

Demand drivers of central bank liquidity: A time-to-exit TLTRO analysis

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In a nutshell

Motivation: By exploiting banks’ early exit behavior from TLTRO following the Oct. 2022 recalibration, our aim is to understand what **drives a sticky, prolonged demand for central bank (long-term) operations** as opposed to an early exit from such facilities.

Why: New operational framework with a **demand-driven floor and new longer-term structural operations**; We use the TLTRO phasing-out experience to shed light on the demand drivers of long-term operations and inform their future design.

Our approach: Bank-level analysis; we employ a **time-to-exit** (duration/survival/event history) **analysis** to study what drives banks’ early vs late exit decisions.

A discrete-time hazard model for TLTRO early exit

- 820 TLTROIII participating banks (groups) $i = 1, \dots, 820$.
- Discrete-time values $t = 1, 2, \dots, 8$ (the repayments times **between Nov. 22 and Dec. 23**).
- Discrete-time hazard:** conditional probability that the TLTRO early exit event occurred for bank i at time t , given that the event has not already occurred

$$h_{i,t} = \Pr[T_i = t | T_i \geq t, X_{i,t}] \quad (1)$$

T_i : the discrete random variable that indicates the (uncensored) time of event occurrence for bank i .
 $X_{i,t}$ a $K \times 1$ vector of bank (country) specific explanatory variables

- Cox (1972) extension of the proportional hazards model to discrete-time.**

$$\frac{h_{i,t}}{1-h_{i,t}} = \frac{h_{0,t}}{1-h_{0,t}} + \exp\{\beta' X_{i,t}\} \quad (2)$$

with $h_{0,t}$ the **baseline hazard** at time t and β' capturing the relative risk associated with covariates values $X_{i,t}$.

Tightening TLTRO conditions

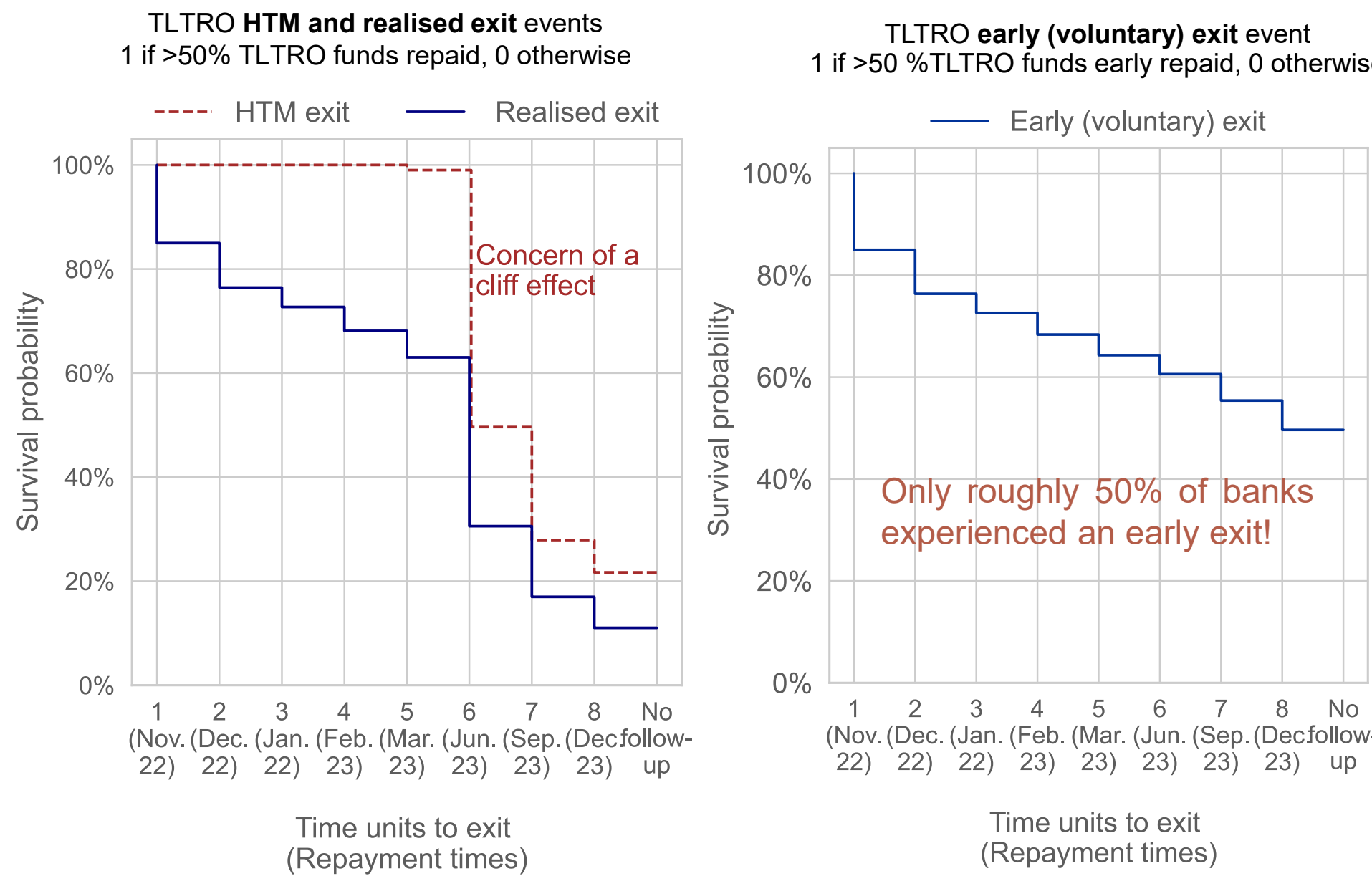
- TLTROIII conditions not in line with the monetary policy normalisation process: TLTROIII remuneration linked to the average DFR/MRO over the life of the respective operation.

