Growth of non-bank financial intermediaries, financial stability, and monetary policy

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(Sintra CB Forum 2025)

LEIBNIZ INSTITUTE SAFE
Sustainable Architecture for Finance in Europe

Objective

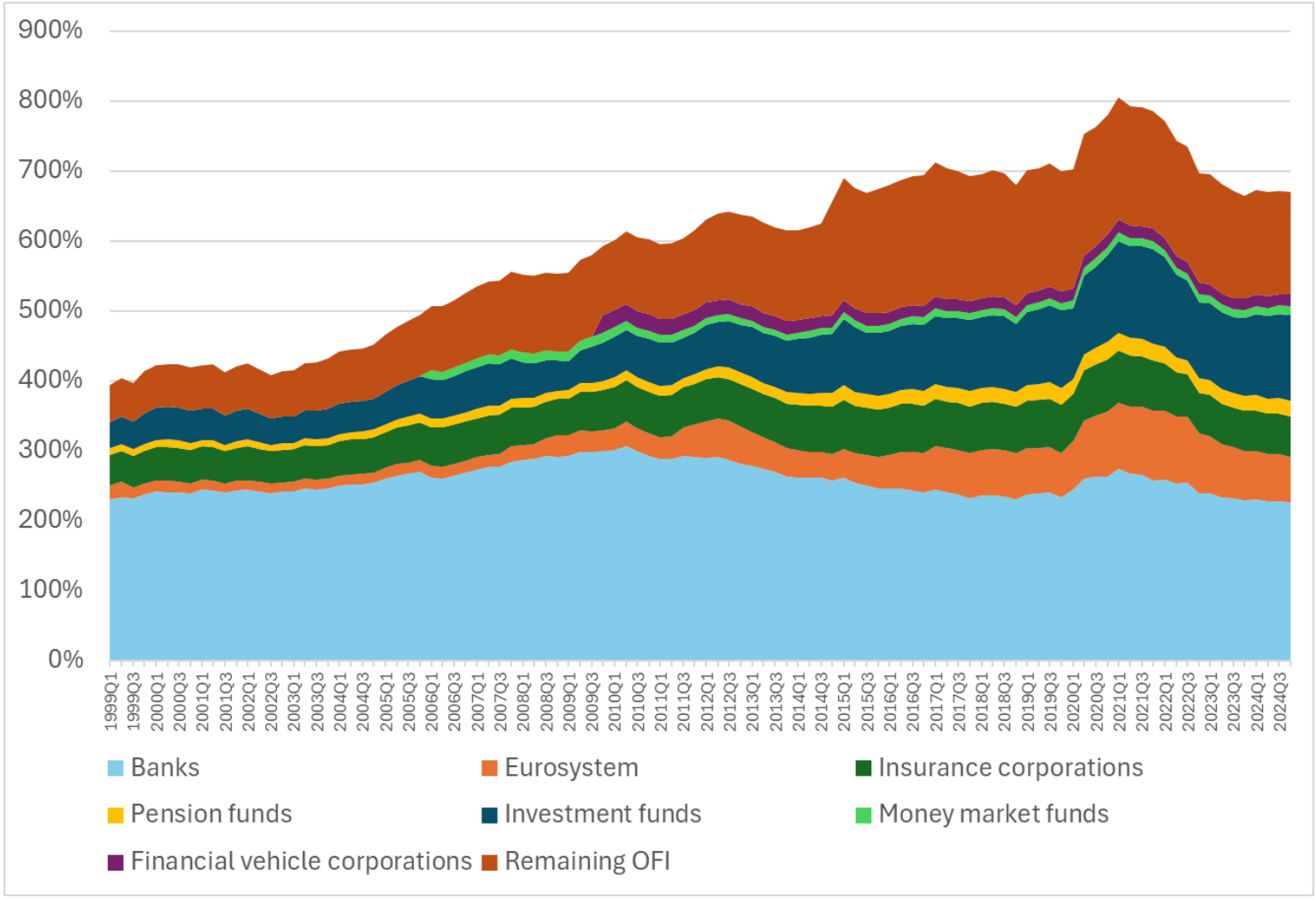
- How large is the financial system in the euro area? How does it compare with the US?

- How much are EU NBFIs supporting the real economy?

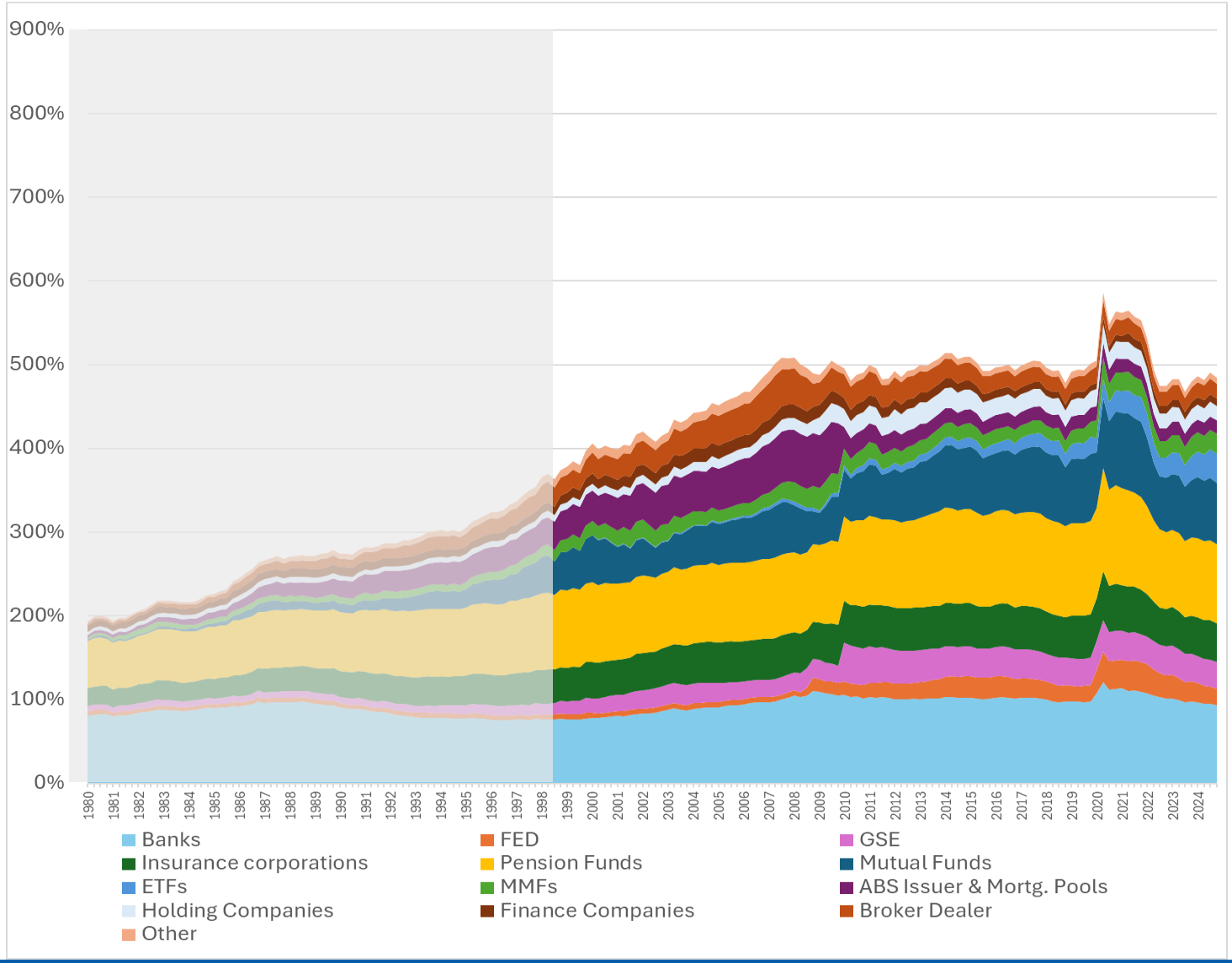
- How NBFIs reshape financial stability and Monetary Policy transmission?
  - Should NBFIs access CB balance sheets?

- How could EU NBFI help (or benefit from) CMU/S&I?

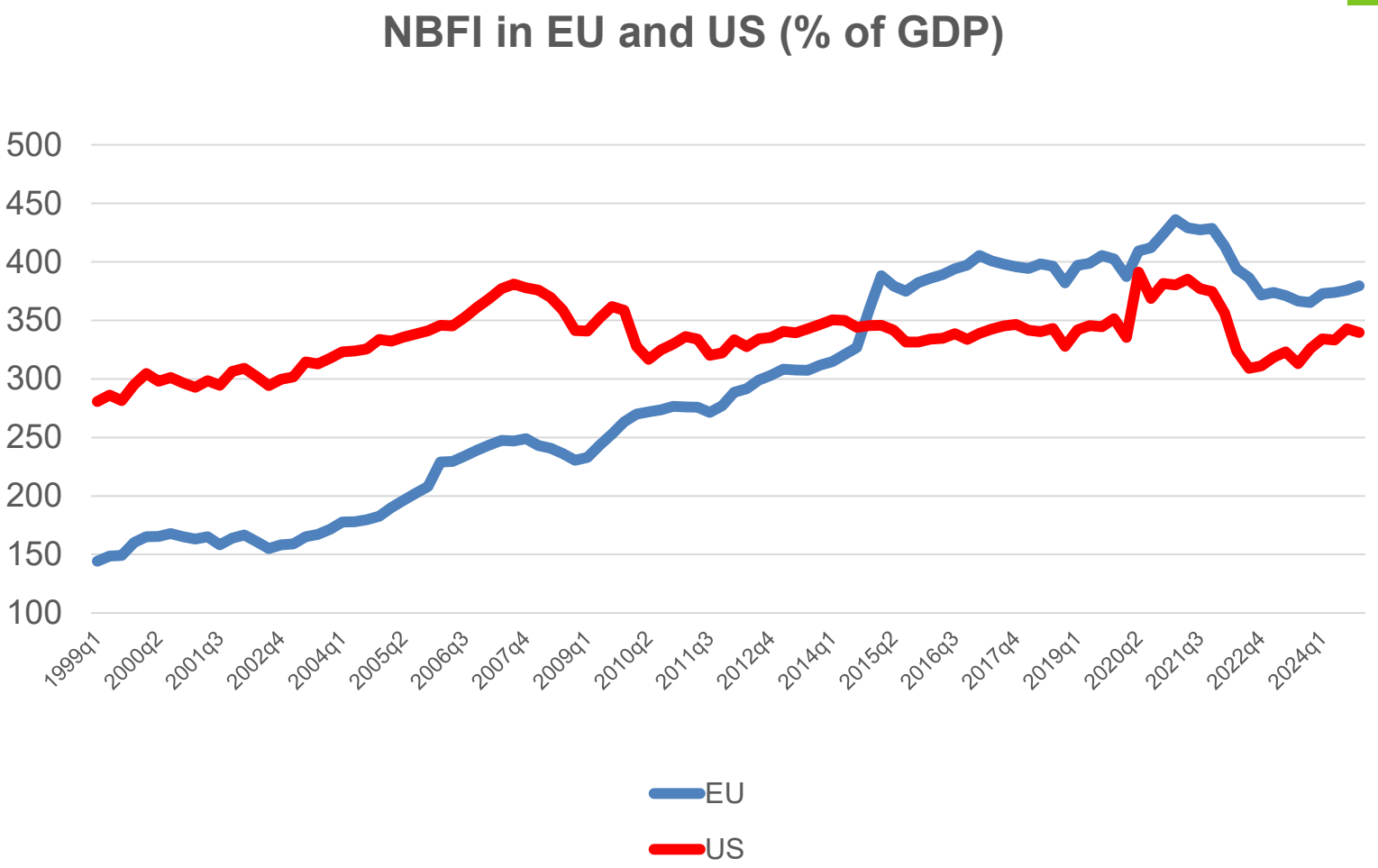
Financial System in Europe (% of GDP)



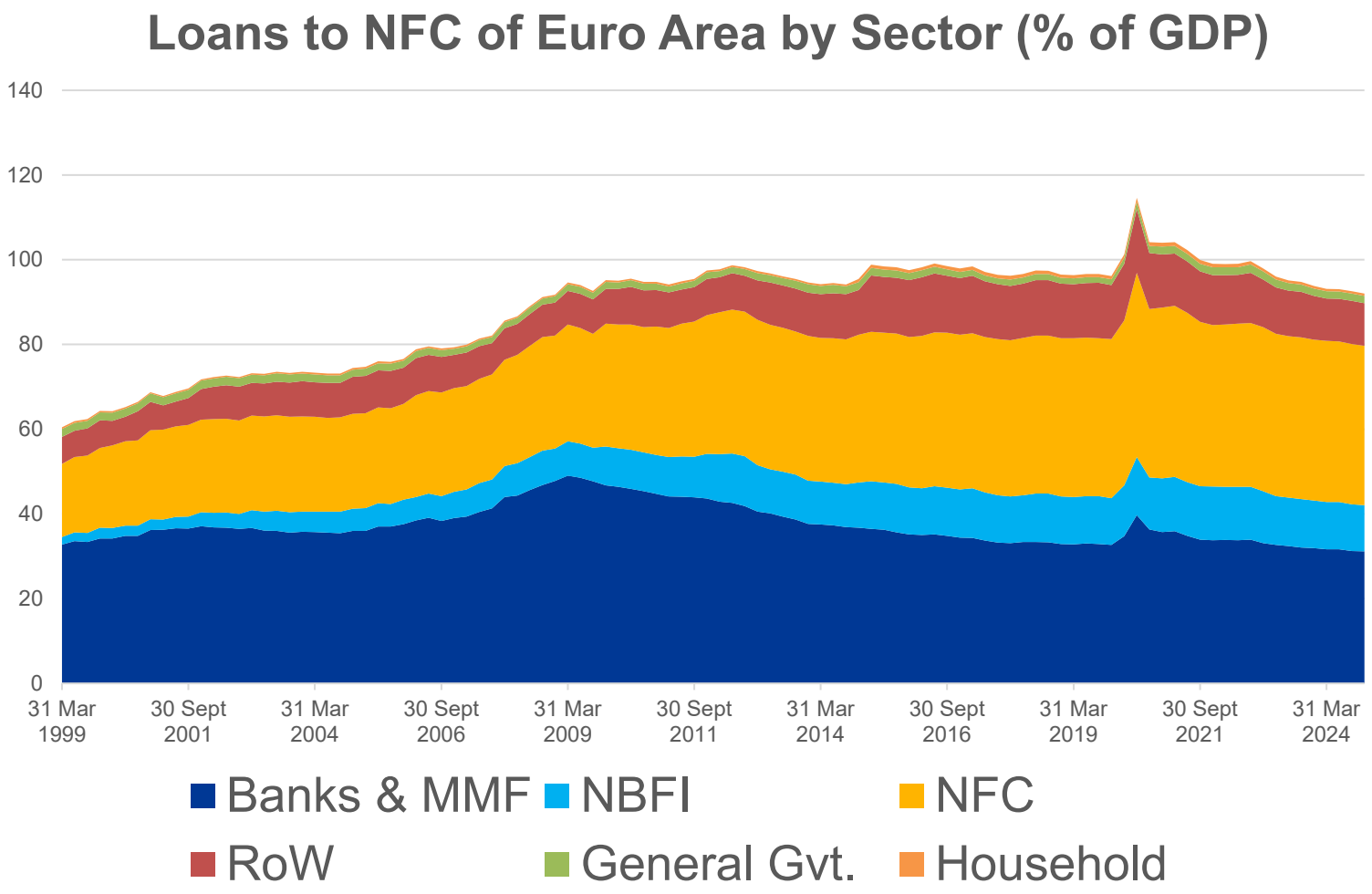
Financial System in the US (% of GDP)



