Internet Appendix for "Trading Volume and Monetary Policy Surprises"

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IA.A Data Details

This section describes in more detail the transformations and the inputs behind the series of Table A.2.

IA.A.1 Daily Financial Data

Treasury yields are the 3-month bill rate and the 1-, 2- and 10-year constant-maturity yields from FRED, in percent. The event-study tables report their daily changes in basis points, Table IA.9 in percentage points. The stock market return is the daily return of the S&P 500 index from CRSP, in

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percent, and the VIX enters in index points. Policy rate uncertainty is the option-implied volatility of Eurodollar and later SOFR futures of Bundick et al. (2024), in percentage points, and its daily changes are reported in basis points.

The yield and forward curves are the zero-coupon nominal curve of Gürkaynak et al. (2007) and the TIPS real yield and breakeven inflation curve of Gürkaynak et al. (2010), both published daily by the Federal Reserve Board. The nominal curve covers the whole sample, and the real curve starts with the February 1999 announcement.

IA.A.2 Monetary Policy Surprises from the Literature

The 30M-PC and the target-path decomposition need a front-month federal funds surprise over the whole sample, while the Time and Sales data carry federal funds futures only from 1995. Through June 2019 I use the surprise of the updated event-window file of Gürkaynak et al. (2005). Through December 2023 I use the front-month change in the updated file of Bauer and Swanson (2023), scaled in the same way, and afterwards I use the U.S. Monetary Policy Database (Acosta et al., 2025). This is the MP1 series of Table IA.4. The second contract, MP2, comes from Gürkaynak et al. (2005) through June 2019 and from the database afterwards.

For every announcement from February 1994, the U.S. Monetary Policy Database reports conventional rate surprises over the statement window, the press-conference window and the monetary-event window that spans both. The press-conference window starts in April 2011. Besides MP1 and MP2 after December 2023, it supplies the announcement timestamps that extend the event list and the changes from which I recreate two of the measures of Appendix F.1. The policy news surprise of Nakamura and Steinsson (2018) is the first principal component of MP1, MP2 and the second to fourth Eurodollar futures over the statement window, and the monetary-event version takes the same component over the monetary-event window. The database's Eurodollar series are SOFR futures from 2022. The other measures come from their authors: the monetary policy surprise of Jarociński and Karadi (2020) under their median rotation, the factors of Lewis (2025) and of Swanson (2021) and the surprise of Bu et al. (2021). I use the published series of Nakamura and Steinsson (2018) only to check the recreation.

IA.A.3 Text, Survey and Calendar Data

Statement dissimilarity measures how far the wording of each FOMC statement departs from that of the previous one. I take the 224 statements released after scheduled meetings between February 4, 1994, the first meeting whose decision was announced, and October 29, 2025, from the press releases on the Federal Reserve's website. Until May 1999 the FOMC released a statement only after meetings at which it changed policy, and from then on after every meeting. Each statement

m is compared with the previous scheduled statement m', which before May 1999 can be several meetings earlier.

Each statement is processed in three steps. First, I keep only its policy text: I drop the release header, the record of the vote, the sentences on related actions such as a change in the discount rate, the implementation note, the media contact and the website's footer. Second, I split the policy text into lower-case words of at least two letters or digits and drop common English words, using the stop-word list of the Natural Language Toolkit, and nineteen terms that name the institution and its procedures, such as "Committee" and "Federal Reserve". Third, the terms of the statement are the remaining words and the two-word phrases they form.

Statement m is then represented by its term-frequency inverse-document-frequency (TF-IDF) vector w_m, whose element for term k is

$$w_{m,k} = n_{m,k} \left(\ln \frac{1 + N_m}{1 + N_{m,k}} + 1 \right),$$

where $n_{m,k}$ is the number of times term k appears in statement m, N_m is the number of statements up to and including m, and $N_{m,k}$ is the number of them that contain k. The weight in parentheses falls with the number of statements that use a term, so a change in distinctive wording moves the measure more than a change in phrases that every statement shares. The vocabulary consists of the 1,000 terms that are most frequent in these N_m statements. Vocabulary and weights are estimated anew for each statement from that statement and all earlier ones, and the previous statement m' is represented with the same vocabulary and weights, so the measure uses no information released later.

The dissimilarity of statement m is one minus the cosine similarity of the two vectors,

$$1 - Similarity_m = 1 - \frac{w_m \cdot w_{m'}}{\|w_m\| \, \|w_{m'}\|}.$$

Since the weights are non-negative, it lies between zero, for statements that use the same terms in the same proportions, and one, for statements that share no term. The resulting series starts with the March 1994 announcement and is available at 222 of the 265 announcements, since the unscheduled announcements and the meetings before May 1999 that ended without a statement have none.

To measure the news in the FOMC's projections of the policy rate, I compare them with what the primary dealers expected before the meeting. At four meetings a year the Summary of Economic Projections gives the median FOMC projection for the year-end federal funds rate one to three years ahead. The Survey of Primary Dealers of the Federal Reserve Bank of New York, merged with its

Survey of Market Participants into the Survey of Market Expectations in 2025, asks primary dealers the same question before each meeting. I take its published result tables and fill in by hand the earlier meetings whose tables cannot be parsed. Both are available at 55 announcements between January 2012 and September 2025.

To identify the other macroeconomic news, I use the Bloomberg economic calendar, a terminal export that records each scheduled release with its timestamp and Bloomberg's relevance score. It covers the releases on FOMC announcement days from November 1996 to October 2025.

IA.A.4 Macroeconomic Data

The local projections and vector autoregressions use five monthly variables. The 1-year real rate is the 1-year Treasury yield at the close of the month's last trading day (FRED `DGS1`), continuously compounded, less 12-month expected inflation, the inflation that the Consensus Economics survey of the following month expects over the bond's year (Internet Appendix IA.A.5). Both enter in percentage points, as does the excess bond premium of Gilchrist and Zakrajšek (2012), taken from the Federal Reserve Board's published update of that series. Industrial production (FRED `INDPRO`) and the consumer price index (FRED `CPIAUCSL`) enter as 100 times their logarithm, so that responses are read in percent. The GS1 system of Internet Appendix IA.F.4 uses the four variables of Gertler and Karadi (2015) instead, with the monthly average 1-year Treasury yield (FRED `GS1`) in place of the two rates. Figure 10 puts three other price indices in the consumer price index's place, each also as 100 times its logarithm: the consumer price index less food and energy (FRED `CPILFESL`), the price index of personal consumption expenditures (FRED `PCEPI`) and that index less food and energy (FRED `PCEPILFE`). The estimation sample runs from February 1994 to February 2020.

The six news predictors of Bauer and Swanson (2023) come from that paper's replication file and are available through December 2023: the nonfarm payroll surprise, employment growth over the preceding year, the commodity price return, the Treasury yield skewness, the stock market return and the change in the yield curve slope over the preceding quarter. The Federal Reserve's own forecasts come from the Greenbook and Tealbook Data Set of the Federal Reserve Bank of Philadelphia. Their projections and revisions for real output growth, the output deflator and unemployment are released with a five-year lag and are public through December 2020. The Fed-information orthogonalization stops in January 2020, at the paper's pre-pandemic cutoff, because the 2020 forecasts are large enough to dominate the regressions.

IA.A.5 Expected Inflation and the Real Rate

The local projections and vector autoregressions of Section 6 measure the real rate of month t as the 1-year Treasury yield on the last trading day of month t (FRED `DGS1`) less the inflation expected from month t to month $t+12$. I take this expectation from Consensus Forecasts, whose panel of professional forecasters reports every month the annual-average CPI inflation it expects for the current and for the next calendar year.[1] For month t I use the survey of month $t+1$, the first to have seen all of month t's FOMC announcements, because Consensus takes its survey in the second week of the month.[2] Miranda-Agrippino and Ricco (2021) align the survey with the month in the same way.

The forecasts do not cover the 12 months from month t, and they contain inflation that is already published. An annual average includes the price levels of months whose CPI is out when the forecasters answer—in a March survey, those of January and of the whole previous year. Panel (a) of Figure IA.1 shows what this implies for a weighted average of the two forecasts, with weights $(13-m)/12$ and $(m-1)/12$ in survey month m. In the survey of March 2019 it puts 45% of its weight on months already published and only 42% on the 12 months from February 2019.

I therefore take the published months out before converting. Because an annual average is an average of monthly price levels, the current-year forecast F^{CY} fixes the sum of the price levels expected for the year, and subtracting the published ones leaves the sum expected for the months still to come. The next-year forecast F^{NY} then fixes the sum for the next year. With P_k the CPI of month k, $\bar{P}_Y$ its average over year Y, A and U the published and the other months of the survey year and P_k^e the expected price level of an unpublished month,

$$\sum_{k\in U} P_k^e = 12\left(1+\frac{F^{CY}}{100}\right)\bar{P}_{Y-1} - \sum_{k\in A} P_k, \qquad \sum_{k\in Y+1} P_k^e = \left(1+\frac{F^{NY}}{100}\right)\left(\sum_{k\in A} P_k + \sum_{k\in U} P_k^e\right).$$

I assume that expected inflation is constant at μ_1 over the unpublished months up to December and at μ_2 over the next year, so that $P^e_{L+h} = P_L e^{\mu_1 h}$ up to December, month D, and $P^e_{D+h} = P^e_D e^{\mu_2 h}$, where L is the last published month. The two equations then determine μ_1 and μ_2, and expected inflation from month $t = m-1$ to month $t+12$ is

$$\pi_t^e = 100\left[(13-m)\,\mu_1 + (m-1)\,\mu_2\right].$$

Published inflation enters only through the levels that are subtracted, so it drops out of this

[1] The United States page of *Consensus Forecasts* lists consumer prices under the heading "Average % Change on Previous Calendar Year" (March 2026 issue, p. 4). I use the consensus, the mean across forecasters, and the seasonally adjusted CPI-U as published on the day before each survey, from the real-time vintages of ALFRED.

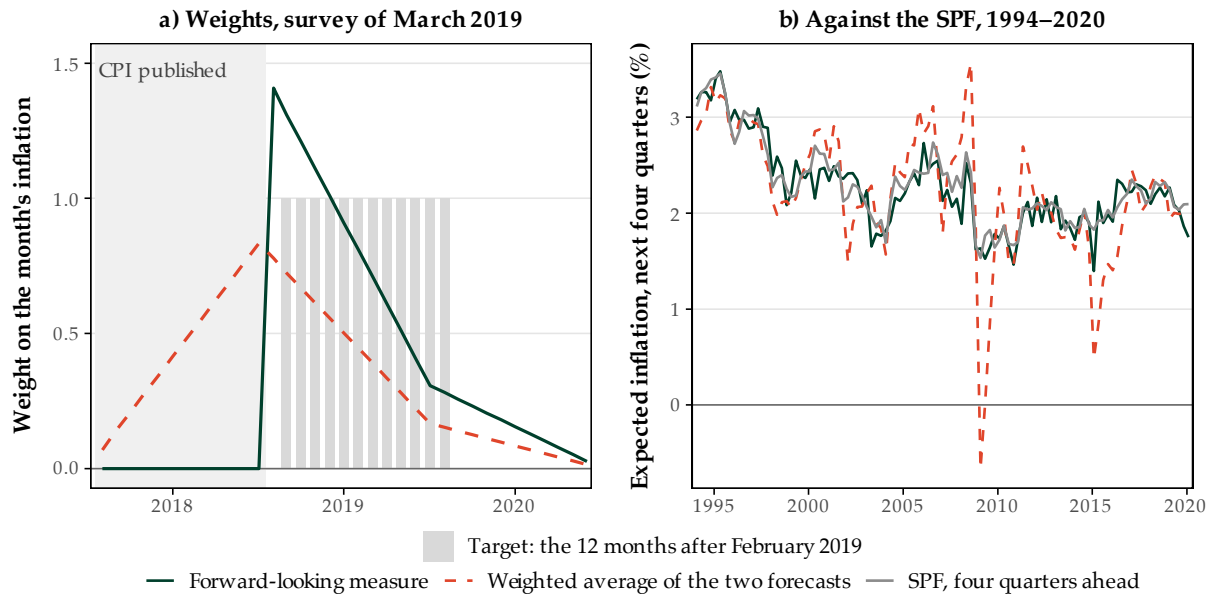
[2] The survey date falls on days 8 to 14 of the month in 288 of the 314 surveys from February 1994 to March 2020, and 176 of the 218 announcements from February 1994 to February 2020 come on or after the survey date of their month.

forward-looking measure. In the survey of March 2019 the measure puts no weight on published months and 77% on the 12 months from February 2019.

Panel (b) compares the measure with the four-quarter-ahead CPI forecast of the Survey of Professional Forecasters, which asks for CPI inflation in each of the next four quarters but only once a quarter. The two move closely together from 1994 to 2020, with a mean absolute gap of 0.13 percentage points. The weighted average departs from both when published inflation swings, most visibly in 2008 and 2009.

The yield enters continuously compounded, as $200\ln(1 + y/200)$, like π^e_t. Because the CPI is a monthly average, the window of π^e_t starts in the middle of month t, and I read the same fitted path over the bond's year, from the yield's date.

Figure IA.1: Twelve-Month Expected Inflation from Consensus Forecasts



Panel (a) shows the weight that each 12-month measure puts on the inflation of each month in the Consensus Forecasts survey of March 2019: the change in the measure per percentage point of that month's inflation, published or expected, when both calendar-year forecasts are formed from the higher path, on an expected path of 2% a year. The CPI was then published through January 2019 (shaded), and the target puts a weight of one on each month from March 2019 to February 2020 (bars). The weighted average weights the current-year forecast by 10/12 and the next-year forecast by 2/12. It puts 45% of its weight on published months and 42% on the target window, and between 37% and 47% on published months in the surveys of the other months. The forward-looking measure puts 77% on the target window, and the rest on February 2019, the unpublished month before it, and on the months of 2020 after it. Panel (b) shows the four-quarter-ahead CPI forecast of the Survey of Professional Forecasters (SPF), the mean across forecasters, and the two Consensus measures of the survey of the same month, the middle month of each quarter, from 1994Q1 to 2020Q1. The forward-looking measure is read over the SPF's window, from the survey quarter to the same quarter a year later. Its mean absolute gap to the SPF is 0.13 percentage points, against 0.28 for the weighted average.

IA.B High-Frequency Evidence

IA.B.1 The Pit Before February 1994

I start the sample in February 1994, when the FOMC began announcing its decisions, because before then scheduled meetings leave almost no trace in the Eurodollar pit. Figure IA.2 compares three groups of events: the scheduled meetings of 1988–1993, whose decisions markets had to infer from the Desk's open market operations, the unscheduled moves of the same years, and every announcement from February 1994 to November 2003. At the scheduled meetings before 1994, trades and prices barely move at the event time. The unscheduled moves of those years do carry news, with price changes as large as after the announcements from 1994. A measure that reads the window and the loadings off trading volume has nothing to read at the scheduled meetings before 1994. The February 1994 start restricts the sample to announced decisions, and it also drops the 20 unscheduled moves of 1988–1993.

