Debt Maturity Heterogeneity and Investment Responses to Monetary Policy

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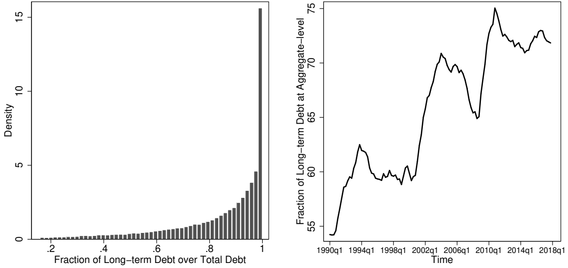
Figure: Debt Maturity in the Cross-section and Time-series



(a) Cross-section (b) Time-series

- Cross-section: It may be of independent interest to policymakers who are concerned about the distributional effects of monetary policy across firms.

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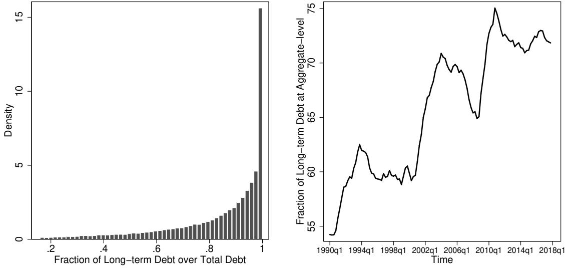

(a) Cross-section (b) Time-series

- Cross-section: It may be of independent interest to policymakers who are concerned about the distributional effects of monetary policy across firms.
- Time-series: It is important to understand the effectiveness of monetary policy when the debt maturity structure changes over time

Questions and answers in this paper

Q1: What are the estimates of $\frac{dI}{d\epsilon^m}$ for different debt maturity in the data?

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  (1) Firm-level Investment Distribution

  (2) Firm-level Leverage and Maturity Distributions
- Monetary transmission depends on the distribution of debt maturity.

Roadmap

Q1: What are the estimates of $\frac{dI}{d\epsilon^m}$ for different debt maturity in the data?

0. Firm-level investment responses to identified monetary shocks
1. Supporting evidence from credit rating and borrowing responses

Q2: Could micro-founded macro models explain the estimates? And how?

3. A heterogeneous firm New Keynesian model with long/short-term debts
4. Parameterization and micro moments of investment and debt
5. Effectiveness of monetary policy over the distribution of debt maturity
6. Inspecting the mechanism in the model

[Empirical Evidence]

Q1: What are the estimates of $\frac{dI}{d\epsilon^m}$ for different debt maturity in the data?

A.Baseline Specification

General Strategy:

$$i_{jt} = \boldsymbol{\alpha}\Delta_t^m + \boldsymbol{\beta}'\left(X_{jt-1} - \mathbb{E}_j[X_{jt}]\right)\Delta_t^m + \gamma_z' Z_{jt-1} + \gamma_a' Agg_{t-1} + \gamma_j + \gamma_{qs} + \gamma_t + \epsilon_{jt} \quad (1)$$

Key Variables: (Compustat Quarterly + HFI MP shocks: 1990-2008)

- X_{jt-1} includes lagged maturity m_{jt-1}, leverage l_{jt-1}, and distance-to-default dd_{jt-1}
- Standardize Δ_t^m (HFI): flip the sign and divided by 0.0025

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Controls and FEs

- Z_{jt-1}: Total Asset, Cash Holding, Total Revenue, Sales, Sales Growth, Profitability, Earning Volatility, Net Equity Issuance
- Agg_{t-1}: VIX, GDP Growth, Unemployment, Inflation
- γ_j: Firm Fixed Effect; γ_q: Quarter Fixed Effect
- γ_t: Time Fixed Effect (Not included when comparing to average effect)
- γ_{qs}: Sector-Quarter Seasonality Fixed Effect; ϵ_{jt}^{st}: Sector-Time Clustering

A.Heterogeneous Responses of Investment to MP

i_{jt}	(1)	(2)	(3)	(4)	(5)	(6)
Δ_t^m	0.185**	0.186**	—	—	0.207**	—
	(0.075)	(0.075)	(.)	(.)	(0.085)	(.)
$\Delta_t^m \times \left(mat_{j,t-1} - \mathbb{E}_j[mat_{j,t}]\right)$		-0.555***	-0.663***	-0.748***	-0.615***	-0.750***
		(0.181)	(0.184)	(0.201)	(0.213)	(0.202)
$\Delta_t^m \times \left(lev_{j,t-1} - \mathbb{E}_j[lev_{j,t}]\right)$			-0.319*		0.357	0.495
			(0.187)		(0.373)	(0.365)
$\Delta_t^m \times \left(dd_{j,t-1} - \mathbb{E}_j[dd_{j,t}]\right)$				0.082***	0.059**	0.090***
				(0.028)	(0.029)	(0.031)
N	104737	104737	104737	88648	88648	88648
adj. R^2	0.365	0.365	0.373	0.368	0.360	0.368
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Seasonality FE	Yes	Yes	Yes	Yes	Yes	Yes
Aggregate Controls	Yes	Yes	—	—	Yes	—
Time FE	No	No	Yes	Yes	No	Yes
Time-Firm Clustering	Yes	Yes	Yes	Yes	Yes	Yes

