Sticky Discount Rates

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Overview

Textbook models

- Investment depends only on real costs and opportunities

New mechanism

- Expected inflation on its own directly raises investment
- Because firms use nominally sticky discount rates
- Consistent with micro and macro data, unlike textbook

Implications for long-standing questions

- Demand shocks raise investment (comovement puzzle)
- Independent source of monetary non-neutrality
- Interest rates less powerful

Investment Decisions

Typical decision rule

- Firms invest in projects for which

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

where δ = nominal discount rate (required return, "hurdle")

Investment Decisions in Practice

Input form		Y0	Y1	Y2	Y3	Y4	[...]
Year							
Units			50,000	50,000	50,000	47,500	[...]
Avg. unit price			550	567	583	601	[...]
Sales			27,500,000	28,325,000	29,174,750	28,547,493	[...]
[...]							
Avg. unit cost			510	525	541	557	[...]
Cost			25,500,000	26,265,000	27,052,950	26,471,312	[...]
EBITDA			2,000,000	2,060,000	2,121,800	2,076,181	[...]
Depreciation			300,000	300,000	300,000	300,000	[...]
EBIT			1,700,000	1,760,000	1,821,800	1,776,181	[...]
Taxes			340,000	352,000	364,360	355,236	[...]
Net operating income after taxes			1,360,000	1,408,000	1,457,440	1,420,945	[...]
[...]							
Capex		6,000,000					
Working capital			550,000	566,500	583,495	570,950	[...]
Change in working capital			550,000	16,500	16,995	-12,545	[...]

Entered by project or division managers

NPV						
FCF	-6,000,000	1,110,000	1,691,500	1,740,445	1,733,490	[...]
Discount rate	14%					
IRR > discount rate	YES					
NPV	POSITIVE					

Set by chief executives

Firm Investment and Textbook Neutrality

Typical decision rule

- Firms invest in projects for which
$$\text{nominal expected return} > \delta,$$
where δ = nominal discount rate (required return, "hurdle")

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
  - $\Delta\delta^{\text{real}} = \Delta\delta - \Delta\pi = \Delta r$
  - Real investment depends on Δr and not $\Delta\pi$

Stickiness in Investment Decisions

Textbook approach

- $\Delta\delta^{\text{real}} = \Delta\delta - \Delta\pi = \Delta r$

Sticky discount rate approach

- What if executives do not constantly change δ?
- In short run: $\Delta\delta \approx 0 \Rightarrow \Delta\delta^{\text{real}} \approx -\Delta\pi$, inflation not neutral
- Potential frictions (not focus):
  - Discipline divisions (Rajan et al. 2000; Graham 2022)
  - Prevent managerial empire building (Jensen 1986)
  - Simplification since cost of capital hard to estimate (Fama and French 1997)

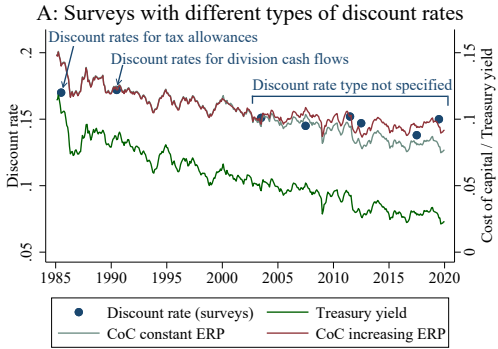
Little Evidence

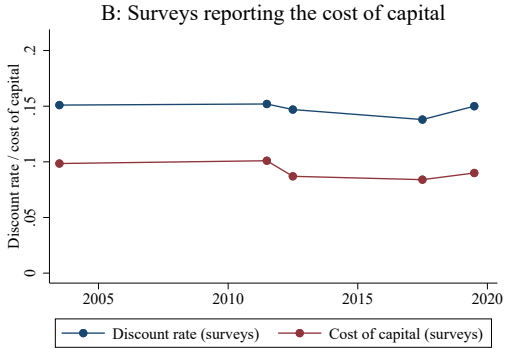
Seminal surveys suggest firms deviate from textbook (Poterba and Summers 1995; Graham and Harvey 2001; Meier and Tarhan 2007) and internal rules change slowly (Rognlie 2019; Sharpe and Suarez 2021; Graham 2022)

