Monetary Policy, Inflation, and Crises: Evidence from History and Administrative Data

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Motivation

- 2022-2024: rising monetary policy rates, inflation high
- Policymakers are balancing risks of inflation vs recession
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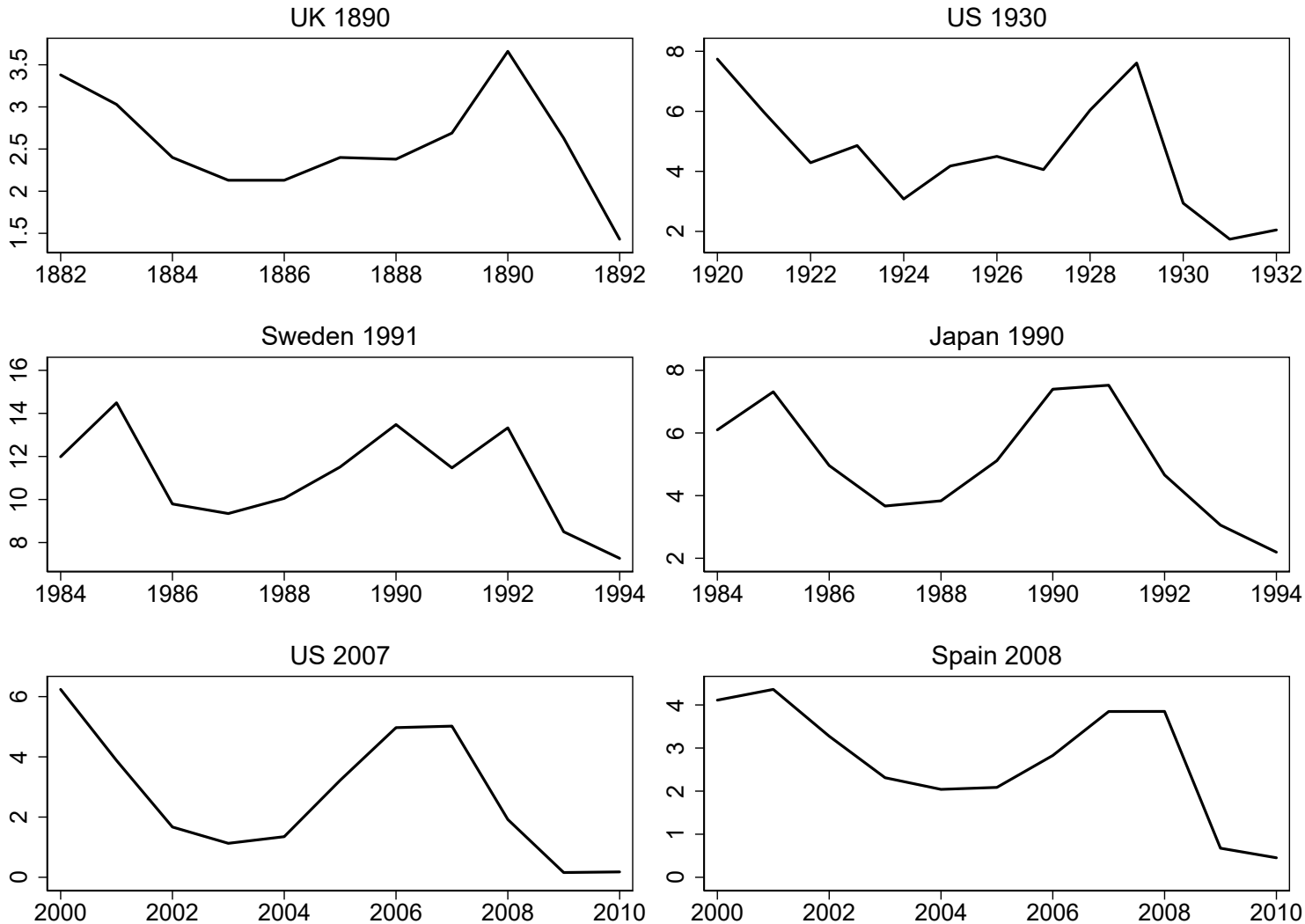
- We **know little** about the **effects of the path of monetary policy on banking crises**

Case studies of important banking crises



y axis: nominal monetary policy rate

top: year of the start of the crisis in different countries/ periods

This paper

- **Monetary policy (MP) rate dynamics on banking crises**
  - What is the full path of the MP rate before a crisis?
  - Does raising monetary rates in an environment like today (U-shaped path) increase crisis risk?
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  - What are the underlying mechanisms?
- **Data: two-pronged approach**
  - A panel of historical crises to establish the results & mechanisms: 17 countries, 1870–2016, 80 crises, hundreds of non-crisis (even deep) recessions
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- **MP rate**: short-term rate (raw or relative to GDP and inflation dynamics); international finance trilemma IV

Findings

1. **U-shape monetary policy (MP) rates raise banking crisis risk**
   - Larger effects for a deeper U (over systematic part)
   - **Different for non-crisis (even deep) recessions**
   - Crises are preceded by U-MP (not just selected crises)

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   - **Both MP U and Red-zone are necessary for crisis risk**. Red zones without U-MP do not imply strong crisis risk

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   - **Bust in bank performance** after U-MP driven by **credit risk** (not by interest rate risk & deposit withdrawals)
   - **Credit register**: Consistent results, stronger identification

Contribution to the literature

1. Monetary policy & financial stability
   - MP rate **cuts** $\rightarrow$ higher credit/risk taking/asset prices Rajan, 2006; Adrian and Shin, 2010; Maddaloni and Peydro, 2011; Jiménez et al., 2014; Becker and Ivashina, 2015; Grimm et al., 2023
   - MP rate **hikes** $\rightarrow$ crises (Schularick et al., 2021)
   - **We show that the full MP rate path matters**: (strong) cuts for long followed by raises imply financial instability
     - Consistent with models with loose MP & subsequent tightening (Boissay, Collard, Galí, and Manea, 2023)

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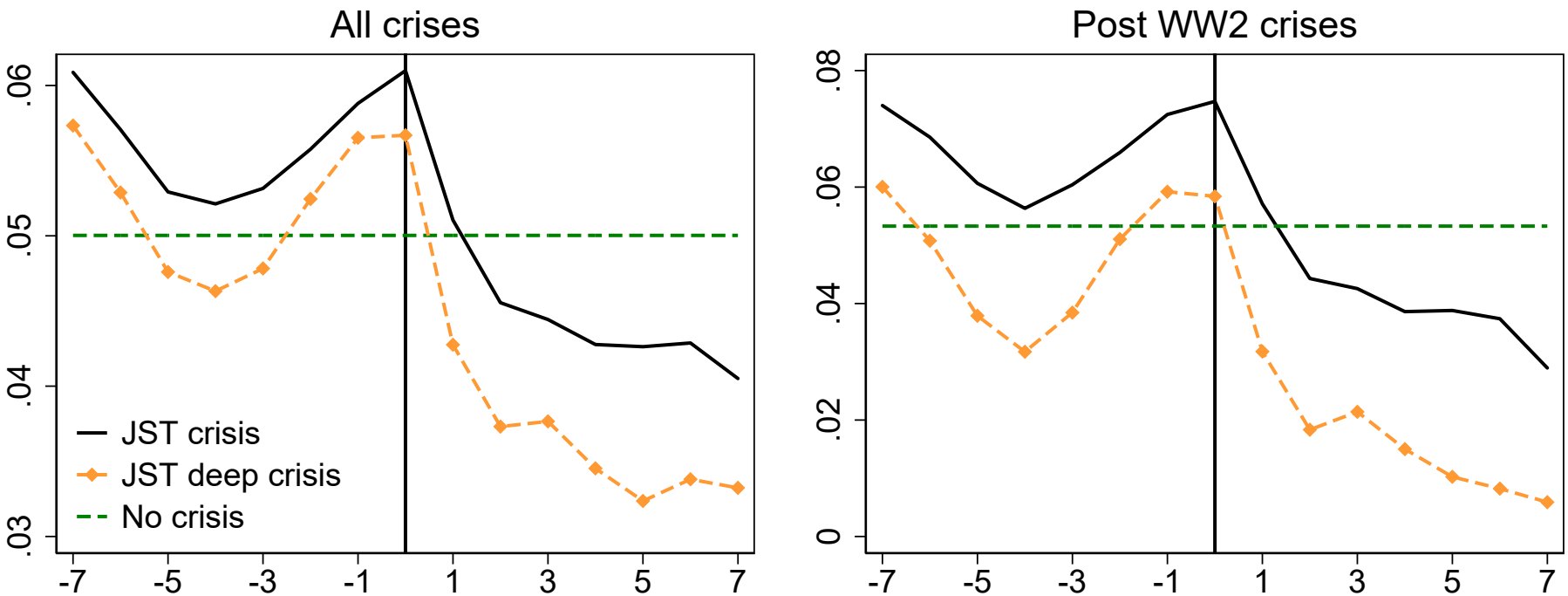
2. Financial crises & credit and asset prices booms
   - Credit and asset price booms → financial crises (Schularick and Taylor, 2012; Mian et al., 2017; Greenwood et al., 2022)
   - **We show that credit & asset prices booms (red zones) without U-MP do not imply strong banking crisis risk**
   - **Mechanisms:** credit supply (also risk-taking & mispricing); then strong credit & asset price declines + banking stress

The path of monetary policy rates and crisis risk

Data

- 17 advanced economies (13 European countries, USA, Canada, Australia, Japan), 1870–2016 (Jordà et al., 2016a)
- Narrative crisis definition (Schularick and Taylor, 2012) (bank runs / defaults / forced mergers)
  - Robust to Baron et al. (2021) chronology: narrative + sharp declines in bank stock returns
- Monetary policy rate: short-term interest rate (central bank / interbank / t-bill rate)

Monetary policy rates around crises

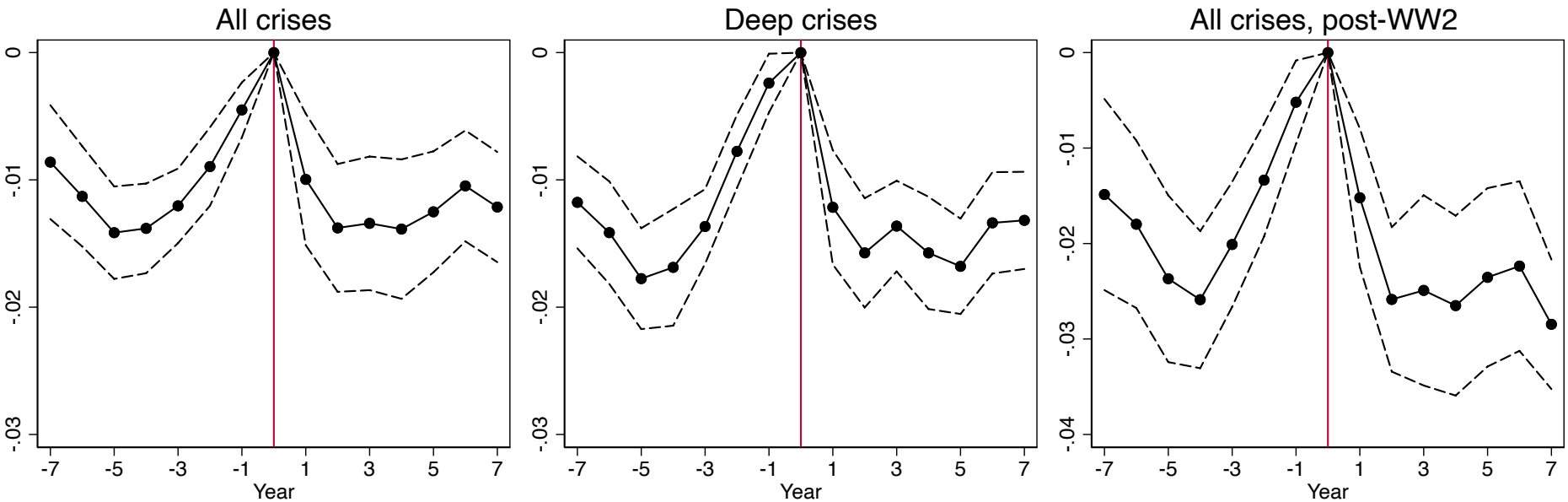


Crisis definitions. JST: Jordà et al. (2016a); JST deep: JST & low GDP growth

▸ Inflation & real rates

Crisis window regressions: monetary policy rates

$$r_{i,t+h} - r_{i,t} = \alpha_{i,h} + \alpha_{d,h} + \beta_h \mathbb{1}_{\text{Crisis}_{i,t}=1} + \epsilon_{i,t+h} \quad h \in \{-7, ..., 7\}.$$



▸ Residual rates ▸ Recessions and long-term rates

Frequency of MP paths before crises & recessions

- Sort data in 2×2 groups by time window (t – 8 to t – 3 & t – 3 to t) and monetary rate change (cut vs raise)
- 55% of crises are preceded by a U in full sample; 71% post WW2
- By contrast, only $\approx 30\%$ of recessions preceded by U ▸ Graphs

	(1) All	(2) Deep	(3) Post-WW2	(4) Post-WW2 deep	(5) Unconditional
	Panel A: Banking crises				
U shape (cut, raise)	0.55***	0.63***	0.71***	1.00***	0.27
Raise, raise	0.19	0.16	0.12	0.00	0.24
Raise, cut	0.16	0.11	0.08	0.00	0.26
Cut, cut	0.10	0.11	0.08	0.00	0.23
	Panel B: Non-financial recessions				
U shape (cut, raise)	0.34**	0.30	0.31	0.31	0.27
Raise, raise	0.21	0.21	0.29	0.46**	0.24
Raise, cut	0.25	0.21	0.26	0.15	0.26
Cut, cut	0.20	0.28*	0.14	0.08	0.23

*: higher frequency than non-crisis obs

Frequency of crises after different MP rate paths

- Sort data in 2×2 groups by time window ($t-8$ to $t-3$ & $t-3$ to t) and monetary rate change (cut vs raise)
- Compute crisis during 3 years after each shape (t to $t+2$)
- Crises are more than twice as frequent after the U shape

	(1)	(2)	(3)	(4)
	Crisis	Deep crisis	Post-WW2 crisis	Post-WW2 deep crisis
U shape (cut, raise)	0.18***	0.11***	0.16***	0.13***
Raise, raise	0.09	0.04	0.04	0.01
Raise, cut	0.06	0.02	0.02	0.00
Cut, cut	0.06	0.03	0.03	0.00
Unconditional	0.10	0.05	0.06	0.03

▸ With numbers of crises ▸ 1-year crisis window ▸ Symmetric U

Frequency of recessions after different MP rate paths

- Recession: non-financial business cycle peak in the 3-year window after the policy shape (t to t + 2)

	(1)	(2)	(3)	(4)
	Non-crisis recession	Deep non-crisis recession	Post-WW2 non-crisis recession	Post-WW2 deep non-crisis recession
U shape (cut, raise)	0.39*	0.16	0.28	0.04
Raise, raise	0.32	0.14	0.26	0.05
Raise, cut	0.30	0.11	0.20	0.02
Cut, cut	0.28	0.15	0.14	0.02

