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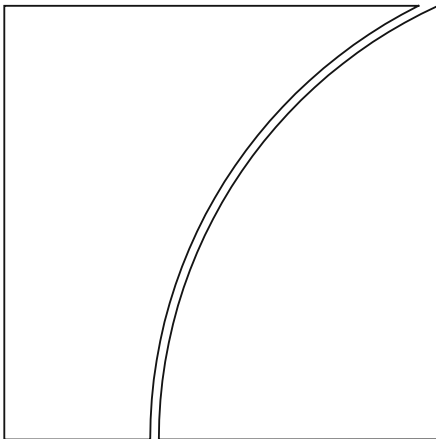
## No 1352

# Liquidity regulation and bank funding costs

by Iñaki Aldasoro, Sebastian Doerr and Haonan Zhou

Monetary and Economic Department

May 2026



JEL classification: G21, G23, G28

Keywords: liquidity coverage ratio, liquidity risk, Basel III, money market funds, market discipline

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ISSN 1020-0959 (print)  
ISSN 1682-7678 (online)

# Liquidity regulation and bank funding costs\*

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May 2026

## Abstract

We establish a causal link between liquidity regulation and a lower cost of bank wholesale funding. For identification, we use pre-determined variation in banks' liquidity coverage ratio (LCR) in a difference-in-differences setup. Granular instrument-level data allow us to carefully control for any observable and unobservable time-varying factors at the creditor, instrument type, and macroeconomic levels. We find that banks with greater LCR exposure see a steeper decline in their wholesale funding costs. Consistent with seminal theoretical papers on bank liquidity risk, we provide novel evidence that wholesale funding costs decline by more for longer-maturity instruments and that banks shift from short to longer-maturity liabilities. Our results support the argument that bank regulation can – at least partly – offset its costs to intermediaries through cheaper wholesale funding.

*JEL classification:* G21, G23, G28.

*Keywords:* Liquidity Coverage Ratio, liquidity risk, Basel III, money market funds, market discipline.

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# 1 Introduction

A central premise in assessments of bank regulation is that safer banks borrow more cheaply. Regulators emphasize this channel in welfare analyses: by reducing the probability of distress, prudential rules can lower the risk premia required by uninsured creditors, partially offsetting banks' private costs of holding higher capital or liquidity buffers (FSB, 2021; BCBS, 2022). This premise builds on the market-discipline literature, which argues that uninsured creditors price bank risk and that the threat of funding withdrawal disciplines bank behavior.

From a theoretical perspective, liquidity regulation affects both the cost and maturity structure of bank debt. First, liquidity regulation should lower banks' wholesale funding costs on average. By forcing banks to self-insure against funding stress, regulation increases bank resilience and thereby reduces the compensation required by uninsured creditors (Calomiris and Kahn, 1991). Second, funding costs should decline by more at longer maturities, because long-term creditors, who are more exposed to rollover risk and dilution during stress, benefit disproportionately when liquidity regulation makes such states less likely (He and Xiong, 2012). Third, regulation should tilt banks' borrowing from very short-term runnable debt toward longer maturities, both because it reduces the disciplining value of runnable short-term debt (Diamond and Rajan, 2001) and because it counteracts the "maturity rat race", in which each creditor has an incentive to shorten the maturity of her claim to obtain de facto seniority, generating excessive rollover risk (Brunnermeier and Oehmke, 2013).

Obtaining causal evidence on how liquidity regulation affects banks' cost of debt and maturity structure, however, has proven difficult for two main reasons. First, financial regulation is often introduced as a package, making it hard to distinguish the effects of one specific regulation from other contemporaneous factors. Second, data on funding costs are usually only available at the aggregate bank or branch level, or at coarse frequencies, limiting researchers' ability to examine effects along the maturity spectrum or to control for time-varying creditor composition, instrument characteristics, and other factors that can move prices independently of regulation. Our paper makes progress on both fronts.

We study the effects of liquidity regulation on bank wholesale funding with granular instrument-level data. We focus on the Liquidity Coverage Ratio (LCR), introduced as part of Basel III and which requires a bank to hold enough high-quality liquid assets (HQLA) to cover its total net cash outflows over a 30-day severe stress scenario. Liquidity regulation is a cornerstone of the post-crisis regulatory framework, on par with capital regulation, reflecting the central role of funding fragility during crises. Indeed, the Great Financial Crisis (GFC) and the 2023 U.S. banking turmoil have underscored that liquidity-driven distress can impose large costs on banks and the macroeconomy. Compared to capital regulation, however, the effects of liquidity regulation remain severely underexplored.<sup>1</sup>

To assess the effects of the LCR on U.S. banks' wholesale funding, we use data on their borrowing from money market funds (MMFs). MMFs are a key provider of short-term wholesale funding to banks (Aldasoro and Doerr, 2023).<sup>2</sup> They are major investors in banks' commercial paper (CP), certificates of deposit (CD), and other short-dated instruments, including repurchase agreements (repos). Importantly for identification, MMF holdings data record the terms of individual instruments and the identity of the creditor, allowing us to compare how the same fund prices different banks and instruments over time in response to liquidity regulation. Our sample runs from February 2011 to December 2015, spanning the LCR implementation window.<sup>3</sup>

Our identification strategy combines pre-determined variation in banks' exposure to liquidity regulation with granular fixed effects that absorb confounding factors at the creditor, instrument type, and macroeconomic levels. The LCR was introduced as a common regulatory standard, but its effective stringency differed sharply across banks due to pre-existing balance sheet structures. We compute banks' *LCR gap* as a measure of the pre-regulation

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<sup>1</sup>According to Diamond and Kashyap (2016) "practice is far ahead of both theory and measurement", while Allen and Gale (2018) lament that "with capital regulation there is a huge literature but [...] with liquidity regulation, we do not even know what to argue about". In a more recent survey, Doerr and Drehmann (2026) conclude that despite some advances, "important questions about the LCR remain unanswered".

<sup>2</sup>MMF lending to banks exceeded \$2.5 trillion in 2025. This compares to about \$11.5 trillion in total deposits and \$4.9 trillion of uninsured deposits among large domestically chartered commercial banks. In our sample, MMFs' claims correspond to about 16% of banks' total estimated uninsured deposits and 26% of their wholesale liabilities.

<sup>3</sup>We stop our sample at the end of 2015 to avoid proximity to the U.S. MMF reform that took effect in October 2016 and led to significant structural changes in the market.

shortfall relative to LCR-defined requirements among banks subject to the LCR. Banks with a larger gap substantially increased their LCR, and in particular their share of HQLA, which made them more resilient to liquidity stress (Hong et al., 2014; Sundaresan and Xiao, 2024).<sup>4</sup> Using a difference-in-differences design around the Basel Committee’s revised LCR rule in 2013Q1, we compare changes in wholesale funding costs and amounts for banks with higher vs. lower pre-regulation LCR gaps, i.e. banks that were more vs. less affected by the introduction of the LCR.

Detailed MMF data allow us to include granular fixed effects that control for a host of possibly confounding factors. These include bank×fund fixed effects, which absorb e.g. time-invariant relationship pricing, and instrument type fixed effects, which absorb e.g. contractual heterogeneity. Importantly, we also include fund×time fixed effects, which absorb time-varying creditor shocks and changes in the supply of wholesale funding. Inclusion of these fixed effects ensures that identification comes from variation across banks, within-creditor and within-instrument type. This constitutes an innovation relative to previous studies that have predominantly relied on bank-level data.<sup>5</sup>

We first show that the introduction of the LCR significantly lowered the cost of bank wholesale funding. Banks with larger pre-treatment LCR gaps experience a significantly larger decline in borrowing costs after the LCR’s introduction. Supporting our identifying assumptions, we find no differential pre-trends in interest rates between more and less exposed banks prior to the treatment period. In our most saturated specification, a one-standard-deviation increase in the pre-regulation LCR gap is associated with a reduction in wholesale funding costs of about 8%. Evaluated at the sample mean of 31 basis points, this corresponds to a sizeable reduction of approximately 2.5 basis points.