- As policy rates were raised, TLTROIII rates adjusted only very gradually. Disincentive to early repay. **Slower than expected balance sheet normalization.**

→ **TLTROIII re-calibration in October 2022**, aligning TLTRO pricing with the monetary policy stance.
→ Ideal laboratory to analyze what drives a prolonged demand for long-term operations.

Institutional setting

Accelerated balance sheet reduction via TLTRO banks



Notes: Kaplan-Meier survival probability estimates of three TLTRO exit events.

Data

- Proprietary market operations data governed by the Eurosystem's Market Operations Committee (MOC)**
 - TOP (tender operations): TLTRO auctions (participation and repayments), participation in SRO, take-up in other operations.
 - LM (liquidity management): MRR, CA, SF.
 - TLTRO templates: TLTRO group composition
 - MOC' Counterparty expert group: supervisory statistics (LCR and NSFR) for the subsample of Spanish banks
- Other confidential bank-level datasets**
 - iBSI: bank balance sheet data
 - AnaCredit: Unused loan commitments
 - CSDB: Bank ratings data
- Public data**
 - ECB SDW: Credit demand indicators (country-level), Country-level indicator of financial stress (CLIFS)
 - ECB SMA: DFR expectations

Liquidity positions as key bank characteristics

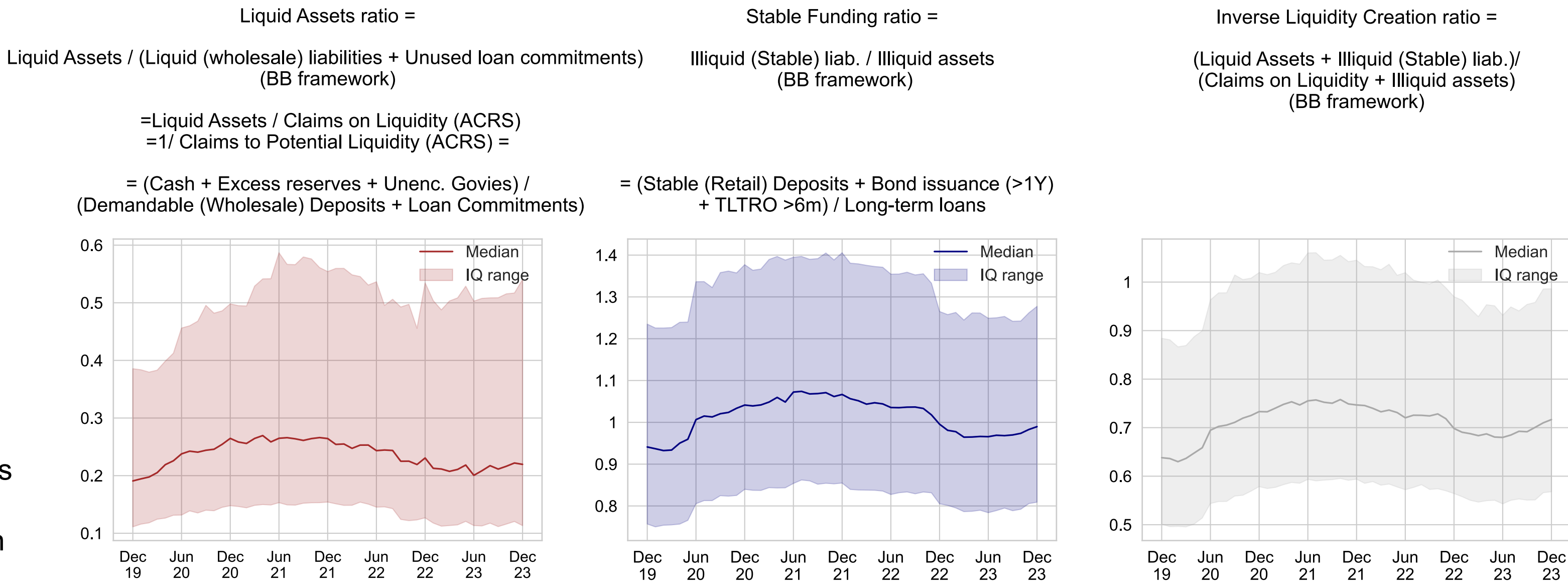
Why?

