

The impact of monetary policy normalisation on secured money markets

Special WS 1 NBFI Workshop

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Overview

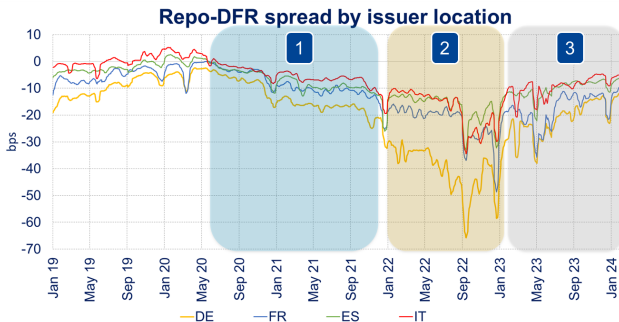
- 1 Research questions
- 2 Introduction and motivation
- 3 Data and methodology to assess the factors explaining repo rates
- 4 Results
- 5 Conclusions
- 6 Annex

Research questions

- ① What are the drivers of historically low repo rates levels in 2022?
 - It is related to higher collateral demand?
 - What is the motivation?
- ② Are the effects different for NBFIs?

Motivation: recent developments in repo markets

1. Post-Covid extension of UMP
2. Shift in MP rate expectations: increasing rates. No significant change in asset purchases holdings
3. Shift in MP rate expectations: decreasing rates. Decrease in ECB balance sheet (TLTRO+ending asset purchases)



Introduction: Literature review

- ① Literature that assess the **impact of unconventional monetary policy (UMP) on money markets**
Carrera de Souza and Hudepohl (2022), Arrata et al. (2020), Brand et al. (2019)
- ② Previous studies on the **interrelations between sovereign debt markets and repo:**
 - *Arrata et al. (2020)*: relevance of short positions in increasing demand for collateral
 - *Nagel (2016)*: increase in monetary policy rate expectations drive up the demand of "money-like-assets" and hedging for additional rate hikes
 - *Dufour and Skinner (2020)*: study determinants of repo specialness
 - *Jappelli et al. (2024)*: when there is excess of collateral demand, the competence for getting the bond, reduces rates

Our work is close to these two strands of literature, combining the **effects of UMP on asset scarcity and interrelations on sovereign debt markets**. We analyse **higher collateral demand** in a context of **monetary policy normalisation**.

Dataset: granular repo rate transactions

Data: repo transactions

- **Individual transactions** (January 2019 - February 2024) from MMSR
- Information on interest rate, volume, counterparty, collateral and type of transaction (borrowing or lending)
- Transactions with **one-day maturity**: O/N, T/N, S/N, which represents around 80% of daily volume
- Transactions backed by **government bonds** from Spain, Germany, France and Italy (around 90% volume).

Data: other

- Demand of collateral: i) a proxy for short positions (MP rate expectations), ii) monetary policy uncertainty and iii) flight-to-quality
- Supply of collateral: ECB footprint
- Liquidity/credit risk

Annex: demand collateral

Annex: supply of collateral

Annex: liquidity/credit risk

Econometric specification

Linear mixed-effects model, with **separate regressions for each country (DE,FR,IT,ES)**

$$\begin{aligned} Repo - DFR_{i,t,j} = & \beta_{Slope} \cdot Slope_t + \beta_{SMOVE} \cdot SMOVE_t + \beta_{Sovereign} \cdot Sovereign_{t,j} \\ & + \beta_{Euribor} \cdot EuriborOIS_t + \beta_{Eurosystemholdings} \cdot Eurosystemholdings_{t,j} + \\ & \alpha_{collateral_i} + \alpha_{counterparty_i} + \alpha_{time} \\ & + Quarter \text{ and year end controls} + Type \text{ transaction}_{i,t,j} + \epsilon_{i,t,j} \end{aligned} \quad (1)$$

where subindex i refers to each transaction, t denotes day of the transaction, and j the country. $\alpha_{collateral}$, $\alpha_{counterparty}$ and α_{time} account for collateral, counterparty and time differences.

Dummies for year and quarter-end for each specific year are included as well as type of transaction (borrowing/lending) identifier.

