \alpha + \beta TS_t + \varepsilon_t$$

$$PS_t^{(res)} = \varepsilon_t = \Delta i_t^{(2yr)} - (\hat{\alpha} + \hat{\beta} TS_t)$$

Unexpected Change/Information in the future path of policy rates

Core Regression: Asset Returns on Target and Path Surprise

$$R_{i,t} = \alpha + \beta_1 TS_t + \beta_2 PS_t + \varepsilon_{i,t}$$

- $R_{i,t}$: Return for asset *i* across FOMC announcement
- TS_t: Target surprise
- PS_t: Path surprise

Regressing on both Target Surprise and Path Surprise allows for inference of asset pricing behaviour due to short-term and long-term monetary policy effects.

Using a regression to calculate Path Surprise from Target Surprise aims to isolate these orthogonal components of monetary policy.

Results & Interpretation

Results - Daily Data

Asset	Constant (std err)	Target Surprise (std err)	R^2	Constant (std err)	Target Surprise (std err)	Path Surprise (std err)	R^2
Bitcoin	0.213 (0.545)	0.023 (0.118)	0.00	0.216 (0.552)	0.023 (0.119)	0.004 (0.092)	0.00
USD Index	-0.072 (0.056)	0.032*** (0.011)	0.10	-0.072 (0.045)	0.032*** (0.009)	0.058*** (0.008)	0.43
Gold Futures	0.113 (0.083)	-0.071*** (0.016)	0.19	0.113 (0.083)	-0.071*** (0.016)	-0.023 (0.015)	0.21
S&P500	0.128 (0.139)	0.056*** (0.026)	0.05	0.128 (0.139)	0.056** (0.027)	-0.024 (0.025)	0.06
5Y T-Note	0.050 (0.032)	0.003 (0.006)	0.00	0.050 (0.016)	0.003 (0.003)	-0.047*** (0.003)	0.76
10Y T-Note	0.015 (0.051)	0.009 (0.010)	0.01	0.017 (0.038)	0.009 (0.007)	-0.059*** (0.007)	0.48

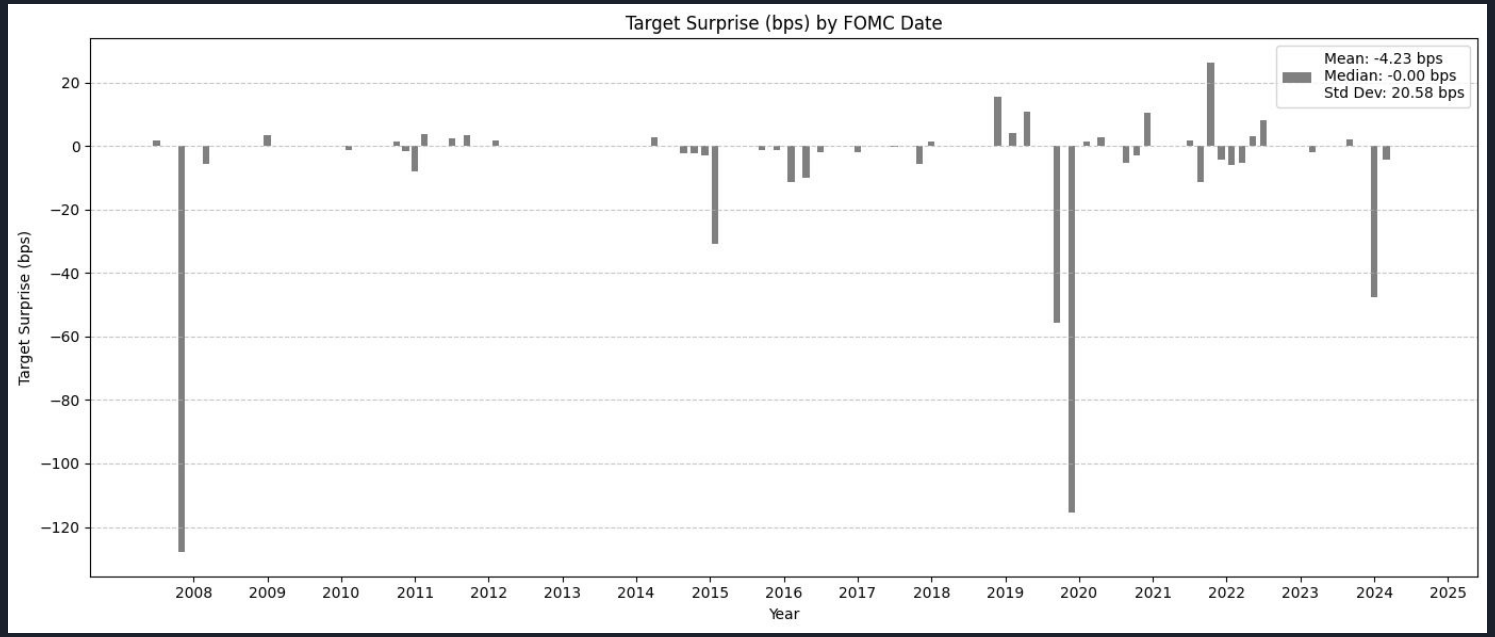
Results - Intraday Data: 2-Min Interval Around FOMC Announcement

