Supplement to "Monetary policy and stock returns beyond FOMC days"

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S1 MOMENT CONDITIONS FOR THE 3-EQUATION SVAR

Rewriting the structural system (7a - 7c) in matrix form we have

$$A\mathbf{y}_t = \boldsymbol{\varepsilon}_t \tag{S1}$$

where $A = [1, -\beta, 0 : -\alpha, 1, -\gamma \ : \ -\eta, 0, 1]$, $\mathbf{y}_t = [\Delta i_t, s_t, \Delta e_t]'$, and $\boldsymbol{\varepsilon}_t = \left[\varepsilon_{i,t}, \varepsilon_{s^{(u)},t}, \varepsilon_{e,t}\right]'$. We omit the exogenous variables in $\mathbf{x}_t$ to simplify notation. Let $\mathbf{u}_t = A^{-1}\boldsymbol{\varepsilon}_t$ be the (3×1) vector of reduced-form errors with the (3×3) reduced-form covariance matrix $\Omega = \mathbb{E}_t[\mathbf{u}_t\mathbf{u}_t']$. Conditional on information at time t, the relation between Ω and the structural covariance Σ is

$$A \ \Omega \ A' - \Sigma = 0 \tag{S2}$$

where

$$\Omega \equiv \begin{bmatrix} \omega_{ii} & \omega_{is} & \omega_{ie} \\ \cdot & \omega_{ss} & \omega_{se} \\ \cdot & \cdot & \omega_{ee} \end{bmatrix} \tag{S3}$$

and Σ is the (3×3) structural covariance matrix.

The relation in (S2) defines 6 moment conditions and 7 structural parameters (β, α, γ, η, $\sigma^2_{\varepsilon_{i,t}}$, $\sigma^2_{\varepsilon_{s,t}}$, $\sigma^2_{\varepsilon_{e,t}}$). Focusing on the 3 moment conditions corresponding to the off-diagonal elements of (S2) we have,

$$\begin{aligned} \omega_{is} - \beta\omega_{ss} - \alpha(\omega_{ii} - \beta\omega_{si}) - \gamma(\omega_{ie} - \beta\omega_{se}) &= 0 \\ \omega_{ie} - \beta\omega_{se} - \eta\omega_{ii} + \eta\beta\omega_{si} &= 0 \\ \omega_{se} - \alpha_i\omega_{ie} - \alpha_e\omega_{ee} + \eta\left(\alpha\omega_{ii} - \omega_{is} + \gamma\omega_{ie}\right) &= 0 \end{aligned} \tag{S4}$$

where the structural variances are absent. These 3 moment conditions in (S4) are used to compute qLL-S($\boldsymbol{\theta}_0$) using (S9). Now we have the three moment conditions used to compute the qLL-test, which is explained in the next section.

S2 COMPUTATION OF THE TESTS

This section outlines the calculation of the qLL-S test used to build the confidence sets. We illustrate using the 3-equation SVAR system of Section 6 in the main text.

$$A_0\mathbf{y}_t = \sum_{j=1}^{5} A_j\mathbf{y}_{t-1} + B\mathbf{x}_t + \boldsymbol{\varepsilon}_t \tag{S5}$$

with $A = [1, -\beta, 0 : -\alpha, 1, -\gamma \ : \ -\eta, 0, 1]$, $\mathbf{y}_t = [\Delta i_t, s_t, \Delta e_t]'$, B is a (3×3) matrix of parameters and $\boldsymbol{\varepsilon}_t = [\varepsilon_{i,t}, \varepsilon_{s,t}, \varepsilon_{e,t}]'$ the structural shocks.

Define $\boldsymbol{\theta}^e = [\alpha, \beta \times 100, \gamma, \eta]$. our interest lies in testing

$$H_0 : \boldsymbol{\theta} = \boldsymbol{\theta}_0 \text{ and } H_a : \boldsymbol{\theta} \neq \boldsymbol{\theta}_0.$$

by verifying if

$$H_0 : \mathbb{E}_{\boldsymbol{\theta}}\left[f_t(\boldsymbol{\theta}_0)\right] = 0 \text{ for all } t \leq T, \text{ and } H_a : \mathbb{E}_{\boldsymbol{\theta}}\left[f_t(\boldsymbol{\theta}_0)\right] \neq 0 \text{ for any } t \leq T. \tag{S6}$$

The required confidence region is the collection of points $\boldsymbol{\theta}_0$ that do not reject the above null hypothesis.

Let $A^{1/2}$ be the symmetric square root of a positive definite matrix A, and let $\widehat{V}_{ff}(\boldsymbol{\theta}_0)$ be the HAC estimate of the variance-covariance matrix of the moment conditions under the null. We use the estimator of Newey and West (1987) with automatic bandwidth selection as described in Newey and West (1994). In order to calculate the qLL-S test for a given $\boldsymbol{\theta}_0$, the following steps are taken:

1. Estimate the residuals of the reduced-form VAR derived from SVAR (S5). Let $\{\hat{\boldsymbol{u}}_t\}_{t=1}^T = \{\hat{\mathrm{u}}_{i,t}, \hat{\mathrm{u}}_{s,t}, \hat{\mathrm{u}}_{e,t}\}_{t=1}^T$ be a sequence of such residuals.