Second, we use our detailed data to obtain three results on prices and quantities along the maturity spectrum. First, funding costs decline by more for longer-maturity instruments among banks more exposed to the LCR, even

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<sup>4</sup>The finding that banks mostly adjust their stock of HQLA in response to the LCR is also confirmed in a survey-based analysis by the BCBS (2019).

<sup>5</sup>Our setup mirrors that for studies of banks’ credit supply. Granular loan-level data allow researchers to include borrower or borrower×time fixed effects (Khwaja and Mian, 2008; Jiménez et al., 2012) to compare lending by different banks to the same borrower in the same period.

when we include bank  $\times$  time fixed effects to absorb unobservable time-varying bank characteristics. For example, the decline in rates is twice as large for instruments with a maturity of 31 or more days compared to those with a one-day maturity. Second, banks with a larger LCR gap borrow larger amounts from MMFs. Third, the same banks shift their borrowing away from shorter-term and toward longer-term instruments. As we discuss, these findings provide novel evidence that closely aligns with the joint predictions of canonical papers on bank liquidity risk (Calomiris and Kahn, 1991; Diamond and Rajan, 2001; He and Xiong, 2012; Brunnermeier and Oehmke, 2013).

Our results are robust to a wide range of alternative specifications and samples. We show that the baseline estimates are not explained by banks' differential exposure to unconventional monetary policy, in particular quantitative easing. Nor are they explained by deposit dynamics due to potential differences in banks' deposit betas as the monetary policy rate changes. We further document stability across various subsamples and under additional fixed effects structures that absorb time-varying instrument type and maturity-specific factors. Our findings are also robust to alternative constructions of the LCR gap, accounting for fund, bank, or fund family bargaining power, and the impact of Comprehensive Capital Analysis and Review (CCAR) stress tests. Finally, we report placebo regressions among banks not subject to the LCR and find that among placebo banks (for which the LCR requirement did not apply), the level of ex-ante liquidity holdings had no statistically or economically significant effect on wholesale funding costs.

**Related literature and contribution.** Our key contribution is to provide causal, instrument-level evidence on a mechanism that is central in both theory and regulatory welfare assessments: liquidity regulation lowers banks' wholesale funding costs, especially for longer maturities, and leads to a shift towards longer-term instruments. By combining pre-determined variation in LCR exposure with time-varying creditor- and instrument-level fixed effects, we isolate this channel. We contribute to two strands of the literature.

First, our paper relates to the market discipline literature arguing that uninsured creditors price bank risk. Calomiris and Kahn (1991) and Diamond and Rajan (2001) provide seminal theoretical contributions that show how runnable liabilities serve to discipline banks. Brunnermeier and Oehmke (2013) show that firms may end up in a maturity rat race, in which each individ-

ual creditor has an incentive to shorten its claim to obtain de facto seniority. This can generate inefficiently short term funding structures and excessive rollover risk. [He and Xiong \(2012\)](#) show how rollover risk raises default risk and credit spreads by relatively more on long-term debt, because long-term creditors bear the cost of dilution when short-term creditors do not roll over their debt.

To our knowledge, no prior work has tested directly how financial regulation affects the cost of debt along the maturity spectrum. In early empirical work, [Flannery and Sorescu \(1996\)](#) document that yields on U.S. banks' subordinated debentures load positively on measures of bank risk. Using country-level deposits data from emerging markets, [Martínez Pería and Schmukler \(2001\)](#) show that less-insured depositors demand higher rates and withdraw funds from weaker banks. Also in a cross-country setting, [Gambacorta and Shin \(2018\)](#) show that better capitalized banks have lower wholesale funding costs. [Hett and Schmidt \(2017\)](#) find that the risk sensitivity of bank bond spreads eroded with GFC-era bailout expectations and re-emerged after subsequent reforms. [Gropp et al. \(2014\)](#) exploit the removal of public guarantees for German savings banks and show that spreads rise and risk-taking declines when creditor protection is withdrawn. [Danisewicz et al. \(2018\)](#) show that making wholesale creditors more exposed to bank risk via subordination raises bank funding costs. Finally, [Calomiris and Jaremski \(2019\)](#) provide historical evidence from the pre-FDIC era that deposit insurance removed market discipline, constraining uninsured banks.<sup>6</sup> While these papers use bank-level data to establish their findings, we leverage micro data that allow us to examine effects along the maturity spectrum while controlling for a wide array of confounding factors.

Second, we complement research on the effects of post-crisis liquidity regulation. [Allen and Gale \(2018\)](#) and [Doerr and Drehmann \(2026\)](#) provide surveys of the LCR, a central pillar of the Basel III framework. Existing work primarily emphasizes balance sheet adjustments and lending responses to liquidity regulation, rather than the pricing of bank (wholesale) funding or effects on market discipline. Banks typically comply with liquidity rules by increasing their HQLA holdings ([Banerjee and Mio, 2018](#); [Raz et al., 2022](#); [Sun-](#)

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<sup>6</sup>See also [Flannery and Bliss \(2019\)](#) for a survey of the literature. [Davydiuk et al. \(2024\)](#) provide complementary evidence in the direct lending space, where creditors do not benefit from a safety net in the form of deposit insurance.

daesan and Xiao, 2024) and tend to cut back lending (Reinhardt et al., 2023; Roberts et al., 2023) as liquid assets displace loans. This can result in lower bank profitability (Curfman and Kandrak, 2022) and may have spurred the growth of private credit (Doerr et al., 2026). Funding structures adjust, but to a much smaller extent than assets: short-term wholesale liabilities contract, while retail deposits and more stable sources expanded somewhat (Bonner and Eijffinger, 2016; Banerjee and Mio, 2018). We provide novel evidence on funding costs and amounts along the maturity spectrum, which so far has been scarce and largely based on bank balance sheet data.

## 2 Institutional background and data

To establish the setting for our analysis, we first detail the U.S. LCR framework and the role of MMFs as wholesale creditors to banks. We then describe our data and key variables, and provide summary statistics.

### 2.1 Institutional background

**The Liquidity Coverage Ratio.** Liquidity risk is part and parcel of banking, as banks fund long-term, illiquid assets with short-term, demandable liabilities. While this liquidity creation serves the real economy, it exposes banks to runs and the economy to the risk of financial crises. The GFC and the banking turmoil of 2023 have exemplified the costs of liquidity crises for banks, the financial system, and the economy (Brunnermeier, 2009; Metrick, 2024).

In response to the GFC, Basel III introduced the first global regulatory framework covering liquidity risk, and in particular the Liquidity Coverage Ratio.<sup>7</sup> Basel III hence placed liquidity risk on an equal footing with solvency risk. The LCR requires that the ratio of an institution’s stock of HQLA to its projected net cash outflows over the next 30 calendar days should exceed 100%:

$$\text{LCR} = \frac{\text{stock of HQLA}}{\text{total net cash outflows over 30 days}} \geq 100\%. \quad (1)$$

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<sup>7</sup>In addition, the Net Stable Funding Ratio (NSFR) was introduced, which aims to address maturity mismatches beyond the one-year horizon. Since the U.S. published the final rule to implement the NSFR in October 2020, i.e., after our sample period, and it was not implemented until 2021, we focus on the LCR only.

For the numerator, only assets that demonstrably retain value and marketability in periods of strain qualify. There are two categories. *Level 1 assets* carry no haircut and may make up 100% of the stock of HQLA. These include cash, central bank reserves and highly rated sovereign or central bank securities. *Level 2 assets* are subdivided into Level 2A assets (for example, certain high-grade public-sector or covered bonds) and, at national discretion, Level 2B assets (for example, lower-rated corporate debt or equities in major indices). Level 2 holdings are subject to mandatory haircuts of at least 15% (Level 2A) or 25–50% (Level 2B) and together may not exceed 40% of the total stock, with Level 2B capped at 15%.

For the denominator, projected net outflows are calculated under a 30-day stress scenario. Net outflows are the difference between total expected cash outflows and total expected cash inflows. Total expected cash outflows are calculated by multiplying the outstanding balances of various categories or types of liabilities and off-balance sheet commitments by a run-off rate. Total expected cash inflows are calculated by multiplying the outstanding balances of various categories of contractual receivables by the rates at which they are expected to flow in under the scenario, up to an aggregate cap of 75% of total expected cash outflows.