Useful approach to identify:

- **Cross-time changes in demand for collateral:** e.g., higher interest rate expectations will motivate short positions
- **Cross-collateral heterogeneity:** within same period of time, some collaterals (specials) will be more demanded
- **Cross-counterparty heterogeneity:** within same period of time, repo rates differ across NBFI, banks...

Exploring heterogeneities across counterparties

Which sectors contribute more to a higher collateral demand?

- *Nguyen et al., 2023*: MP transmission works better when transactions are done primarily by banks.
- *Jappelli et al., 2024*: arbitrageurs investors (i.e. NBFIs) borrow the overpriced and more demanded bonds to sell it short.

Need to account for **different effects of short-positioning demand across counterparties** (Banks, NBFI)*

$$\begin{aligned} Repo - DFR_{i,t,j} = & \beta_{Slope} * Counterparty_{sector} \cdot Slope_t + \beta_{SMOVE} \cdot SMOVE_t + \\ & \beta_{Sovereign} \cdot Sovereign_{t,j} + \beta_{Euribor} \cdot EuriborOIS_t + \\ & \beta_{Eurosistemholdings} \cdot Eurosistemholdings_{t,j} + \\ & \alpha_{collateral} + \alpha_{Reportingagent} + \alpha_{time} + Quarter \text{ and year end controls} + \epsilon_{i,t,j} \end{aligned} \quad (2)$$

That way, we can identify **heterogeneities across sectors related to bond demand**.

*transactions done by CCP are also separated.

Exploring heterogeneities across collaterals: *on-the-run* specialness

Is the effect of short positions different for *on-the-run* bonds?

- *Dufour and Skinner, 2020*: consider time-varying bond characteristics determining collateral specialness.
- *d'Amico and Pancost, 2022*: bonds *on-the-run* have a higher price than others (motivated by higher demand)

Account for different effects across *on-the-run* and *off-the-run* bonds

$$\begin{aligned} Repo - DFR_{i,t,j} = & \beta_{Slope} * ontherun_{i,t,j} \cdot Slope_t + \beta_{Slope} * NBFI_{sector} \cdot Slope_t + \\ & \beta_{SMOVE} \cdot SMOVE_t + \beta_{Sovereign} \cdot Sovereign_{t,j} + \beta_{Euribor} \cdot EuriborOIS_t + \\ & \beta_{Eurosystemholdings} \cdot Eurosystemholdings_{t,j} + \\ & \alpha_{Reportingagent} + \alpha_{time} + Quarter \text{ and year end controls} + \epsilon_{i,t,j} \end{aligned} \quad (3)$$

That way, we can identify **time changing effects of higher policy rate expectations and heterogeneities across bonds.**

German collateral

- The downward pressure on repo-DFR spread driven by short positions is mainly working through **NBFI** and, at a lesser extent, using *on-the-run bonds*
- NBFI pay **higher costs for the collateral** (4-5 bps more)

<i>dependent variable: repo-DFR spread</i>	(I)	(II)	(III)	(IV)	(V)	(VI)
Slope	-	-4.07*** (0.00)	-4.25*** (0.00)	-4.49*** (0.00)	-	-
SMOVE	-	-0.17*** (0.00)	-0.17*** (0.00)	-0.16*** (0.00)	-0.16*** (0.00)	-0.18*** (0.00)
Sov.spread	-	0.31*** (0.00)	0.22*** (0.00)	0.23*** (0.00)	0.23*** (0.00)	0.23*** (0.00)
EuriborOIS	-	0.55*** (0.00)	0.20*** (0.00)	0.25*** (0.00)	0.26*** (0.00)	0.27*** (0.00)
APP	-0.53*** (0.00)	-0.52*** (0.00)	-0.56*** (0.00)	-0.49*** (0.00)	-0.48*** (0.00)	-0.51*** (0.00)
NBFI vs bank	-	-	-	-	-4.39*** (0.00)	-5.80*** (0.00)
CCP vs bank	-	-	-	-	1.66*** (0.00)	0.92*** (0.00)
Slope bank	-	-	-	-	-3.16*** (0.00)	-3.74*** (0.00)
Slope NBFI	-	-	-	-	-4.41*** (0.00)	-3.98*** (0.00)
Slope CCP	-	-	-	-	-4.55*** (0.00)	-3.75*** (0.00)
Slope on-the-run	-	-	-	-	-	-1.56*** (0.00)
Adjusted Rsquared	42%	56%	62%	68%	68%	64%
Observations	1,411,529	1,411,529	1,411,529	1,411,529	1,411,529	1,411,529
Quarter and year end controls	yes	yes	yes	yes	yes	yes
Time effects	no	no	no	yes	yes	yes
Collateral FE	no	yes	yes	yes	yes	no
Reporting agent location FE	no	no	yes	yes	yes	yes