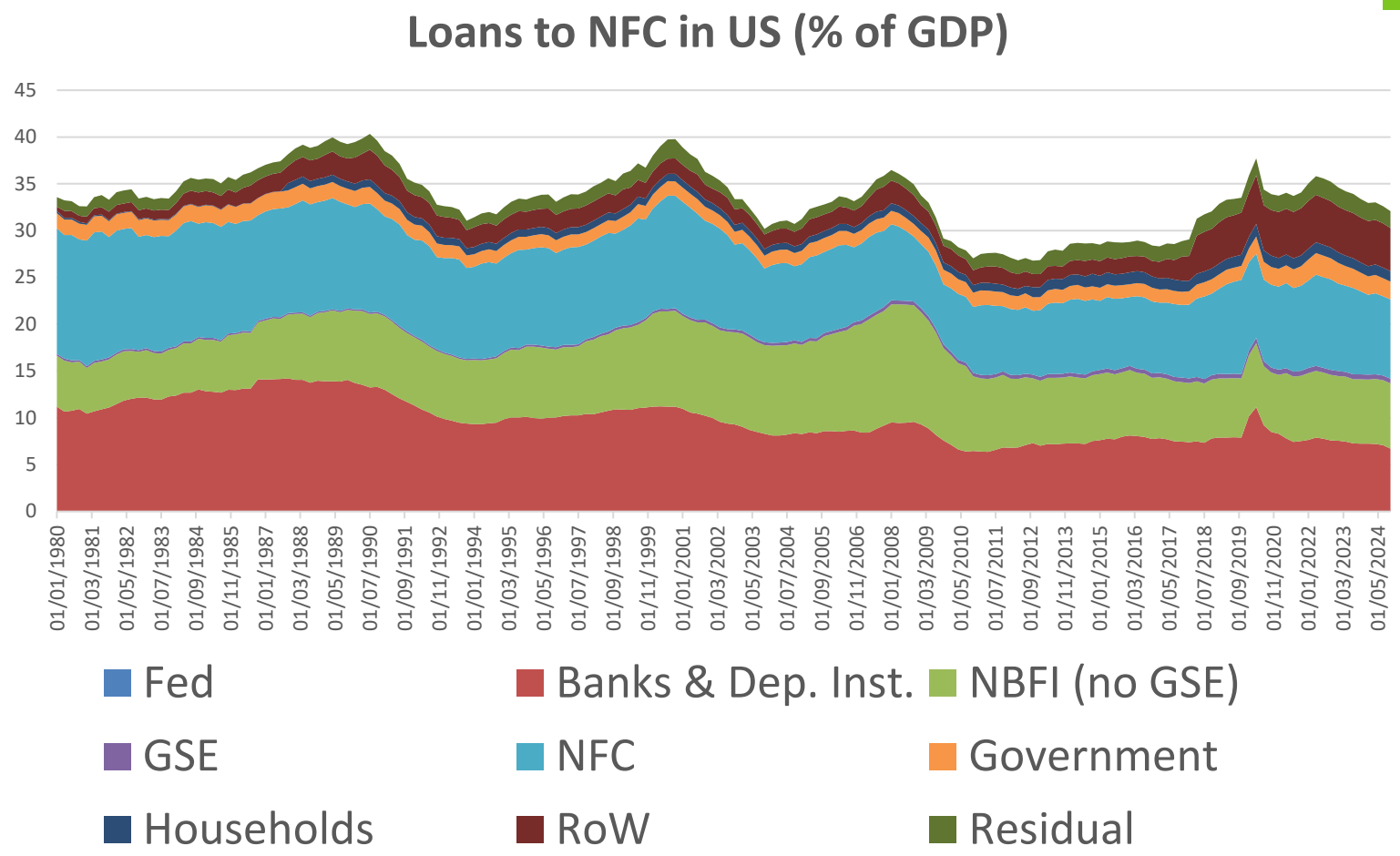
A comparison



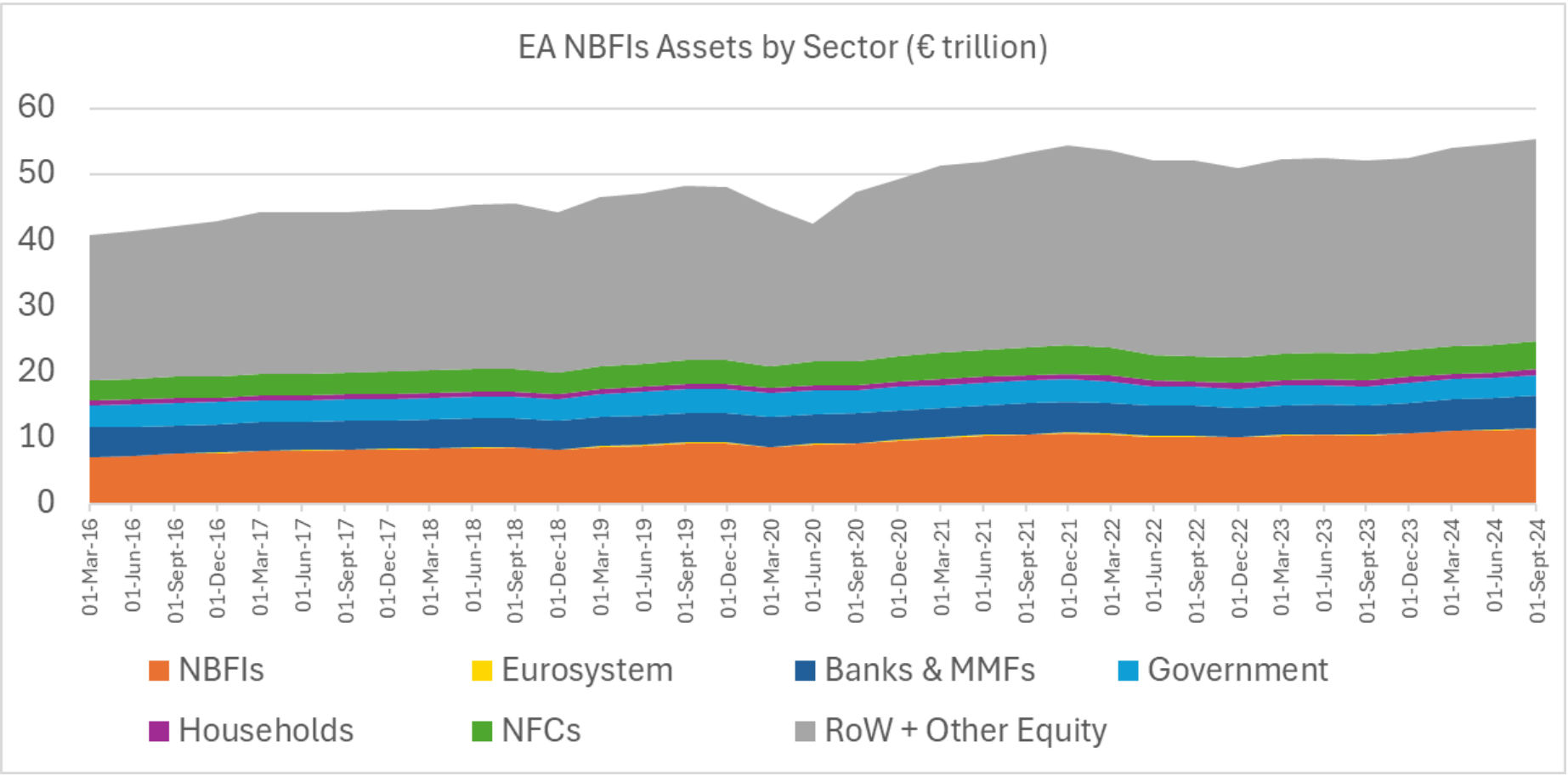
EU NBFI and the real economy



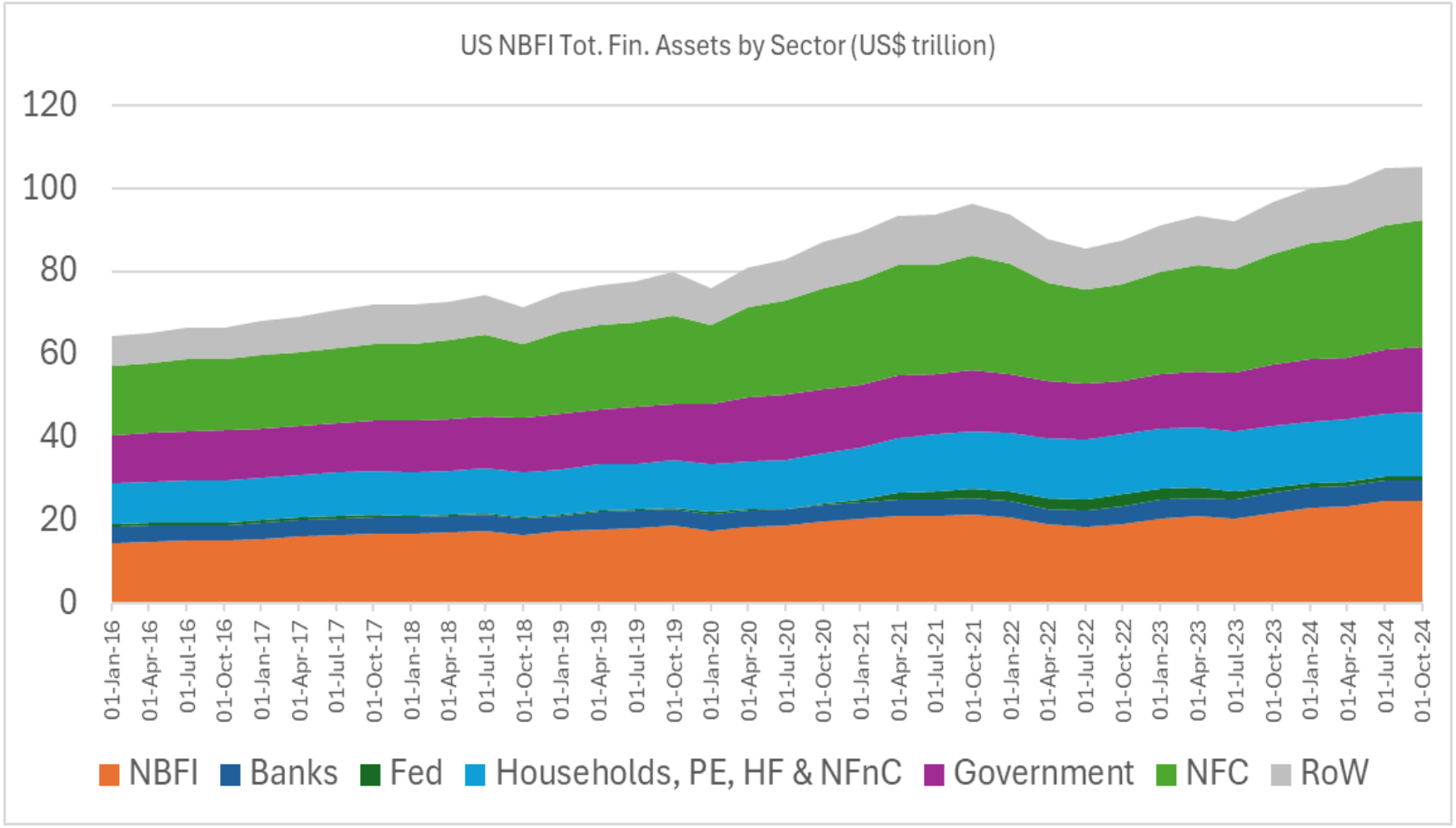
US NBFI and the real economy



Where are NBFIs investing? NBFI Asset Allocation



And the US? US NBFI Asset allocation



Why is EU NBFI sector so large and largely investing abroad?

The Euro Area:

- *has lower GDP growth*
- *financial system has lower direct access to Capital Markets and has longer intermediation chains*
- *saving rates are higher than in the US*
- *savings are largely managed by global asset managers (as for banks, we do not have NBFI champions like BlackRock)*
- *has an underdeveloped, fragmented, segmented Capital Market (including the sovereign bond market)*
- *……*

EU NBFIs are an opportunity for domestic capital market development. (so far missed!)

Suggestion

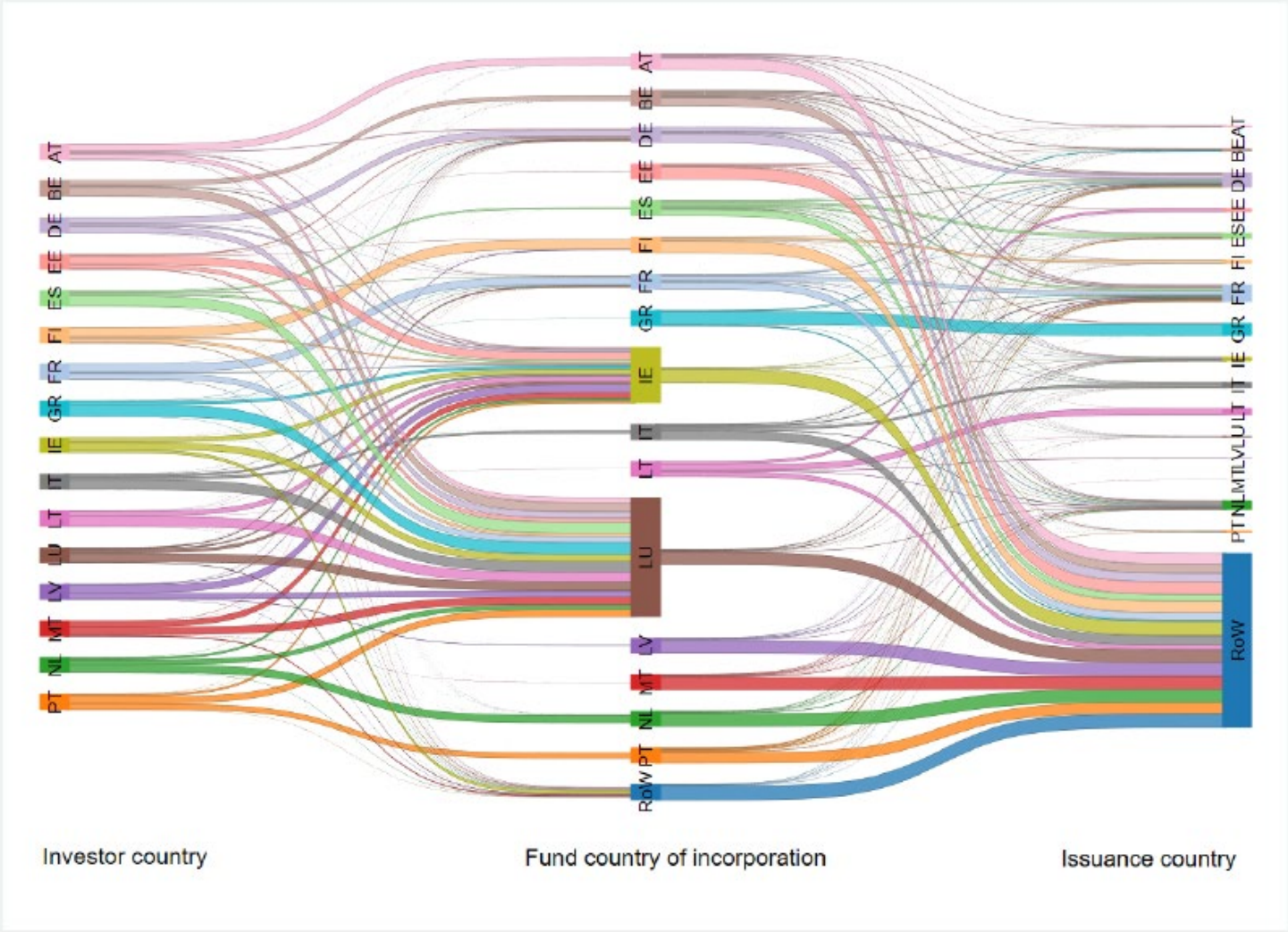
Develop the Savings and Investment Union:

- Advancing this initiative would help channel **more NBFI capital within Europe**, boosting domestic funding sources and strengthening integration, including sovereign bond markets.