IA.B.2 Volatility Around FOMC Announcements

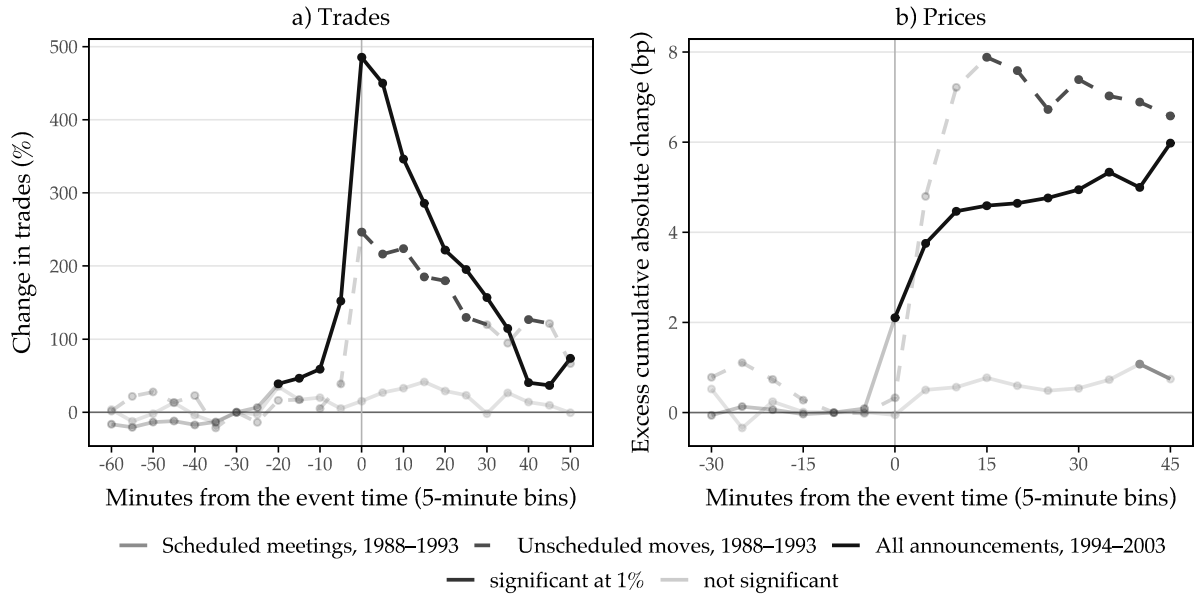
Figure IA.3 repeats the event-time regression of Figure 1 for absolute price changes. Volatility mirrors volume: the front-month federal funds future returns to normal within 10 minutes of the announcement, while absolute price changes in Eurodollar futures remain elevated for 75 to 130 minutes.

IA.B.3 Underreaction

The gradual price adjustment documented in Section 3 is an underreaction: the implied rate keeps moving in the direction of its initial change. Table IA.1 regresses the move of the implied rate of the first quarterly Eurodollar contract after the first 10 minutes, up to the end of the window, on its move from 10 minutes before to 10 minutes after the announcement. Over the 164 scheduled announcements without a press conference from February 1994 to November 2018 whose window extends beyond the first 10 minutes, the slope is 0.253. Before volume returns to normal, the implied rate thus moves roughly another quarter of its initial change in the same direction. The slope stays between 0.221 and 0.314 without the turning points of the target rate, without the Global Financial Crisis and from December 2003.

A simple trading strategy puts a size on this underreaction. It takes the direction of the first contract's price change from 10 minutes before to 10 minutes after the announcement and holds the position until volume returns to normal. Over the same announcements it earns 0.95 percentage points, with an annualized Sharpe ratio of 0.95 (Figure IA.4). The strategy ignores transaction costs, bid-ask spreads and market impact, so it measures the size of the underreaction rather than

Figure IA.2: Trading and Prices in the Eurodollar Pit Before and After February 1994



The figure shows the response of the Eurodollar pit at the event time for three groups of FOMC events with a Gürkaynak et al. (2005) surprise: the 41 scheduled meetings from November 1988 to December 1993, whose decisions the FOMC did not announce and whose event time is when the market could infer the decision, mostly the Desk's open market operation at 11:30 AM; the 20 unscheduled moves of the same years; and the 83 announcements from February 1994 to November 2003, scheduled and unscheduled. Panel (a) shows the percentage change in the number of trades in the first twelve quarterly Eurodollar futures, $100(\exp(\hat{\beta}_k) - 1)$, from the Poisson regression

$$Trades_{m,d,\tau} = \exp\left(\alpha_{m,\tau} + \alpha_d + \sum_{k \neq -30} \beta_k \cdot \mathbb{1}\{\tau = k\} \cdot FOMC_d\right) \epsilon_{m,d,\tau}$$

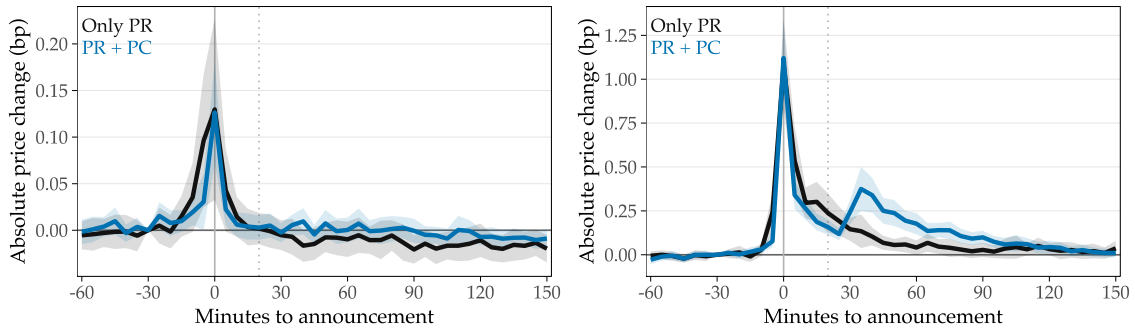
on one-minute observations of the event day and its 20 prior business days, without days that are themselves FOMC events. Panel (b) shows the cumulative absolute change of the twelve contracts' prices from 10 minutes before the event, in excess of the same change on the comparison days, in basis points. Pit volume is the number of trades, as the Time and Sales data contain no contract volume for the pit. Two events fall after the pit close at 3:00 PM and are excluded: December 18, 1990 and October 15, 1998. Lines are solid where the 99% confidence interval excludes zero and faded otherwise. Standard errors are clustered by trade date. Table A.2 lists the data sources.

a tradeable profit. Fleming and Piazzesi (2005) document a similar sluggish response of Treasury yields in the cash market, much of it at intermeeting moves, and show that transaction costs largely eliminate the profits of trading on it.

IA.B.4 Heterogeneity in Cumulative Price Response

How much of the price adjustment the 30-minute window misses varies with the announcement. Figure IA.5 splits the announcements by three characteristics that should govern how much the market has to process. The first is how much the statement changes from the previous one, its dissimilarity (Internet Appendix IA.A.3). The second is the policy rate uncertainty of Bundick et al. (2024) on the day before, what the market does not yet know about the payoff of the futures. The third is the Summary of Economic Projections, a precise signal about the path of the policy

Figure IA.3: Absolute Price Changes Around FOMC Announcements



(a) Front-Month FFR Future **(b)** Q1–Q12 Eurodollar Futures

The figure shows the estimated $\hat{\beta}_k$ and their 99% confidence intervals from

$$|\Delta P_{c,m,d,\tau}| = \alpha_{c,m,\tau} + \alpha_{c,d} + \sum_{\substack{k=-60 \\ k\neq -30}}^{150} \beta_k \cdot \mathbb{1}\{\tau = k\} \cdot FOMC_d + \epsilon_{c,m,d,\tau}$$

where c denotes the contract, m indexes FOMC meetings, d denotes the calendar day, τ denotes event time in minutes relative to the FOMC announcement (in 5-minute intervals), and $FOMC_d$ is an indicator equal to one on FOMC announcement days. The baseline period is $\tau = -30$ and the sum is over 5-minute intervals: $k \in \{-60, -55, -50, \ldots, 145, 150\}$. The coefficients are estimated by OLS. Table A.2 lists the data sources. The sample runs from December 2003 to October 2025 and contains all scheduled FOMC announcements and the 20 prior trading days. From the announcement of June 15, 2022, the Eurodollar series are three-month SOFR futures. The two series hold announcements with a press conference (PR + PC) apart from those without (Only PR). The solid vertical line indicates the FOMC announcement at $\tau = 0$, the dotted line $\tau = 20$, the end of the 30-minute window of Gürkaynak et al. (2005). Standard errors are clustered at the meeting level.

Table IA.1: Underreaction of Eurodollar Futures Prices

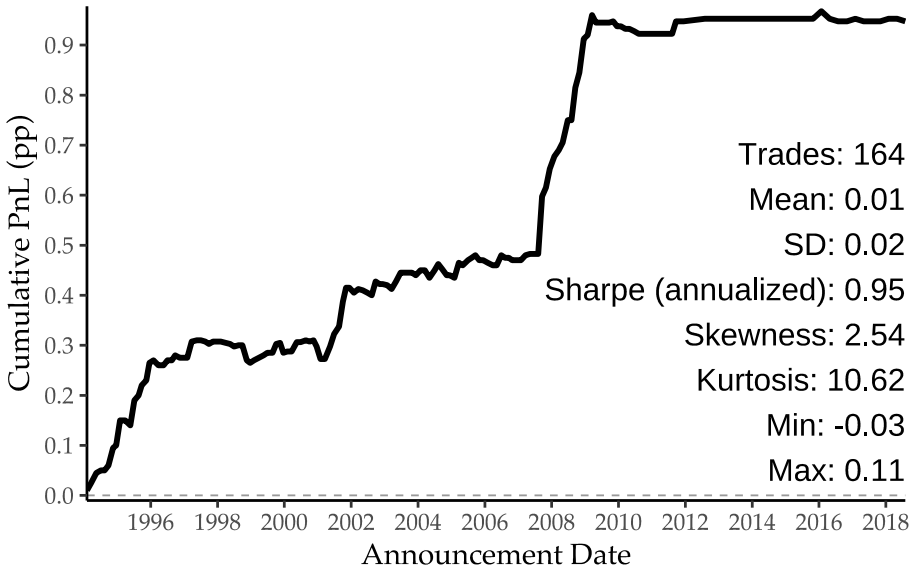
	$f_{m,t+\bar{x}_m} - f_{m,t+10}$			
	All	No turning points	No crisis	2003/12 - 2018/11
Constant	−0.001	0.000	−0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
$f_{m,t+10} - f_{m,t-10}$	0.253***	0.221***	0.237***	0.314***
	(0.042)	(0.028)	(0.056)	(0.081)
R^2	0.396	0.328	0.323	0.564
n	164	157	156	85

This table reports the estimated coefficient of a regression of the change in the implied rate of the first quarterly Eurodollar contract from 10 minutes after the FOMC announcement to the upper bound of the announcement-specific window of the VBS, $f_{m,t+\bar{x}_m} - f_{m,t+10}$, on its change from 10 minutes before to 10 minutes after the announcement, $f_{m,t+10} - f_{m,t-10}$. A positive coefficient means that the implied rate keeps moving in the direction of its initial change. The sample includes the scheduled FOMC announcements without a press conference from February 1994 to November 2018 whose window ends later than 10 minutes after the announcement, the sample of the trading strategy in Figure IA.4. No turning points drops the 7 announcements at which the target rate moved opposite to its previous move, No crisis the Global Financial Crisis (2008/07 to 2009/06), and the last column keeps the announcements from December 2003, the sample of Figure 2. The R^2 row reports the adjusted R^2. Reported standard errors are heteroskedasticity-robust (HC3).

rate that the FOMC releases at every other meeting. From 2019, when every meeting has a press conference, its effect can be told apart from that of the press conference.

Announcements that bring more news show more of the adjustment that the 30-minute window

Figure IA.4: Cumulative PnL of Long-Short First Eurodollar Contract



The figure shows the cumulative PnL of a long-short strategy in the first Eurodollar contract that enters a long (short) position if there has been a price increase (decrease) from 10 minutes before to 10 minutes after the FOMC announcement and closes the position once volume is no longer abnormal. The box reports the number of trades and the mean, standard deviation, Sharpe ratio (annualized with eight announcements a year), skewness, kurtosis, minimum and maximum of the per-trade PnL, in percentage points. The sample includes the scheduled FOMC announcements without a press conference from February 1994 to November 2018 whose window ends later than 10 minutes after the announcement, those of Table IA.1. Table A.2 lists the data sources.

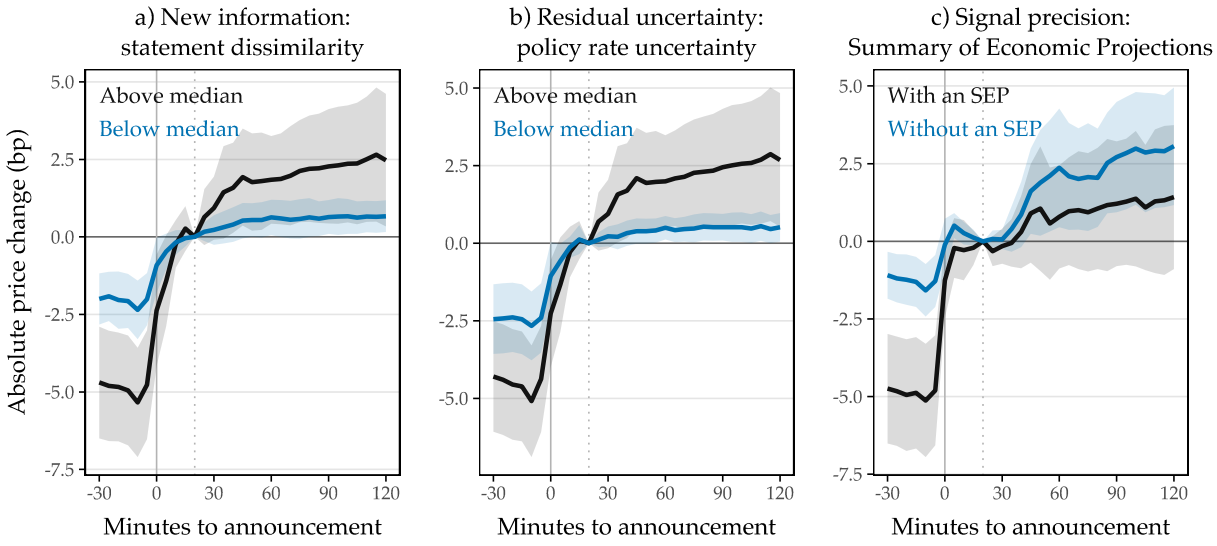
misses. When the statement changes more than at the median announcement, prices move 5.3 basis points within the window and another 1.8 by 60 minutes, against only 2.4 and 0.6 when it changes less. High policy rate uncertainty shows the same pattern. The Summary of Economic Projections moves the adjustment forward. With one, the later moves of prices are not significant. Without one, prices move another 2.4 basis points by 60 minutes, during the press conference. These patterns are consistent with markets needing longer to absorb a statement that changes more or that meets more uncertainty, and less long when the projections spell out the path.

IA.B.5 Poisson Regressions

Volume and absolute price changes are non-negative and skewed to the right, so a linear regression may misstate their dynamics. Figure IA.6 therefore estimates the event-time regressions of Figures 1 and IA.3 by Poisson regression, which is consistent for the conditional mean of a non-negative outcome and the natural estimator for a count such as volume (Cohn et al., 2022). Its coefficients are percentage changes, $(\exp(\hat{\beta}) - 1) \times 100$, which puts volume and absolute price changes on one scale.