Asset	Constant (std err)	Target Surprise (std err)	R^2	Constant (std err)	Target Surprise (std err)	Path Surprise (std err)	R^2
Bitcoin	0.002 (0.060)	-0.017*** (0.003)	0.48	-0.013 (0.061)	-0.014*** (0.003)	-0.022* (0.011)	0.49
USD Index	0.002 (0.021)	0.003*** (0.001)	0.11	0.005 (0.017)	0.004*** (0.001)	0.020*** (0.003)	0.42
Gold Futures	-0.011 (0.037)	-0.004*** (0.002)	0.09	-0.018 (0.031)	-0.006*** (0.001)	-0.033*** (0.006)	0.37
S&P500	-0.003 (0.080)	0.024*** (0.003)	0.38	0.019 (0.077)	0.030*** (0.004)	0.009 (0.015)	0.43
5Y T-Note	-0.001 (0.017)	-0.002** (0.001)	0.05	-0.005 (0.014)	-0.002*** (0.001)	-0.017*** (0.003)	0.38
10Y T-Note	0.002 (0.019)	-0.000 (0.001)	0.00	-0.001 (0.017)	-0.001 (0.001)	-0.018*** (0.003)	0.29

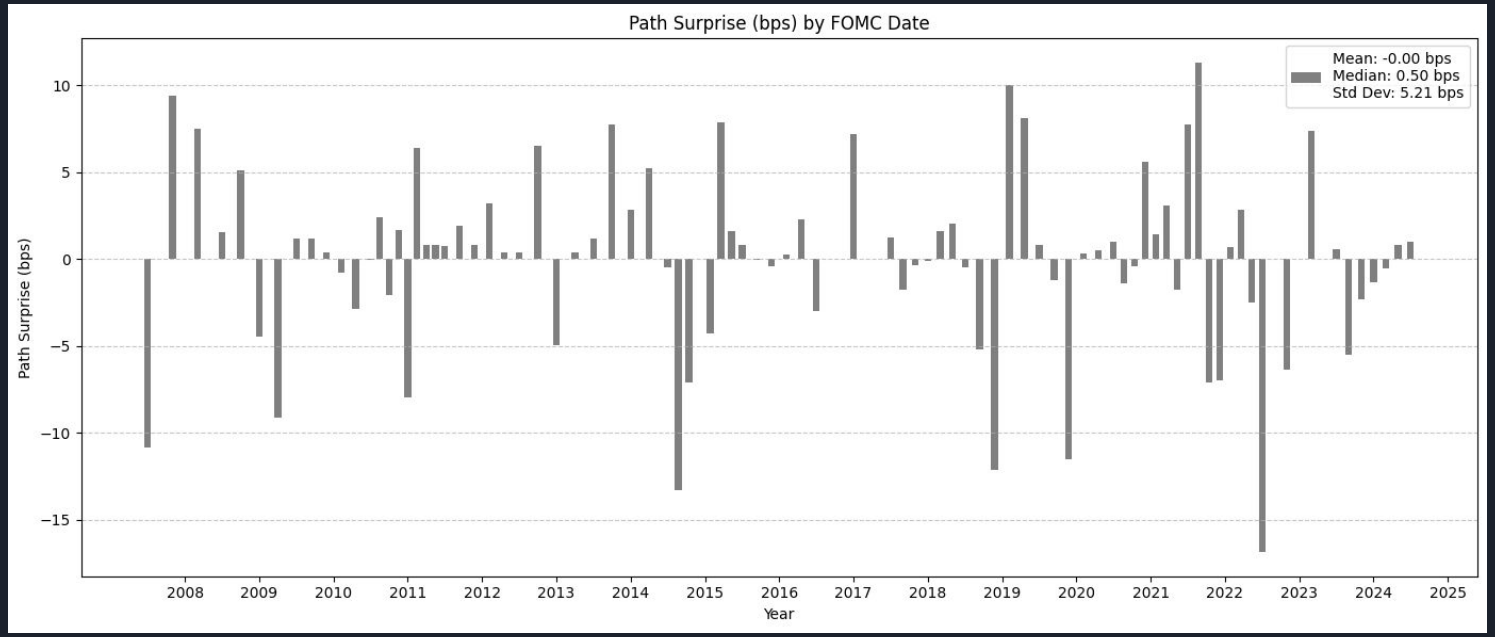
Results - Intraday: 2-Min vs 60-Min Interval