Important role for NBFIs in developing S&IU:

- NBFIs face fewer cross-border barriers than banks!

Any investment cross border barriers?



Sources: Lambert, Molestina Vivar and Wedow (2024), Figure 2

But they are not so efficient….

Category	Europe	United States
Equity Funds	1.47	0.40
Bond Funds	0.94	0.38
Mixed/Hybrid Funds	1.48	0.58
ETF	0.23	0.16
Money Market Funds	0.16	0.22

Key takeaway and suggestion

Untapped Potential of NBFIs:
NBFIs could **foster cross-border capital flows**

Enhance Capital Market Infrastructure:

- well-functioning securitization system of both **covered bonds** and **Asset-Backed Securities** (e.g., for mortgages and SMEs)

- Private Credit and Private Equity (?)

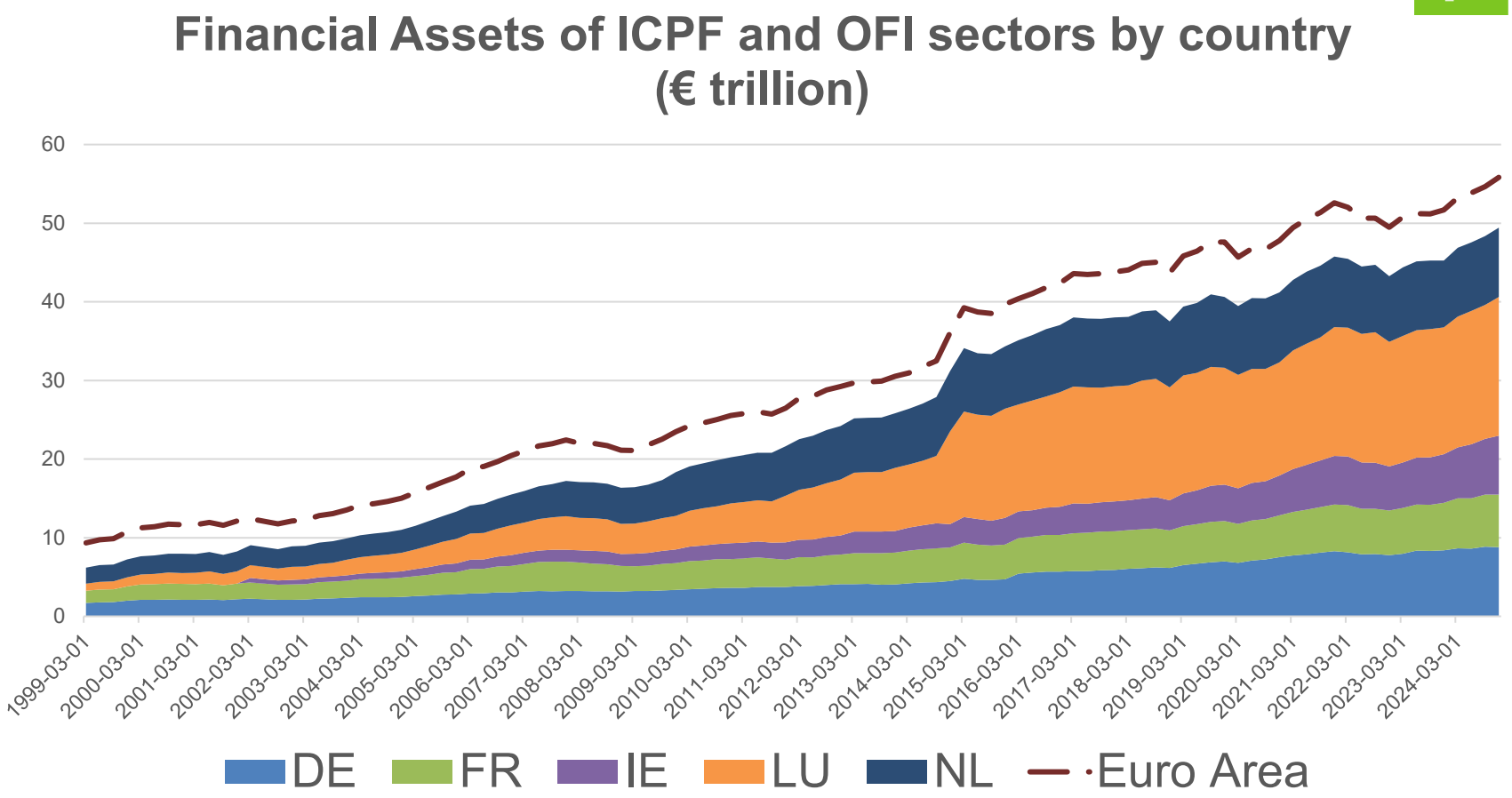
What about NBFIs and systemic risk?

- *5 traditional indicators*: **size**, **interconnectedness**, substitutability, complexity, and cross-jurisdictional activity

- *6 specific indicators*: Leverage, Liquidity Mismatch, Maturity Transformation, **Risk Concentration** and Correlation, procyclicality of behavior and **links to core financial institutions** (see Acharya, Cetorelli and Tuckman (2024))

- *3 other indicators*:
  1. **Opacity and Data Gaps**
  2. **Inadequate Supervisory Coordination and Fragmentation**
  3. **Moral Hazard and Central Bank Dependence**

2. Inadequate Supervisory Coordination and Fragmentation



Need for a **unified supervisory mechanism**

3. Moral Hazard and Central Bank Dependence

- Expectations of central bank interventions during crises, such as liquidity backstops or asset purchases, create moral hazard.

- NBFIs may engage in excessive risk-taking under the assumption of eventual rescue.

- This undermines market discipline, can lead to misallocation of resources and financial instability (see Cieslak et al. (2021) and Buiter et al. (2023)).

The Role of NBFIs for Monetary Policy

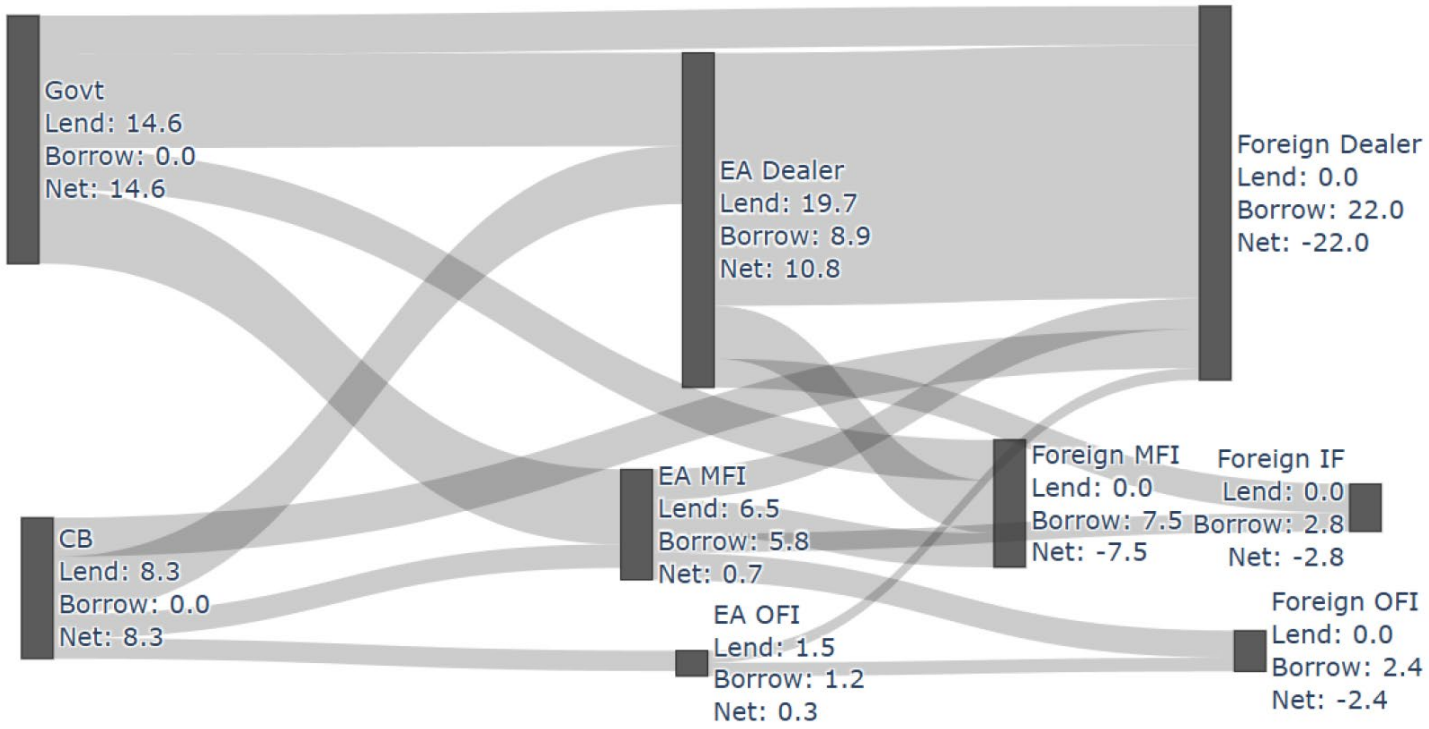
- Credit and Deposit Channel
- Exchange rate channel
- Expectations Channel
- Risk-Taking, Collateral, and Asset Pricing Channels
- **Interest Rate Channel**
  - **large footprint of NBFI in financial markets (ESRB NBFI Monitor 2025)**

Should CBs give access to their balance sheets to NBFI?

NBFI are at the significant actors in the Repo market

Bund Repo Market Structure in 2022: Flows between Sectors

(bn EUR)

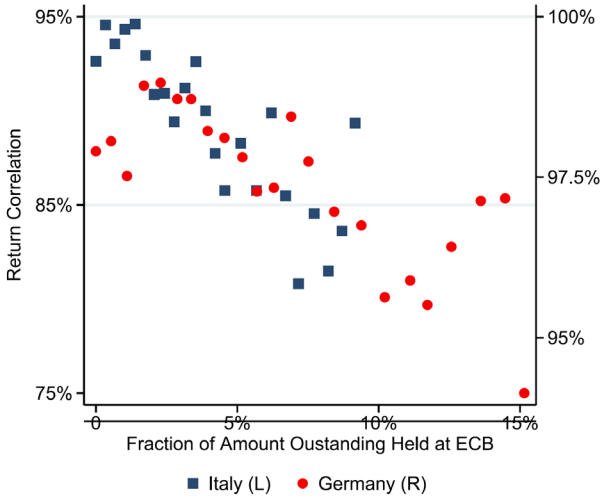


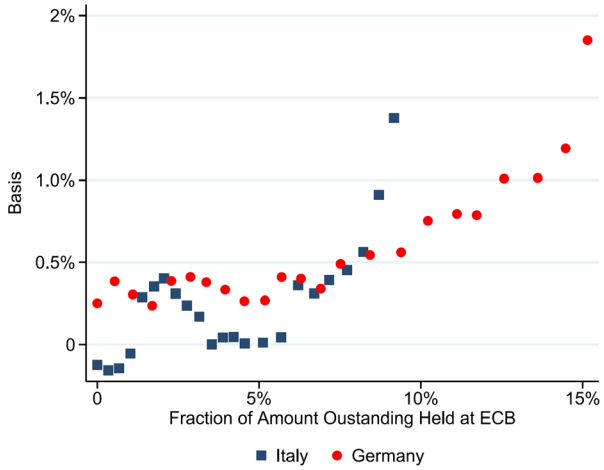
Sources: SFTDS and MOPDB.
Notes: Authors' calculations. This is a reproduction of Figures 5 in Linzert et al. 2025.Sample of German government bonds for the year 2022.

MP and Repo market

- CB affects Repo market by:
  - Setting short term rates (but only for FI having access to the CB
  - Supply and demand of bonds, the collateral largely used in the Repo market
  - QE: significant reduction of Bund availability: Scarcity effect

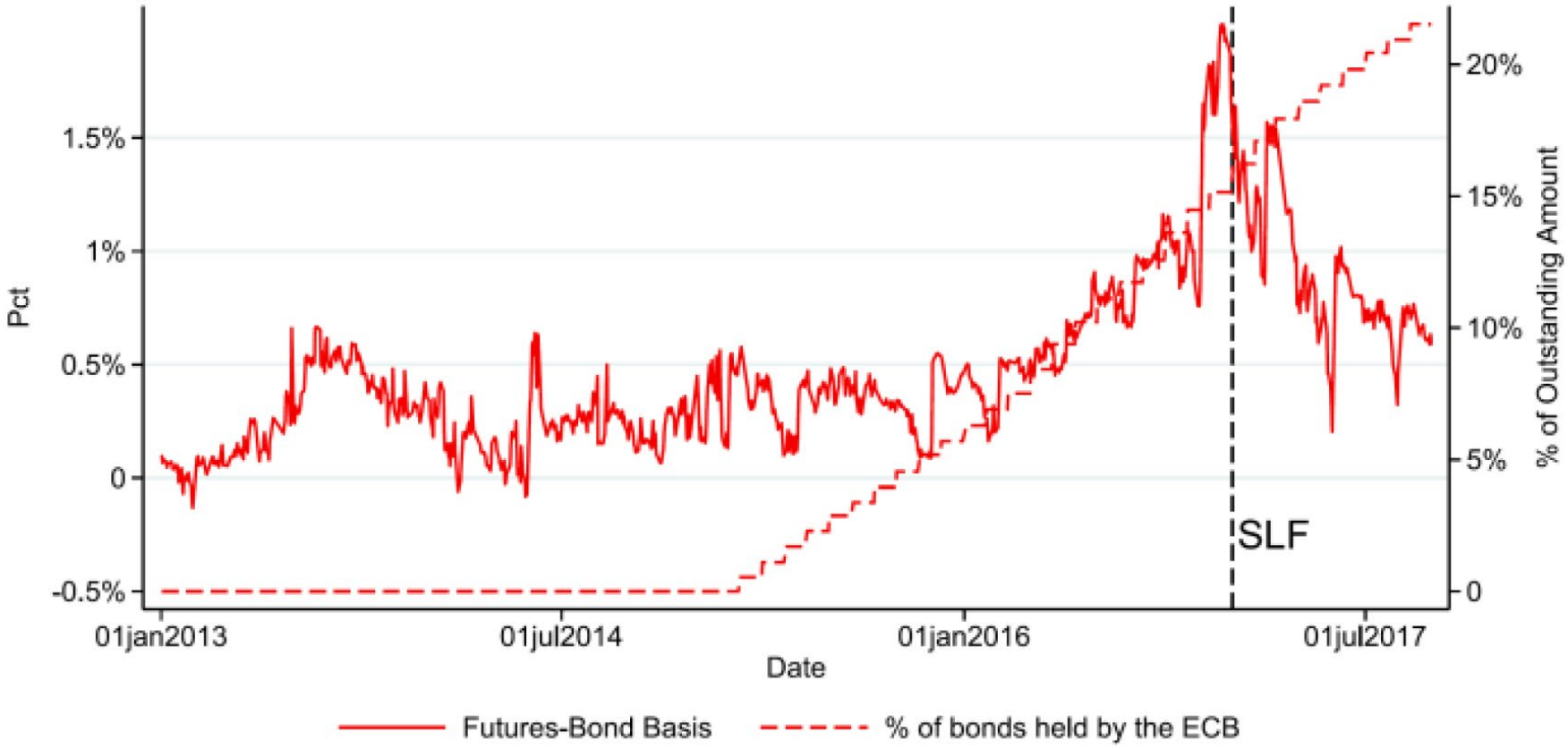
Central bank-driven mispricing, Pelizzon et al. (JFE2025)