The Poisson estimates tell the same story as the OLS estimates. Volume and absolute price

Figure IA.5: Cumulative Absolute Price Changes: Heterogeneity



The figure shows $\hat{\beta}_{k,g}$ and their 99% confidence intervals from

$$|P_{c,m,\tau} - P_{c,m,-10}| = \alpha_{c,m} + \sum_{g} \sum_{\substack{k=-30 \\ k\neq 20}}^{120} \beta_{k,g} \cdot \mathbb{1}\{\tau = k\} \cdot \mathbb{1}\{m \in g\} + \epsilon_{c,m,\tau}$$

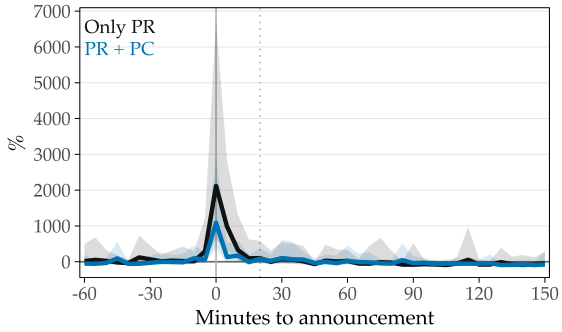
where c denotes the contract, m indexes FOMC meetings, g the two groups of announcements of a panel and τ event time in minutes relative to the FOMC announcement, in 5-minute intervals. The contracts are the first twelve quarterly Eurodollar futures, from the announcement of June 15, 2022 three-month SOFR futures, and the price changes are in basis points. The baseline period is $\tau = 20$ (dotted line), the end of the 30-minute window of Gürkaynak et al. (2005), so that after it a line shows the price adjustment the 30-minute window misses. Panels (a) and (b) use the sample of Figure 2, the scheduled FOMC announcements without a press conference from December 2003 to November 2018, and split them at the median of the text-based statement dissimilarity and of the policy rate uncertainty of Bundick et al. (2024) on the day before the announcement, 44 announcements above the median and 45 below. Panel (c) uses the scheduled FOMC announcements from January 2019 to October 2025, all with a press conference: 26 with a Summary of Economic Projections and 28 without. The coefficients are estimated by OLS on FOMC announcement days, with standard errors clustered at the meeting level. Table A.2 lists the data sources.

changes spike at the announcement and then decay over 75 to 145 minutes. Only in Eurodollar futures do they persist. Twenty minutes after an announcement without a press conference, when the conventional 30-minute window closes, Eurodollar volume is still around 370% above its level 30 minutes before the announcement and volatility around 160% above it. In the front-month federal funds future both are back at their pre-announcement level by then.

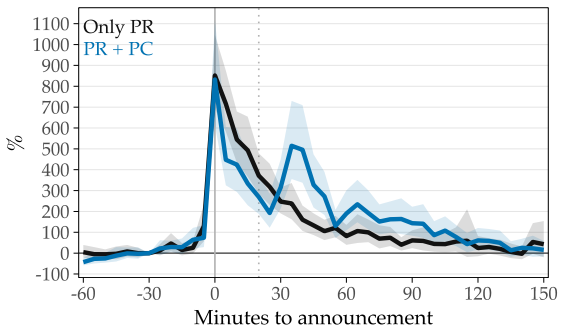
IA.B.6 Equity Markets

Do equity markets process FOMC announcements as slowly as interest rate futures? Stock prices respond to the path of interest rates through discount rates and expected cash flows, and Zhu (2023) documents that volume in the SPY ETF and across stocks falls in the 24 hours before FOMC announcements and rises by a similar amount in the 24 hours after. Figure IA.7 repeats the event-

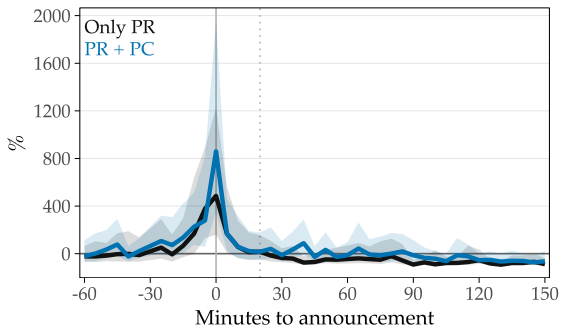
Figure IA.6: Trading Volume and Absolute Price Changes Around FOMC Announcements: Poisson



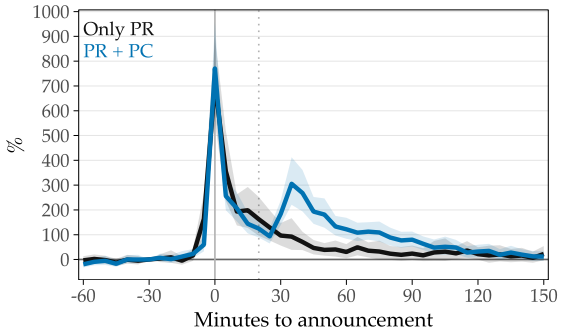
(a) Front-Month FFR Future Volume



(b) Eurodollar Futures Volume



(c) Front-Month FFR Future Price Volatility



(d) Q1–Q12 Eurodollar Futures Price Volatility

Panels (a) and (b) show the estimated $\hat{\beta}_k$ and their 99% confidence interval from

$$\log\left(E\left[Volume_{m,d,\tau} \mid \cdot\right]\right) = \alpha_{m,\tau} + \alpha_d + \sum_{\substack{k=-60 \\ k\neq -30}}^{150} \beta_k \cdot \mathbb{1}\{\tau = k\} \cdot FOMC_d,$$

where m indexes FOMC meetings, d denotes the calendar day, τ denotes event time in minutes relative to the FOMC announcement, in 5-minute intervals from 60 minutes before to 150 minutes after it, and $FOMC_d$ is an indicator equal to one on FOMC announcement days. Panels (c) and (d) show the estimated $\hat{\beta}_k$ and their 99% confidence interval from

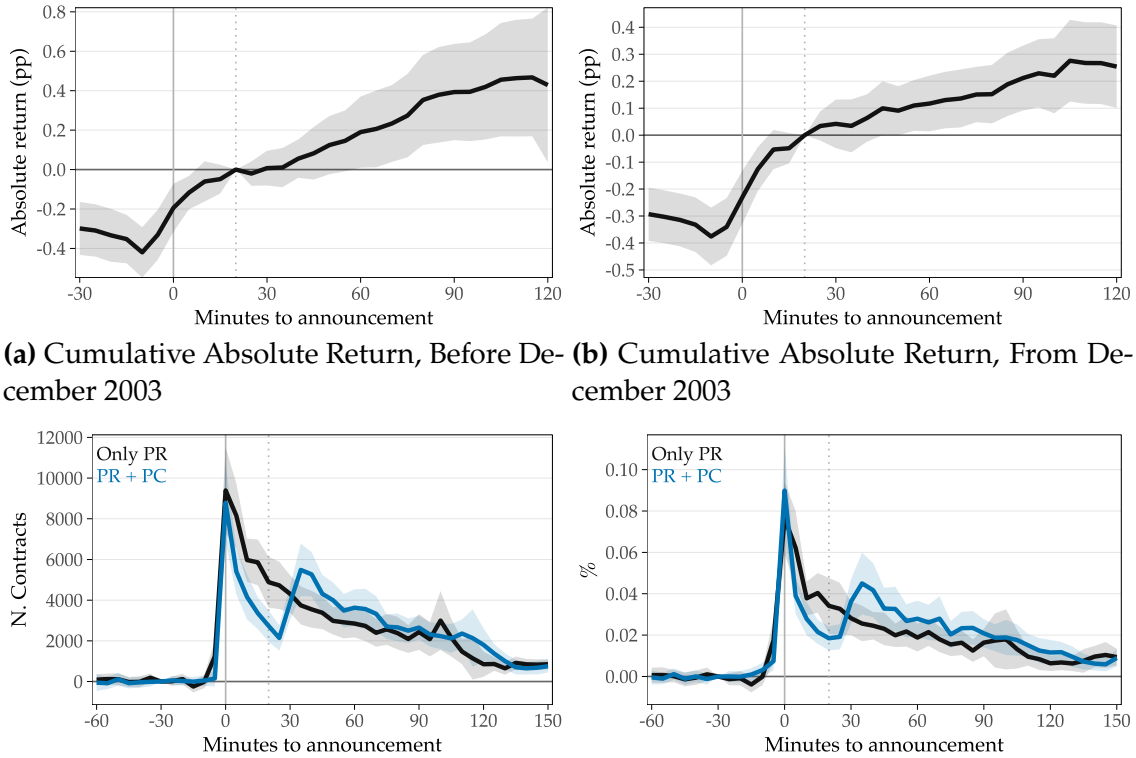
$$\log\left(E\left[|\Delta P_{c,m,d,\tau}| \mid \cdot\right]\right) = \alpha_{c,m,\tau} + \alpha_{c,d} + \sum_{\substack{k=-60 \\ k\neq -30}}^{150} \beta_k \cdot \mathbb{1}\{\tau = k\} \cdot FOMC_d,$$

where the subscripts are as above and c denotes the contract. The dot denotes conditioning on the fixed effects and group indicators. The coefficients are estimated by Poisson regression and reported as percentage changes. Table A.2 lists the data sources. The sample runs from December 2003 to October 2025 and contains all scheduled FOMC announcements and the 20 prior trading days. From the announcement of June 15, 2022, the Eurodollar series are three-month SOFR futures. The two series hold announcements with a press conference (PR + PC) apart from those without (Only PR). The solid vertical line indicates the FOMC announcement at $\tau = 0$, the dotted line $\tau = 20$, the end of the 30-minute window of Gürkaynak et al. (2005). Standard errors are clustered at the meeting level.

time analysis for the E-mini S&P 500 futures contract traded on the CME. Volume and absolute returns spike at the announcement and remain significantly above their pre-announcement level through the 150 minutes shown, longer than in Eurodollar futures.

The E-mini also shows whether longer windows would have been needed before electronic trading took over the Eurodollar market, since it has traded electronically since its launch in September 1997. They would have. Before December 2003 the cumulative absolute return keeps rising after the 30-minute window has closed, as it does afterwards. Its point estimates are larger before 2004, but the intervals of the two periods overlap.

Figure IA.7: Behavior of E-mini Futures Around FOMC Announcements



(a) Cumulative Absolute Return, Before December 2003

(b) Cumulative Absolute Return, From December 2003

(c) Volume

(d) Volatility

Panels (a) and (b) show the cumulative absolute return of the E-mini contract from 10 minutes before the announcement, $\hat{\beta}_k$ and their 99% confidence intervals from

$$|P_{m,\tau} - P_{m,-10}| = \alpha_m + \sum_{\substack{k=-30 \\ k\neq 20}}^{120} \beta_k \cdot \mathbb{1}\{\tau = k\} + \epsilon_{m,\tau},$$

where m indexes FOMC announcements and τ is event time in minutes, with the baseline at $\tau = 20$. Panel (a) estimates it on the announcements from the start of E-mini trading in September 1997 to November 2003 and panel (b) on those from December 2003 to November 2018, both restricted to announcements without a press conference. Panels (c) and (d) show the volume of the contract, in contracts traded, and its absolute return, in percent, on announcement days relative to the same 5-minute bucket on the surrounding non-announcement days, with the baseline 30 minutes before the announcement and with announcement-date by bucket and trade-date fixed effects. The two series hold announcements with a press conference (PR + PC) apart from those without (Only PR), and the sample runs from December 2003 to October 2025. All four panels are estimated by OLS. The solid vertical line indicates the FOMC announcement at $\tau = 0$, the dotted line $\tau = 20$, the end of the 30-minute window of Gürkaynak et al. (2005). Standard errors are clustered at the meeting level. Table A.2 lists the data sources.

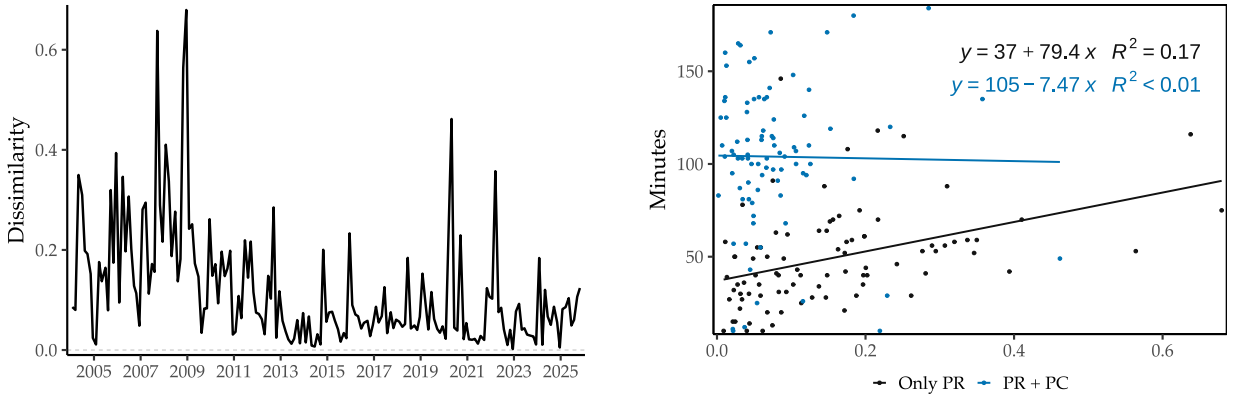
IA.C Validation of the Window and the Loadings

IA.C.1 Statement Dissimilarity and the Window

Figure IA.8 shows the dissimilarity behind Table 1. Statements change most when policy changes course: in 2007 and 2008, as the FOMC cut the federal funds rate toward zero, and again in 2020 and 2022. From 2013 to 2019 they change little from one meeting to the next. The press release contains the decision as well as the reasoning behind it, and the media and market participants alike analyze each change in its wording as soon as the statement is out.[3]

Panel (b) plots the window against dissimilarity. Without a press conference the fitted line slopes up, as in Table 1. With one the line is flat and lies higher, consistent with the press conference rather than the statement setting how long markets trade. A fixed window cannot follow this variation, since it closes 20 minutes after every statement however much the statement has changed.

Figure IA.8: Statement Dissimilarity and the Window



(a) Statement Dissimilarity **(b)** Window Length vs. Statement Dissimilarity

Statement dissimilarity is $1 - Similarity_m$, where $Similarity_m$ is the cosine similarity between the TF-IDF vectors of the FOMC statement and of the previous scheduled statement. Internet Appendix IA.A.3 describes the construction. Panel (a) shows it at each announcement. Panel (b) plots the upper bound of the window $\overline{x}_m$ in minutes after the statement against dissimilarity. Black marks the announcements without a press conference and blue those with one, each with its least-squares line. Both panels cover the scheduled announcements from January 2004 to October 2025.