2. Generate the values of the moment conditions under the null by fixing the structural

parameter at the candidate values $\boldsymbol{\theta}_0$, which are

$$\boldsymbol{f}_t\left(\boldsymbol{\theta}_{\mathbf{0}}^{\boldsymbol{e}}\right)=\begin{bmatrix}\omega_{is,t}-\beta_0\omega_{ss,t}-\alpha_0(\omega_{ii,t}-\beta_0\omega_{si,t})-\gamma_0(\omega_{ie,t}-\beta_0\omega_{se,t})\\ \omega_{ie,t}-\beta_0\omega_{se,t}-\eta_0\omega_{ii,t}+\eta_0\beta_0\omega_{si,t}\\ \omega_{se,t}-\alpha_0\omega_{ie,t}-\gamma_0\omega_{ee,t}+\eta_0\left(\alpha_0\omega_{ii,t}-\omega_{is,t}+\gamma_0\omega_{ie,t}\right)\end{bmatrix} \tag{S7}$$

where the ω's are the variance-covariance terms of $\mathbb{E}\left[\mathbf{u}_t\mathbf{u}_t'\right]=\Omega_t$, which are replaced by the upper diagonal terms of $\hat{\boldsymbol{u}}_t\hat{\boldsymbol{u}}_t'$.

3. Compute the $S(\boldsymbol{\theta}_{\mathbf{0}})$ statistic as

$$S(\boldsymbol{\theta}_0)=\frac{1}{T}\left[T^{-1}\sum_{t=1}^{T}\boldsymbol{f}_t(\boldsymbol{\theta}_0)\right]'\hat{V}_{ff}(\boldsymbol{\theta}_0)^{-1}\left[T^{-1}\sum_{t=1}^{T}\boldsymbol{f}_t(\boldsymbol{\theta}_0)\right]. \tag{S8}$$

4. Define $\mathbf{v}_t=\widehat{V}_{ff}(\theta_0)^{-1/2}f_t(\theta_0)$. Denote the i^{th} element by $v_{i,t}$, $i=1,2,3$.

5. For $i=1,2,3$, generate the series $\{w_{i,t}\}_{t=1}^{T}$ as $w_{i,1}=v_{i,1}$ and $w_{i,t}=\tilde{r}w_{i,t-1}+\Delta v_{i,t}$, for $t=2,\ldots,T$, with $\tilde{r}=1-\frac{10}{T}$.

6. Regress $\{w_{i,t}\}_{t=1}^{T}$ on $\{\tilde{r}^t\}_{t=1}^{T}$ and obtain the squared residuals. Sum them over all $i=1,2,3$, and multiply by $\tilde{r}$.

7. Compute $\sum_{i=1}^{3}\sum_{t=1}^{T}\left(v_{i,t}-\bar{v}_i\right)^2$, where $\bar{v}_i=T^{-1}\sum_{t=1}^{T}v_{i,t}$, and subtract the quantity in step 6 from it to get the statistic qLL–$\widetilde{S}_T(\boldsymbol{\theta}_0)$.

8. Compute the qLL-S test using the formula

$$qLL-S(\boldsymbol{\theta}_0)=qLL-\widetilde{S}(\boldsymbol{\theta}_0)+\frac{10}{11}S(\boldsymbol{\theta}_0). \tag{S9}$$

9. Determine if the calculated value of qLL-S($\boldsymbol{\theta}_0$) is less than the critical value at the 10% level of significance. If so, the value of $(\alpha,\beta\times 100,\gamma,\eta)$, for the 3-equation SVAR, belongs to the 90% confidence set. For the qLL-S test the corresponding critical value at the 10% significance level is 21.8, see Magnusson and Mavroeidis (2014), Table S.I. For the qLL–$\widetilde{S}$, the stability only part, computed in step 7 the

critical value at the 10% significance level is 7.17, see Table S.VII in Magnusson and Mavroeidis (2014).

When conducting the grid search over the two- and four-dimensional parameter space, we set the parameter space boundaries as per Table S.I.

Parameter	Minimum	Maximum
$\beta \times 100$	-3	3
α	-20	20
γ	-20	20
η	-20	20

Table S.I: PROPERTIES OF THE PARAMETER SPACE.

S3 DATA

S3.1 Data sources

- ***Policy rate expectations***

  Fed funds futures. Bloomberg. Ticker code: FF1, FF2.

  1-month eurodollar deposit rate. Thomson Reuters Refinitiv Eikon. RIC: USD1MFSR.

  CBOE eurodollar futures rates. Refinitiv DataScope Select. RICs: EDcm2, EDcm3, EDcm4.

  US Treasury bond rates. FRED. IDs: DGS3MO, DGS1.