Central Bank Driven Mispricing (Pelizzon et al. JFE2025)

(in %)



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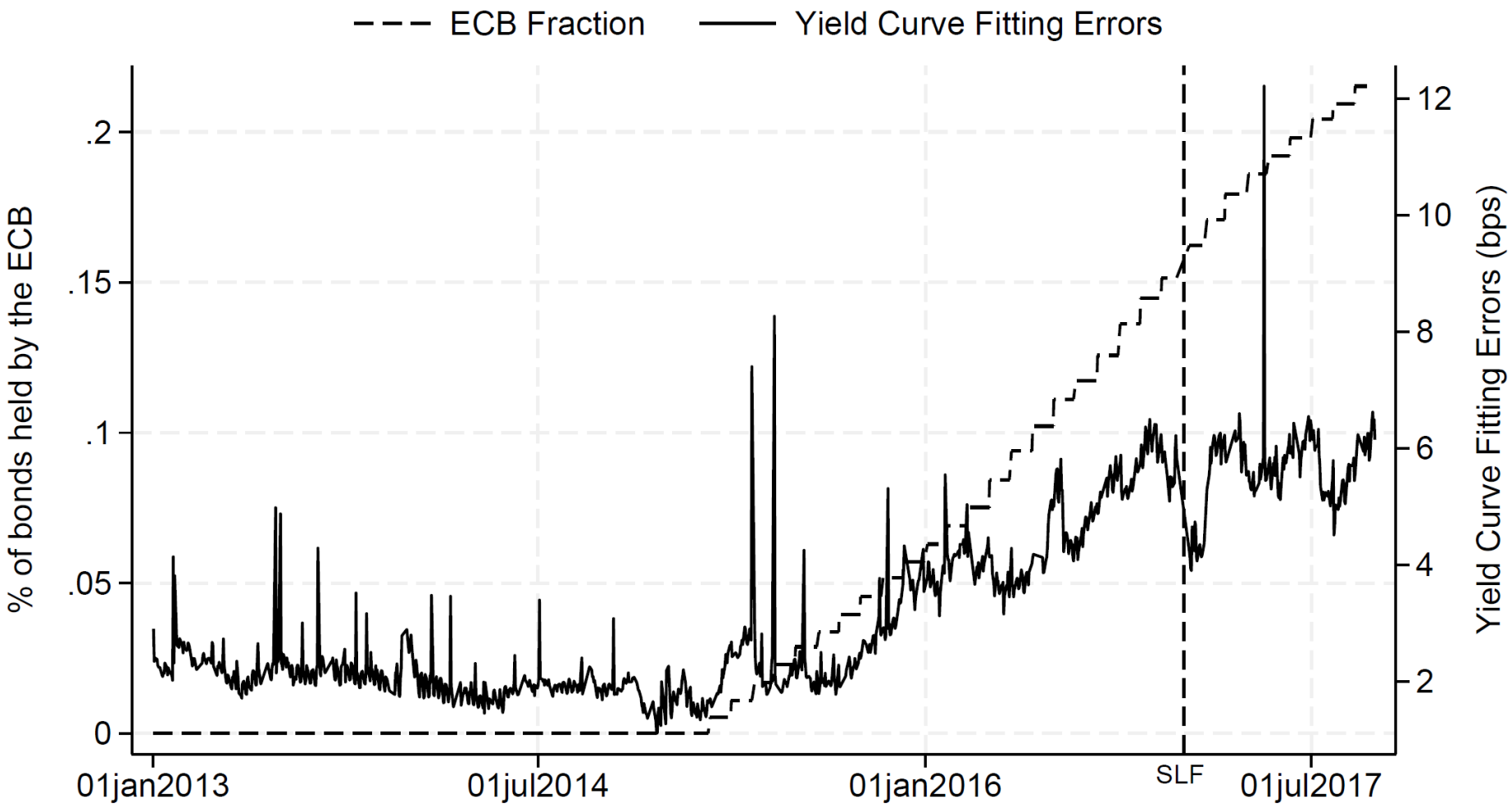

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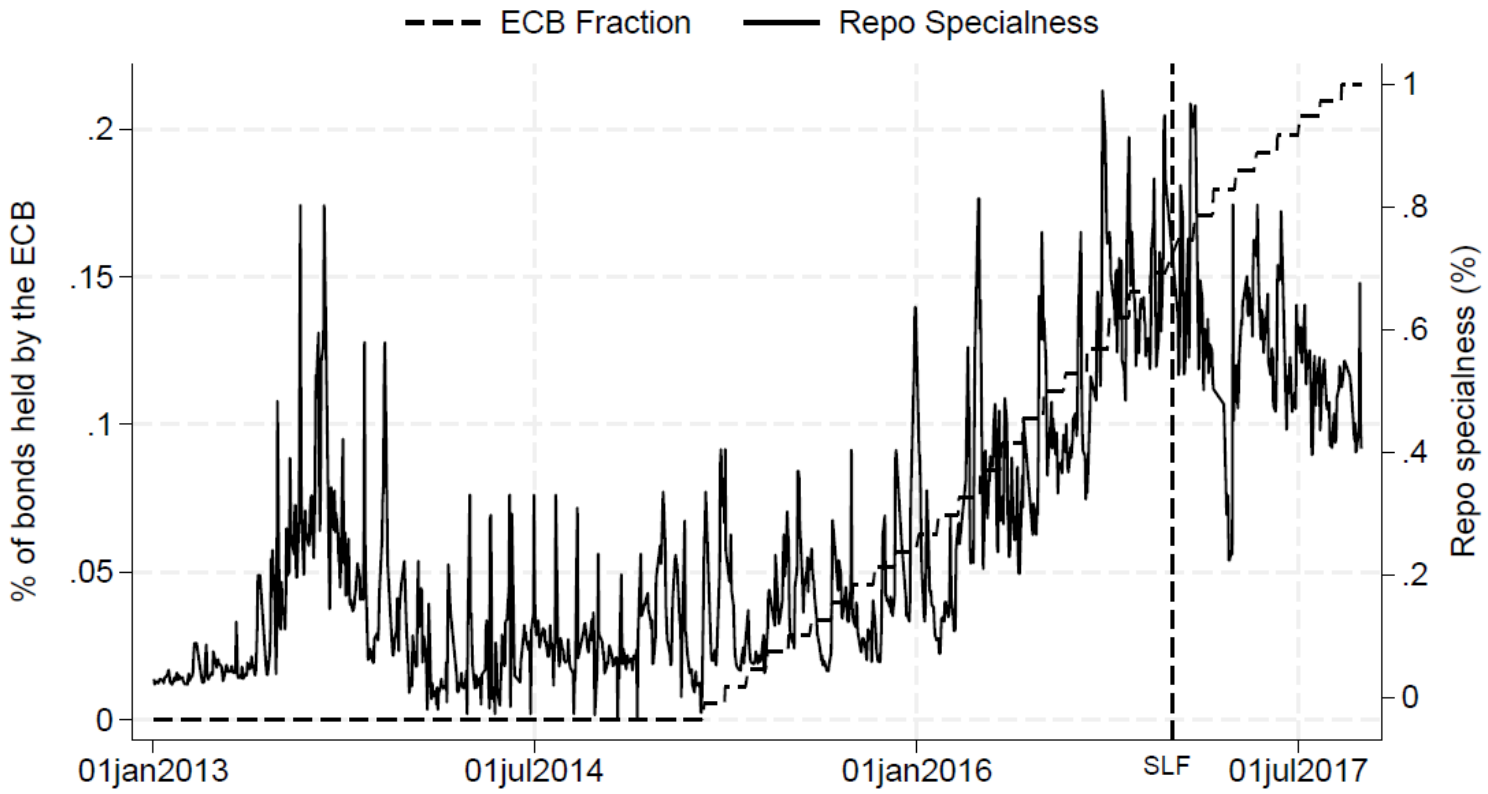
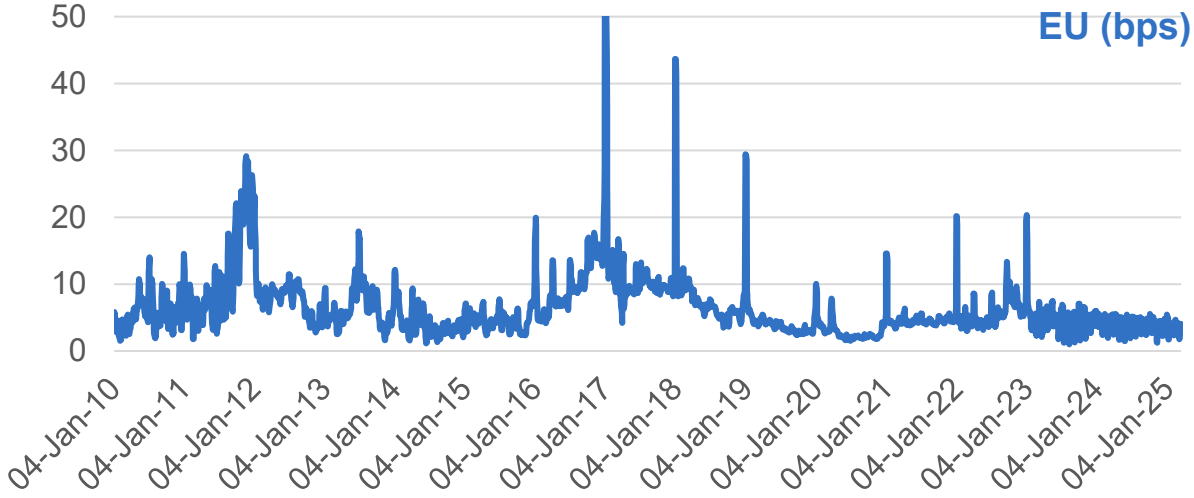
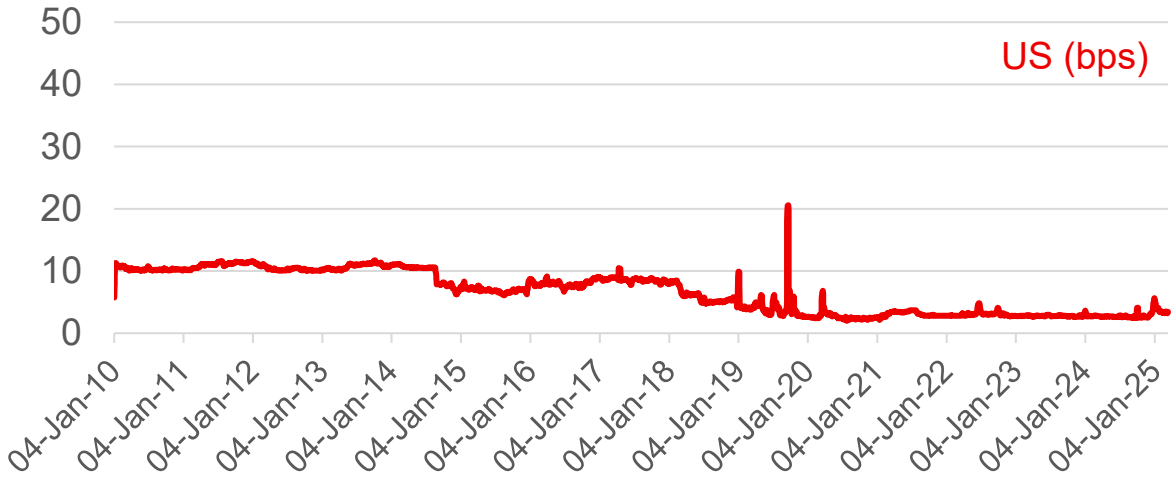


All in the corridor: EU and US dispersion index





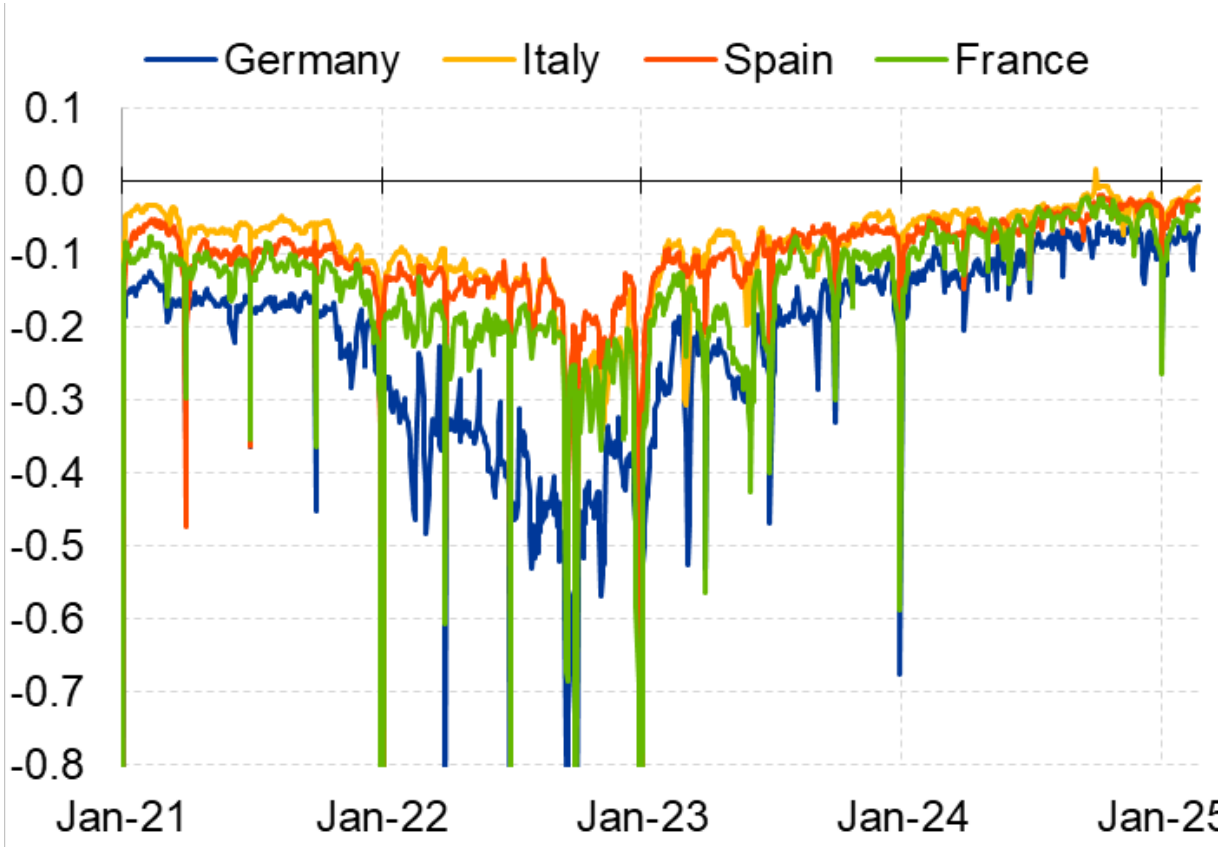
DK (2016): dispersion index

$$D_t = \frac{1}{\sum_i v_{i,t}} \sum_i v_{i,t} \left| \hat{y}_{i,t} - \bar{y}_t \right|,$$