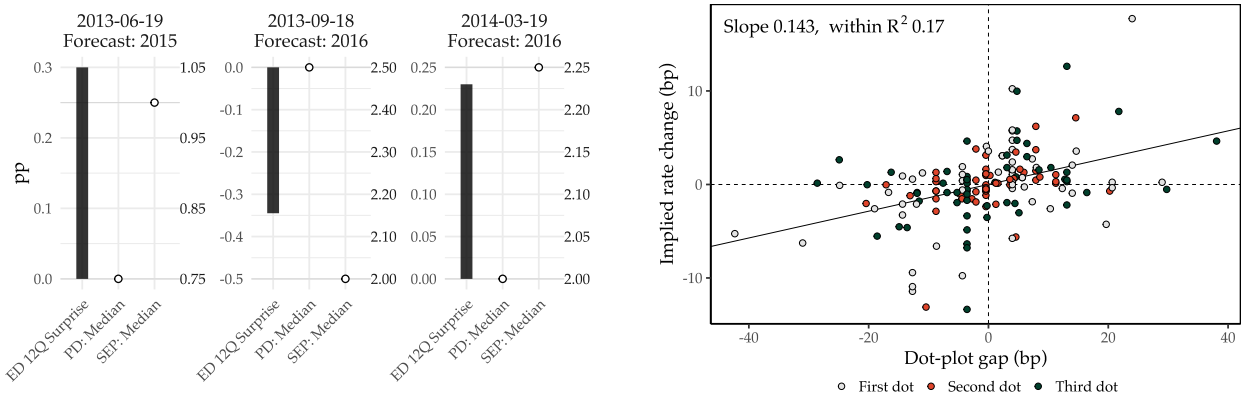
IA.C.2 Large Volume-Weighting Components and the Dot Plot

Figure IA.9 shows the announcements behind the largest volume-weighting components of the sample, in absolute value: June 2013, September 2013 and March 2014. The fourth, the date-based guidance of August 2011 in Figure 4, came before the FOMC published projections of the rate. In principle, the repricing on these days could reflect news about the Federal Reserve's asset purchases rather than about the path of the policy rate. The surveys show that the path was news. At each

[3]For instance, the Wall Street Journal maintains a "Fed Statement Tracker" that highlights the changes in each statement, at https://graphics.wsj.com/fed-statement-tracker-embed/.

of the three announcements the dot plot differed from the dealers' median for the end of the year two or three years ahead by at least 25 basis points (panel a). Over the volume-based window the twelfth Eurodollar contract, which settles at a similar horizon, moved by at least 23 basis points in the direction of the gap. The largest of the three gaps, 50 basis points in September 2013, came with the largest move. The 30M-PC, with its loadings fixed on the first year of contracts, accounts for at most about an eighth of the VBS on these days (Figure 6b). Panel (b) plots the relationship of Table 2 across the 55 announcements with projections.

Figure IA.9: Beliefs About Interest Rates: Primary Dealer Survey vs. Dot Plot



(a) Survey Forecast Differences **(b)** Futures vs. Dot-Plot Gap

Panel (a) shows three of the four announcements with the largest volume-weighting component. The fourth, August 9, 2011, predates the projections. The circles are the median forecasts of the federal funds rate at the end of the year above each panel from the Primary Dealer Survey of the Federal Reserve Bank of New York and from the Summary of Economic Projections, in percent (right axis). The bar is the change in the implied rate of the twelfth Eurodollar contract over the volume-based window, in percentage points (left axis). Panel (b) plots, for the first three dots of each projection, the change in the implied rate of the matched futures contract over the volume-based window against the dot-plot gap at that dot, the Summary of Economic Projections median minus the Primary Dealer Survey median. Both are in basis points and net of the announcement's and the dot's mean, and the line is the pooled coefficient of Table 2. Panel (b) covers the 55 announcements with a Summary of Economic Projections from January 2012 to September 2025.

IA.C.3 No Confounding with Economic News

Section 4.3 shows that other news is unlikely to explain the length of the windows, and Tables IA.2 and IA.3 give the detail. Releases come out before the statement at 218 announcements, with a major release at 56 of them. On average the closest comes more than four and a half hours before the statement, long before the window opens. The releases at or after the statement are minor and come at 40 announcements, most of them after the window has closed, among them the 18 releases of the Langer Consumer Comfort survey at 5:00 PM. Bloomberg's relevance ranks 168 releases, 108 of which come out on FOMC days. The Consumer Credit report, which falls inside three windows after the 30-minute window has closed, ranks only 91st.

Table IA.2: Economic News on the FOMC Announcement Day

		Before ($N = 218$)		At or After ($N = 40$)	
		Mean	Std. Dev.	Mean	Std. Dev.
News (N.)		2.1	1.1	1.1	0.3
Closest Release (Minutes)		281.7	86.3	133.3	86.9
		N	Pct.	N	Pct.
NFP | INJ | GDP | CPI | ISM	FALSE	162	74.3	40	100.0
	TRUE	56	25.7	0	0.0

The table summarizes the releases of the Bloomberg Economic Calendar with a positive relevance score on FOMC announcement days from November 1996 to October 2025, separately for the announcements with a release before the statement and those with a release at or after it. News is the number of releases per announcement, and the closest release is the distance of the closest one to the statement in minutes. The last rows count the announcements with and without a major release, one of the five most relevant in Bloomberg's ranking: Non-Farm Payrolls (NFP), initial jobless claims (INJ), GDP, the CPI and ISM manufacturing.

Table IA.3: News Releases after the FOMC Press Release

Release	Meetings	Ranking	First Meeting	Last Meeting	Min Distance	News in Window
Consumer Credit	4	91	2002-05-07	2025-05-07	45	3
Langer Consumer Comfort	18	59	2005-03-22	2008-12-16	165	0
Monthly Budget Statement	6	40	2007-08-10	2020-06-10	0	4
U. of Mich. Sentiment	1	6	2007-08-17	2007-08-17	105	0
Trade Balance	1	23	2008-03-11	2008-03-11	0	1
MBA Mortgage Applications	1	10	2008-10-08	2008-10-08	0	1
Pending Home Sales MoM	1	37	2008-10-08	2008-10-08	180	0
Wards Total Vehicle Sales	3	85	2010-11-03	2013-05-01	110	0
Net Long-term TIC Flows	8	43	2016-06-15	2025-06-18	120	0

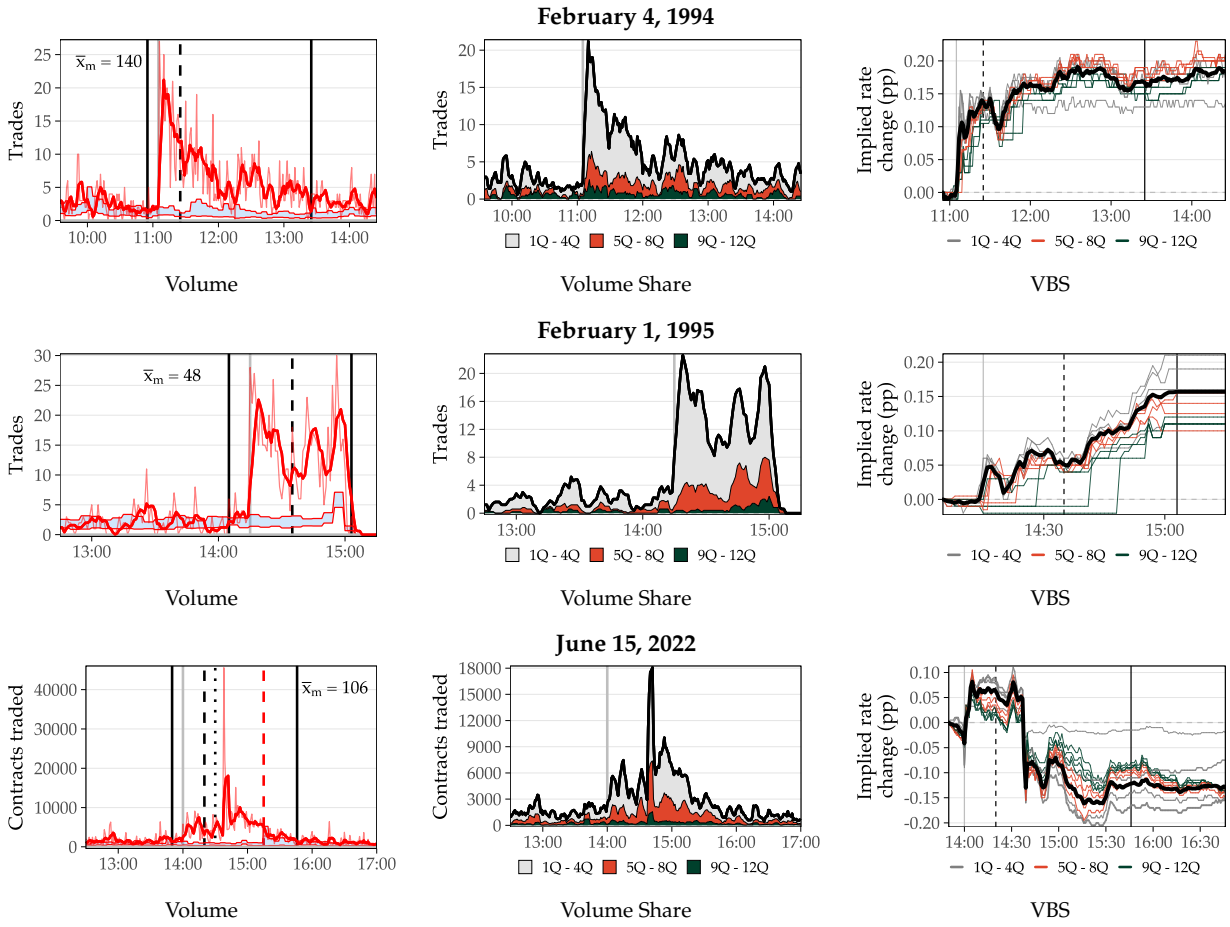
The table lists the releases at or after the statement from November 1996 to October 2025. For each it gives the number of announcements with the release, its rank among the 168 releases in Bloomberg's ranking by relevance, the first and the last of these announcements, the shortest distance to the statement in minutes, and the number of announcements at which it falls inside the volume-based window.

IA.C.4 Narrative Evidence

A long window changes the surprise only when prices keep moving after the 30-minute window has closed. The three announcements of Figure IA.10 show the difference.

On February 4, 1994, the FOMC released a statement explaining its rate hike, the first statement in its history. The hike caught markets by surprise (The New York Times, 1994), and trading stayed above normal for 140 minutes after the announcement. Yet most of the repricing came within the 30-minute window, and trading concentrated in the first four contracts, on which the 30M-PC also rests. The VBS and the 30M-PC are therefore similar in size.

Figure IA.10: Examples: STIR Futures Market Response to FOMC Announcements



Each row is one FOMC announcement and each column one view of the short-term interest rate (STIR) futures market on that day, Eurodollar in the first two rows and three-month SOFR in the last. The left column shows market-wide volume, thin red for the minute and thick red for its 5-minute moving average, against the bootstrapped 0.5% and 99.5% bounds of normal volume from the 20 prior trading days as the shaded band. The vertical lines are the window: solid black 10 minutes before the release, grey at the release, dashed black 20 minutes after it, where the conventional 30-minute window closes, and solid black at the announcement-specific upper bound $\bar{x}_m$, whose value is printed in the panel. Where the press conference restarts the window, as on June 15, 2022, the dashed red line marks where the statement window closed and the dotted line the start of the press conference. The middle column splits the same volume by contract maturity, stacked, with the market aggregate as the black line. The right column shows each contract's implied rate change from 10 minutes before the release, drawn at a line width equal to that contract's cumulative share of volume, and in black the volume-based surprise, the sum of those changes weighted by those shares. Activity is measured as the number of transactions before December 2003 and as contracts traded afterwards, since the Time and Sales data carry no volume for pit trades. Table A.2 lists the data sources.

On February 1, 1995, the Federal Reserve raised interest rates by 50 basis points, leaving market participants wondering when the tightening cycle would peak. The statement set off heavy trading that lasted until the Eurodollar pit closed, 45 minutes after the statement, and implied rates kept rising until then. By the close the VBS was almost three times as large as at the end of the 30-minute window. Its window-length component is the largest of the pit era.

On June 15, 2022, the Federal Reserve raised interest rates by 75 basis points, the largest increase

since 1994. During the press conference, Chair Jerome Powell said that he did "not expect moves of this size to be common" (Powell, 2022), and the SOFR futures market repriced sharply. The window first closes 75 minutes after the announcement, and renewed trading late in the press conference restarts it, so that it ends 106 minutes after the announcement. The VBS, about 6 basis points at the end of the 30-minute window, falls to −12 basis points by the end of the window. Its window-length component is the largest of the sample. The 30M-PC, whose window closes before the press conference begins, records the hike but not the reversal.

IA.C.5 Loadings for Benchmark Surprises

The principal component over the announcement-specific windows weights the five futures much as the 30M-PC does (Table IA.4). The 30M-PC is the first principal component of the 30-minute changes in the front-month federal funds future and the first four quarterly Eurodollar futures, following Nakamura and Steinsson (2018), with the first Eurodollar future in place of the next-meeting federal funds future. The x_m-PC is the first principal component of the same changes over the announcement-specific windows x_m. The window-length component is the part of the x_m-PC that the 30M-PC does not explain. Because the two principal components weight the futures alike, it reflects the longer window rather than different weights.

Table IA.4: Loadings of the Input Surprises on the Principal Component

Sample	MP1	ED1	ED2	ED3	ED4
30M-PC	0.713	0.939	0.986	0.961	0.908
x_m-PC	0.656	0.911	0.969	0.964	0.909

The table reports the loadings of the five inputs on the first principal component of their changes over the 30-minute window (30M-PC) and over the announcement-specific windows (x_m-PC). The inputs are the front-month federal funds future (MP1) and the first four quarterly Eurodollar futures (ED1–ED4), three-month SOFR futures from June 2022. Each loading is the slope of a regression of the standardized input on the standardized component, which is their correlation, over the 265 announcements from February 1994 to October 2025.

IA.D Robustness of the Announcement-Specific Window

The results are robust to the choices behind the announcement-specific window. The window rests on four of them: the estimator of normal volume, the percentile that bounds it, the rule that detects the end of the window, and the lower bound of the window before the announcement. Because the window determines both the price change and the loadings of the VBS, each choice could matter. Table IA.5 varies one choice at a time relative to the baseline window of Section 4.1.

The window itself changes across the variants, most under a different detection rule. However, the VBS remains nearly unchanged: its correlation with the baseline VBS is at least 0.986. The effect of a one-standard-deviation surprise on the 2-year yield is therefore virtually the same in

every variant.

Table IA.5: Choices Behind the Announcement-Specific Window

	Mean $\overline{x}_m$ (minutes)		Correlation		2Y Treasury	
	No PC	PC	Window	VBS	Estimate	R^2
Baseline	48.6	104.6	—	—	5.48***	0.634
Estimator						
iid bootstrap	52.4	106.8	0.985	0.999	5.48***	0.633
Regression bound	49.5	105.5	0.996	1.000	5.48***	0.634
Threshold						
90th percentile	59.6	115.5	0.898	0.994	5.48***	0.633
95th percentile	56.2	111.8	0.923	0.998	5.48***	0.634
99th percentile	50.4	105.3	0.995	1.000	5.48***	0.633
99.9th percentile	46.1	98.5	0.935	0.999	5.46***	0.629
Detection rule						
5-minute bins	62.0	114.9	0.868	0.995	5.54***	0.646
5-minute bins, regression	62.8	115.6	0.864	0.993	5.53***	0.646
Number of trades	52.8	113.7	0.848	0.986	5.41***	0.617
Surprise						
Lower bound 5 minutes	—	—	—	0.997	5.43***	0.623
Lower bound 15 minutes	—	—	—	0.998	5.50***	0.639

Each row detects the announcement-specific window, constructs the VBS over it and regresses the announcement-day change in the 2-year Treasury yield on the standardized VBS. Baseline is the window of Section 4.1. Each other row changes one choice, and the 5-minute bins with the regression bound change two. Estimator: the iid bootstrap resamples minutes instead of days, and the regression bound is the one-sided upper bound of an OLS regression of one-minute volume on 5-minute bucket dummies, with standard errors clustered by day. Threshold: the percentile of the cluster bootstrap. Detection rule: the baseline rule evaluated only at the end of each 5-minute clock bin, or detected on the number of trades instead of contracts. Surprise: the baseline window, with the price change and the volume shares measured from 5 or 15 minutes before the announcement. All rows keep the press-conference restart of Appendix B.2. No PC and PC are the mean upper window bound $\overline{x}_m$ in minutes after the announcement, over the 80 announcements without and the 85 with a press conference. Window and VBS are correlations with the baseline row. Estimate is the effect of a one-standard-deviation surprise on the 2-year yield in basis points, with HC3 standard errors, and R^2 is adjusted. The threshold rows take other percentiles of the baseline's own bootstrap draws, the iid row is a separate bootstrap that resamples minutes, and the regression bound uses no draws. The sample comprises the 165 scheduled FOMC announcements from December 2003 to October 2025 outside the crisis windows.