Trilemma instrument

- Countries with fixed exchange rate and open capital accounts are forced to track base country interest rates (Mundell, 1963)
- Use base country interest rate changes to look at exogenous policy responses (Jordà et al., 2020, see also Maddaloni and Peydro, 2011; Jiménez et al., 2012, 2014)

$$\text{Trilemma IV} = \Delta \text{Rate}^{\text{Residual}}_{b(i),t} * \text{PEG}_{i,t} * \text{PEG}_{i,t-1} * \text{KOPEN}_{i,t}.$$

- $\text{Rate}^{\text{Residual}}_{b(i),t}$: change in the base country residual rate
  - Controls: inflation, GDP, consumption, investment, current account, short-term rates, long-term rates

U-shaped monetary policy rates and crises

$$\text{Crisis}_{i,t \text{ to } t+2} = \alpha_i + \beta_1 \Delta_3 \text{Rate}_{i,t} + \beta_2 \text{Cut}_{i,t-8,t-3} + \beta_3 \Delta_3 \text{Rate}_{i,t} \times \text{Cut}_{i,t-8,t-3} + \gamma X_{i,t} + u_{i,t}$$

	Dependent variable: $\text{Crisis}_{t \text{ to } t+2}$							
	Full sample				Post-WW2			
	OLS		IV		OLS		IV	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta_3 \text{Rate}_t$	0.02**	0.01	0.03	0.01	0.01	0.01	0.03	0.01
	(0.01)	(0.00)	(0.02)	(0.01)	(0.01)	(0.01)	(0.03)	(0.02)
$\text{Cut Rate}_{t-8,t-3}$		0.05		0.04		0.04		0.01
		(0.03)		(0.03)		(0.03)		(0.03)
$\Delta_3 \text{Rate}_t \times \text{Cut Rate}_{t-8,t-3}$		0.03**		0.07**		0.02**		0.08***
		(0.01)		(0.03)		(0.01)		(0.03)
Country fixed effects	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓
Kleibergen-Paap Weak ID			45.41	26.57			54.27	24.34
Observations	1626	1626	1626	1626	951	951	951	951

$X_{i,t}$ contemporaneous + 8 lags ΔGDP & inflation (country & global), 8 lags crisis dummy. Driscoll-Kraay s.e., 5 lags.

▸ Economic effects ▸ Alt. specifications ▸ Subsamples ▸ BVX crises ▸ Probit ▸ Long horizons ▸ Vary cut length ▸ Real rates ▸ r-r* control

No U-shape effects for (deep) non-crisis recessions

	Normal recession$_{t \text{ to } t+2}$				Deep recession$_{t \text{ to } t+2}$	
	OLS		IV		OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)
Δ_3Rate$_t$	0.03***	0.02***	0.06**	0.06**	0.01***	0.03*
	(0.01)	(0.01)	(0.03)	(0.03)	(0.00)	(0.02)
Cut Rate$_{t-8,t-3}$		-0.05		-0.08**	-0.03	-0.05*
		(0.04)		(0.04)	(0.02)	(0.03)
Δ_3Rate$_t$ $\times$ Cut Rate$_{t-8,t-3}$		0.01		-0.00	-0.00	-0.01
		(0.01)		(0.04)	(0.01)	(0.02)
Country fixed effects	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
Kleibergen-Paap Weak ID			58.49	31.24		31.24
Observations	1626	1626	1626	1626	1626	1626

$X_{i,t}$ contemporaneous + 8 lags ΔGDP & inflation (country & global), 8 lags (deep) recession dummy. Driscoll-Kraay s.e. with 5 lags.

Does the depth of the U matter?

- Analyse (residual) MP relative to systematic MP proxied by GDP and inflation, by country and period (pre-1914, interwar, Bretton-Woods, post-1973), as well as other key macro variables, including several lags
- **Cutting and raising by more than systematic component** is linked to higher crisis risk

	(1)	(2)	(3)	(4)
	Crisis	Deep crisis	Post-WW2 crisis	Post-WW2 deep crisis
Strong U (residual cut & raise)	0.28***	0.19***	0.25***	0.20***
Moderate U (systematic cut or raise)	0.12	0.08	0.10	0.07
Raise, raise	0.08	0.03	0.05	0.01
Raise, cut	0.03	0.02	0.02	0.00
Cut, cut	0.06	0.04	0.03	0.00
Unconditional	0.10	0.06	0.07	0.04

Residual cuts and raises, and crisis risk

- Distinguish between residual vs systematic cuts (Cut dummy) and raises (Δ_3Rate) in IV regression setting
- Interaction of residual cuts and/or raises is key

	Dependent variable: $\text{Crisis}_{t \text{ to } t+2}$					
	All cuts & raises (baseline) (1)	Residual cuts (2)	Systematic cuts (3)	Residual raises (4)	Systematic raises (5)	Residual cuts & raises (6)
$\Delta_3\text{Rate}_t$	0.01	0.02	0.03	0.00	0.02**	0.02
	(0.02)	(0.02)	(0.02)	(0.03)	(0.01)	(0.03)
$\text{Cut}_{t-8,t-3}$	0.06*	0.05	-0.02	0.04	0.08*	0.00
	(0.04)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)
$\Delta_3\text{Rate}_t \times \text{Cut}$	0.07**	0.09**	0.00	0.11**	0.01	0.13**
	(0.03)	(0.04)	(0.04)	(0.05)	(0.01)	(0.06)
Country FE	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
K-P Weak ID	28.99	20.93	34.96	11.22		7.38
Observations	1322	1322	1322	1322	1322	1322

Findings so far

U-shape monetary policy (MP) rates raise banking crisis risk

- Larger effects for a deeper U (over a proxy of the systematic part of monetary policy)
- Different for non-crisis (even deep) recessions, which suggests that financial mechanisms play a key role

Understanding the mechanisms

Why do U-shaped MP rates increase crisis risk?

- Low rates create financial vulnerabilities (Jiménez et al., 2014; Acharya and Rajan, 2022; Kashyap and Stein, 2000)
- Rate increases may crystallize these vulnerabilities
- Define financial "red zone" (R-zone) as in Greenwood, Hanson, Shleifer, and Sørensen (2022)
- Red zone (R-zone) = joint credit & asset price boom:

$$\text{R-zone}_{i,j,t} = \text{High-Credit-Growth}_{i,j,t} * \text{High-Price-Growth}_{i,j,t}$$

$$\text{High-Cred.-Growth}_{i,j,t} = 1\left\{\Delta_3(\text{Credit/GDP})_{i,j,t} > 80^{\text{th}} \text{ percentile}\right\}$$

$$\text{High-Price-Growth}_{i,j,t} = 1\left\{\Delta_3 \ln(\text{Asset Price})_{i,j,t} > 66.7^{\text{th}} \text{ percentile}\right\}$$

Rate cuts increase the likelihood of future R-zones

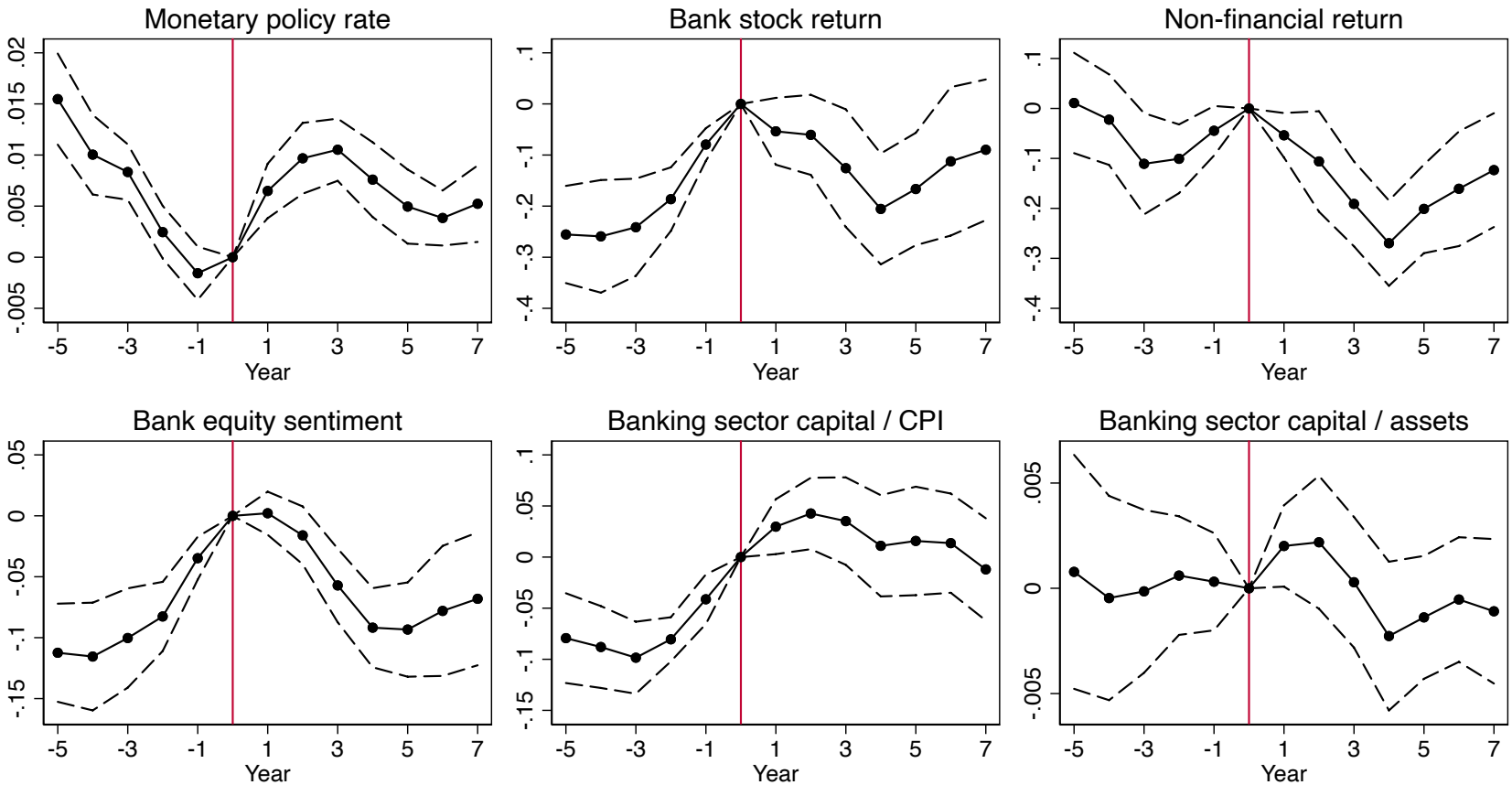
- Monetary rate cuts increase the likelihood of ending up in the R-zone over the next 3 years
- Strong effects for (large) residual rate cuts; also: stronger effects for cuts over a long period ▸ Vary cut length

	Dependent variable: R-Zone Either$_{t+1 \text{ to } t+3}$							
	ΔRate$_{t-5,t}$		Cut Rate$_{t-5,t}$		ΔResidual Rate$_{t-5,t}$		Large Resid. Cut$_{t-5,t}$	
	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)	OLS (7)	IV (8)
See header	-0.02***	-0.05***	0.07**	0.34**	-0.02***	-0.06**	0.05*	0.41**
	(0.01)	(0.02)	(0.04)	(0.15)	(0.01)	(0.03)	(0.03)	(0.17)
Country fixed effects	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓
Kleibergen-Paap		43.48		54.67		58.47		23.10
Observations	1335	1335	1335	1335	1247	1247	1247	1247

Financial developments before pre-MP-cut R-zones

(t = 0: enter Rzone; boom t = −3 to 0). Credit supply evidence:

- Bank stock prices & sentiment ↑, over non-financial firms
- Book & market bank capital ↑, credit ↑



▸ Sentiment ▸ All R-zones ▸ Predict bank R ▸ Predict non-fin. R

Rate cuts and low-spread credit volume expansions

- Long MP rate cuts ⇒ ↑ likelihood of a low-spread credit boom (red zone credit volume growth & declining spreads)

  ▸ Vary cut length

- Also, low-spread booms ⇒ worse future outcomes ▸ Outcomes
- Consistent with credit supply; bank risk-taking/reach for yield

	ΔRate$_{t-5,t}$		Cut Rate$_{t-5,t}$		ΔRes. Rate$_{t-5,t}$		Large Res. Cut$_{t-5,t}$	
	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)	OLS (7)	IV (8)
	Panel A. Dependent variable: Low-spread credit boom$_{t+1 \text{ to } t+3}$							
See header	-0.03***	-0.06***	0.12**	0.44***	-0.02**	-0.08***	0.12*	0.54***
	(0.01)	(0.02)	(0.05)	(0.17)	(0.01)	(0.03)	(0.06)	(0.17)
	Panel B. Dependent variable: High-spread credit boom$_{t+1 \text{ to } t+3}$							
See header	0.02**	0.01	-0.03	-0.06	-0.00	0.01	-0.09*	-0.07
	(0.01)	(0.02)	(0.05)	(0.15)	(0.01)	(0.03)	(0.05)	(0.19)
Country fixed effects	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓
KP Weak ID		56.52		20.67		102.87		30.68
Observations	555	555	555	555	554	554	554	554

Raising monetary rates in the R-zone triggers crises

- (Strong) raises in the R-zone increase crisis risk
- R-zone alone not strongly associated to crisis risk

	Dependent variable: $\text{Crisis}_{t \text{ to } t+2}$					
	All raises			Residual raises		Systematic raises
	OLS (1)	OLS (2)	IV (3)	OLS (4)	IV (5)	OLS (6)
$\text{R-Zone}_{t-3 \text{ to } t-1}$	0.13***	0.04	-0.05	0.06**	-0.02	0.10***
	(0.03)	(0.02)	(0.07)	(0.02)	(0.06)	(0.03)
$I(\Delta_3 \text{Rate}_t \geq 0)$		0.05*	-0.01	0.05	-0.04	0.03
		(0.03)	(0.10)	(0.03)	(0.11)	(0.02)
$\text{R-Zone} \times I(\Delta_3 \text{Rate} \geq 0)$		0.18***	0.36**	0.19***	0.42***	0.10**
		(0.05)	(0.15)	(0.06)	(0.16)	(0.05)
Country fixed effects	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
Kleibergen-Paap Weak ID			14.52		11.24	
Observations	1351	1351	1351	1351	1351	1351

Combination of U-MP & R-zone is crucial for crises

- Sort: U-MP (t − 8 to t) & R-zone (t − 3 to t); crises t to t + 2
- R-zone without U is not key. Both are necessary
- Also, both long cuts and subsequent raises matter ▸ Pre-cut RZ