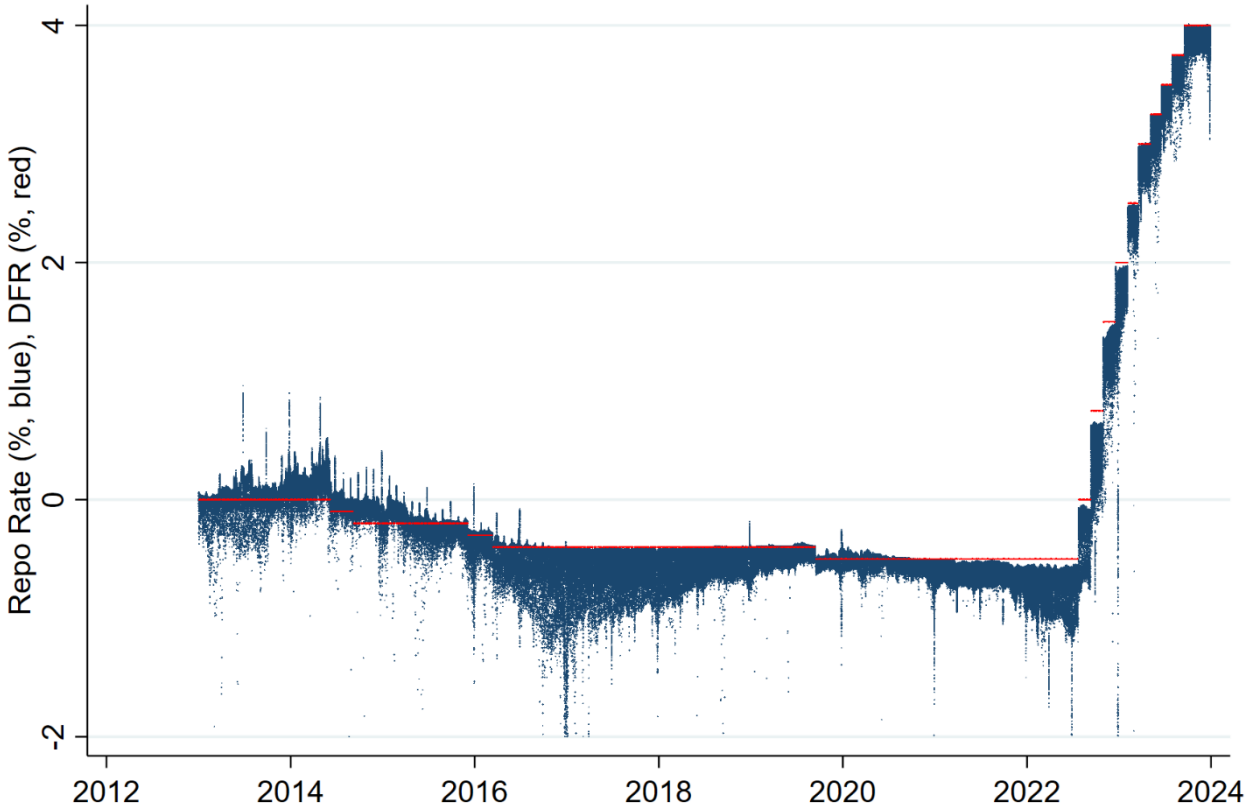
EU: EONIA, €str, GC, SC repo

US: ON RRPs, EFFR, IORB, IORR, OBFR, SOFR, LIBOR, TP repo

Why is this the case?



Why is this the case?



Would NBFI access to the CB balance sheet help to keep rates in the corridor?

What are the CB facilities for NBFIs in place?

- ON RRP (Fed) – in place since 2014
- Contingent Non-Bank Repo Facility (BoE) – never used

What would be needed to reduce the dispersion in EA?

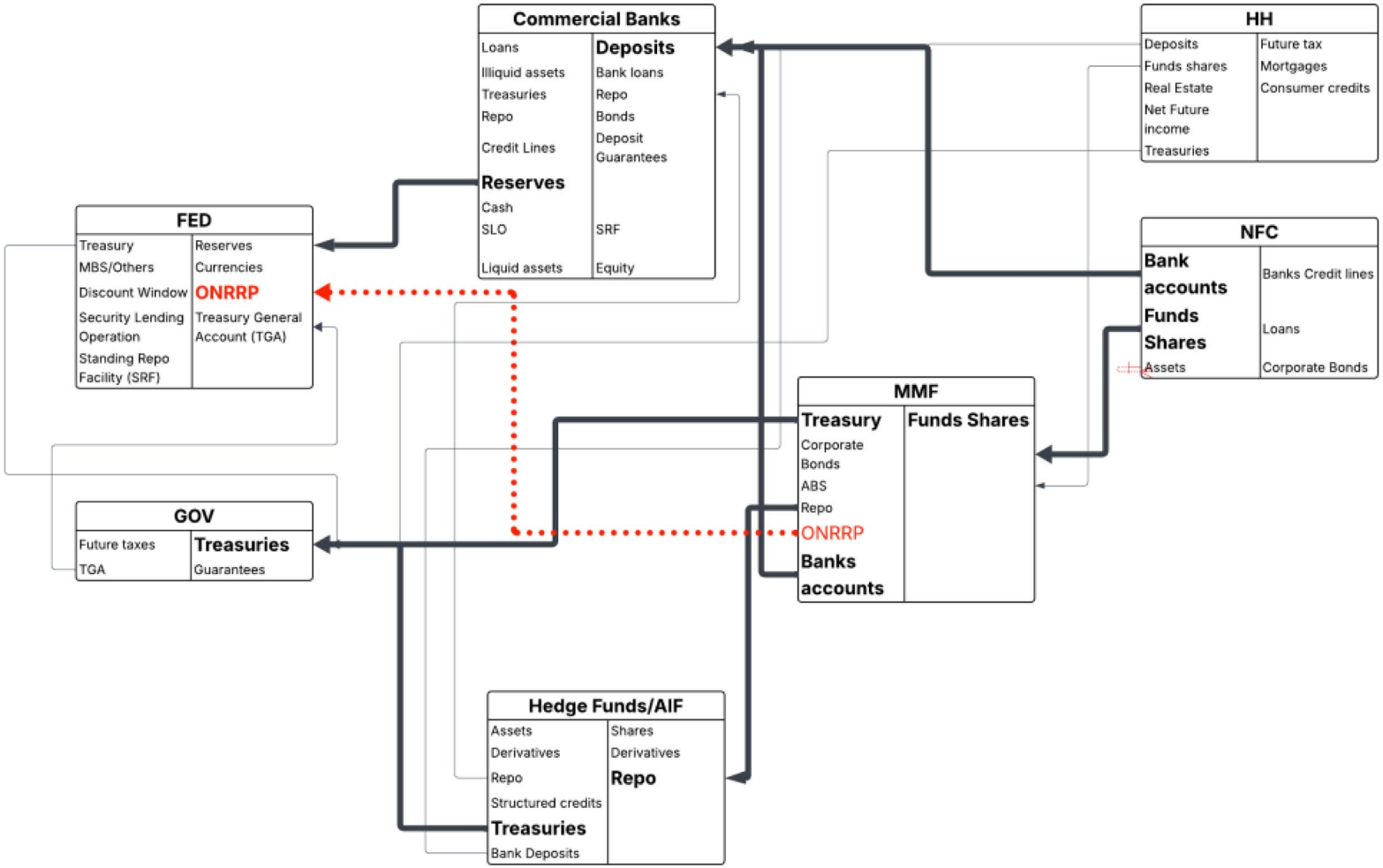
- Security Lending Facility

What are the CB facilities for NBFIs?

- **Short term rates (corridor floor):**

  ONRRP: in place the US
- **Collateral scarcity (corridor floor):**
  extending the *Securities Lending Facility:* not for NBFI in EU
- **Stress episodes (corridor cap)** operationalizing a dedicated *Contingent NBFI Repo Facility:* in place in BoE

ONRRP


Commercial Banks
Loans
Deposits
Illiquid assets
Bank loans
Treasuries
Repo
Repo
Bonds
Credit Lines
Deposit Guarantees
Reserves
Cash
SLO
SRF
Liquid assets
Equity
HH
Deposits
Future tax
Funds shares
Mortgages
Real Estate
Consumer credits
Net Future income
Treasuries
FED
Treasury
Reserves
MBS/Others
Currencies
Discount Window
ONRRP
Security Lending Operation
Treasury General Account (TGA)
Standing Repo Facility (SRF)
NFC
Bank accounts
Banks Credit lines
Funds Shares
Loans
Assets
Corporate Bonds
MMF
Treasury
Funds Shares
Corporate Bonds
ABS
Repo
ONRRP
Banks accounts
GOV
Future taxes
Treasuries
TGA
Guarantees
Hedge Funds/AIF
Assets
Shares
Derivatives
Derivatives
Repo
Repo
Structured credits
Treasuries
Bank Deposits

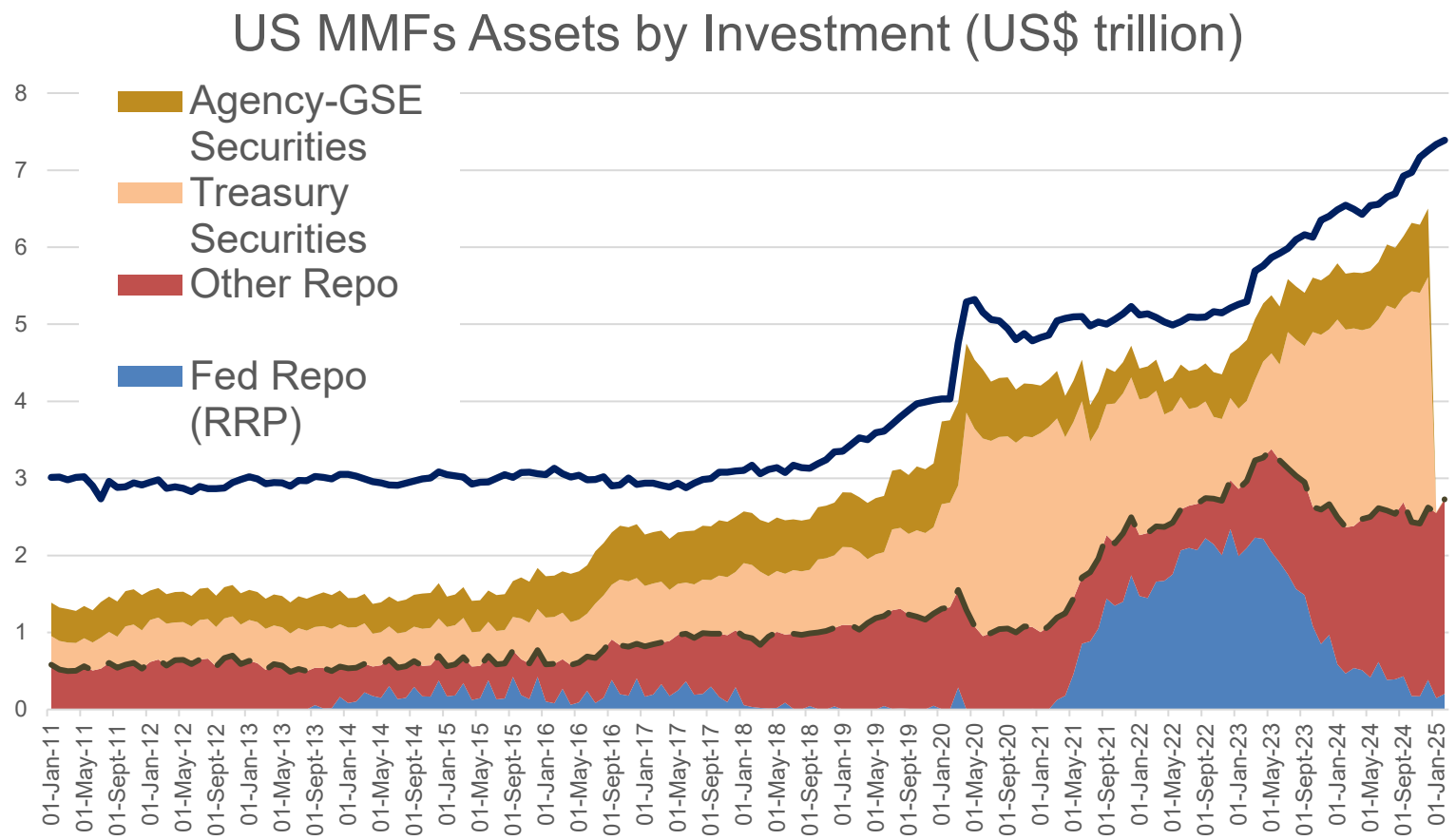
The CB dilemma

Duffie and K 2016 theoretical model:

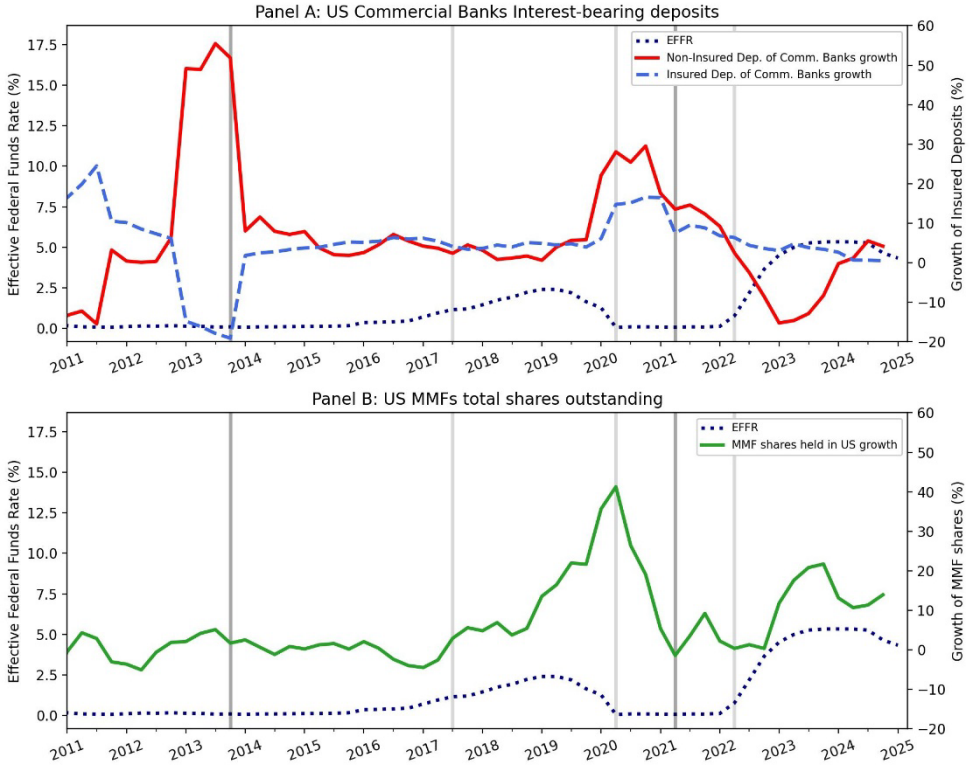
+ the Fed's overnight reverse repurchase (ONRRP) facility **improves the pass-through** of changes in Fed policy rates into average wholesale money market rates (everything in the corridor).

- this improvement in average pass-through is achieved mainly through the **disintermediation of bank deposits**

Is that really the case?



Relationship between interest rates and deposit dynamics



Suggestion

Access to CB's balance sheet only as a backstop in the presence of collateral scarcity and stress episodes:

- **Collateral scarcity (corridor floor):** extending the *Securities Lending Facility*
- **Stress episodes (corridor cap)** operationalizing a dedicated *Contingent NBFI Repo Facility*

to key NBFI participants (under appropriate regulation)

Conclusion

1. *Develop the Savings and Investment Union:*
   would **help channel more NBFI capital within Europe**

2. *Enhance Capital Market Infrastructure:*
   covered bonds and Asset-Backed Securities would unlock **NBFI participation in critical credit markets** without the cross-border issues that banks face.

