Monetary tightening, inflation drivers, and financial stress

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Motivation: rate hikes and financial stress

- Recent empirical studies show that financial crises tend to follow abrupt monetary tightening

  → hiking rates during inflationary episodes may have unwarranted effects on financial stress

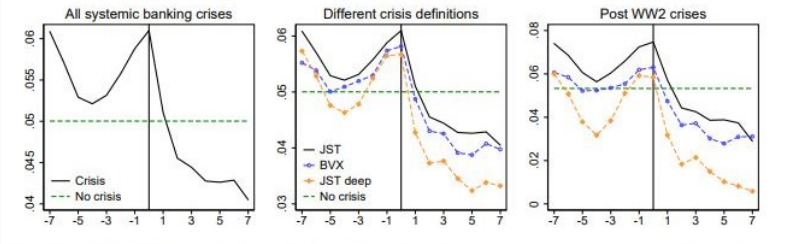


Figure 1: Average short-term rates around financial crises (Jiménez, Kuvshinov, Peydró & Richter 2023)

- Financial stability – central consideration in central banks' decision making process since GFC

Motivation: state contingent effects (Boissay, Collard, Galí, Manea 2023)

- Recent theory suggests that the effect of policy rate hikes on financial stress may depend on whether inflation is driven by adverse supply shocks or expansionary demand shocks
  - raising rates to curb supply-driven inflation amplifies recessionary pressures due to the adverse shock ... increasing agency costs and causing in extreme cases financial markets to collapse
  - taming demand-driven inflation implicitly tames a potentially "bad" boom

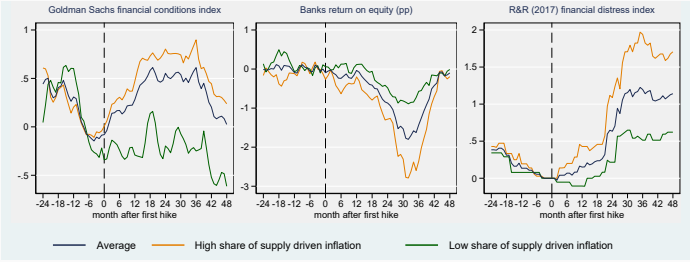


Figure 2: Average dynamics of financial stress indices around past monetary tightening cycles

This paper

- Assesses empirically how a rate hike affects financial stress and how this effect varies depending on whether inflation is supply– or demand–driven
- Empirical methodology
  - Country-level LPs on monthly data using high frequency identified monetary policy surprises
- Main findings – policy rate hikes:
  - unambiguously increase financial stress in the presence of supply–driven inflation
  - may leave unaffected or reduce financial stress in the presence of demand–driven inflation

Place in the literature

Roadmap

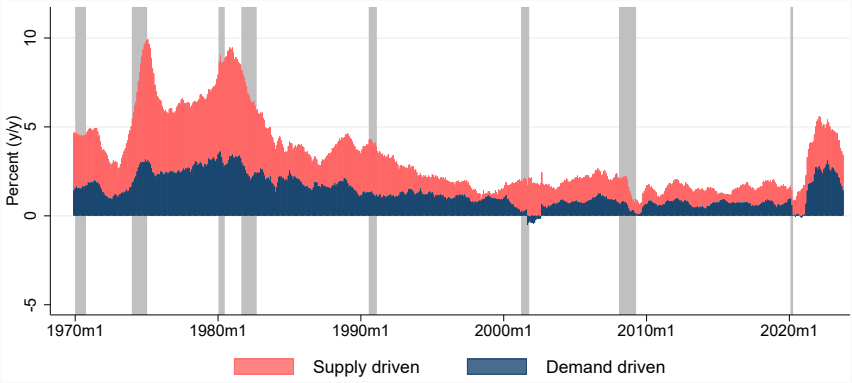
1. Empirical methodology

2. Main findings and robustness

3. Monetary policy transmission channels

Empirical methodology

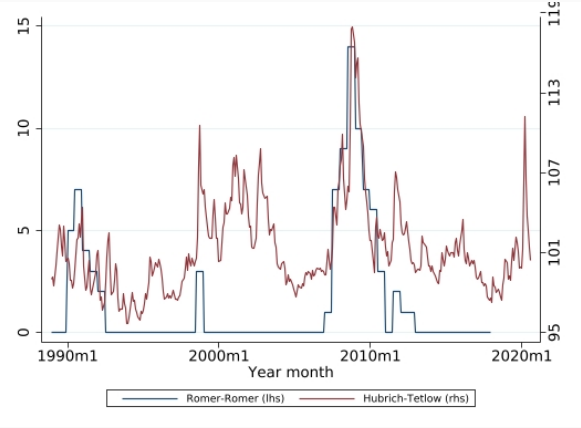
Data: US PCE inflation decomposition into demand and supply factors