- To capture how “available” reserves and stable funding sources really are.

- We find that a bank’s share of excess reserves is linked with the time-to-exit TLTRO only after adjusting for the influence of *Claims on liquidity* such as demandable (wholesale) deposits and unused loan commitments (Acharya et al. 2023, Acharya and Rajan 2024).

- Similarly, a bank’s share of stable funding sources significantly affects early exit decisions only when balance sheet items requiring such funding—such as long-term loans—are accounted for.

- Based on Berger and Bouwman (2009) framework for **Bank Liquidity creation (BB framework)** and the **Claims to Potential Liquidity measure** by Acharya et al. 2023 (**ACRS framework**).



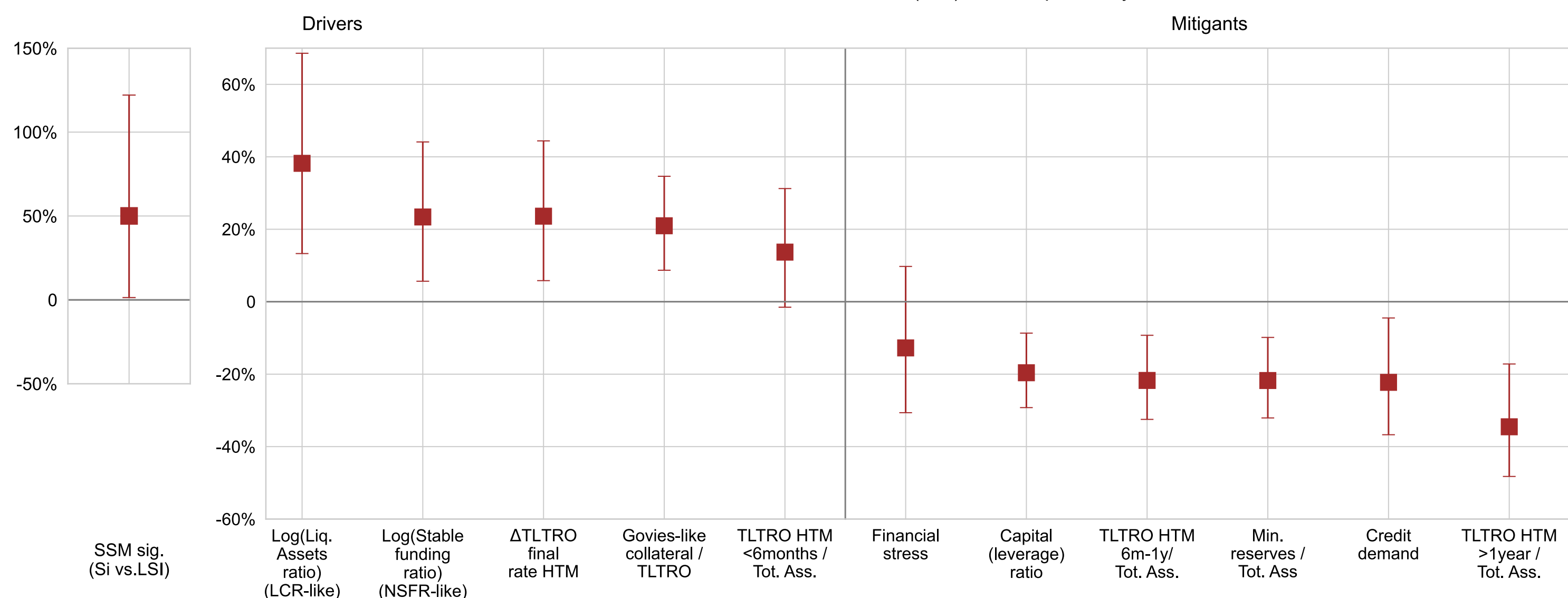
Regulatory interpretability

- Strong association between the liquidity position indicators and regulatory ratios (for the subsample of Spanish banks).
- Association confirmed using panel regressions with bank fixed effects over Q3 2022–Q4 2023 (unreported).

Results: Drivers and mitigants of TLTRO early exit

a) Specification with Liquid assets ratio and Stable funding ratio.

Change in the odds of early exiting TLTRO associated with 1 std. deviation (unit) $\nearrow$ of explanatory variables



Notes: This figure plots the percentage change in the odds of early exit associated with one-standard-deviation (unit) increase in each explanatory variable together with the standard errors, in decreasing order.

Demand for standard refinancing operations (SRO)

- Our liquidity position measures also explain demand for SRO: Banks with weaker liquidity positions were more likely to use SRO during the TLTRO phasing-out. This effect was more pronounced for TLTRO late exiters (*Interactions with Time-to-exit TLTRO unreported*).

Liquidity positions and demand for SRO

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	MRO participation		3mLTRO participation		SRO participation (MRO or 3mLTRO)	
-Log(Liquid assets ratio) (t-1)	0.022** (0.009)		0.001 (0.004)		0.024** (0.010)	
-Log(Stable funding ratio) (t-1)	0.053 (0.033)		0.057** (0.023)		0.080** (0.033)	
Log(Liquidity creation ratio) (t-1)		0.076** (0.030)		0.060*** (0.021)		0.118*** (0.031)
R squared	0.453	0.453	0.374	0.375	0.467	0.467
Bank fixed effects	x	x	x	x	x	x
Country x Month fixed effects	x	x	x	x	x	x
SSM sign. x Month fixed effects	x	x	x	x	x	x
TLTRO repayment rate, capital ratio, minimum reserves required	x	x	x	x	x	x
Observations	10,150	10,184	10,150	10,184	10,150	10,184
Number of banks	807	808	807	808	807	808