How has the LCR affected banks? Banks mostly met the LCR requirement by increasing their HQLA, at times at the expense of their lending (see the literature surveys by [Allen and Gale \(2018\)](#) and [Doerr and Drehmann \(2026\)](#), as well as [BCBS \(2019\)](#)). Changes to funding models were in general modest, with some banks replacing short-term wholesale funding (in particular interbank loans) with more stable retail or longer-maturity liabilities. Consistent with this evidence, [Figure OA.2](#) and [Table OA.8](#) show that U.S. banks for which the LCR was more binding substantially increased their LCR, and in particular their HQLA share, but did not differentially adjust funding structures. We discuss these results in more detail below.

In the U.S., the introduction of the LCR adhered to the following timeline. The BCBS proposed the LCR in December 2010 and a revised LCR rule was issued in January 2013 ([BCBS, 2013](#)). The first U.S. version was proposed in October 2013, and finalized in September 2014. The final compliance deadline was in December 2017. All banks with assets above \$50 billion are subject to the LCR, albeit to a different degree (discussed below). Consistent with other work, including [Roberts et al. \(2023\)](#), [Sundaresan and Xiao \(2024\)](#), and

[Bosshardt et al. \(2024\)](#), we use 2013Q1 as the cut-off date for the LCR introduction. This corresponds to the quarter when the Basel Committee issued the revised LCR rule and aligns with breaks in the time series of key variables.

**Bank borrowing from MMFs.** MMFs are open-ended collective investment funds that invest in short-term instruments and seek to maintain stable share prices. MMFs provide investors with a money-like asset while offering funding to governments (by purchasing securities) and the private sector (largely through repurchase agreements (repos), certificates of deposit (CD), commercial paper (CP), and asset-backed commercial paper (ABCP)). As of 2025, they manage about \$10 trillion in assets globally, with total assets under management of roughly \$7.5 trillion in the U.S. alone.

Besides the government, MMFs mostly fund banks. In an average month, over half of all U.S. MMF lending is to the private sector, of which 90% goes to banks, 7% to NBFIs, and 3% to non-financial firms ([Aldasoro and Doerr, 2023](#)). [Figure OA.3](#), panels (a) and (b) show the allocation of MMF assets to major sectors based on aggregate From-Whom-to-Whom (FWTW) data as well as MMFs in our granular sample (see description below). Panel (c) shows that banks are the dominant non-government borrower by a wide margin.

[Figure OA.3](#), panel (d) zooms in on banks as borrowers to illustrate the instrument composition of that borrowing. Bank borrowing from MMFs used to consist largely of unsecured instruments such as CDs and CP. Over time – and especially following post-crisis 2016 MMF reform – secured borrowing through repos has become the primary channel for bank borrowing from MMFs. During our sample period (i.e. February 2011 to December 2015), however, CD and CP borrowing was most prominent. Unlike repo borrowing, which tends to be mostly short-term and even overnight, CDs and CPs provide funding across the maturity spectrum.

Since the financial crisis of 2007/08, MMFs have become an important source of short-term wholesale funding for banks. According to Financial Accounts data, MMF lending to banks exceeded \$2.5 trillion in 2025. This compares to about \$11.5 trillion in total deposits and \$4.9 trillion of uninsured deposits among large domestically chartered commercial banks.<sup>8</sup> In our sample, the average bank borrows \$22.1 billion from MMFs in a given quarter.

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<sup>8</sup>See FRED series DPSLCBW027SBOG for total deposits and Call Reports data for the estimated share of uninsured deposits for the average large bank.

MMFs' claims thus correspond to about 16% of banks' total estimated uninsured deposits and 26% of total wholesale liabilities.<sup>9</sup>

Their outsized importance in providing wholesale funding to banks as well as the availability of instrument-level data make MMFs ideally suited to study the effects of financial regulation on banks' funding costs.

## 2.2 Data and main variables

**LCR gap and bank controls.** Banks generally did not have an established framework to disclose their LCR before 2017. We thus follow [Hong et al. \(2014\)](#) and [Sundaresan and Xiao \(2024\)](#) to compute the LCR for each bank holding company (BHC) from U.S. Call Reports data. That is, we compute each bank's realized LCR in each quarter before the introduction of the LCR in 2013Q1 as well as thereafter. As explained in Section 2.1, the LCR requires a bank's stock of HQLA to be greater than projected net cash outflows over the next 30 calendar days ([Equation 1](#)). [Table OA.9](#) and [Table OA.10](#) in the Appendix detail the different components of HQLA and net cash outflows.

For each bank  $b$ , we then define the  $LCR\ gap_b$  as the *required LCR* minus the average *realized LCR* between 2011Q1 and 2012Q4. The required LCR is 100% for banks with assets exceeding \$250 billion or foreign banks and 70% for banks with assets exceeding \$50 billion but below \$250 billion:

$$LCR\ gap_b = 100\ (70) - LCR_b^{Pre}. \quad (2)$$

A positive gap means the realized LCR was below the ratio required by regulation prior to its introduction. A larger positive gap means the bank was further from compliance and thus more affected by the introduction of the LCR. This variable is only defined for banks subject to the LCR. As we explain in more detail in Section 3.2 below, the LCR gap captures cross-sectional variation in exposure among banks subject to regulation.<sup>10</sup>

In addition, we use Call Reports data to construct the following quarterly bank-level characteristics: the log of total assets; the share of non-interest income; the return on assets; the Tier-1 capital ratio; the share of securities in

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<sup>9</sup>Wholesale liabilities are defined following [Choi and Choi \(2021\)](#), as the sum of wholesale deposits (brokered deposits, foreign deposits, and time deposits over \$100,000), federal funds and repo borrowing, and other borrowed money.

<sup>10</sup>A similar approach is taken by [Cortés et al. \(2020\)](#) and [Sundaresan and Xiao \(2024\)](#).

total assets; and the share of loans over total assets. These factors control, among other things, for bank size, capitalization, and business models. Finally, we define *MBS share* as banks' pre-treatment total mortgage-backed securities (MBS) over total assets.

**MMF data.** We source monthly data on U.S. MMFs' portfolio holdings from Crane Data, based on their regulatory filings to the Securities and Exchange Commission (SEC N-MFP forms). The sample covers the universe of U.S. MMF funds with granular information at the position level, including the total amount of a given investment, instrument type (e.g. repo, CD, CP, ABCP), and, critically for our exercise, remaining maturity and the (annualized) yield.

We follow the categorization of borrower types in [Aldasoro and Doerr \(2023\)](#). We exclude all non-bank borrowers and match banks in the MMF sample to the Call Reports via RSSD IDs.<sup>11</sup> Moreover, we focus on bank borrowing from MMFs through repos, CP, CD, and ABCP. Finally, we complement our data with information available on the New York Federal Reserve [website](#) to construct a time series of MMFs' eligibility to invest in the Overnight Reverse Repo Facility of the Fed (ONRRP).

We define the following main variables. The main outcome variable is the log of the funding interest rate (called the "coupon" in the source data), winsorized at the 1st and 99th percentiles. In addition, we compute the remaining days to maturity ("maturity", winsorized at the 99th percentile), the log of the maturity, as well as categorical variables for instruments with maturities of 1 day, 2 to 30 days, or more than 30 days. We also compute the log of the total amount borrowed.

We further construct measures of market power at the fund and bank levels. We follow [Duffie et al. \(2005\)](#) and [Aldasoro et al. \(2022\)](#) and compute measures of fund market power (*Fund MP*) and bank market power (*Bank MP*)

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<sup>11</sup>While some MMFs belong to banks, lending by MMFs to their parent bank or affiliated banks is negligible.

separately.<sup>12</sup>

$$Fund MP_{bft} = \frac{Value_{bft}}{\sum_{f=1}^{F_b} Value_{bft}} \times 100; \quad Bank MP_{bft} = \frac{Value_{bft}}{\sum_{b=1}^{B_f} Value_{bft}} \times 100, \quad (3)$$

where  $Value_{bft}$  is the total dollar amount of outstanding contracts between a bank  $b$  and a fund  $f$  at time  $t$ .  $\sum_{f=1}^{F_b} Value_{bft}$  is the total dollar amount of outstanding contracts for bank  $b$  at time  $t$ , where  $F_b$  is the total number of funds the bank interacts with.  $\sum_{b=1}^{B_f} Value_{bft}$  is the total dollar amount transacted by fund  $f$  on the same date, with  $B_f$  representing the number of banks fund  $f$  interacts with. To allow for the possibility that a fund's bargaining power stems from the fund family it belongs to, we construct each measure for fund families (FF) analogously.