Source: Shapiro (2022)

Details methodology

Data: Financial stress



Notes: The figure plots for the United States our baseline FSI (Hubrich-Tetlow, red line) along with the Romer and Romer (2017) qualitative financial crisis indicator (blue line). Data is shown monthly from December 1988 to August 2020 for the FSI, and semiannual until 2017:2 for Romer and Romer. Details index

Econometric specification

- Country-level local projection:

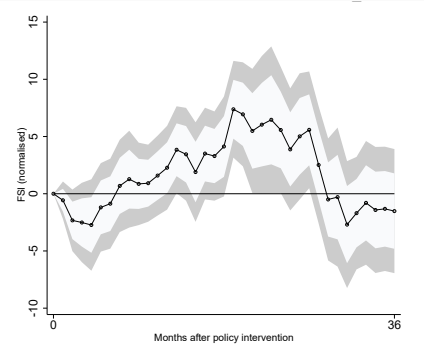
$$\begin{aligned} y_{t+h} - y_{t-1} =& \alpha_h + \beta_h^T 1\{mps_t > 0\} mps_t + \beta_h^{TS} 1\{mps_t > 0\} mps_t \pi_t^s + \beta_h^{TD} 1\{mps_t > 0\} mps_t \pi_t^d \\ &+ \beta_h^L 1\{mps_t < 0\} mps_t + \beta_h^{LS} 1\{mps_t < 0\} mps_t \pi_t^s + \beta_h^{LD} 1\{mps_t < 0\} mps_t \pi_t^d \\ &+ A_h \sum_{\tau=1}^{L} \mathcal{C}_{t-\tau} + e_{t+h}, \end{aligned}$$

- Dependent variable y: financial stress indices
- Independent variables: mps_t MP surprise, $\mathbb{1}\{mps_t > 0\}$ indicator variable for a tightening, $\pi_t^{s/d}$ supply/demand-driven inflation (year on year)
- Controls $\mathcal{C}_{t-\tau}$: six lags of the dependent and independent variables; $\pi_t^{s/d}$ (year-on-year), log of industrial production, unemployment rate, Gilchrist and Zakrajsek (2012) series of excess bond premium and corporate credit spreads;
- Newey-West standard errors to control for serial corelation

Main findings and robustness

Unconditional effect of a monetary tightening on financial stress

- US monthly data from January 1990 to December 2019, baseline specification



Notes: Dynamic responses to a 25 basis points positive monetary policy surprise. Shown are regression coefficients β_h^T for $h = 0, \ldots, 36$. Baseline specification with Bauer and Swanson (2022) MP shocks, core inflation, Fed Board Financial Stress Index and 6 lags. 90% confidence bands, Newey-West standard errors. US monthly data from January 1990 to December 2019.

Additional effect of a MP tightening on financial stress

- US monthly data from January 1990 to December 2019, baseline specification

Notes: Additional responses to a 25 basis points positive MP shock. Shown are regression coefficients β_h^{TS} (left) and β_h^{TD} (right) for $h = 0, \ldots, 36$. Baseline specification with Bauer and Swanson (2022) MP shocks, core inflation, Fed Board Financial Stress Index and 6 lags. 90% confidence bands, Newey-West standard errors (statistically significant differences).

Findings robust across a wide range of financial stress indices for the US and the other OECD for which data was available. Robustness