*P-values in parenthesis: Significant levels: *p < 0.1; **p < 0.05; ***p < 0.01. CCP refers to non bilateral transactions.*

French collateral

<i>dependent variable: repo-DFR spread</i>	(I)	(II)	(III)	(IV)	(V)	(VI)
Slope	-	-2.93*** (0.00)	-3.07*** (0.00)	-3.39*** (0.00)	-	-
SMOVE	-	-0.11*** (0.00)	-0.12*** (0.00)	-0.11*** (0.00)	-0.11*** (0.00)	-0.12*** (0.00)
Sov.spread	-	-0.03*** (0.00)	-0.13*** (0.00)	-0.11*** (0.00)	-0.11*** (0.00)	-0.12*** (0.00)
EuriborOIS	-	0.29*** (0.00)	0.15*** (0.00)	0.24*** (0.00)	0.24*** (0.00)	0.24*** (0.00)
APP	-0.69*** (0.00)	-0.24*** (0.00)	-0.58*** (0.00)	-0.46*** (0.00)	-0.46*** (0.00)	-0.56*** (0.00)
NBFI vs bank	-	-	-	-	-4.80*** (0.00)	-2.22*** (0.00)
CCP vs bank	-	-	-	-	0.43*** (0.00)	2.38*** (0.00)
Slope bank	-	-	-	-	-0.03 (0.93)	-0.16 (0.64)
Slope NBFI	-	-	-	-	-3.43*** (0.00)	-3.39*** (0.00)
Slope CCP	-	-	-	-	-3.56*** (0.00)	-3.36*** (0.00)
Slope on-the-run	-	-	-	-	-	-1.06*** (0.00)
Adjusted Rsquared	35%	41%	50%	55%	55%	48%
Observations	1,189,501	1,189,501	1,189,501	1,189,501	1,189,501	1,189,501
<i>Quarter and year end controls</i>	yes	yes	yes	yes	yes	yes
<i>Time effects</i>	no	no	no	yes	yes	yes
<i>Collateral FE</i>	no	no	yes	yes	yes	no
<i>Reporting agent location FE</i>	no	no	yes	yes	yes	yes

*P-values in parenthesis: Significant levels: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. CCP refers to non bilateral transactions.*

counterparty differences

Spanish collateral

<i>dependent variable: repo-DFR spread</i>	(I)	(II)	(III)	(IV)	(V)	(VI)
Slope	-	-2.51*** (0.00)	-2.05*** (0.00)	-2.08*** (0.00)	-	-
SMOVE	-	-0.03*** (0.00)	-0.03*** (0.00)	-0.04*** (0.00)	-0.04*** (0.00)	-0.04*** (0.00)
EuriborOIS	-	0.24*** (0.00)	0.13*** (0.00)	0.16*** (0.00)	0.16*** (0.00)	0.15*** (0.00)
APP	-0.53*** (0.00)	-0.11*** (0.00)	-0.73*** (0.00)	-0.68*** (0.00)	-0.68*** (0.00)	-0.89*** (0.00)
NBFI vs bank	-	-	-	-	-3.09*** (0.00)	-2.61*** (0.00)
CCP vs bank	-	-	-	-	1.64*** (0.00)	0.51*** (0.00)
Slope bank	-	-	-	-	-1.29*** (0.00)	-1.73*** (0.00)
Slope NBFI	-	-	-	-	-0.47** (0.03)	-2.48** (0.03)
Slope CCP	-	-	-	-	-3.18*** (0.00)	-2.48*** (0.00)
Slope on-the-run	-	-	-	-	-	-0.35*** (0.00)
Adjusted Rsquared	43%	49%	53%	57%	58%	54%
Observations	1,164,961	1,164,961	1,164,961	1,164,961	1,164,961	1,164,961
<i>Quarter and year end controls</i>	yes	yes	yes	yes	yes	yes
<i>Time effects</i>	no	no	no	yes	yes	yes
<i>Collateral FE</i>	no	no	yes	yes	yes	no
<i>Reporting agent location FE</i>	no	no	yes	yes	yes	yes

