Sticky Discount Rates

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Sticky Discount Rates

Modern Macro

- Price rigidity crucial for monetary non-neutrality

This Paper: Distinct Rigidity, Distinct Implications

- Firms' discount rates (required returns) sticky w.r.t. expected inflation
- Inflation directly affects real discount rates and investment

New Macro Dynamics

- Independent source of monetary non-neutrality
- Demand shocks crowd in investment
- Low effect of interest rates on investment
- Consistent with stylized empirical patterns

Firm Investment and Textbook Neutrality

Firms' typical decision rule

- Invest in projects for which

$$\text{nominal expected return} > \delta,$$

  where δ = nominal discount rate (required return)

Textbook approach

- δ should be the project's cost of capital: $i = r + \pi$
  - r = real cost of capital (long-run interest rate)
  - π = expected inflation (long-run)
  - Assumed in standard models because it max. firm value

- Implies inflation neutrality of discount rates
  - $\Delta\delta^{\text{real}} = \Delta\delta - \Delta\pi = \Delta r$
  - Real investment depends on Δr and not $\Delta\pi$

Stickiness in Investment Decisions

Textbook approach

- $\Delta\delta^{\text{real}} = \Delta\delta - \Delta\pi = \Delta r$
    - $r =$ real cost of capital (long-run interest rate)
    - $\pi =$ expected inflation (long-run)

Sticky discount rate approach

- What if frictions prevent firms from constantly changing δ?
- In short run: $\Delta\delta \approx 0 \Rightarrow \Delta\delta^{\text{real}} \approx -\Delta\pi$, inflation not neutral
- Potential frictions (not focus):
    - Commitment device against managerial empire building (Jensen 1986)
    - Prevent internal power struggles (Rajan et al. 2000; Graham 2022)
    - Simplification since cost of capital hard to estimate (Fama and French 1997)
    - Inattention, but only w.r.t. discount rate (Reis 2006; Coibion and Gorodnichenko 2015)

Data from Corporate Conference Calls

Example Nasdaq 100 firm Intuit, Q1-2014:
We invest in opportunities that yield 15%-plus. Our weighted average cost of capital is about 9 or 9.5% ... Our IRR hurdle is a 15% rate of return.

Example S&P 500 firm Ball Corp, Q3-2015:
The discount rate has been 9% for a long time. In fact, our cost of capital is less than 6% now.

Data features

- based on repeated, high-stakes interactions
- calls cited in lawsuits (Rogers et al. 2011)
- firms with multiple discount rates cover 15% of total global Compustat assets
- predicted data: costofcapital.org
- firms representative, except larger