	(1)	(2)	(3)	(4)
	Crisis	Deep crisis	Post-WW2 crisis	Post-WW2 deep crisis
		Panel A: All U shapes		
U-shaped MP & R-zone	0.36*** (18/49)	0.25*** (12/49)	0.37*** (12/33)	0.30*** (10/33)
U-shaped MP & no R-zone	0.10 (11/118)	0.07 (8/118)	0.06 (3/58)	0.04 (2/58)
No U-shaped MP & R-zone	0.11 (10/98)	0.05 (5/98)	0.06 (4/71)	0.01 (1/71)
No U-shaped MP & no R-zone	0.05 (19/364)	0.03 (10/364)	0.02 (4/220)	0.00 (0/220)
Unconditional	0.09 (58/628)	0.06 (36/628)	0.06 (24/382)	0.03 (13/382)
		Panel B: Systematic vs residual U shapes		
Residual U-MP & R-zone	0.46*** (14/31)	0.32*** (10/31)	0.43*** (10/23)	0.35*** (8/23)
Systematic U-MP & R-zone	0.20 (3/13)	0.12 (2/13)	0.23* (2/10)	0.17* (2/10)

* if frequency > other bins

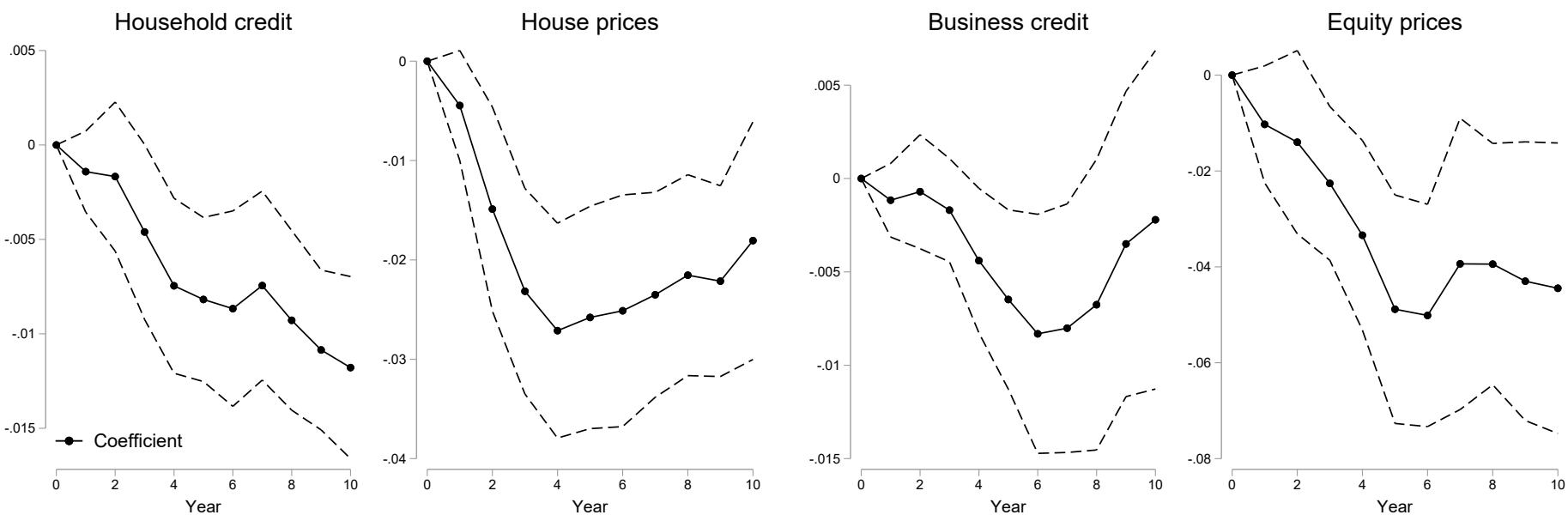
▸ Broader R-zone window

Why is the combination of U-MP & R-zone conducive to crises?

- Raising rates in the R-zone reverses the vulnerabilities built up during the lower for longer rate period (credit supply, including bank risk-taking and mispricing)
  - Test: when monetary rates are raised, is the reversal in vulnerabilities (e.g., house prices, credit) larger, the more elevated the financial vulnerability?
- Raising rates after long periods of cuts puts stress on the banking system
  - Test: what is the impact of U-shaped policy rates on banking sector performance?

Reversal in pre-existing vulnerabilities

$$\Delta_h y_{i,t+h} = \alpha_{i,h} + \alpha_{d,h} + \beta_{1,h}\Delta \text{Rate}_{i,t} + \beta_{2,h} I(\Delta_3 y_{i,t} \geq \text{Rz}) +$$
$$\beta_{3,h}\Delta \text{Rate}_{i,t} \times I(\Delta_3 y_{i,t} \geq \text{Rz}) + \sum_{L=0}^{L=5} \gamma_L X_{i,t-L} + \epsilon_{i,t+h}$$



- Raising rates when, e.g., house prices are elevated, results in larger future drops in house prices ▸ All responses

U-shaped monetary policy and bank performance

- U-MP $\Rightarrow \uparrow$ bank loan losses/equity, $\downarrow$ bank profitability, $\downarrow$ bank stock returns, $\uparrow$ bank equity crash risk
- Credit risk drives the decline in bank RoE (and market returns); evidence not consistent with interest rate risk (also U-MP doesn't predict deposit outflows)
  $\Rightarrow$ Realized credit risks crucial ▸ RoE deco. ▸ Mkt deco. ▸ Deps. ▸ Res.U

	ΔRoE$_{t \text{ to } t+2}$		ΔLoan losses$_{t \text{ to } t+2}$		Return$^{\text{Bank equity}}_{t \text{ to } t+2}$		Crash$^{\text{Bank equity}}_{t \text{ to } t+2}$	
	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)	OLS (7)	IV (8)
Δ_3Rate$_t$	-0.13	-0.01	0.64*	1.08***	-0.02	0.02	-0.00	-0.00
	(0.16)	(0.33)	(0.35)	(0.39)	(0.01)	(0.02)	(0.00)	(0.01)
Cut Rate$_{t-8,t-3}$	-0.06	0.43	-1.09	-1.48**	-0.04	-0.06	0.04	0.03
	(0.73)	(0.65)	(1.27)	(0.75)	(0.05)	(0.05)	(0.03)	(0.03)
Δ_3Rate$_t$ $\times$ Cut Rate$_{t-8,t-3}$	-0.83***	-3.16***	1.19***	3.23**	-0.03*	-0.07*	0.02**	0.07**
	(0.26)	(1.04)	(0.32)	(1.48)	(0.02)	(0.04)	(0.01)	(0.03)
Country fixed effects	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓
Kleibergen-Paap Weak ID		30.49		17.48		17.91		27.01
Observations	1350	1350	770	770	1298	1298	1626	1626

Loan-level evidence from Spain's boom and crisis

Spanish case study: Data and setting

- Loan-level evidence from Spain's real estate boom & crisis
- Sample: all new loans by banks to businesses 1995-2008
- Exogenous monetary policy set in Frankfurt; bank-dominated financial system; crisis typical of many post-WW2 (Jordà et al., 2016b)
- Study:
  - Long rate cuts, lending volumes, and cost of debt
  - Raising rates after long cuts and loan defaults
  - Heterogeneities: loans by ex ante riskier banks (high NPLs) to riskier firms (construction & real estate)

Monetary rate cuts and lending volumes

- Monetary rate cuts for long ⇒ more lending, especially by riskier banks to riskier firms
- Also: ↓cost of debt for firms borrowing from riskier banks

▸ Cost of debt

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent variable: $\Delta\log(\text{Credit})_t$							
$\text{Cut}_{t-5,t}$	0.97**	1.22***	1.38**	2.57***				
	(0.42)	(0.43)	(0.56)	(0.64)				
$\text{Cut}_{t-5,t} \times$ Bank NPL ratio				3.23***	1.34**	1.25**		
				(0.91)	(0.58)	(0.60)		
$\text{Cut}_{t-5,t} \times$ Bank NPL ratio $\times$ Real estate firm						2.26***	2.53***	2.23*
						(0.69)	(0.64)	(1.23)
Industry $\times$ Location FE	Yes	-	-	-	-	-	-	-
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	-	-
Bank FE	Yes	Yes	-	-	-	-	-	-
Macro Controls	Yes	Yes	Yes	Yes	-	-	-	-
Time FE	No	No	No	No	Yes	Yes	-	-
Firm FE	No	Yes	-	-	-	-	-	-
Firm $\times$ Bank FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Bank $\times$ Time FE	No	No	No	No	No	No	Yes	Yes
Firm $\times$ Time FE	No	No	No	No	No	No	No	Yes
Observations	1.9m	1.9m	1.9m	1.9m	1.9m	1.9m	1.9m	1.9m
R^2	0.054	0.078	0.187	0.187	0.188	0.188	0.192	0.518

Monetary policy path & loan-level defaults in Spain

- Loans extended when rates were cut have much higher default rates when rates are raised ▸ Economic Effects
- Effects much stronger for ex ante riskier firms & banks

	Dependent variable: Loan default$_{t+1 \text{ to } t+3}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Δ_3Rate$_{t,t+3}$	0.001*	0.001**	0.003***	0.002**		
	(0.001)	(0.001)	(0.001)	(0.001)		
Cut Rate$_{t-5,t}$	0.012***	0.010***	0.008***	0.014***		
	(0.003)	(0.002)	(0.003)	(0.003)		
Δ_3Rate$_{t,t+3}$ × Cut Rate$_{t-5,t}$		0.003**	0.004***	0.007***		
		(0.001)	(0.001)	(0.001)		
Δ_3Rate × Cut × Bank NPL ratio					0.002***	0.002***
					(0.001)	(0.001)
Δ_3Rate × Cut × Bank NPL × Real estate						0.003*
						(0.002)
Industry × Location FE	No	No	-	-	-	-
Bank Controls	No	No	Yes	Yes	Yes	Yes
Bank FE	No	No	-	-	-	-
Firm FE	No	No	-	-	-	-
Firm × Bank FE	No	No	Yes	Yes	Yes	Yes
Firm Controls	No	No	No	Yes	Yes	Yes
Time FE	No	No	No	No	Yes	Yes
Observations	1.1m	1.1m	1.1m	0.7m	0.7m	0.7m
R^2	0.031	0.031	0.551	0.584	0.584	0.586

Summary of main findings

1. **U-shape monetary policy (MP) rates raise banking crisis risk**
   - Larger effects for a deeper U (over systematic part)
   - **Different for non-crisis (even deep) recessions**
   - Crises are preceded by U-MP (not just selected crises)

2. **Mechanism**: higher **credit & asset prices** as MP rates are cut for long, much stronger reversal if MP raises follow such cut
   - **Red-zone booms** of very high credit & asset prices growth (Greenwood et al., 2022) after (strong) MP rate cuts for long
   - Consistent with **credit supply** (& risk-taking & mispricing)
   - Higher crisis risk after MP raises in the Red-zone, partly driven by strong reversal in credit & asset prices
   - **Both MP U and Red-zone are necessary for crisis risk**. Red zones without U-MP do not imply strong crisis risk
   - **Bust in bank performance** after U-MP driven by **credit risk** (not by interest rate risk & deposit withdrawals)
   - **Credit register**: Consistent results, stronger identification

Contribution to the literature

1. Monetary policy & financial stability
   - MP rate **cuts** → higher credit/risk taking/asset prices Rajan, 2006; Adrian and Shin, 2010; Maddaloni and Peydro, 2011; Jiménez et al., 2014; Becker and Ivashina, 2015; Grimm et al., 2023
   - MP rate **hikes** → crises (Schularick et al., 2021)
   - **We show that the full MP rate path matters**: (strong) cuts for long followed by raises imply financial instability
     - Consistent with models with loose MP & subsequent tightening (Boissay, Collard, Galí, and Manea, 2023)

2. Financial crises & credit and asset prices booms
   - Credit and asset price booms → financial crises (Schularick and Taylor, 2012; Mian et al., 2017; Greenwood et al., 2022)
   - **We show that credit & asset prices booms (red zones) without U-MP do not imply strong banking crisis risk**
   - **Mechanisms:** credit supply (also risk-taking & mispricing); then strong credit & asset price declines + banking stress

Bigger picture policy implications

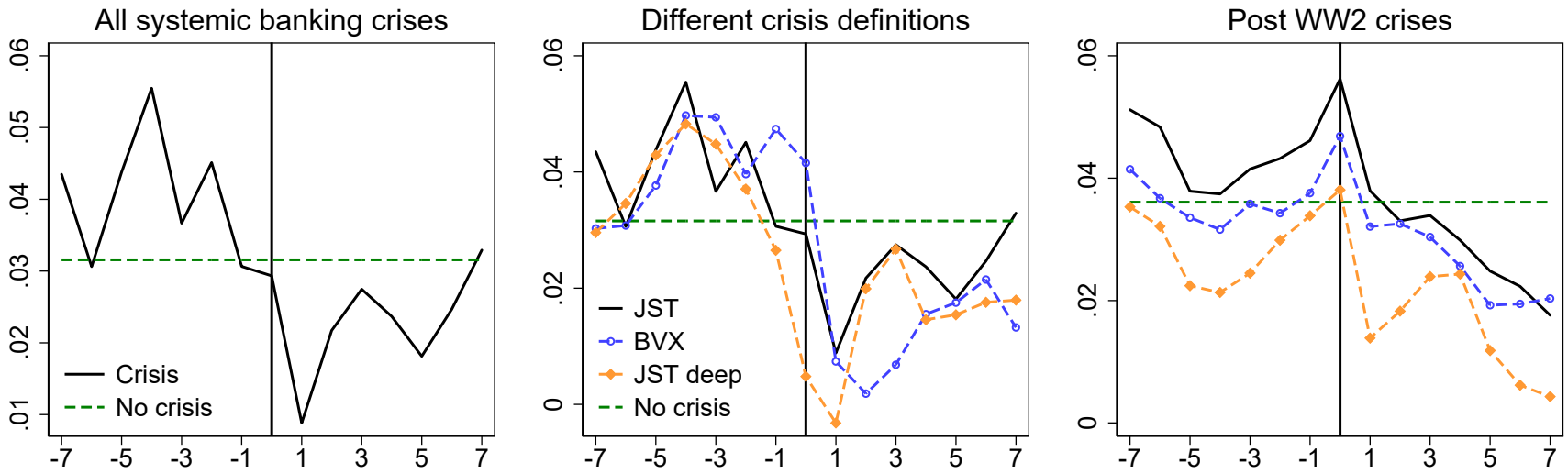
- Effects of monetary policy on crises are path-dependent
- To prevent financial booms from turning into crises, better for MP (or/and macropru) to act before the red zone
  - Deviations from Taylor rule of GDP & inflation
- Avoid very strong MP raises in the red zone, especially if monetary rates were cut for a long period before
- If in red zone & need higher MP rates, banking supervision crucial
  - Credit risk crucial, and not interest rate risk
- Consistent with recent theoretical models of Boissay, Collard, Galí, and Manea (2023) and Goldberg and López-Salido (2023)