  Shadow rate and effective monetary stimulus. Obtained from Leo Krippner website

- ***Stock market returns***

  S&P500. S&P500 Price index. Yahoo! Finance.

  Wilshire 5000 Price Index. Wilshire 5000 Total Market Index. FRED. Code: WILL5000PR.

  Wilshire 5000 Total Market Index. Total market returns which includes reinvested dividends. FRED. Code: WILL5000IND.

- ***Risk premium***

  CBOE VIX. Implied volatility index based in S&P500 option prices. We join the series VXO and VIX rescaling the VIX as per Whaley (2008) footnote 9. Chicago Board Options Exchange.

- ***Yield slope***

  10-Year rate minus 3-month US Treasury rate. 10-Year US Treasury constant maturity rate minus 3-month US Treasury constant maturity rate. FRED. Codes: T10Y3M.

- ***Risk-free rate***

  Daily risk-free rate. Obtained from Kenneth French. It is the daily rate that, over the number of trading days in the month, compounds to a 1-month T-Bill rate.

- ***Inflation expectations***

  Inflation compensation from TIPS. Obtained from Fed NY. We use the instantaneous 2-year forward inflation (BKEVENF02).

- ***Economic activity***

  Aruoba-Diebold-Scotti (ADS) Business Conditions Index. Obtained from Fed Philadelphia (Aruoba et al., 2009).

- ***Macroeconomic releases***

  ISM Manufacturing, PMI total index. Seasonally adjusted, first release value from LSEG Refinitiv Eikon (RIC aUSPMIAQ).

  All Employees: Total Nonfarm Payrolls. First release data from Archival Federal Reserve Economic Data (ALFRED), Federal Reserve Bank of St. Louis (Series ID: PAYEMS).

  Consumer Price Index. For All Urban Consumers: All Items, not seasonally adjusted, first release data from ALFRED (Series ID: CPIAUCNS).

- ***Expectations on macroeconomic releases***

Expectations of the ISM Manufacturing, PMI. Median value of the Reuters Poll from LSEG Refinitiv Eikon (RIC pUSPMI=M)

Expectations of non-farm payroll absolute change. Median value of the Reuters Poll from LSEG Refinitiv Eikon (RIC pUSNFAR=M)

Expectations of the variation in CPI index. Median value of the Reuters Poll from LSEG Refinitiv Eikon (RIC USCPNY=ECI)

- ***FOMC meetings time***

  Since 1994-02-04 to 2011-03-15. Obtained from Lucca and Moench (2015), Online Appendix Table IA.I.

  Since 1994-02-04 to 2011-03-15. Obtained from Lucca and Moench (2015), Online Appendix Table IA.I.

  From 2011-04-27 to 2015-12-16. Factiva, timestamp from the first Down Jones newswire.

  From 2016-01-27 to 2021-03-17. Fed website

- ***Intraday futures prices***

  Fed funds and eurodollar futures. RICs: FFc1, FFc4, EDcm2, EDcm3, EDcm4, EDcm5.

- ***Special days***

  Dates of flight-to-safety days. From Baele et al. (2019).

S3.2 Data transformations

The **fed funds futures market slope** is defined as $Slope_t^{(ff)} = (ff_t^{(4)} - ff_{t-1}^{(4)}) - \kappa_d(ff_t^{(1)} - ff_{t-1}^{(1)})$ where $ff^{(1)}$ and $ff^{(4)}$ are, respectively, the implied rates of the front-month and the 3-month ahead future contracts (that is, the fourth contract) and κ_d is the Kuttner factor for day d in the month which adjusts the first-difference in the front-month contract, see Subsection S3.2.2 for details. [1] Finally, the spread between the 10-year U.S.

[1]Note that we only scale the first-difference in the front-month contract, which is slightly different from Neuhierl and Weber (2019) and Gürkaynak et al. (2005) who are instead interested in identifying the effect of the slope separately from the level of the target rate.

bond and the 3-month U.S. Treasury bill is the measure of the **Treasure yield curve slope**.

S3.2.1 Liquidity measures based on the effective spread

We measure market liquidity using the effective bid-ask spread. We build a daily proxy for the effective spread using intraday data. We consider the bid-ask spread at 15-minute intervals and then use the volume-weighted average of these spreads to obtain a daily measure. Let d be a 15-minute interval during day t and ES_t be the spread for day t defined as:

$$ES_t = \sum \left(\frac{\text{vol}_d}{\text{VOL}_t} \right) (2 \times | \ln P_d - \ln M_d|) \,. \tag{S10}$$