Robustness Checks

▸ Alternative MP Shocks (60mins) ▸ Alternative MP Shocks (Smoothed) ▸ Alternative MP Shocks (Net CBI) ▸ Total Maturity
▸ Transitory Maturity ▸ Other Characteristics ▸ Control Lagged Investment

A.Heterogeneous Responses of Investment to MP

Quantitative Interpretations:

- Column (3) provides a comparison between the maturity channel and the leverage channel. In our sample, $sd_{mat} = 0.187$ and $sd_{lev} = 0.19$. The corresponding coefficients are -0.663 and -0.319, the heterogeneous responses due to debt maturity are comparable (twice) to the magnitude explained by debt leverage.

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- Column (4) provides a comparison between the maturity channel and the distance-to-default channel. In our sample, $sd_{dd} = 3.95$. The corresponding coefficients are -0.748 and 0.082, the heterogeneous responses due to debt maturity is comparable (43%) to the magnitude explained by distance-to-default.

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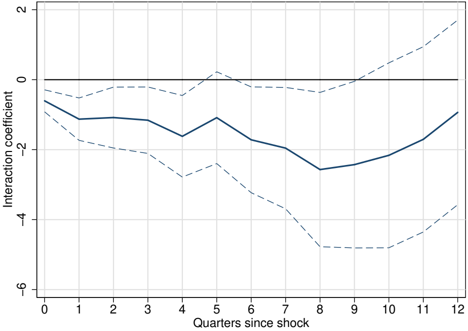
- Column (6) provides a self comparison. For firms with debt maturity one SD longer than average ($sd_{mat} = 0.187$), this effect is reduced by 0.14% (0.75×0.187). Compared to the average effect of 0.207%, a standard deviation longer in debt maturity generates 68% (0.14%/0.207%) less of an investment response.

A.Dynamics Specification

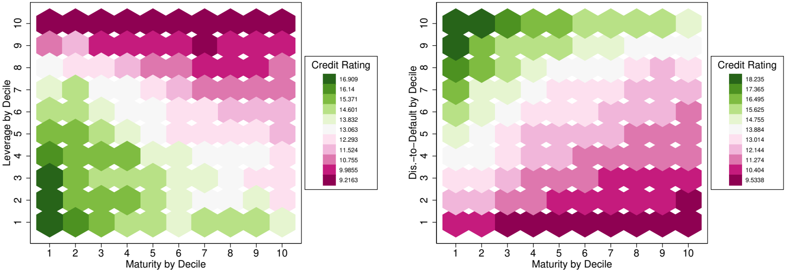
$$\sum_{\tau=t+0}^{\tau=t+h} i_{j\tau} = \boldsymbol{\beta}_h' \left(X_{jt-1} - \mathbb{E}_j[X_{jt}]\right) \Delta_t^m + \Gamma_h' Z_{jt-1} + \gamma_{jh} + \gamma_{qsh} + \gamma_{th} + \epsilon_{jth} \tag{2}$$

Figure: Dynamics of Heterogeneous Responses to Monetary Policy



B.Evidence from Credit Rating

Figure: Credit Rating Distributions over Maturity and Leverage/Distance-to-Default



(a) Maturity and Leverage

(b) Maturity and Distance-to-Default

Notes: Maturity, leverage, and distance-to-default are equally divided into ten deciles, therefore, 10*10=100 groups. We then calculate the average credit rating of each group: green bins represent higher credit ratings and purple bins represent lower credit ratings. This figure shows that default risk embedded in having more long-term debt is not fully captured in either leverage or distance-to-default.

B.Evidence from Credit Rating

Table: Heterogeneous Responses of Investment to Monetary Policy by Long-term Bond Credit Ratings