But no tests so far for:

1. stickiness of δ w.r.t. to i, π, r
2. real effects of δ

Previous Surveys: Averages Not Comparable





Survey averages not comparable over time because

1. they record different types of discount rates
2. sample composition varies

Hence, no conclusions from surveys on stickiness w.r.t. i, π, r

New Data from Corporate Conference Calls

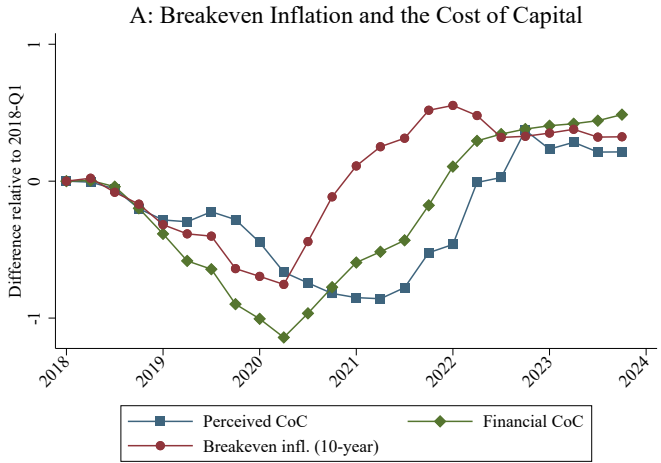
Example Nasdaq 100 firm Intuit, Q1-2014:
We invest in opportunities that yield 15%-plus. Our weighted average cost of capital is about 9 or 9.5% ... Our IRR hurdle is a 15% rate of return.

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 collection

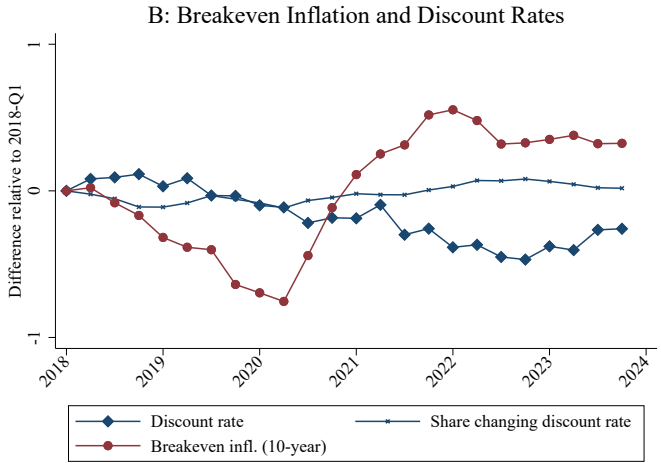
- manually collect data on within-firm changes
- sample of 1,600 listed firms
- representative, except size: 40 of 100 largest US firms
- firms with multiple discount rates cover 15% of total global Compustat assets
- calls are repeated high-stakes interactions, cited in lawsuits (Rogers et al. 2011)
- verification: discount rates predict investment
- costofcapital.org

Example: “Soaring 20s”



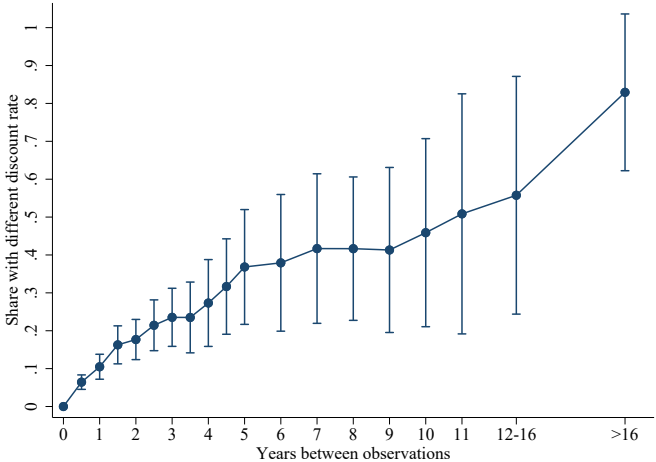
- Breakeven: fin. markets expect long-run inflation (Bocola et al. 2025)
- Fin. CoC from fin. markets: firms’ funding costs increase
- Perceived CoC from conference calls: firms report higher funding costs

