Inflation and Investors

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EEA Congress 2025

August 27^{th}, 2025

Investors behavior depends on Inflation Source

Inflation may be driven by

- $\downarrow$ Aggregate Supply $\Longrightarrow$ "Bad" inflation
- $\uparrow$ Aggregate Demand $\Longrightarrow$ "Good" inflation

Investors behavior depends on Inflation Source

Inflation may be "good or "bad"

Inflation always leads to selloff of bonds

- Coupon fixed in Nominal terms
- $\uparrow$ Inflation $\Longrightarrow \downarrow$ Real cash flows

Investors behavior depends on Inflation Source

Inflation may be "good or "bad"

Inflation always leads to selloff of bonds

Flows to stocks depend on inflation source

- "Bad" inflation $\implies \downarrow$ stocks
  - $\uparrow$ Inflation $\implies$ Recession $\implies \downarrow$ Future cash flows
- "Good" inflation $\implies \uparrow$ stocks
  - $\uparrow$ Inflation $\implies$ Boom $\implies \uparrow$ Future cash flows

Do investors have different sensitivity to Inflation?

- "Bad" inflation $\Longrightarrow$ $\downarrow$ stocks, $\downarrow$ bonds
- "Good" inflation $\Longrightarrow$ $\uparrow$ stocks, $\downarrow$ bonds

Research question(s)

- How good are different investors at forecasting inflation and its source?
- How do they rebalance following "good" and "bad" inflation shocks?

Do investors have different sensitivity to Inflation?

- "Bad" inflation $\Longrightarrow$ $\downarrow$ stocks, $\downarrow$ bonds
- "Good" inflation $\Longrightarrow$ $\uparrow$ stocks, $\downarrow$ bonds

Research question(s)

- How good are different investors at forecasting inflation and its source?
- How do they rebalance following "good" and "bad" inflation shocks?

Preview of results

- Households are good forecasters of inflation and its source
- "Bad" inflation
  - Households $\Longrightarrow$ $\downarrow$ equity and bond funds
  - Investment Funds $\Longrightarrow$ stronger reaction
  - Insurance Companies $\Longrightarrow$ weaker response
- "Good" inflation
  - Households $\Longrightarrow$ $\uparrow$ equity funds, $\downarrow$ bond funds
  - Investment Funds $\Longrightarrow$ stronger reaction
  - Insurance Companies $\Longrightarrow$ weaker response

Contributions

Inflation $\rightarrow$ **Heterogenous agents** $\rightarrow$ Inflation expectations $\rightarrow$ Asset prices

- Households are good forecasters of inflation Coibion and Gorodnichenko (2015), Känzig (2021)

  $\Rightarrow$ *Households good forecasters of source of inflation*
- Impact of inflation on asset prices Fama and Schwert (1977), French et al. (1983), Piazzesi and Schneider (2006), Campbell et al. (2020), Cieslak and Pflueger (2023)
- Co-movement of stocks and bonds Baele et al. (2010), Viceira (2012), Bekaert et al. (2021), Campbell et al. (2021), Cieslak and Pang (2021), Pflueger (2024)

  $\Rightarrow$ *What investors are behind the co-movement*
- Fund flows, heterogeneous investors and portfolio re-balancing Greenwood and Shleifer (2014), Berk and van Binsbergen (2016),Vayanos and Vila (2021), Gabaix and Koijen (2024), Coppola (2025)

  $\Rightarrow$ *Role of inflation*

Overview

Overview

How "Good" and "Bad" inflation impact Stocks and Bonds

Cieslak et al. (2023)

- Representative agent with CRRA utility
- Risk premium for two-period nominal bond

$$cov_t(m_{t+1}, \pi^e_{t+1}) = -\gamma cov_t(c_{t+1}, \pi^e_{t+1})$$

  - m_{t+1}: SDF
  - c_{t+1}: consumption
  - π^e_{t+1}: expected inflation
  - γ: risk aversion parameter

How "Good" and "Bad" inflation impact Stocks and Bonds

Risk premium for the two-period nominal bond

$$cov_t(m_{t+1}, \pi^e_{t+1}) = -\gamma cov_t(c_{t+1}, \pi^e_{t+1})$$

- $cov_t(c^e_{t+1}, \pi^e_{t+1}) < 0$: "Bad" inflation
  - Inflation high when consumption low ("recession")
  - Outflows from both stocks and bonds $\implies$ co-movement> 0

- $cov_t(c^e_{t+1}, \pi^e_{t+1}) > 0$: "Good" inflation
  - Inflation high when consumption high ("boom")
  - Inflows into stocks, Outflows from bonds $\implies$ co-movement< 0

Overview

Data

Off-the-shelf inflation shocks

- "Bad" inflation shocks Känzig (2021)
  - Shifts in oil futures prices in narrow window around OPEC announcements
  - "Exogenous" to macro or demand-side factors
- "Good" inflation shocks Baumeister and Hamilton (2019)
  - SVAR with sign restrictions
  - Isolate supply- and demand-driven shocks

Expectations on inflation, economic growth, unemployment

- Households: European Commission
- Professional Forecasters: ECB

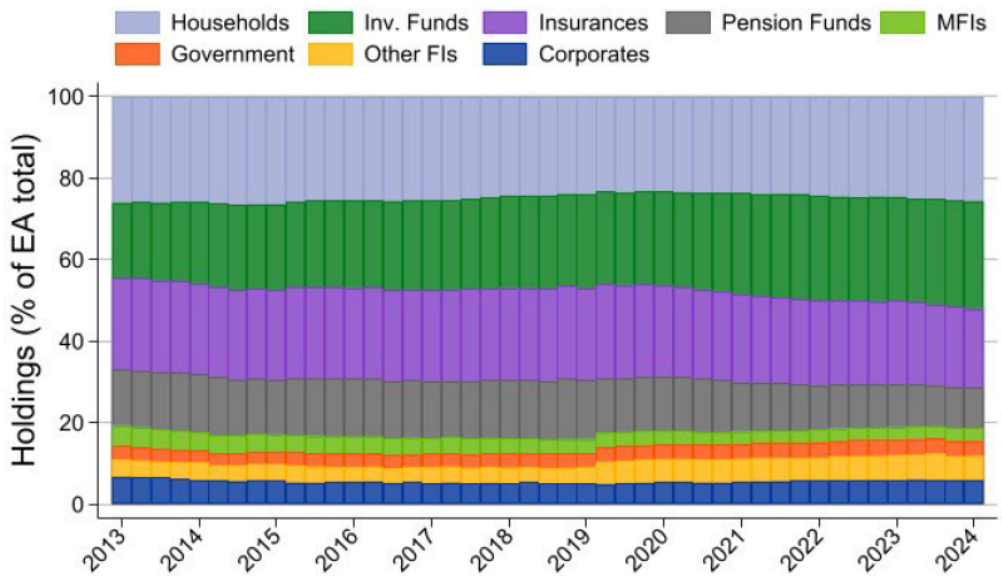
Bond and equity funds flows and investors

- Thomson Reuters Lipper $\Longrightarrow$ monthly flows and performance
- ECB proprietary database $\Longrightarrow$ quarterly fund share ownership
- Sample:
  - At least 50% of fund share's asset is EA-owned
  - At least two such fund-shares per fund
  - Oct 2013 - June 2024

Mutual Funds Holdings

Shock $\Rightarrow$ Investors purchase (redeem) shares $\Rightarrow$ Fund managers buy (sell) assets $\Rightarrow$ Asset prices

