Monetary Policy under Multiple Financing Constraints

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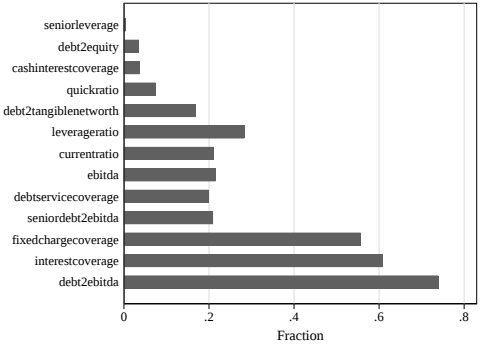
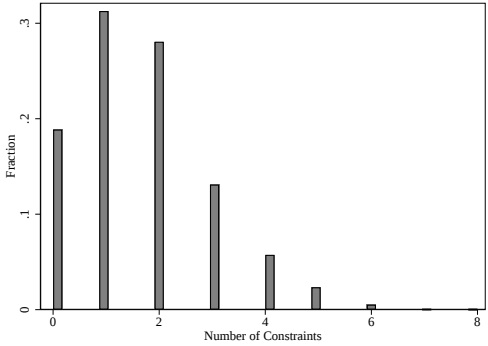
Firms face multiple financing constraints

Most common debt covenants for firms



Density of # "tight" debt covenants across firms



Increasing share of firms with multiple tight covenants in last years

What this paper does & What it finds

→ Studies implications of multiple tight debt covenants / binding financing constraints for transmission of monetary policy

Key findings:

1. Investment of firms with multiple binding financing constraints responds more aggressively to monetary tightening than to monetary easing
2. Investment of firms with single binding or with slack financing constraint responds instead roughly symmetrically
3. The larger the number of binding financing constraints, the stronger the asymmetry in investment response
4. Financing constraints with higher sensitivity to monetary surprises tend to be binding after tightening but slack after easing

Strong support for key findings in empirical analysis

Related literature

- **Anatomy of Financing Constraints**
  Greenwald (2019); Lian and Ma (2021); Ivashina et al. (2022); Drechsel (2023); Chava and Roberts (2008)
- **Financial Frictions and Firm Heterogeneity**
  Jeenas (2019); Ottonello and Winberry (2020); Cloyne et al. (2023)
- **Asymmetry in Monetary Transmission**
  Tenreyro and Thwaites (2016); Barnichon et al. (2017); Angrist et al. (2018); Debortoli et al. (2020); Jordà et al. (2020); Barnichon et al. (2022)

Theory

A parsimonious model of firm investment

- A competitive firm that lives for two periods $t \in \{0, 1\}$
- Technology: Firm produces output good $y_t = F(k_t)$ using physical capital k_t
- Financing: $k_1 = n_0 + b_1$, with *multiple* ($J > 1$) restrictions on debt b_1:

$$b_1 \leq \tilde{G}_j(k_1; R) \Rightarrow k_1 \leq G_j(n_0; R), \text{ with } j \in \{1, 2, ..., J\},$$

where R is gross interest rate

! Key assumptions:

1. Multiple financing constraints can be binding
2. Financing constraints can feature different sensitivities to interest rate

Financially constrained firm: Investment response

Proposition 1. (source of asymmetry)

a. *If firm faces multiple binding financing constraints, investment responds more aggressively to marginal increase in interest rate than to marginal decrease*

b. *If firm faces single binding financing constraint, investment response is instead symmetric*

Financially constrained firm: Investment response

Proposition 1. (source of asymmetry)

a. *If firm faces multiple binding financing constraints, investment responds more aggressively to marginal increase in interest rate than to marginal decrease*

b. *If firm faces single binding financing constraint, investment response is instead symmetric*

Proof. If firm is financially constrained, then

$$\left| \lim_{h \to 0^+} \frac{\hat{k}_1 (n_0; R+h) - \hat{k}_1 (n_0; R)}{h} \right| = \max_{j \in B(n_0)} \left\{ \left| \frac{\partial}{\partial R} G_j (n_0; R) \right| \right\}, \tag{1}$$

and

$$\left| \lim_{h \to 0^-} \frac{\hat{k}_1 (n_0; R+h) - \hat{k}_1 (n_0; R)}{h} \right| = \min_{j \in B(n_0)} \left\{ \left| \frac{\partial}{\partial R} G_j (n_0; R) \right| \right\}, \tag{2}$$

where $\hat{k}_1 (\cdot;\cdot)$ is the constrained optimal investment and $B(\cdot)$ is the set of binding financing constraints.

