Forward Guidance and the Dynamics of Bank Credit

Elliot Spears

Economics Department · University of Washington

January 6, 2026

Background

Motivation:

- Forward guidance has become an important policy tool for central banks
- From 2008 - 2015, central banks hit zero bound — turned to forward guidance

Key Question:

- Did FG expand bank lending? Can it affect bank lending at all?

Finding:

- FG can effectively contract credit, but not expand it

Overview

Of particular interest are commercial banks - how do these banks adjust to FG Shocks?

- “Commercial Banks" = FDIC-insured, federal or state-chartered institutions
- “FG Shocks" = shocks to yields around FOMC announcements

What this paper will do:

- Show asymmetric responses of credit to FG shocks in the data
- Fit model to data
- Simulate the effects of an expansionary FG shock at ZLB on credit

Overview

Findings

- Asymmetric responses to contractionary versus expansionary FG shocks
  $\Rightarrow$ Contractionary FG = signaled tightening, Expansionary FG = signaled easing
- FG more effective at *contracting* than *stimulating* credit
- FG is least effective at stimulating credit when most needed

Transmission: **news about future path of policy rate $\Rightarrow$ asset prices react immediately**

- CB signals surprise future tightening $\Rightarrow$ asset prices $\downarrow$ $\Rightarrow$ treasury yields $\uparrow$ $\Rightarrow$ leverage $\uparrow$ $\Rightarrow$ lending $\downarrow$
- CB signal surprise future easing $\Rightarrow$ results flipped, but... statistically indistinguishable from zero

Related Literature

- **Forward Guidance Literature:**
  - Shock identification and effects: Gürkaynak et al. (2005), Nakamura & Steinsson (2018), Swanson (2021), Bauer & Swanson (2023)
  - Effects on firm-level investment: Kroner (2021)
- **Banks and Monetary Policy:**
  - Banks respond strongly to FFR shocks: Bernanke, Gertler (1995), Adrian & Shin (2010)
  - Interest rate sensitivity to policy: Benigno & Benigno (2021)
  - Bank leverage cyclicality: Adrian, Etula, Muir (2014) - procyclical
    He, Kelly, Manela (2017) - countercyclical
- **This Paper**
  - Bridges gap between forward guidance & banking literatures

Outline

- Identifying Forward Guidance Surprises
- Bank Data
- Empirical Results
- Model
- Model Results
- Conclusion

Identification Strategy

High-frequency identification

- Changes in interest-rate futures in a 30-minute window around FOMC announcements (Gürkaynak et al., 2005; Nakamura & Steinsson, 2018)

Sample

- FOMC announcements from July 1995 - December 2019

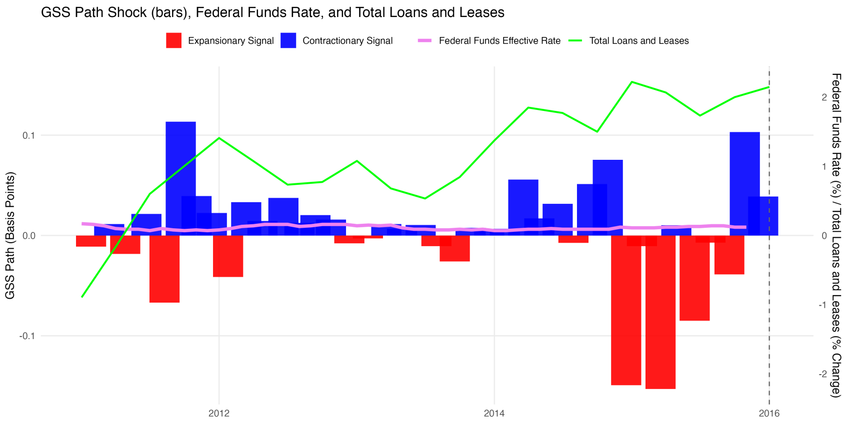
Data Source

- Jacobson, Acosta, and Brennan (2024), Harvard Dataverse

Methodology:

- From 30-minute futures moves around FOMC releases, estimate two factors:
  - Extract a *path* shock capturing forward guidance
- Sum bi-quarterly FG shock to an average quarterly measure
  - Control for effects of publicly available data