**Summary statistics.** Our sample covers the period from February 2011 to December 2015. We observe 223 distinct funds, belonging to 72 fund families, lending to 28 banks. Table 1 reports summary statistics for the main variables used in our analysis. Panel (a) summarizes the distribution of the LCR gap in the pre-period, confirming substantial dispersion in regulatory exposure across banks. Consistently, Figure 1 illustrates the large cross-sectional dispersion in LCR levels and LCR gaps across banks in the pre-period.

Table 1, panel (b) reports instrument-level characteristics for bank wholesale funding from MMFs, including interest rates (coupon), maturities, and issue sizes. The average (median) interest rate is 31 (26) bps, with a standard deviation of 25 bps. Note that policy rates were close to zero during our sample period, so interest rates effectively correspond to spreads. The average (median) maturity is 42 (19) days. For CDs, CP, and ABCP average (median) maturities are 54, 55, and 59 (33, 38, and 39) days, compared to 11 (3) for repos. About 41% of all observations are CDs and 30% are repos. CP and ABCP together make up around 20% of all deals.

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<sup>12</sup>The market where MMFs and banks interact is not centralized, but rather reflects an over-the-counter (OTC) structure. As such, it could be subject to OTC bargaining frictions. The intuition for our bargaining power measures is the following. If a bank relies heavily on a given lender, then the latter has higher bargaining power as the bank has limited outside options. Similarly, if a borrower bank is important within the portfolio of a given lender, then the bank should have more bargaining power.

### 3 Empirical strategy

This section first discusses the mechanism linking liquidity regulation to bank wholesale funding costs and maturity structure. It then presents our empirical approach and explains the identification strategy.

#### 3.1 Mechanism

The LCR is designed to ensure that banks can withstand severe short-term funding stress without access to unsecured wholesale markets. As discussed, banks have responded to the LCR by substantially increasing their HQLA as a share of total assets, improving their ability to withstand liquidity-driven distress episodes (BCBS, 2019; Doerr et al., 2026). In the Online Appendix we confirm that banks with a larger ex-ante LCR gap significantly increased their LCR through a higher HQLA share, lowering their liquidity risk (Table OA.8). In our sample, banks subject to the LCR increased their LCR (HQLA share) by 20 pp, or ca. 25% (7 pp, or ca. 30%), between 2012 and 2017.

From the perspective of wholesale creditors, liquidity regulation alters the distribution of future states in which bank debt is repaid. In the absence of liquidity regulation, wholesale creditors are exposed not only to solvency risk but also to the risk that a funding shock, triggered by runs on short-term liabilities, forces inefficient asset liquidation or outright default. As argued in the literature on market discipline, wholesale creditors should price changes in bank risk (Calomiris and Kahn, 1991; Diamond and Rajan, 2001). Liquidity regulation, by making banks safer, is therefore expected to lower wholesale funding costs on average.

We further expect the decline in funding costs to be larger for longer-maturity instruments. In models of debt maturity structure, a conflict of interest exists between short-term and long-term creditors. As banks cannot commit to an aggregate debt maturity structure, individual creditors have an incentive to shorten maturity in order to obtain de facto seniority, generating a “maturity rat race” and excessive rollover risk (Brunnermeier and Oehmke, 2013). This harms longer-term creditors, who remain exposed to future refinancing conditions. He and Xiong (2012) show that higher rollover risk raises credit spreads through a dilution channel, because maturing creditors are repaid first so that long-term debt holders become more exposed to default risk.

In our setting, the LCR, which reduces the likelihood and severity of such rollover risk episodes, should benefit longer-maturity creditors disproportionately, leading them to require a lower risk premium.

The same theoretical mechanisms suggest that liquidity regulation can tilt bank funding away from very short-term runnable debt and toward longer maturities. First, when regulation constrains banks to hold a safer asset mix, the disciplining value of runnable short-term debt is reduced, weakening banks' reliance on very short-term funding (Calomiris and Kahn, 1991; Diamond and Rajan, 2001). Second, by reducing rollover risk, the LCR can lean against the maturity rat race that would otherwise generate inefficiently short funding structures (Brunnermeier and Oehmke, 2013).

In sum, by forcing banks to self-insure against short-term funding stress, the LCR is expected to lower wholesale borrowing costs, do so more strongly at longer maturities, and induce banks to shift their borrowing away from shorter-term and toward longer-term instruments.

### 3.2 Baseline specification

We study how liquidity regulation affects bank wholesale funding using granular instrument-level data on MMF holdings of bank-issued funding instruments. Our baseline specification is a difference-in-differences model estimated at the instrument level:

$$\log(\text{rate}_{bfit}) = \beta \text{LCR gap}_b \times \text{Post}_t + \Gamma' X_{b,t-1} + \delta_{bf} + \delta_{ft} + \delta_i + \varepsilon_{bfit}, \quad (4)$$

where  $\log(\text{rate}_{bfit})$  is the log interest rate paid by bank  $b$  on instrument  $i$  held by fund  $f$  in month  $t$ .  $\text{LCR gap}_b$  measures a bank's pre-regulation shortfall in terms of the LCR, where a larger gap corresponds to a larger shortfall. The indicator  $\text{Post}_t$  equals one in the post-LCR period from 2013Q1 onward and zero otherwise. The coefficient of interest,  $\beta$ , captures how wholesale funding costs change after the introduction of the LCR for banks with different ex-ante exposure to the regulation.  $X_{b,t-1}$  denotes a vector of lagged time-varying bank-level controls, including the log of total assets, the capital ratio, return on assets, the share of non-interest income, and securities over assets. Standard errors are two-way clustered at the bank and fund levels throughout, to account for the fact that errors may be correlated across observations for the

same bank and the same fund.

**Identification and fixed effects.** Identification follows a two-pronged approach. Most studies on the LCR compare banks subject to the LCR to those that are not. An important concern with this identification strategy is that LCR banks are generally much larger than non-LCR banks. Any differential evolution in funding costs between both groups may thus reflect the impact of factors other than the LCR. The use of the *LCR gap*, i.e. the ex-ante exposure to the LCR among banks subject to the LCR only, as in [Sundaresan and Xiao \(2024\)](#) overcomes this challenge. The identification strategy is close in spirit to [Cortés et al. \(2020\)](#), who study U.S. stress tests. Similar to stress-test exposure, the LCR gap captures cross-sectional variation in exposure to regulation among banks subject to regulation only. Indeed, in our data the correlation between the LCR gap and total assets in the pre-treatment period is low and insignificant, with a correlation coefficient of 0.02 (see [Figure OA.1](#)).<sup>13</sup>

In addition, our granular data allow us to include a rich set of fixed effects and absorb possibly confounding variation at the creditor, instrument type, and macroeconomic levels. First, fund  $\times$  time fixed effects  $\delta_{ft}$  absorb all fund-specific time-varying shocks, including changes in risk appetite, assets under management, or portfolio re-balancing that are common across banks within a fund on a given date. Inclusion of these fixed effects is a major improvement compared to previous studies based on bank-level or bank branch-level data.<sup>14</sup> Such studies require the strong assumption that banks affected by regulation face an identical pool of creditors or, for branch-level studies, serve identical creditors/depositors in a county or Metropolitan Statistical Area. Instead, our setup allows us to compare borrowing by banks subject to different shocks from the *same* creditor.<sup>15</sup>

In addition, bank  $\times$  fund fixed effects  $\delta_{bf}$  control for time-invariant pricing

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<sup>13</sup>[Table OA.1](#) in the Online Appendix compares bank-level characteristics among banks with a positive vs. negative LCR gap over the years 2011–2012.

<sup>14</sup>Seminal studies, including [Flannery and Sorescu \(1996\)](#); [Martínez Pería and Schmukler \(2001\)](#); [Gropp et al. \(2014\)](#); [Danisewicz et al. \(2018\)](#), and [Calomiris and Jaremski \(2019\)](#), mostly use bank-level panel data.