Appendix

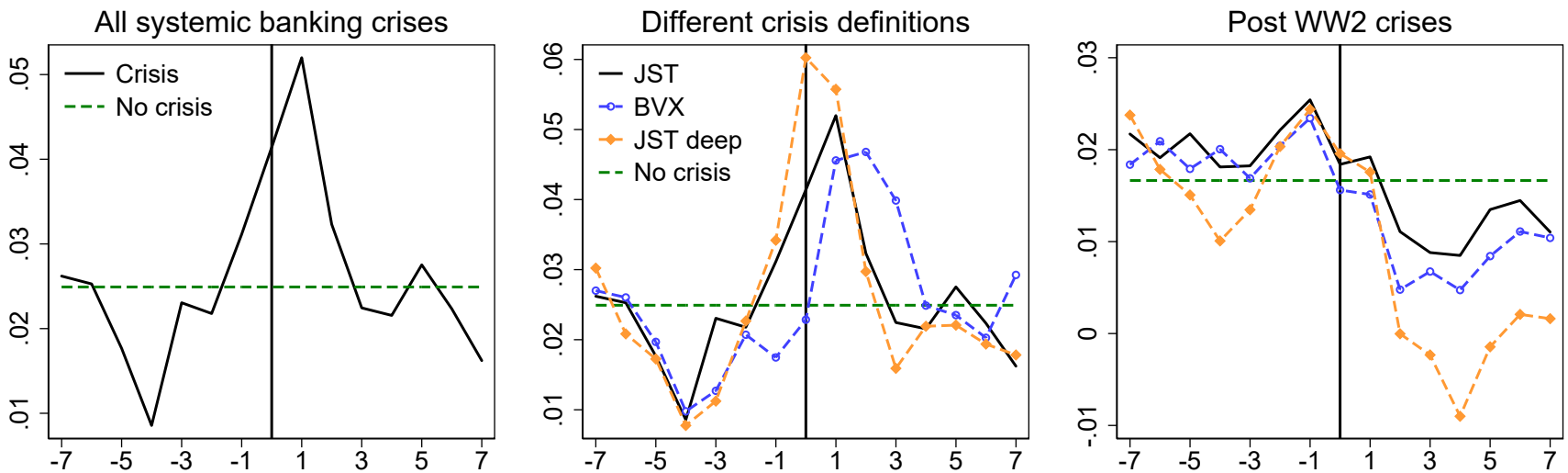
Inflation and real interest rates around crises

back

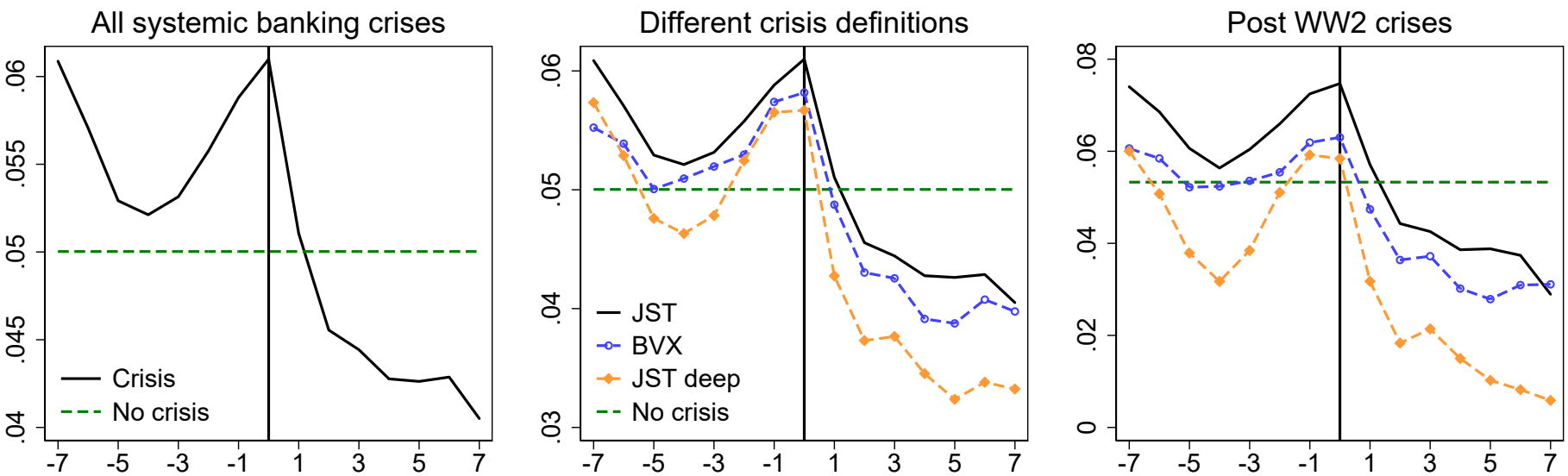
(a) Inflation:



(b) Real interest rates:



Monetary policy rates around crises

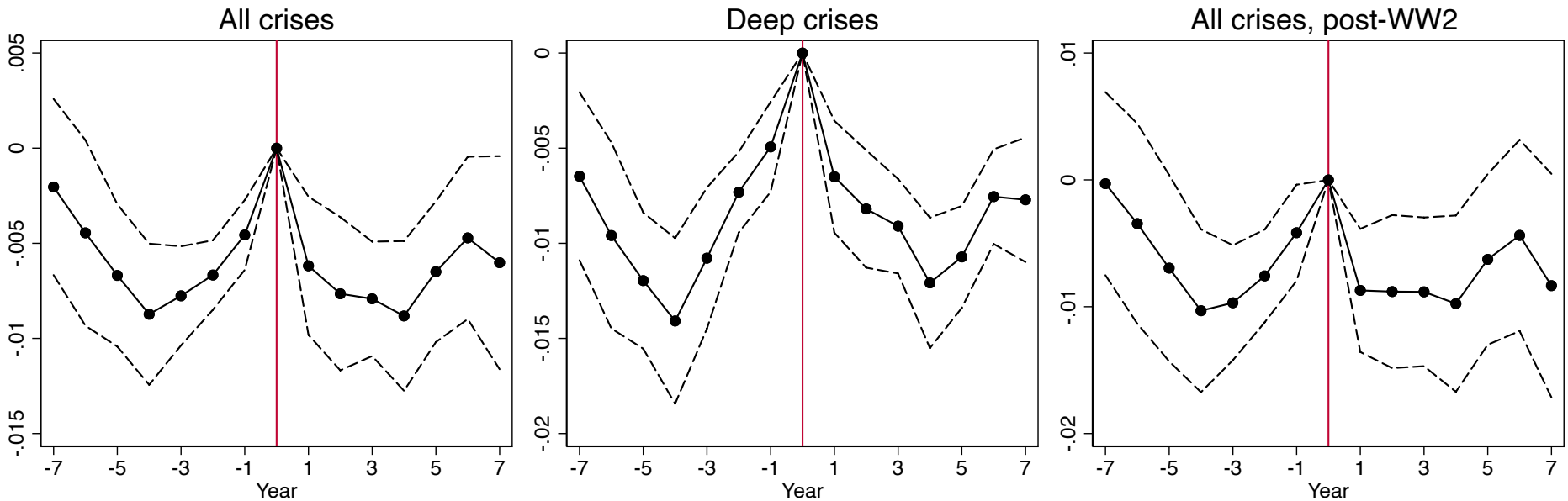


Crisis definitions. JST: Jordà et al. (2016a), BVX: Baron et al. (2021), JST deep: JST & low GDP growth

Back

Crisis window regressions: residual MP rates

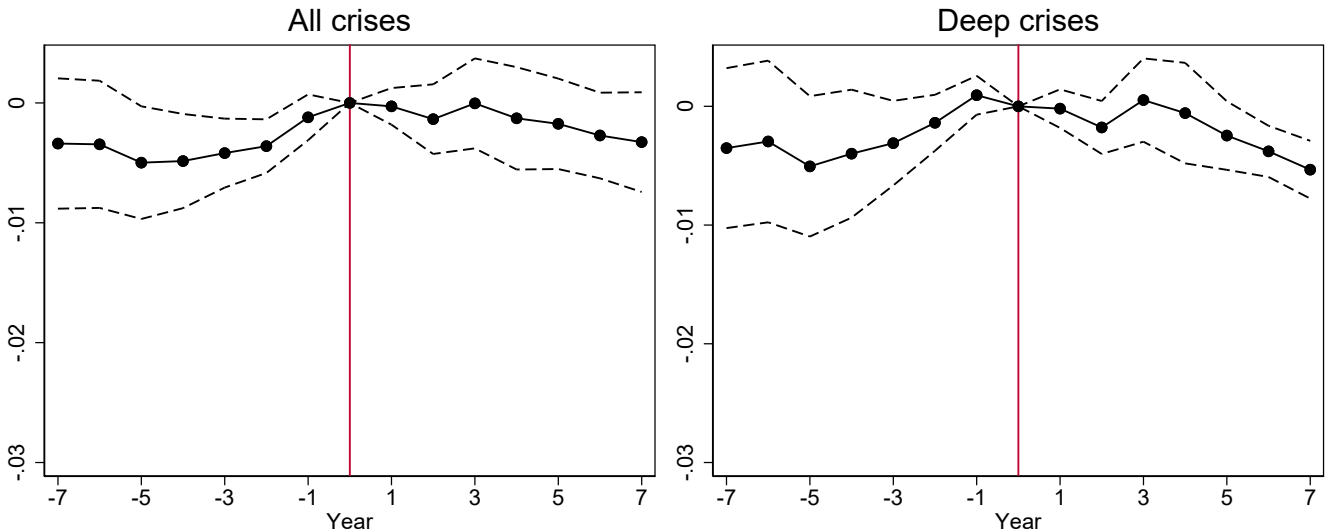
- Residualize monetary rates to systematic policy component proxied by macro dynamics (GDP, inflation, other variables, including lags)



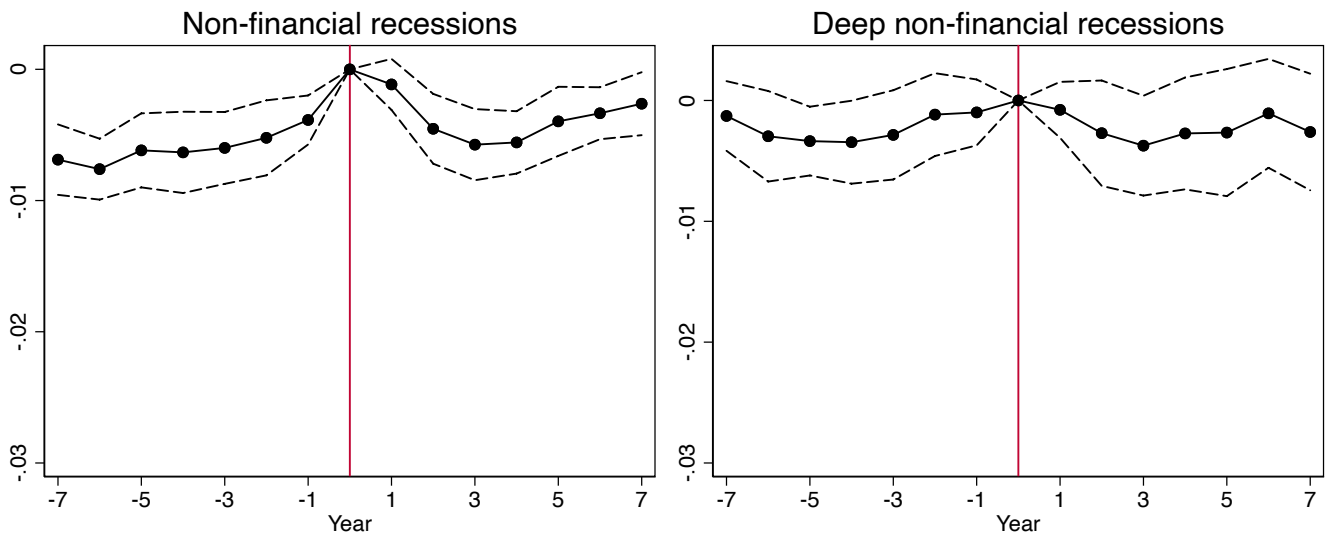
▸ back

Window regressions: recessions & long-term rates

(a) Long-term rate around crises:

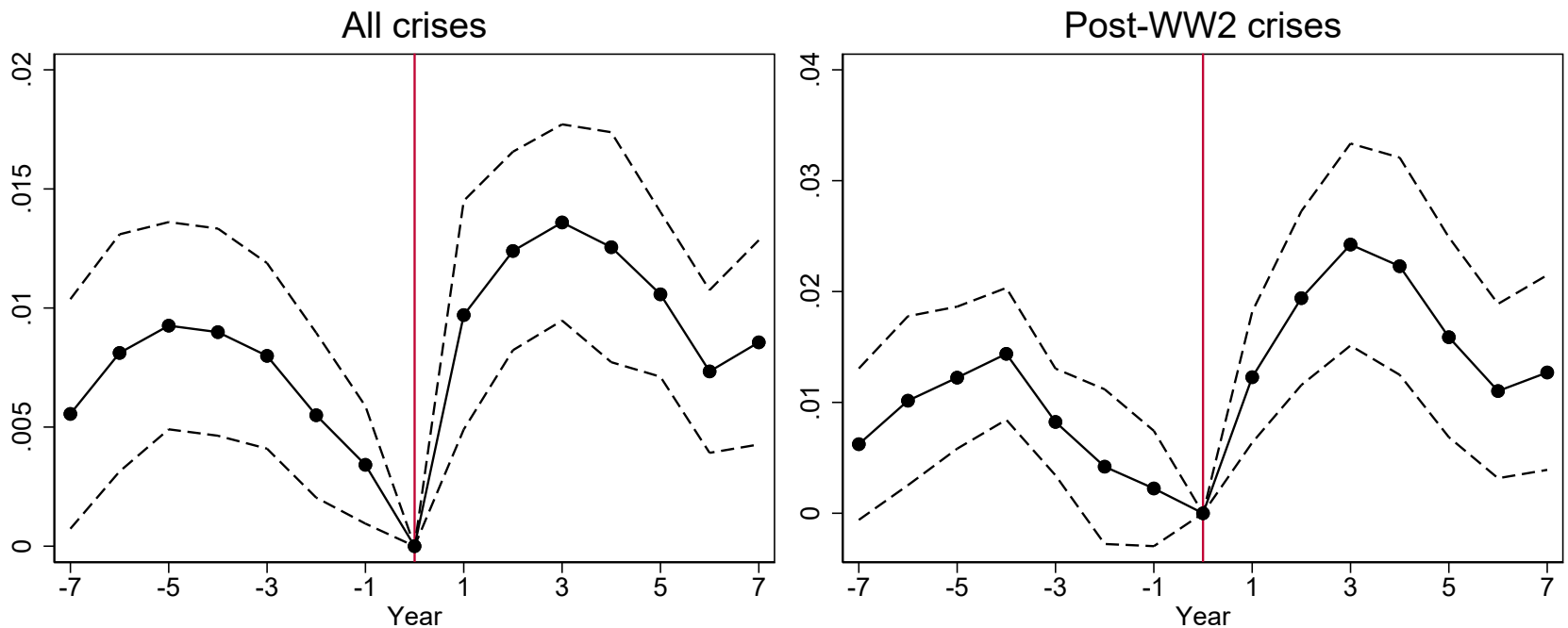


(b) Monetary policy rate around recessions:



Recession graphs: business cycle peak at t = 0. back

Crisis window regressions: term premia (long – short rate)

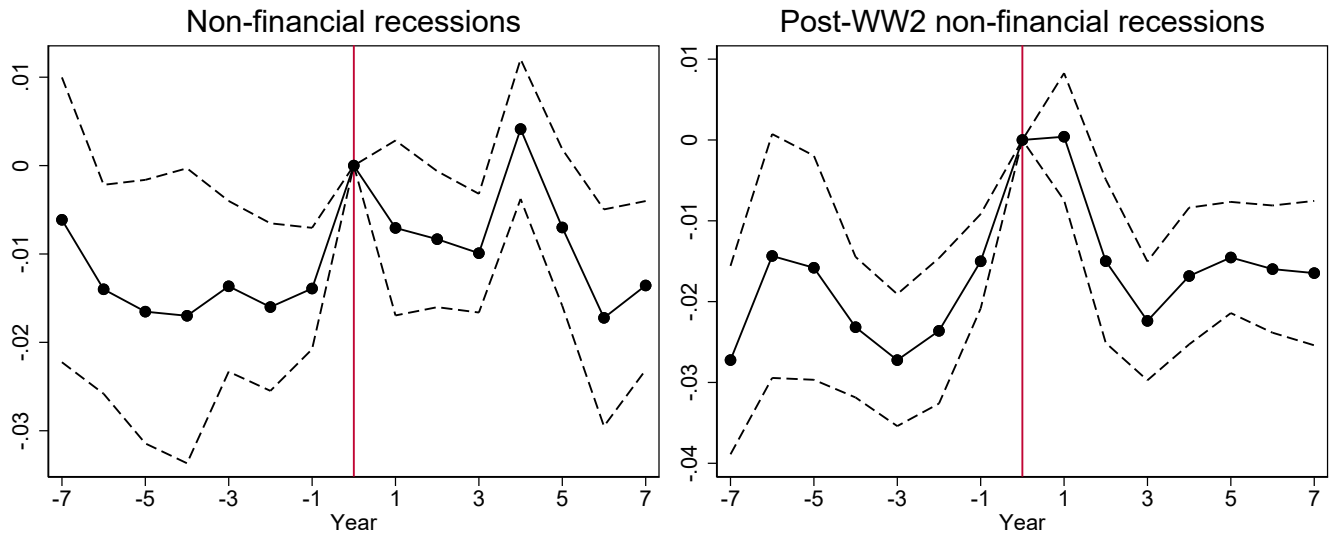


Back

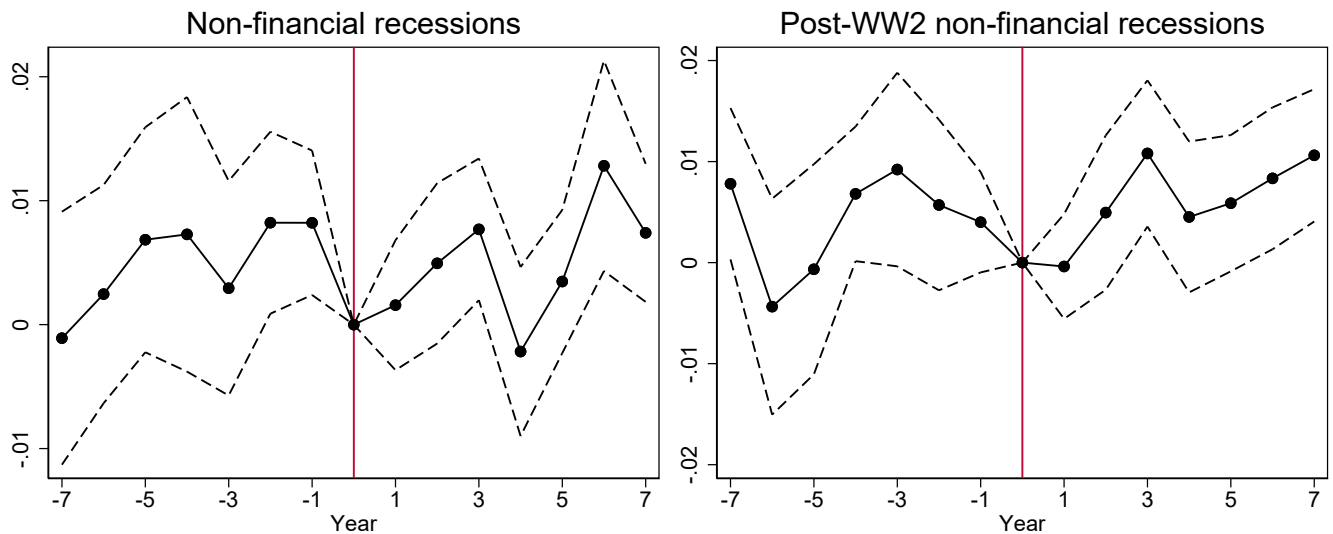
Recession window regressions: real rates & inflation

back

(a) Inflation:



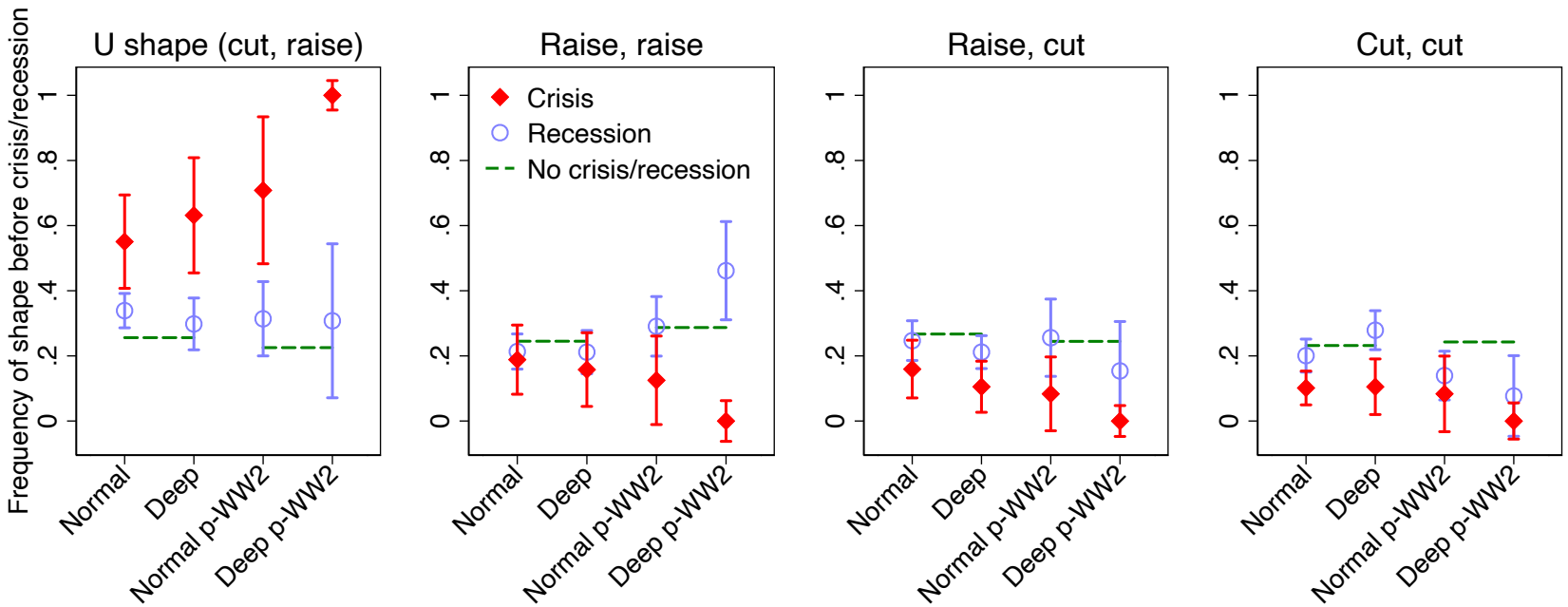
(b) Real interest rate:



Frequency of MP-rate paths before crises and recessions

back

- What is the frequency of the four different policy shapes before crises relative to sample average (and relative to recessions)?
- Red diamonds correspond to previous table / blue circles show frequency of shapes for non-financial recessions



Frequency of crises – with numbers of crises

	(1)	(2)	(3)	(4)
	Crisis	Deep crisis	Post-WW2 crisis	Post-WW2 deep crisis
U shape (cut, raise)	0.18 (35/196)	0.11 (22/196)	0.16 (15/93)	0.13 (12/93)
Raise, raise	0.09 (15/170)	0.04 (7/170)	0.04 (4/109)	0.01 (1/109)
Raise, cut	0.06 (10/186)	0.02 (4/186)	0.02 (2/93)	0.00 (0/93)
Cut, cut	0.06 (9/164)	0.03 (5/164)	0.03 (2/93)	0.00 (0/93)
Unconditional	0.10 (70/715)	0.05 (39/715)	0.06 (24/388)	0.03 (13/388)

back

Frequency of crises by policy rate path: 1 year ahead crises

	(1)	(2)	(3)	(4)
	Crisis	Deep crisis	Post-WW2 crisis	Post-WW2 deep crisis
U shape (cut, raise)	0.06***	0.04**	0.06*	0.05**
Raise, raise	0.03	0.01	0.01	0.00
Raise, cut	0.02	0.01	0.01	0.00
Cut, cut	0.01	0.01	0.01	0.00
Unconditional	0.03	0.02	0.02	0.01

Back

Frequency of crises by policy rate path: symmetric U window (t − 6 to t − 3 and t − 3 to t)

	(1)	(2)	(3)	(4)
	Crisis	Deep crisis	Post-WW2 crisis	Post-WW2 deep crisis
U shape (cut, raise)	0.19***	0.11***	0.16***	0.12***
Raise, raise	0.09	0.05	0.03	0.01
Raise, cut	0.06	0.03	0.02	0.00
Cut, cut	0.06	0.03	0.03	0.00
Unconditional	0.10	0.06	0.06	0.03

Back

U-shaped policy and crises: economic effects

back

Economic effects based on IV estimation in column (6):

- Δ_3Rate: a 1 percentage point 3-year increase in monetary rates is associated with a subsequent 1 percentage point higher crisis probability (insignificant).
- Cuts between t − 8 and t − 3 are associated with a 4% higher crisis probability (insignificant).
- A 1 percentage point 3-year increase in monetary rates following a five-year cut is associated with a subsequent 7 percentage point higher crisis probability.
- A sequence of a cut from t − 8 to t − 3 and then increasing rates by 1 percentage point over three years is associated with a 12 percentage points increase in crisis risk (the sum of the above), more than doubling the crisis probability compared to the sample mean of 10%

U-MP and crises: Alternative specifications

back

	1-year ahead		2-way cluster		Global credit	
	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta_3 \text{Rate}_t$	0.00	0.01	0.01	0.01	0.01	-0.00
	(0.00)	(0.01)	(0.00)	(0.01)	(0.01)	(0.02)
Cut $\text{Rate}_{t-8,t-3}$	0.02	0.01	0.05*	0.04	0.02	0.02
	(0.01)	(0.01)	(0.03)	(0.03)	(0.02)	(0.03)
$\Delta_3 \text{Rate}_t \times \text{Cut Rate}_{t-8,t-3}$	0.01*	0.03*	0.03***	0.07**	0.02**	0.07**
	(0.01)	(0.02)	(0.01)	(0.03)	(0.01)	(0.03)
Country fixed effects	✓	✓	✓	✓	✓	✓
Kleibergen-Paap Weak ID		26.57		23.24		21.71
Observations	1626	1626	1626	1626	1626	1626

U-MP and crises: Subsamples

back

	Pre-2000		Post-Bretton-Woods		CB in place		Decade FE	
	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)	OLS (7)	IV (8)
$\Delta_3 \text{Rate}_t$	0.01	-0.00	0.01	0.04	0.01	0.01	0.01	0.01
	(0.00)	(0.01)	(0.01)	(0.03)	(0.00)	(0.01)	(0.01)	(0.02)
$\text{Cut Rate}_{t-8,t-3}$	0.03	0.03	0.04	-0.03	0.04	0.03	0.04*	0.02
	(0.02)	(0.03)	(0.04)	(0.06)	(0.03)	(0.03)	(0.02)	(0.03)
$\Delta_3 \text{Rate}_t \times \text{Cut Rate}_{t-8,t-3}$	0.02**	0.05**	0.03**	0.06***	0.03**	0.08***	0.03**	0.07**
	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.03)	(0.01)	(0.03)
Country fixed effects	✓	✓	✓	✓	✓	✓	✓	✓
Kleibergen-Paap Weak ID		20.89		29.40		24.10		36.61
Observations	1418	1418	623	623	1507	1507	1626	1626

Baron, Verner and Xiong (2021) crises

back

	Dependent variable: $\text{Crisis}_{t \text{ to } t+2}$							
	Full sample				Post-WW2			
	OLS		IV		OLS		IV	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta_3 \text{Rate}_t$	0.02**	0.01	0.06***	0.04**	0.02**	0.01***	0.04**	0.03
	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)
$\text{Cut Rate}_{t-8,t-3}$		0.03		-0.00		0.01		-0.02
		(0.04)		(0.04)		(0.04)		(0.04)
$\Delta_3 \text{Rate}_t \times \text{Cut Rate}_{t-8,t-3}$		0.03**		0.07***		0.02**		0.06**
		(0.01)		(0.03)		(0.01)		(0.03)
Country fixed effects	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓
Kleibergen-Paap Weak ID			46.39	25.56			53.15	22.69
Observations	1626	1626	1626	1626	951	951	951	951

U-shaped policy and crises: probit

back

	Dependent variable: $\text{Crisis}_{t \text{ to } t+2}$							
	Full sample				Post-WW2			
	OLS		IV		OLS		IV	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta_3 \text{Rate}_t$	0.16***	0.08*	0.29***	0.02	0.13***	0.03	0.33***	-0.06
	(0.03)	(0.05)	(0.11)	(0.12)	(0.05)	(0.05)	(0.08)	(0.11)
$\text{Cut Rate}_{t-8,t-3}$		0.27		0.22		0.34		-0.03
		(0.17)		(0.18)		(0.33)		(0.37)
$\Delta_3 \text{Rate}_t \times \text{Cut Rate}_{t-8,t-3}$		0.15***		0.44***		0.17***		0.65***
		(0.05)		(0.13)		(0.04)		(0.09)
Country fixed effects	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓
Kleibergen-Paap Weak ID			54.32	26.16			38.23	18.01
Observations	1565	1565	1565	1565	757	757	757	757