i_{jt}	(1)	(2)	(3)	(4)	(5)	(6)
Δ_t^m	0.180***	0.126*	—	—	0.139*	—
	(0.062)	(0.065)	(.)	(.)	(0.070)	(.)
Δ_t^m x $\{Rating_{j,t-1} \geq A\}$		0.254***	0.227***	0.249**	0.287***	0.248***
		(0.083)	(0.080)	(0.095)	(0.087)	(0.093)
$\Delta_t^m \times \left(mat_{j,t-1} - \mathbb{E}_j[mat_{j,t}]\right)$		-0.215	-0.438	-0.275	-0.046	-0.277
		(0.265)	(0.326)	(0.279)	(0.274)	(0.279)
$\Delta_t^m \times \left(lev_{j,t-1} - \mathbb{E}_j[lev_{j,t}]\right)$			-0.603**		-0.268	-0.145
			(0.269)		(0.518)	(0.486)
$\Delta_t^m \times \left(dd_{j,t-1} - \mathbb{E}_j[dd_{j,t}]\right)$				0.033*	0.009	0.031
				(0.020)	(0.019)	(0.019)
N	38997	38997	38997	32584	32584	32584
adj. R^2	0.468	0.468	0.476	0.472	0.463	0.472
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Seasonality FE	Yes	Yes	Yes	Yes	Yes	Yes
Aggregate Controls	Yes	Yes	—	—	Yes	—
Time FE	No	No	Yes	Yes	No	Yes
Time-Firm Clustering	Yes	Yes	Yes	Yes	Yes	Yes

C.Evidence from Borrowing Responses

Table: Borrowing Responses to Monetary Policy
Long-term Debt vs Short-term Debt

	(A). Long-term Debt Δb^L_{jt}			(B). Short-term Debt Δb^S_{jt}		
	(1)	(2)	(3)	(1)	(2)	(3)
Δ^m_t	0.389*	0.395*	—	0.093	0.089	—
	(0.223)	(0.224)	(.)	(0.111)	(0.112)	(.)
$\Delta^m_t \times \left(mat_{j,t-1} - \mathbb{E}_j[mat_{j,t}]\right)$		-4.137**	-4.321**		2.802	3.147
		(2.059)	(2.114)		(1.714)	(2.035)
$\Delta^m_t \times \left(lev_{j,t-1} - \mathbb{E}_j[lev_{j,t}]\right)$			7.432**			2.894**
			(3.002)			(1.221)
$\Delta^m_t \times \left(dd_{j,t-1} - \mathbb{E}_j[dd_{j,t}]\right)$			0.357***			0.005
			(0.133)			(0.039)
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adj. R^2	0.057	0.057	0.058	0.101	0.101	0.102
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Seasonality FE	Yes	Yes	Yes	Yes	Yes	Yes
Aggregate Controls	Yes	Yes	—	—	Yes	—
time FE	No	No	Yes	Yes	No	Yes
Time-Firm Clustering	Yes	Yes	Yes	Yes	Yes	Yes

Takeaway from Empirical Evidence

- A.Heterogeneous Responses of Investment to Monetary Policy:
  (Firms with more long-term debt is less responsive to monetary expansion.)
  (Magnitude is comparable to effect of well-addressed leverage heterogeneity.)
- B.Evidence from Credit Rating:
  (Credit rating of long-term debt reflects the significant heterogeneous responses.)
- C.Evidence from Borrowing Responses:
  (Firms with more long-term debt significant borrow less long-term debt to finance the investment (therefore, less) in response to monetary expansion.)

[Quantitative Theory]

Q2: Could micro-founded macro models explain the estimates? And how?

Model Setup

Heterogeneous Production Firms:

- Produce and invest subject to capital adj. costs
- Face idiosyncratic productivity shocks

Long/Short-term Debt Financing:

- External finance through issuing long/short-term debt
- Debt adjustment incurs adjustment costs
- Firms may default on their debt

Monetary Expansion:

- Monetary expansion as real interest shock in a PE fashion

Firms' Problem

Production and Investment:

$$y_{jt} = z_{jt} k_{jt}^{\alpha}, \qquad \alpha \in (0,1)$$

$$\log(z_{jt}) = \rho_z \log(z_{jt-1}) + \eta_z \varepsilon_{jz,t}$$

$$k_{jt+1} = (1-\delta) k_{jt} + i_t \quad \text{subject to} \quad \Theta(k_{t+1}, k_t) = \frac{\theta_k}{2}\left(\frac{k_{t+1}}{k_t} - 1\right)^2 k_t$$

Debt Financing:

$$\text{for long-term debt:} \quad b_{L,t+1} = (1-\lambda)\, b_{L,t} + n_{L,t}$$

$$\text{debt issurance cost:} \quad \theta_{bS} b_S'^2 + \theta_{bL}\left(b_L' - (1-\lambda) b_L\right)^2$$

The dividend of the firm is given by:

$$D = (1-\tau)\underbrace{[zk^{\alpha} - \delta k]}_{\text{Taxable Income}} - \underbrace{(b_S + \lambda b_L)}_{\text{Principal Repayment}} - \underbrace{(k' - k)}_{\text{Gross Investment}} - \underbrace{\frac{\theta_k}{2}\left(\frac{k'}{k} - 1\right)^2 k}_{\text{Capital Adjustment Cost}}$$

$$+\underbrace{q_S(z, k', r, b_S', b_L')\, b_S' + q_L(z, k', r, b_S', b_L')\, \left(b_L' - (1-\lambda) b_L\right)}_{\text{Revenue from Debt Issuance}} - \underbrace{\left[\theta_{bS} b_S'^2 + \theta_{bL}\left(b_L' - (1-\lambda) b_L\right)^2\right]}_{\text{Debt Issuance Cost}},$$