<sup>15</sup>Our setup mirrors that for studies on banks' credit supply. Early studies used bank-level data to examine how e.g. shocks to bank capital affect lending, but were not able to account for potential differences in the pool of borrowers served by banks subject to different shocks. Subsequent studies used granular loan-level data to include borrower or borrower  $\times$  time fixed effects ([Khwaja and Mian, 2008](#); [Jiménez et al., 2012](#)) to compare lending by shocked banks to the *same* borrower in the *same* year.

relationships between a given bank and MMF, such as persistent monitoring technologies or structural bargaining frictions that are not time-varying. Finally, instrument type fixed effects  $\delta_i$  control for structural differences across security types and contractual features. Together, these fixed effects ensure that identification comes from within-fund, within-instrument changes in how the same MMF prices loans to differentially exposed banks around the introduction of the LCR. In some specifications, we can further include bank  $\times$  time fixed effects (discussed below).

## 4 Results

This section tests the theoretical predictions discussed in Section 3.1. It first reports results for the effects of the LCR on bank wholesale funding costs vis-à-vis MMFs and examines how effects vary with the maturity of the instrument. It then examines alternative explanations for the link between liquidity regulation and funding costs. Finally, we study whether a larger LCR gap led to a change in the amount and maturity structure of banks' wholesale borrowing from MMFs.

### 4.1 Effects of the LCR on wholesale funding costs

Table 2 presents the results from estimating Equation (4). Column (1) reports a parsimonious specification with bank  $\times$  fund fixed effects, bank-level controls, and time fixed effects. The coefficient on LCR gap  $\times$  Post is negative and statistically significant at the 1% level, indicating that banks with a larger LCR gap experienced a stronger decline in wholesale funding costs after the reform. This finding is consistent with the argument that the LCR, by increasing banks' resilience to shocks, lowered the risk premium required by wholesale creditors.

Column (2) introduces instrument-level controls. In particular, we include instrument type (repo, CD, CP, ABCP, other) fixed effects as well as the log of the borrowed amount. We thus compare the effect on the interest rate within instruments of the same type and of similar amount. Column (3) further adds fund  $\times$  time fixed effects to absorb any observable and unobservable fund-level characteristics that vary over time, including fund inflows or strategic

portfolio allocation decisions. We hence compare two banks with different LCR gaps borrowing from the same fund in the same month. The estimated coefficient remains stable in magnitude and significance across specifications, despite the substantial increase in absorbed variation.

Our baseline result is not only statistically significant but also economically relevant. In the most saturated specification (column (3)), the point estimate implies that a one standard deviation (sd) larger LCR gap (1.1 units) is associated with a reduction in wholesale funding rates in the post-LCR period of about 8%. Evaluated at the mean interest rate of 31 basis points, this amounts to a reduction of 2.6 basis points. Column (4) reports similar results for the interest rate as dependent variable, rather than the log of the interest rate. It shows a decline of 2.5 basis points for a one sd increase in the LCR gap.

Figure 2 shows that there were no differential pre-treatment trends between banks with higher vs. lower ex-ante LCR gaps. The figure plots coefficients and 90% confidence intervals for Equation (4) with the *LCR gap* variable interacted with dummies for the quarters before and after the introduction of the LCR in 2013Q1. The omitted time period is 2012Q4, i.e. the quarter before our treatment. Coefficient estimates are statistically and economically insignificant prior to the event. They are negative during and in the quarters after the event. The absence of differential pre-treatment trends in funding costs across banks with high and low LCR gaps supports the parallel trends assumption underlying our difference-in-differences design.<sup>16</sup>

Having established that the LCR reduced average funding costs, we next test the theoretical prediction that its benefits should be more pronounced for longer-maturity instruments.

**Results by maturity.** Table 3 extends the baseline specification by interacting the LCR gap and the Post dummy with various measures of instrument maturity. We use the following three measures: the log of maturity, maturity in days, and three buckets for instruments with 1-day, 2-30 day and more than 30 days maturity. For ease of interpretation, we only report the main coefficients of interest. The full set of maturity-specific coefficients is reported in

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<sup>16</sup>A common concern with DiD studies is a violation of the Stable Unit Treatment Value Assumption (SUTVA). In our setting, liquidity regulation at one bank could lower fire-sale spillovers to other banks, as suggested by the model in Brunnermeier and Oehmke (2013). Such spillovers would, however, bias our estimates towards zero. We revisit this concern in placebo regressions below.

Online Appendix [Table OA.2](#).<sup>17</sup>

The estimates reveal that the effect of the LCR gap on rates is significantly stronger for longer-maturity instruments. This maturity gradient is present irrespective of whether we use  $\log(\text{maturity})$ , maturity, or maturity buckets in columns (1)–(3). Across specifications, short-maturity instruments exhibit smaller declines in rates than longer-maturity instruments. For example, in column (3) the decline in rates is twice as large for instruments with a maturity of 31 or more days compared to those with a one-day maturity.

Columns (4)–(6) show that results are robust to including  $\text{bank} \times \text{time}$  fixed effects. These fixed effects absorb any observable and unobservable bank-level characteristics that vary over time, such as size, profitability, or management quality. These results suggest that the relatively stronger decline in interest rates for longer-maturity instruments among banks with a higher LCR gap is not driven by unobservable time-varying fund or bank characteristics.

Taken together, results in [Table 2](#) and [Table 3](#) are consistent with our hypotheses and theoretical predictions in [Calomiris and Kahn \(1991\)](#), [Diamond and Rajan \(2001\)](#), [He and Xiong \(2012\)](#), and [Brunnermeier and Oehmke \(2013\)](#). The LCR lowered the risk premium required by wholesale creditors, and did so by more for longer-maturity instruments.

## 4.2 Extensions and robustness

In what follows, we first examine alternative explanations that could confound our estimates of the negative effect of the LCR gap on interest rates. We then present results from placebo regressions, and finally report further robustness tests.

One concern is that our baseline results may be driven by unconventional monetary policy. The third round of post-GFC quantitative easing (QE3) was started by the Federal Reserve in September 2012 and targeted mortgage-backed securities (MBS). QE3 could have allowed banks to move out of Level 2 HQLA into Level 1 HQLA. At the same time, it may have affected MMFs through purchases of Treasuries, freeing up funds to invest with banks. The inclusion of  $\text{fund} \times \text{time}$  fixed effects, which absorb any fund-specific shock to assets under management and their overall allocation across instruments/-

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<sup>17</sup>Appendix [Table OA.3](#) reports results when we use the interest rate as the dependent variable.

counterparties, addresses the latter concern. To examine the former channel, we follow [Rodnyansky and Darmouni \(2017\)](#) and [Luck and Zimmermann \(2020\)](#) and include banks' *MBS share*, interacted with the Post dummy, in Equation (4).

[Table 4](#) reports the results. In column (1), the coefficient on  $\text{LCR gap} \times \text{post}$  increases in magnitude compared to our baseline specification (from  $-0.075$  to  $-0.084$ ) and remains highly significant. The coefficient on the interaction term of *MBS share* and *post* is negative but insignificant. We obtain similar results when we interact *MBS share* with the Post dummy as well as the various measures of maturity in columns (2)–(4). These results suggest that banks' LCR gap does not capture their differential exposure to QE3.

Next, we estimate placebo regressions at the bank level for banks not subject to the LCR. For each bank not subject to the LCR (i.e. banks with less than \$50 billion in assets as of 2012), we compute the pre-treatment LCR. We then examine whether banks with a lower ex-ante LCR (akin to a larger LCR gap) saw a stronger decline in their wholesale funding costs, measured via the time deposit rate.<sup>18</sup> [Table 5](#) reports results. Column (1) includes all banks not subject to the LCR, column (2) the largest 200 banks (by 2012 assets) not subject to the LCR, and column (3) the largest 100 banks (by 2012 assets) not subject to the LCR. Across specifications, there is an economically and statistically insignificant effect of the pre-treatment LCR on funding costs. These results confirm our identification strategy: among the set of placebo banks (that were not subject to the LCR requirement after 2013Q1) a lower ex-ante liquidity ratio has no effect on the cost of wholesale funding. Reassuringly, as column (4) shows, banks subject to the LCR saw a significant decline also in time deposit rates.