	2-Min Interval				60-Min Interval			
Asset	Constant (std err)	Target Surprise (std err)	Path Surprise (std err)	R^2	Constant (std err)	Target Surprise (std err)	Path Surprise (std err)	R^2
Bitcoin	-0.013 (0.061)	-0.014*** (0.003)	-0.022* (0.011)	0.49	0.256 (0.183)	-0.008 (0.008)	-0.048 (0.033)	0.09
USD Index	0.005 (0.017)	0.004*** (0.001)	0.020*** (0.003)	0.42	-0.011 (0.030)	0.005*** (0.001)	0.055*** (0.006)	0.56
Gold Futures	-0.018 (0.031)	-0.006*** (0.001)	-0.033*** (0.006)	0.37	0.098 (0.056)	-0.004 (0.003)	-0.095*** (0.011)	0.5
S&P500	0.019 (0.077)	0.030*** (0.004)	0.009 (0.015)	0.43	0.058 (0.093)	0.032*** (0.004)	-0.011 (0.017)	0.38
5Y T-Note	-0.005 (0.014)	-0.002*** (0.001)	-0.017*** (0.003)	0.38	0.03 (0.016)	-0.002** (0.001)	-0.046*** (0.003)	0.74
10Y T-Note	-0.001 (0.017)	-0.001 (0.001)	-0.018*** (0.003	0.29	0.047 (0.025)	-0.000 (0.001)	-0.052*** (0.005)	0.58