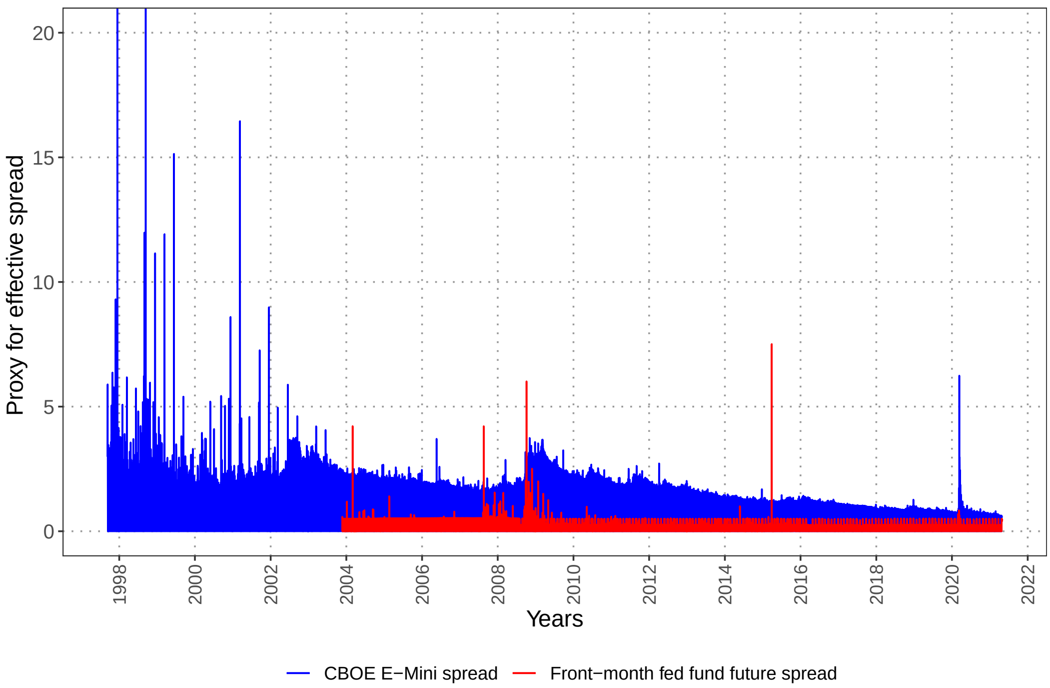
The first parenthesis is the weight, given by the ratio of traded volume during interval d to total trade on day t. The second parenthesis contains the effective spread at the end of interval d where P_d is the last price at the end of the interval and M_d is the midprice, defined as the midpoint of the bid and ask at the end of the interval.[2] See Goyenko et al. (2009) for definitions of effective spreads and a review of liquidity measures and Chung and Zhang (2014) for an analysis of the bid-ask spread as an approximation to the effective spread using order book data.

We compute ES_t for the fed fund future contracts and the front-month CBOE E-mini S&P 500 future, Figure S.1 plots the series for both contracts. Fed fund future data are only available since November 2003.

S3.2.2 Building measures of monetary policy expectations

Our baseline measure of expectations on the policy rate are the implied rates from five future contracts. Outside the effective lower bound period, the policy rate is the adjusted change in the front-month fed fund futures (FF1). During the ELB, the policy rate is the first component from a principal component analysis (PCA) of the daily changes in five futures: FF1, the 3-month ahead fed funds future (FF4), 1, 2 and 3 quarters ahead futures on the 3-month eurodollar deposit rate (ED2, ED3, ED4). We also use the

[2] We also consider a version in which the midprice is lagged one interval.



centering

Figure S.1: Proxy for effective spread using 15-minutes intervals quote data.

intraday change in these measures to compute event-study shocks, see below.

Let $f_t^{(n)}$ be the implied rate for the n-future, where $n = 1, 4$ for monthly fed funds futures and $n = 2, 3, 4$ for eurodollar quarterly contracts, d the age of the contract in days and N the maturity of the contract in days. Then, for all five contracts we compute the daily change Δi_t as follows:

$$\Delta i_t = \begin{cases} f_t^{(n)} - f_{t-1}^{(n+1)} & \text{if } d = 1 \\ f_t^{(n)} - f_{t-1}^{(n)} & \text{if } d \leq 7 \\ \frac{N}{N-d}\left(f_t^{(n)} - f_{t-1}^{(n)}\right) & \text{if } d > 7 \text{ and } f_t^{(n)} = f_t^{(1)} \\ f_t^{(n+1)} - f_{t-1}^{(n+1)} & \text{if } d \geq N - 7. \end{cases} \tag{S11}$$

where the third line only applies to FF1.

For a new contract ($d = 1$), the difference is computed using the previous day price of the next future, $f_{t-1}^{(n+1)}$. For "young" contracts ($d \leq 7$) the raw first-difference is used. For FF1, the difference is adjusted by the Kuttner (2001) factor $N/(N-d)$ when the contract age is greater than 7 days. Notice that the factor is equal to 1 for the 7 first observations within the month to avoid extreme weights for these observations, as in

Gürkaynak (2005), Gürkaynak et al. (2005), and Nakamura and Steinsson (2018). Fed funds futures settlement price is for the *monthly* average of the effective fed funds rate. This implies that in order to obtain expectations of the effective rate, daily changes must be appropriately scaled: the same change in the future price at the beginning of the month implies a different expectation that at the end of the month when most of the uncertainty regarding the monthly average has been resolved. In particular, the variance of the future price is changing during the month, see Hamilton (2008) for a detailed description.