Monetary policy transmission channels

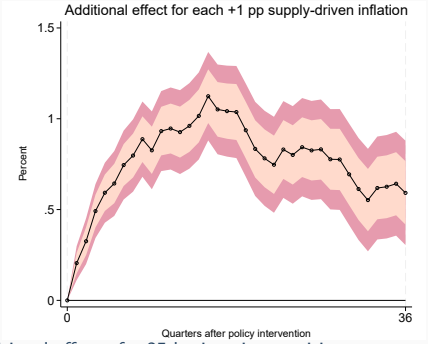
Transmission channels

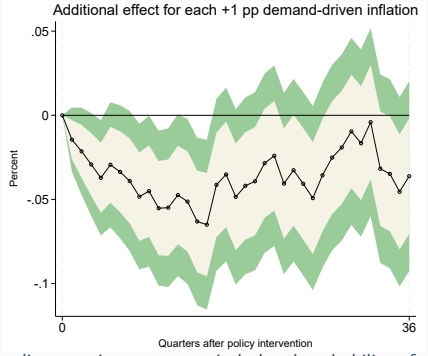
- Environment characterised by supply–driven inflation:
  - *adverse* supply shocks (e.g. supply chain disruptions or an unexpected rise in energy prices) not only spur inflation but also generally weigh on borrowers' cash flows and ability to repay their debt
    1. policy rate hikes further contract real activity and amplify credit default risk and agency costs
    2. counter–party risk may become so elevated that financial markets freeze $\Rightarrow$ taming it rises crisis risk

- Environment characterised by demand–driven inflation:
  - demand–driven inflation is due to *expansionary* shocks
    1. buoyant profits and incomes provide firms and households with a "natural hedge" against rate hikes and dampen the effect of the latter on credit default and bankruptcy risks
    2. left unaddressed, may lead to financially unsustainable booms $\Rightarrow$ taming it reducing crisis risk

Firm bankruptcies | Loan delinquencies | Excess bond premium

Model–based dynamic responses estimates with LPs (BCGM 2023)





Notes: Additional effect of a 25 basis points positive monetary policy surprise on one-period-ahead probability of a crisis. Left panel: regression coefficients β_h^{TS} for $h = 0, \ldots, 36$. Right panel: regression coefficients β_h^{TD} for $h = 0, \ldots, 36$. Based on simulated time series from the model in Boissay, Collard, Galí, Manea 2023 with supply shocks and monetary policy surprises (left panel), and with demand shocks and monetary policy surprises (right panel). Specification with 6 lags similar to our baseline empirical specification for the US. 90% confidence bands.

Econometric specification

Main takeaways

Main takeaways

- Rate hikes have state contingent effects on financial stress depending on the underlying supply versus demand nature of inflation
  - financial stress rises in the short–term in response to a monetary tightening during supply–driven inflation whereas it (if anything) recedes in the medium–term than during demand–driven inflation
- Policy implications:
  - the level and demand/supply composition of inflation during monetary tightening cycles relevant for the odds of a hard (financial) landing
  - curbing demand-driven inflation may reduce the probability of a future financial crisis

Current tightening cycle | Inflation decomposition OECD

Backup slides

Place in the literature

- **State-dependent effects of monetary policy**
  - Booms versus recessions: *Lo and Piger (2005), Tenreyro and Thwaites (2016)*
  - Rate cuts vs. hikes: *Barnichon and Matthes (2018), Alessandri, Jorda, Venditti (2023)*
- **Monetary policy and financial stability**
  - Monetary loosening ("Low–rate–for–long") and buildup of financial imbalances
    Borio and Lowe (2002), Taylor (2011), CGFS (2018), Grimm, Jorda, Schularick and Taylor (2023)
  - (Domestic) Monetary tightening and (domestic) financial stress
    Schularick, ter Steege, and Ward (2021), Jiménez, Kuvshinov, Peydró and Richter (2023)
  - This paper: effect on financial stress depends on the level and S/D composition of inflation

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Data: Components of the Federal Reserve Board Staff's Financial Stress Index

#	Description	Source	Stddev
1.	AA rate-Treasury spread, const. maturity	Merrill & Bloomberg	66.3
2.	BBB rate-Treasury spread, const. maturity	Merrill & Bloomberg	96.2
3.	Federal funds rate less 2-yr Treasury yield	FRB & Bloomberg	0.70
4.	10-year Treasury bond implied volatility	Bloomberg	1.40
5.	Private long-term bond implied volatility	Bloomberg	2.30
6.	10-Year Treasury on-the-run premium	Bloomberg	9.43
7.	2-year Treasury on-the-run premium	Bloomberg	3.60
8.	S&P 500 earnings/price less 10-year Treasury	I/B/E/S & FRB	2.01
9.	S&P 100 implied volatility (VIX)	Bloomberg	8.53

Notes: Baseline FSI for the US. The index is computed as a simple demeaned sum of the nine components shown, weighted as a function of the inverse of their sample standard deviations.

