Monetary Policy, the Yield Curve, and the Repo Market

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Fixed Income

Introduction

Bonds as investment and collateral assets

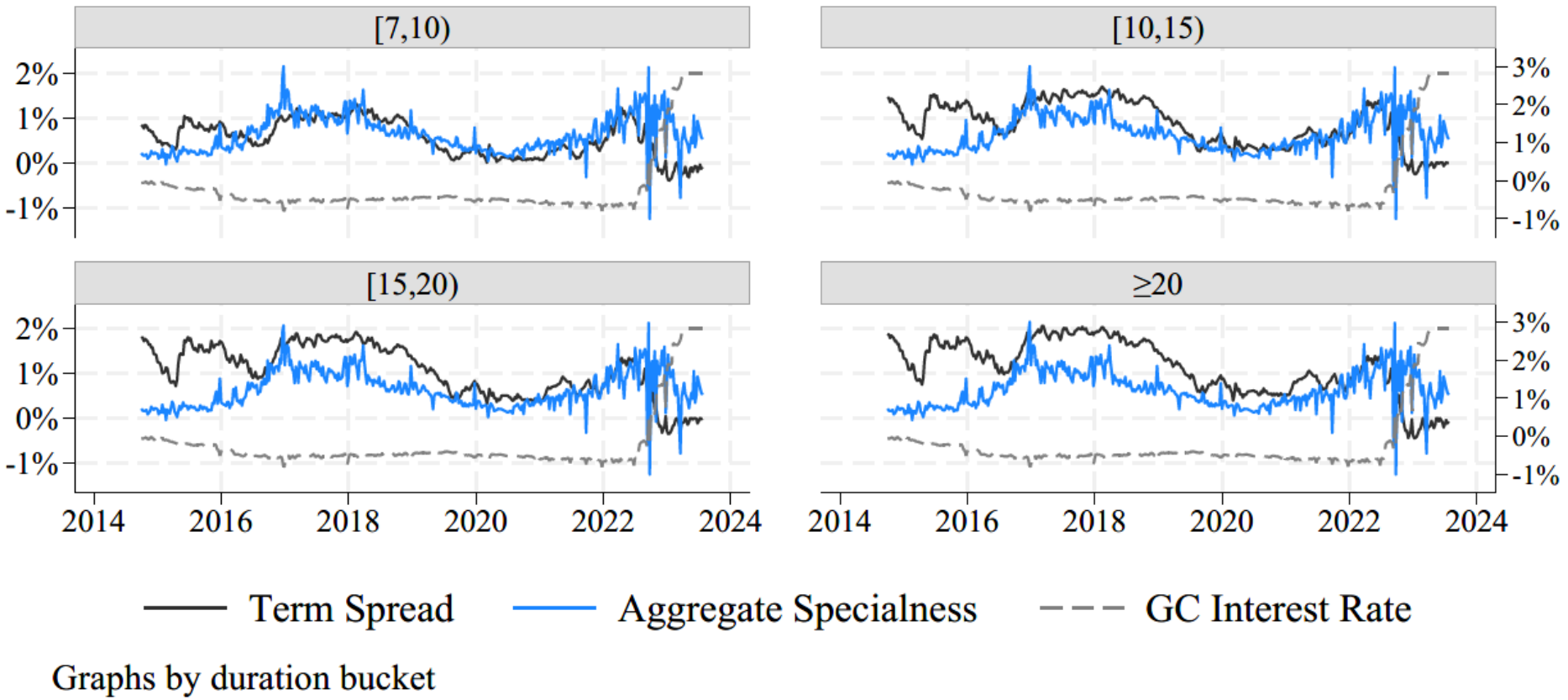
- Standard theories of the yield curve primarily regard bonds as investment assets.
- Quantitative Easing flattened the yield curve and induced collateral specialness, the spread between repo rates of generic and specific securities.

This paper: a preferred-habitat theory of the yield curve and the repo market

- How does the yield curve interact with the repo market?
- How should monetary policy account for this effect?

How does the yield curve interact with the repo market?