Recursive Formulation

Value Functions:

$$v(z, k, r, b_S, b_L) = \max\left\{ v^c(z, k, r, b_S, b_L),\ 0 \right\}. \tag{3}$$

$$v^c(z, k, r, b_S, b_L) = \max_{k', b'_S, b'_L, D} \left\{ D - \psi + (1 - \pi_d)\, \Lambda v(z', k', r', b'_S, b'_L) \right\}, \tag{4}$$

Recovery Value Upon Default:

$$R(z, k, r, b_S, b_L) = \max\{\chi[(1 - \tau)(zk^\alpha - \delta k) + k - \frac{\theta_k}{2} k],\ 0\} \tag{5}$$

Bond Prices:

$$q_S(z, k', r, b'_S, b'_L) = \frac{1 - \pi_d}{1 + r} \left[(1 - d(z', k', r', b'_S, b'_L)) + d(z', k', r', b'_S, b'_L) \frac{R(z', k', r', b'_S, b'_L)}{b'_S + b'_L} \right], \tag{6}$$

$$\begin{aligned} q_L(z, k', r, b'_S, b'_L) = \frac{1 - \pi_d}{1 + r} \Big[& (1 - d(z', k', r', b'_S, b'_L))(\lambda + (1 - \lambda) q'_L) \\ & + d(z', k', r', b'_S, b'_L) \frac{R(z', k', r', b'_S, b'_L)}{b'_S + b'_L} \Big], \end{aligned} \tag{7}$$

Monetary Expansion

Monetary expansion as real interest shock cut in a PE fashion

- Part 1: Enters firms' stochastic discount factor $\Lambda \Uparrow$ (incentive to invest)
- Part 2: Enters firms' bond prices $\frac{1}{1+r} \Uparrow$ (incentive to borrow)

Magnitudes (-15bps) matches -25bps cut in federal fund rate as in literature.

Parameterization and Moments

Table: Fixed Parameters

Parameter	Description	Value
β	Discount factor	0.96
α	Capital share	0.65
δ	Capital depreciation rate	0.025
λ	Long-term debt repayment rate	0.05
τ	Corporate income tax rate	0.2
χ	Recovery rate	0.8
π_d	Exogenous exit rate	0.01
ρ_z	Productivity persistence	0.9
η_z	Productivity volatility	0.03
ρ_r	Interest rate persistence	0.5
η_r	Interest rate volatility	0.08

Model Fit: Investment and Debt Moments

Table: Fitted Parameters

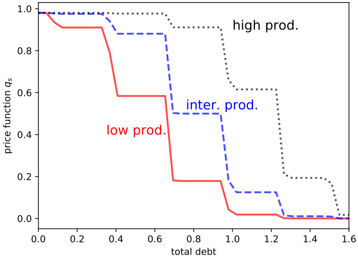
Parameter	Description	Value
θ_k	Capital adjustment cost	0.5
θ_{bS}	Short-term debt issuance cost	0.12
θ_{bL}	Long-term debt issuance cost	1.17
ψ	Fixed cost of operation	1.605

Table: Model Fit

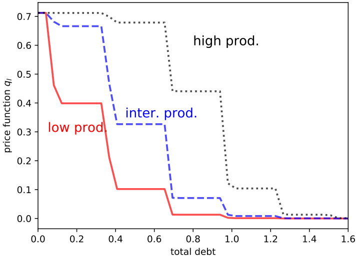
Average annualized moments	Data	Model
Investment rate (%)	23.2	20.5
Default rate (%)	3.0	3.3
Leverage (%)	35.2	36.9
Long-term debt share (%)	84.2	85.3

Model Validation: Prices for Short-term and Long-term Bonds

Figure: Bond Prices as Functions of Total Debt for Different Productivity Levels



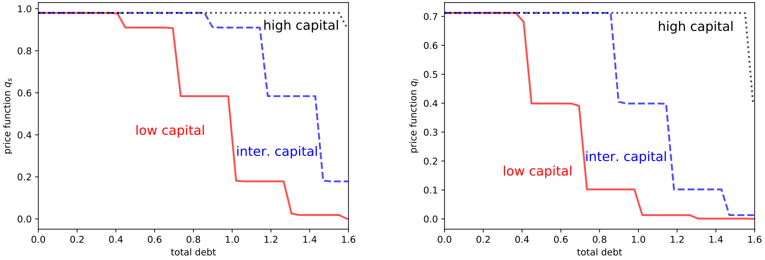
(a) Price function q_s



(b) Price function q_l

Model Validation: Prices for Short-term and Long-term Bonds

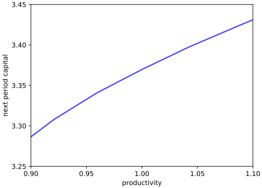
Figure: Bond Prices as Functions of Total Debt for Different Capital Levels