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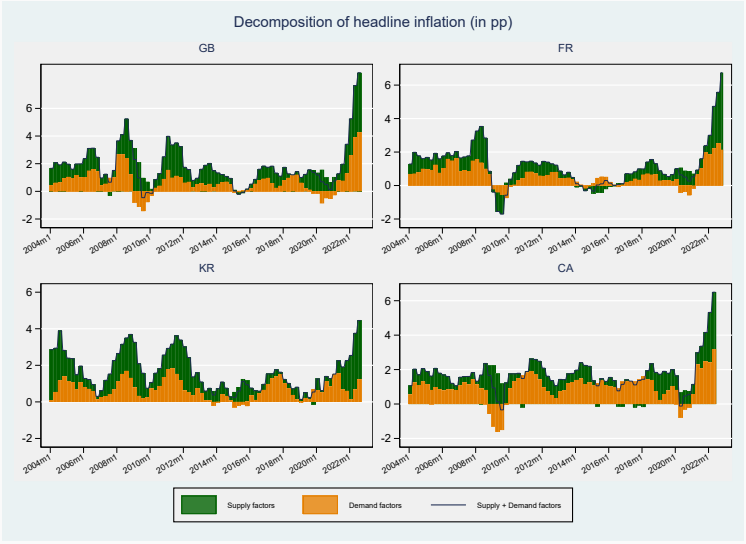
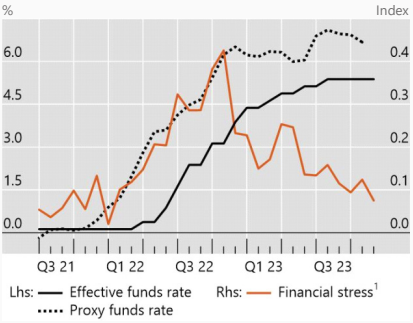
Cross country comparison supply/demand inflation decomposition

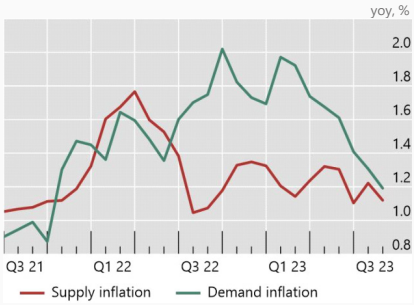
- Latest updates from the OECD



Insights for the current monetary policy tightening cycle

▶ Financial stress initially highly sensitive due to high supply-driven inflation





Notes: Financial stress: composite index of systemic stress (CISS) from the ECB. Proxy funds rate: proxy rate adjusted for the effects of forward guidance from San Francisco Fed. Supply/demand inflation: supply and demand components of core PCE year-on-year inflation computed with the methodology in (Shapiro 2022) net of the prepandemic 2015-2019 average.

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US inflation decomposition into demand and supply factors (Shapiro 2022)

- Decomposition based on the price and quantity data from the 136 goods and services categories underlying the Personal Consumption Expenditure (PCE) index
- Theory: demand (supply) shocks move prices and quantities in the same (opposite) directions
- Extract residuals from separate price and quantity regressions on each product category

$$q_{i,t} = \sum_{j=1}^{j=12} \gamma_j^{qp} p_{i,t-j} + \sum_{j=1}^{j=12} \gamma_j^{qq} q_{i,t-j} + \nu_{i,t}^{q}$$

$$p_{i,t} = \sum_{j=1}^{j=12} \gamma_j^{pp} p_{i,t-j} + \sum_{j=1}^{j=12} \gamma_j^{pq} q_{i,t-j} + \nu_{i,t}^{p}$$

- Classify product inflation as supply/demand–driven based on the signs of residuals

Methodology in a nutshell

- Example: categories with residuals of opposite signs likely experienced a net-supply shock $\Rightarrow$ classified as "supply–driven"

$$\mathbb{1}_{i \in sup(+),t} = \begin{cases} 1 \text{ if } \nu^p_{i,t} < 0, \quad \nu^q_{i,t} > 0 \\ 0 \text{ otherwise} \end{cases}$$

- Supply–driven (demand–driven) contribution to inflation in a given month constructed as the expenditure–weighted average of the inflation rates of those categories classified as supply–driven (demand–driven) in that month

$$\gamma_{s,t} = \sum_i \mathbb{1}_{i \in s,t} \omega_{i,t}$$

where $s \in \{dem(+), dem(-), sup(+), sup(-)\}$ and $\omega_{i,t}$ is the expenditure weight of category i in the PCE consumption basket