Finally, for all contracts, observations close to the contract maturity date ($d \geq N-7$) are replaced by the first-difference from the closest maturity contract, that is, we rollover the contract 7 days before the last trading day. This avoid introducing spurious volatility[3]. For fed funds futures, the last trading day is the last day of the month, whereas for eurodollar contracts, it is the second London bank business day before the 3rd Wednesday of the contract month. These adjustments are similar to Bauer and Swanson (2020), Gertler and Karadi (2015), and Nakamura and Steinsson (2018).

During the ELB, our policy rate is the first component of a PCA that contains the first-difference of the five contracts, that is Δi_t for each contract, as in Bauer and Swanson (2020) and Nakamura and Steinsson (2018).

S3.2.3 Computation of intraday monetary surprises

We define the intraday monetary surprises or event-study monetary shocks as the intraday change for both of our policy instruments, front-month fed funds futures and the PCA rate, surrounding scheduled FOMC announcements. We compute them following the methodology of Gürkaynak et al. (2005) and Nakamura and Steinsson (2018). The data sources about announcements and the intraday prices are in the Table S3.1.

We compute the intraday change as the difference between the price of the contracts in the policy instruments about 10 minutes before the announcement and around 20 minutes after. Strictly, the value before can be between 5 and 20 minutes before the announcement, while the value after can be between 15 and 25 minutes after, since we

[3]The volatility of a future contract changes as does its time to maturity. This follow from Samuelson's hypotehsis, see Bessembinder et al. (1995) and Duong and Kalev (2008)

only have data in 15-minute intervals and we allow a distance of at least 5 minutes before and after the event. When no trade occurs before the event, the last available price is used and when no trade occurs after the event, the first available price.

To obtain the change in the policy instruments, we adjust the above raw changes in prices following equation (S11), likewise the daily data. However, no adjustment is made for a new contract ($d = 1$) since with intraday data there is always trade before the event. Finally, the intraday PCA rate is the first component of a PCA of all intraday (adjusted) changes in prices, alike done for daily data.

The intraday surprises thus computed appear in Figure S.2 where the front-month fed fund future is the policy instrument outside the ELB and the PCA rate during the ELB. The observation in 2008 with a value -93 is omitted so as not to distort the plot.

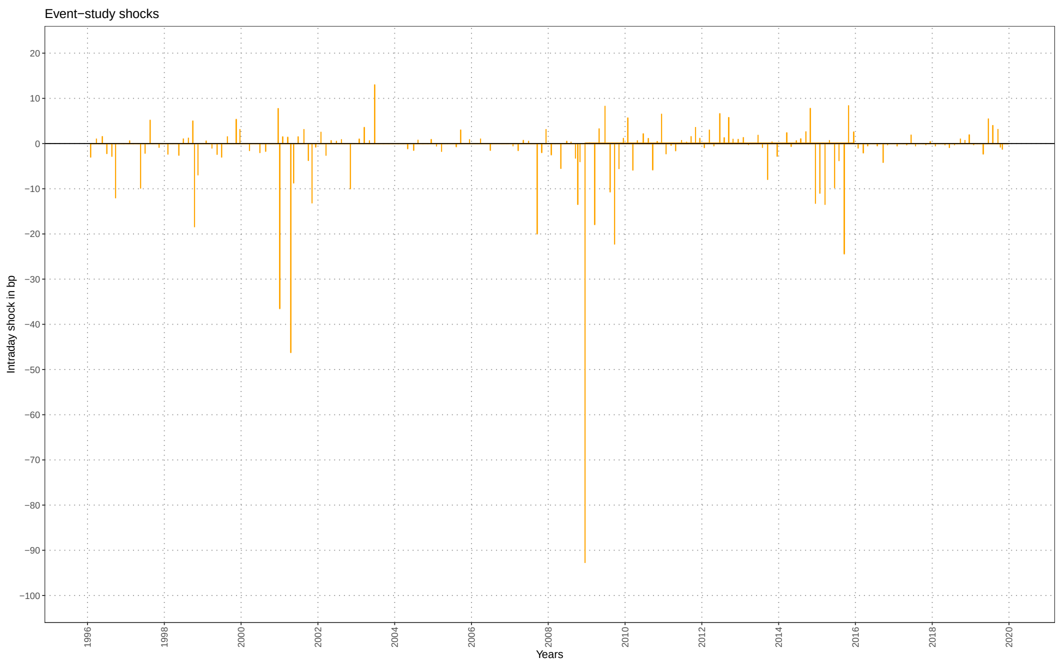


Figure S.2: EVENT-STUDY SHOCKS. Computed as the intraday change in the policy instruments surrounding the FOMC announcement

S4 ADDITIONAL RESULTS

In this section we present additional results and we focus only in the periods since the ELB period, since our baseline results before the ELB are similar to those in the literature.[4]

[4]Additionally, most of the control variables in this section only became available since 1999.