- Investor-security level data
  - Different investors hold same mutual fund
  - Same risk exposure
- Open-end mutual funds
  - Shares not in fixed supply
  - All investors can buy and redeem daily
- HH holdings of mutual funds sizeable, while direct holdings small



Overview

Same Fund issues Fund Shares targeting different Investors

- Investor heterogeneity across different fund shares **within the same fund**
  - Fund shares issued by same fund have same underlying portfolio...
  - ...but differ in min investment amounts, fees etc., catering to different investor types

- Panel local projections with fund fixed effects

$$y_{f,s,t+h} = \beta_f + \phi_h Shock_t + \beta_{f,s,h} \mathbf{X}_{t-j} + \epsilon_{f,s,t,h}$$

- Panel local projections with fund-month fixed effects:

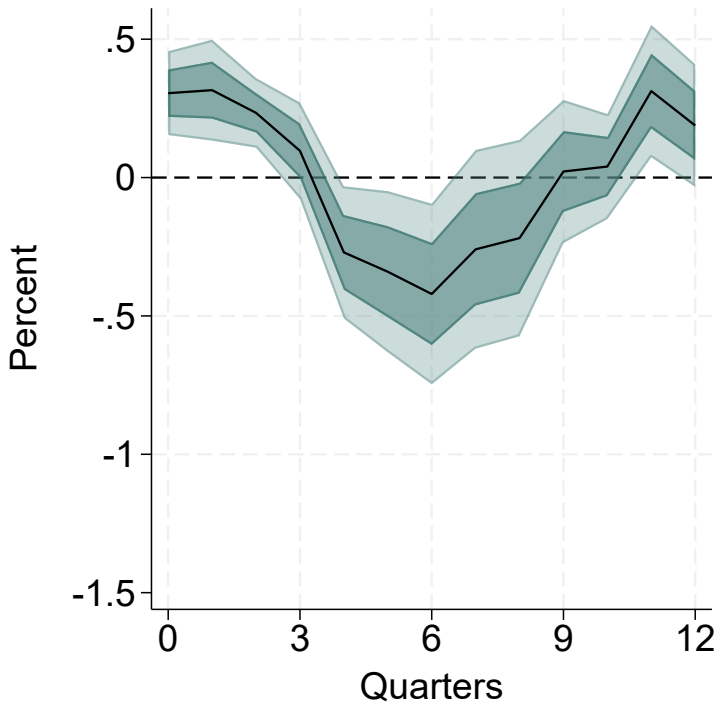
$$y_{f,s,t+h} = \beta_f \times \theta_t + \phi_h Shock_t \times InvType_{f,s,t} + \phi_s InvType_{f,s,t} + \beta_{f,s,h} \mathbf{X}_{t-j} + \epsilon_{f,s,t,h}$$

  - β_f: fund fixed effect
  - θ_t: time fixed effect
  - $Shock_t$: demand-driven or cost-push inflationary shock
  - $InvType_{f,s,t}$: HH, IC, or IF
  - $\mathbf{X}_{t-j}$: 3 lags of dependent variable, shocks, overnight rate, business cycle controls, financial controls