- Repo specialness of individual bonds influences their own yield (Duffie 1996).
- In Germany, *aggregate* repo specialness correlates positively with *term spreads*.



Aggregate Specialness is defined as the average repo specialness weighted on bond duration.

A preview of the results

First quantity-driven term structure model with endogenous repo specialness.

- Demand forces affect bond prices (Bernanke 2020, Vayanos and Vila 2021).
- The same forces affect repo rates (Duffie 1996, Corradin and Maddaloni 2020).
- However, affine models usually regard the short rate as *exogenous* to demand.

New finding: special repo rates shed light on the entire yield curve.

- The repo market is key for short-selling and arbitrageurs' transmission of shocks.

Policy implication: consider bond market in combination with money market.

- We study Yield Curve Control, Quantitative Easing, Securities Lending Facility.

A theory of the yield curve and the repo market

Model setup

- Continuous-time infinite-horizon market for risk-free zero-coupon bonds.
- There are two groups of agents: preferred-habitat investors and arbitrageurs.
- Standard setup, except that there are two markets: the bond and the repo market.

- Repos are contracts where bonds are used as collateral, either General or Special.
- Market forces induce repo spreads among bonds with identical cash flows.
- The General Collateral repo rate, such as the SOFR, is exogenous:

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

- The Special Collateral rate varies endogenously with demand forces.

Preferred-habitat investors

- Habitat preferences are defined among bonds with equivalent tenor τ.
- E.g., only certain bonds of a given tenor are eligible for Quantitative Easing.
- Preferred-habitat investors demand specific bonds, which acquire *special* status i:

Demand function:

$$Z_{i,t}^{\tau} = \begin{cases} -\alpha_{\tau} \log P_{i,t}^{\tau} - \theta_{\tau} & i = s \quad \text{Special bonds} \\ 0 & i = g \quad \text{General bonds} \end{cases}$$

Market clearing:

$$\underset{\substack{\uparrow \\ \text{Habitat investors}}}{Z_{it}^{\tau}} = - \underset{\substack{\uparrow \\ \text{Arbitrageurs}}}{X_{it}^{\tau}}$$

- Demand from preferred-habitat investors induces arbitrageurs to *short-sell* bonds.

Arbitrageurs

Arbitrageurs transmit excess demand to the *repo market* and across the *yield curve*.

Optimization program:

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

$$dW_t = r_t W_t dt + \underbrace{\int_0^\infty X^\tau_{gt}\left(\frac{dP^\tau_{gt}}{P^\tau_{gt}} - r_t\right)d\tau}_{\text{General bonds}} + \underbrace{\int_0^\infty X^\tau_{st}\left(\frac{dP^\tau_{st}}{P^\tau_{st}} - r^\tau_{st}\right)d\tau}_{\text{Special bonds}}$$

- Short selling a bond requires repo lending at the *Special Collateral* rate $r^\tau_{st} \leq r_t$.

Bond prices

- Demand forces induce price differences among bonds with identical cash flows.

$$P_{it}^{\tau} = \exp\left(- a_{i\tau} r_t - b_{i\tau} \theta_t^{\tau} - c_{i\tau} \right)$$