We further examine whether our results hold in various subsamples in [Table 6](#). The significant and negative impact of the LCR gap on the interest rate is present when we narrow the sample to the years 2011-14 or 2012-13 in columns (1) and (2),<sup>19</sup> when we focus on global systemically important banks (GSIBs) only in column (3); when we split the sample of MMFs into those

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<sup>18</sup>Borrowing from MMFs by banks not subject to the LCR (i.e., smaller banks) is scarce, so we cannot use these data to estimate placebo regressions.

<sup>19</sup>The second subsample addresses a potential concern regarding the MMF reform. While actually implemented in October 2016, the reform package was approved in July 2014. As documented in other work, most of the action in response to the reform took place in a narrow window around the implementation date ([Cipriani and La Spada, 2021](#); [Aldasoro et al., 2022](#)).

with and without ONRRP access in columns (4)–(5); and when we include instrument type  $\times$  maturity bucket  $\times$  time fixed effects in column (6). Column (7) further controls for the interaction of banks’ deposit beta (taken from [Drechsler et al. \(2017\)](#)) and the Post dummy. Results remain unaffected, suggesting that the effect of the LCR gap on funding costs is not capturing the effect of changes in the policy rate on deposit funding.

The set of banks subject to the LCR comprises several large U.S. banks that were also subject to stress tests after 2012.<sup>20</sup> In column (8) of [Table 6](#) we drop banks subject to stress tests in any year during the sample and find that our results remain robust. In column (9), we follow [Cortés et al. \(2020\)](#) and define for each stress-tested bank its *Stress test Tier 1 shortfall* as the difference between the bank’s lowest implied capital ratio expected under the severely adverse stress-test scenario and its current capital ratio. We set the gap to zero for non-stress-tested banks. Results show that the coefficient on *LCR gap*  $\times$  *post* remains unaffected. Reassuringly, the coefficient on *Stress test Tier 1 shortfall*  $\times$  *post* is negative, suggesting that a stress-test induced increase in capital also lowers banks’ wholesale funding costs.

[Table 7](#) shows that our results are robust to alternative constructions of the LCR gap following [Hong et al. \(2014\)](#) and [Sundaresan and Xiao \(2024\)](#), confirming that the findings are not driven by a particular measurement choice. The measures correspond to alternative LCR gaps computed under progressively more pessimistic assumptions on banks’ liability structure and run-off rates (see [Hong et al. \(2014\)](#) for details).

[Table 8](#) includes measures of market power at the bank and fund (or fund family) level (*Fund MP<sub>bft</sub>* and *Bank MP<sub>bft</sub>*, as defined in [Section 2](#)), interacted with the LCR gap and Post dummy. Across specifications, the coefficient on the interaction term of *LCR gap* and *post* remains negative and significant and similar in magnitude to our baseline estimates.

Finally, we examine whether our results aggregate. To this end, we estimate regressions at the bank-fund-time, bank-time, and bank-fund family-time level in [Table 9](#). Across aggregation levels and independent of included

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<sup>20</sup>Stress tests assume adverse economic scenarios, for example rising unemployment and falling house prices. For each scenario, an internal model predicts banks’ hypothetical losses given their asset portfolios. These losses are then projected into minimum capital ratios that would be required for banks to withstand the downturn. If financial institutions fail a test, they must adjust their equity and may not distribute capital over the following quarters ([Doerr, 2021](#)).

fixed effects, we obtain an economically and statistically significant negative coefficient on  $LCR\ gap \times post$  that is comparable in magnitude across specifications.

### 4.3 Effects on quantities

The preceding results document that the LCR lowered wholesale funding costs and did so more strongly at longer maturities. The theoretical framework laid out in Section 3.1 discussed further predictions regarding quantities: Banks more exposed to the LCR should borrow larger aggregate amounts from MMFs (as lower required compensation makes wholesale funding more attractive), and they should shift the maturity composition of their borrowing away from very short-term and toward longer-term instruments (as the LCR weakens the disciplining role of runnable debt and counteracts the maturity rat race). In this subsection we test both predictions.

We first test whether banks shift the maturity composition of their wholesale borrowing toward longer tenors. We estimate the contract-level specification (4) and use the log of the amount as the dependent variable, interacting  $LCR\ gap_b \times Post_t$  with the three measures of instrument maturity. All regressions include  $bank \times fund$ ,  $fund \times time$ , and  $bank \times time$  fixed effects, so that the maturity-composition results are identified from within-bank, across-maturity variation.

Table 10 reports the results.<sup>21</sup> The positive coefficients on the triple interaction terms indicate that banks with a larger LCR gap borrow disproportionately larger amounts at longer maturities. In column (1), the interaction with the log of maturity is positive and significant at the 1% level. Column (2) confirms this pattern using maturity in days. Column (3) uses maturity buckets and shows that the shift is concentrated at the long end: the triple interaction for instruments with a maturity of 31 or more days is positive and strongly significant, while the interaction for 2–30 day instruments is economically small and insignificant.

These results are consistent with two complementary theoretical channels discussed above. First, when the LCR forces banks to hold a safer asset mix, the disciplining value of runnable short-term debt is reduced (Calomiris and

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<sup>21</sup>Table OA.7 shows the full set of estimated coefficients.

Kahn, 1991; Diamond and Rajan, 2001). This weakens banks' incentive to maintain very short-term funding structures. Second, by lowering rollover risk, the LCR counteracts the (socially inefficient) maturity rat race (Brunnermeier and Oehmke, 2013). In consequence, banks can tilt their funding toward longer maturities.

Second, we aggregate the data to the bank-fund-month level and estimate regressions similar to Equation (4), with the log difference in total amounts borrowed by bank  $b$  from fund  $f$  between months  $t$  and  $t - 1$  as the dependent variable.

Table 11 shows that banks with a larger ex-ante LCR gap, i.e. those that experienced a stronger decline in their wholesale funding costs, also increased their overall borrowing from MMFs. Column (1), which includes bank  $\times$  fund and time fixed effects, reports a positive coefficient on the interaction term of *LCR gap* and *post*, significant at the 10% level. Adding bank-level control variables in column (2) leads to an increase in the coefficient estimate. Finally, we include fund  $\times$  time fixed effects in column (3), thereby comparing how the same fund allocates across differentially exposed banks, and obtain a positive coefficient significant at the 5% level. In terms of economic magnitude, a one standard deviation increase in the LCR gap leads to a 1.5% increase in borrowing growth after the LCR's implementation.

Together with the decline in rates, the increase in quantities helps to further disentangle demand and supply factors. If the LCR had primarily induced banks to reduce their reliance on wholesale funding (a demand-side contraction), we would expect quantities to decline alongside prices. Instead, the concurrent decline in rates and expansion of borrowing indicates a supply-side shift: MMFs are willing to lend more to LCR-exposed banks at lower rates because these banks are perceived as safer.

## 5 Conclusion

This paper provides causal, instrument-level evidence that the LCR, a cornerstone of the Basel III regulatory framework, significantly lowered banks' wholesale funding costs. This effect is more pronounced for longer-maturity instruments. By exploiting pre-determined variation in banks' pre-regulation exposure to the LCR and employing granular data from money market funds,

we isolate the impact of liquidity regulation from confounding creditor, instrument type, and macroeconomic factors. Consistent with theoretical work on bank liquidity risk, banks also shift towards longer-term debt instruments.

Our results offer empirical support for the classical market discipline channel. Uninsured wholesale creditors price bank risk, and when regulation compels banks to become more resilient (achieved primarily by building higher HQLA buffers), these creditors demand a lower risk premium. In other words, liquidity regulation sends a signal about bank resilience that is internalized by the market. The finding that funding costs decline more sharply for longer-maturity instruments aligns not only with theory, but with the LCR's specific design goal of mitigating short-term run risk and excessive maturity transformation.