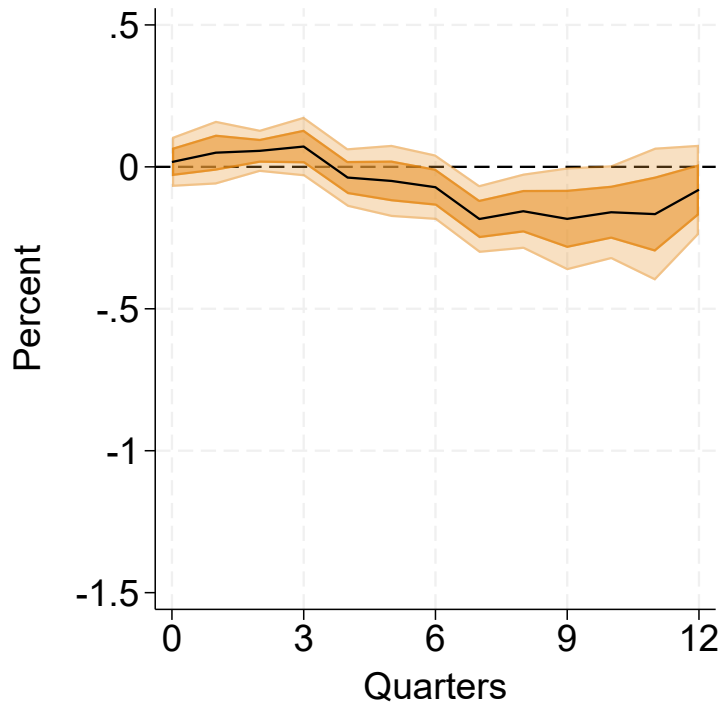
Overview

Households are good forecasters of inflation

Cost-push shock and Inflation Expectations



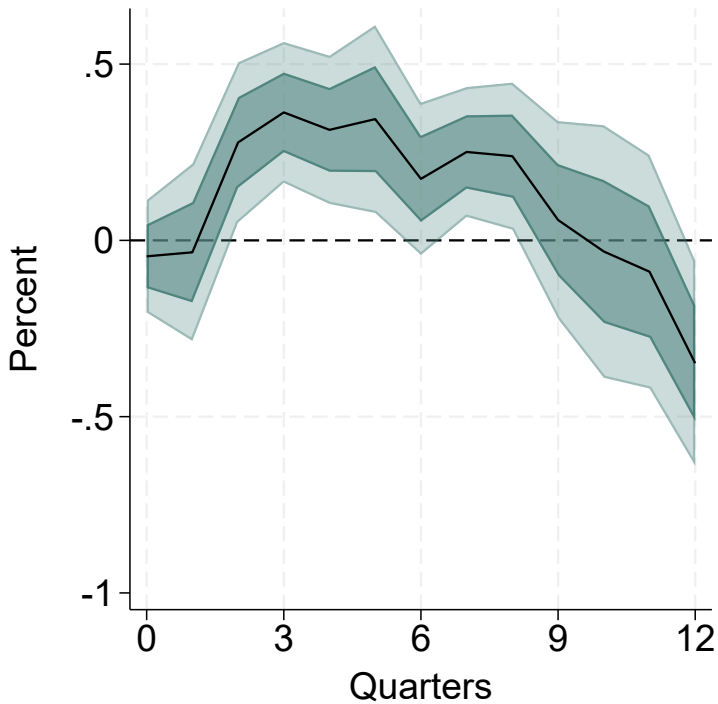
(a) Households



(b) Professional Forecasters

Households are good forecasters of inflation Source

Cost-push shock and Unemployment Expectations



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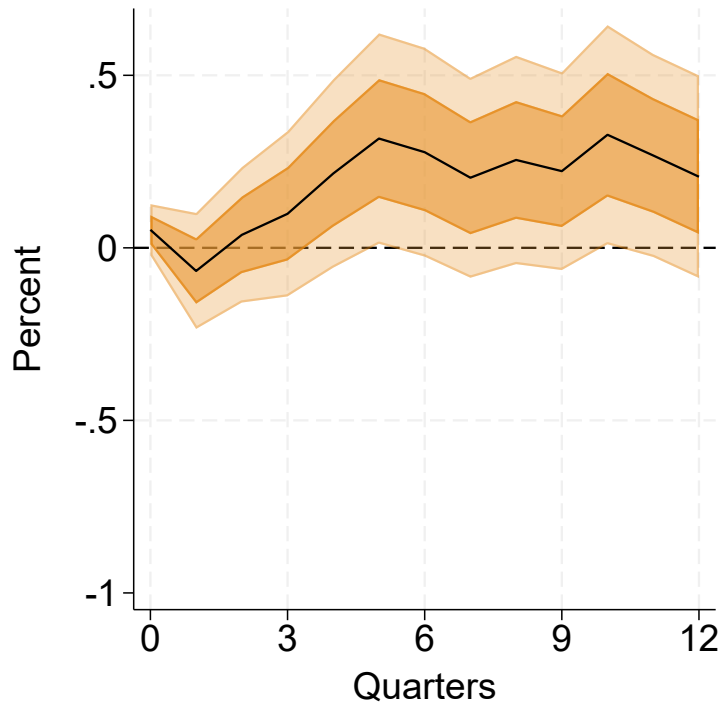
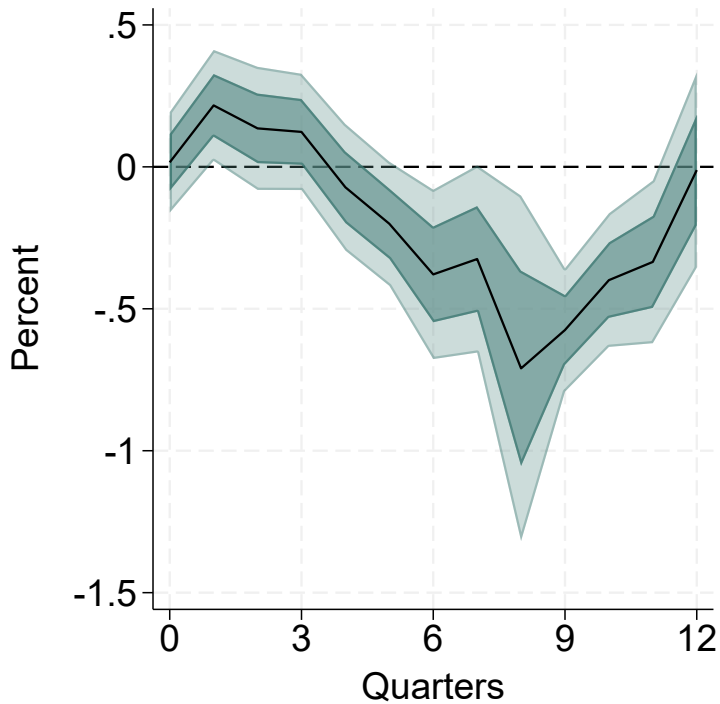


(b) Professional Forecasters

Households are good forecasters of inflation

Aggregate Demand shock and Inflation Expectations



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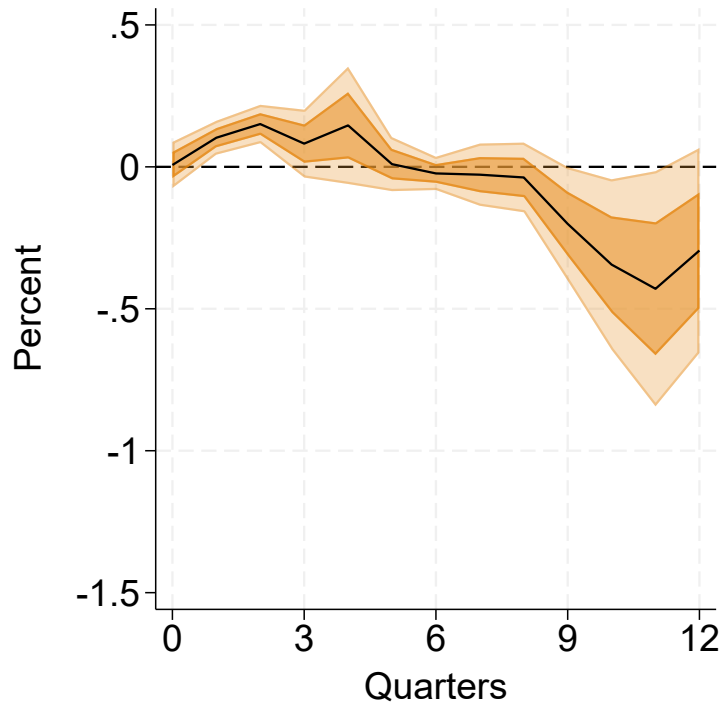

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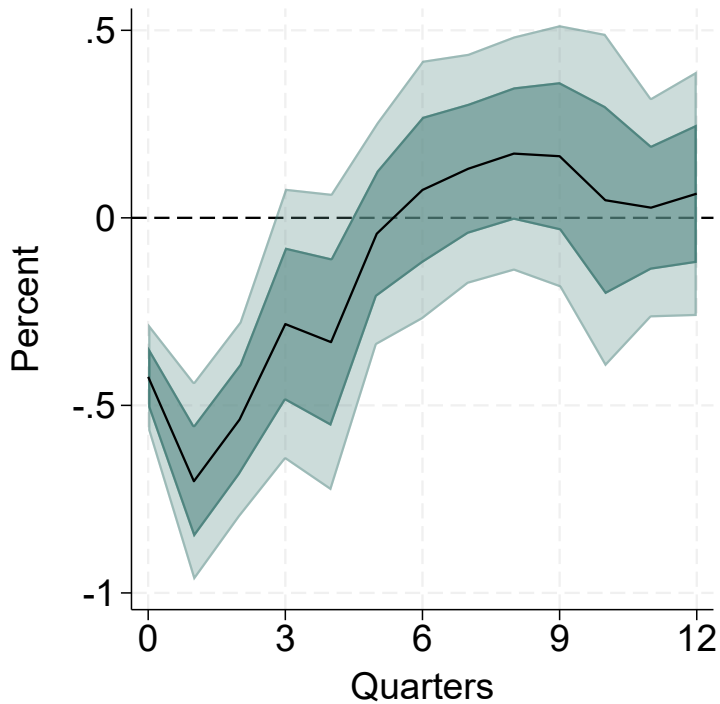
Households are good forecasters of inflation Source

Aggregate Demand shock and Unemployment Expectations



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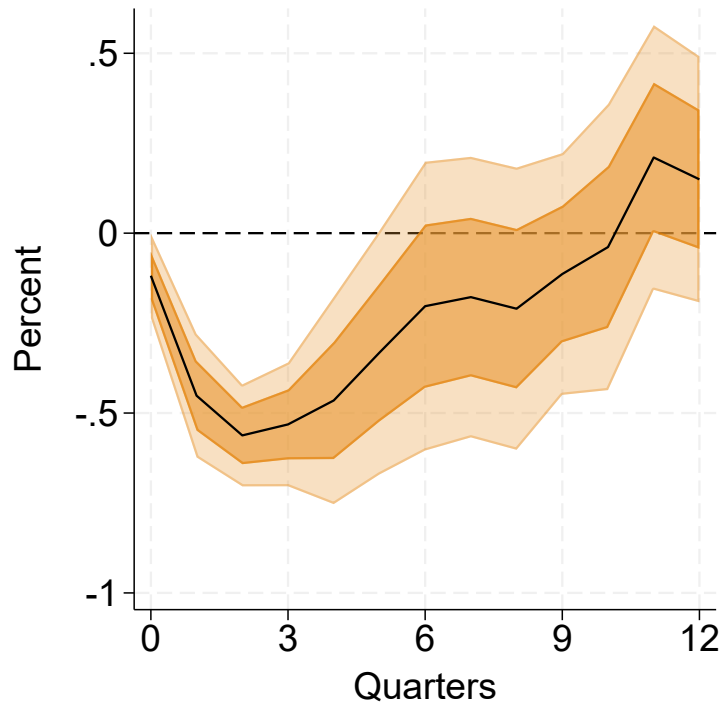