U-shaped policy and crises at long horizons

back

	$\text{Crisis}_{t \text{ to } t+2}$		$\text{Crisis}_{t \text{ to } t+5}$		$\text{Crisis}_{t \text{ to } t+8}$	
	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta_3 \text{Rate}_t$	0.01	0.01	-0.00	-0.00	0.01	0.00
	(0.00)	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)
$\text{Cut Rate}_{t-8,t-3}$	0.05	0.04	0.04	0.03	0.05	0.04
	(0.03)	(0.03)	(0.05)	(0.04)	(0.05)	(0.05)
$\Delta_3 \text{Rate}_t \times \text{Cut Rate}_{t-8,t-3}$	0.03**	0.07**	0.03*	0.07**	0.03**	0.09**
	(0.01)	(0.03)	(0.01)	(0.03)	(0.01)	(0.04)
Country fixed effects	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
Kleibergen-Paap Weak ID		26.57		26.57		26.57
Observations	1626	1626	1626	1626	1626	1626

U-shaped policy and crises: vary cut length

back

	Dependent variable: $\text{Crisis}_{t \text{ to } t+2}$									
	h = 1		h = 2		h = 3		h = 4		h = 5	
	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)	OLS (7)	IV (8)	OLS (9)	IV (10)
$\Delta_3 \text{Rate}_t$	0.02**	0.02	0.01***	0.01	0.01**	0.00	0.01*	0.00	0.01	0.01
	(0.01)	(0.02)	(0.00)	(0.02)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)
$\text{Cut Rate}_{t-3-h,t-3}$	0.01	0.01	0.04*	0.04*	0.05	0.02	0.04	0.03	0.05	0.04
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)
$\Delta_3 \text{Rate}_t \times \text{Cut Rate}_{t-3-h,t-3}$	0.00	0.03	0.01	0.04	0.02*	0.10**	0.02**	0.06**	0.03**	0.07**
	(0.01)	(0.02)	(0.01)	(0.03)	(0.01)	(0.04)	(0.01)	(0.03)	(0.01)	(0.03)
Country fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Kleibergen-Paap Weak ID		16.45		13.52		8.35		18.42		26.57
Observations	1658	1658	1649	1649	1641	1641	1633	1633	1626	1626

Paths of inflation and real rates do not predict crises

back

	ΔInflation		ΔReal rate		r − r* level	
	(1)	(2)	(3)	(4)	(5)	(6)
Var_t	0.001	0.000	0.004*	0.003	0.014**	0.015**
	(0.002)	(0.002)	(0.002)	(0.003)	(0.006)	(0.007)
$1(Var_{t-8,t-3} < 0)$		-0.007		-0.007		0.019
		(0.024)		(0.038)		(0.034)
$Var_t \times 1(Var_{t-8,t-3} < 0)$		0.003		0.002		-0.001
		(0.002)		(0.002)		(0.005)
Country fixed effects	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
Observations	1893	1893	1899	1899	1895	1895

Baseline regression controlling for 8 lags of average $r - r^*$ back

	Dependent variable: $\text{Crisis}_{t \text{ to } t+2}$							
	Full sample				Post-WW2			
	OLS		IV		OLS		IV	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta_3 \text{Rate}_t$	0.03***	0.02***	0.06	0.03	0.02**	0.02**	0.05	0.04
	(0.01)	(0.01)	(0.04)	(0.03)	(0.01)	(0.01)	(0.05)	(0.04)
$\text{Cut Rate}_{t-8,t-3}$		0.09**		0.08*		0.08		0.06
		(0.04)		(0.04)		(0.05)		(0.06)
$\Delta_3 \text{Rate}_t \times \text{Cut Rate}_{t-8,t-3}$		0.03**		0.07**		0.02**		0.06**
		(0.01)		(0.03)		(0.01)		(0.03)
Country fixed effects	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓
Kleibergen-Paap Weak ID			46.79	28.21			47.66	31.34
Observations	1613	1613	1613	1613	943	943	943	943

Residual vs systematic U, detailed decomposition

	(1)	(2)	(3)	(4)
	Crisis	Deep crisis	Post-WW2 crisis	Post-WW2 deep crisis
Strong cut + Strong raise	0.27***	0.18***	0.24***	0.19***
Strong cut + moderate raise	0.07	0.03	0.00	0.00
Moderate cut + Strong raise	0.18*	0.15*	0.24*	0.21*
Moderate cut + moderate raise	0.09	0.04	0.05	0.00
Raise + raise	0.08	0.03	0.05	0.01
Raise + cut	0.03	0.02	0.02	0.00
Cut + cut	0.06	0.04	0.03	0.00
Unconditional	0.10	0.06	0.07	0.04

Back

LP set up

$$\Delta_h y_{i,t+h} = \alpha_{i,h} + \alpha_{d,h} + \beta_h \Delta \text{Rate}_{i,t} + \sum_{L=0}^{L=4} \gamma_L X_{i,t-L} + \epsilon_{i,t+h}, \quad h \in \{1, ..., 5\}.$$

- $\Delta_h y_{i,t+h}$ is the change in credit or asset prices
- Controls: credit, asset prices, GDP, inflation (contemporaneous + 4 lags); interest rates (4 lags)
- We reverse the sign on ΔRate

back

Boom: credit & AP response to rate cuts

back

$$\Delta_h y_{i,t+h} = \alpha_{i,h} + \alpha_{d,h} + \beta_h \Delta \text{Rate}_{i,t} + \sum_{L=0}^{L=4} \gamma_L X_{i,t-L} + \epsilon_{i,t+h}, \quad h \in \{1, ..., 5\}.$$

(a) Raw:

(b) Instrumented:

Cuts of different lengths and red zones

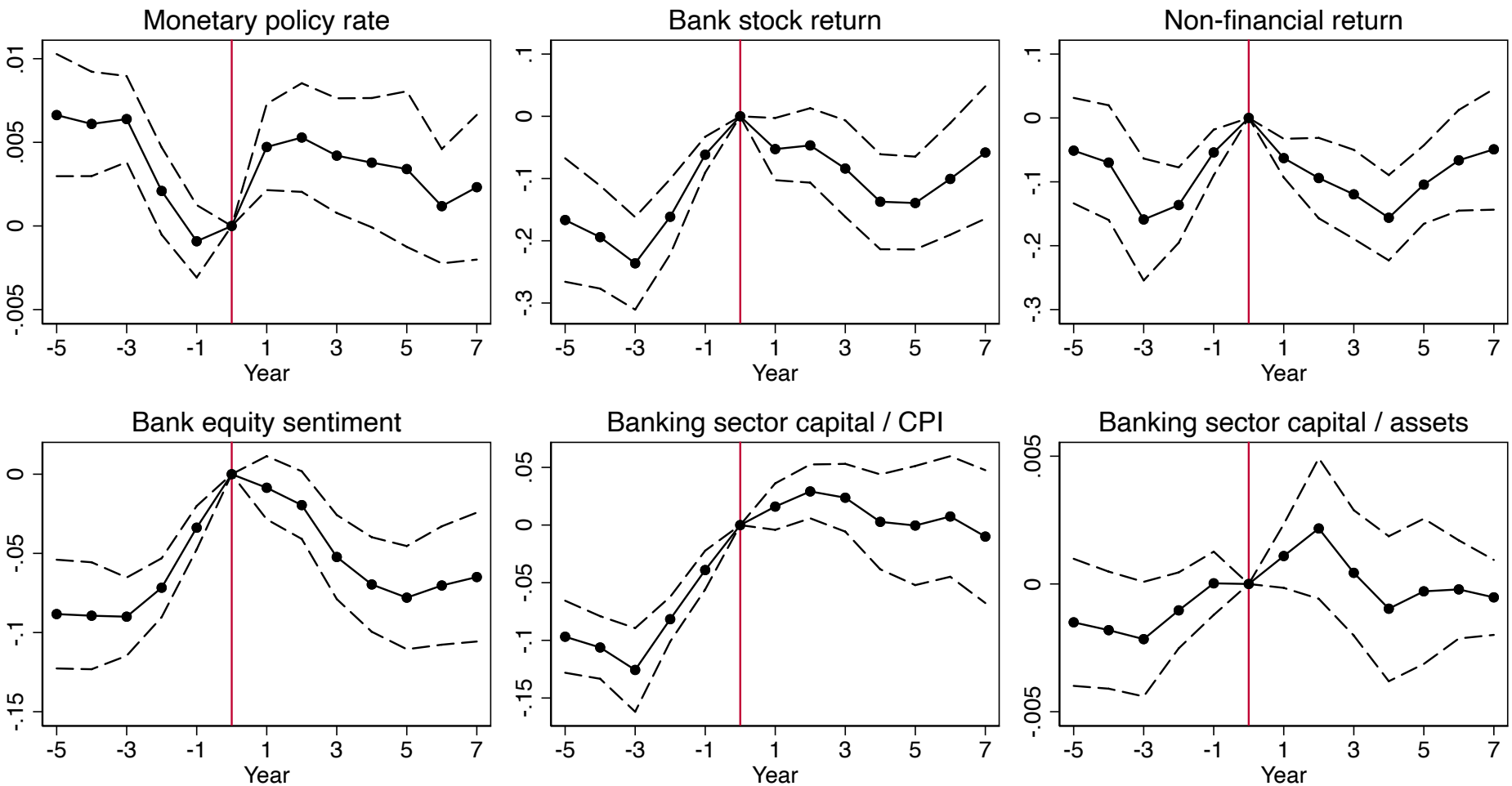
back

- Red zones much more likely after a **long** period of (strong) monetary cuts

	Dependent variable: R-zone$_{t+1}$							
	h=1	h=2	h=3	h=4	h=5	h=6	h=7	h=8
h-year Δ Rate	-0.11	-0.85	-1.12**	-1.40**	-1.53**	-1.66***	-1.58***	-1.37***
	(0.69)	(0.54)	(0.57)	(0.58)	(0.59)	(0.55)	(0.48)	(0.49)
Observations	1678	1678	1678	1678	1678	1678	1678	1678
h-year rate cut dummy	0.02	0.06***	0.06**	0.07**	0.08**	0.09**	0.08***	0.08**
	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)	(0.04)
Observations	1682	1681	1682	1681	1682	1681	1681	1682
h-year Δ resid. rate	-0.47	-1.52	-1.94*	-2.12**	-2.24***	-2.45***	-2.26***	-1.83***
	(1.09)	(1.05)	(1.04)	(0.87)	(0.82)	(0.82)	(0.76)	(0.60)
Observations	1359	1359	1359	1359	1359	1359	1359	1359
h-year large resid. cut	0.03	0.09**	0.10**	0.13***	0.09**	0.12**	0.13***	0.09**
	(0.03)	(0.04)	(0.04)	(0.05)	(0.04)	(0.05)	(0.05)	(0.04)
Observations	1359	1359	1359	1359	1359	1359	1359	1359

Macro-financial developments around all R-zones

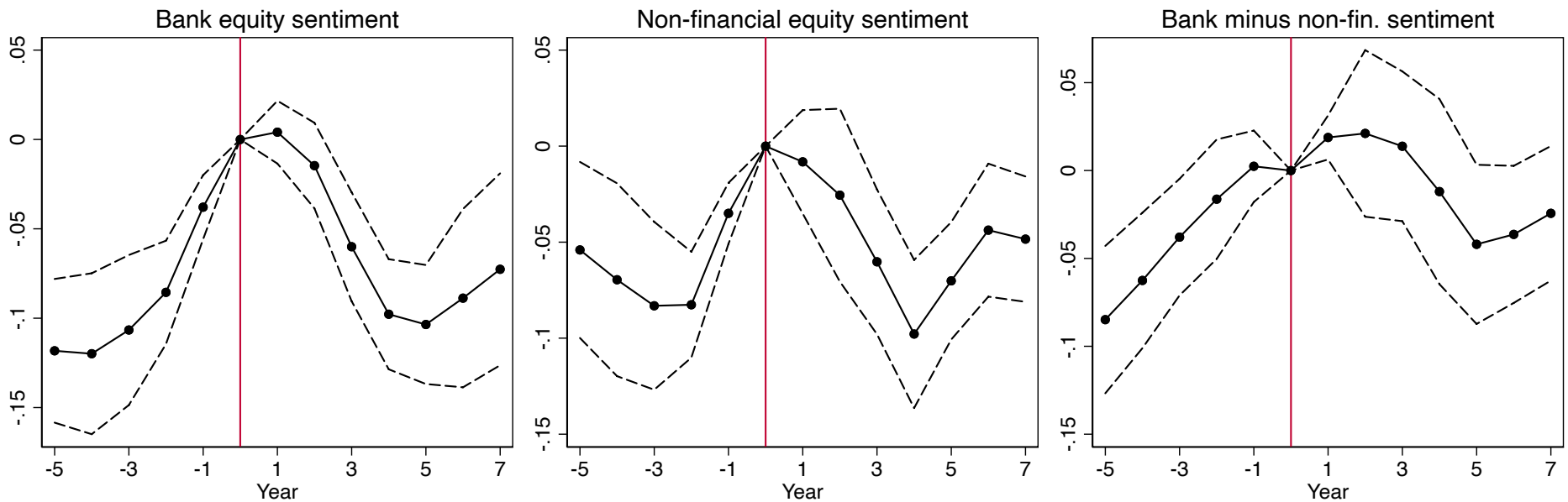
$$y_{i,t+h} - y_{i,t} = \alpha_{i,h} + \alpha_{d,h} + \beta_h \mathbb{1}_{\text{Enter R-zone}_{i,t}=1} + \epsilon_{i,t+h}$$



Bank & non-financial sentiment around pre-cut R-zones

back

- Bank sentiment increases during the boom, over and above non-financial firms



R-zones strongly predict low bank stock returns

back

	Dependent variable: Cum. Return$^{\text{Bankindex}}_{\text{t+1 to t+3}}$					
	(1)	(2)	(3)	(4)	(5)	(6)
R-zone	-0.21***		-0.19***	-0.19***	-0.20***	
	(0.05)		(0.05)	(0.04)	(0.05)	
log(bank dividend yield)		0.17***	0.17***	0.17***	0.17***	0.18***
		(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Pre-cut R-zone						-0.24***
						(0.07)
Pre-raise R-zone						-0.09
						(0.07)
R^2	0.031	0.057	0.083	0.092	0.150	0.156
Country fixed effects	✓	✓	✓	✓	✓	✓
Lagged dep. var.				✓	✓	✓
Baseline Controls					✓	✓
Observations	1306	1306	1306	1306	1306	1293