*P-values in parenthesis: Significant levels: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. CCP refers to non bilateral transactions.*

Annex: only bilateral trades

Italian Collateral

<i>dependent variable: repo-DFR spread</i>	(I)	(II)	(III)	(IV)	(V)	(VI)
Slope	-	-1.49*** (0.00)	-1.53*** (0.00)	-1.52*** (0.00)	-	-
SMOVE	-	-0.04*** (0.00)	-0.04*** (0.00)	-0.04*** (0.00)	-0.04*** (0.00)	-0.05*** (0.00)
EuriborOIS	-	0.25*** (0.00)	0.16*** (0.00)	0.19*** (0.00)	0.20*** (0.00)	0.17*** (0.00)
APP	-0.68*** (0.00)	-0.39*** (0.00)	-0.61*** (0.00)	-0.55*** (0.00)	-0.55*** (0.00)	-0.61*** (0.00)
NBFI vs bank	-	-	-	-	-11.13*** (0.00)	-10.85*** (0.00)
CCP vs bank	-	-	-	-	-1.47*** (0.00)	-1.08*** (0.00)
Slope bank	-	-	-	-	-3.33*** (0.00)	-2.93*** (0.00)
Slope NBFI	-	-	-	-	-1.22*** (0.00)	-1.00*** (0.00)
Slope CCP	-	-	-	-	-3.47** (0.03)	-3.00** (0.03)
Slope on-the-run	-	-	-	-	-	-0.54** (0.03)
Adjusted Rsquared	22%	29%	40%	44%	45%	36%
Observations	2,221,427	2,221,427	2,221,427	2,221,427	2,221,427	2,221,427
<i>Quarter and year end controls</i>	yes	yes	yes	yes	yes	yes
<i>Time effects</i>	no	no	no	yes	yes	yes
<i>Collateral FE</i>	no	no	yes	yes	yes	no
<i>Reporting agent location FE</i>	no	no	yes	yes	yes	yes

*P-values in parenthesis: Significant levels: *p < 0.1; **p < 0.05; ***p < 0.01. CCP refers to non bilateral transactions.*

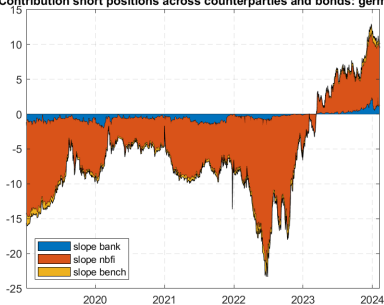
Annex: contributions COVID period

Annex: contributions 2022

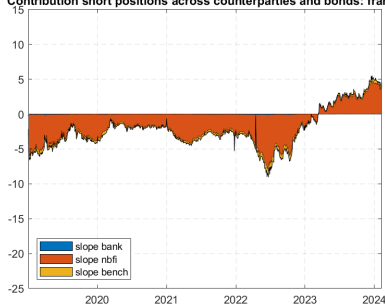
Contribution of short positions by counterparty

- Short positions effect on repo-DFR spread is mainly observed through the participation of NBFIs, who borrow collateral
- This is observed by: i) higher proportion of NBFIs trades, ii) higher effect of short positions for NBFIs

Contribution short positions across counterparties and bonds: germany



Contribution short positions across counterparties and bonds: france



Note: We exclude centrally cleared transactions

[◀ back](#)

Conclusions

- ECB footprint played a relevant role in explaining collateral scarcity and repo-DFR spread levels, but...
- ...other sources of collateral demand arise in 2022, amid MP normalisation.
- We present an empirical assessment of such **conjunctural factors**: rising (and later declining) **MP rate expectations**, **MP uncertainty**, **sovereign spread (flight-to-quality)**, while controlling for **structural factors** (ECB footprint), **funding pressures** (EURIBOR-OIS) and...
- ...we show that **higher demand** for collateral in repo markets to enter into **short positions** was **stronger for on-the-run bonds and NBFIs**.
- Indeed, the effect of short positions on repo spread widening is **stronger** for German and French collateral when **traded by NBFIs**. Additionally, **repo-DFR spread** (for an average transaction) is around **5 to 10 bps bigger** when the counterparty is a **NBFI**.
- In 2024, ECB balance sheet reduction, MP rates repricing, and gov. bonds long positions were the main factors driving repo rates up.
- These findings could be valuable for pricing strategies in other markets, given the close linkage between repo markets and sovereign debt markets.