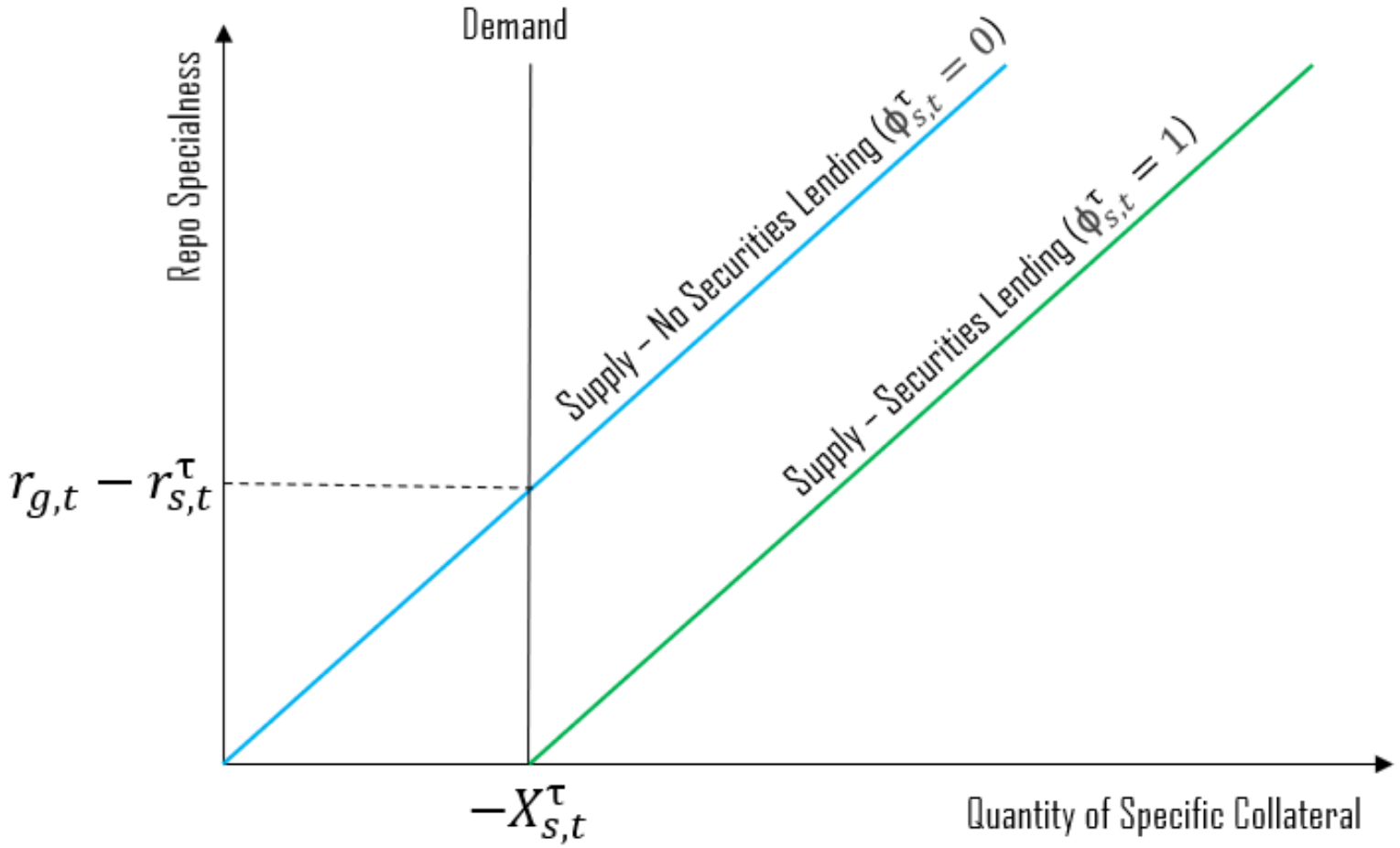
- Arbitrageurs' FOC takes into account repo financing costs:

$$\mathbb{E}_t[dP_{it}^{\tau} / P_{it}^{\tau}] - \overset{\text{Repo rate}}{\overset{\downarrow}{r_{it}^{\tau}}} = -a_{i\tau} \lambda_t$$

- The market price of risk depends on arbitrageurs' exposure to special bonds:

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

Repo rates



- Securities lending by preferred-habitat investors increases collateral supply.

Equilibrium

Collateral abundance:

- Vayanos and Vila 2021 bond market with unique short rate and no specialness.