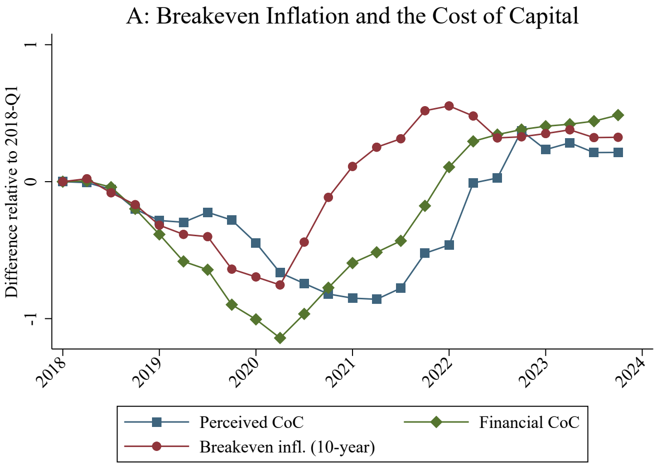
Cross-Firm Representativeness

	(1)	(2)	(3)	(4)
	Firm with obs. disc. rate		Firm with obs. perc. CoC	
Log assets	1.82***	1.82***	1.99***	1.99***
	(0.21)	(0.21)	(0.22)	(0.22)
Net investment rate	-0.0066		-0.052	
	(0.073)		(0.068)	
Asset growth		-0.073		-0.14
		(0.23)		(0.15)
Leverage	0.0021	0.0020	0.0042	0.0042
	(0.0032)	(0.0031)	(0.0055)	(0.0054)
Tobin's Q	-0.0094	-0.0093	-0.0027	-0.0027
	(0.016)	(0.016)	(0.025)	(0.026)
Return on equity	0.00043	0.00043	0.0015	0.0015
	(0.0020)	(0.0021)	(0.0029)	(0.0029)
Sales / assets	-0.00033	-0.00032	-0.00049	-0.00048
	(0.00062)	(0.00061)	(0.00076)	(0.00075)
Observations	38,216	38,216	38,216	38,216
Country FE	Yes	Yes	Yes	Yes
Within R^2	0.063	0.063	0.073	0.073

Within-Firm Representativeness

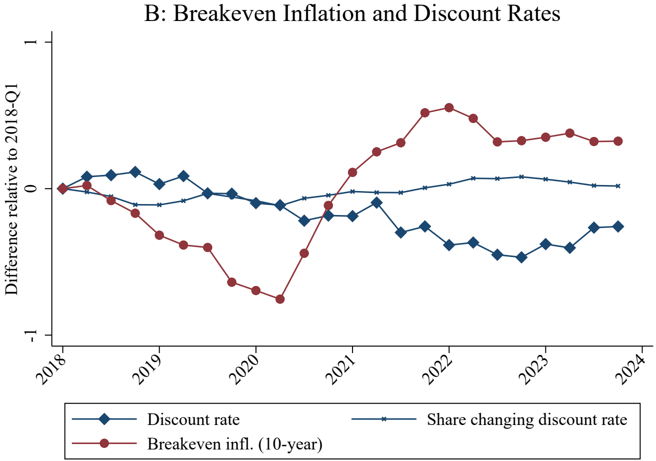
	(1)	(2)	(3)	(4)
	Discount rate observed		Perc. CoC observed	
Net investment rate	0.010		-0.023	
	(0.010)		(0.014)	
Asset growth		0.015		0.014
		(0.016)		(0.0095)
Leverage	9.7e-06	0.000012	0.000016	0.000021
	(0.000016)	(0.000018)	(0.000029)	(0.000032)
Tobin's Q	0.000047	0.000056	-0.00016	-0.00020
	(0.00037)	(0.00037)	(0.0011)	(0.0011)
Return on equity	0.000043	0.000040	-9.3e-06	-0.000015
	(0.000042)	(0.000040)	(0.000076)	(0.000076)
Sales / assets	-8.8e-06	-0.000012	-0.000014	-0.000020
	(8.9e-06)	(0.000013)	(0.000022)	(0.000026)
Observations	363,637	363,637	363,637	363,637
Country*Year FE and Firm FE	Yes	Yes	Yes	Yes
Within R^2	1.2e-06	1.7e-06	5.7e-06	1.3e-06

Illustrative Example: "Soaring 20s"



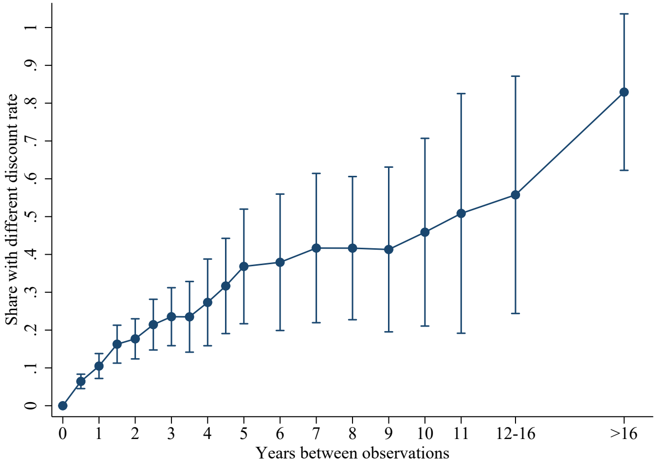
- Breakeven: fin. markets expect long-run inflation (also firms in Coibion-Gorodnichenko)
- Fin. CoC from fin. markets: firms' funding costs increase
- Perceived CoC from conference calls: firms report higher funding costs