IA.E Robustness & Extensions: Financial Markets

Do the financial-market results depend on the announcements or on the yield data? On every announcement, crisis and unscheduled meetings included, the VBS still moves the 2- and 10-year yields significantly more than the 30M-PC, while at one year the two are no longer different (Table IA.6). On these announcements a 60-minute window comes close to the VBS at two years, but every surprise of the table, the 60-minute window included, falls short at ten (Table IA.7). The differences at two and ten years are larger still on the announcements of Figure 7, with the yields of Gürkaynak et al. (2007) and with daily or 2-day changes (Table IA.8). Table IA.9 reports the responses of Table 3 per percentage point of the 1-year yield, the scale of Nakamura and Steinsson (2018).

Table IA.6: Interest Rates and Risk Assets - Event Study Results (Including Crisis + Unscheduled)

		1994/02 - 2025/10 (n = 265)		
		30M-PC	VBS	VBS − 30M-PC
Interest rates				
3M Treasury	Estimate	3.70***	2.59***	−1.11***
	SE	(0.80)	(0.67)	(0.38)
	R^2	0.310	0.150	
1Y Treasury	Estimate	4.19***	4.36***	0.17
	SE	(0.59)	(0.50)	(0.35)
	R^2	0.441	0.478	
2Y Treasury	Estimate	4.38***	5.89***	1.51***
	SE	(0.57)	(0.49)	(0.29)
	R^2	0.322	0.586	
10Y Treasury	Estimate	2.14***	4.14***	2.00***
	SE	(0.54)	(0.55)	(0.35)
	R^2	0.080	0.308	
Risk assets				
S&P 500 Return	Estimate	−0.36***	−0.47***	−0.10
(Daily)	SE	(0.12)	(0.10)	(0.06)
	R^2	0.078	0.131	
VIX	Estimate	0.37**	0.57***	0.19*
	SE	(0.16)	(0.16)	(0.10)
	R^2	0.030	0.075	
Policy Rate	Estimate	1.00***	1.30***	0.30
Uncertainty (bp)	SE	(0.32)	(0.30)	(0.18)
	R^2	0.097	0.165	

Each estimate is from a separate OLS regression of the daily change in the variable in the first column, in basis points for yields and policy rate uncertainty and index points for the VIX, or of the daily S&P 500 return, in percent, on the standardized surprise. The first two columns use as surprises the 30M-PC and the VBS, with HC3 standard errors in parentheses. The last column displays the difference between the two estimated coefficients, with its HC3 standard error in parentheses. The test of equal effects takes the p-value of its t-statistic from the wild bootstrap rather than from the normal distribution (Appendix C). R^2 is adjusted. The sample is the 265 scheduled and unscheduled FOMC announcements from February 1994 to October 2025, including the Global Financial Crisis (2008/07 to 2009/06) and March to April 2020. The cut of October 15, 1998 came at 3:15 PM and the day's H.15 yields do not reflect it, so its yield changes run to the next day's quote.

Table IA.7: Window and Loadings (Including Crisis + Unscheduled)

	Loadings	Λ				Λ_m		
	Window	30M	60M	ME	x_m	30M	30M	x_m
	Contracts	Q1–Q4	Q1–Q4	Q1–Q4	Q1–Q4	Q1–Q4	All	All
Interest rates								
3M Treasury	Estimate	3.70***	3.26***	3.72***	3.41***	3.27***	3.01***	2.59***
	Difference	1.11***	0.67**	1.14***	0.82***	0.68**	0.42*	—
	R^2	0.160	0.089	0.164	0.113	0.092	0.054	0.150
1Y Treasury	Estimate	4.19***	4.72***	4.66***	4.72***	3.97***	3.88***	4.36***
	Difference	−0.17	0.36*	0.30	0.36*	−0.39	−0.48**	—
	R^2	−0.037	0.083	0.069	0.082	−0.082	−0.101	0.478
2Y Treasury	Estimate	4.38***	5.50***	5.25***	5.39***	4.44***	4.75***	5.89***
	Difference	−1.51***	−0.39	−0.64**	−0.50**	−1.45***	−1.14***	—
	R^2	−0.264	−0.075	−0.121	−0.096	−0.255	−0.207	0.586
10Y Treasury	Estimate	2.14***	3.39***	2.75***	3.15***	2.30***	2.86***	4.14***
	Difference	−2.00***	−0.75**	−1.40***	−0.99***	−1.84***	−1.28***	—
	R^2	−0.228	−0.103	−0.175	−0.131	−0.216	−0.164	0.308
Risk assets								
S&P 500 return	Estimate	−0.36***	−0.43***	−0.45***	−0.46***	−0.35***	−0.39***	−0.47***
	Difference	0.10	0.04	0.02	0.01	0.12**	0.08*	—
	R^2	−0.054	−0.023	−0.013	−0.005	−0.058	−0.043	0.131
VIX	Estimate	0.37**	0.47***	0.48***	0.48***	0.38***	0.49***	0.57***
	Difference	−0.19*	−0.10	−0.08	−0.08	−0.19*	−0.07	—
	R^2	−0.044	−0.025	−0.021	−0.022	−0.044	−0.019	0.075
Policy rate	Estimate	1.00***	1.36***	1.15***	1.14***	1.11***	1.20***	1.30***
uncertainty	Difference	−0.30	0.06	−0.15	−0.16*	−0.19	−0.10	—
	R^2	−0.068	0.016	−0.037	−0.039	−0.045	−0.025	0.165

Each estimate is from a separate OLS regression of the daily change in the variable in the first column, in basis points for yields and policy rate uncertainty and index points for the VIX, or of the daily S&P 500 return, in percent, on the standardized surprise of the column. Each surprise combines loadings, Λ from a principal component that includes the front-month federal funds futures or the volume shares Λ_m; a window, 30 or 60 minutes (30M, 60M), the monetary event (ME: from 10 minutes before the statement to 60 minutes after the start of the press conference, 30 minutes without one) or x_m; and contracts, the first four quarterly (Q1–Q4) or all traded contracts (All). The first column is the 30M-PC and the last the VBS. Inference on the estimates uses HC3 standard errors. Difference is the column's estimated coefficient minus that of the VBS, with inference from the wild bootstrap that tests for equal effects. R^2 is the adjusted R^2 of the VBS and the difference from it elsewhere. The sample is the 265 scheduled and unscheduled FOMC announcements from February 1994 to October 2025, including the Global Financial Crisis (2008/07 to 2009/06) and March to April 2020. The cut of October 15, 1998 came at 3:15 PM, after the close of the Eurodollar pit, and the day's H.15 yields do not reflect it: its yield changes run to the next day's quote, and, with no trade in the 30-minute window, the two 30-minute Λ_m surprises weight each contract by its share of trades at the year's earlier announcements, as the VBS does.

Table IA.8: Treasury Yields: Sample, Data and Horizon

	Sample	1994/02 - 2025/10	2003/12 - 2025/10		
	Yields	H.15	H.15	GSW	GSW
	Change	1 day	1 day	1 day	2 days
2Y Treasury	30M-PC	3.60***	2.88***	2.53***	2.57***
		(0.50)	(0.79)	(0.76)	(0.85)
	VBS	5.43***	5.48***	5.14***	5.71***
		(0.34)	(0.48)	(0.45)	(0.71)
	VBS − 30M-PC	1.83***	2.60***	2.61***	3.14***
		(0.28)	(0.43)	(0.40)	(0.57)
10Y Treasury	30M-PC	1.64***	0.83	0.64	0.94
		(0.46)	(0.64)	(0.61)	(0.92)
	VBS	3.54***	3.50***	3.18***	3.92***
		(0.37)	(0.51)	(0.52)	(0.87)
	VBS − 30M-PC	1.91***	2.67***	2.54***	2.98***
		(0.22)	(0.30)	(0.30)	(0.55)
	n	244	165	165	163

Each estimate is from a separate OLS regression of the change in the 2-year or 10-year Treasury yield, in basis points, on the standardized surprise. The first column is Table 3: the H.15 yields with daily changes, February 1994 to October 2025. The second keeps the H.15 yields and the daily changes on the announcements of Figure 7, December 2003 to October 2025. The third uses the yields of Gürkaynak et al. (2007) that Figure 7 uses, with daily changes, and the fourth is Figure 7 itself, with 2-day changes. Each surprise is standardized over the announcements of its column, in the last two columns over the 165 announcements from December 2003, as in Figure 7. HC3 standard errors are in parentheses, for the difference between the two estimated coefficients as well. The test of equal effects takes the p-value of its t-statistic from the wild bootstrap rather than from the normal distribution (Appendix C). Both samples include the scheduled FOMC announcements and exclude the Global Financial Crisis (2008/07 to 2009/06) and March to April 2020.

Table IA.9: Interest Rates and Risk Assets - Responses per Percentage Point of the 1-Year Yield

		1994/02 - 2025/10 (n = 244)	
		30M-PC	VBS
Interest rates			
3M Treasury	Estimate	0.76***	0.47***
	SE	(0.12)	(0.08)
2Y Treasury	Estimate	1.27***	1.53***
	SE	(0.11)	(0.10)
10Y Treasury	Estimate	0.58***	1.00***
	SE	(0.13)	(0.13)
Risk assets			
S&P 500 Return	Estimate	−7.66***	−10.02***
(Daily)	SE	(2.84)	(2.47)
VIX	Estimate	12.62**	15.40***
	SE	(5.48)	(5.26)
Policy Rate	Estimate	0.33***	0.34***
Uncertainty	SE	(0.08)	(0.08)

Each estimate is from a separate instrumental-variables regression of the daily change in the variable in the first column on the daily change in the 1-year Treasury yield, instrumented by the surprise of the column: the response to an announcement that raises the 1-year yield by 1 percentage point, the scale of Nakamura and Steinsson (2018). Yields, from the Federal Reserve H.15 report, and policy rate uncertainty are in percentage points, the S&P 500 return in percent and the VIX in index points. The first stage is the 1-year row of Table 3. HC3 standard errors are in parentheses. The sample is the 244 scheduled FOMC announcements from February 1994 to October 2025, excluding the Global Financial Crisis (2008/07 to 2009/06) and March to April 2020.

IA.F Robustness: Macroeconomic Effects

IA.F.1 Scaling Conventions and Decompositions

Section 6 reports every response to a surprise that raises the 1-year Treasury yield by 25 basis points on the announcement day. Each surprise is scaled with the slope of a regression of the announcement-day change in that yield on the surprise over the 218 announcements from February 1994 to January 2020. A month's surprise is the sum over its announcements. Section 5 standardizes the surprises instead. On these announcements the two scales agree: one standard deviation of the VBS and of the 30M-PC moves the 1-year yield by about the same amount (Panel A of Table IA.15).

Section 6 splits the surprises in two ways. First, WL + VW, the part of the VBS that the 30M-PC does not explain, is the residual of a regression of the VBS on the 30M-PC over all announcements from February 1994 to October 2025 (Figure 9). Second, the target part of each surprise is its fitted value on the front-month federal funds surprise and the path part is the residual (Table 5).

Each part enters the figures and tables as its contribution to the response to a 25 basis point surprise, its own response multiplied by its share of the surprise. The share is the slope of a regression of the part on the surprise over the announcements of the macro sample. The target part's share is therefore the R^2 of the split. The front-month surprise explains about a quarter of the VBS but more than half of the 30M-PC. Because the shares describe announcements and the responses months, the target and path contributions add up to the response to the full surprise only approximately, and for prices and output least well at one year.

IA.F.2 Estimator, Measurement Choices and Information Effects

A VAR sits at the other end of the bias-variance trade-off from a local projection (Li et al., 2024), so the fall in prices could depend on the estimator. Figure IA.11 estimates the system of Figure 9 as a VAR of order 12 in which the surprise is ordered first (Plagborg-Møller and Wolf, 2021). The inflation response survives the change. A contractionary VBS surprise lowers the CPI by 0.29% after two years, most of it through WL + VW, while after a 30M-PC surprise the CPI rises insignificantly in the first half year and stays slightly above zero thereafter. As in the local projection, the responses to the VBS and to WL + VW lie below the 30M-PC's.

The VAR's responses are smaller. From the sixth month on the VBS's response is smaller than the local projection's, and at two years it is less than half as large. This is consistent with a parametric structure that returns the dynamics to the mean faster and with the misspecification bias of a VAR whose lag length is too short (Li et al., 2024; Montiel Olea et al., 2026). Both estimators are bias-corrected and reported in the same unit, so the attenuation belongs to the estimator. Measured

with the 30M-PC, the VAR's price response is of the size that high-frequency VARs find (Gertler and Karadi, 2015; Jarociński and Karadi, 2020; Miranda-Agrippino and Ricco, 2021), so the larger response of the VBS comes from the measure rather than from the system or the sample. Both estimators thus attribute to the VBS and to WL + VW a fall in prices that the 30M-PC does not deliver. Figure IA.12 repeats the two adjustments of Appendix E in this VAR.

Which of the two measurement choices drives the fall in prices? Figure IA.13 changes the window and the loadings one at a time. Moving the loadings from the 30M-PC to the 30M-VBS brings the early response. After 12 months the CPI falls considerably more and significantly so, while the 30M-PC's decline is not significant. Moving only the window from the 30M-PC to the x_m-PC raises the response more at two years than at one, and the estimate is noisy. Moving both gives the VBS, which is larger than either single step at both horizons.

The two choices are complements rather than substitutes. The loadings carry most of the response at both horizons, the window adds more at two years than at one, and neither choice on its own reaches the VBS. This is consistent with the two choices measuring different parts of the same processing—which contracts the market absorbs an announcement in, and how long it takes—rather than two routes to the same measurement.