References

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Thanks for your attention!

Annex: Factors driving the demand for collateral

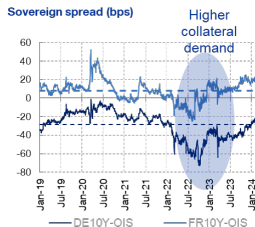
Short positions in sovereign markets



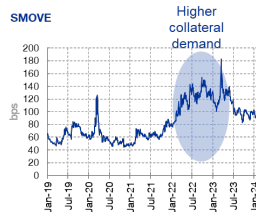
[Expected path of policy rates](#)

[back](#)

Flight-to-quality



Monetary policy uncertainty



Factors driving supply of collateral

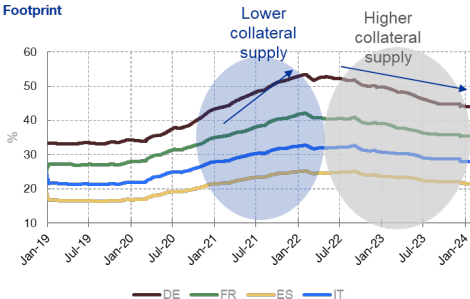
ECB footprint

Eurosystem holdings over free

$$\text{float}_{j,t} = \frac{PSPP_{j,t} + PEPP_{j,t}}{\text{Free float}_{j,t}},$$

where Free-float = Outstanding amount - Eurosystem holdings - Pledged collateral + SLF balance

ECB Footprint



Other factors increasing the SUPPLY

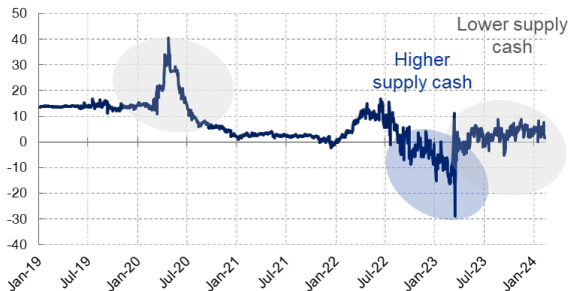
- Increase SL limit
- TLTRO repayments
- Increasing gov. debt. issuances

Cash-driven factors

Euribor-OIS (credit and liquidity risk)

- Euribor 3 months (reference for interbank rates) - OIS (risk-free rate)
- Negative liquidity premium observed in 2022, related to excess liquidity and preference for short tenors

Euribor-OIS 3M (bps)



Annex: only with bilateral trades (Germany and France)

- The impact of **liquidity/credit risk (EuriborOIS)** is bigger in the case of **bilateral** transactions: intuitive as centrally cleared transactions imply lower risks.
- Still the impact of **short positions** is bigger for **NBFIs and on-the-run bonds**

<i>dependent variable: repo-DFR spread</i>	German collateral		French collateral	
	all	only bilateral	all	only bilateral
SMOVE	-0.18*** (0.00)	-0.22*** (0.00)	-0.12*** (0.00)	-0.22*** (0.00)
Sov.spread	0.23*** (0.00)	0.27*** (0.00)	-0.12*** (0.00)	-0.11*** (0.00)
EuriborOIS	0.27*** (0.00)	0.34*** (0.00)	0.24*** (0.00)	0.50*** (0.00)
APP	-0.51*** (0.00)	-0.48*** (0.00)	-0.56*** (0.00)	-0.23*** (0.00)
NBFI vs bank	-5.80*** (0.00)	-4.57*** (0.00)	-2.22*** (0.00)	-0.69*** (0.00)
Slope bank	-3.74*** (0.00)	-3.95*** (0.00)	0.16 (0.64)	0.90 (0.10)
Slope NBFI	-3.98*** (0.00)	-4.43*** (0.00)	-3.39*** (0.00)	-2.64*** (0.00)
Slope on-the-run	-1.56*** (0.00)	-0.76*** (0.00)	-1.06*** (0.00)	-0.94*** (0.00)
Adjusted R-squared	64%	56%	48%	24%
Observations	1,411,529	253,618	1,189,501	200,148
<i>Quarter and year-end controls</i>	yes	yes	yes	yes
<i>Time effects</i>	yes	yes	yes	yes
<i>Collateral FE</i>	no	no	no	no
<i>Reporting agent location FE</i>	yes	yes	yes	yes