S4.1 Allowing for a common shock

The model with a common shock as in Rigobon (2003) is

$$\begin{cases} \Delta i_t = \beta s_t \ + \ \gamma z_t \ + \ \varepsilon_{i,t} & \text{(S12a)} \\ s_t = \alpha \Delta i_t \ + \ z_t \ + \ \varepsilon_{s,t} & \text{(S12b)} \end{cases}$$

z_t is a common unobservable shock, γ is the response of interest rate to the common shock, and σ_z^2 is the variance of the common unobservable shock, which is commonly assumed to be constant over time. The moment condition in this case is

$$(1 + \alpha\beta)\omega_{is,t} - \alpha\omega_{i,t} - \beta\omega_{s,t} - \underbrace{\gamma\sigma_z^2}_{\lambda_t} = 0 \tag{S13}$$

We accommodate potential time variation in λ_t in the moment condition above by modelling it as a moving-average process. We compute the moment equation under the null and fit it as a moving average (MA) process of order 1 with an intercept. Finally, the values of moment condition emerge by replacing λ_t by $\hat{\lambda}_t$, the predicted value for t from the moving average process. As a consequence, under the null the moment condition accommodates time variation in the variance of the common shock $\sigma_{z,t}^2$, the structural response γ_t or both. The procedure for computing the qLL-$\widetilde{S}$ remains the same, see Section S2 steps 1 through 7. We only focus on a moving average of order 1 to reduce the risk of overfitting, note that the VAR has an order 5 and it is robust to higher orders (see below).

The resulting confidence sets appear in panel A of Figure S.3. The sets retain their shape and location as the baseline sets in the main manuscript. Additionally, the sets in Panel B are also slightly larger than the sets for the constant λ case, which is expected since fitting a time-varying λ_t reduces variation in the moment condition and, consequently diminishes the power of any test.