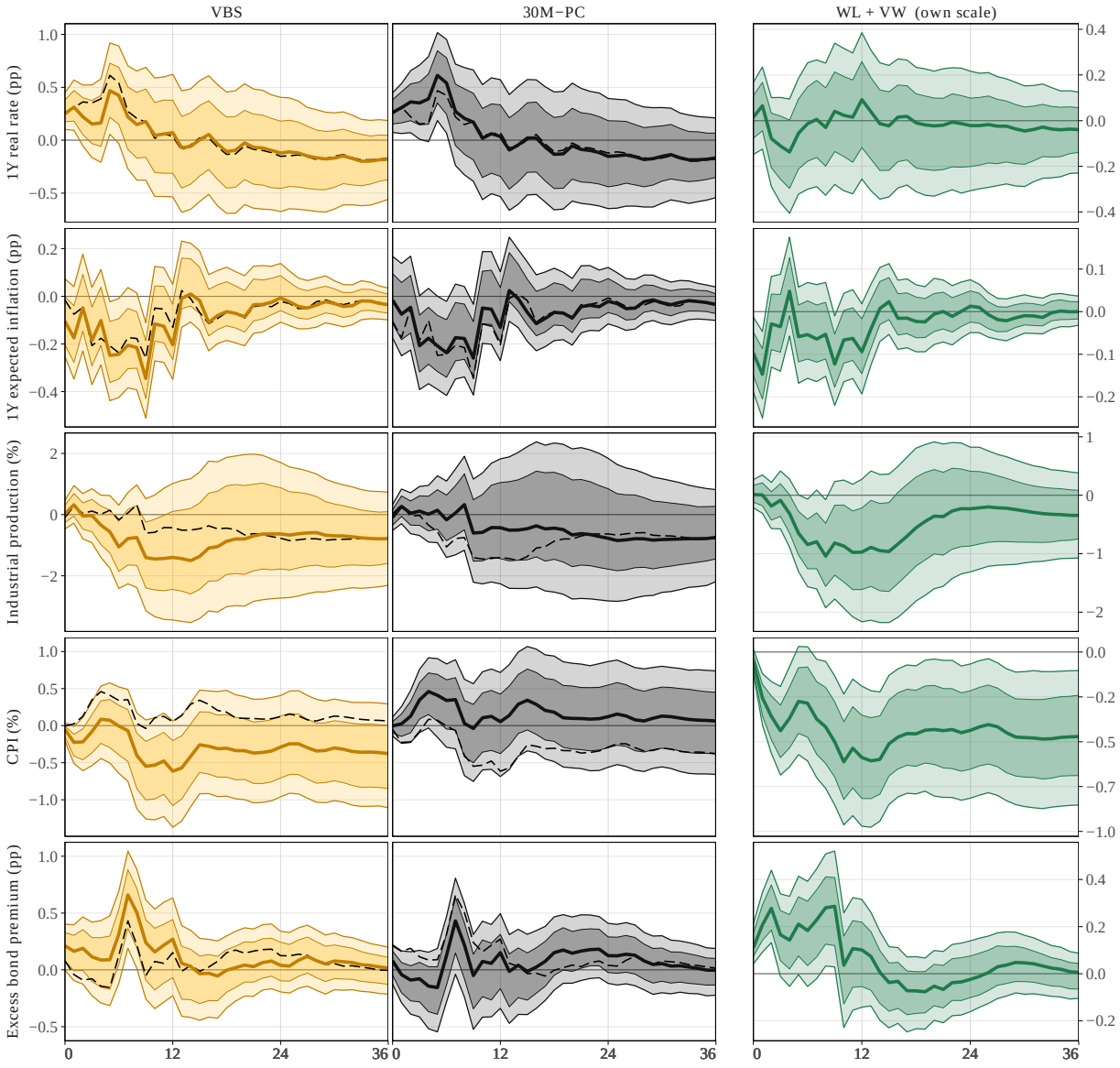
The window matters even with the loadings held fixed (Figure IA.14). Before 2004 the 60-minute window of an afternoon announcement ends at the pit close. Even so, lengthening the window changes the result: at 60 minutes the two-year inflation response is considerably larger than at 30 minutes. The monetary-event window, which differs from the 30-minute window only at press conferences, stays close to the 30M-PC, and at two years the flexible x_m lies between the 30- and the 60-minute windows. The two figures differ from the announcement-day comparison of Table 4 in their sample. The monthly surprise sums every announcement from February 1994 on, scheduled, unscheduled and crisis meetings included, while the table uses the scheduled announcements outside the crisis windows from February 1994.

Table IA.10 estimates the target and path parts of each surprise in one internal-instrument VAR. The target is ordered before the path, so that the path part's innovation is orthogonal to the target part's. The path part carries the fall in prices: after a year it lowers the CPI by 0.83% for the VBS. The target part raises the real rate on impact and, if anything, raises prices in the first year, offsetting part of that decline.

IA.F.3 Announcements, Samples and Specification

In the local projection, the fall in prices does not depend on the choices of the baseline (Table IA.13). In every local projection of the table the VBS lowers the CPI by more than the 30M-PC after

Figure IA.11: The Impact of Monetary Policy Surprises on the Economy: Internal-Instrument VAR



Impulse responses to a contractionary monetary policy surprise that raises the 1-year Treasury yield by 25 basis points on the announcement day, from a recursive VAR of order 12 in which the surprise is ordered first (Plagborg-Møller and Wolf, 2021). The system is the surprise and the five variables of Figure 9: the 1-year real rate, expected inflation and the excess bond premium (EBP) in percentage points, industrial production (IP) and the consumer price index (CPI) in percent. Columns, layout and units as in Figure 9. The shaded areas here are 68% and 90% intervals from the residual-based moving block bootstrap of Brüggemann et al. (2016) with the block length of Jentsch and Lunsford (2019), the coefficients carry the analytical bias correction of Pope (1990), and no simultaneous band is drawn. The sample runs from February 1994 to February 2020 at monthly frequency.

one and after two years, significantly so in most of them, while the 30M-PC's decline is significant only at two years and only from the earlier start. It therefore rests neither on the unscheduled

Figure IA.12: Reaction to News vs. Fed Information Effect: Internal-Instrument VAR

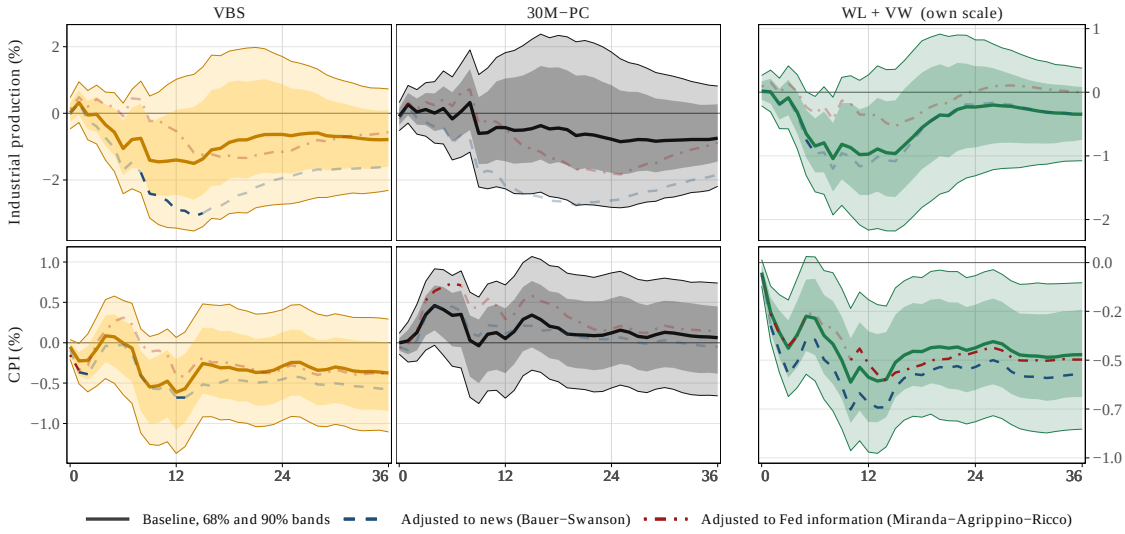


Figure E.1 for the internal-instrument VAR of Figure IA.11: industrial production and the CPI, both in percent, the baseline response with its 68% and 90% moving block bootstrap intervals, and the responses once the surprises are adjusted to the economic news that predicts them (Bauer and Swanson, 2023) and to the Fed's information set (Miranda-Agrippino and Ricco, 2021), each drawn in full where its 90% band excludes zero and faded where it does not. Layout and units as in Figure E.1. The sample runs from February 1994 to February 2020 at monthly frequency.

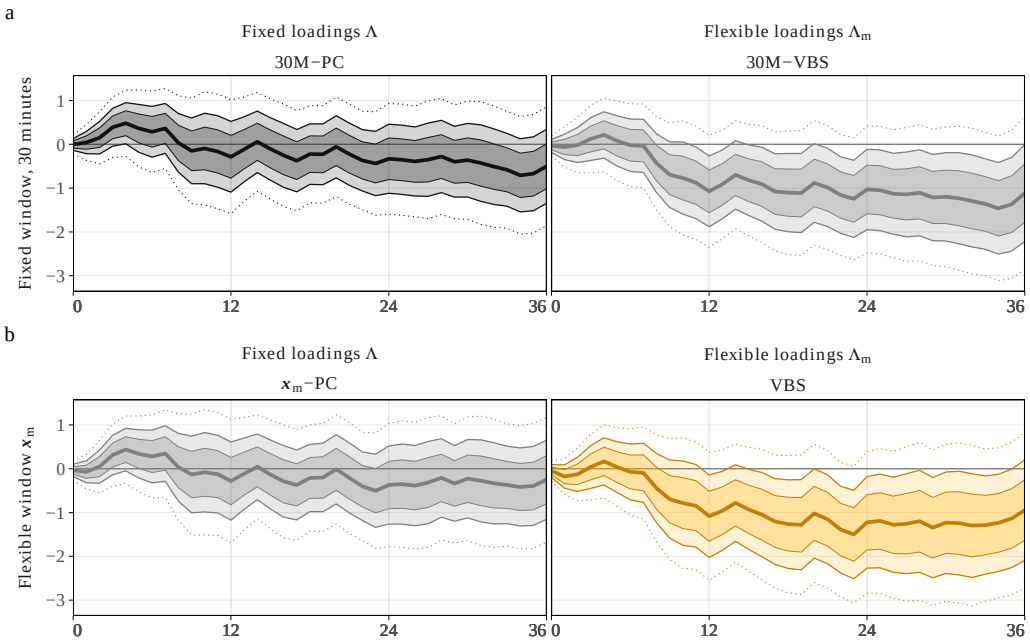
announcements nor on those of the financial crisis. Nor does it rest on starting the sample in February 1994, the first meeting whose decision was announced. From January 1990, the first month with a complete real rate, the VBS lowers the CPI by 1.27% after two years. Its size depends on the lag length and on the bias correction, from 0.87% with 6 lags to 1.49% with 24. In the internal-instrument VAR the lag length decides the size of the fall in prices. With 18 lags it is about as large as the local projection's with the same lags, and with 6 lags it disappears, consistent with the misspecification bias of a VAR with too few lags (Li et al., 2024; Montiel Olea et al., 2026).

The activity response is less robust. Outside the baseline, the band of industrial production after one and two years contains zero in most rows, and the response shrinks with the earlier start.

IA.F.4 The GS1 System

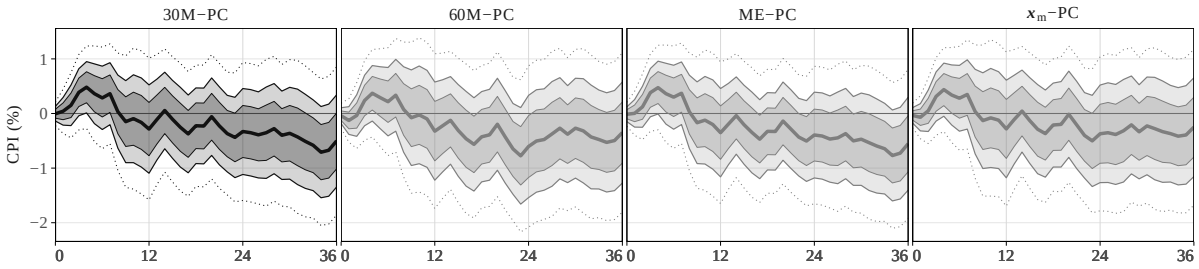
Figure IA.15 re-estimates the local projection of Figure 9 and the internal-instrument VAR of Figure IA.11 on the four variables of Gertler and Karadi (2015) and Bauer and Swanson (2023), with the monthly average 1-year Treasury yield (GS1) in place of the real rate and expected inflation, so that the estimates are directly comparable with the weak inflation responses of previous studies. In this system the VBS lowers the CPI by 1.61% after two years in the local projection, against only 0.53% for the 30M-PC. The monthly yield rises by only a fraction of the 25 basis points of the announcement day, because the monthly average covers the days before the announcement. Table

Figure IA.13: The Inflation Response: The Window and the Loadings



The CPI response, in percent, from the local projection of Figure 9 re-estimated on four surprises that differ in two measurement choices. The rows are the window: panel (a) fixes it at 30 minutes and panel (b) lets it be the announcement's own x_m. The columns are the loadings: fixed Λ, the first principal component of the front-month federal funds surprise and the first four quarterly contracts, and flexible Λ_m, the contracts' own in-window volume shares, which span every contract that trades inside the window. The four panels are therefore the 30M-PC, the 30M-VBS, the x_m-PC and the VBS, named under their column headers, and share one vertical scale. Layout, units and bands as in Figure 9. The sample runs from February 1994 to February 2020 at monthly frequency.

Figure IA.14: The Inflation Response as the Window Lengthens



The CPI response, in percent, from the local projection of Figure 9 re-estimated on four surprises that hold the loadings fixed at Λ and differ only in the window length x. From left to right: 30 minutes (the 30M-PC), 60 minutes, the monetary-event window (ME-PC), which runs from 10 minutes before the statement to 60 minutes after the press conference starts and is the 30-minute window at meetings without one, and the flexible x_m. The four panels share one vertical scale. The VBS is not among them, because it moves the loadings as well as the window. Layout, units and bands as in Figure 9. The sample runs from February 1994 to February 2020 at monthly frequency.

IA.14 repeats the robustness table in this system.

Table IA.10: What Drives the Fall in Prices: Internal-Instrument VAR

	Real rate (pp)	Expected inflation (pp)	CPI (%)		Industrial production (%)	
	On impact	12 months	12 months	24 months	12 months	24 months
Full surprise						
VBS	0.25**	−0.20	−0.61	−0.29	−1.40	−0.63
	[0.10, 0.45]	[−0.35, 0.05]	[−1.37, 0.07]	[−0.96, 0.41]	[−3.44, 1.02]	[−2.73, 1.70]
30M-PC	0.26**	−0.13	0.05	0.12	−0.43	−0.78
	[0.07, 0.45]	[−0.27, 0.10]	[−0.69, 0.72]	[−0.56, 0.87]	[−2.27, 1.82]	[−2.82, 1.84]
Target part						
VBS	0.17**	−0.04	0.47**	0.30	0.68	0.00
	[0.06, 0.27]	[−0.13, 0.07]	[0.09, 0.80]	[−0.06, 0.65]	[−0.36, 1.67]	[−1.07, 1.16]
30M-PC	0.24**	−0.06	0.70**	0.35	0.70	−0.51
	[0.06, 0.37]	[−0.19, 0.10]	[0.16, 1.20]	[−0.20, 0.88]	[−0.85, 2.24]	[−2.07, 1.31]
Path part						
VBS	0.10	−0.17	−0.83**	−0.41	−1.67	−0.65
	[−0.05, 0.29]	[−0.30, 0.04]	[−1.49, −0.25]	[−1.01, 0.19]	[−3.35, 0.32]	[−2.38, 1.35]
30M-PC	0.04	−0.06	−0.50*	−0.19	−0.98	−0.46
	[−0.07, 0.16]	[−0.16, 0.09]	[−1.01, −0.10]	[−0.66, 0.26]	[−2.26, 0.51]	[−1.69, 1.08]

Table 5 from one internal-instrument VAR per surprise, with 12 lags of the target and path parts, ordered first (the target before the path), the 1-year real rate, expected inflation, industrial production, the CPI and the excess bond premium, and the bias correction of Pope (1990). Each part's response is multiplied by its share of the surprise, as in Table 5. The full surprise's estimates are those of the VAR of Figure IA.11. The 90% bands of the residual-based moving block bootstrap of Brüggemann et al. (2016) are in brackets, and stars mark the estimates whose 90, 95 and 99% bands exclude zero. The sample runs from February 1994 to February 2020 at monthly frequency.

IA.F.5 External Instruments

The surprises enter the macroeconomic estimates directly and are scaled on the announcement day, where both move the 1-year yield strongly and precisely (Panel A of Table IA.15). This scaling takes care of measurement error in the surprise, and the paper's estimators need neither invertibility nor a monthly first stage (Section 6). Many researchers instead rescale the surprise to the month, instrumenting a monthly interest rate with it in LP-IV or in a proxy SVAR (Mertens and Ravn, 2013; Stock and Watson, 2018; Gertler and Karadi, 2015). For completeness, this subsection reports what these estimators give in the baseline system.