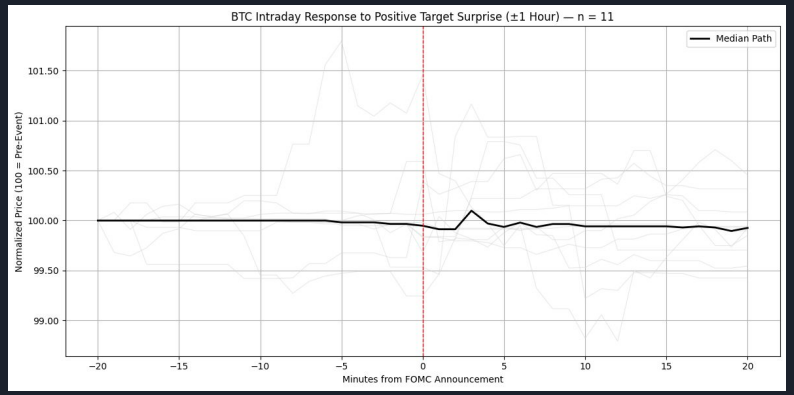
Target Surprise Over Time

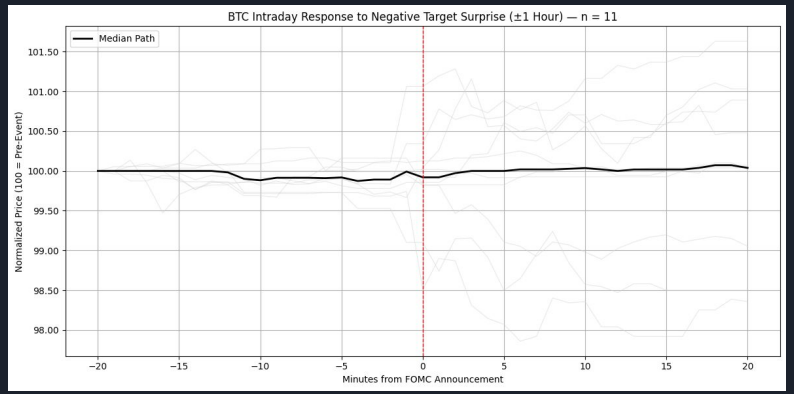


Path Surprise Over Time



Bitcoin: BTC-USD

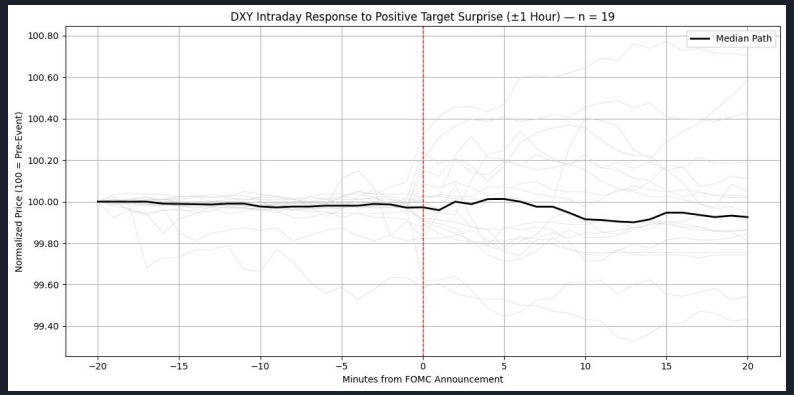


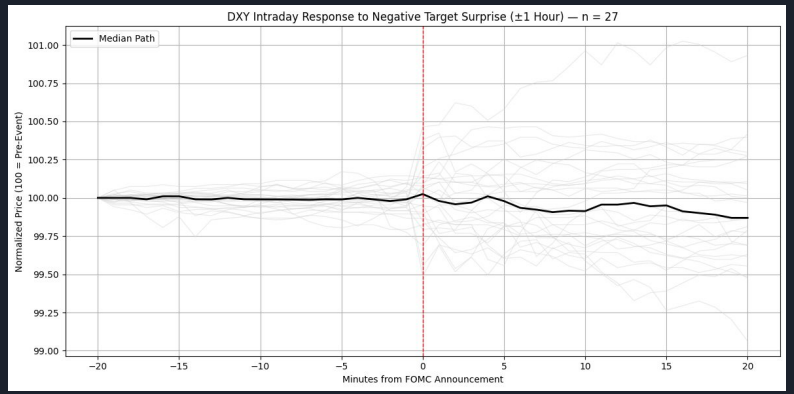


$R^2 = 0.49$	Return
1 bps Target Surprise	**-0.013%**
1 bps Path Surprise	**-0.022%**

- Bitcoin behaves as a liquidity-sensitive risk asset.
- Reacts more to path surprises, which reflect expectations of sustained future tightening.
- Hawkish signals reduce liquidity and risk appetite, causing BTC to sell off — even if the current rate decision is as expected.