Illustrative Example: “Soaring 20s”



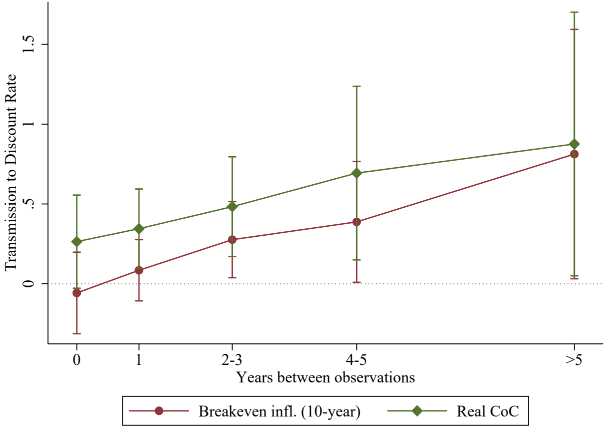
- Discount rates are sticky
- Little change in share of firms adjusting discount rate
- Soaring 20s represent only 18% of breakeven variation in 2002-2024 sample

Adjustment Frequency



- Analyze firms reporting multiple discount rates over time
- 15% adjust over 1.5 years, 40% over 5 years

Slow Incorporation



- Textbook: $\delta = r + \pi$, so coefficients are 1 throughout
- Analysis requires within-firm data, see paper, previous surveys inconclusive (Poterba and Summers 1995; Meier and Tarhan 2007; Sharpe and Suarez 2021; Graham 2022)

Slow Incorporation

	(1)	(2)
	Discount rate change	
Breakeven change	-0.046	0.28*
	(0.13)	(0.16)
Breakeven change * year diff. ≥ 1.5	0.44**	
	(0.22)	
Breakeven change * year diff.		0.12**
		(0.057)
Real CoC change	0.25	0.56**
	(0.18)	(0.24)
Real CoC change * year diff. ≥ 1.5	0.39*	
	(0.22)	
Real CoC change * year diff.		0.11*
		(0.058)
Observations	7,378	7,378
Controls	Yes	Yes
Within R^2	0.020	0.030

Controls: horizon, quarter, year-by-country-by-industry

Similar results excluding 2020–21

Discount Rate Dynamics Raise New Questions

1. **Secular distortions?**
   Discount rate wedges fluctuate and account for US "missing investment" puzzle
   (Gormsen and Huber 2024)

2. **Macro policy?**
   Conventional monetary policy weak, but demand shocks and exp. inflation powerful
   (**this paper**)

3. **Micro foundations?**
   Organizational, behavioral, or financing frictions
   (Barry et al. 2024; Best et al. 2024; Caramp et al. 2024; Jeenas 2024; Wroblewski 2024)

4. **Long run capital allocation?**
   Depends on perc. CoC, so want to understand its drivers
   (Gormsen and Huber 2025)

Large Changes in Breakeven and Real CoC

	(1)	(2)
	Discount rate change	
Breakeven change	0.012	-0.049
	(0.10)	(0.11)
Breakeven change * $\|change\| > 0.6$	-0.12	
	(0.12)	
Breakeven change * $\|change\| > 0.45$		-0.0021
		(0.13)
Real CoC change	0.064	0.043
	(0.14)	(0.16)
Real CoC change * $\|change\| > 0.6$	0.058	
	(0.17)	
Real CoC change * $\|change\| > 0.45$		0.091
		(0.17)
Observations	2,283	2,283
Controls	Yes	Yes
Within R^2	0.0040	0.0033

Slow incorporation even when breakeven inflation and the real cost of capital change by a lot