Firm with multiple binding financing constraints: Additional results

Proposition 2. (strength of asymmetry)

The larger the number of binding financing constraints, the stronger the asymmetry in investment response

Proposition 3. (binding status of financing constraints)

Financing constraints with higher sensitivity to interest rate tend to be binding after rate-increase but slack after rate-decrease

Proofs. Follow directly as corollary from Proposition 1

Financially unconstrained firm: Investment response

Proposition 4. (symmetry under slack financing constraints)

If firm faces no binding financing constraint, investment responds symmetrically to marginal changes in interest rate

Proof. If firm is financially unconstrained, then

$$\left|\frac{\partial}{\partial R}k_1(R)\right| = -\frac{\frac{1}{R}\left[F'\left[k_1(R)\right]+(1-\delta)\right]}{F''\left[k_1(R)\right]}, \tag{3}$$

where unconstrained optimal investment $k_1(\cdot) \leq \min_j\{G_j(\cdot,\cdot)\}$ is characterized by

$$1 = \frac{1}{R}\left[F'\left[k_1(R)\right]+(1-\delta)\right]. \tag{4}$$

Summary: Testable implications

1. Investment of firms with multiple binding financing constraints responds more aggressively to monetary tightening than to monetary easing shocks
2. Investment of firms with single binding or with slack financing constraint responds instead roughly symmetrically
3. The larger the number of binding financing constraints, the stronger the asymmetry in investment response
4. Financing constraints with higher sensitivity to monetary policy shocks tend to be binding after tightening but slack after easing

Empirics

Data

- Firm-level balance sheet data
  - Compustat sample, U.S. nonfinancial firms, quarterly between 1995 and 2022
- Balance sheet / Income statement -based constraints
  - Data from Dealscan on covenants
  - Banks write legally binding financial covenants in loans to non-financial firms
- Market-based constraint
  - Firm-level financial constraints: distance to default (D2D)
  - Merton (1974) model: firm's equity as call option on assets (strike price=debt)
  - CRSP (daily stock price data) combined with Compustat
- Monetary policy shocks from Miranda-Agrippino and Ricco (2021)
  - High-frequency changes in 2Y US Treasury yields around policy announcements
  - Abstract from new information from Fed regarding economy
  - Separate policy shocks in two types: "loosening" and "tightening"
    (similar average size between types and independence w.r.t. economic cycle)

Definition of multiple binding financing constraints

Binding financing constraints ≡ # Tight debt covenants + $\mathbb{1}$\{Close to default\}

Tight debt covenant → Closer than 2 standard deviations away from violating covenant

Close to default → Distance to default < 2 standard deviations

Illustrative example of tight debt covenant: ICR (EBITDA/Interest Payments)

Current Value: 3

Covenant: > 1

⇒ Distance to Covenant: 2

Firm-level standard deviation of ICR: 4

⇒ Std distance to covenant: 0.5 ($\frac{2}{4}$)

Empirical strategy

Local projections:

$$\begin{aligned}\Delta_{h+1} LogK_{i,t+h} =& \beta^h_{c,m}(\text{Contr. MP Shock}_t * \text{Mul. Constraint}_{i,t}) + \beta^h_{a,m}(\text{Acc. MP Shock}_t * \text{Mul. Constraint}_{i,t}) \\ & \beta^h_{c,s}(\text{Contr. MP Shock}_t * \text{Single Constraint}_{i,t}) + \beta^h_{a,s}(\text{Acc. MP Shock}_t * \text{Single Constraint}_{i,t}) \\ & \beta^h_{c,u}(\text{Contr. MP Shock}_t * \text{Unconstrained}_{i,t}) + \beta^h_{a,u}(\text{Acc. MP Shock}_t * \text{Unconstrained}_{i,t}) \\ & + \mathbf{X}'\gamma + \epsilon_{i,t}\end{aligned}$$