US Dollar Index: DXY

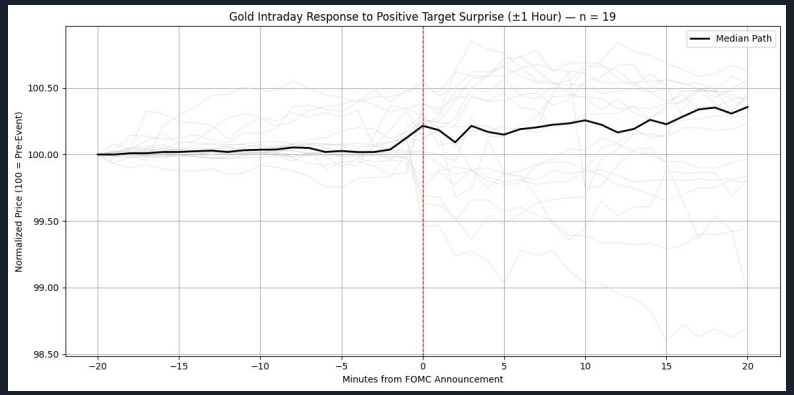


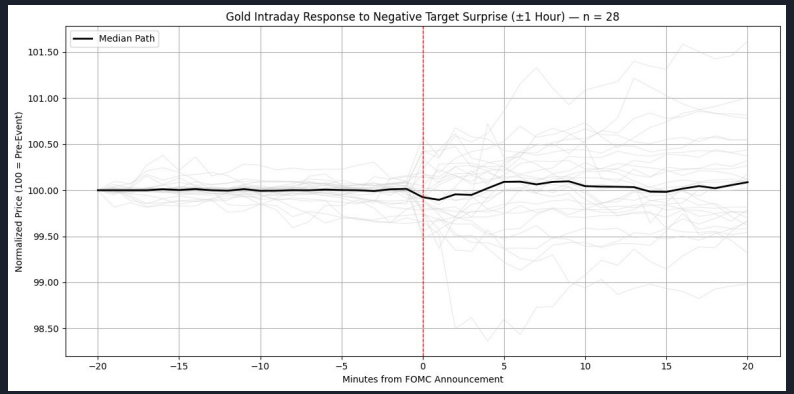


$R^2 = 0.42$	Return
1 bps Target Surprise	+0.004%
1 bps Path Surprise	+0.020%

- Path surprise is the dominating effect from FOMC decisions on the strength of the dollar ⟶ Forward guidance drives the currency
- Higher expected US rates attract inflows and result in dollar appreciation, making DXY a key measure of US monetary sentiment

Gold Futures: GC=F

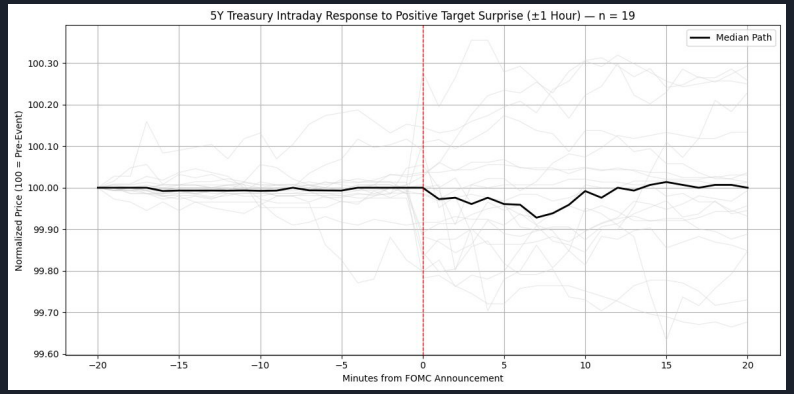


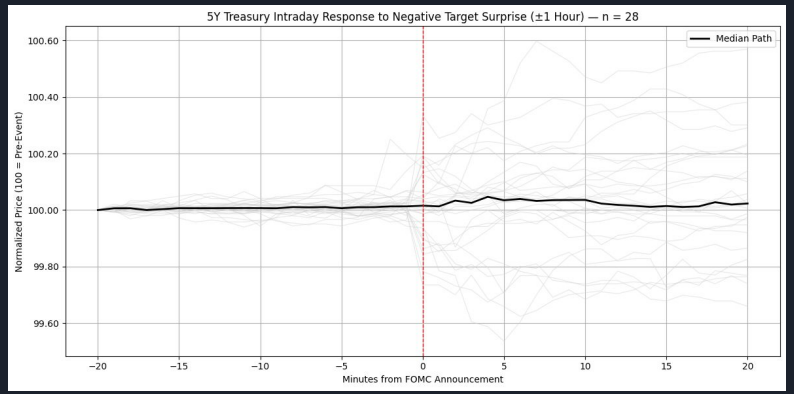


$R^2 = 0.37$	Return
1 bps Target Surprise	-0.006%
1 bps Path Surprise	-0.033%

- Stronger reaction to forward guidance compared to BTC and DXY due to tighter relationship with interest rates
- Path Surprise is 5x more important than Target Surprise ⟶ Forward guidance is extremely important given that gold is non-yielding