Example: “Soaring 20s”



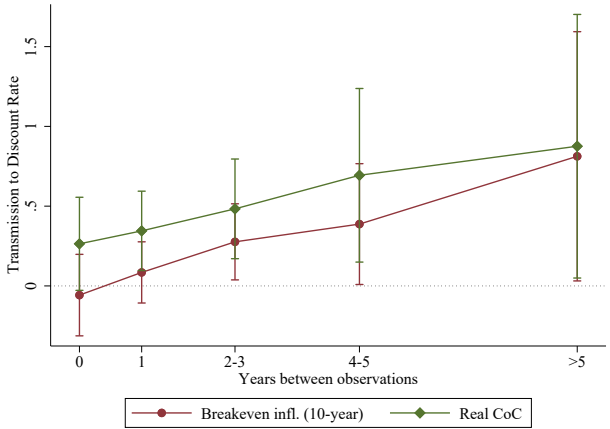
- Discount rates are sticky
- Little change in share of firms adjusting discount rate
- Soaring 20s represent only 18% of breakeven variation in 2002-2024 sample

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 all coefficients should be 1

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. **Business cycle policy**
   Conventional monetary policy weak, but demand shocks and exp. inflation powerful
   (**this paper**)

2. **Secular distortions**
   Discount rate wedges account for US "missing investment" 2000-2019
   (Gormsen and Huber 2025a)

3. **Long run TFP**
   Depends on perc. CoC, so want to understand its drivers
   (Gormsen and Huber 2025b)

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

Large Changes in Breakeven and Real CoC

	(1)	(2)
	Discount rate change	
Breakeven change	0.012	-0.049
	(0.10)	(0.11)
Breakeven change * $\|\text{change}\| > 0.6$	-0.12	
	(0.12)	
Breakeven change * $\|\text{change}\| > 0.45$		-0.0021
		(0.13)
Real CoC change	0.064	0.043
	(0.14)	(0.16)
Real CoC change * $\|\text{change}\| > 0.6$	0.058	
	(0.17)	
Real CoC change * $\|\text{change}\| > 0.45$		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 (top 10% and 20%)

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)

Split firms roughly at median of stickiness

1% of sticky firms adjust discount rate over horizons below two quarters

20% of flexible firms adjust

Both firm types violate textbook approach

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 * discount rate unchanged			3.22**
			(1.60)
Breakeven infl. * sticky firm * discount rate changed			-1.83
			(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

Key evidence

Sticky discount rates matter

No sig. association when sticky firm adjusts discount rate

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

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

Consistent with Coibion et al. (2018)

Price Forecasts Less Sticky

	(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

Inputs and outputs

Price expectations less sticky

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

Briefly: Organizational Drivers Within Firms

Cost of sticky discount rates $\approx 5\%$ of firm value in our model

Modest effects on firms, but large effects for macro (Mankiw 1985)

Stickiness may be a "lesser evil" management tool:

- Discipline divisions (Rajan et al. 2000; Graham 2022)
- Prevent managerial empire building (Jensen 1986)
- Simplification since cost of capital hard to estimate (Fama and French 1997)

In data, sticky firms have:

- multiple divisions (in Compustat Segments)
- fewer mentions of competition (Hassan et al. 2025)
- lower total assets

Implications

Sticky discount rates change our understanding of investment and business cycles

New inflation-investment mechanism

- Textbook: $\Delta\delta = \Delta r + \Delta\pi \quad \Rightarrow \quad \Delta\delta^{\text{real}} = \Delta\delta - \Delta = \Delta r$
- Reality: $\Delta\delta \approx 0 \quad \Rightarrow \quad \Delta\delta^{\text{real}} = \Delta\delta - \Delta \approx -\Delta\pi$