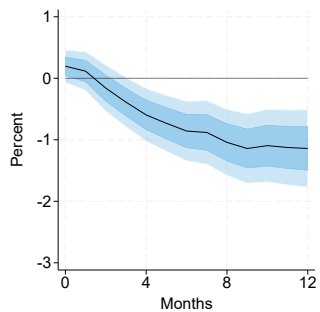
(b) Professional Forecasters

Overview

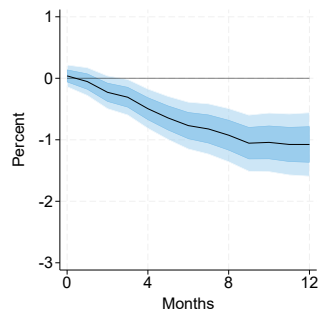
Cost-push shocks $\Longrightarrow$ Outflows from Bond and Equity funds

$$y_{f,s,t+h} = \beta_f + \phi_h Shock_t + \beta_{f,s,h}\mathbf{X}_{t-j} + \epsilon_{f,s,t,h}$$

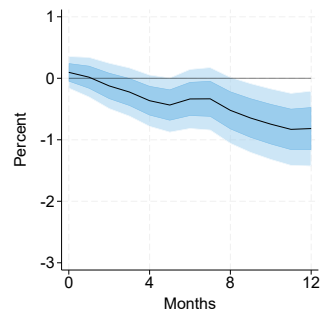
- Theory (representative agent): co-movement > 0
- IF $>$ HH $>$IC



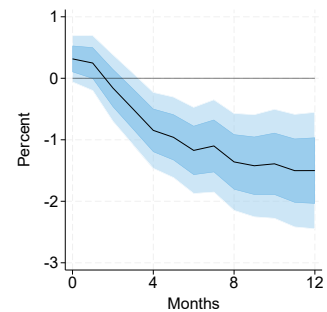
(a) All (Bond)



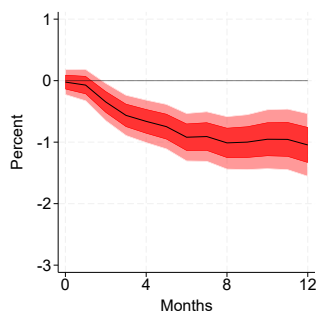
(b) HH (Bond)



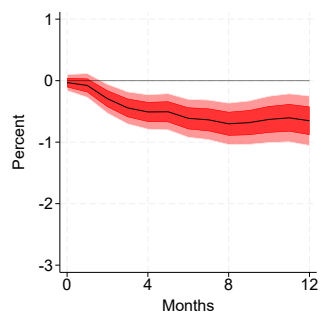
(c) IC (Bond)



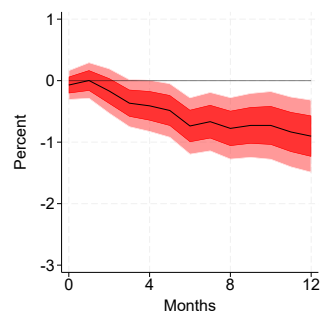
(d) IF (Bond)



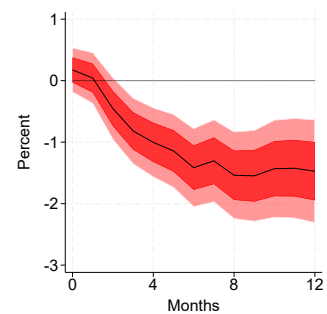
(e) All (Equity)



(f) HH (Equity)



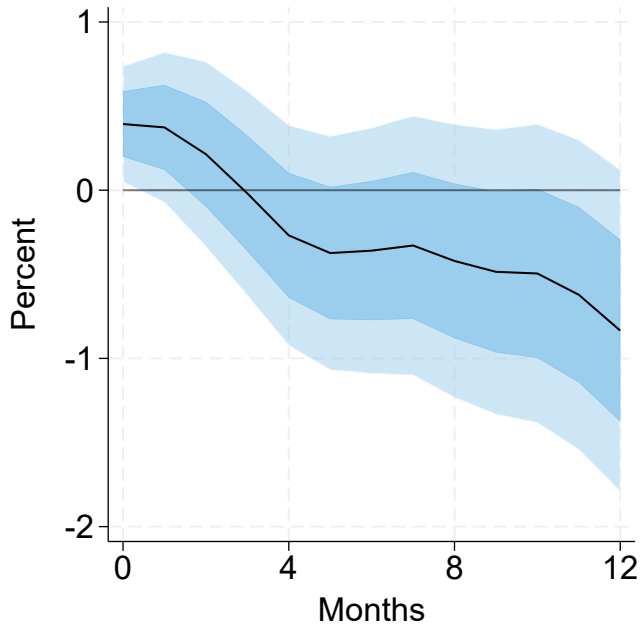
(g) IC (Equity)



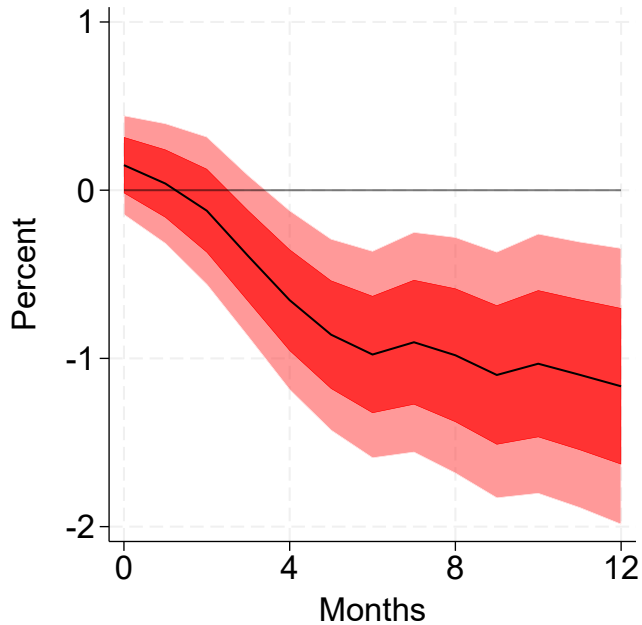
(h) IF (Equity)

IF react more than HH, but HH do react

$$y_{f,s,t+h} = \beta_f \times \theta_t + \phi_h Shock_t \times InvType_{f,s,t} + \phi_s InvType_{f,s,t} + \beta_{f,s,h}\mathbf{X}_{t-j} + \epsilon_{f,s,t,h}$$



(a) Bond



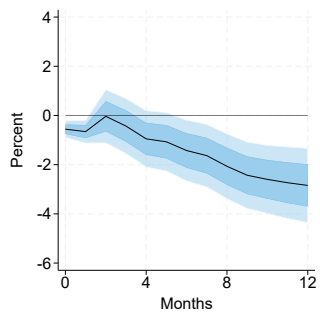
(b) Equity

Fund-shares held by Investment funds
Households base category

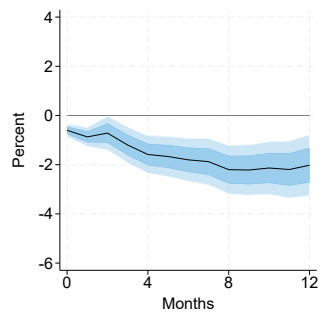
Demand shocks $\Longrightarrow$ Outflows from Bond, Inflows to Equity

$$y_{f,s,t+h} = \beta_f + \phi_h Shock_t + \beta_{f,s,h}\mathbf{X}_{t-j} + \epsilon_{f,s,t,h}$$