3. *Strengthen Supervisory Frameworks:*
   enhanced, harmonized, **unified supervisory mechanism** at the EA level to **mitigate systemic risks** due to NBFI country-level concentration activity

4. *Access to CB's balance sheet only as a backstop in the presence of collateral scarcity and stress episodes:* **Securities Lending Facility** and the **Contingent NBFI Repo Facility** to key NBFI participants (under appropriate regulation)

Monetary Policy, the Yield Curve, and the Repo Market

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Introduction

- Quantitative Easing in the E.U. and U.S. shows that bond demand impacts

  i) the yield curve
  ii) repo rates

- Previous studies have considered these facts in isolation. Does the term structure interact with money markets where bonds collateralize loans?

- This paper: quantity-driven model where bonds serve as

  i) investment opportunities
  ii) collateral for overnight loans

The Literature

Demand for bonds persistently affects bond prices

D'Amico and King 2013, Bernanke 2020, Vayanos and Vila 2021

Demand for bonds also affects bond repo rates

Duffie 1996, Corradin and Maddaloni 2020, He, Nagel, and Song 2022

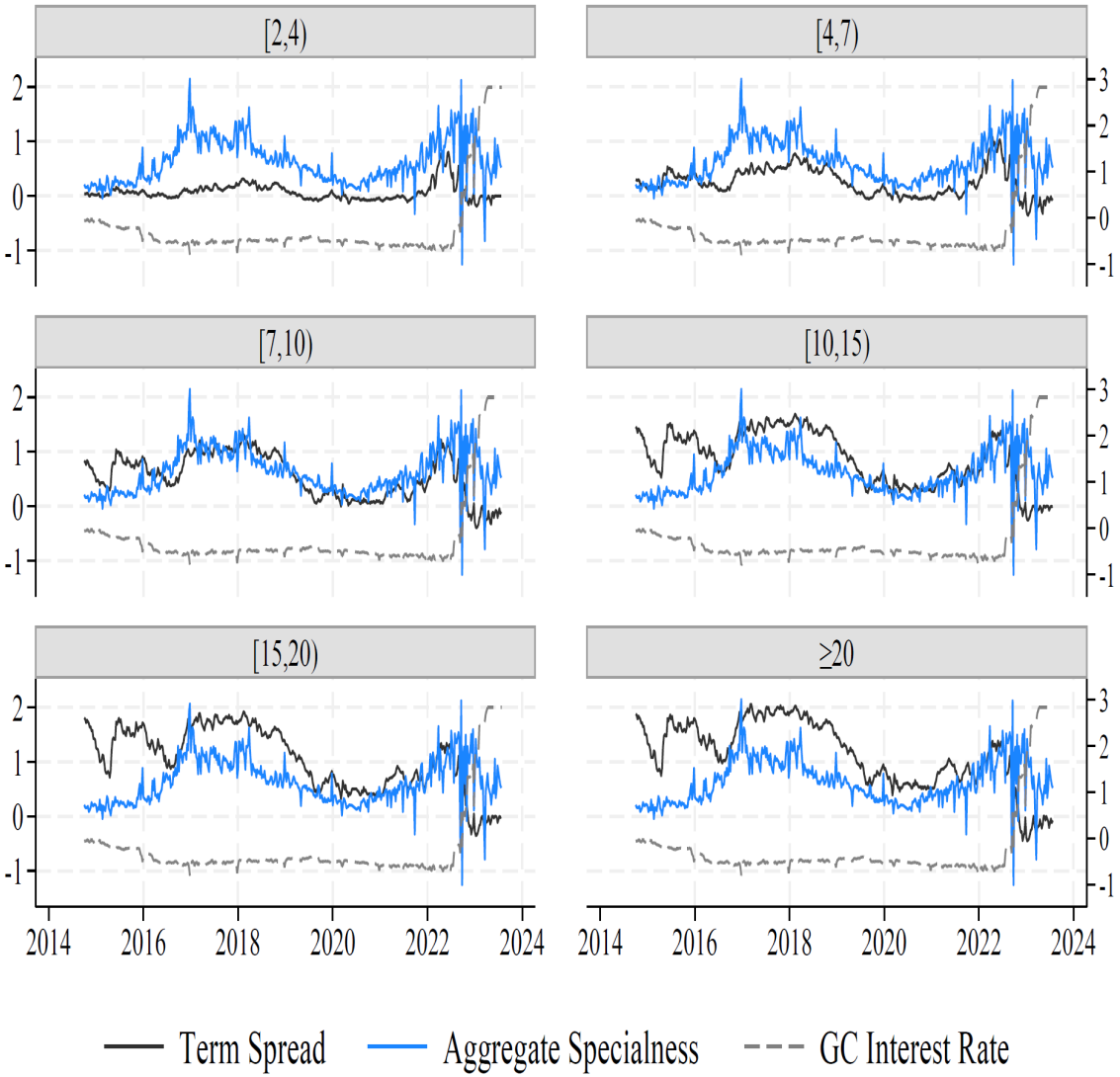
Problem: in TSMs, the short rate is *exogenous* to demand pressure

This paper: interactions of bond and repo markets along the yield curve

Stylized facts

$$\text{Aggregate Specialness}_t = \frac{1}{N_t}\sum_j D_{jt}\text{Repo Specialness}_{jt},$$

$$\text{Term Spread}_t^{\tau} = \beta_0 + \beta_1\ \text{Aggregate Specialness}_t + \varepsilon_t^{\tau}.$$


[2,4)
[4,7)
[7,10)
[10,15)
[15,20)
≥20
2014
2016
2018
2020
2022
2024
Term Spread
Aggregate Specialness
GC Interest Rate

The Results

First quantity-driven term structure model with endogenous money market

We find that repo specialness

i) strengthens the local supply channel of QE

ii) dampens the duration extraction channel of QE

Implication: consider yield curve in combination with collateralized money market (Repo)

The Model

Cash market

- Continuous-time market for riskless ZCB with tenor τ and status $i = \{\text{g, s}\}$
- General (g) and special (s) bonds have equal cash flows, different demand

$$\text{Yield to maturity is } y_{i,t}^{\tau} = -\frac{1}{\tau} \log P_{i,t}^{\tau}.$$

Repo market

- Short rate (SOFR) is the GC repo rate

$$dr_t = \kappa_r(\bar{r} - r_t)dt + \sigma_r dv_t^r.$$

- What about the SC rate r_t^{τ}? Solve endogenously

Preferred-habitat investors

Bonds "*on special*" are issues subject to considerable demand pressure $Z_t^\tau(s)$.

$$Z_t^\tau(i) = \begin{cases} -\alpha_\tau \log P_{i,t}^\tau - \theta_\tau & i = s \quad \leftarrow \text{QE-eligible} \\ 0 & i = g \quad \leftarrow \text{QE-ineligible} \end{cases}$$

Arbitrageurs connect prices over habitat segments (Modigliani and Sutch 1966)

Market clearing

$$\underset{\substack{\uparrow \\ \text{habitat investors}}}{Z_{i,t}^\tau} = - \underset{\substack{\uparrow \\ \text{arbitrageurs}}}{X_{i,t}^\tau}$$

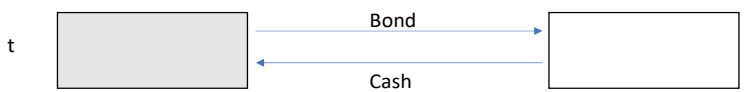
The Arbitrageurs

$$\max_{\{X^{\tau}_{i,t}\}} \quad \frac{\mathbb{E}_t\left[dW_t\right]}{dt} - \frac{\gamma}{2}\frac{\mathbb{V}_t\left[dW_t\right]}{dt}$$

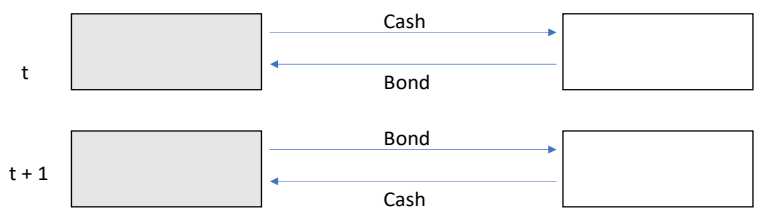
$$dW_t = r_t W_t dt + \underbrace{\int_0^{\infty} X^{\tau}_{g,t}\left(\frac{dP^{\tau}_{g,t}}{P^{\tau}_{g,t}} - r_t\right)d\tau}_{\text{General bonds}} + \underbrace{\int_0^{\infty} X^{\tau}_{s,t}\left(\frac{dP^{\tau}_{s,t}}{P^{\tau}_{s,t}} - r^{\tau}_t\right)d\tau}_{\text{Special bonds}}$$

Short Sale

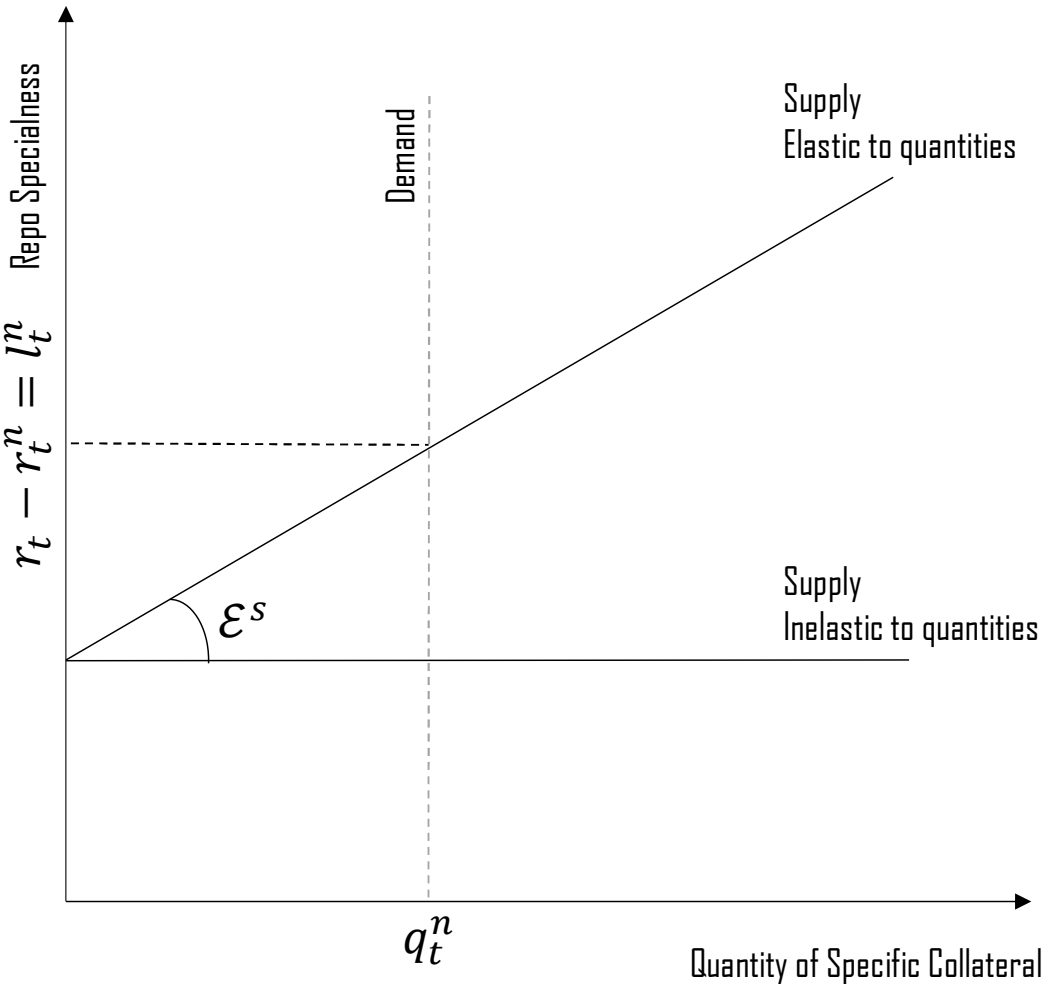
Spot Trade



Reverse repo



The repo market



$$\mathcal{E}^i = \begin{cases} \frac{\partial l_t}{\partial q_t} & i = s, \\ 0 & i = g. \end{cases}$$

General bonds, Special bonds

Segmentation: price is affine in short rate and, conditionally on status, demand

$$-\log P_{i,t}^{\tau} = \begin{cases} A_\tau r_t + B_\tau X_{s,t}^{\tau} + C_\tau & i = s, \\ A_\tau r_t + C_\tau & i = g. \end{cases}$$

Demand pressure $\Rightarrow$ bonds with identical cash flows trade at different prices

more compactly, rewrite $-\log P_{i,t}^{\tau} = a_{i,\tau} r_t + b_{i,\tau} \theta_t^{\tau} + c_{i,\tau}$

Equilibrium - Bond Market

$$\mu_{i,t}^{\tau} - \overset{\text{Repo rate}}{\overset{\downarrow}{r_t^{\tau}}} = -a_{i,\tau}\lambda_t$$

- Interest rate is bond specific
- Slope of both yield curves depends on arbitrageurs' holdings

$$\text{Price of risk } \lambda_t = -\gamma \underbrace{\sigma_r^2 \int_0^{\infty} \left(a_{g,\tau} \overset{\overset{=0}{\downarrow}}{X_{g,t}^{\tau}} + a_{s,\tau} X_{s,t}^{\tau} \right) d\tau}_{\text{arbitrageurs' duration}}$$

Bond yield function of market price of risk

Lemma 1. *Bond yields satisfy the following decomposition.*

$$y_{it}^{\tau} = \underbrace{\frac{1}{\tau}\mathbb{E}_t\left[\int_0^{\tau} r_{i,t+u}^{\tau-u} du\right]}_{\textit{Expected short rates}} - \underbrace{\frac{1}{\tau}\mathbb{E}_t\left[\int_0^{\tau} a_{i,\tau-u}\lambda_{t+u} du\right]}_{\textit{Risk premium}} - \underbrace{\frac{1}{\tau}\left[\int_0^{\tau} a_{i,\tau-u}^2 \frac{\sigma_r^2}{2} du\right]}_{\textit{Convexity adjustment}}.$$

Market price of Risk

$$\lambda_t^\tau = \underbrace{\gamma\sigma_r^2 \int_0^\infty a_{s\tau}\left[\eta_\tau\left(A_\tau r_t + C_\tau\right) - \theta_\tau\right] d\tau}_{\text{Investment-value duration}} - \underbrace{\gamma\sigma_r^2 \int_0^\infty a_{s\tau}\eta_\tau B_{s\tau} Z_{st}^\tau d\tau}_{\text{Collateral-value duration}}.$$

Remark 3. *The market price of interest rate risk reflects both bonds' investment and collateral value.*

Equilibrium - Repo market

- Crucially depends on the repo market activity of preferred-habitat investors
- Think of Central Bank's Securities Lending Facility (SLF)

- No SLF $\longrightarrow$ Specialness

$$I_t^\tau = r_t - r_{i,t}^\tau = \mathcal{E}_i Z_{i,t}^\tau$$

- SLF $\longrightarrow$ No specialness

$$I_{i,t}^\tau = \mathcal{E}_i (X_{i,t}^\tau + Z_{i,t}^\tau) = 0$$

General Equilibrium (i) No scarcity of collateral

Bond pricing coefficients

$$a_{i,\tau} = \frac{1 - e^{-\kappa_r^* \tau}}{\kappa_r^*}$$

$$b_{i,\tau} = 0$$

$$c_{i,\tau} = \kappa_r^* \bar{r}^* \int_0^\infty a_{i,u} du - \frac{\sigma_r^2}{2} \int_0^\infty a_{i,u} du$$