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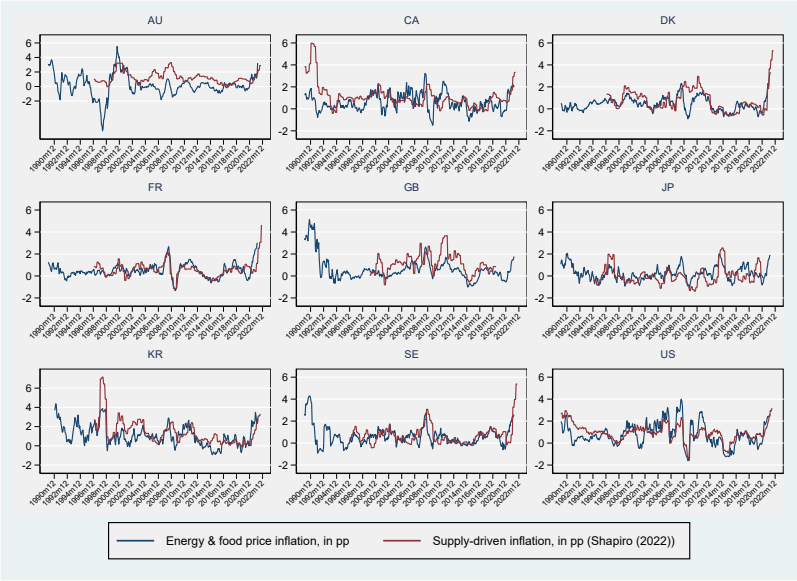
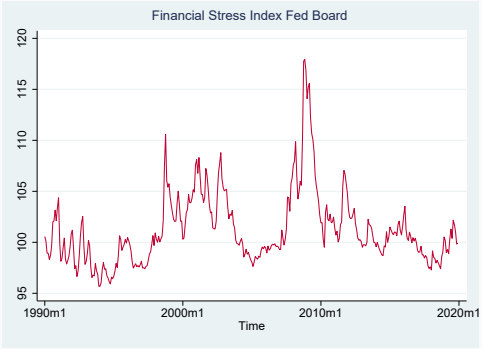
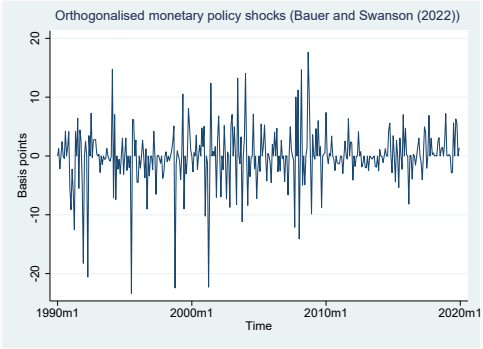
Demand–Supply decomposition: proof of concept



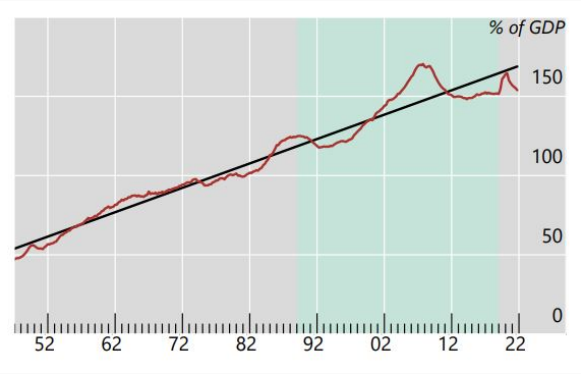
Data baseline specification





Notes: Data is stationary at 5% level (ADF tests)

Private credit to gdp ratio during the estimation period in the US



Notes: Shaded area: estimation period. Source: National Data, BIS.

Robustness checks

- *Financial stress components:* Gilchrist and Zakrajsek (2012) corporate credit spreads and excess bond premium indices, CISS subindices of financial stress in the bond market, the equity market (nonfinancial/financial firms), and the foreign exchange market.

- *Financial conditions versus financial stress:* results less salient for FCIs (e.g., Goldman Sachs FCIs, Chicago Fed National FCI and its credit, risk, and leverage subindices)

- *Other countries:* Canada, UK, France, Australia and Sweden – chosen based on the joint availability of demand– and supply–driven inflation series and monetary policy surprises.

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Firm bankruptcies: state contingent effect of a monetary tightening

Notes: Dynamic responses to a 25 basis points positive monetary policy surprise. Shown are regression coefficients β_h^{TS} (left) and β_h^{TD} (right) for $h = 0, \ldots, 36$. Baseline specification with Bauer and Swanson (2023) monetary policy surprises, core inflation, total of businesses bankruptcies filling (quarterly), 4 lags. 90% confidence bands, Newey-West standard errors (statistically significant differences). US monthly data from January 1990 to December 2019.