5Y T-Note Futures: ZF=F

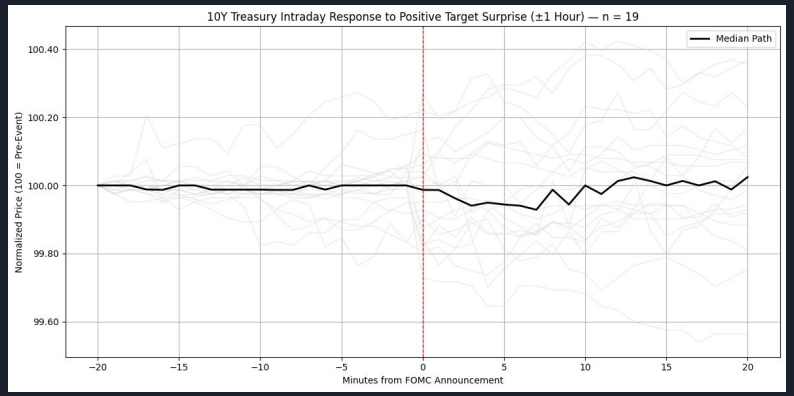


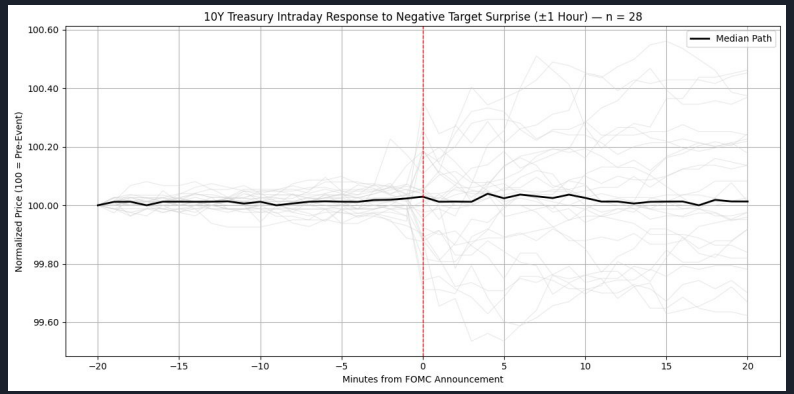


$R^2 = 0.38$	Return
1 bps Target Surprise	**-0.002%**
1 bps Path Surprise	**-0.017%**

- Both target and path surprises lower prices, consistent with rising rate expectations pushing yields up.
- Path surprise has over 8x the effect of target surprise for the same magnitude of surprise
- Sitting mid-yield curve means 5Y treasuries are particularly sensitive to Forward Guidance

10Y T-Note Futures: ZN=F

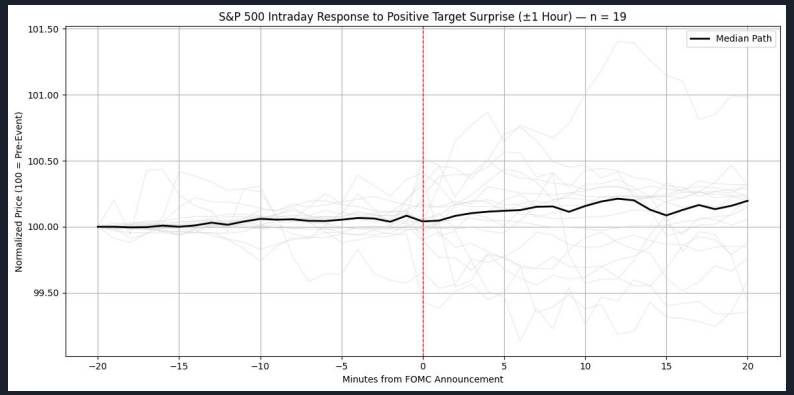


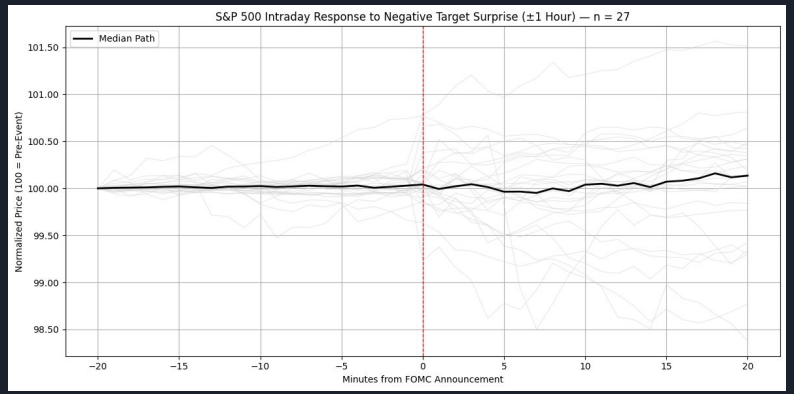


$R^2 = 0.29$	Return
1 bps Target Surprise	**-0.001%**
1 bps Path Surprise	**-0.018%**