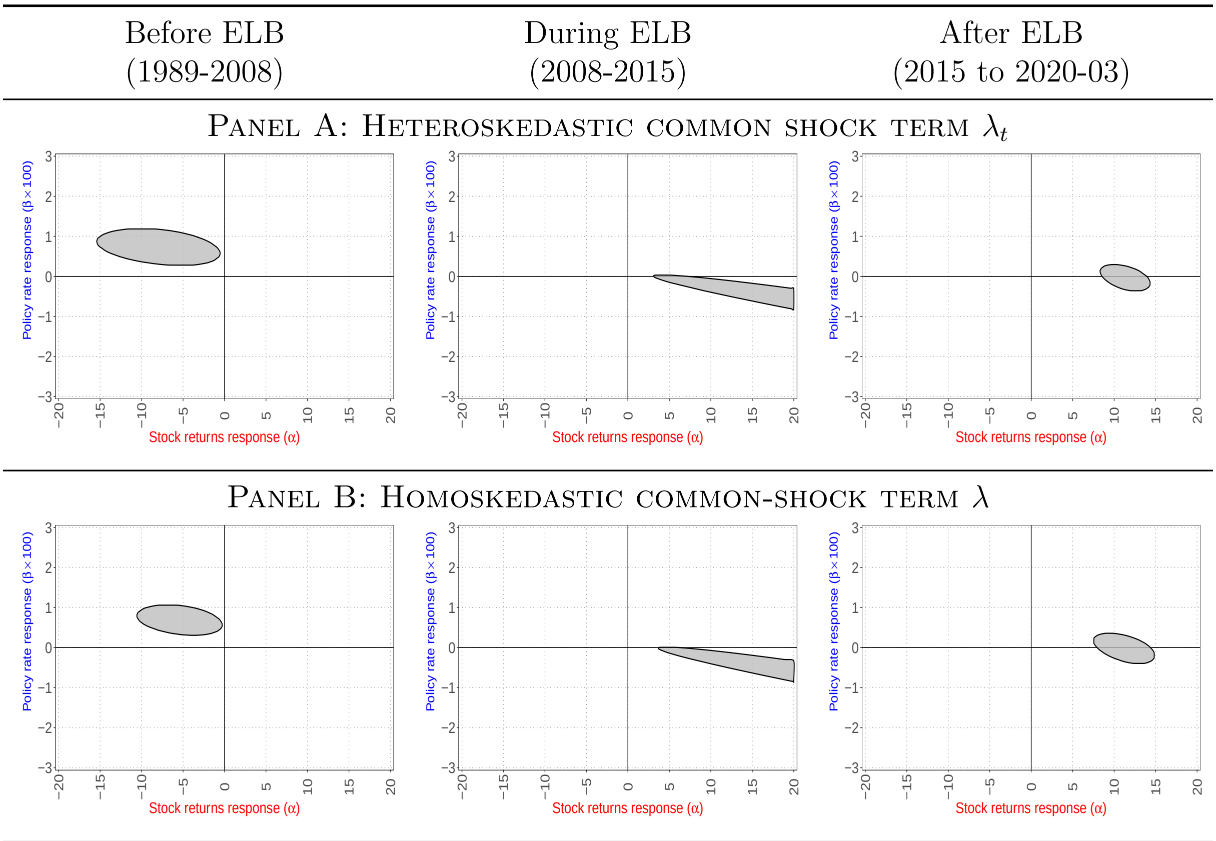


Figure S.3: ALLOWING FOR A COMMON SHOCK. The qLL-$\widetilde{S}$ 90% confidence sets for the reaction of stock returns to monetary policy shock (α) and the reaction of monetary policy to stock returns (β) when a common shock term ($\gamma_t \sigma^2_{z,t}$) is allowed in the SVAR. In Panel A, the variance is allowed to shift over time, while in Panel B, the variance is time invariant. Before ELB: 1989-01-01 to 2008-12-15, During ELB: 2008-12-16 to 2015-12-15, After ELB: 2015-12-16 to 2020-03-14.

S4.2 Alternative subperiods

We investigate three other subperiods. The first, from February 1994 to December 2008, refers to the change in the FOMC communication scheme, which began to release an immediate announcement every time the target rate was modified. Before 1994, the opacity of monetary policy decisions led to a volatile fed funds market.[5] The second subperiod starts in January 1989 and finishes before the Global Financial Crisis in June 2007. Finally, the third subperiod corresponds to the After ELB period ending before the onset of the COVID-19 pandemic on 1st December 2019. Figure S.4 shows the confidence sets of these alternative subperiods. Although the shape of the confidence sets differs

[5] See Lindsey (2003, p. 163) for a history of FOMC communication describing the immediate announcement, and Poole et al. (2002) for an empirical analysis of the implications that this change has for event-study identification.

FOMC Immediate Announcement (1994-2008)	Before GFC (1989-2007)	Before COVID (2015-2019)

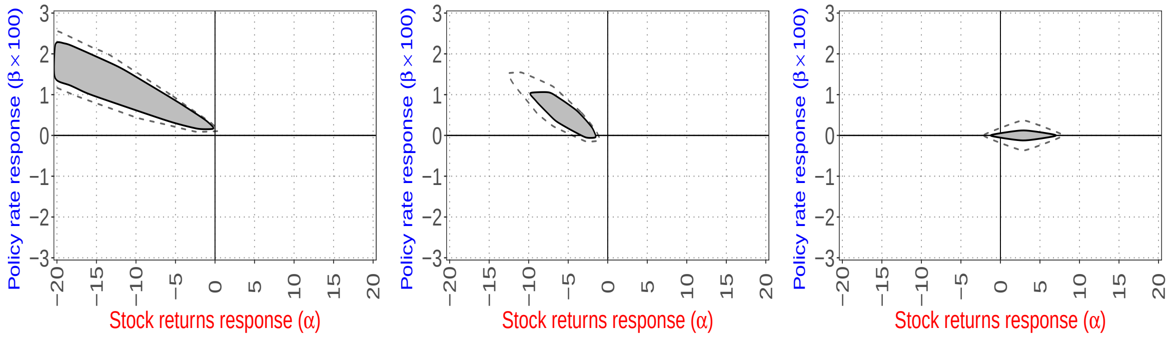


Figure S.4: ALTERNATIVE SUBPERIODS. The 85% (grey area) and 90% (dashed lined area) qLL–S confidence sets for the reaction of stock returns to monetary policy shock (α) and the reaction of monetary policy to stock returns ($\beta \times 100$). FOMC immediate announcement: 1994-02-05 to 2008-12-15. Before GFC: 1989-01-01 to 2007-06-01. Before Covid period: 2015-12-16 to 2019-12-01.

from the baseline one, they retain their location, corroborating the previous results: in the pre-ELB period, the stock market reacts negatively to a monetary tightening, and the FOMC raises the policy instrument when confronted with increases in stock returns. In the after-ELB period, the stock market reacts positively to monetary tightening, and the FOMC does not raise the policy instrument when faced with increases in stock returns.

S4.3 Controlling for major macroeconomic news

Worse-than-expected macroeconomic news can trigger a flight-to-safety episode where investors sell off stocks, driving down returns, and buy fed fund futures, driving down the implied policy rate, potentially generating a positive correlation in the data. In the baseline analysis, we accounted for this by including the flight-to-safety indicator variable by Baele et al. (2019).

Here we extend this by also including as exogenous variables in the SVAR the forecast errors of three major macroeconomic news releases: total non-farm payrolls, the consumer price index, and the Institute for Supply Management (ISM) Manufacturing Purchasing Managers' Index (PMI). The forecast errors are zero when no news exists, while on the days of news releases, we compute the error as the difference between the released value and the expectation from the Reuters Polls. See the S3 Data section for data sources.

We present results only for the last two subsamples, since the data on the expectations are not available for the first subsample.