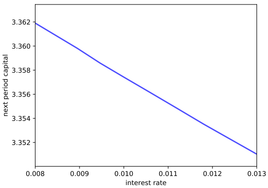
(a) Price function q_s (b) Price function q_l

Model Validation: Decision Rules for Next Period Capital

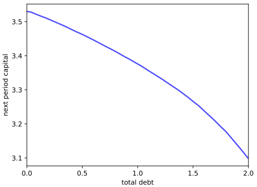
Figure: Decision Rules for Next Period Capital as a Function of Productivity, Interest Rate, Debt, and Maturity



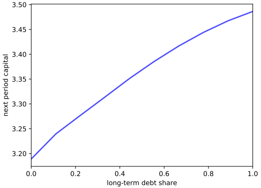
(a) Productivity



(b) Interest rate



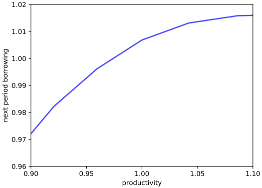
(c) Total debt



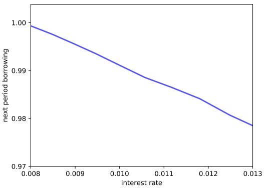
(d) Maturity

Model Validation: Decision Rules for Next Period Borrowing

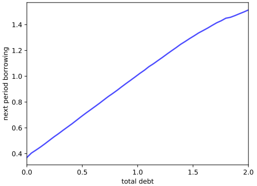
Figure: Decision Rules for Next Period Borrowing as a Function of Productivity, Interest Rate, Debt, and Maturity



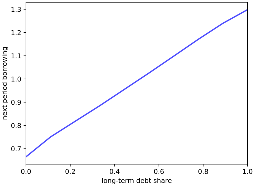
(a) Productivity



(b) Interest rate



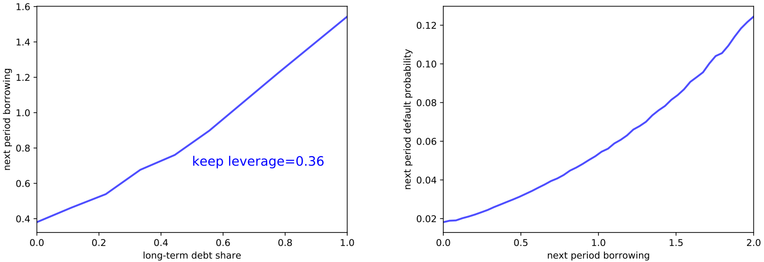
(c) Total debt



(d) Maturity

The Role of Debt Maturity: Future Default Risk

Figure: Long-term Debt Increases Future Default Risk



(a) (b)

Notes: This figure illustrates how debt maturity affects firm future default risk, given firm leverage. Panel (a) plots next period borrowing as a function of long-term debt share, keeping leverage fixed. Panel (b) shows that the next period default probability increases with more next period borrowing.

The Role of Debt Maturity: Compare to Only-short-debt Model

Table: Moments Comparison

Average annualized moments	Benchmark	Only-short-term-debt
Investment rate (%)	20.5	20.0
Default rate (%)	3.3	4.3
Leverage (%)	36.9	3.1
Long-term debt share (%)	85.3	0

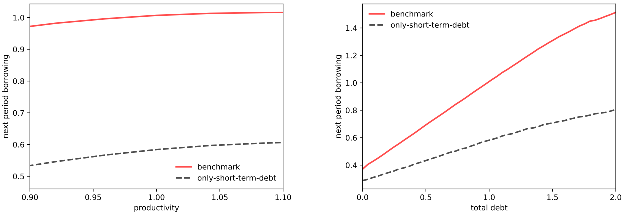


Figure: Comparison: Next Period Borrowing

The Role of Debt Maturity

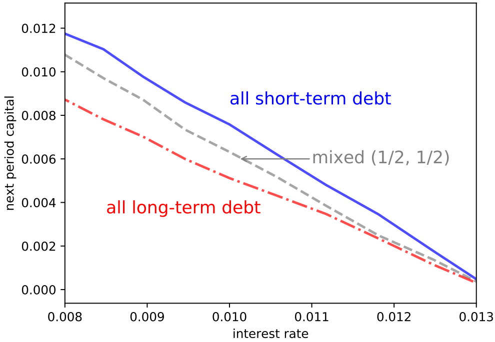


Figure: Heterogeneous Responses Due to Debt Maturity

Notes: This figure plots the decision rules for next period capital with respect to the interest rate for different debt maturity levels. We normalize each series by its own value when the interest rate is at the grid maximum. The solid blue line plots for firms with only short-term debt (f=0), the dash-dotted red line plots for firms with only long-term debt (f=1), and the dashed gray line is firms with half short-term debt and half long-term debt (f=1/2).