The monthly first stages are weak for every surprise, the three-month federal funds surprise that Gertler and Karadi (2015) use included (Panel B).

LP-IV confirms the main section. On the paper's design it is the local projection of Figure 9 divided by its own first stage, and a VBS surprise that raises the real rate by 25 basis points lowers the CPI by 1.14% after a year and by 1.29% after two (Figure IA.16). The Anderson-Rubin sets, which remain valid when the first stage is weak, exclude zero at both horizons.

Table IA.11: Predictability of the Surprises: Economic News

	VBS	30M-PC	WL + VW
Constant	−0.021***	−0.010*	0.000
	(0.008)	(0.005)	(0.002)
NFP Surprise	0.000	0.000**	0.000
	(0.000)	(0.000)	(0.000)
NFP 12M	0.005	0.003	0.001
	(0.004)	(0.003)	(0.001)
BCom 3M	0.115	0.092	0.011
	(0.100)	(0.068)	(0.026)
TR Skew	0.039**	0.035***	0.002
	(0.018)	(0.013)	(0.007)
SP500 3M	0.143	0.112	0.015
	(0.099)	(0.076)	(0.029)
Slope 3M	−0.007	−0.011	0.002
	(0.013)	(0.010)	(0.004)
R^2	0.107	0.154	−0.011
n	218	218	218

Each column reports a separate OLS regression of the respective monetary policy surprise on the six economic news predictors of Bauer and Swanson (2023). WL + VW is the part of the VBS that the 30M-PC does not explain, the sum of the window-length and volume-weighting components. Heteroskedasticity-robust (HC3) standard errors are in parentheses. The sample runs from February 1994 to January 2020 ($N = 218$).

The proxy SVAR, in contrast, finds almost no fall in prices. This is the kind of gap between a local projection and a proxy SVAR that Ramey (2016) documents, and it comes from the VAR side: the proxy SVAR requires the VAR to span the shock and extrapolates the VAR's dynamics. The VAR with the surprise ordered first, which needs no invertibility, lies halfway between LP-IV and the proxy SVAR after one year and close to the proxy SVAR after two. The recursive VAR that orders the real rate first in the proxy SVAR's own VAR carries a different impact through the same dynamics: after its real-rate innovation output rises and prices return to their path within a year, while proxied with the VBS the same VAR lowers output and keeps prices lower.

Table IA.12: Predictability of the Surprises: Fed Information

	VBS	30M-PC	WL + VW
Constant	−0.076	−0.053	−0.006
	(0.071)	(0.063)	(0.017)
grgdpb1	−0.001	−0.002	0.000
	(0.004)	(0.004)	(0.001)
grgdpf0	0.017*	0.012	0.003
	(0.010)	(0.009)	(0.003)
grgdpf1	−0.001	0.004	−0.003
	(0.017)	(0.015)	(0.004)
grgdpf2	−0.017	−0.012	−0.002
	(0.016)	(0.013)	(0.003)
grgdpf3	0.011	0.003	0.004
	(0.017)	(0.015)	(0.003)
grgdpb1rev	−0.001	−0.001	0.000
	(0.005)	(0.003)	(0.001)
grgdpf0rev	−0.007	−0.001	−0.003
	(0.009)	(0.007)	(0.003)
grgdpf1rev	0.020*	0.009	0.006*
	(0.011)	(0.010)	(0.003)
grgdpf2rev	0.028**	0.018*	0.005
	(0.011)	(0.010)	(0.003)
gpgdpb1	0.018*	0.010	0.004*
	(0.009)	(0.007)	(0.002)
gpgdpf0	0.000	0.005	−0.003
	(0.012)	(0.009)	(0.003)
gpgdpf1	0.013	0.008	0.003
	(0.015)	(0.013)	(0.004)
gpgdpf2	0.007	−0.007	0.008
	(0.026)	(0.018)	(0.008)
gpgdpf3	−0.011	0.004	−0.008
	(0.029)	(0.018)	(0.010)
gpgdpb1rev	−0.004	−0.008	0.002
	(0.008)	(0.006)	(0.002)
gpgdpf0rev	0.013	0.005	0.004
	(0.010)	(0.008)	(0.003)
gpgdpf1rev	−0.011	−0.007	−0.002
	(0.016)	(0.012)	(0.004)
gpgdpf2rev	−0.002	0.008	−0.006
	(0.021)	(0.016)	(0.006)
unempb1	−0.052	−0.046	−0.002
	(0.061)	(0.045)	(0.017)
unempf0	0.176	0.107	0.036
	(0.119)	(0.091)	(0.038)
unempf1	−0.076	0.049	−0.070
	(0.145)	(0.124)	(0.044)
unempf2	−0.027	−0.103	0.044
	(0.149)	(0.122)	(0.042)
unempf3	−0.022	−0.007	−0.008
	(0.094)	(0.078)	(0.024)
unempb1rev	0.043	0.004	0.021*
	(0.035)	(0.025)	(0.013)
unempf0rev	−0.141*	−0.041	−0.054**
	(0.081)	(0.065)	(0.022)
unempf1rev	−0.047	−0.116	0.040
	(0.123)	(0.098)	(0.036)
unempf2rev	0.152	0.151**	−0.002
	(0.097)	(0.073)	(0.032)
R^2	0.127	0.097	0.054
n	218	218	218

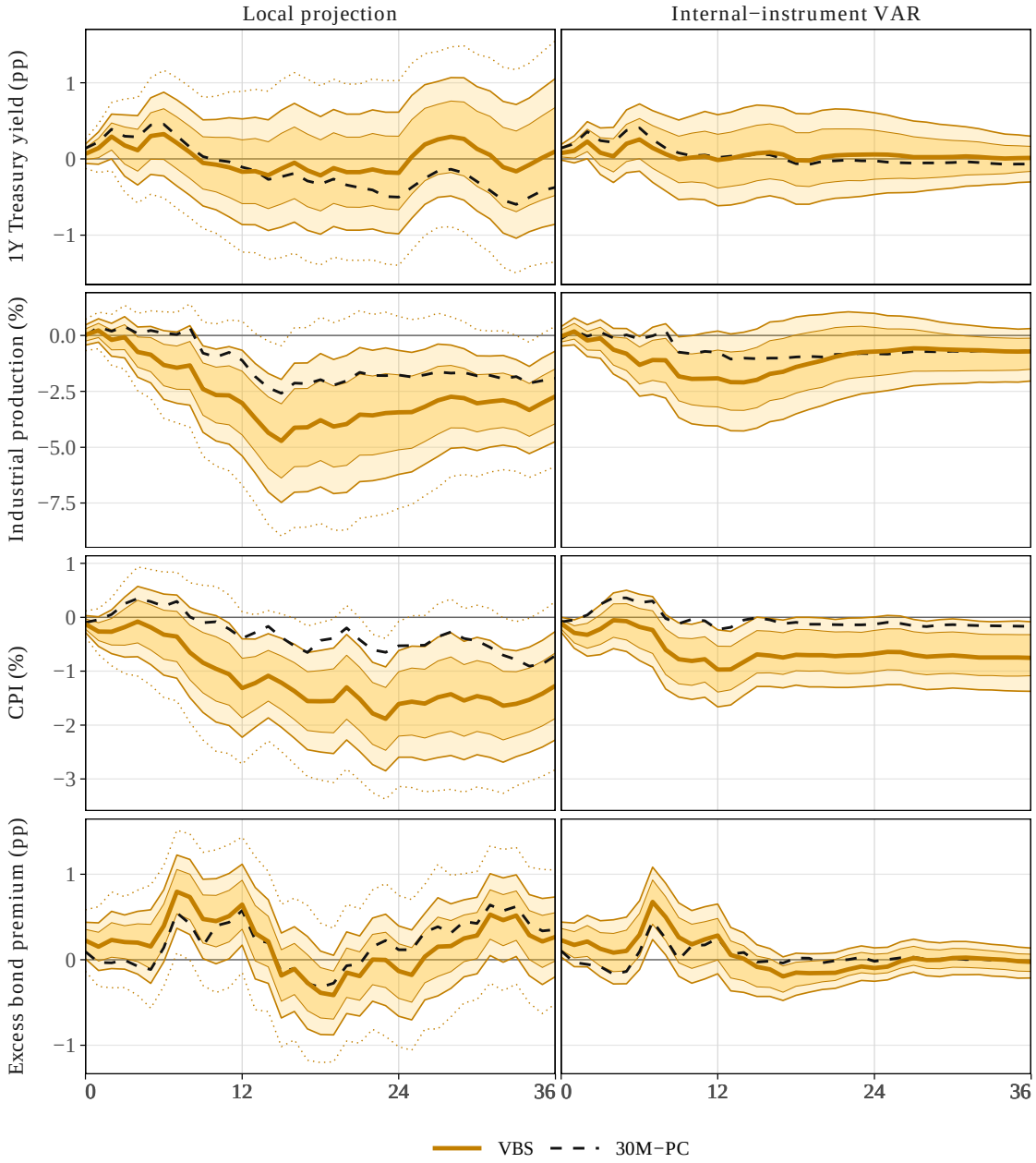
Each column reports a separate OLS regression of the respective monetary policy surprise on 27 Greenbook forecasts and forecast revisions, the specification of Miranda-Agrippino and Ricco (2021) with the unemployment forecast at every horizon. The row labels are the Greenbook mnemonics: grgdp is the forecast of real GDP growth, gpgdp the forecast of GDP price inflation and unemp the forecast of the unemployment rate, with b1 the previous quarter, f0 the current quarter and f1 to f3 the next three, and the suffix rev the revision to that forecast since the previous Greenbook. WL + VW is the part of the VBS that the 30M-PC does not explain, the sum of the window-length and volume-weighting components. Heteroskedasticity-robust (HC3) standard errors are in parentheses. The sample runs from February 1994 to January 2020 ($N = 218$). Greenbook forecasts are released with a five-year lag and are currently public through December 2020. The sample stops at the paper's pre-COVID cutoff because the 2020 Greenbooks carry pandemic forecasts large enough to dominate the regression.

Table IA.13: The Macroeconomic Responses across Specifications

	CPI (%)				Industrial production (%)			
	12 months		24 months		12 months		24 months	
	VBS	30M-PC	VBS	30M-PC	VBS	30M-PC	VBS	30M-PC
Local projection								
Baseline, 12 lags	−1.08	−0.28	−1.22	−0.33	−3.08	−1.21	−3.49	−1.20
	[−2.03, −0.14]	[−1.09, 0.52]	[−2.27, −0.18]	[−1.12, 0.46]	[−5.44, −0.72]	[−3.88, 1.45]	[−6.38, −0.59]	[−3.86, 1.47]
Scheduled meetings only	−1.86	−1.03	−2.14	−0.82	−2.49	0.11	−2.16	2.50
	[−2.94, −0.78]	[−2.16, 0.11]	[−3.32, −0.96]	[−1.99, 0.34]	[−5.45, 0.46]	[−2.77, 2.98]	[−5.89, 1.58]	[−1.02, 6.01]
Without 2008/07–2009/06	−0.92	−0.25	−1.03	−0.25	−2.50	−1.13	−3.33	−1.49
	[−1.87, 0.03]	[−1.08, 0.59]	[−2.06, 0.01]	[−1.02, 0.51]	[−5.02, 0.02]	[−3.95, 1.68]	[−6.21, −0.44]	[−4.21, 1.23]
From 1990/01	−1.00	−0.38	−1.27	−0.66	−1.25	−0.26	−0.78	0.03
	[−1.70, −0.29]	[−0.97, 0.21]	[−2.06, −0.49]	[−1.28, −0.04]	[−3.57, 1.08]	[−2.65, 2.14]	[−4.24, 2.68]	[−3.10, 3.15]
6 lags	−0.77	−0.26	−0.87	−0.41	−2.27	−1.09	−1.84	−0.72
	[−1.60, 0.06]	[−1.03, 0.50]	[−1.83, 0.08]	[−1.20, 0.38]	[−4.95, 0.41]	[−4.02, 1.84]	[−4.66, 0.98]	[−3.34, 1.90]
18 lags	−0.71	0.07	−1.12	−0.65	−2.19	−1.41	−2.32	−2.20
	[−1.62, 0.20]	[−0.79, 0.93]	[−2.14, −0.10]	[−1.65, 0.34]	[−4.70, 0.33]	[−3.87, 1.05]	[−5.12, 0.48]	[−4.89, 0.49]
24 lags	−0.95	0.15	−1.49	−0.63	−2.83	−1.98	−2.91	−3.05
	[−1.89, −0.01]	[−0.70, 1.00]	[−2.27, −0.70]	[−1.35, 0.09]	[−5.90, 0.24]	[−5.03, 1.07]	[−5.83, 0.00]	[−5.54, −0.56]
No bias correction	−1.02	−0.31	−0.98	−0.29	−2.86	−1.19	−2.63	−0.87
	[−1.97, −0.08]	[−1.12, 0.50]	[−2.02, 0.07]	[−1.08, 0.49]	[−5.21, −0.50]	[−3.85, 1.48]	[−5.53, 0.27]	[−3.53, 1.80]
Internal-instrument VAR								
12 lags	−0.61	0.05	−0.29	0.12	−1.40	−0.43	−0.63	−0.78
	[−1.37, 0.07]	[−0.69, 0.72]	[−0.96, 0.41]	[−0.56, 0.87]	[−3.44, 1.02]	[−2.27, 1.82]	[−2.73, 1.70]	[−2.82, 1.84]
6 lags	0.10	0.48	0.26	0.73	−0.28	1.00	0.13	1.26
	[−0.36, 0.55]	[0.04, 0.90]	[−0.25, 0.76]	[0.19, 1.19]	[−1.80, 1.41]	[−0.50, 2.47]	[−1.17, 1.63]	[−0.21, 2.63]
18 lags	−0.70	−0.17	−0.79	−0.53	−1.95	−0.91	−2.32	−1.74
	[−1.53, 0.05]	[−0.94, 0.53]	[−1.60, 0.28]	[−1.25, 0.41]	[−4.00, 0.16]	[−2.74, 1.10]	[−4.45, 0.59]	[−3.62, 0.73]

Responses of the CPI and of industrial production, in percent, 12 and 24 months after a contractionary surprise that raises the 1-year Treasury yield by 25 basis points on the announcement day, the VBS's and the 30M-PC's side by side, each with its 90% pointwise band below (the VAR's from the moving-block bootstrap). The first row of each block is the baseline of Figure 9 or of Figure IA.11, and every other row changes one thing in it: the announcements that enter the monthly surprise, at the baseline's scaling, either the scheduled ones only or all but those from July 2008 to June 2009; the start of the sample, with the 30M-PC's loadings estimated from November 1988; the lag length; or the bias correction of Herbst and Johannsen (2024). The baseline sample runs from February 1994 to February 2020 at monthly frequency.

Figure IA.15: The Impact of Monetary Policy Surprises on the Economy: The GS1 System



Impulse responses to a contractionary monetary policy surprise that raises the 1-year Treasury yield by 25 basis points on the announcement day, in the system of Gertler and Karadi (2015): the 1-year Treasury yield (GS1), the monthly average, and the excess bond premium in percentage points, industrial production and the CPI in percent. The left column is the local projection of Figure 9, the right column the internal-instrument VAR of Figure IA.11, each with its bands as there. Each panel shows the VBS with its bands and the 30M-PC's point estimate dashed. Table A.2 lists the data sources. The sample runs from February 1994 to February 2020 at monthly frequency.