During ELB (2008-2015)	After ELB (2015 to 2020-03)

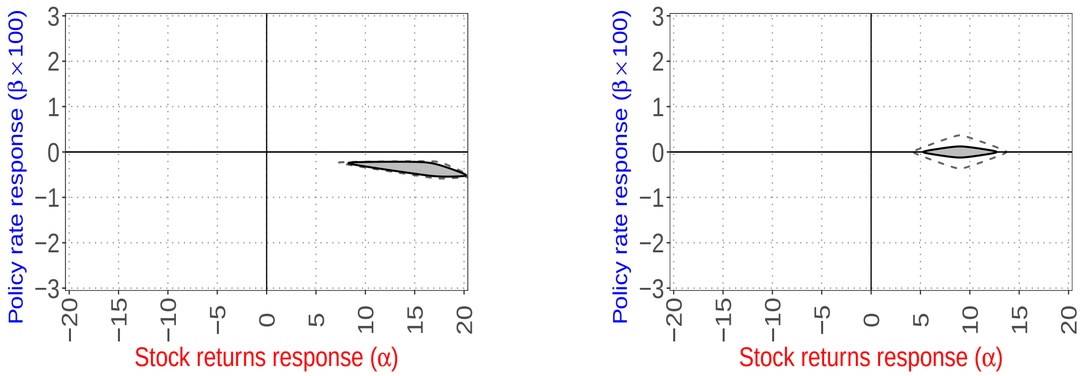


Figure S.5: ADDING MACROECONOMIC NEWS SURPRISES. Controlling for the contemmporaneous surprise in three macroeconomic news: the non-farm payroll, the CPI and the ISM Manufacturing index.

In the reduced-form VAR the surprises have the expected sign. For example, a surprise increment in the non-farm payroll employment of 100 people increases stock returns by 0.2%.

The confidence sets including the macroeconomic surprises appear in the Figure S.5. The sets resemble the baseline sets. This may be due to the fact that the inclusion of the flight-to-safety indicator variable by Baele et al. (2019) already captures the potential consequences of macroeconomic releases for the dynamic of returns and the policy rate.

S4.4 Alternative proxies for policy rates during the ELB period

Since there is no consensus on the policy rate during the ELB period, we consider two alternative measures of the policy rate: the current-month Fed Funds futures rate and the yield on the 1-year constant maturity US Treasury bond, as in Lakdawala (2019) and Kekre and Lenel (2022). The current-month Fed Funds futures works as a benchmark since it was constrainted by definition in this period we expect to have no identification whatsoever.

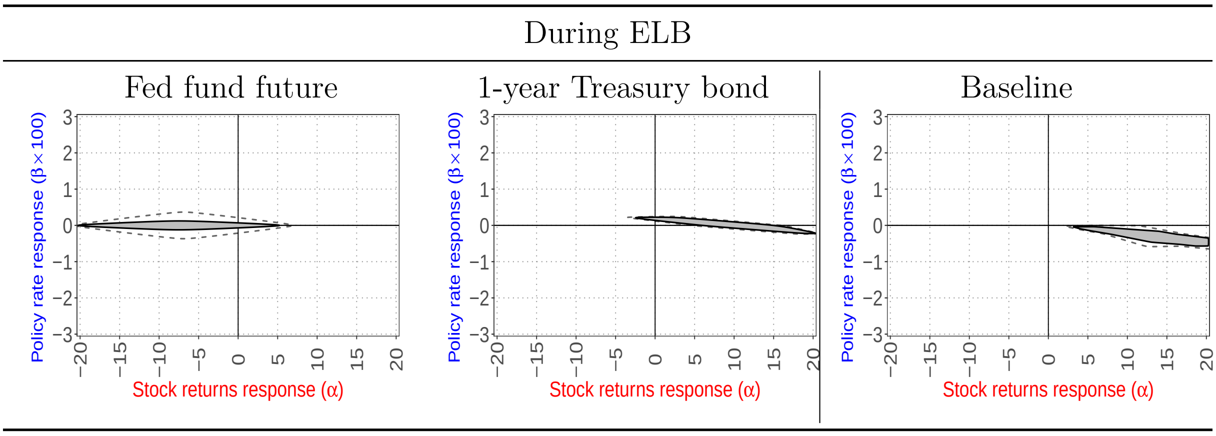


Figure S.6: ALTERNATIVE POLICY INSTRUMENTS DURING ELB. The 85% (grey area) and 90% (dashed lined area) qLL–S confidence sets for the reaction of stock returns to monetary policy shock (α) and the reaction of monetary policy to stock returns ($\beta \times 100$).

Figure S.6 presents the sets. The new confidence sets clearly indicate that the FOMC does not respond to stock return movements (β is tightly centered around zero in both cases). Regarding the effect of monetary policy on stock returns, while the confidence set based on the fed fund rate does not clearly indicate the sign of the effect, as expected, the 1-year Treasury bond confidence set qualitatively reproduces baseline findings: a monetary contraction increases stock returns.[6]

[6] During the ELB period, the fed fund future was constrained, suggesting its inadequacy to proxy monetary policy expectations. Conversely, when conventional monetary policy is in place, we find empty sets when the PCA rate is used as a policy instrument outside the ELB period.

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