Sample includes only horizons below 1.5 years

Sticky Firms versus Flexible Firms

	(1)	(2)
	Discount rate change	
Breakeven change * sticky firm	0.043	-0.018
	(0.062)	(0.063)
Breakeven change * flexible firm	0.71**	0.57**
	(0.27)	(0.26)
Breakeven change * year diff. * sticky firm		0.0023
		(0.015)
Breakeven change * year diff. * flexible firm		0.18***
		(0.042)
Real CoC change * sticky firm	0.091	0.080
	(0.16)	(0.17)
Real CoC change * flexible firm	0.99***	0.89***
	(0.31)	(0.28)
Real CoC change * year diff. * sticky firm		0.055
		(0.054)
Real CoC change * year diff. * flexible firm		0.13*
		(0.067)

Sticky firms: discount rate changed for less than 1% of observations (roughly median)

Both firm types violate textbook approach

Price Forecasts

	(1)	(2)	(3)
	Expected price change		
Breakeven infl.	0.84***	0.84***	0.80***
	(0.23)	(0.22)	(0.26)
Breakeven infl. * input price		-0.019	
		(0.39)	
Breakeven infl. * sticky firm			0.21
			(0.64)
Observations	2,883	2,883	2,883
Base Controls	Yes	Yes	Yes
Full Controls	Yes	Yes	Yes
Within R^2	0.015	0.015	0.015

Measure expected price changes reported on conference calls for 71 goods (e.g., oil, gold, cheese blocks, corn), manually harmonize units

Price expectations less sticky, firms aware of breakeven inflation

Consistent with surveys (Meyer et al. 2021; Bunn et al. 2022; Coibion et al. 2020; Andrade et al. 2022; Baumann et al. 2024)

Real Investment of Sticky Firms Rises with Expected Inflation

	(1)	(2)	(3)
	Net investment rate		
Breakeven infl. * sticky firm	3.65*	3.32**	
	(1.87)	(1.62)	
Breakeven infl. * sticky firm			3.22**
* discount rate unchanged			(1.60)
Breakeven infl. * sticky firm			-1.83
* discount rate changed			(5.43)
Observations	8,251	8,251	8,251
Breakeven infl.	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	No	Yes	Yes
Firm controls	No	Yes	Yes
Country controls	No	Yes	Yes
Breakeven infl. * disc. rate changed	No	No	Yes
R^2	0.60	0.66	0.66

Firm controls: real CoC, Tobin's Q, log assets, industry

Country controls: sticky*GDP growth, sticky firm* change in unemployment rate, country-by-year

No sig. association when sticky firm adjusts discount rate

Consistent with Coibion et al. (2018)

Potential Drivers of Sticky Discount Rates

We focus on macro implications of stickiness (similar to NK literature)

Briefly, potential frictions (not our focus):

- Commitment device against managerial empire building (Jensen 1986)
- Prevent internal power struggles (Rajan et al. 2000; Graham 2022)
- Simplification since cost of capital hard to estimate (Fama and French 1997; Gabaix 2025)
- Inattention, but only w.r.t. discount rate (Reis 2006; Coibion and Gorodnichenko 2015)

In data, sticky firms have:

- multiple divisions (in Compustat Segments)
- more discussions about competition (Hassan et al. 2025)
- lower total assets

Model: cost of sticky discount rates $\approx 5\%$ of firm value

Firm Problem with Sticky Discount Rates

Two-step setup: (1) Choose δ. (2) Choose investment given δ.