Money market rates

$l_{i,t}^\tau = 0$ The short rate r_t is unique

Vayanos and Vila 2021 model

General Equilibrium (ii) Scarcity of collateral

Bond pricing coefficients

$$a_{i,\tau} = \frac{1 - e^{-\kappa_r^* \tau}}{\kappa_r^*}$$

$$b_{i,\tau} = \frac{\mathcal{E}_i (1 - g_\tau)(1 - e^{-\int \overline{\theta}_\tau d\tau})}{\overline{\theta}_\tau}$$

$$c_{i,\tau} = \kappa_r^* \overline{r}^* \int_0^\infty a_{i,u} du - \frac{\sigma_r^2}{2} \int_0^\infty a_{i,u} du$$

Money market rates

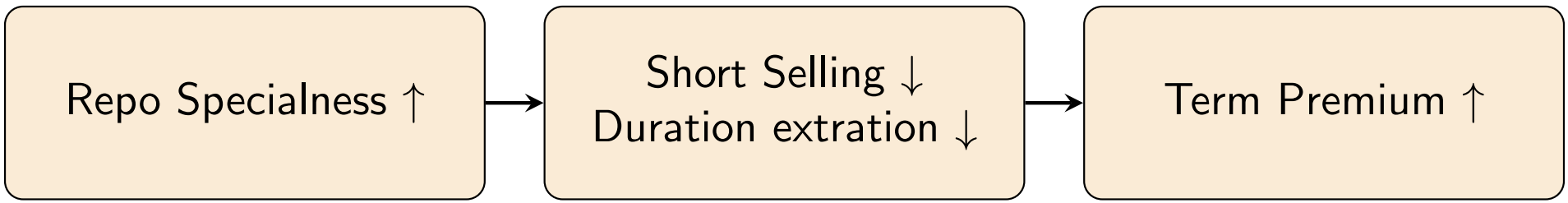
Cross-section of repo rates $r_t^\tau = r_t - \mathcal{E}_i Z_{i,t}^\tau$

Two-markets GE exchange economy

Monetary Policy Transmission

In equilibrium, repo specialness

- impairs conventional MP pass-through (see Nguyen, Tomio, and Vari 2023)
- strengthens local supply effects of QE
- dampens the effects of QE on the term premium *TP*



Overall, bond market policies are more effective with functional money markets

Trade-off between local supply and duration extraction

FOC of arbitrageurs

$$\mu_{i,t}^{\tau} - r_t + l_t^{\tau} = -a_{i,\tau}\lambda_{r,t}$$

Repo specialness $l_t^{\tau} \uparrow$ for given r_t, either

i) Stronger local supply $\mu_{i,t} \uparrow$ relative to duration risk $a_{i,\tau}$ (price anomaly - yields of special bonds decline by more than the yields of general bonds)

ii) Weaker duration extraction $\lambda_{r,t} \downarrow$ (steeper YC - this effect is the same for both special and general bonds)

- applies to both QE and QT
- particularly useful for green QE

Duration extraction

"In purchasing long-dated assets, a central bank takes duration risk off private hands, which translates into lower term premia and long-term interest rates."

Philip Lane, New York, October 11, 2022.

Lemma 3. ***Securities Lending and the transmission of QE.*** *The effect of QE on the yield of long-term general bonds is stronger if asset purchases are paired with securities lending. Analytically,*

$$\underbrace{\frac{1}{\tau}\gamma\sigma_r^2\int_0^\infty a_{s\tau}d\tau}_{\text{Effect of QE with SLF } (\phi_{st}^\tau=1)} \geq \underbrace{\frac{1}{\tau}\gamma\sigma_r^2\int_0^\infty a_{s\tau}(1-\eta_\tau b_{s\tau})d\tau.}_{\text{Effect of QE without SLF } (\phi_{st}^\tau=0)}$$

Proof. See Appendix F.

Calibration

Yield curve

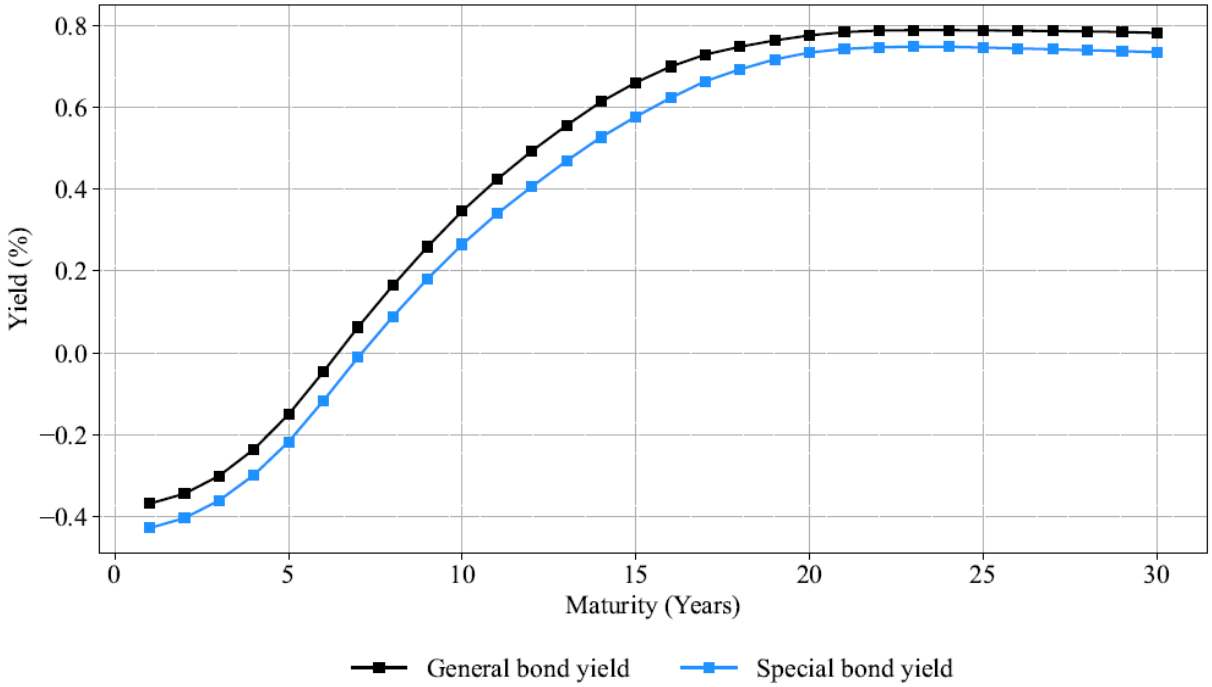


FIGURE 2: **Yield Curve Measurement.** This figure presents the yield curves of general and special bonds. The curves are constructed as the average of daily yield curves interpolated using German Treasury bond-level data from LSEG covering the period from October 2014 to July 2023.

Model Fit

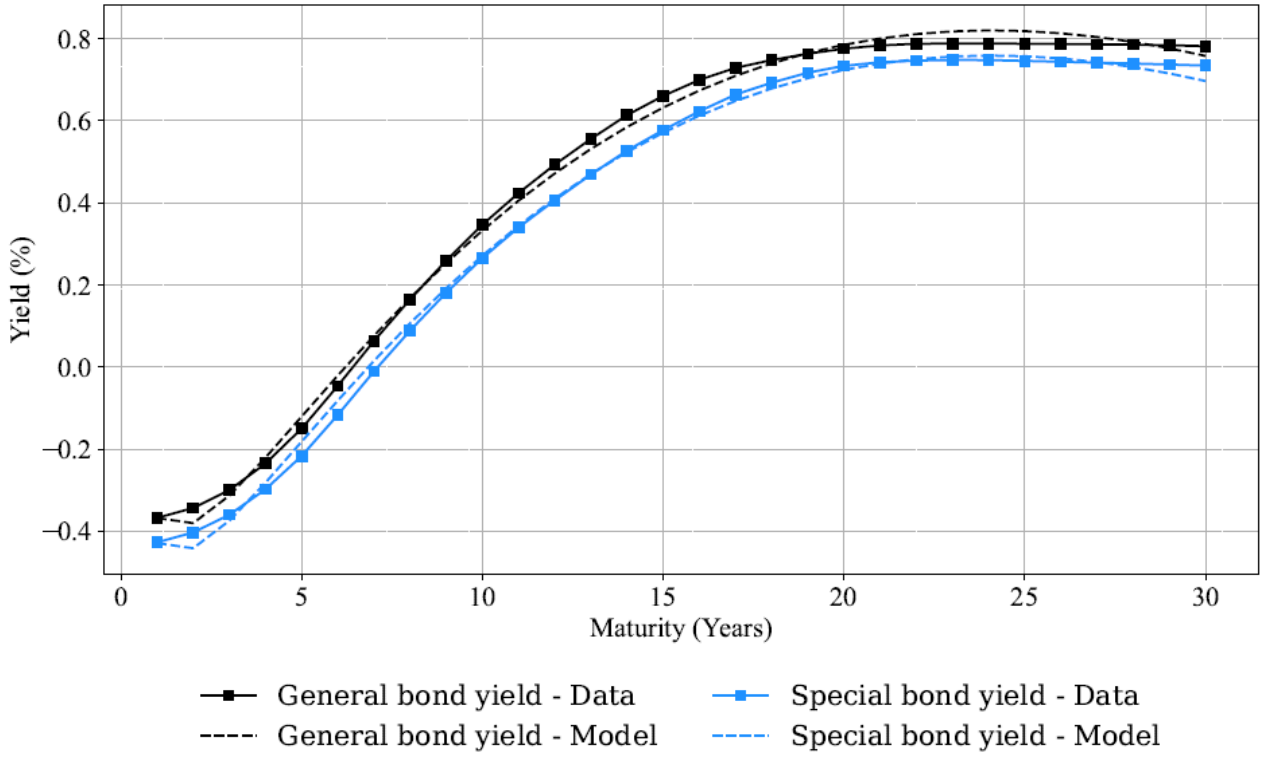
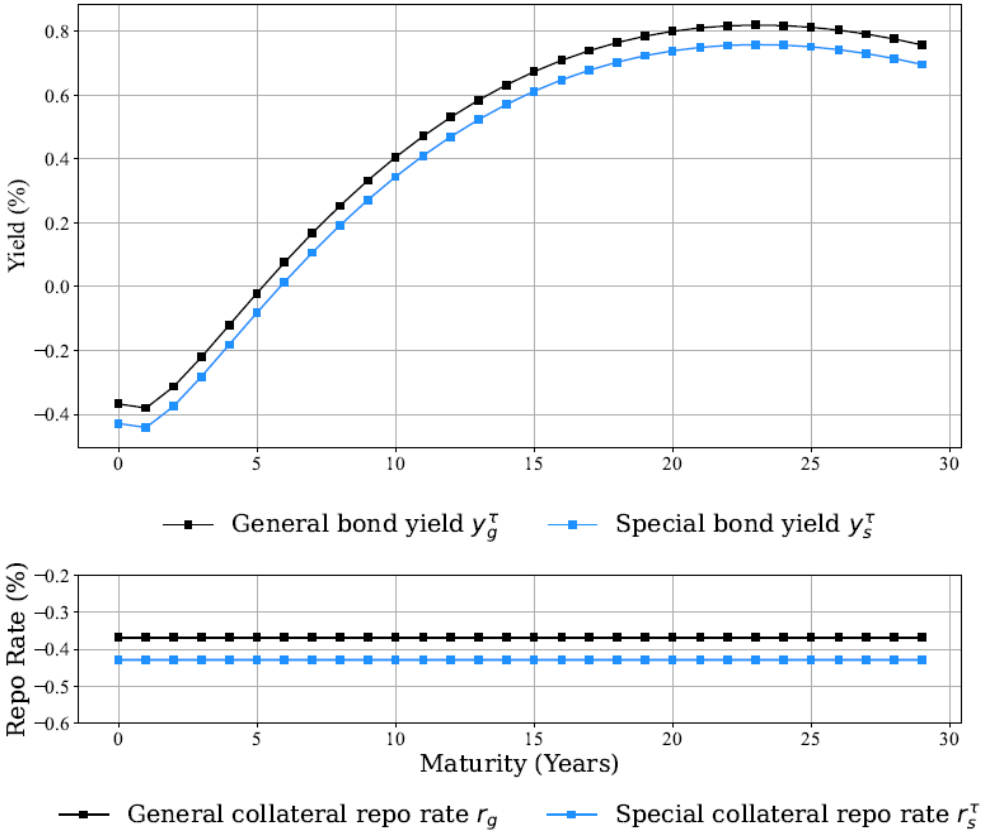


FIGURE 3: **Model Fit.** This figure compares the yields implied by the quantitative model against the data.

Baseline calibration



Yield Curve Control

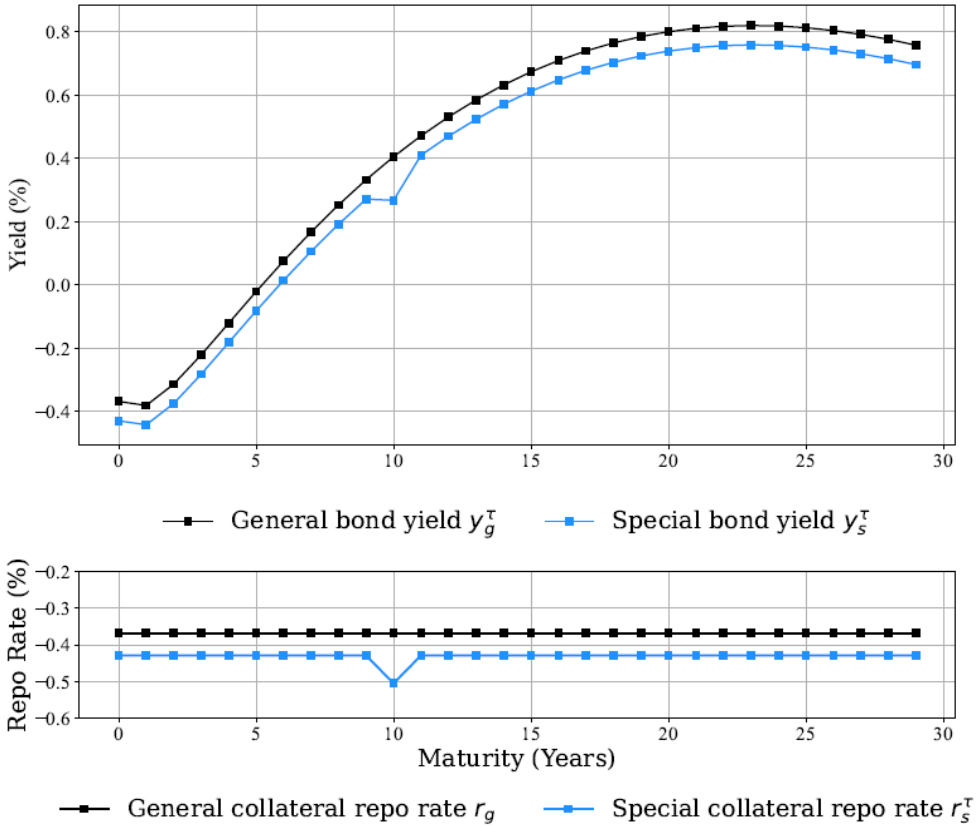


FIGURE 5: **Yield Curve Control.** This figure shows the effects of purchases targeted to specific bonds.