FG Shocks 2010 - 2016



- **Interpretation:**
  - Small changes in lending despite strong FG signals

Bank Data

The Data

- Dates: 1995 Q3 - 2019 Q4
- Frequency: Quarterly
- **Sources:**
  - Lending data: FFIEC Call Reports via WRDS
  - Leverage data: Compustat Capital IQ Bank Fundamentals
  - Remaining bank-level and control variables: FDIC, FRB

Structure

- No. of Units: $\sim$ 10,849 commercial banks
- Observations: 642,387
- Controls:
  - Macro: Fed funds rate, RGDP, RINV, BAA10Y, GDP Def
  - Bank: Assets (loans LP), Tier 1 Risk-Based Capital Ratio, Risk-Weighted Assets/Assets, Deposits/Assets, AOCI/Equity

Bank Data

Measure of Lending

- “Total Loans" from RCON Series on WRDS Call Reports

Measure of Bank Leverage

- Leverage is specified as:

$$\text{Leverage}_t = \frac{\text{Assets}_t}{\text{Equity}_t}$$

- Specifically,

$$\text{Leverage}_t = \frac{\sum_i (\text{Market Equity}_{i,t} + \text{Book Debt}_{i,t})}{\sum_i \text{Market Equity}_{i,t}}$$

Across “i" firms at time t

Forward Guidance Shock Setup

Shock Decomposition

$$FG_t^{con} = \max(\psi_t, 0), \qquad FG_t^{exp} = \max(-\psi_t, 0)$$

Contractionary Signal ($FG_t^{con} > 0$)

- Expectations of higher future rates
- $E_t[i^*_{t+k}] \uparrow \Rightarrow$, tighter funding
- Bank equity $\downarrow$ bank Assets $\downarrow$ $\Rightarrow$ Bank Leverage $\uparrow$ (equity falls faster)
- *Front-loaded IRFs*

Expansionary Signal ($FG_t^{exp} > 0$)

- Expectations of lower future rates
- $E_t[i^*_{t+k}] \downarrow \Rightarrow$ cheaper funding
- Loans $\uparrow$, leverage $\downarrow$ (equity adjusts first)
- *Back-loaded IRFs*

Asymmetry: with contractionary shocks eliciting immediate, amplified responses; expansionary shocks are weaker and delayed

Empirical Specification: Local Projections

For each horizon $h = 0, 1, ..., 20$ estimate:

$$\Delta_\tau \log(y_{i,t+h}) = \alpha_{h,i} + \beta_h^C FG_t^C + \beta_h^E FG_t^E + \sum_{j=1}^{4} \Gamma_{h,j} Z_{t-j} + \varepsilon_{i,t+h}$$

Where $\Delta_h \log(y_{i,t+h}) = \log(y_{i,t+h}) - \log(y_{i,t-1})$

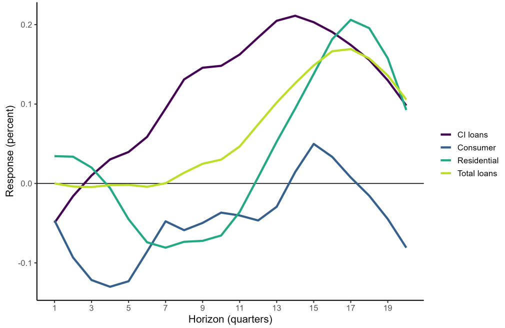
Outcome Variable: $y_{i,t}$ is either loans or leverage

Bank-level fixed effects: $\alpha_{h,i}$

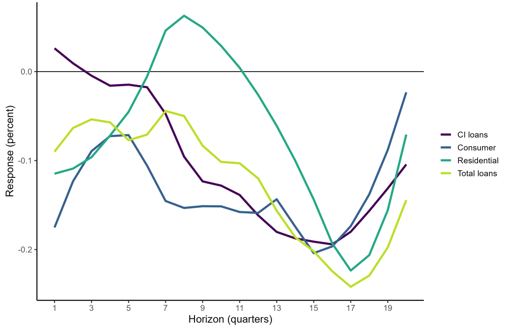
Macro Controls: $Z_{i,t-j}$

FG Shocks: FG_t^C for contractionary FG shock and FG_t^E for expansionary FG shock at time t