(2) Textbook investment problem:

$$V_t^I(k,\delta_t) = \max_{k',I} \Omega_t(k) - P_t(I + \Phi(I,k)) + \frac{1}{1+\delta_t}\mathbb{E}_t V_{t+1}^I(k',\delta_t)$$
$$\text{s.t.} \quad k' = (1-\xi)k + I$$

Solution: investment policy $I_t(k,\delta_t)$

Choice of Optimal Discount Rate

(1) Random fraction $1-\theta$ can adjust δ_t

Adjusters max. fin. market value:

$$V_t^a(k) = \max_{\delta_t} \Omega_t(k) - P_t(I + \Phi(I,k)) + \frac{1}{1+i_t}\mathbb{E}_t\left[\theta V_{t+1}^n(k',\delta_t) + (1-\theta)V_{t+1}^a(k')\right]$$

$$\text{s.t.} \quad k' = (1-\xi)k + I,$$

$$I = I_t(k,\delta_t)$$

First-order solution:

$$\delta_t = \theta\hat{\delta}_{t-1} + (1-\theta)\hat{\delta}_t^*$$

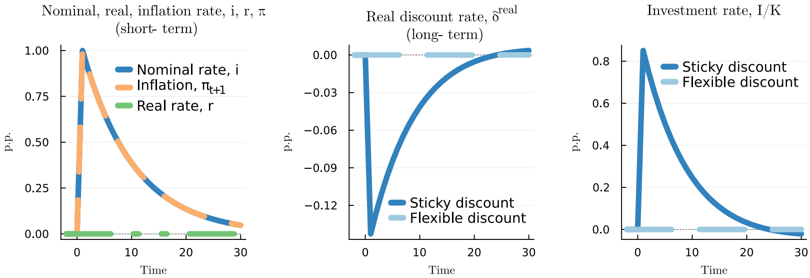
$$\hat{\delta}_t^* = \frac{1+r-\theta}{1+r}\widehat{coc}_t + \frac{\theta}{1+r}\hat{\delta}_{t+1}^*$$

$\theta = 0 \Rightarrow \hat{\delta}_t = \widehat{coc}_t \Rightarrow$ textbook solution

$\theta \neq 0 \Rightarrow \hat{\delta}_t \neq \widehat{coc}_t \Rightarrow$ investment differs from textbook

$\theta = 0.99$ for sticky and $\theta = 0.8$ for flexible firms

Key Mechanism 1: Expected Inflation and Investment



Recall:

$$i = r + \pi$$

$$\delta^{real} = \delta - \pi$$

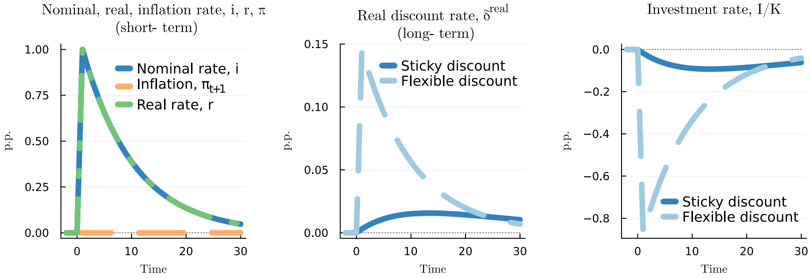
Shock only π (partial equilibrium)

Flexible: $\pi \uparrow \Rightarrow i \uparrow \Rightarrow \delta \uparrow \Rightarrow \delta^{real} \not\Delta$

Sticky: $\pi \uparrow \Rightarrow i \uparrow \Rightarrow \delta \not\Delta \Rightarrow \delta^{real} \downarrow$

Consistent with time series (e.g., Mumtaz and Theodoridis 2017)

Key Mechanism 2: Interest Rate Sensitivity



Recall: $$i = r + \pi$$

Shock only r (partial equilibrium)

Flexible: $r \uparrow \Rightarrow i \uparrow \Rightarrow \delta \uparrow \Rightarrow \delta^{\text{real}} \uparrow$

Sticky: $\pi \uparrow \Rightarrow i \uparrow \Rightarrow \delta \nearrow \Rightarrow \delta^{\text{real}} \nearrow$

Helps resolve the puzzle of why investment sensitivity is often too high (e.g., Koby and Wolf 2020)

General Equilibrium Model

Mechanisms matter in many GE environments

- with fully flexible prices or sticky wages/prices
- with and without constrained households
- with and without government