These findings have important implications for regulatory practice and cost-benefit analyses. Standard-setting bodies have long hypothesized that the benefits of prudential regulation include lower funding costs for safer banks, offsetting some of the potential costs such as reduced lending. Our study provides micro-level evidence for this funding-cost benefit, specifically for liquidity regulation. This suggests that assessments of the LCR's net economic impact should account for these savings in banks' cost of debt.

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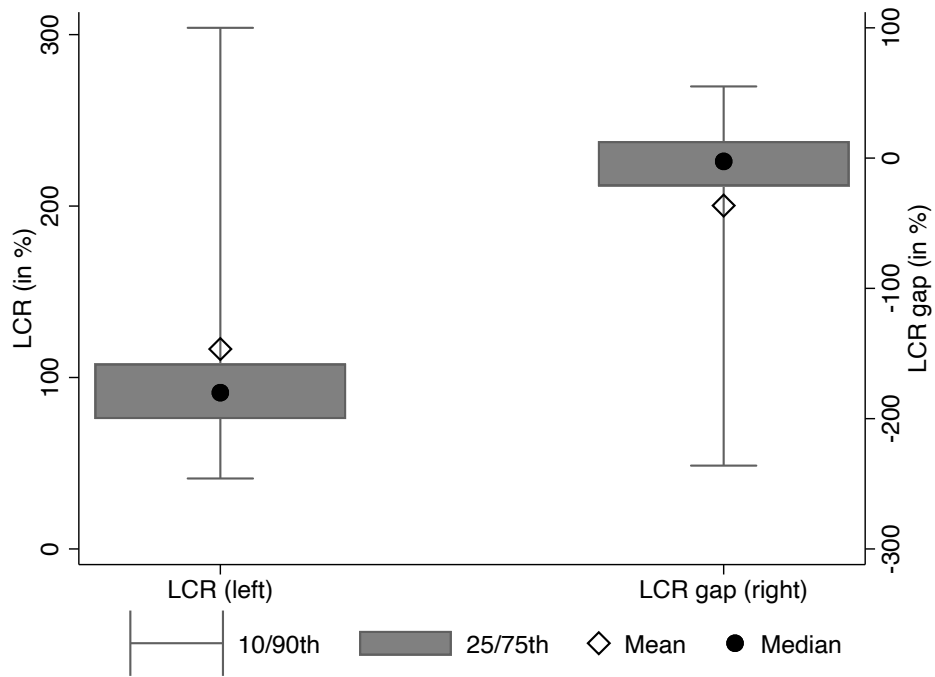
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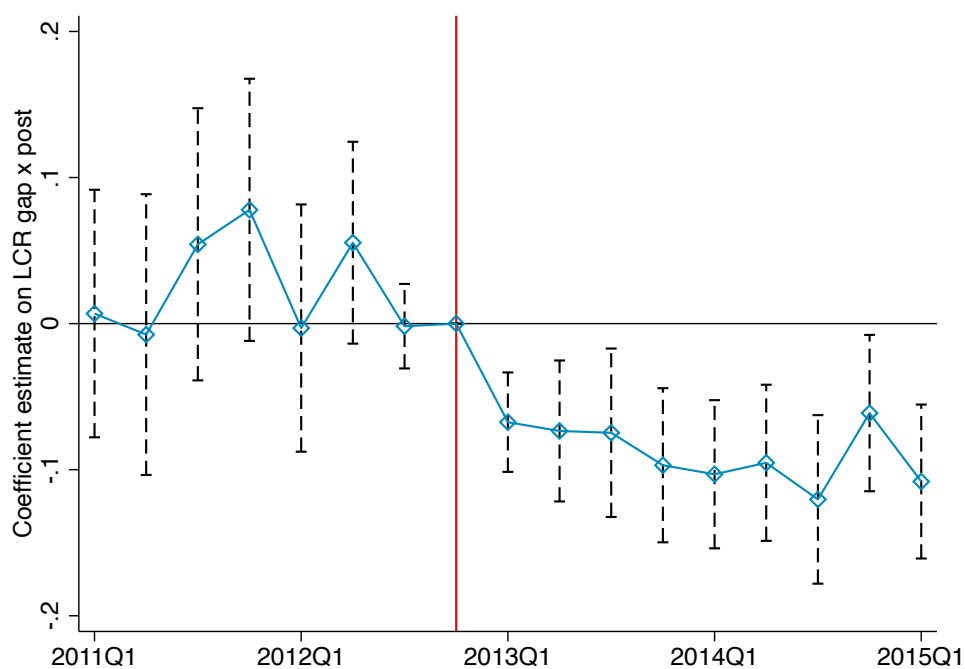
# Figures and Tables

Figure 1: LCR and LCR gap



Note: This figure plots the distribution of the LCR and LCR gap among our sample of banks. A positive gap indicates shortfall relative to the LCR standard of 100% or 70% depending on bank size.

Figure 2: Pre-treatment trends



Note: This figure presents coefficient estimates and 90% confidence bands obtained from estimating Equation (4) when we interact the *LCR gap* with dummies for the quarters before, during, and after the LCR introduction in 2013Q1. The omitted quarter is 2012Q4, i.e. the quarter before the treatment period begins.

Table 1: Summary statistics

(a): LCR gap

Variable	Obs	Mean	Std. Dev.	Min	Max	P50
LCR	75902	1.35	1.1	.2	4.36	.92
LCR gap	75902	-.36	1.1	-3.36	.75	-.03
LCR gap (alt 1)	75902	-.18	.81	-2.77	.75	.01
LCR gap (alt 2)	75902	.01	.65	-2.38	.76	.22

(b): Instrument characteristics

Variable	Obs	Mean	Std. Dev.	Min	Max	P50
Interest rate (%)	246690	.31	.25	0	2	.26
Maturity (days)	246690	41.57	53.02	0	269	19
Size (USD mln)	246690	111.4	160.51	0	919.78	50
ABCP (0/1)	246690	.08	.27	0	1	0
Commercial paper (0/1)	246690	.12	.33	0	1	0
Certificate of deposit (0/1)	246690	.41	.49	0	1	0
Repo (0/1)	246690	.3	.46	0	1	0
Other (0/1)	246690	.09	.29	0	1	0

(c): Bank characteristics

Variable	Obs	Mean	Std. Dev.	Min	Max	P50
log(Assets)	434	17.9	2.75	11.15	21.53	18.6
Non-interest income	434	.35	.18	-.05	.84	.33
Securities/assets	434	.22	.16	0	.76	.2
Return on assets (%)	434	.19	.21	-1.67	1.07	.2
Capital ratio	434	.13	.08	.07	.99	.12
Loans/assets	434	.49	.2	0	.86	.53

Note: This table reports summary statistics for the main variables in our analysis. Panel (a) reports summary statistics for banks' LCR and LCR gap measures for the years 2011-12. A positive gap indicates shortfall relative to the LCR standard of 100% or 70% depending on bank size. "Alt 1" and "alt 2" correspond to alternative LCR gap measures under progressively more pessimistic assumptions on banks' liability structure and run-off rates (see [Hong et al. \(2014\)](#)). Panel (b) reports characteristics at the instrument level over the full sample period. Panel (c) reports quarterly bank characteristics over the full sample period.

Sources: Crane Data; U.S. Call Reports.

Table 2: LCR gap and interest rates

VARIABLES	(1) ln(rate)	(2) ln(rate)	(3) ln(rate)	(4) rate
LCR gap $\times$ post	-0.086*** (0.029)	-0.093*** (0.030)	-0.075*** (0.024)	-0.023** (0.010)
Observations	246,690	246,690	246,478	246,478
R-squared	0.438	0.494	0.560	0.491
Bank controls	✓	✓	✓	✓
Contract controls	-	✓	✓	✓
Bank $\times$ Fund FE	✓	✓	✓	✓
Time FE	✓	✓	F $\times$ T	F $\times$ T

Note: This table reports results for regressions at the instrument level (see Equation (4)). The dependent variable is the log of the interest rate in columns (1)–(3) and the interest rate in column (4). The variable *LCR gap* is defined as the *required LCR* minus the *pre-regulation LCR* (see Equation (2)). The dummy *post* takes on a value of one for observations in the period after 2013Q1 and zero otherwise. Standard errors are clustered at the bank and fund level. “F  $\times$  T” denotes fund  $\times$  time fixed effect. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5%, and 10% levels.