R-zones weakly predict low non-financial returns

back

	Dependent variable: Cum. Return$^{\text{Nonfindex}}_{\text{t+1 to t+3}}$					
	(1)	(2)	(3)	(4)	(5)	(6)
R-zone	-0.11**		-0.08	-0.07	-0.07*	
	(0.05)		(0.05)	(0.05)	(0.04)	
log(non-fin dividend yield)		0.15***	0.14***	0.14***	0.15***	0.15***
		(0.05)	(0.05)	(0.05)	(0.04)	(0.04)
Pre-cut R-zone						-0.14**
						(0.06)
Pre-raise R-zone						0.02
						(0.06)
R^2	0.009	0.043	0.048	0.050	0.209	0.220
Country fixed effects	✓	✓	✓	✓	✓	✓
Lagged dep. var.				✓	✓	✓
Baseline Controls					✓	✓
Observations	1277	1277	1277	1277	1277	1268

Low-spread credit expansions and subsequent outcomes

back

Dependent variable:	$\text{Crisis}_{t \text{ to } t+2}$		Δ $\text{RoE}_{t \text{ to } t+2}$		Δ $\text{Loan losses}_{t \text{ to } t+2}$		$\text{Return}^{\text{Bank equity}}_{t \text{ to } t+2}$	
	Low (1)	High (2)	Low (3)	High (4)	Low (5)	High (6)	Low (7)	High (8)
$\text{Credit boom}_{t-3 \text{ to } t-1}$	0.13***	0.07**	-5.66***	-1.51**	6.60***	2.19	-0.16**	-0.10***
	(0.04)	(0.03)	(1.27)	(0.70)	(1.70)	(1.68)	(0.08)	(0.04)
Country fixed effects	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓
Observations	639	639	598	598	461	461	604	604

- Low-spread boom $\Rightarrow$ higher crisis risk, lower RoE, higher loan losses, lower bank stock returns

Cuts of different lengths and low-spread booms

back

- Low-spread credit booms much more likely after a **long** period of (strong) monetary cuts

	Dependent variable: Low-spread boom_{t+1}							
	h=1	h=2	h=3	h=4	h=5	h=6	h=7	h=8
h-year Δ Rate	0.55	-0.17	-0.20	-0.45	-0.86**	-0.81***	-0.68**	-0.56**
	(0.56)	(0.40)	(0.35)	(0.33)	(0.34)	(0.27)	(0.29)	(0.28)
Observations	582	582	582	582	582	582	582	582
h-year rate cut dummy	0.01	0.01	0.02	0.02	0.04***	0.03	0.01	0.02
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Observations	582	582	582	582	582	582	582	582
h-year Δ resid. rate	0.62	-0.44	-0.53	-0.62	-0.96**	-0.90**	-0.68*	-0.38
	(0.78)	(0.48)	(0.34)	(0.40)	(0.48)	(0.36)	(0.36)	(0.28)
Observations	571	571	571	571	571	571	571	571
h-year large resid. cut	-0.03*	0.03	0.03	0.05*	0.02	0.05**	0.07***	0.02
	(0.02)	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
Observations	571	571	571	571	571	571	571	571

Cuts of different lengths and high-spread booms

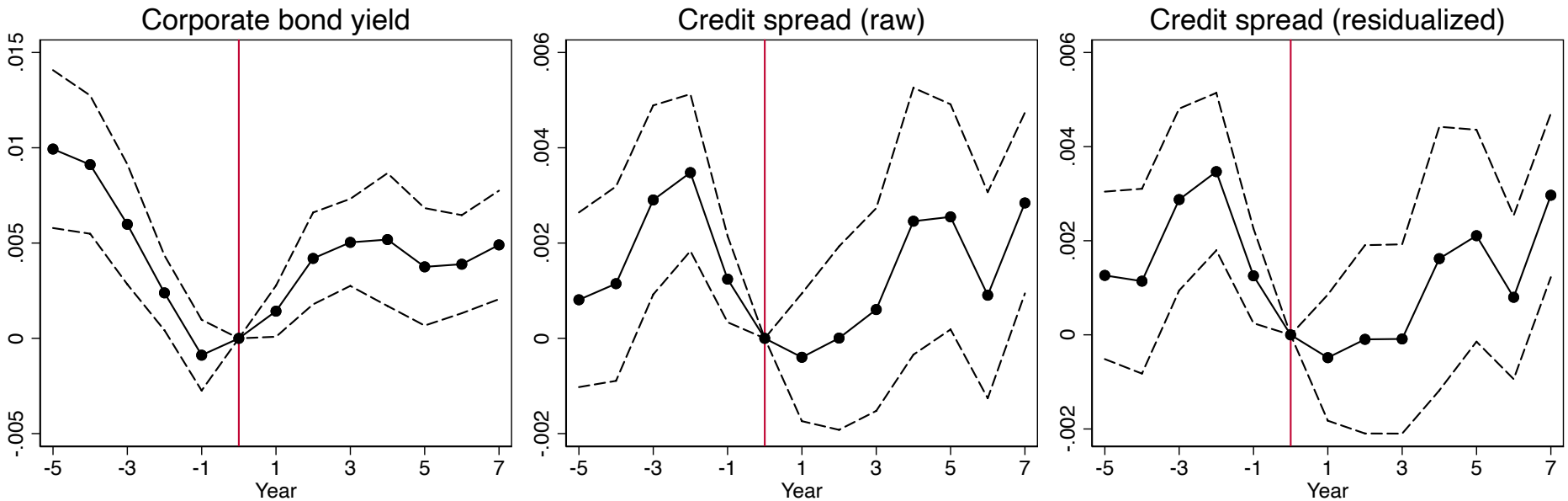
back

- High-spread credit booms not more likely for any length of monetary cuts

	Dependent variable: High-spread boom$_{t+1}$							
	h=1	h=2	h=3	h=4	h=5	h=6	h=7	h=8
h-year Δ Rate	0.65	0.55	0.67*	0.60*	0.46	0.25	0.32	0.38*
	(0.42)	(0.34)	(0.35)	(0.32)	(0.32)	(0.26)	(0.24)	(0.21)
Observations	582	582	582	582	582	582	582	582
h-year rate cut dummy	0.01	-0.01	-0.00	-0.02	-0.02	0.00	-0.01	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Observations	582	582	582	582	582	582	582	582
h-year Δ resid. rate	0.53	0.49	0.57	0.40	0.14	-0.26	-0.34	-0.10
	(0.68)	(0.59)	(0.56)	(0.51)	(0.55)	(0.32)	(0.30)	(0.34)
Observations	571	571	571	571	571	571	571	571
h-year large resid. cut	0.01	0.01	-0.03	-0.03	-0.03	-0.01	-0.02	-0.06***
	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)
Observations	571	571	571	571	571	571	571	571

Corporate bond spreads around pre-cut R-zones

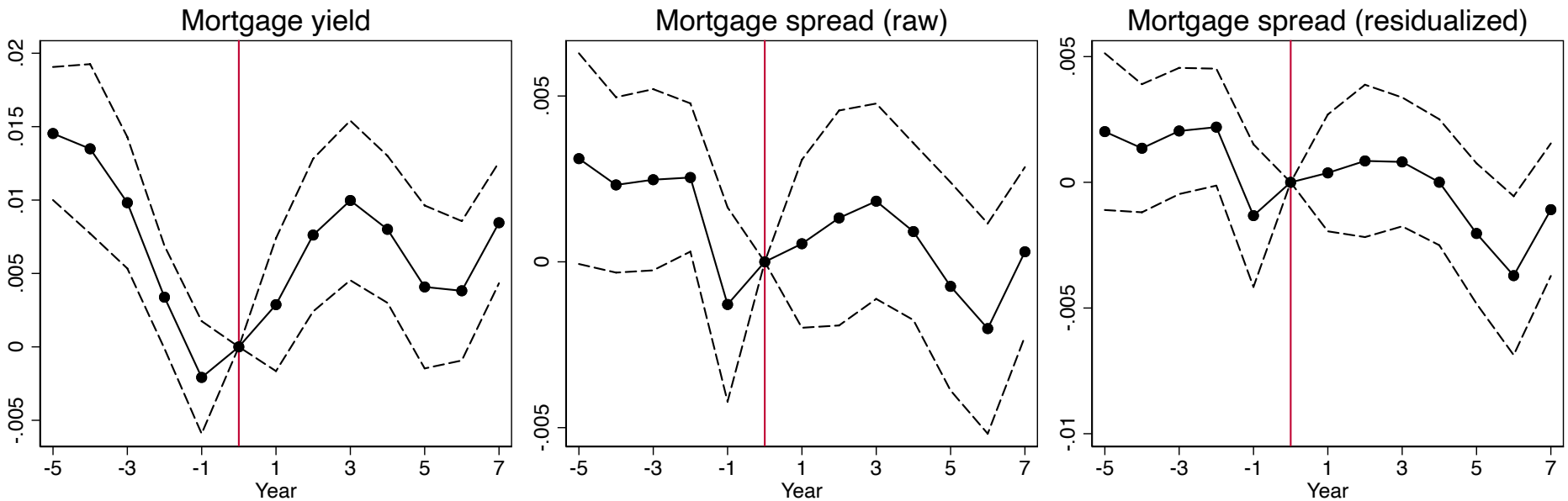
back



- Falling spreads & cost of credit when credit & asset prices are growing (t = -3 to 0)

Mortgage spreads around pre-cut R-zones

back



- Falling spreads & cost of credit when credit & asset prices are growing (t = -3 to 0)

Raising rates in R-zone and previous cuts

back

- Raising rates in R-zone increases crisis risk only if the R-zone was preceded by a rate cut

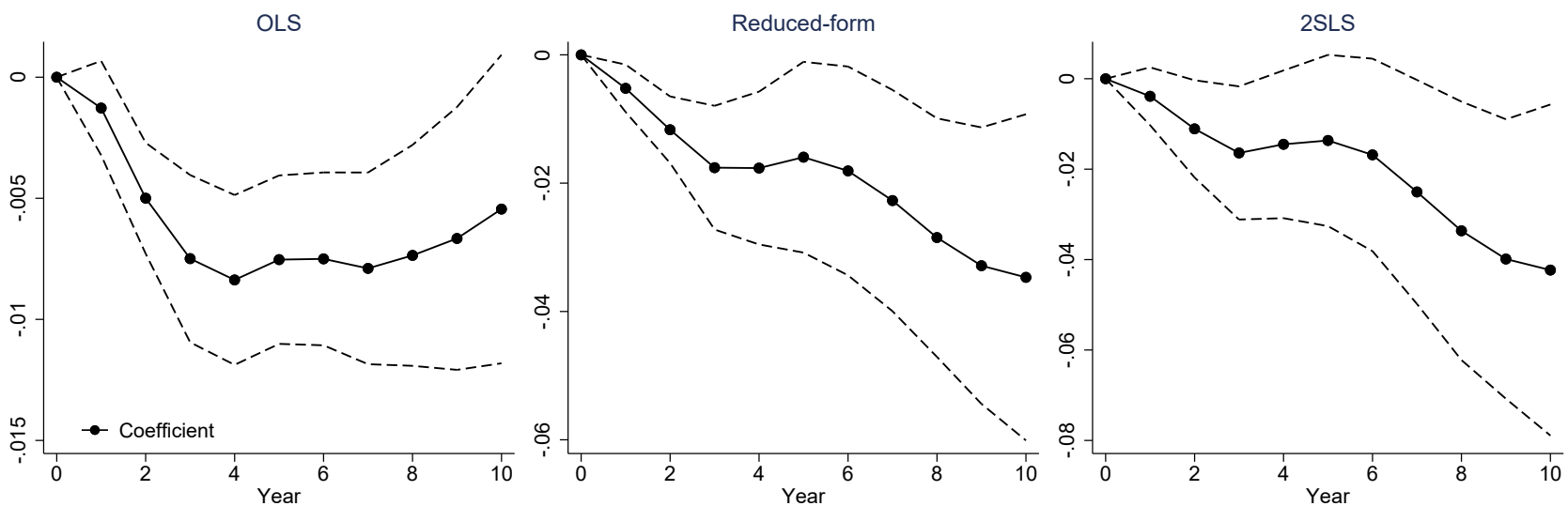
	Dependent variable: $\text{Crisis}_{t \text{ to } t+2}$								
	R-zone			R-zone, pre cut			R-zone, pre raise		
	OLS		IV	OLS		IV	OLS		IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\text{R-Zone}_{t-3 \text{ to } t-1}$	0.11***	0.03	-0.09	0.16***	0.04	-0.05	0.02	0.01	-0.06
	(0.03)	(0.03)	(0.08)	(0.05)	(0.04)	(0.11)	(0.03)	(0.03)	(0.12)
$I(\Delta_3 \text{Rate}_t \geq 0)$		0.05	-0.05		0.05**	-0.03		0.10**	0.09
		(0.03)	(0.10)		(0.02)	(0.11)		(0.05)	(0.15)
$\text{R-Zone}_{t-3 \text{ to } t-1} \times I(\Delta_3 \text{Rate}_t \geq 0)$		0.17***	0.41***		0.22***	0.40*		0.03	0.16
		(0.06)	(0.16)		(0.08)	(0.24)		(0.07)	(0.28)
Country fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
Kleibergen-Paap Weak ID			14.56			12.03			3.36
Observations	1476	1476	1476	1470	1470	1470	1470	1470	1470

Raising in the R-zone and output: local projections

back

$$\Delta_h y_{i,t+h} = \alpha_{i,h} + \sum_{j=0}^{5} \beta^{R}_{h,j} \text{R-zone}_{i,t-j-1} + \sum_{j=0}^{5} \beta^{MP}_{h,j} \Delta \text{MP}_{i,t-j}$$

$$+ \sum_{j=0}^{5} \beta^{R \times MP}_{h,j} \Delta \text{MP}_{i,t-j} \times \text{R-zone}_{i,t-j-1} + \sum_{j=0}^{5} \gamma^{X}_{h,j} X_{i,t-j} + \epsilon_{i,t+h}$$