[◀ back](#)

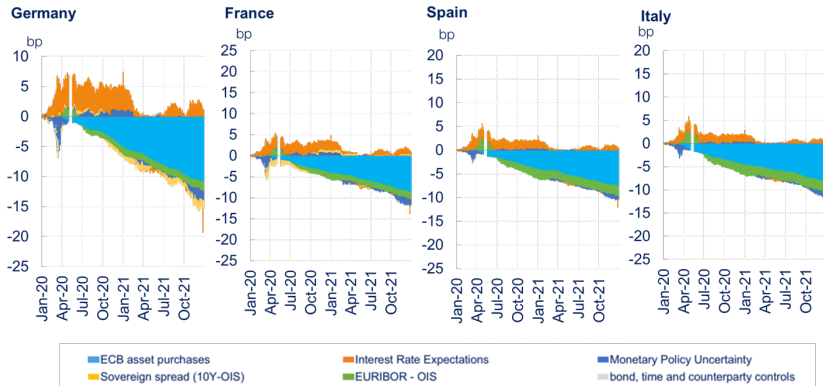
Annex: only with bilateral trades (Spain and Italy)

- The impact of **liquidity/credit risk (EuriborOIS)** is bigger in the case of **bilateral** transactions: intuitive as centrally cleared transactions imply lower risks.
- No additional effect of short-positions for *on-the-run* bonds.

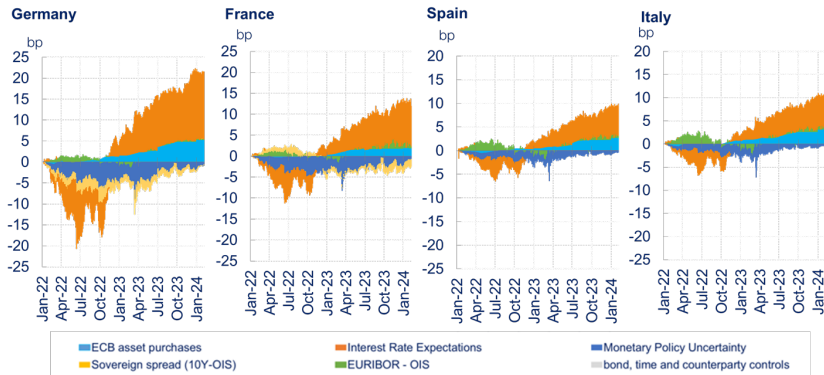
<i>dependent variable: repo-DFR spread</i>	Spanish collateral		Italian collateral	
	all	only bilateral	all	only bilateral
SMOVE	-0.04*** (0.00)	-0.06*** (0.00)	-0.05*** (0.00)	-0.07*** (0.00)
EuriborOIS	0.15*** (0.00)	0.22*** (0.00)	0.17*** (0.00)	0.32*** (0.00)
APP	-0.89*** (0.00)	-0.53*** (0.00)	-0.61*** (0.00)	-0.44*** (0.00)
NBFI vs bank	-2.61*** (0.00)	-2.45*** (0.00)	-10.85*** (0.00)	-10.61*** (0.00)
Slope bank	-1.73*** (0.00)	-1.99*** (0.00)	-2.93*** (0.64)	-4.47*** (0.10)
Slope NBFI	-2.48*** (0.00)	-1.27*** (0.00)	-1.00*** (0.00)	-1.86*** (0.00)
Slope on-the-run	-0.35*** (0.00)	-0.04 (0.27)	-0.54*** (0.11)	0.45 (0.00)
Adjusted R-squared	54%	44%	36%	22%
Observations	1,164,961	521,259	2,221,427	418,525
<i>Quarter and year-end controls</i>	yes	yes	yes	yes
<i>Time effects</i>	yes	yes	yes	yes
<i>Collateral FE</i>	no	no	no	no
<i>Reporting agent location FE</i>	yes	yes	yes	yes