Model using Calvo friction, consistent with: (1) low adjustment rate even after large shocks and (2) mass of small changes (Alvarez et al. 2016; Cavallo et al. 2024; Auclert et al. 2024)

A first step: point is not Calvo, but the new mechanism

Similar spirit to NK literature

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:

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

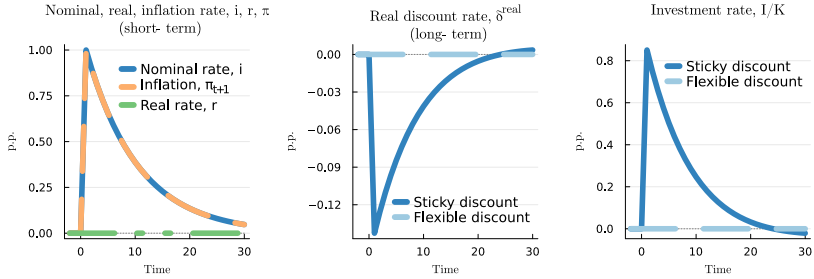
$$\hat{\delta}_t^* = \frac{1+r-\theta}{1+r}\widehat{coc}_t + \frac{\theta}{1+r}\hat{\delta}_{t+1}^*$$

$\theta = 0 \Rightarrow \hat{\delta}_t = \widehat{coc}_t \Rightarrow$ 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: $i = r + \pi$

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

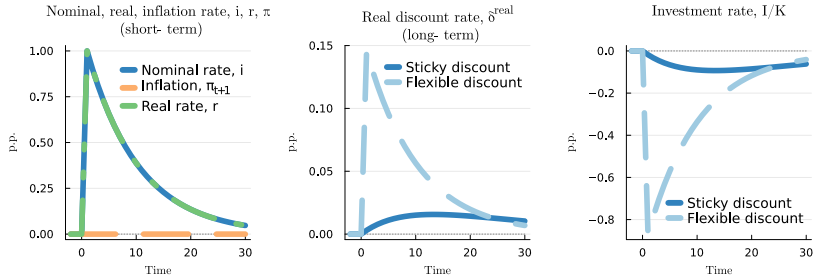
Shock only π (partial equilibrium)

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

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

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

Mon. policy operates not only through interest rate (e.g., as in Winberry 2021; Auclert et al. 2025)