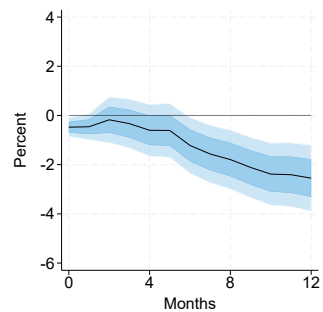
- Theory (representative agent): co-movement < 0
- IF $>$ HH $>$ IC



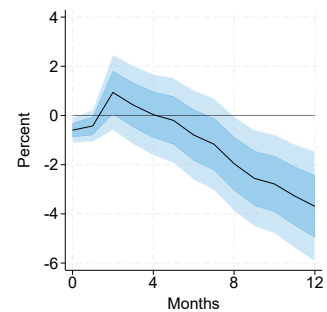
(a) All (Bond)



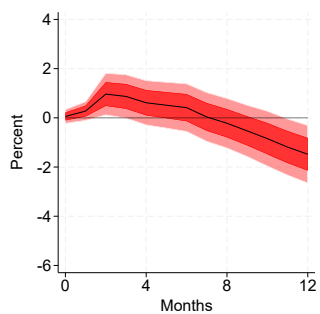
(b) HH (Bond)



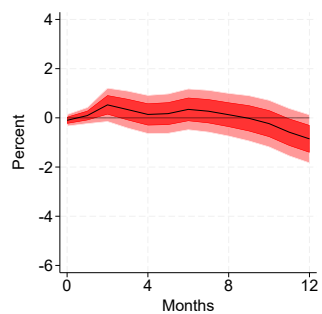
(c) IC (Bond)



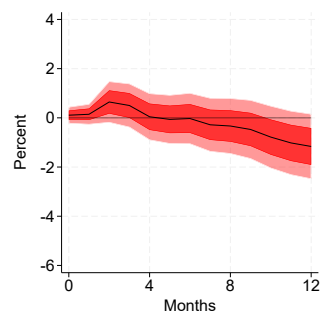
(d) IF (Bond)



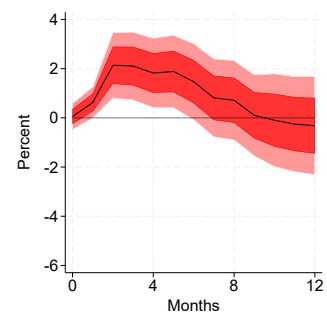
(e) All (Equity)



(f) HH (Equity)



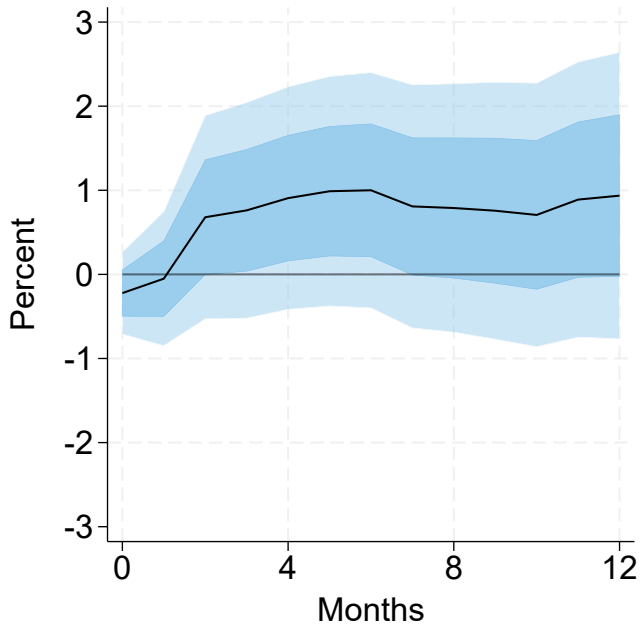
(g) IC (Equity)



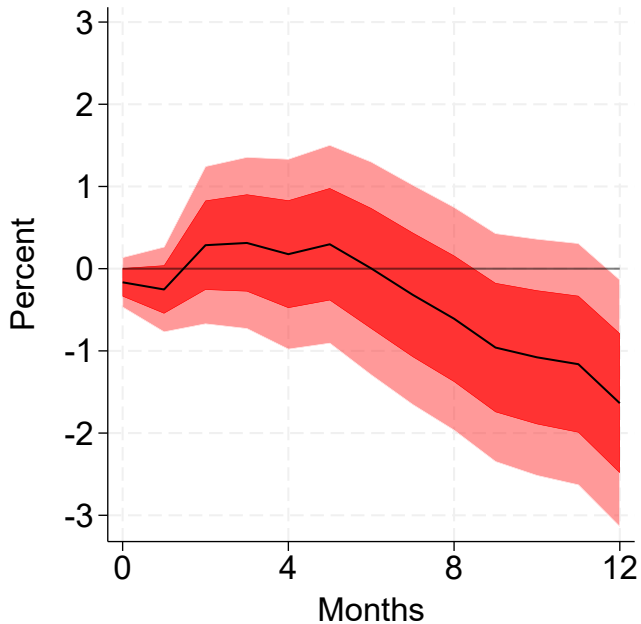
(h) IF (Equity)

IF react more than HH

$$y_{f,s,t+h} = \beta_f \times \theta_t + \phi_h Shock_t \times InvType_{f,s,t} + \phi_s InvType_{f,s,t} + \beta_{f,s,h} \mathbf{X}_{t-j} + \epsilon_{f,s,t,h}$$



(a) Bond



(b) Equity

Fund-shares held by Investment funds
Households base category

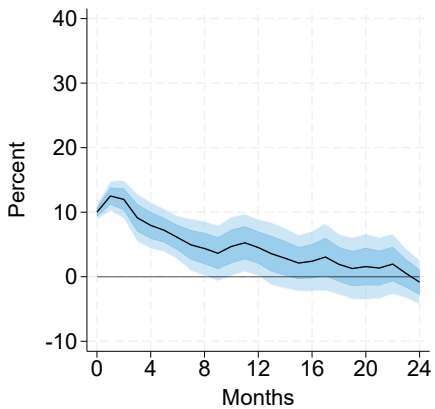
Overview

Final Remarks

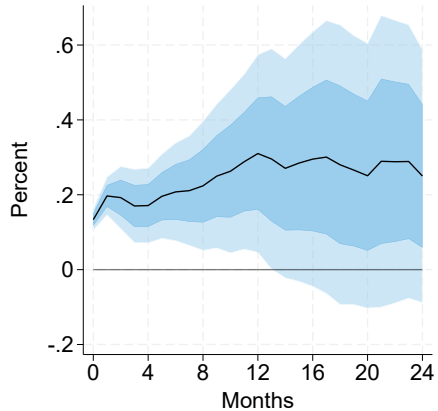
- Among bond and equity fund shareholders
  - Investment funds: react strongly and quickly
  - Households: smaller magnitudes than IF but sizeable
  - Insurance companies: more passive, esp. for demand-driven shocks