where

Contr. MP Shock → contractionary monetary policy shock

Acc. MP Shock → accommodative monetary policy shock

Mul. Constraint → dummy if firm faces multiple binding financing constraints

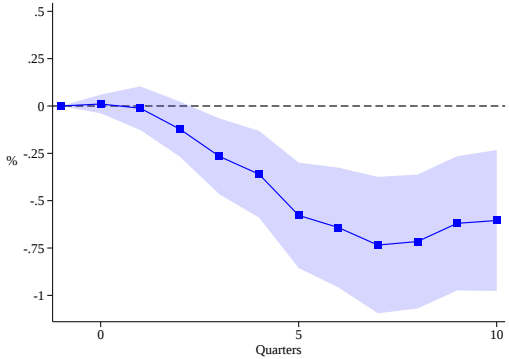
Single Constraint → dummy if firm faces a single binding financing constraint

Unconstrained → dummy if firm faces no binding financing constraint

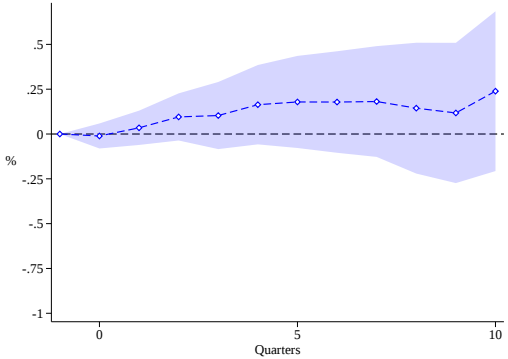
Investment response

Multiple binding financing constraints

(a) Contractionary Shock



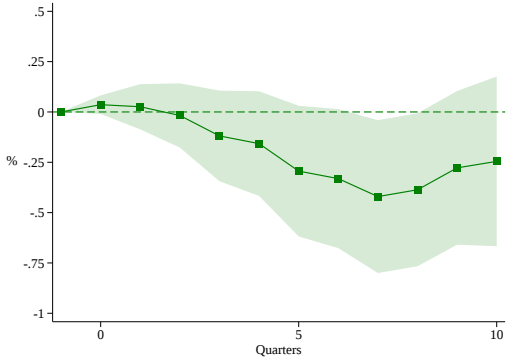
(b) Accommodative Shock



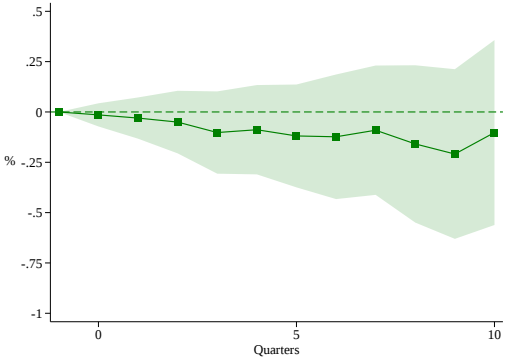
Investment response

Single binding financing constraint

(a) Contractionary Shock



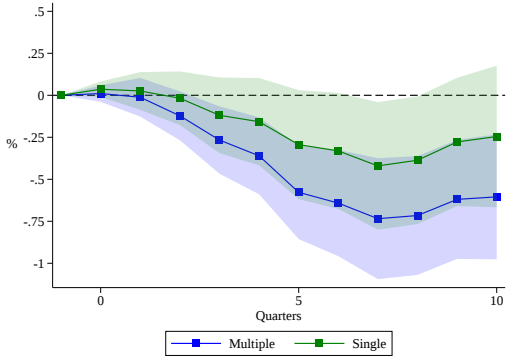
(b) Accommodative Shock



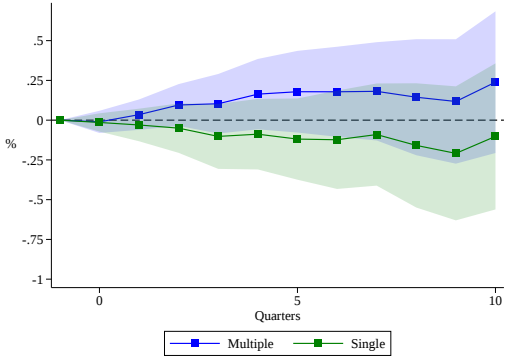
Investment response

Multiple versus Single binding financing constraints

(a) Contractionary Shock



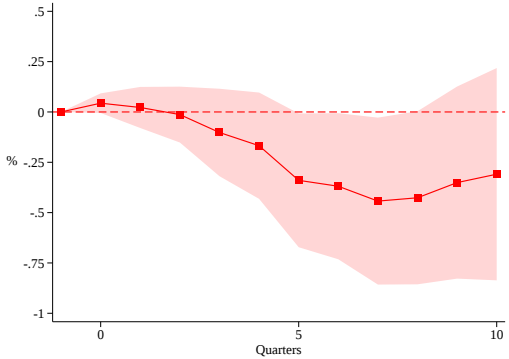
(b) Accommodative Shock



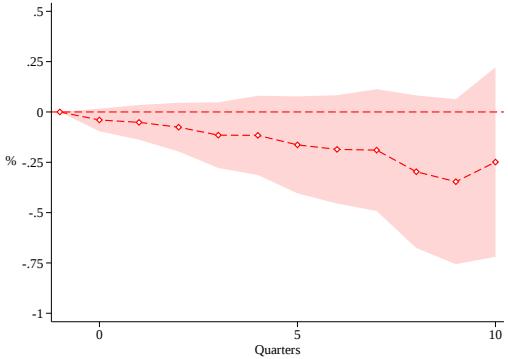