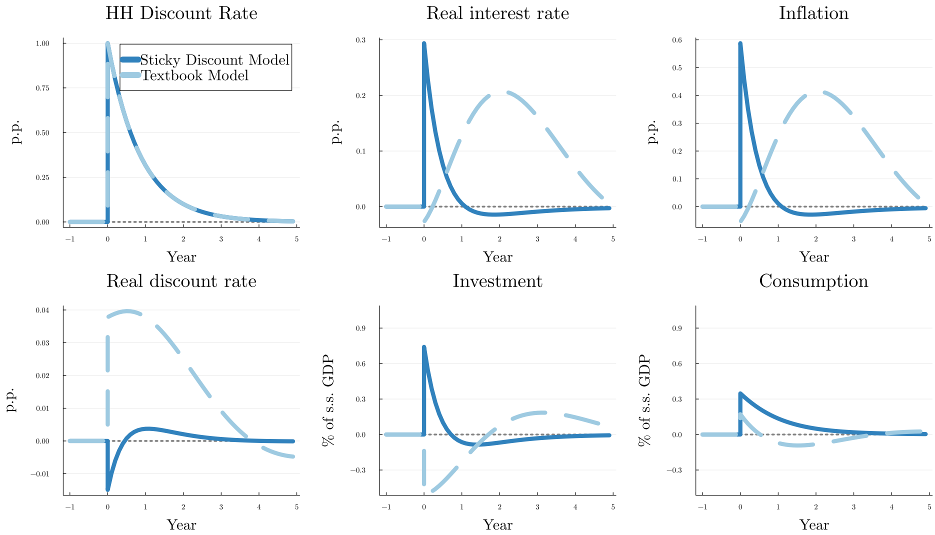
Here: standard NK model

- Sticky prices (0.75, Nakamura and Steinsson 2008) and Ricardian households
- Taylor rule with shocks and inflation target: $\hat{i}_t = \pi_t^\infty + \phi_\pi(\hat{\pi}_t - \pi_t^\infty) + \varepsilon_t^m$

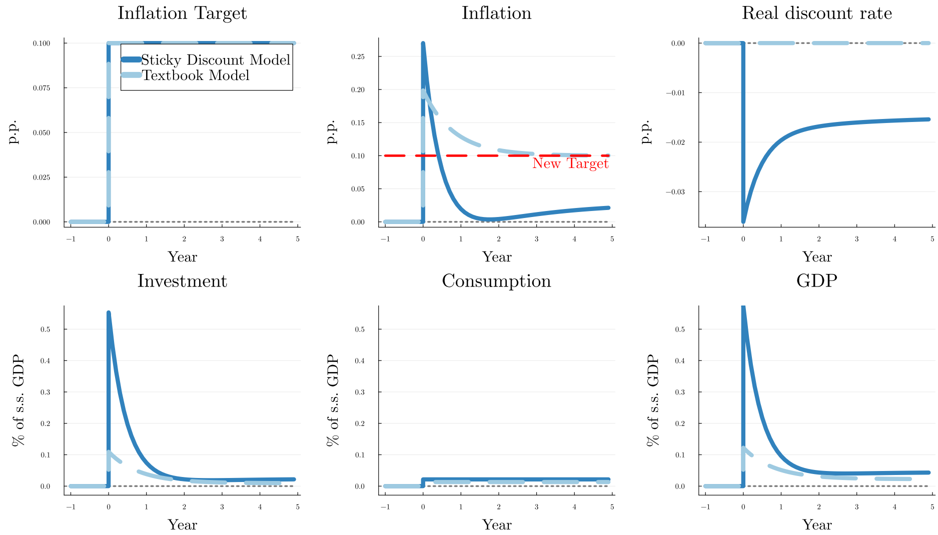
Findings

1. Household demand $\uparrow \Rightarrow$ consumption and investment $\uparrow \Rightarrow$ addresses "comovement puzzle" (Barro and King 1984)
2. Monetary non-neutrality (even with flex. prices): inflation target $\uparrow \Rightarrow$ investment $\uparrow$
3. Policy rate shock $\Rightarrow$ investment $\nearrow$ (less than textbook)