IRFs by Loan Category



Responses to Expansionary Forward Guidance



Responses to Contractionary Forward Guidance

Model

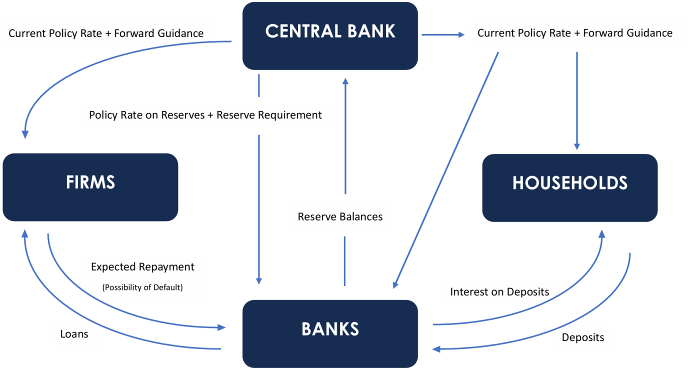


Figure 1: Model Structure

Forward Guidance Structure

$$i_t^R = \phi_\pi \pi_t + \phi_y y_t + \theta_t ,$$

$$\theta_t = \sum_{j=1}^{20} \varepsilon_{t-j}^{(j)}$$

- θ_t: represents past deviations from the policy rule
- $\varepsilon_t^{(j)}$: j-period **policy rule deviation** — announced at t but realized in $t + j$

Forward Guidance Shock:

$$\epsilon_t^{FG} = [s_t^0 \;\; s_t^1 \;\; \dots \;\; s_t^{20}]$$

A vector of noisy **signals** about future policy deviations

Signals and Belief Filtering

Noisy observation of each future component:

$$s_t^j \;=\; \varepsilon_t^j + \eta_t, \qquad \eta_t \sim N(0, \sigma^2)$$

With perfect information about today's deviation:

$$s_t^0 = \epsilon_t^0$$

Belief updating (reduced-form Kalman filter):

$$E_t\theta_{t+j} \;=\; E_{t-1}\theta_{t+j} \;+\; K_j\, s_t^j$$

Perfect information today:

$$E_t\theta_t = \theta_t$$

Intuition

- Agents receive a vector of signals ϵ_t^{FG} from the central bank about the future path of the policy rate i_t
- The signals contain ambiguity about the true realization of future policy rates
- These signals feed into forward looking equations that effect outcomes today, without affecting i_t today

Forward Guidance Transmission

Say that the central bank announces a three-period ahead shock ϵ_t^3 to the policy rate

Forward Guidance Transmits Through Forward Looking Variables

Take the Euler equation:

$$
\begin{aligned}
c_t &= E_t[c_{t+1}] - \frac{1}{\sigma}(i_t - E_t[\pi_{t+1}]) \\
&= E_t[c_{t+2} + \frac{1}{\sigma}(i_{t+1} - \pi_{t+2})] + \frac{1}{\sigma}(i_t - E_t[\pi_{t+1}) \\
&\vdots \\
&= E_t\{c_{t+4} + \frac{1}{\sigma}[\phi_\pi \pi_{t+3} + \phi_y y_{t+3} + \theta_{t+3} - \pi_{t+4}]\} + \frac{1}{\sigma}\sum_{j=0}^{2}(i_{t+j} - \pi_{t+j+1})
\end{aligned}
$$

Inserting the definition of θ_{t+3} and s_t^3, we get:

$$
c_t = E_t\{c_{t+4} + \frac{1}{\sigma}[\phi_\pi \pi_{t+3} + \phi_y y_{t+3} + K_3(\underbrace{\epsilon_t^3}_{\text{forward guidance shock}} + \eta_t) + E_{t-1}\theta_{t+3} - \pi_{t+4}]\} + \frac{1}{\sigma}\sum_{j=0}^{2}(i_{t+j} - \pi_{t+j+1})
$$