Model Results: Hetero. Responses to Monetary Policy Shock

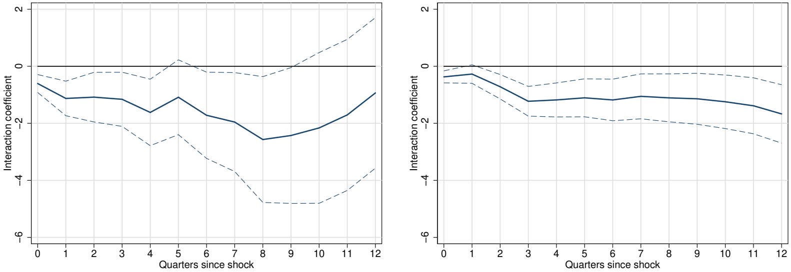
Table: Regression Results: Model and Data

	Model		Data	
	(1)	(2)	(1)	(2)
$\Delta_t^m \times \left(mat_{j,t-1} - \mathbb{E}_j[mat_{j,t}]\right)$	-0.370***	-0.365**	-0.656***	-0.663***
	(0.128)	(0.163)	(0.185)	(0.184)
$\Delta_t^m \times \left(lev_{j,t-1} - \mathbb{E}_j[lev_{j,t}]\right)$		-0.016		-0.319*
		(0.341)		(0.187)
Firm FE	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes

Notes: This table compares the regression results from model-simulated data and Compustat data. "Model" reports results from estimating $i_{jt} = \boldsymbol{\beta}' \left(X_{jt-1} - \mathbb{E}_j[X_{jt}]\right) \Delta_t^m + \gamma_z' Z_{jt-1} + \gamma_j + \gamma_t + \epsilon_{jt}$, where i_{jt} is the firm-level investment rate, Δ_t^m is the interest rate shock occurring between quarter $t-1$ and quarter t, X_{jt-1} is a vector capturing firm j's corporate debt structure at quarter $t-1$, including both demeaned and lagged maturity and leverage. Z_{jt-1} is a vector of lagged firm-level controls, including leverage, debt maturity, total assets, sales, and sales growth. γ_j are firm fixed effects and γ_t are time fixed effects. "Data" reports the coefficients of the baseline regression in Table **??**. "Data" Column (1) corresponds to Table **??** Column (2) but with time fixed effects. "Data" Column (2) corresponds to Table **??** Column (3). Significance level: * p<0.1, ** p<0.05, *** p<0.01.

Model Results: Hetero. Responses to Monetary Policy Shock

Figure:
Dynamics of Heterogeneous Responses: Data vs. Model



(a) Data (b) Model

Notes: Dynamics of the interaction coefficients between debt maturity positions and monetary shocks overtime. Panel (a) is the dynamics responses in the data as in Figure 2. Panel (b) plots the coefficient β_h over quarters h from estimating $\sum_{\tau=t+0}^{\tau=t+h} i_{j\tau} = \boldsymbol{\beta_h'} \left(X_{jt-1} - \mathbb{E}_j[X_{jt}]\right) \Delta_t^m + \Gamma_h' Z_{jt-1} + \gamma_{jh} + \gamma_{th} + \epsilon_{jth}$ using the model-simulated data. Dashed lines indicates the 90% confidence interval.

Takeaway from Quantitative Theory

- A model matches the empirical moments of investment and debt indicates that long-term debt has higher issurance costs and lower bond prices.
- Firms with more long-term debt have higher potential default risk.
- Firms with more long-term debt are less sensitive to real interest rate on investment decisions.
- Therefore, the model replicates the empirical estimates.

Conclusion

- Heterogeneity in debt maturity matters for monetary transmission to inv..
- Magnitude is comparable to effect of well-addressed leverage heterogeneity.
- A quantitative model with both long/short-term debt replicates the estimates.
- Therefore, the effect of MP depend on the distribution of debt maturity.

Appendix

Robustness Check 1

Table: HETEROGENEOUS RESPONSES OF INVESTMENT TO MONETARY POLICY, USING SHOCKS WITH 60 MINS WINDOW

i_{jt}	(1)	(2)	(3)	(4)	(5)	(6)
Δ_t^m	0.183**	0.184**	—	—	0.212**	0.000
	(0.075)	(0.075)	(.)	(.)	(0.086)	(.)
$\Delta_t^m \times \left(mat_{j,t-1} - \mathbb{E}_j[mat_{j,t}]\right)$		-0.509***	-0.606***	-0.691***	-0.568***	-0.694***
		(0.175)	(0.175)	(0.194)	(0.206)	(0.196)
$\Delta_t^m \times \left(lev_{j,t-1} - \mathbb{E}_j[lev_{j,t}]\right)$			-0.270		0.338	0.452
			(0.183)		(0.362)	(0.361)
$\Delta_t^m \times \left(dd_{j,t-1} - \mathbb{E}_j[dd_{j,t}]\right)$				0.075***	0.056**	0.082***
				(0.026)	(0.027)	(0.029)
N	104737	104737	104737	88648	88648	88648
adj. R^2	0.365	0.365	0.373	0.368	0.360	0.368
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Seasonality FE	Yes	Yes	Yes	Yes	Yes	Yes
Aggregate Controls	Yes	Yes	—	—	Yes	—
Time FE	No	No	Yes	Yes	No	Yes
Time-Firm Clustering	Yes	Yes	Yes	Yes	Yes	Yes