- Forward Guidance is more important relative to the actual FOMC decision compared to other assets
- Target Surprise limited influence - lacks economic significance
- Less reactive compared to Bitcoin and Gold since its main use case is liability matching (pension funds)

S&P 500: ^SPX





$R^2 = 0.43$	Return
1 bps Target Surprise	**+0.030%**
1 bps Path Surprise	**+0.009%**

- Target Surprise is the main driver of returns for S&P 500, having a 3x greater effect compared to a Path Surprise of the same magnitude
- S&P 500 performance reflects market sentiment in equity markets around FOMC decisions
- Hawkish surprises are not purely negative, but also indicate macroeconomic strength

Other Equity Indexes - Daily Analysis

Asset	Constant	Target Surprise	Path Surprise	R^2
Bitcoin	0.216	0.023	0.004	0.00
USD Index	-0.072	0.032***	0.058***	0.43
Gold Futures	0.113	-0.071***	-0.023	0.21
S&P500	0.128	0.056**	-0.024	0.06
5Y T-Note	0.050	0.003	-0.047***	0.76
10Y T-Note	0.017	0.009	-0.059***	0.48
Nasdaq	0.232	0.041	-0.034	0.03
Dow Jones	0.051	0.054**	-0.029	0.08

Both Nasdaq and Dow Jones exhibit positive reactions to Target Surprise

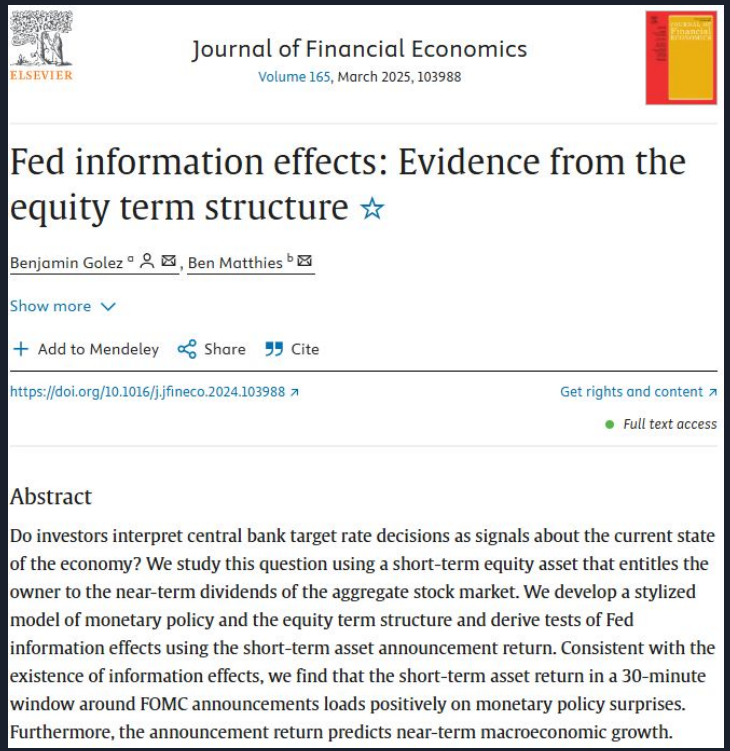
Daily data remains very noisy, making inference difficult.

Both also exhibit (statistically insignificant) negative reactions to Path Surprise

Low R^2 further demonstrates lack of explanatory power.

Supporting Evidence

Equities - Evidence in recent literature of a positive reaction to monetary surprise



Journal of Financial Economics
Volume 165, March 2025, 103988

Fed information effects: Evidence from the equity term structure ☆

Benjamin Golez [a], Ben Matthies [b]

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Abstract

Do investors interpret central bank target rate decisions as signals about the current state of the economy? We study this question using a short-term equity asset that entitles the owner to the near-term dividends of the aggregate stock market. We develop a stylized model of monetary policy and the equity term structure and derive tests of Fed information effects using the short-term asset announcement return. Consistent with the existence of information effects, we find that the short-term asset return in a 30-minute window around FOMC announcements loads positively on monetary policy surprises. Furthermore, the announcement return predicts near-term macroeconomic growth.