Notes: This table reports results from OLS regressions at the bank-month level. In Columns (1)-(2) the dependent variable is a dummy variable, taking on the value of one if a bank participated in the main refinancing operation (MRO) and zero otherwise. In Columns (3)-(4) the dependent variable is a dummy variable, taking on the value of one if a bank participated in the regular long-term operation with three months maturity (3mLTRO) - and zero otherwise. In columns (5)-(6) the dependent variable is a dummy variable, taking on the value of one if a bank participated in any of the SRO, i.e. either the MRO or the 3mLTRO - and zero otherwise. Standard errors are clustered at the bank level and reported in parentheses. *, **, *** mean significance at ten, five, and one percent, respectively.

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Conclusions and policy implications

- Design features such as **maturity structure, pricing, and collateral type**, as well as balance sheet characteristics such as **capital (leverage) ratio** and **minimum reserves** emerge as key demand drivers.
- A bank’s share of excess reserves or stable funding is not (strongly) linked to banks’ early/late exit decisions; however, our **bank liquidity indicators** show a strong relationship with the demand for central bank reserves.
- The regulatory interpretability of the liquidity position ratios coupled with the evidence for **an NSFR-value** of operations with maturities exceeding six months, suggest a link between the demand for (long-term) central bank liquidity and the fulfillment of regulatory liquidity ratios.
- Despite the different purpose of TLTRO, our findings have policy implications for the **design of the new structural long-term operations under the revised ECB operational framework**, envisaged to be calibrated in 2026. Understanding the relative importance of demand drivers can also help policymakers assess which design features are most critical when calibrating the operations.
- Our **liquidity position measures, which differentiate between short-term and long-term bank liquidity needs** could serve as monitoring indicators to identify shifts in the demand for longer-term versus short-term operations, thereby informing the **optimal timing for activating the new structural longer-term refinancing operations**.

References

- Acharya, V. and R. Rajan (2024) "Liquidity, Liquidity Everywhere, Not A Drop To Use -Why Flooding Banks With Central Bank Reserves May Not Expand Liquidity", *Journal of Finance* 79(5), 2943-2991.
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