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Robustness Check 2

Table: Heterogeneous Responses of Investment to Monetary Policy, using smoothed monetary policy shocks

i_{jt}	(1)	(2)	(3)	(4)	(5)	(6)
Δ_t^m	0.332***	0.332***	—	—	0.373***	0.000
	(0.108)	(0.109)	(.)	(.)	(0.131)	(.)
$\Delta_t^m \times \left(mat_{j,t-1} - \mathbb{E}_j[mat_{j,t}]\right)$		-0.647**	-0.854***	-1.053***	-0.828***	-1.060***
		(0.256)	(0.183)	(0.261)	(0.280)	(0.260)
$\Delta_t^m \times \left(lev_{j,t-1} - \mathbb{E}_j[lev_{j,t}]\right)$			-0.266		0.908*	1.049**
			(0.360)		(0.461)	(0.465)
$\Delta_t^m \times \left(dd_{j,t-1} - \mathbb{E}_j[dd_{j,t}]\right)$				0.142***	0.113**	0.157***
				(0.045)	(0.043)	(0.047)
N	104737	104737	104737	88648	88648	88648
adj. R^2	0.366	0.366	0.373	0.368	0.361	0.368
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Seasonality FE	Yes	Yes	Yes	Yes	Yes	Yes
Aggregate Controls	Yes	Yes	—	—	Yes	—
time FE	No	No	Yes	Yes	No	Yes
Time-Firm Clustering	Yes	Yes	Yes	Yes	Yes	Yes

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Robustness Check 3

Table: Heterogeneous Responses of Investment to Monetary Policy, using monetary policy shocks net of CBI channel

i_{jt}	(1)	(2)	(3)	(4)	(5)	(6)
Δ_t^m	0.239*	0.240*	—	—	0.288*	0.000
	(0.131)	(0.131)	(.)	(.)	(0.147)	(.)
$\Delta_t^m \times \left(mat_{j,t-1} - \mathbb{E}_j[mat_{j,t}]\right)$		-0.485*	-0.463*	-0.564*	-0.554*	-0.565*
		(0.267)	(0.271)	(0.330)	(0.309)	(0.334)
$\Delta_t^m \times \left(lev_{j,t-1} - \mathbb{E}_j[lev_{j,t}]\right)$			-0.800**		-0.008	0.113
			(0.376)		(0.594)	(0.674)
$\Delta_t^m \times \left(dd_{j,t-1} - \mathbb{E}_j[dd_{j,t}]\right)$				0.099**	0.050	0.101*
				(0.049)	(0.051)	(0.057)
N	104737	104737	104737	88648	88648	88648
adj. R^2	0.365	0.365	0.373	0.367	0.360	0.367
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Seasonality FE	Yes	Yes	Yes	Yes	Yes	Yes
Aggregate Controls	Yes	Yes	—	—	Yes	—
Time FE	No	No	Yes	Yes	No	Yes
Time-Firm Clustering	Yes	Yes	Yes	Yes	Yes	Yes

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Robustness Check 4

Table: Heterogeneous Responses of Investment to Monetary Policy, using not demeaned financial positions

i_{jt}	(1)	(2)	(3)	(4)	(5)	(6)
Δ_t^m	0.185**	0.187**	—	—	-0.102	—
	(0.075)	(0.075)	(.)	(.)	(0.111)	(.)
$\Delta_t^m \times mat_{j,t-1}$		-0.302**	-0.331***	-0.398***	-0.370**	-0.432***
		(0.143)	(0.114)	(0.140)	(0.157)	(0.142)
$\Delta_t^m \times lev_{j,t-1}$			-0.297*		0.344*	0.454**
			(0.165)		(0.195)	(0.203)
$\Delta_t^m \times dd_{j,t-1}$				0.069***	0.066***	0.078***
				(0.019)	(0.022)	(0.021)
N	104737	104737	104737	88648	88648	88648
adj. R^2	0.365	0.365	0.373	0.368	0.360	0.368
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Seasonality FE	Yes	Yes	Yes	Yes	Yes	Yes
Aggregate Controls	Yes	Yes	—	—	Yes	—
Time FE	No	No	Yes	Yes	No	Yes
Time-Firm Clustering	Yes	Yes	Yes	Yes	Yes	Yes