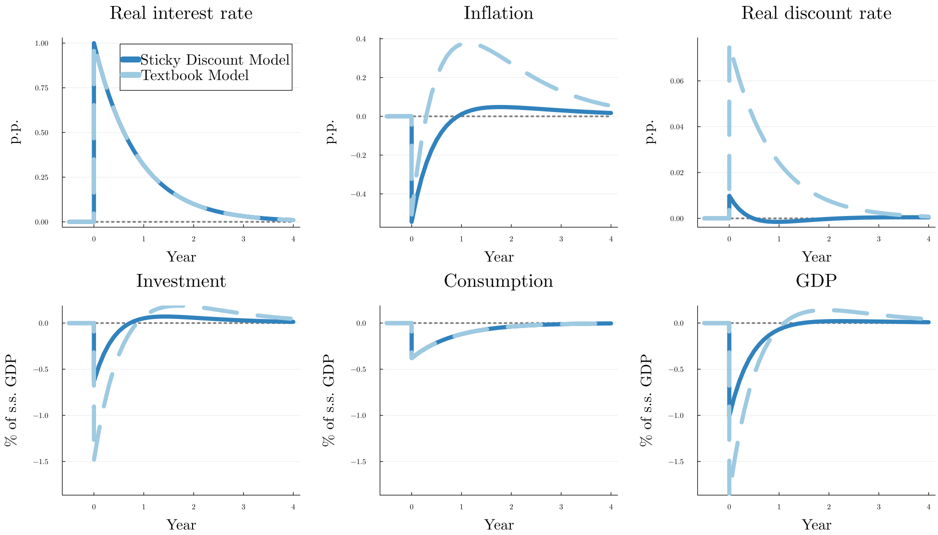
Demand Shocks Generate Comovement



Long-Run Inflation Target Raises Investment



Monetary Policy Shocks Less Powerful



Ramsey Optimal Policy Problem

Textbook solution: stable inflation, “divine coincidence”

With sticky discount rates, credible central bank:
- changes long-run inflation target after temporary shocks
- effective way of closing discount rate wedges
- short-run rate not sufficient, generates wedges and misallocation

Policy implications:
- not high-frequency changes to long-run target
- new mechanism linking inflation expectations to investment
- relevant for debates about whether the central bank should explicitly allow inflation to deviate from its target after shocks

Summary

Evidence

1. Discount rates are sticky w.r.t. inflation in short run
2. Sticky versus flexible firm
3. Direct link from expected inflation to real investment

Implications consistent with stylized patterns

1. Changes in expected inflation stimulate investment
2. Monetary non-neutrality (even with flexible prices)
3. Demand shocks crowd in investment
4. Changes in exp. inflation and inflation targets may be effective policy tools

References

Andrade, Philippe, Olivier Coibion, Erwan Gautier, and Yuriy Gorodnichenko, "No Firm is an Island? How Industry Conditions Shape Firms' Expectations," *Journal of Monetary Economics*, 2022, *125*, 40–56.

Barro, Robert J. and Robert G. King, "Time-Separable Preferences and Intertemporal-Substitution Models of Business Cycles," *Quarterly Journal of Economics*, 1984, *99* (4), 817–839.

Barry, John W., Bruce I. Carlin, Alan D. Crane, and John Graham, "Project development with delegated bargaining: The role of elevated hurdle rates," 2024.

Baumann, Ursel, Annalisa Ferrando, Dimitris Georgarakos, Yuriy Gorodnichenko, and Timo Reinelt, "SAFE to Update Inflation Expectations? New Survey Evidence on Euro Area Firms," 2024.

Best, Lea, Benjamin Born, and Manuel Menkhoff, "The impact of interest: Firms' investment sensitivity to interest rates," 2024.