General Equilibrium Model

Mechanisms matter in GE

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

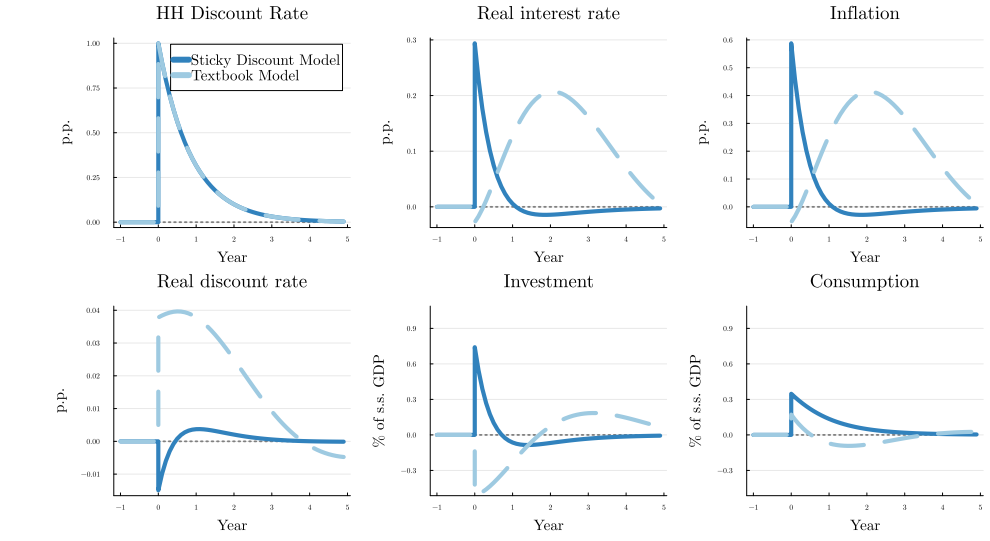
Here: standard NK model

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

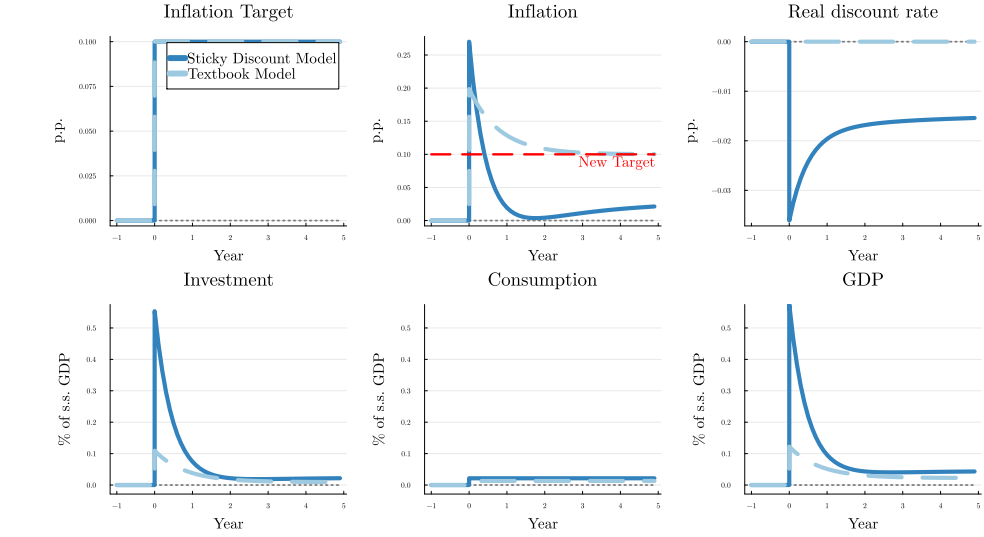
Findings

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

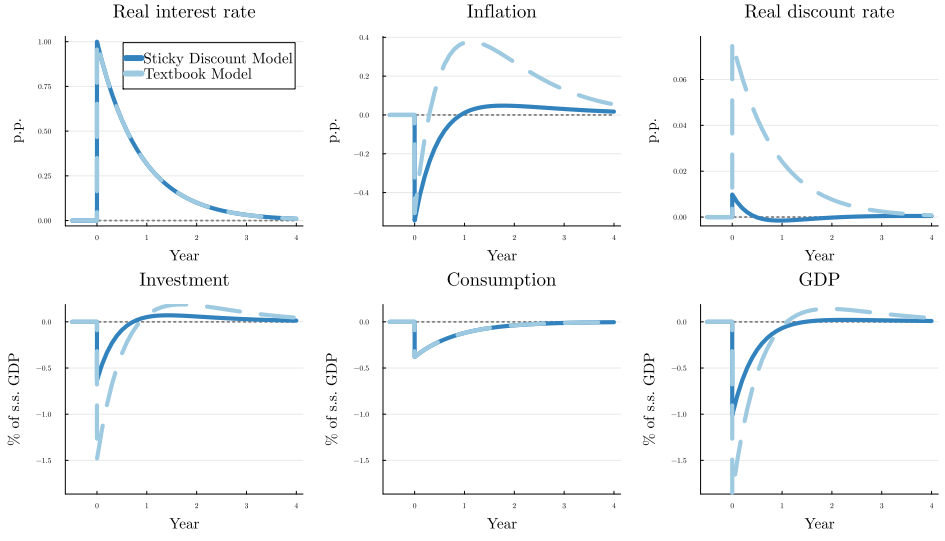
Demand Shocks Generate Comovement



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. Price expectations are less sticky
3. Direct link from expected inflation to real investment

Implications consistent with facts

1. Changes in expected inflation stimulate investment
2. Monetary non-neutrality (even with flexible prices)
3. Demand shocks crowd in investment

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