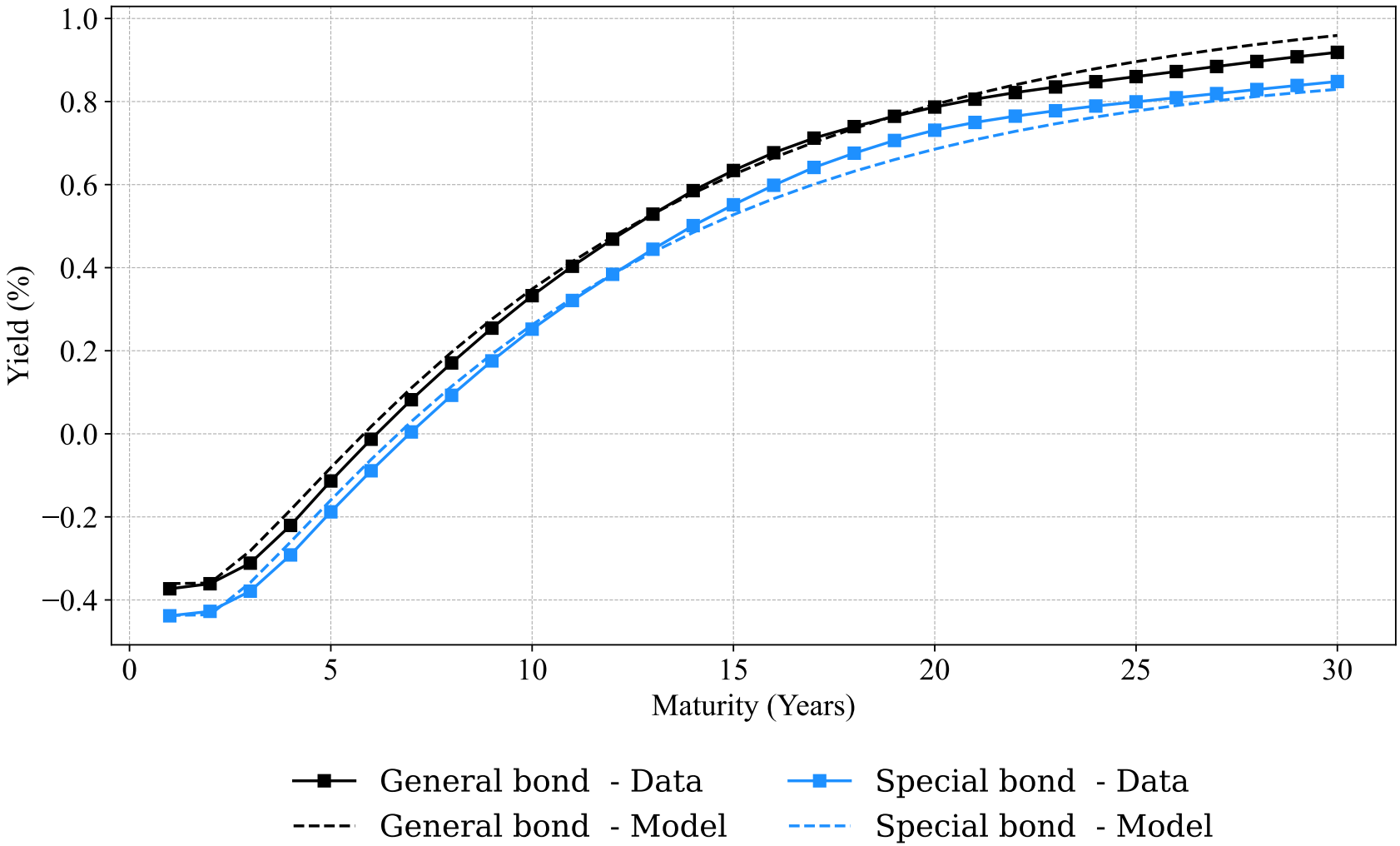
Collateral scarcity:

- Repo rates vary endogenously at the bond level.
- Bonds with identical cash flows have different prices.
- Repo specialness affects the arbitrageurs' portfolio and the market price of risk.

- Repo rates affect *a bond's yield* and, via the pricing of risk, *the entire yield curve*.
- Securities lending by preferred-habitat investors reduces collateral scarcity.