Crisis frequencies: U-MP & R zone alternative timing $t-5$ to t for R-zone

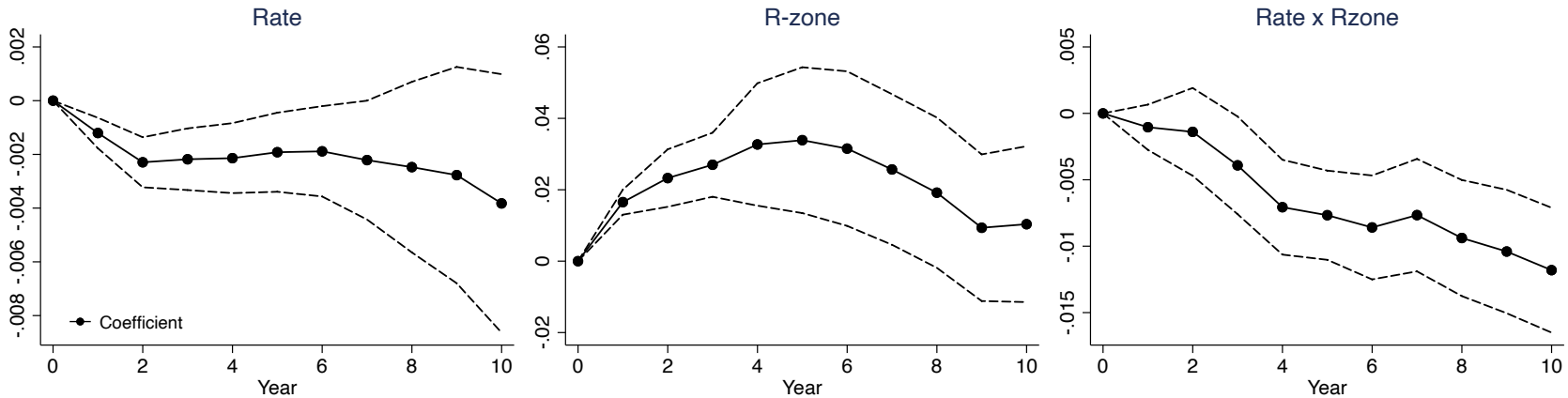
	(1)	(2)	(3)	(4)
	Crisis	Deep crisis	Post-WW2 crisis	Post-WW2 deep crisis
		Panel A: All U shapes		
U-shaped MP & R-zone	0.32*** (19/60)	0.21*** (13/60)	0.32*** (13/40)	0.25*** (10/40)
U-shaped MP & no R-zone	0.09 (10/107)	0.07 (8/107)	0.05 (3/51)	0.04 (2/51)
No U-shaped MP & R-zone	0.09 (14/148)	0.05 (8/148)	0.05 (5/103)	0.01 (1/103)
No U-shaped MP & no R-zone	0.05 (15/319)	0.03 (8/319)	0.02 (4/188)	0.00 (0/188)
Unconditional	0.09 (58/633)	0.06 (36/633)	0.06 (24/382)	0.03 (13/382)
		Panel B: Systematic vs residual U shapes		
Residual U-MP & R-zone	0.44*** (16/36)	0.29*** (10/36)	0.40*** (10/26)	0.32*** (8/26)
Systematic U-MP & R-zone	0.14 (3/19)	0.09 (2/19)	0.17 (2/14)	0.12 (2/14)

▸ back

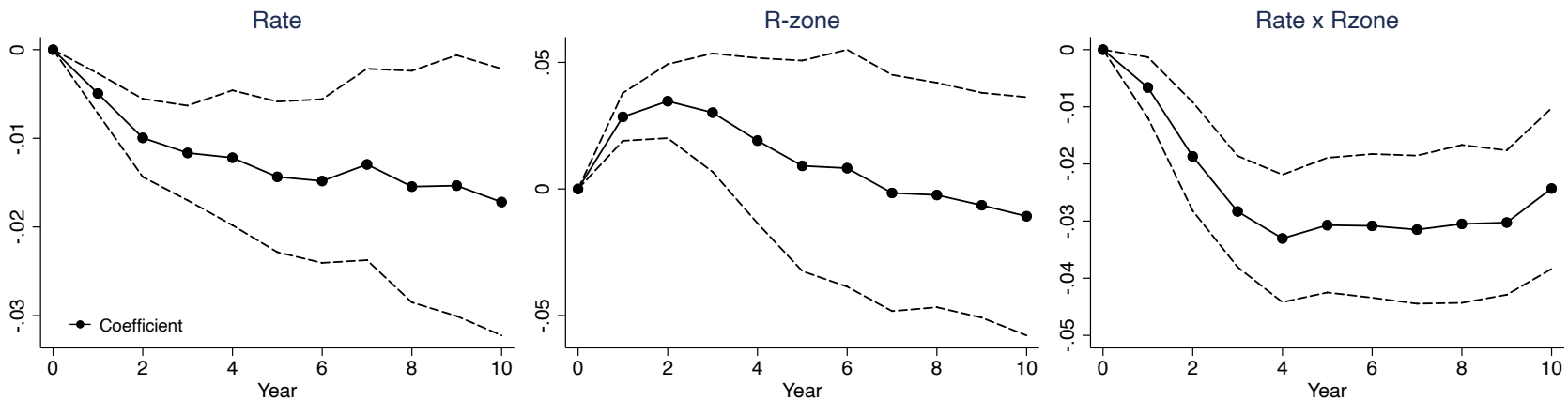
Reversal in vulnerabilities – all responses I

back

Household credit:



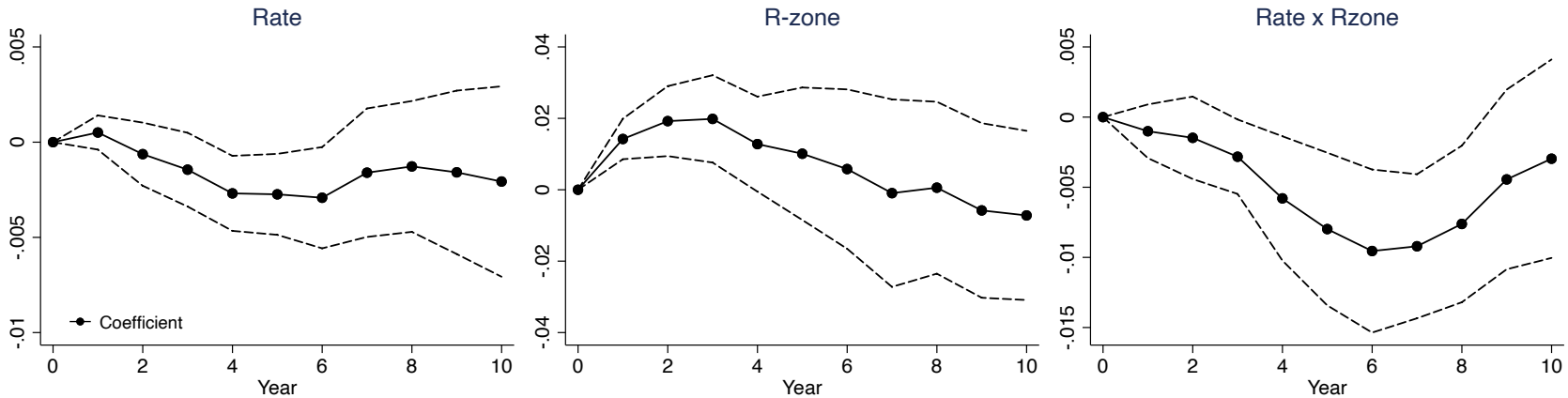
House prices:



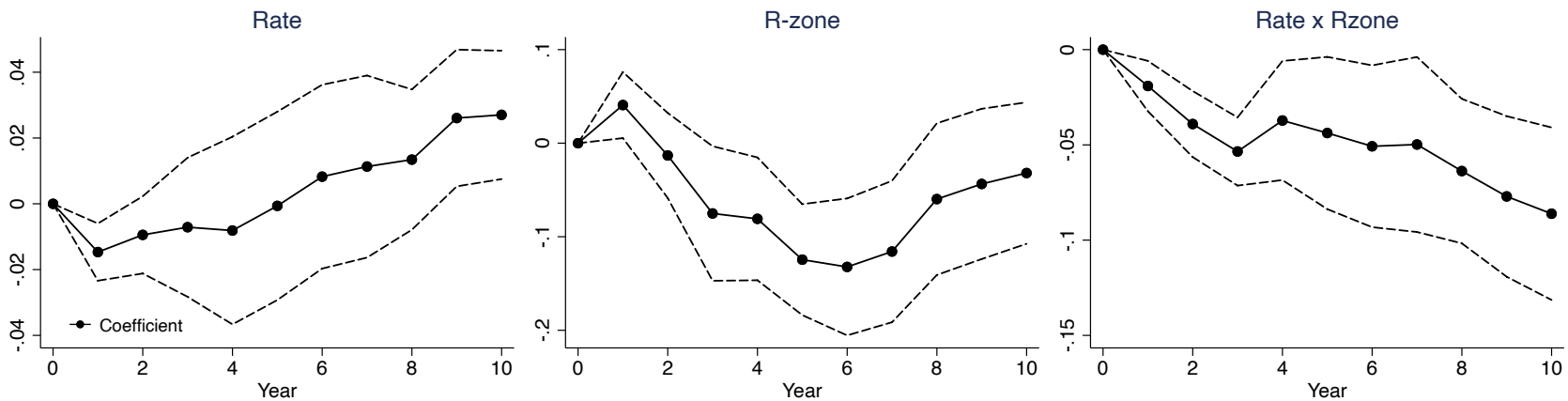
Reversal in vulnerabilities – all responses II

back

Business credit:



Stock prices:



U-MP and loan losses vs other bank income

back

- After U-MP, loan losses drive the decline in banks' RoE
- Other income components change little
- Suggests realized credit risks are key

	ΔRoE$_{t \text{ to } t+2}$		ΔLoan Losses/Equity$_{t \text{ to } t+2}$		ΔOther Net Income/Equity$_{t \text{ to } t+2}$	
	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)
Δ_3Rate$_t$	-0.25	-0.07	0.66*	1.14***	0.41***	1.06
	(0.35)	(0.98)	(0.37)	(0.43)	(0.13)	(0.78)
Cut Rate$_{t-8,t-3}$	0.07	-0.20	-1.26	-1.69**	-1.19**	-1.89**
	(1.26)	(1.34)	(1.29)	(0.85)	(0.53)	(0.86)
Δ_3Rate$_t$ $\times$ Cut Rate$_{t-8,t-3}$	-1.14***	-4.19***	1.27***	3.26**	0.12	-0.92
	(0.32)	(1.28)	(0.30)	(1.42)	(0.19)	(0.77)
Country fixed effects	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
Kleibergen-Paap Weak ID		15.22		15.22		15.22
Observations	758	758	758	758	758	758

U-MP and loan-loss vs other components of bank market returns

back

- Separate bank stock returns into part correlated with realized credit risks and interest rate risks
- Credit risk component key after U-MP

	$r^{\text{Total}}_{t \text{ to } t+2}$ (1)	$r^{\text{Loan Losses}}_{t \text{ to } t+2}$ (2)	$r^{\text{Credit Spreads}}_{t \text{ to } t+2}$ (3)	$r^{\text{Deposits}}_{t \text{ to } t+2}$ (4)	$r^{\text{Term Spread}}_{t \text{ to } t+2}$ (5)	$r^{\text{Residual}}_{t \text{ to } t+2}$ (6)
$\Delta_3 \text{Rate}_t$	-0.022	-0.013*	0.002	-0.002	-0.014***	0.005
	(0.015)	(0.007)	(0.002)	(0.002)	(0.002)	(0.012)
$\text{Cut Rate}_{t-8,t-3}$	-0.147*	-0.024	-0.009	-0.005	0.010	-0.119**
	(0.084)	(0.030)	(0.010)	(0.009)	(0.012)	(0.056)
$\Delta_3 \text{Rate}_t \times \text{Cut Rate}_{t-8,t-3}$	-0.035*	-0.014***	-0.008***	-0.003	-0.005	-0.005
	(0.019)	(0.005)	(0.002)	(0.003)	(0.004)	(0.016)
Country fixed effects	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
Observations	533	533	533	533	533	533

U-MP and deposit outflows

back

- U-shaped monetary rates do not strongly predict deposit outflows

	ΔDeposits/GDP$_{t \text{ to } t+2}$		ΔReal Deposits$_{t \text{ to } t+2}$		ΔDeposits/Assets$_{t \text{ to } t+2}$	
	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)
Δ_3Rate$_t$	-0.06	0.16	0.10	0.17	0.05	-0.00
	(0.09)	(0.17)	(0.18)	(0.44)	(0.09)	(0.19)
Cut Rate$_{t-8,t-3}$	1.24	0.94	-0.55	-0.70	0.17	0.17
	(0.86)	(0.84)	(1.11)	(1.05)	(0.36)	(0.32)
Δ_3Rate$_t$ $\times$ Cut Rate$_{t-8,t-3}$	0.23	0.98*	-0.00	0.57	0.10	0.32
	(0.25)	(0.56)	(0.33)	(0.77)	(0.13)	(0.35)
Country fixed effects	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
Kleibergen-Paap Weak ID		27.36		26.57		22.47
Observations	1432	1432	1432	1432	1432	1432

Residual vs. systematic U-MP, loan losses and bank equity crashes

back

- Residual cuts or/and raises strongly increase loan losses and bank equity crash risk

	ΔLoan losses$_{t \text{ to } t+2}$				Crash$^{\text{Bank equity}}_{t \text{ to } t+2}$			
	All cuts & raises (1)	Residual cuts (2)	Residual raises (3)	Res. cuts & res. raises (4)	All cuts & raises (5)	Residual cuts (6)	Residual raises (7)	Res. cuts & res. raises (8)
$\Delta_3 \text{Rate}_t$	1.05**	1.33**	0.38	1.10	-0.01	-0.00	-0.02	-0.01
	(0.52)	(0.54)	(1.02)	(0.75)	(0.01)	(0.01)	(0.02)	(0.02)
$\text{Cut}_{t-8,t-3}$	-1.92**	-3.05*	-3.69**	-10.00***	0.03	0.01	0.01	-0.05
	(0.97)	(1.72)	(1.46)	(3.86)	(0.03)	(0.03)	(0.03)	(0.04)
$\Delta_3 \text{Rate}_t \times \text{Cut}$	3.10**	4.71**	5.09***	9.57**	0.07***	0.10***	0.12***	0.15**
	(1.23)	(2.01)	(1.97)	(3.85)	(0.03)	(0.03)	(0.04)	(0.06)
Country FE	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓
K-P Weak ID	15.25	8.61	16.15	5.79	30.61	20.13	12.64	5.69
Observations	670	670	670	670	1322	1322	1322	1322

Administrative data: summary statistics

back

		Mean (1)	S.D. (2)	P25 (3)	Median (4)	P75 (5)
Loan default$_{t,t+1}$	0/1	0.019	0.135	0.000	0.000	0.000
ΔRate$_{t,t+1}$	%	-0.326	1.093	-0.906	-0.143	0.245
Cut Rate$_{t-5,t}$	0/1	0.427	0.495	0.000	0.000	1.000
Short maturity	0/1	0.503	0.500	0.000	1.000	1.000
Firm bad credit history	0/1	0.109	0.311	0.000	0.000	0.000
Construction & real estate firm	0/1	0.214	0.410	0.000	0.000	0.000
Firm not in Mercantile Register the previous year	0/1	0.246	0.431	0.000	0.000	0.000
Firm average cost of credit	%	3.190	2.801	1.052	2.597	4.610
Bank NPL Ratio	0.0x	0.043	0.051	0.008	0.017	0.061

U-shaped policy and defaults: economic effects

back

- A 1 percentage point change in the monetary interest rate after loan origination increases the 3-year probability of loan delinquency by 7.4% in relative terms (given that the average default probability equals 4.5 percentage points).
- The probability of loan delinquency increases by 17.1% if monetary rates were cut around loan origination (from the coefficient on the Cut dummy).
- A 1 percentage point increase in the monetary policy rate after periods of declining policy rates raises the probability of loan default by 8.1%.
- Summing together the coefficients, the probability of delinquency increases by 32.6% if at origination, the Cut dummy is one, and monetary rates increase by 1 percentage point over the following three years.