[◀ back](#)

Cumulative changes of factors contributing to repo-DFR spread: post-COVID period (2020-21)



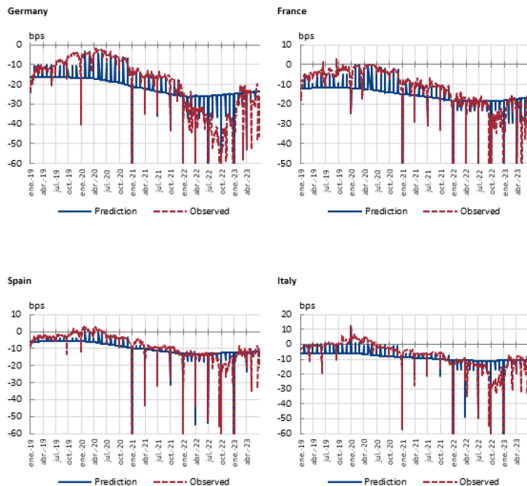
Cumulative changes of factors contributing to repo-DFR spread: MP normalisation period (2022-24)



[back](#)

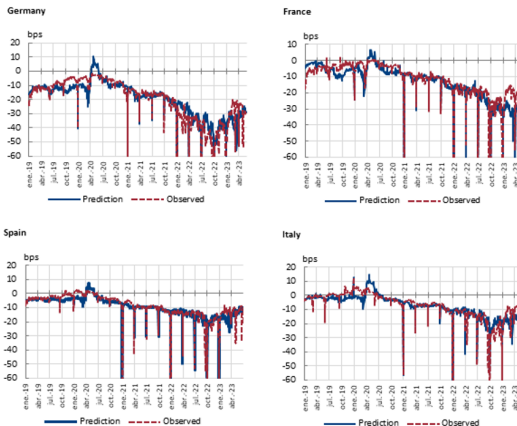
Estimated repo-DFR using different models

Figure: Estimated repo-DFR spread assessing only ECB footprint



Estimated repo-DFR using different models

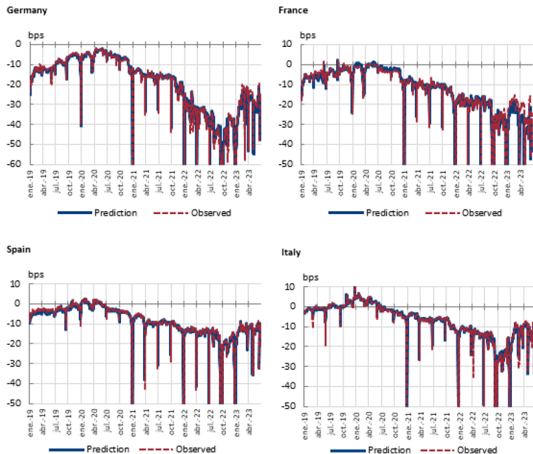
Figure: Estimated repo-DFR spread including MP normalisation



[◀ back](#)

Estimated repo-DFR using different models

Figure: Estimated repo-DFR spread including MP normalisation, collateral and counterparty effects



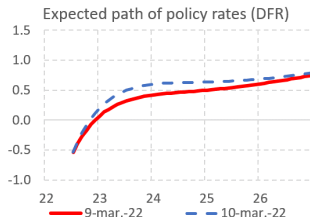
Shift in the monetary policy stance

- Significant increase in both slope and level of the expected path of policy rates during 2022
- Turning point in 2023: historically high level of MP reached but expected to decline in the future

Figure: Level and slope of the expected path of policy rates



Shift in the monetary policy stance: NS model



We apply a Kalman filter for estimating time-varying parameters of the yield curve (following Nelson-Siegel model) where y_τ is the zero-coupon yield with τ days to maturity, β_1 is the long-term level, β_2 is the slope and β_3 is the curvature.

$$y_\tau = \beta_1 + \beta_2 \cdot \frac{(1 - e^{-\lambda\tau})}{\lambda\tau} + \beta_3 \cdot \left(\frac{1 - e^{-\lambda\tau}}{\lambda\tau} - e^{-\lambda\tau} \right)$$

(4)