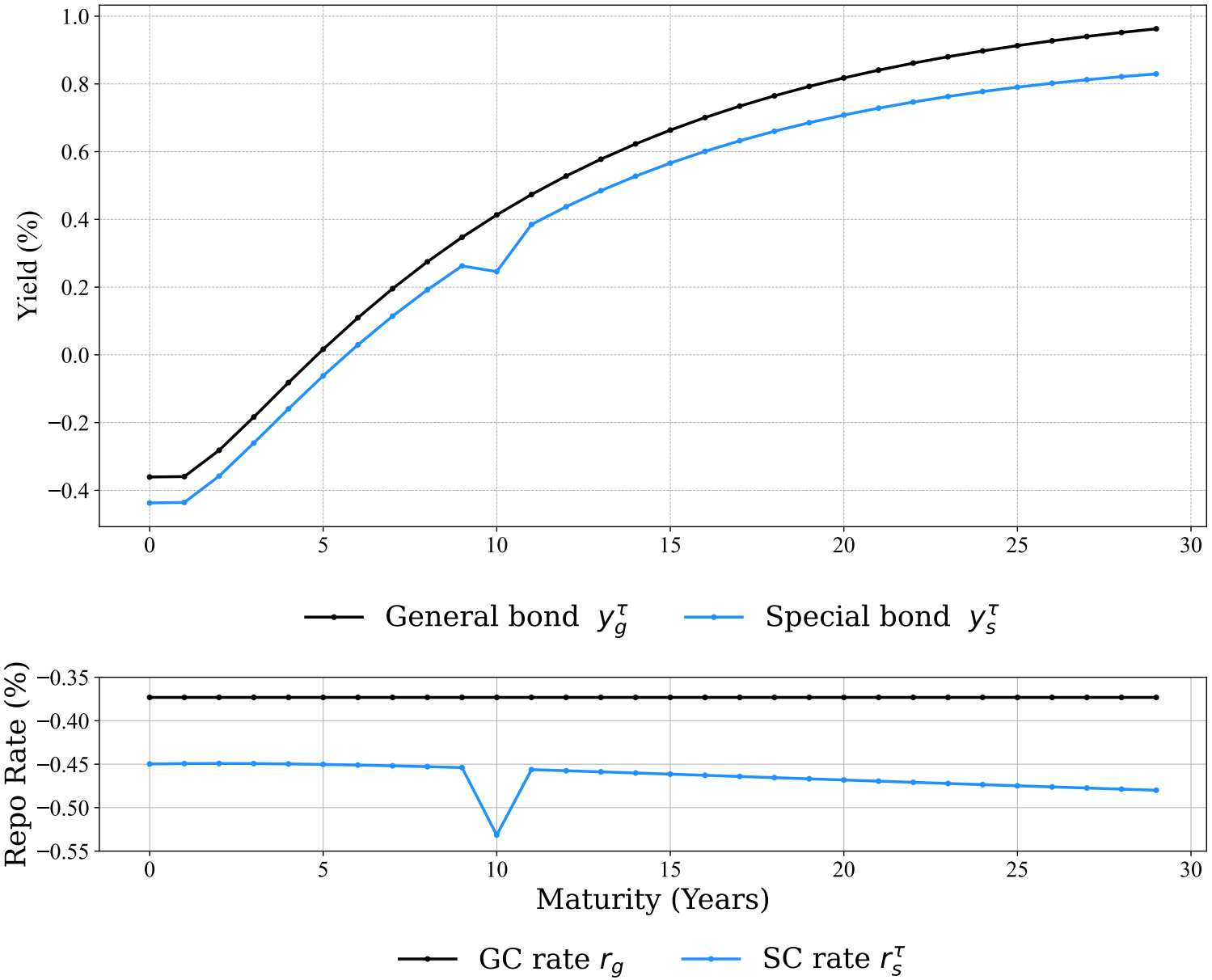
Calibration

Model fit

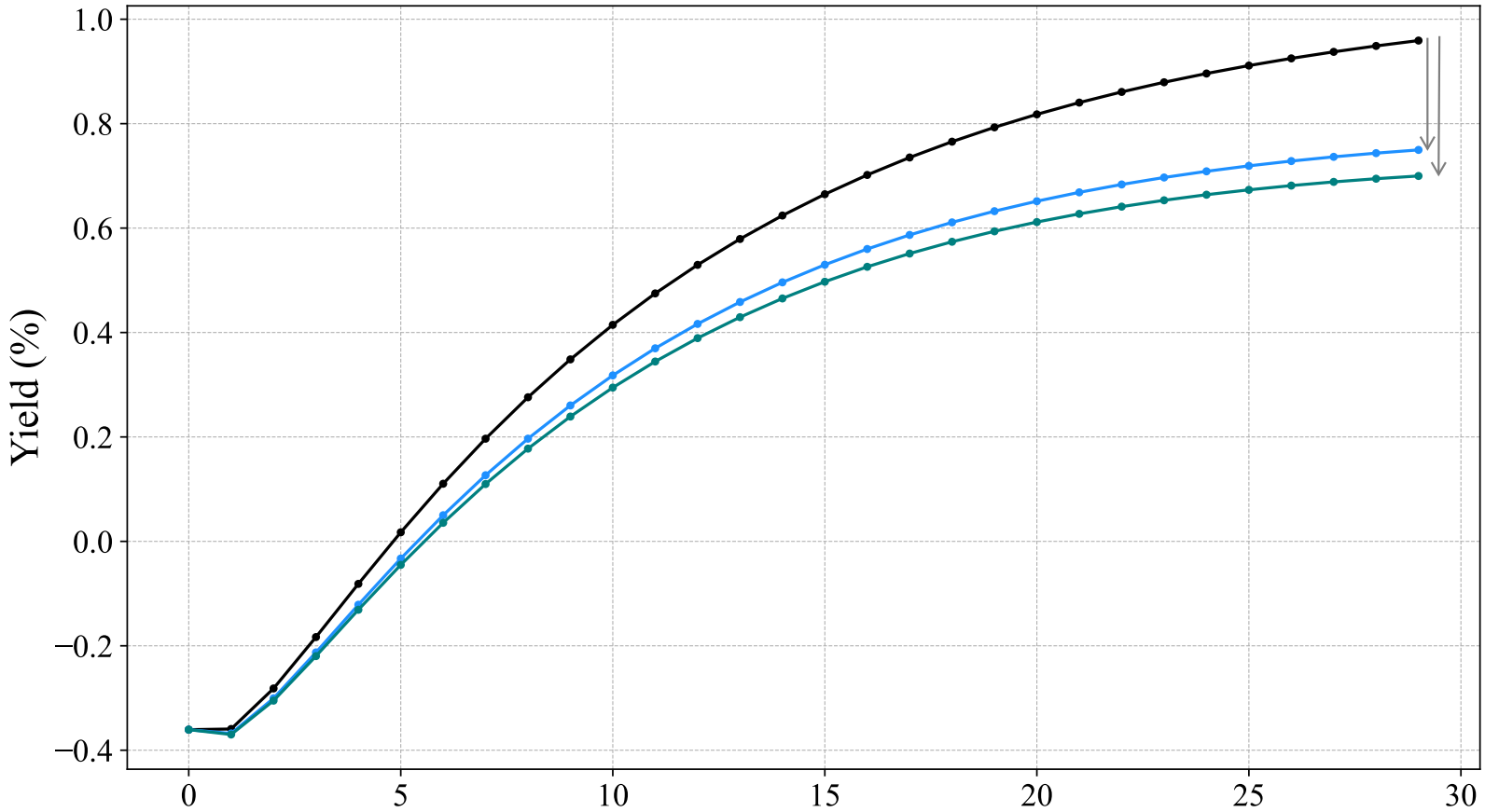


- German Bunds data covering the ECB's APP period, 2014-2023.