Forward guidance with asymmetric Kalman filtering

Belief updating (reduced-form Kalman filter):

$$E_t\theta_{t+j} \;=\; E_{t-1}\theta_{t+j} \;+\; K_j\, s_t^j .$$

Asymmetric Kalman update (bad news bites harder)

$$K_j(s) \;=\; \begin{cases} K_j^-, & \text{if } s_t^{(j)} > 0 \;\; \text{(contractionary news)} \\ K_j^+, & \text{if } s_t^{(j)} \le 0 \;\; \text{(expansionary news)} \end{cases} \qquad \text{with } K_j^- > K_j^+ \ge 0,$$

Intuition: downturns tighten the capital constraints faced by banks

Financial Frictions

Banks face

- Budget Constraint: $L_t + B_t + R_t = D_t + (1 - f(\delta_t))X_t$ where $\delta_t = \dfrac{L_t}{X_t}$
- Cost of Raising Equity: $f(\delta_t) = \dfrac{\alpha}{2}\delta_t^2$
- Reserve Requirement: $R_t \geq \rho D_t$ $0 \leq \rho < 1$

Firms face

- Marginal Cost: $(1 + i_t^L)[1 - \phi_{d,t+1}(j)]W_t(j)$
- Possibility of Default: $\phi_{d,t+1}(j) = \max\left(1 - \dfrac{Y_t(j)}{(1 + i_t^L)}, 0\right)$

Calibration

Parameter	Value	Description	Source
β	0.99	Discount Factor	–
σ	2	Risk Aversion	–
η	2	Frisch Elasticity of Labor Supply	–
θ	1	Labor Disutility Weight	–
ϕ	0.1	Liquidity Services Weight	–
ρ	0.1	Reserve Ratio	Benigno & Benigno (2021)
κ	0.5	Kalman Gain	Coibion & Gorodnichenko (2015)
τ	0.3	Tax Rate	OECD Centre for Tax Policy and Administration

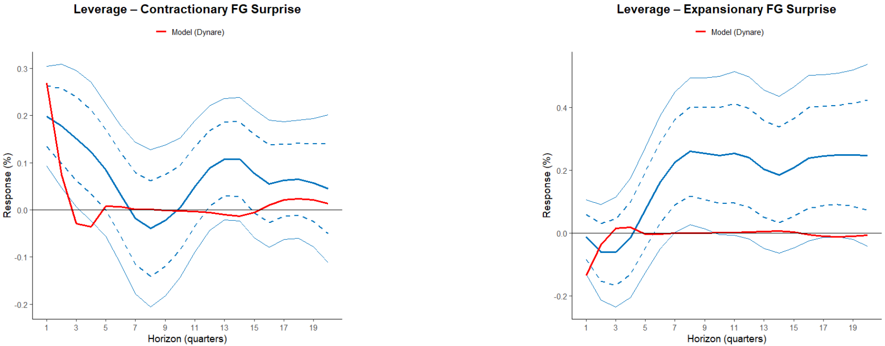
These parameters are fixed, the remainder are estimated using Bayesian methods

Estimation: Priors and Posteriors

- The remainder of the parameters are estimated using Bayesian methods (Smets & Wouters, 2007)
- I use 16 observables from FRED to estimate the model

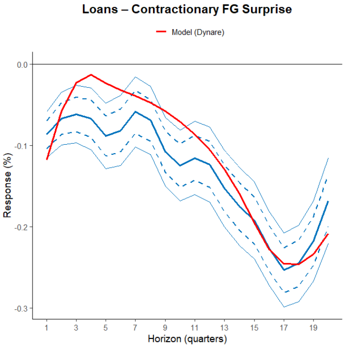
Parameter	Description	Dist.	Prior Mean / SD	Mean	5%	95%
Model Parameters						
ρ_A	TFP AR(1) persistence	Beta	0.800 / 0.150	0.8590	0.8022	0.9201
ϕ_π	Taylor-rule inflation	Normal	1.500 / 1.000	0.3155	-1.3936	2.0172
ϕ_y	Taylor-rule output	Normal	0.500 / 0.600	1.3405	0.3804	2.3038
ξ	Calvo *price* stickiness	Beta	0.550 / 0.250	0.7824	0.7189	0.8538
ϕ_w	Calvo *wage* stickiness	Beta	0.750 / 0.150	0.4930	0.4535	0.5353
ρ_b	Bank shock persistence	Beta	0.850 / 0.080	0.9426	0.9036	0.9838
ϕ_x	Loan adjustment-cost	Gamma	1.200 / 0.600	0.3670	0.0939	0.6319
γ_b	Bank intermediation cost	Gamma	0.100 / 0.050	0.1372	0.0718	0.2011
λ_h	External habit persistence	Beta	0.900 / 0.050	0.9554	0.9274	0.9848
ε	Elast. sub w.r.t goods	Normal	6.000 / 2.000	6.0186	2.7377	9.2301
ε_w	Elast. sub w.r.t labor	Normal	4.500 / 1.000	3.1864	2.3972	4.1106