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Robustness Check 5

Table: Heterogeneous Responses of Investment to Monetary Policy, Permanent Components of Financial Positions

i_{jt}	(1)	(2)	(3)	(4)	(5)	(6)
Δ_t^m	0.180**	0.180**	—	—	-0.067	—
	(0.080)	(0.080)	(.)	(.)	(0.136)	(.)
$\Delta_t^m \times \bar{mat}_{j,t}$		-0.052	-0.002	-0.093	-0.196	-0.116
		(0.215)	(0.229)	(0.247)	(0.247)	(0.263)
$\Delta_t^m \times \bar{lev}_{j,t}$			-0.333		0.194	0.137
			(0.200)		(0.273)	(0.274)
$\Delta_t^m \times \bar{dd}_{j,t}$				0.040**	0.054***	0.043**
				(0.017)	(0.019)	(0.020)
N	104737	104737	104737	88648	88648	88648
adj. R^2	0.365	0.365	0.373	0.368	0.360	0.368
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Seasonality FE	Yes	Yes	Yes	Yes	Yes	Yes
Aggregate Controls	Yes	Yes	—	—	Yes	—
Time FE	No	No	Yes	Yes	No	Yes
Time-Firm Clustering	Yes	Yes	Yes	Yes	Yes	Yes

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Robustness Check 6

Table: Heterogeneous Responses of Investment to Monetary Policy, controlling for financial constraints measures

i_{jt}	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta_t^m \times \left(mat_{j,t-1} - \mathbb{E}_j[mat_{j,t}]\right)$	-0.663***	-0.748***	-0.823***	-0.510**	-0.617***	-0.808***
	(0.184)	(0.201)	(0.199)	(0.218)	(0.184)	(0.229)
$\Delta_t^m \times \left(lev_{j,t-1} - \mathbb{E}_j[lev_{j,t}]\right)$	-0.319*					0.471
	(0.187)					(0.414)
$\Delta_t^m \times \left(dd_{j,t-1} - \mathbb{E}_j[dd_{j,t}]\right)$		0.082***				0.061**
		(0.028)				(0.026)
$\Delta_t^m \times \left(liq_{j,t-1} - \mathbb{E}_j[liq_{j,t}]\right)$			4.588***			2.935***
			(1.030)			(0.883)
$\Delta_t^m \times age_{j,t-1}$				-0.001**		-0.001**
				(0.000)		(0.000)
$\Delta_t^m \times size_{j,t-1}$					7.205*	7.972*
					(3.950)	(4.347)
N	104737	88648	104737	72892	104737	66700
adj. R^2	0.373	0.368	0.366	0.361	0.365	0.372
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Seasonality FE	Yes	Yes	Yes	Yes	Yes	Yes
time FE	Yes	Yes	Yes	Yes	Yes	Yes
Time-Firm Clustering	Yes	Yes	Yes	Yes	Yes	Yes

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Robustness Check 7

Table: Heterogeneous Responses of Investment to Monetary Policy, Controlling for lagged firm-level investment

i_{jt}	(1)	(2)	(3)	(4)	(5)	(6)
Δ_t^m	0.039	0.039	0.000	0.000	0.054	0.000
	(0.040)	(0.041)	(.)	(.)	(0.047)	(.)
$\Delta_t^m \times \left(mat_{j,t-1} - \mathbb{E}_j[mat_{j,t}]\right)$		-0.506**	-0.590**	-0.616***	-0.524**	-0.616***
		(0.206)	(0.224)	(0.209)	(0.202)	(0.209)
$\Delta_t^m \times \left(lev_{j,t-1} - \mathbb{E}_j[lev_{j,t}]\right)$			-0.126		-0.086	-0.033
			(0.229)		(0.319)	(0.326)
$\Delta_t^m \times \left(dd_{j,t-1} - \mathbb{E}_j[dd_{j,t}]\right)$				0.042**	0.032*	0.041*
				(0.020)	(0.019)	(0.023)
L.inv	0.259***	0.259***	0.256***	0.257***	0.260***	0.257***
	(0.010)	(0.010)	(0.017)	(0.011)	(0.011)	(0.011)
L2.inv	0.104***	0.104***	0.101***	0.103***	0.107***	0.103***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
L3.inv	0.035***	0.035***	0.032***	0.026***	0.029***	0.026***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
L4.inv	0.075***	0.075***	0.072***	0.070***	0.074***	0.070***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
N	83912	83912	83912	71867	71867	71867
adj. R^2	0.466	0.466	0.468	0.464	0.462	0.464
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Seasonality FE	Yes	Yes	Yes	Yes	Yes	Yes
Aggregate Controls	Yes	Yes	—	—	Yes	—
Time FE	No	No	Yes	Yes	No	Yes
Time-Firm Clustering	Yes	Yes	Yes	Yes	Yes	Yes

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