- Takeaways
  - HH are not "sleepy": good forecasters of inflation and its source
  - HH re-balance in the same direction as sophisticated investors (IF)
    $\Longrightarrow$ affect asset prices

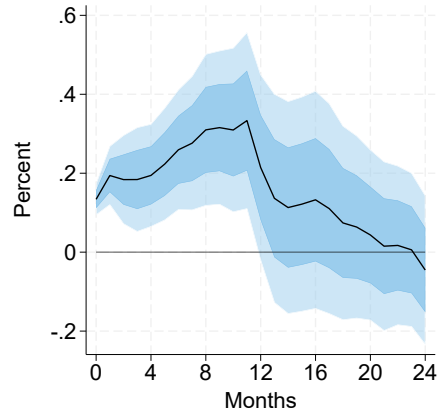
Response of macro variables to cost-push shocks



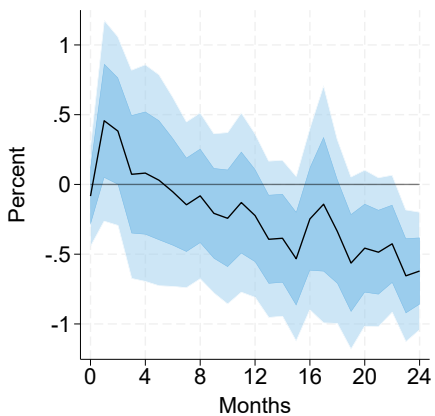
(a) Real Oil Price



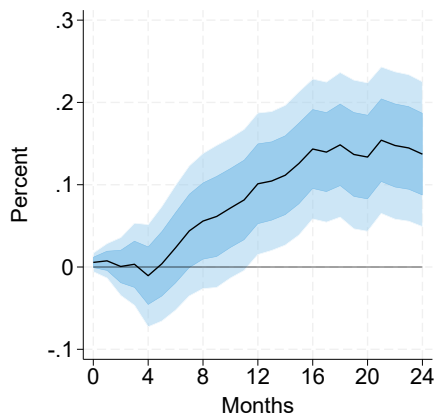
(b) Price Index



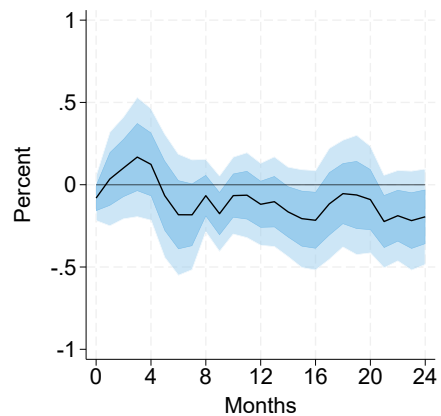
(c) Inflation Rate



(d) Industrial Production

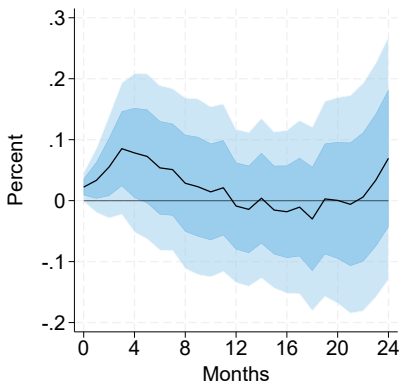


(e) Unemployment Rate

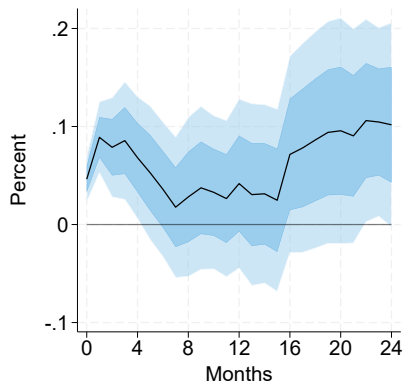


(f) Real Consumption

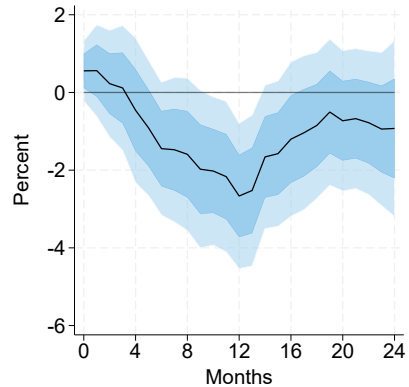
Response of financial variables to cost-push shocks



(a) Overnight Rate



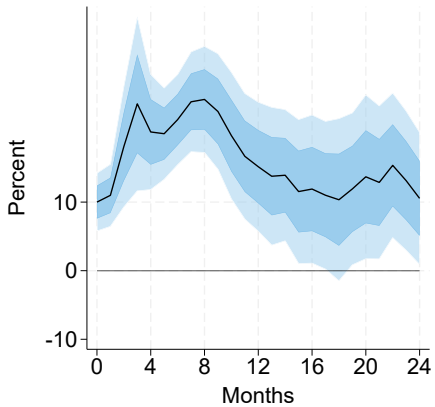
(b) 10-year German Yield



(c) STOXX Europe 600

Bad inflation shocks $\rightarrow$ prices of bonds and equity $\downarrow$

Response of macro variables to demand shocks



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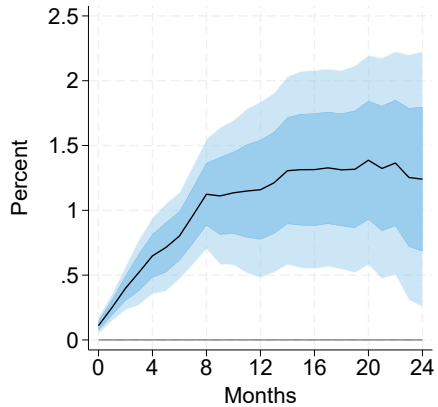
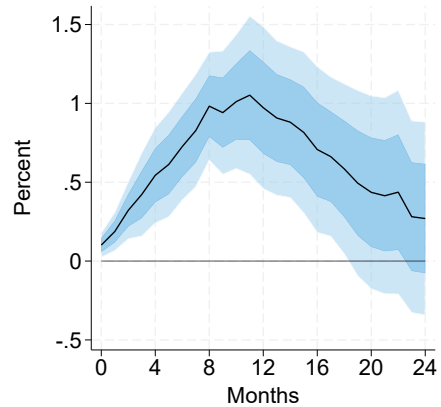
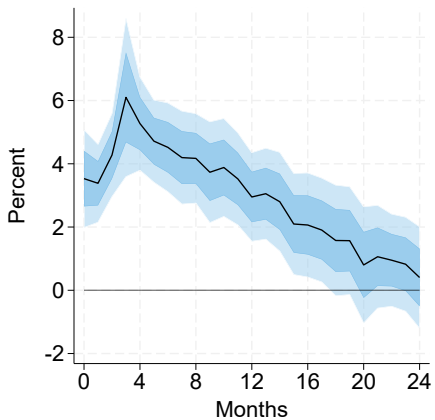