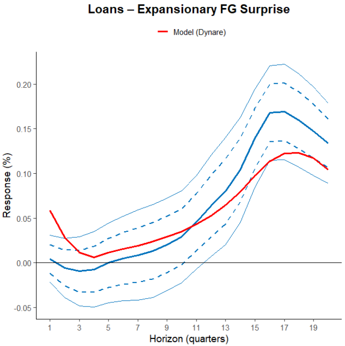
Bank Leverage Responses to FG Shock



Note: The blue IRFs are data-based estimates (solid line with bands). The dashed lines represent the 68% confidence bands, and the outer solid lines represent the 90% confidence bands. The red IRF is generated by the quantitative model.

Loan Responses to FG Shock





Note: The blue IRFs are data-based estimates (solid line with bands). The dashed lines represent the 68% confidence bands, and the outer solid lines represent the 90% confidence bands. The red IRF is generated by the quantitative model.

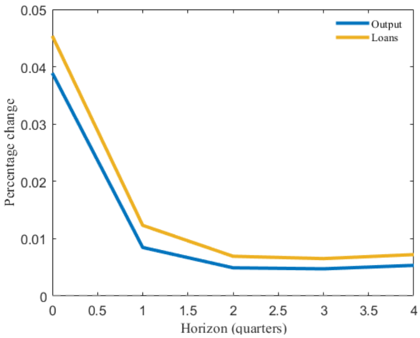
Zero Bound

- To implement an expansionary FG shock at the ZLB, I force the policy rate to remain at zero for longer
- Later liftoff = more accommodative policy
- Fix the policy rate $i_t^R = 0$ by setting $\phi_\pi, \phi_y = 0$
- Introduce a shock ε_t^4 (tightening four quarters into the future)
- Separately, introduce a shock ε_t^8 (tightening eight quarters into the future)
- Take differences in impulse responses between two shocks across all horizons:

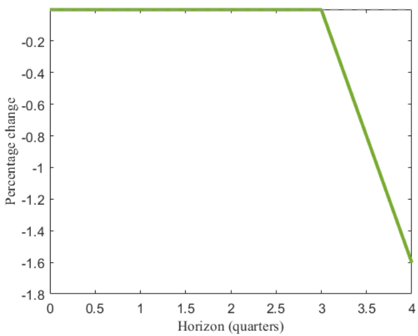
$$\Delta Y_{8,4} = Y_{t,\varepsilon_t^8} - Y_{t,\varepsilon_t^4} \equiv Y^{ZLB}_{t,\varepsilon_t^{FG}}$$

- Where $Y^{ZLB}_{t,\varepsilon_t^{FG}}$ is the impulse response of Y to an expansionary forward guidance shock at the ZLB

Zero Bound



Responses of Output & Loans



Policy Rate Surprise

Note: The figure displays the effects of an expansionary forward guidance shock at the zero lower bound (policy rate is held at zero for longer). The central banks modifies agents' expectations that tightening will begin five quarters into the future to an expectation that tightening will begin 10 quarters in the future.