Investigates whether financial markets interpret Fed Policy as signals about the current state of the economy

Provides empirical evidence supporting ‘Fed information effects’ - idea that monetary policy decisions convey CB information about macroeconomic conditions beyond what is publicly known

Part of Empirical Methodology: Regressing an equity asset on intraday ‘Monetary Policy Surprise’ (Target Surprise)

Unexpected rate hike leads to higher short-term asset prices (better near-term outlook)

Fed Information Effects

Fed information effects occur when markets interpret a central bank's policy decision as a signal about the state of the economy, rather than reacting purely to its mechanical impact on interest rates. This happens if investors believe the Fed has superior information..

Support for Info Effects	● Romer & Romer (2000) – FOMC has informational advantage ● Nakamura & Steinsson (2018) – Forecasts move in direction of rate surprises
Critics of Info Effects	● Bauer & Swanson (2023a) – “Fed response to news” explains findings ● Karnaukh & Vokata (2022) – Evidence disappears after controlling for predictable components

Summary

	Return					
	BTC-USD	DXY	GC=F	ZF=F	ZN=F	^SPX
1 bps Target Surprise	-0.013%	+0.004%	-0.006%	-0.002%	-0.001%	+0.030%
1 bps Path Surprise	-0.022%	+0.020%	-0.033%	-0.017%	-0.018%	+0.009%

Path Surprise Dominates

Forward guidance (Path Surprise) is generally more impactful than actual rate decisions (Target Surprise), especially for rates, commodities, and FX.

S&P 500 uniquely reacts more strongly to **Target Surprise**, likely due to equity market interpretation of the short-term economic outlook.

BTC behaves as a very liquidity-sensitive asset - it exhibits large and similarly-sized negative reactions to both target and path surprises

Assets most closely tied to interest rates—like gold and treasuries—respond significantly more to forward guidance than to actual target rate surprises.

Results Comparison vs Prior Literature

H&W, 2011

Equity Markets

- Respond primarily to target surprise
- 25bp surprise cut ≈ 1% increase
- Mostly statistically significant
- Adjusted R-squared: 0.043

Short-Term Interest Rates

- Respond to both surprises
- 25bp surprise cut ≈ 5bp decline
- 25bp path decline ≈ 5bp decline
- Adjusted R-squared: 0.057

Exchange Rates

- Respond primarily to path surprise
- 25bp path decline ≈ 0.5% USD drop
- Varies by exchange rate regime

Long-Term Interest Rates

- Respond primarily to path surprise
- 25bp path decline ≈ 8bp decline
- Highest explanatory power (R-squared: 0.144)
- Globally synchronised responses

Insight Different transmission channels operate for different asset classes

GSS, 2005

Table 5. Response of Asset Prices to Target and Path Factors

	One Factor			Two Factors			
	Constant (std. err.)	*Target Factor (std. err.)*	R^2	*Constant (std. err.)*	*Target Factor (std. err.)*	*Path Factor (std. err.)*	R^2
MP Surprise	–0.021*** (0.003)	1.000*** (0.047)	.91	–0.021*** (0.003)	1.000*** (0.048)	0.001 (0.026)	.91
One-Year-Ahead Eurodollar Future	–0.018*** (0.006)	0.555*** (0.076)	.36	–0.017*** (0.001)	0.551*** (0.017)	0.551*** (0.014)	.98
S&P 500	–0.008 (0.041)	–4.283*** (1.083)	.37	–0.008 (0.040)	–4.283*** (1.144)	–0.966 (0.594)	.40
Two-Year Note	–0.011** (0.005)	0.485*** (0.080)	.41	–0.011*** (0.002)	0.482*** (0.032)	0.411*** (0.023)	.94
Five-Year Note	–0.006 (0.005)	0.279*** (0.078)	.19	–0.006** (0.002)	0.276*** (0.044)	0.369*** (0.035)	.80
Ten-Year Note	–0.004 (0.004)	0.130** (0.059)	.08	–0.004* (0.002)	0.128*** (0.039)	0.283*** (0.025)	.74
Five-Year Forward Rate Five Years Ahead	0.001 (0.003)	–0.098** (0.049)	.06	0.001 (0.003)	–0.099** (0.047)	0.157*** (0.028)	.34

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