Table IA.14: The Macroeconomic Responses across Specifications: The GS1 System

	CPI (%)				Industrial production (%)			
	12 months		24 months		12 months		24 months	
	VBS	30M-PC	VBS	30M-PC	VBS	30M-PC	VBS	30M-PC
Local projection								
Baseline, 12 lags	−1.31	−0.39	−1.61	−0.53	−3.03	−1.11	−3.44	−1.77
	[−2.23, −0.40]	[−1.15, 0.37]	[−2.60, −0.62]	[−1.25, 0.19]	[−5.39, −0.66]	[−3.64, 1.41]	[−6.22, −0.67]	[−4.18, 0.65]
Scheduled meetings only	−1.91	−0.81	−2.26	−0.60	−2.14	0.75	−2.15	1.59
	[−2.96, −0.85]	[−1.93, 0.31]	[−3.35, −1.16]	[−1.59, 0.40]	[−5.00, 0.71]	[−2.08, 3.59]	[−5.68, 1.38]	[−1.69, 4.87]
Without 2008/07–2009/06	−1.02	−0.27	−1.27	−0.39	−2.20	−0.76	−3.49	−1.97
	[−1.94, −0.10]	[−1.06, 0.51]	[−2.24, −0.30]	[−1.09, 0.31]	[−4.74, 0.34]	[−3.40, 1.89]	[−6.26, −0.72]	[−4.45, 0.50]
From 1988/11	−0.98	−0.41	−1.30	−0.67	−1.98	−0.96	−1.61	−0.78
	[−1.70, −0.26]	[−1.00, 0.19]	[−2.10, −0.50]	[−1.29, −0.06]	[−4.40, 0.44]	[−3.35, 1.43]	[−4.97, 1.75]	[−3.68, 2.12]
6 lags	−1.01	−0.40	−1.28	−0.62	−2.63	−1.21	−1.73	−0.74
	[−1.86, −0.16]	[−1.15, 0.35]	[−2.23, −0.34]	[−1.36, 0.12]	[−5.43, 0.16]	[−4.13, 1.71]	[−4.51, 1.06]	[−3.32, 1.84]
18 lags	−0.98	−0.12	−1.15	−0.24	−2.09	−1.54	−2.09	−2.67
	[−1.94, −0.01]	[−0.96, 0.72]	[−2.22, −0.08]	[−1.15, 0.66]	[−4.39, 0.22]	[−3.84, 0.77]	[−4.77, 0.59]	[−5.13, −0.22]
24 lags	−1.00	0.08	−1.11	0.07	−2.48	−1.65	−1.43	−2.36
	[−1.99, −0.02]	[−0.85, 1.00]	[−2.20, −0.02]	[−0.84, 0.98]	[−5.21, 0.24]	[−4.34, 1.04]	[−4.10, 1.23]	[−5.01, 0.29]
No bias correction	−1.22	−0.41	−1.31	−0.46	−2.79	−1.10	−2.64	−1.40
	[−2.13, −0.31]	[−1.16, 0.35]	[−2.30, −0.32]	[−1.18, 0.26]	[−5.15, −0.42]	[−3.62, 1.43]	[−5.42, 0.13]	[−3.81, 1.02]
Internal-instrument VAR								
12 lags	−0.97	−0.23	−0.68	−0.13	−1.91	−0.75	−0.72	−0.82
	[−1.66, −0.23]	[−0.96, 0.47]	[−1.27, 0.01]	[−0.76, 0.56]	[−4.05, 0.20]	[−2.84, 1.34]	[−2.54, 0.99]	[−2.55, 1.14]
6 lags	−0.20	0.21	−0.17	0.30	−1.39	0.09	−1.27	−0.15
	[−0.68, 0.32]	[−0.27, 0.70]	[−0.70, 0.41]	[−0.26, 0.86]	[−2.82, 0.44]	[−1.36, 1.74]	[−2.34, 0.45]	[−1.35, 1.37]
18 lags	−0.98	−0.25	−1.00	−0.49	−2.05	−0.98	−1.28	−1.00
	[−1.82, −0.28]	[−1.08, 0.47]	[−1.72, −0.16]	[−1.23, 0.33]	[−4.20, −0.23]	[−2.97, 0.97]	[−3.28, 0.95]	[−2.98, 1.20]

Table IA.13 for the four variables of Figure IA.15; the start of the sample is November 1988, where the VBS begins.

Table IA.15: Instrument Strength at the Daily and the Monthly Frequency

Panel A: Daily, the announcement-day change in the 1-year yield

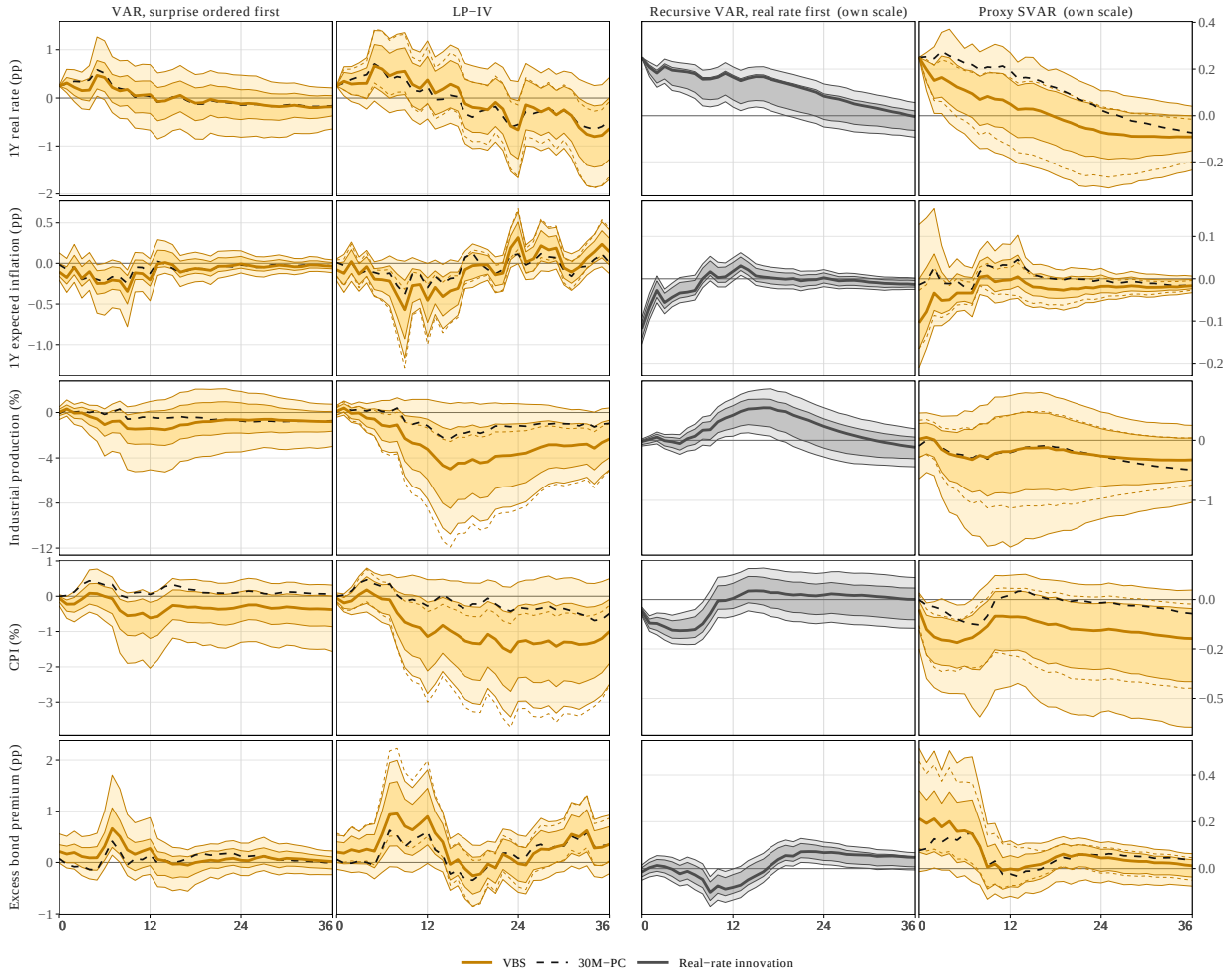
	VBS	30M-PC
Response of the 1-year yield (bp)	25.0	25.0
Response to a one-standard-deviation surprise (bp)	4.2	4.5
Robust F	59.4	51.9
n	218	218

Panel B: Monthly, the first stages of LP-IV and the proxy SVAR

	LP-IV			Proxy SVAR		
	VBS	30M-PC	FF4	VBS	30M-PC	FF4
1-year real rate, month end	3.6	3.5	4.2	6.0	5.0	5.7
GS1, the monthly average	0.8	2.6	1.6	1.2	2.9	1.9

Panel A regresses the announcement-day change in the 1-year Treasury yield on the surprise over the 218 announcements of the macro sample, February 1994 to January 2020; responses are in basis points per unit of the surprise, 25 by construction, and per standard deviation in the second row. Panel B reports the first stages of the two external-instrument estimators for the month-end real rate of the baseline system and for GS1, the monthly average, of the system of Internet Appendix IA.F.4. LP-IV regresses the rate on the surprise with 12 lags of the surprise and of the system as controls, on the months of the local projection of Figure 9; the proxy SVAR regresses the rate's forecast error from a VAR in the system on the surprise net of 12 lags of the system and the surprise. FF4 is the three-month federal funds surprise of Gertler and Karadi (2015). F is heteroskedasticity-robust.

Figure IA.16: External Instruments: LP-IV and the Proxy SVAR



Impulse responses per 25 basis points of the 1-year real rate on impact, in the system of Figure 9, February 1994 to February 2020. The columns are the VAR of order 12 with the surprise ordered first, rescaled within its bootstrap; LP-IV on the design of Figure 9, the local projection divided by its own first stage; the recursive VAR that orders the real rate first in the proxy SVAR's own VAR; and the proxy SVAR, with the surprise net of 12 lags of the system as the proxy. The last two columns share a vertical scale of their own. Shaded areas are 68% and 90% bands, from the bootstrap for the three VARs and from Eicker-Huber-White standard errors for LP-IV, and the thin dashed lines in the two IV columns are the 68% Anderson-Rubin sets of the VBS. The thick dashed line is the 30M-PC's estimate.

References

Acosta, Miguel, Andrea Ajello, Michael Bauer, Francesca Loria, and Silvia Miranda-Agrippino (2025) "Financial Market Effects of FOMC Communication: Evidence from a New Event-Study Database," Working Paper 2025-30, Federal Reserve Bank of San Francisco.

Bauer, Michael D and Eric T Swanson (2023) "A Reassessment of Monetary Policy Surprises and High-Frequency Identification," *NBER Macroeconomics Annual*, 37, 87–155.

Brüggemann, Ralf, Carsten Jentsch, and Carsten Trenkler (2016) "Inference in VARs with conditional heteroskedasticity of unknown form," *Journal of Econometrics*, 191 (1), 69–85.

Bu, Chunya, John Rogers, and Wenbin Wu (2021) "A unified measure of Fed monetary policy shocks," *Journal of Monetary Economics*, 118, 331–349.

Bundick, Brent, A Lee Smith, and Luca Van der Meer (2024) "Introducing the Kansas City Fed's Measure of Policy Rate Uncertainty (KC PRU)," *Economic Review, Federal Reserve Bank of Kansas City*, 109 (7).

Cohn, Jonathan B, Zack Liu, and Malcolm I Wardlaw (2022) "Count (and count-like) data in finance," *Journal of Financial Economics*, 146 (2), 529–551.

Fleming, Michael J and Monika Piazzesi (2005) "Monetary Policy Tick-by-Tick," Working paper.

Gertler, Mark and Peter Karadi (2015) "Monetary policy surprises, credit costs, and economic activity," *American Economic Journal: Macroeconomics*, 7 (1), 44–76.

Gilchrist, Simon and Egon Zakrajšek (2012) "Credit spreads and business cycle fluctuations," *American Economic Review*, 102 (4), 1692–1720.

Gürkaynak, Refet S, Brian Sack, and Jonathan H Wright (2007) "The US Treasury yield curve: 1961 to the present," *Journal of Monetary Economics*, 54 (8), 2291–2304.

——— (2010) "The TIPS yield curve and inflation compensation," *American Economic Journal: Macroeconomics*, 2 (1), 70–92.

Gürkaynak, Refet S, Brian Sack, and Eric Swanson (2005) "Do Actions Speak Louder Than Words? The Response of Asset Prices to Monetary Policy Actions and Statements," *International Journal of Central Banking*, 1 (1), 55–93, https://ideas.repec.org/a/ijc/ijcjou/y2005q2a2.html.

Herbst, Edward P. and Benjamin K. Johannsen (2024) "Bias in local projections," *Journal of Econometrics*, 240 (1), 105655.

Jarociński, Marek and Peter Karadi (2020) "Deconstructing monetary policy surprises—the role of information shocks," *American Economic Journal: Macroeconomics*, 12 (2), 1–43.

Jentsch, Carsten and Kurt G. Lunsford (2019) "The dynamic effects of personal and corporate income tax changes in the United States: Comment," *American Economic Review*, 109 (7), 2655–2678.

Lewis, Daniel J (2025) "Announcement-Specific Decompositions of Unconventional Monetary Policy Shocks and Their Effects," *The Review of Economics and Statistics*, 107 (4), 1086–1103.

Li, Dake, Mikkel Plagborg-Møller, and Christian K Wolf (2024) "Local Projections vs. VARs: Lessons from Thousands of DGPs," *Journal of Econometrics*, 244 (2), 105722.

Mertens, Karel and Morten O Ravn (2013) "The dynamic effects of personal and corporate income tax changes in the United States," *American Economic Review*, 103 (4), 1212–1247.

Miranda-Agrippino, Silvia and Giovanni Ricco (2021) "The transmission of monetary policy shocks," *American Economic Journal: Macroeconomics*, 13 (3), 74–107.

Montiel Olea, José Luis, Mikkel Plagborg-Møller, Eric Qian, and Christian K Wolf (2026) "Local Projections or Vector Autoregressions? A Primer for Macroeconomists," *NBER Macroeconomics Annual*, 40, 111–152.

Nakamura, Emi and Jón Steinsson (2018) "High-frequency identification of monetary non-neutrality: the information effect," *The Quarterly Journal of Economics*, 133 (3), 1283–1330.

Plagborg-Møller, Mikkel and Christian K Wolf (2021) "Local projections and VARs estimate the same impulse responses," *Econometrica*, 89 (2), 955–980.

Pope, Alun L. (1990) "Biases of estimators in multivariate non-Gaussian autoregressions," *Journal of Time Series Analysis*, 11 (3), 249–258.

Powell, Jerome (2022) "Press Conference Transcript, June 15, 2022," https://www.federalreserve.gov/mediacenter/files/FOMCpresconf20220615.pdf, June, Accessed: 2025-07-31.

Ramey, Valerie A (2016) "Macroeconomic shocks and their propagation," *Handbook of Macroeconomics*, 2, 71–162.

Stock, James H and Mark W Watson (2018) "Identification and estimation of dynamic causal effects in macroeconomics using external instruments," *The Economic Journal*, 128 (610), 917–948.

Swanson, Eric T (2021) "Measuring the effects of Federal Reserve forward guidance and asset purchases on financial markets," *Journal of Monetary Economics*, 118, 32–53.

The New York Times (1994) "Federal Reserve Changing Course Raises a Key Rate," https://www.nytimes.com/1994/02/05/business/federal-reserve-changing-course-raises-a-key-rate.html, February, Accessed: 2025-07-31.

Zhu, Xingyu Sonya (2023) "Volume Dynamics around FOMC Announcements," BIS Working Paper 1079, Bank for International Settlements.