Conclusion

- **Objectives**:
  - Assess the effectiveness of central bank forward guidance on stimulating credit
  - Build a model that simulates the response of credit to forward guidance at the zero bound
- **Findings**
  - Asymmetry in credit responses to contractionary versus expansionary FG shocks
  - Loan categories respond differently: consumer loans respond strongly, C&I more gradually
  - The response of bank credit to stimulus at the zero bound is very modest
  - Forward guidance is least effective at stimulating credit when most needed

Thank You

Appendix

Shock Identification

Data

- **Source:** Jacobson, Acosta, and Brennan (2024), Harvard Dataverse
- High-frequency (intraday) data on Federal Funds and Eurodollar futures
- **Dates**: July 1995 - December 2019

Identification

- Follows Gurkaynak et al. (2005) and Nakamura & Steinsson (2018).

$$\underset{(T\times n)}{X} = \underset{(T\times k)}{F}\,\underset{(k\times n)}{\Lambda} + \underset{(T\times n)}{\eta}$$

X matrix:

- **Rows**: FOMC announcement dates
- **Columns**: Changes in prices of interest rate futures

Forward guidance shock ≡ “path factor" — rotated so as to have zero effect on current fed funds rate

A Quarterly Measure

Purge effects of macroeconomic news:

$$\text{Path}_\tau = \alpha + \beta V_\tau + \mu_\tau$$

- Path_τ is the GSS path factor at announcement date τ
- V_τ is a vector of macroeconomic news shocks

Sum to an average quarterly measure:

$$FG_t = \frac{\sum_{\tau \in t} \mu_\tau}{2}$$

Macro news:

- Core CPI, PPI, GDP, Unemployment Rate, Nonfarm Payrolls, etc.

Policy Rate Response to FG Shock

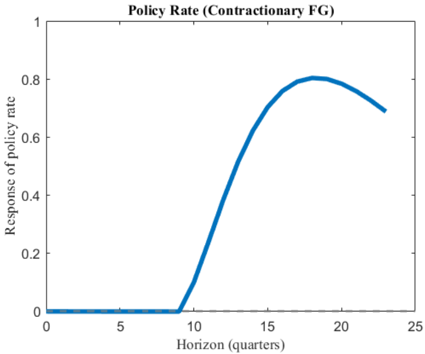
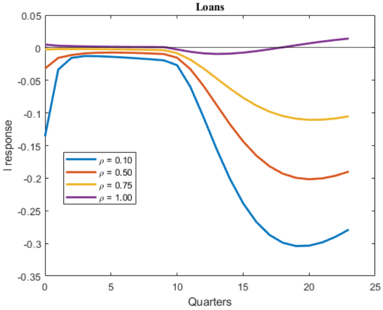


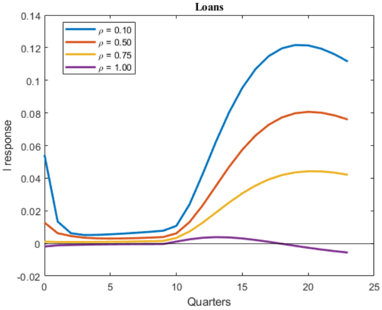
Figure 2: Policy Rate Response to Expansionary FG Shock

Note: This is the response to the policy rate after a forward guidance shock that is announced be going into effect 10 periods hence. We have no lift-off until the actual implementation of the policy rate change.

Loan Responses to FG Shock



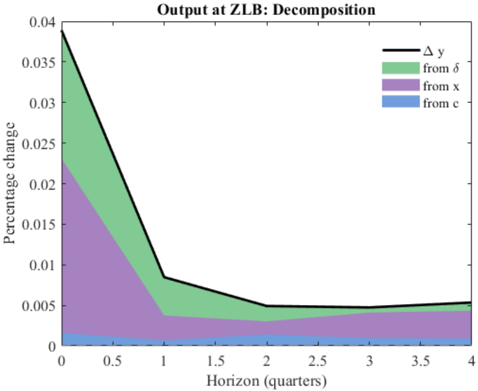
Contractionary FG Surprise



Expansionary FG Surprise

Note: ρ represents the reserve ratio. When $\rho = 0.10$, banks must hold 10% of deposits in reserves. When $\rho = 1$, deposits are fully backed by reserves.

Banks and the Real Economy



Note: δ, x, and c are bank leverage, bank equity, and consumption, respectively. This figure decomposes the response of output by contribution from each variable that y is a function of in the model. The IRF is output's response to an expansionary forward guidance shock at the ZLB.