QE and SLF

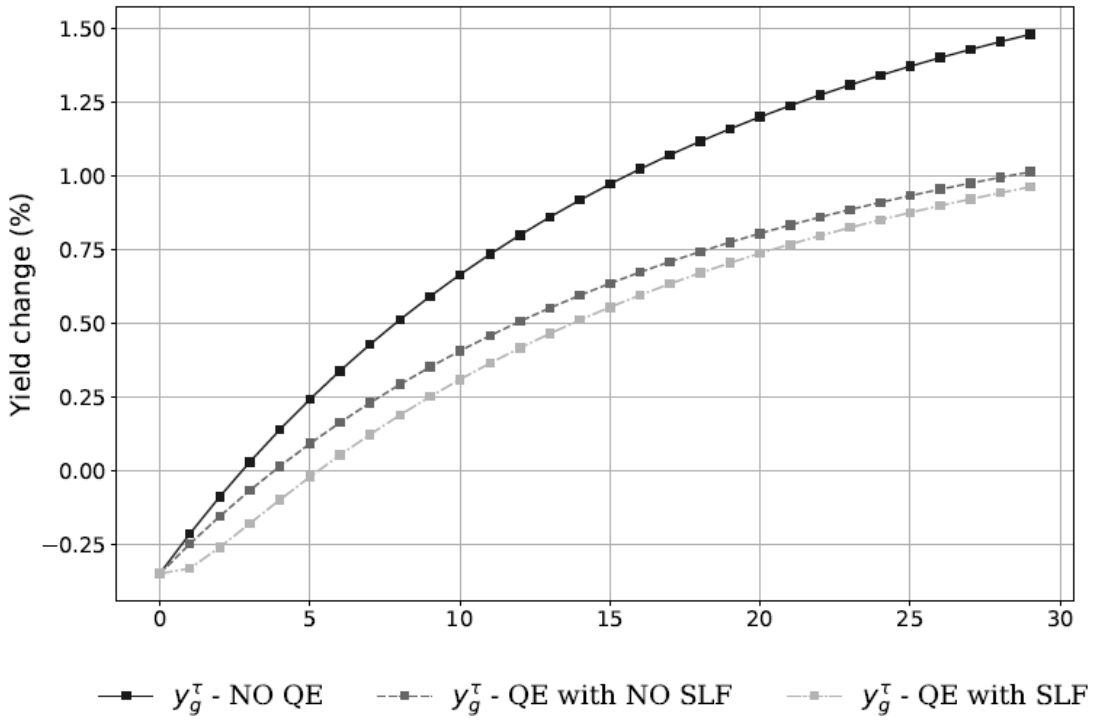


FIGURE 6: **Quantitative Easing and the Securities Lending Facility.** This figure shows the effects of alternative scenarios involving quantitative easing and the securities lending facility on the yields of general bonds.

Conclusion

New framework to think about yield curve and money market

intuitive: bond scarcity, local supply $\uparrow$ duration extraction $\downarrow$

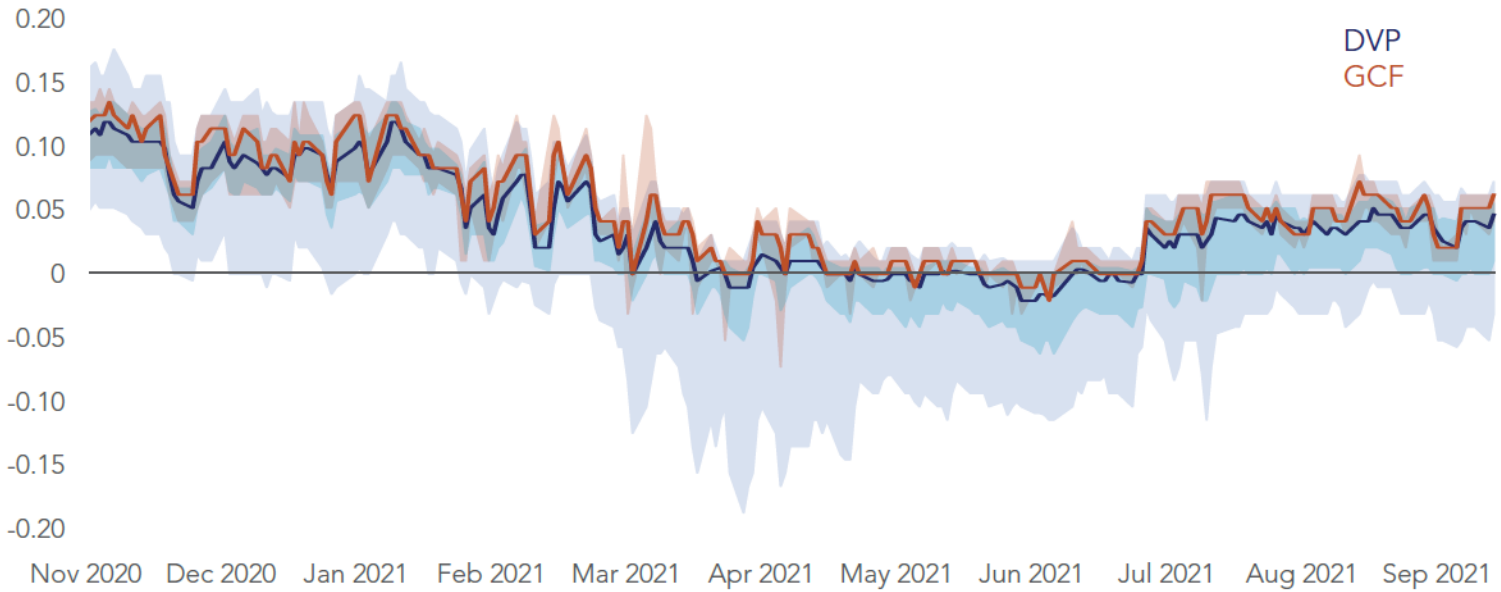
realistic: specialness endogenous in arbitrageurs' short-selling

tractable: admits solutions in closed form

Policy implications

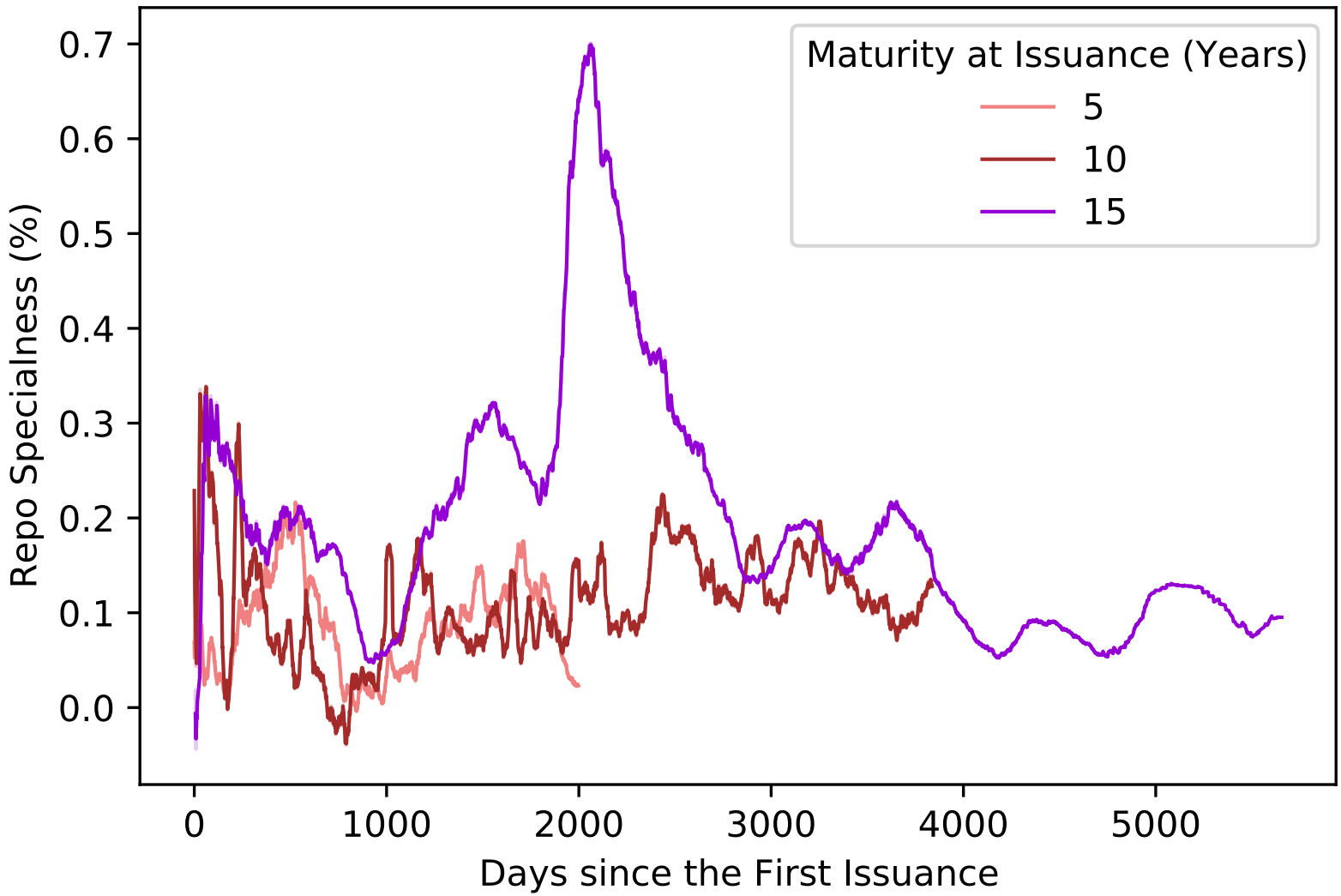
- MP should account for specialness on the repo market
- QE should be paired with securities lending facilities
- Regulators may want to induce investors to lend securities

Thank you!



- US Treasury data, source OFR

back



- MTS German data show that repo specialness is persistent

back

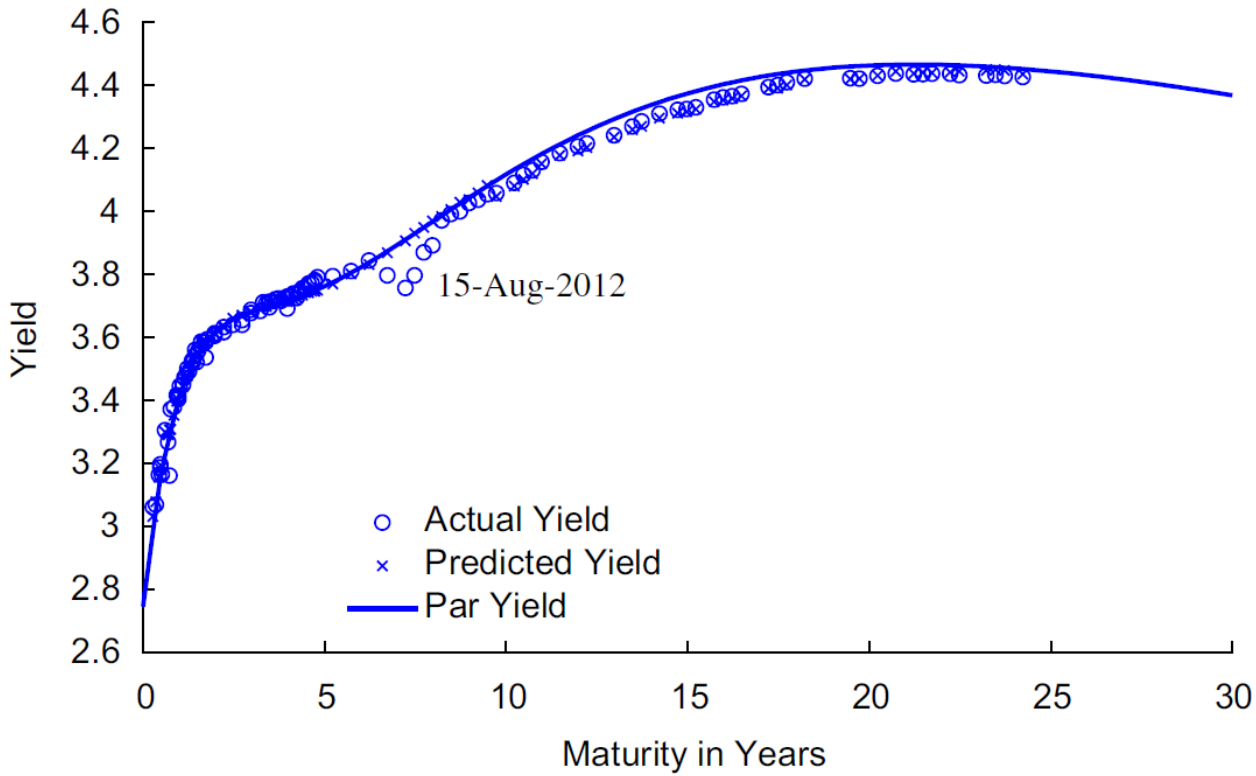


Fig. 4. Premium for the cheapest-to-deliver issue on May 24, 2005.

- Figure from Gürkaynak, Sack, and Wright 2007

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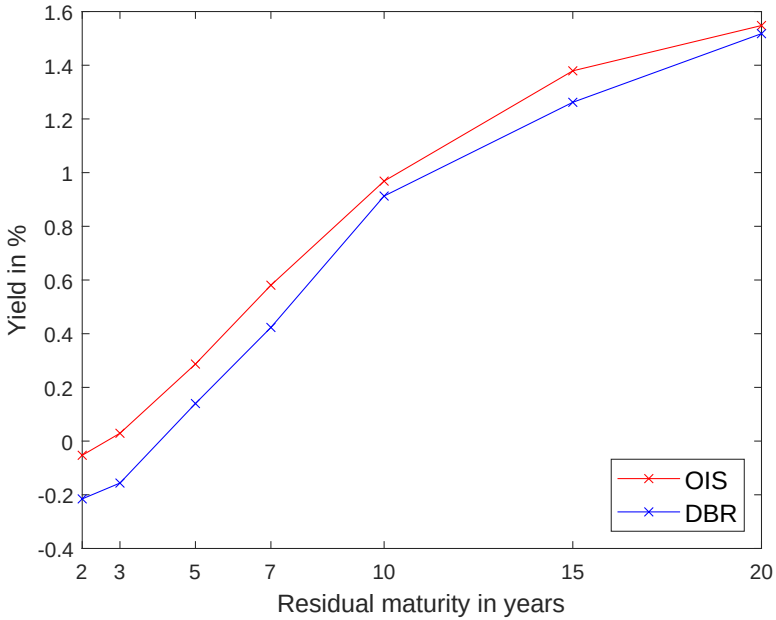
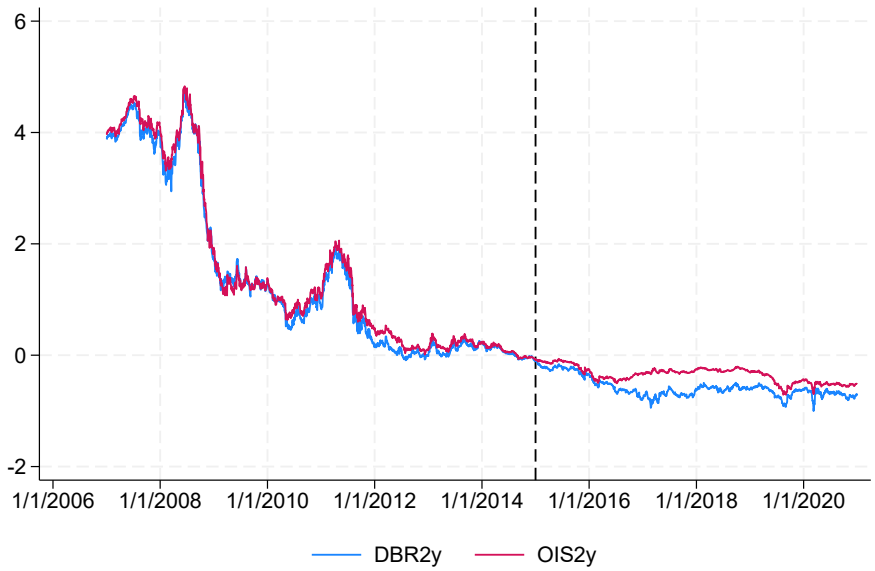
General Bonds, Special Bonds



Yield curves



Yield spreads and the PSPP