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Loan delinquencies: state contingent effect of a monetary tightening

Notes: Dynamic responses to a 25 basis points positive monetary policy shock. Shown are regression coefficients β_h^{TS} (left) and β_h^{TD} (right) for $h = 0, \ldots, 36$. Baseline specification with Bauer and Swanson (2023) monetary policy shocks, core inflation, loan delinquency rate (quarterly) for total loans and leases, 6 lags. 90% confidence bands, Newey-West standard errors (statistically significant differences). US monthly data from January 1990 to December 2019, baseline specification. Delinquency Rates on Loans and Leases at Commercial Banks are taken from Fed Board's website.

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Excess bond premium: state contingent effect of a monetary tightening

Figure 3: Additional effect of a monetary tightening on the GZ excess bond premium

Notes: Dynamic responses to a 25 basis points positive monetary policy surprise. Shown are regression coefficients β_h^{TS} (left) and β_h^{TD} (right) for $h = 0, \ldots, 36$. Baseline specification with Bauer and Swanson (2023) monetary policy surprises, core inflation, Gilchrist and Zakrajsek (2012) (GZ-EBP) Excess Bond Premium and 6 lags. 90% confidence bands, Newey-West standard errors (statistically significant differences). US monthly data from January 1990 to December 2019.

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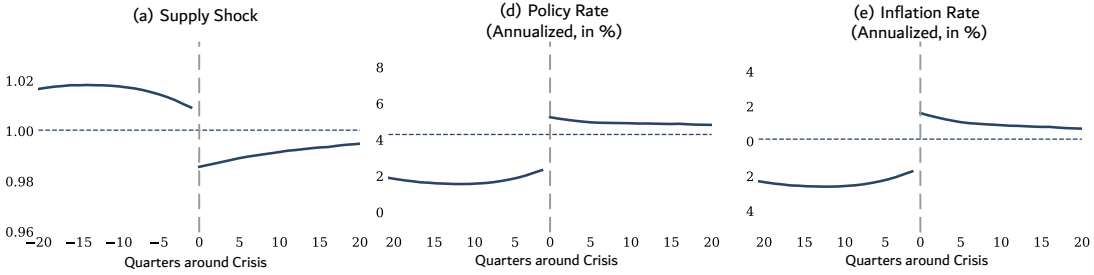
Theory (1/3):
Raising rates to fight supply–driven inflation increases the risk of financial stress

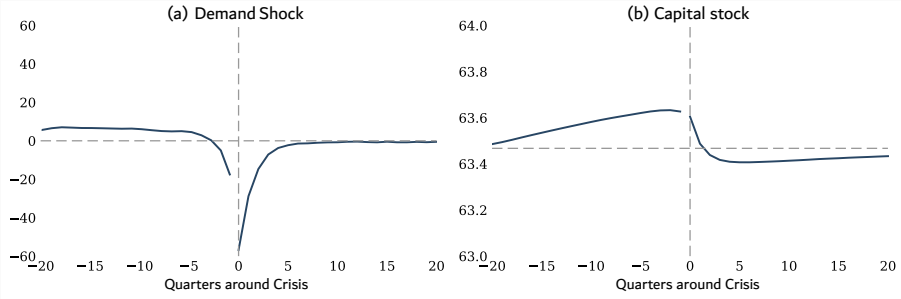
- Contracts aggregate demand in the face of adverse supply shocks ⇒ ↗ Financial stress/crisis



Average dynamics around financial crises with supply shocks only (Boissay, Collard, Galí, Manea 2023)

Theory (2/3):
Raising rates to fight demand–driven inflation reduces the risk of financial stress

- Rein in credit booms $\Rightarrow$ $\searrow$ Financial stress/crisis



Average dynamics around financial crises with demand shocks only (Boissay, Collard, Galí, Manea 2023)

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\begin{aligned}
y_{t+h} - y_{t-1} =& \alpha_h + \beta_h^T 1\{mps_t > 0\} mps_t + \beta_h^{TS/D} 1\{mps_t > 0\} mps_t \pi_t^{s/d} \\
&+ \beta_h^L 1\{mps_t < 0\} mps_t + \beta_h^{LS/D} 1\{mps_t < 0\} mps_t \pi_t^{s/d} \\
&+ A_h \sum_{\tau=1}^{L} \mathcal{C}_{t-\tau} + e_{t+h},
\end{aligned}
$$

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