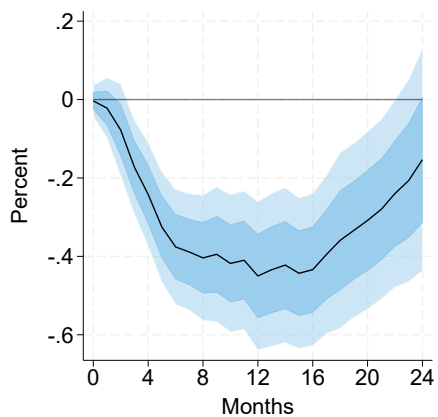
(b) Price Index



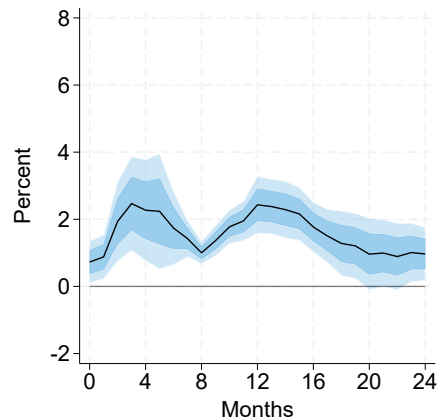
(c) Inflation Rate



(d) Industrial Production

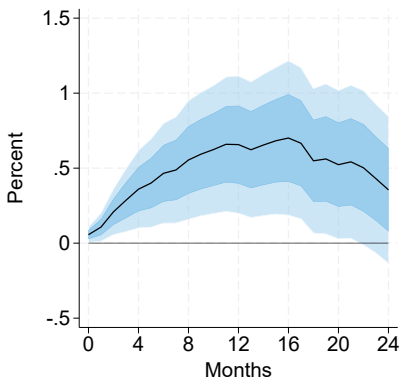


(e) Unemployment Rate

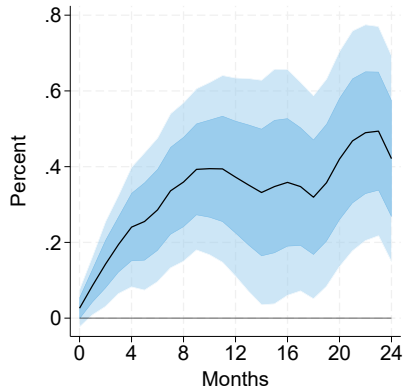


(f) Real Consumption

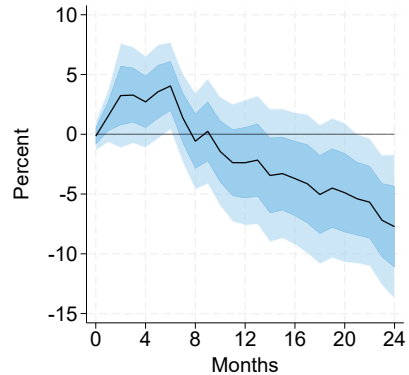
Response of financial variables to demand shocks



(a) Overnight Rate



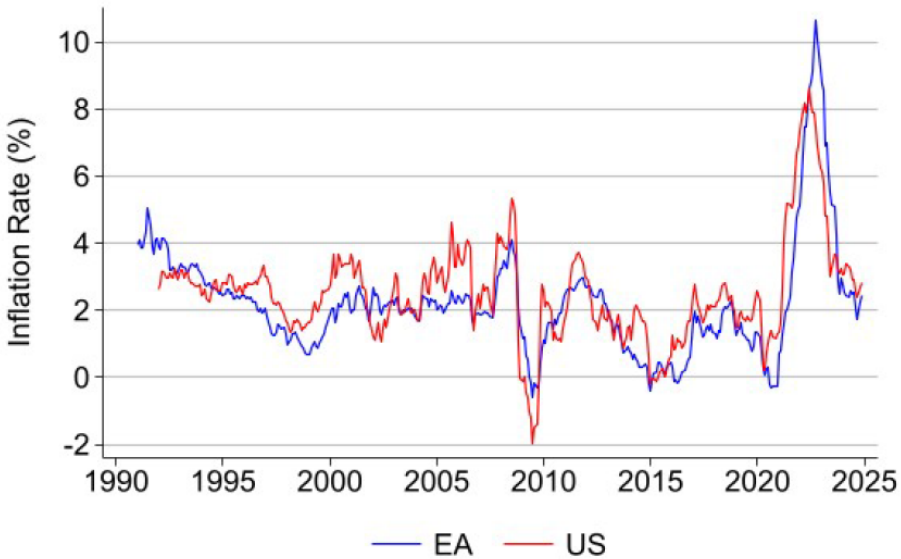
(b) 10-year German Yield



(c) STOXX Europe 600

Good inflation shocks $\rightarrow$ prices of bonds $\downarrow$ and equity $\uparrow$

Inflation in the euro area and in the US



Note: Annual inflation rate (%), seasonally adjusted. Monthly data, Jan. 1991 - Dec. 2024.
Source: Eurostat and FRED.

The 2022-24 inflation surge:

- the biggest in developed economies since the 1970s
- peak inflation: 8.6% in the US, 10.6% in the euro area (EA)

Conceptual framework: "Good" and "bad" inflation

From Cieslak and Pflueger (2023):

-1em0em

Interest rate on one-period bond:

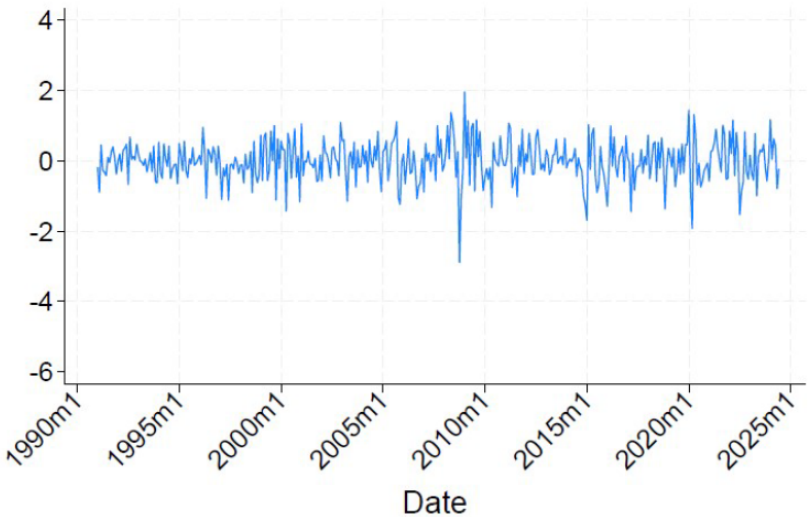
$$i_t = \underbrace{r + E_t \pi_{t+1}}_{\text{Fisher Equation}} + \underbrace{\text{Cov}_t(m_{t+1}, \pi_{t+1})}_{\text{Risk Premium}} - \frac{1}{2}\sigma_\pi^2$$

Interest rate on two-period bond:

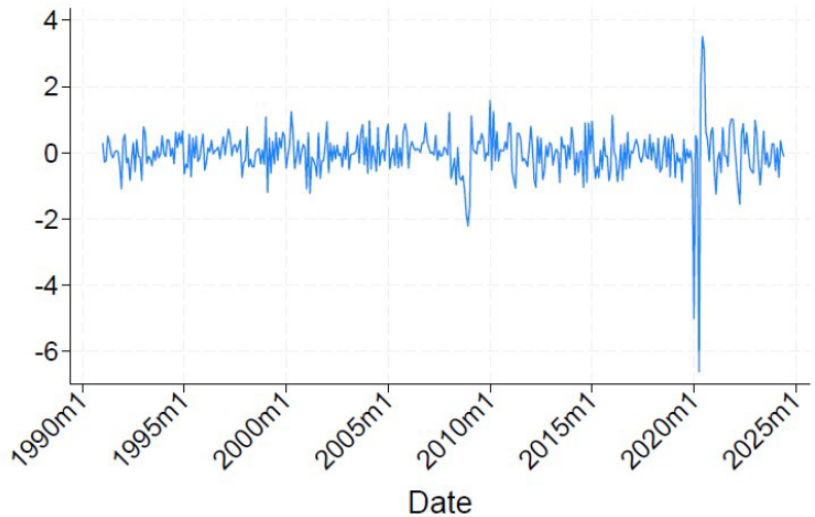
$$i_t^{(2)} = \underbrace{\frac{i_t + E_t i_{t+1}}{2}}_{\text{Expectations Hypothesis}} = \frac{1}{2}\underbrace{\text{Cov}_t(m_{t+1}, \pi_{t+1}^e)}_{\text{Risk Premium}} - \left(\frac{1}{2}\text{Cov}_t(\pi_{t+1}, \pi_{t+1}^e) + \frac{1}{4}\text{Var}(\pi_{t+1}^e)\right.$$

"Bad" inflation: $\text{Cov}_t(m_{t+1}, \pi_{t+1}^e) > 0$ "Good" inflation: $\text{Cov}_t(m_{t+1}, \pi_{t+1}^e) < 0$

Time-series of inflation shocks



(a) Cost-push shocks



(b) Demand-driven shocks

Econometric set-up: Macro local projections

$$y_{i,t+h} = \beta_0^i + \phi_h^i Shock_t + \beta_h^i \mathbf{X}_{t-1} + \epsilon_{i,t,h} \quad (1)$$

$y_{i,t}$: aggregate variable of interest

$Shock_t$: cost-push or demand-driven shocks, respectively

$\mathbf{X}_{t-1}$: 3 lags of the dependent variable, shocks, overnight rate, business cycle control, inflation control

Data: Two novel data sources

1. Securities Holdings Database Aggregated by Sector (SHSS):
   - mandatory data reporting, collected by the national central banks in the EA
   - frequency: quarterly
   - holdings: all securities (ISIN-level) held in the EA or with an EA custodian
   - holder information: investor type (24 different types) by country
2. Refinitiv's Lipper for Investment Fund Management:
   - detailed fund-level data (**bond, equity**, mixed, alternative. . .)
   - in/outflows on fund share level
   - fund performance (returns net of fees)

Data: Combining SHSS and Lipper information

Merged SHSS-Lipper sample comprises of:

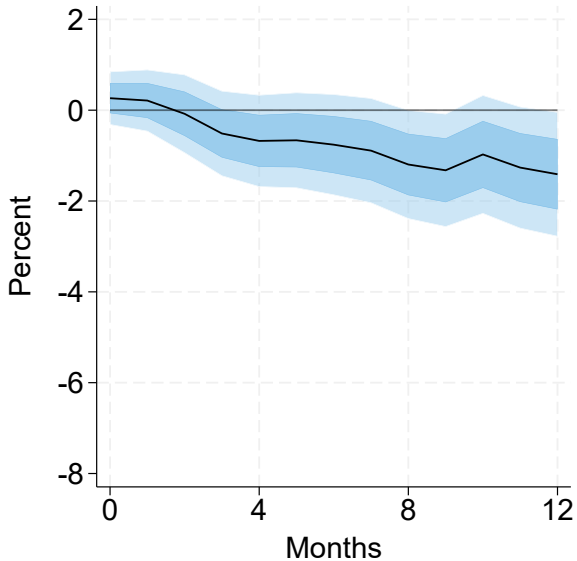
- security-level panel of bond or equity mutual fund-shares
- fund performance and net flows at the month-fund-share level
- October 2013 to June 2024

Fund ownership measured on the fund-share level in the preceding quarter

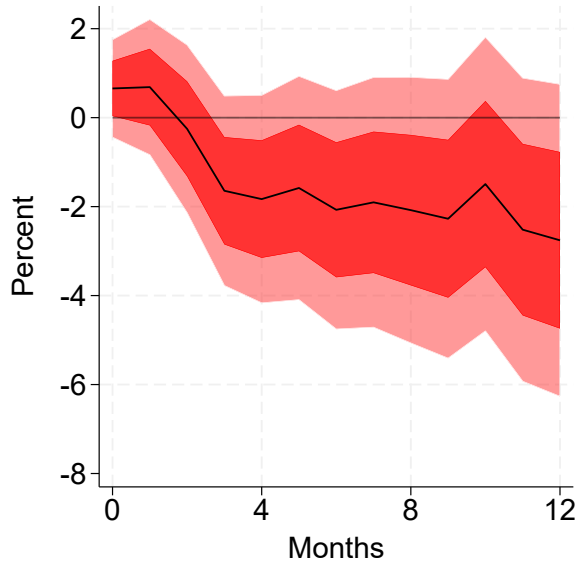
Study funds satisfying 2 criteria:

- EA ownership of a fund share at least 50% of TNA
- at least two such fund-shares per fund (to hold fund portfolio fixed and exploit variation across fund-shares of the same fund)

Prediction 1: Cost-push shocks → returns



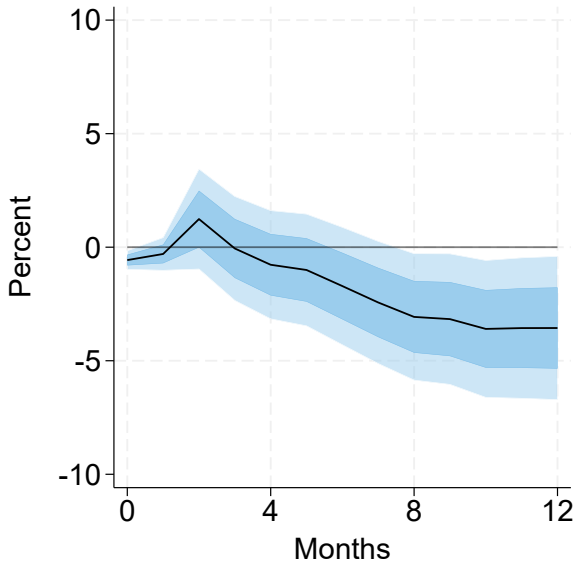
(a) Bond



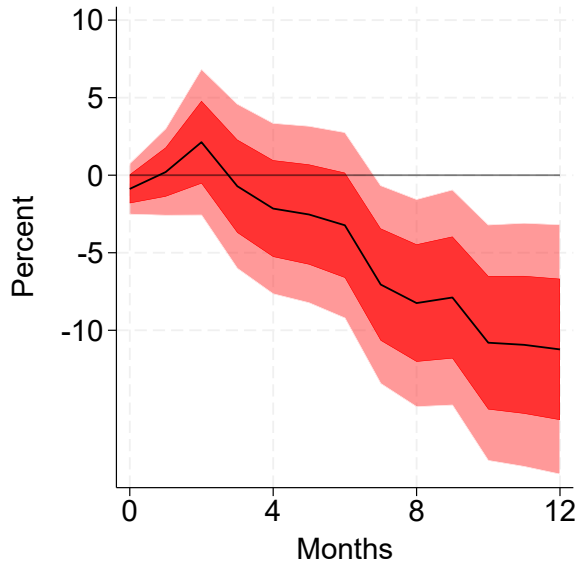
(b) Equity

Bad inflation shocks → bond returns ↓ and equity ↓

Prediction 2: Demand-driven shocks → returns



(a) Bond



(b) Equity

Good inflation shocks → bond returns ↓ and equity ↑

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