Investment response

Slack financing constraints

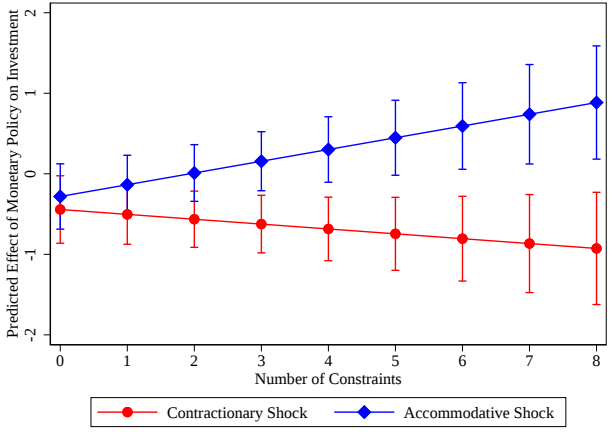
(a) Contractionary Shock



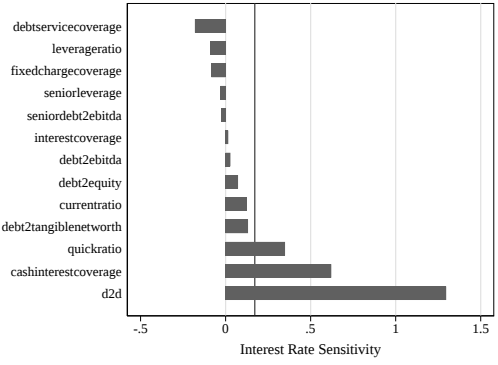
(b) Accommodative Shock

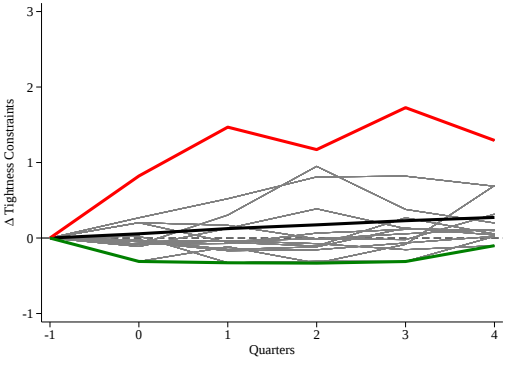


Asymmetry increasing in # binding financing constraints



Sensitivity of financing constraints to monetary policy rate





Empirical test: $\Delta_{h+1} TightnessConstraint^{k}_{i,t+h} = \beta^{h}_{k}$ MP Shock$_t + \mathbf{X}'\gamma + \epsilon_{i,t}$

Conclusion

- Firms face multiple financing constraints
- Firms with multiple binding financing constraints respond more aggressively to monetary tightening than to monetary easing
- Firms with single binding or with slack financing constraint respond symmetrically
- The larger the number of binding financing constraints, the stronger the asymmetry in investment responses
- Financing constraints with higher sensitivity to monetary policy tend to be binding after tightening but slack after easing

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