Yield curve control



Quantitative easing and Securities lending facility



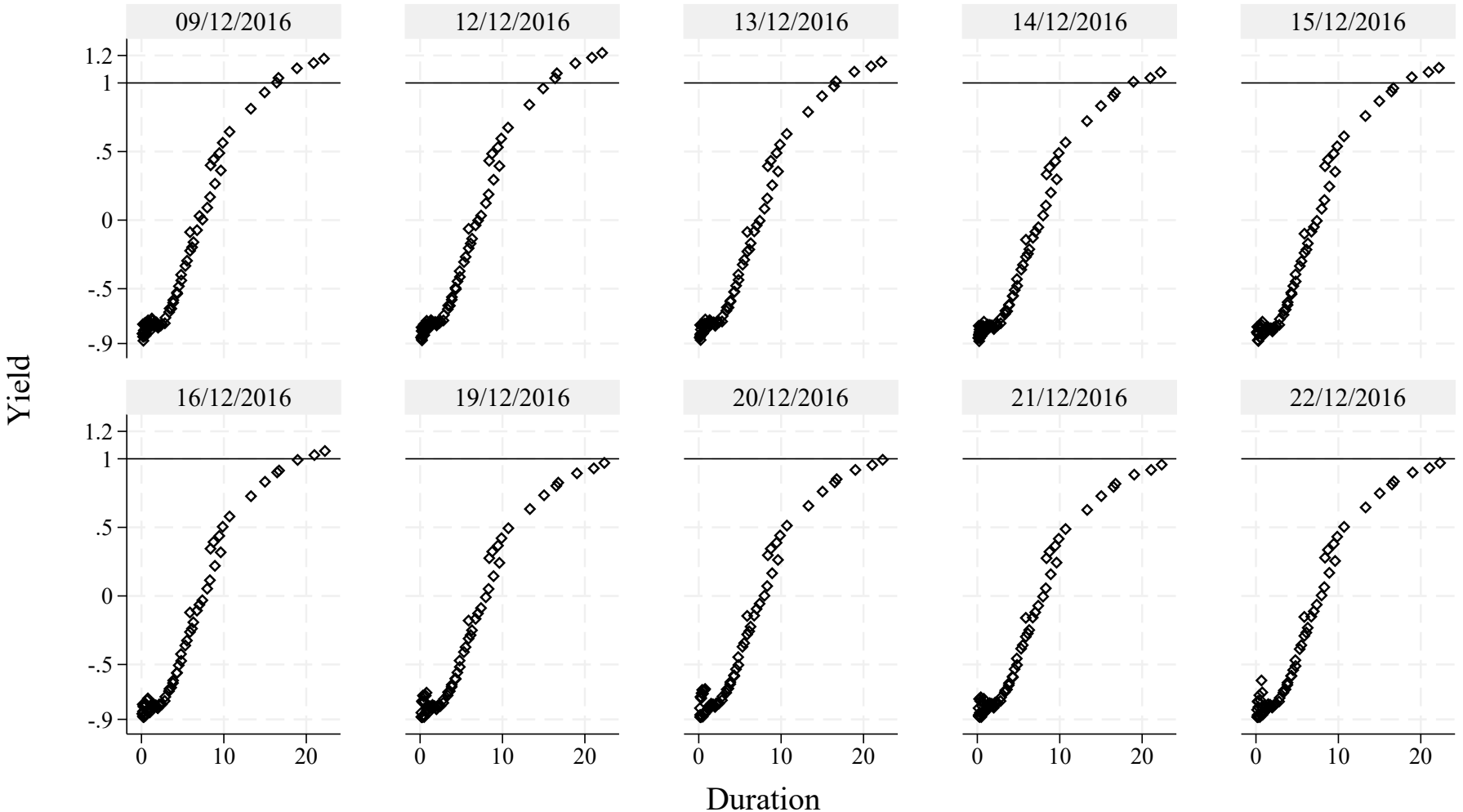
General bond y_g^τ - Baseline

General bond y_g^τ - QE without SLF ($\phi_{st}^\tau = 0$)

General bond y_g^τ - QE with SLF ($\phi_{st}^\tau = 1$)

Securities lending facility and the term spread

ECB's SLF



Conclusion

How does the yield curve interact with the repo market?

- Repo rates affect *a bond's yield* and, via the pricing of risk, *the entire yield curve*.

How should monetary policy account for this effect?

- Control the strength of bond market interventions using repo facilities.

Thank you for your attention

References

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