Bunn, Philip, Lena S. Anayi, Nicholas Bloom, Paul Mizen, Gregory Thwaites, and Ivan Yotzov, "Firming up Price Inflation," 2022.

Caramp, Nicolas, Julian Kozlowski, and Keisuke Teeple, "Liquidity and Investment in General Equilibrium," 2024.

Coibion, Olivier and Yuriy Gorodnichenko, "Information Rigidity and the Expectations Formation Process: A Simple Framework and New Facts," *American Economic Review*, 2015, *105* (8), 2644–2678.

___ , ___ , and Saten Kumar, "How Do Firms Form Their Expectations? New Survey Evidence," *American Economic Review*, 2018, *108* (9), 2671–2713.

___ , ___ , and Tiziano Ropele, "Inflation Expectations and Firm Decisions: New Causal Evidence," *Quarterly Journal of Economics*, 2020, *135* (1), 165–219.

Fama, Eugene F. and Kenneth R. French, "Industry Costs of Equity," *Journal of Financial Economics*, 1997, *43* (2), 153–193.

Gabaix, Xavier, "A Theory of Complexity Aversion," 2025.

Gormsen, Niels J. and Kilian Huber, "Corporate Discount Rates," 2024.

___ and ___ , "Firms' Perceived Cost of Capital," 2025.

Graham, John R., "Presidential Address: Corporate Finance and Reality," *Journal of Finance*, 2022, *77* (4), 1975–2049.

Hassan, Tarek Alexander, Stephan Hollander, Aakash Kalyani, Laurence van Lent, Markus Schwedeler, and Ahmed Tahoun, "Economic Surveillance using Corporate Text," *Journal of Economic Perspectives*, 2025.

Jeenas, Priit, *Firm balance sheet liquidity, monetary policy shocks, and investment dynamics* 2024.

Jensen, Michael C., "Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers," *American Economic Review*, 1986, *76* (2), 323–329.

Koby, Yann and Christian Wolf, "Aggregation in Heterogeneous-Firm Models: Theory and Measurement," 2020.

Meier, Iwan and Vefa Tarhan, "Corporate Investment Decision Practices and the Hurdle Rate Premium Puzzle," 2007.

Meyer, Brent, Nicholas Parker, and Xuguang Sheng, "Unit Cost Expectations and Uncertainty: Firms' Perspectives on Inflation," 2021. FRB Atlanta Paper 2021-12a.

Mumtaz, Haroon and Konstantinos Theodoridis, "The Federal Reserve's Implicit Inflation Target and Macroeconomic Dynamics: A SVAR analysis," *International Economic Review*, 2017, *64* (4), 1749–1775.

Nakamura, Emi and Jón Steinsson, "Five Facts about Prices: A Reevaluation of Menu Cost Models," *Quarterly Journal of Economics*, 2008, *123* (4), 1415–1464.

Poterba, James M. and Lawrence H. Summers, "A CEO Survey of US Companies' Time Horizons and Hurdle Rates," *MIT Sloan Management Review*, 1995, *37* (1), 43.

Rajan, Raghuram, Henri Servaes, and Luigi Zingales, "The Cost of Diversity: The Diversification Discount and Inefficient Investment," *Journal of Finance*, 2000, *55* (1), 35–80.

Reis, Ricardo, "Inattentive Producers," *Review of Economic Studies*, 2006, *73* (3), 793–821.

Rogers, Jonathan L., Andrew Van Buskirk, and Sarah L.C. Zechman, "Disclosure Tone and Shareholder Litigation," *The Accounting Review*, 2011, *86* (6), 2155–2183.

Sharpe, Steven A. and Gustavo A. Suarez, "Why Isn't Business Investment More Sensitive to Interest Rates? Evidence from Surveys," *Management Science*, 2021, *67* (2), 720–741.

Wroblewski, Caleb, "The Interest Rate Elasticity of Investment: Micro Estimates and Macro Implications," 2024.