Table 3: LCR gap, interest rates, and maturity

VARIABLES	(1) ln(rate)	(2) ln(rate)	(3) ln(rate)	(4) ln(rate)	(5) ln(rate)	(6) ln(rate)
LCR gap $\times$ post	-0.033* (0.018)	-0.048** (0.022)	-0.050** (0.022)			
LCR gap $\times$ post $\times$ log(maturity)	-0.015*** (0.005)			-0.018*** (0.006)		
LCR gap $\times$ post $\times$ maturity		-0.001*** (0.000)			-0.001*** (0.000)	
LCR gap $\times$ post $\times$ maturity 2-30 days			-0.021 (0.013)			-0.035** (0.015)
LCR gap $\times$ post $\times$ maturity 31+ days			-0.050*** (0.014)			-0.067*** (0.017)
Observations	246,474	246,478	246,474	246,463	246,467	246,463
R-squared	0.616	0.593	0.594	0.631	0.608	0.611
Bank controls	✓	✓	✓	✓	✓	✓
Contract controls	✓	✓	✓	✓	✓	✓
Bank $\times$ Fund FE	✓	✓	✓	✓	✓	✓
Time FE	F $\times$ T	F $\times$ T	F $\times$ T	F $\times$ T + B $\times$ T	F $\times$ T + B $\times$ T	F $\times$ T + B $\times$ T

Note: This table reports results for regressions at the instrument level (see Equation (4)). The dependent variable is the log of the interest rate. The variable *LCR gap* is defined as the *required LCR* minus the *pre-regulation LCR* (see Equation (2)). The dummy *post* takes on a value of one for observations in the period after 2013Q1 and zero otherwise. We interact the LCR gap and post dummy with the following three measures: the log of maturity (columns 1 and 4), maturity in days (columns 2 and 5), and three buckets for instruments with 1-day maturity, 2-30 days maturity, and maturity greater 30 days (columns 3 and 6). Standard errors are clustered at the bank and fund level. "F  $\times$  T" denotes fund  $\times$  time fixed effect. "B  $\times$  T" denotes bank  $\times$  time fixed effect. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5%, and 10% levels.

Table 4: **Robustness – QE**

VARIABLES	(1) ln(rate)	(2) ln(rate)	(3) ln(rate)	(4) ln(rate)
LCR gap × post	-0.084** (0.034)	-0.042 (0.026)	-0.056* (0.030)	-0.057* (0.031)
LCR gap × post × log(maturity)		-0.013*** (0.005)		
LCR gap × post × maturity			-0.001*** (0.000)	
LCR gap × post × maturity 2-30 days				-0.021* (0.011)
LCR gap × post × maturity 31+ days				-0.050*** (0.014)
MBS share × post	-0.353 (0.543)	-0.917 (0.955)	-0.489 (0.685)	-1.215** (0.559)
MBS share × post × log(maturity)		0.217 (0.231)		
MBS share × post × maturity			0.008 (0.006)	
MBS share × post × maturity 2-30 days				1.146 (0.702)
MBS share × post × maturity 31+ days				0.872* (0.487)
Observations	246,478	246,474	246,478	246,474
R-squared	0.560	0.617	0.594	0.595
Bank controls	✓	✓	✓	✓
Contract controls	✓	✓	✓	✓
Bank × Fund FE	✓	✓	✓	✓
Time FE	F × T	F × T	F × T	F × T

Note: This table reports results for regressions at the instrument level (see Equation (4)). The dependent variable is the log of the interest rate. The variable *LCR gap* is defined as the *required LCR* minus the *pre-regulation LCR* (see Equation (2)). The dummy *post* takes on a value of one for observations in the period after 2013Q1 and zero otherwise. The variable *MBS share* is defined as pre-treatment MBS over total assets and captures banks' exposure to QE3. Standard errors are clustered at the bank and fund level. "F × T" denotes fund × time fixed effect. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5%, and 10% levels.

Table 5: **Placebo regressions among non-LCR banks**

	(1)	(2)	(3)	(4)
VARIABLES	All non-LCR Time dep rate	top-200 non-LCR Time dep rate	top-100 non-LCR Time dep rate	LCR banks Time dep rate
-LCR $\times$ post	-0.000 (0.002)	-0.046 (0.032)	0.012 (0.072)	-0.488** (0.218)
Observations	166,476	2,501	756	946
R-squared	0.785	0.773	0.848	0.233
Bank controls	✓	✓	✓	✓
Bank FE	✓	✓	✓	✓
Time FE	✓	✓	✓	✓

Note: This table reports results for regressions at the bank level. The dependent variable is the time deposit rate. The variable  $-LCR$  is defined as the *pre-regulation LCR*. The dummy *post* takes on a value of one for observations in the period after 2013Q1 and zero otherwise. Column (1) includes all banks not subject to the LCR, column (2) the largest 200 banks (by 2012 assets) not subject to the LCR, and column (3) the largest 100 banks (by 2012 assets) not subject to the LCR. Column (4) focuses on LCR banks only. Standard errors are clustered at the bank level. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5%, and 10% levels.

**Table 6: Robustness – subsamples**

VARIABLES	(1) 2011-14 ln(rate)	(2) 2012-13 ln(rate)	(3) GSIB ln(rate)	(4) RRP yes ln(rate)	(5) RRP no ln(rate)	(6) FE ln(rate)	(7) Dep beta ln(rate)	(8) Not ST ln(rate)	(9) ST Tier-1 ln(rate)
LCR gap $\times$ post	-0.061** (0.022)	-0.055** (0.024)	-0.427** (0.183)	-0.081*** (0.028)	-0.072*** (0.022)	-0.069*** (0.017)	-0.079*** (0.024)	-0.072*** (0.016)	-0.079*** (0.024)
Deposit $\beta \times$ post							0.168 (0.235)		
Stress test Tier 1 shortfall									-0.031*** (0.010)
Observations	189,465	96,682	173,704	144,557	101,877	246,452	246,478	158,453	246,478
R-squared	0.567	0.593	0.566	0.498	0.646	0.694	0.560	0.578	0.561
Bank controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
Contract controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bank $\times$ Fund FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Time FE	F $\times$ T	F $\times$ T	F $\times$ T	F $\times$ T	F $\times$ T	FxT + CxMxT	F $\times$ T	F $\times$ T	F $\times$ T

Note: This table reports results for regressions at the instrument level (see Equation (4)). The dependent variable is the log of the interest rate. The variable *LCR gap* is defined as the *required LCR* minus the *pre-regulation LCR* (see Equation (2)). The dummy *post* takes on a value of one for observations in the period after 2013Q1 and zero otherwise. The variables *Deposit  $\beta$*  and *Stress test Tier 1 shortfall* capture banks' deposit beta (obtained from Drechsler et al. (2017)) and Tier-1 capital shortfall in CCAR stress tests (obtained from Cortés et al. (2020)). Standard errors are clustered at the bank and fund level. "F  $\times$  T" denotes fund  $\times$  time fixed effect. "C  $\times$  M  $\times$  T" denotes instrument type  $\times$  time  $\times$  residual maturity decile fixed effect. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5%, and 10% levels.

Table 7: **Robustness – alternative gap measures**

VARIABLES	(1) Gap > -1 ln(rate)	(2) ln(rate)	(3) ln(rate)	(4) ln(rate)	(5) Gap > -1 rate	(6) rate	(7) rate	(8) rate
LCR gap × post	-0.230*** (0.068)				-0.082*** (0.022)			
LCR gap (alt 1) × post		-0.106*** (0.029)				-0.034** (0.013)		
LCR gap (alt 2) × post			-0.124*** (0.032)				-0.041*** (0.014)	
LCR gap (alt 3) × post				-0.406** (0.155)				-0.152*** (0.038)
Observations	197,389	246,478	246,478	246,478	197,389	246,478	246,478	246,478
R-squared	0.567	0.560	0.560	0.560	0.503	0.491	0.491	0.491
Bank controls	✓	✓	✓	✓	✓	✓	✓	✓
Contract controls	✓	✓	✓	✓	✓	✓	✓	✓
Bank × Fund FE	✓	✓	✓	✓	✓	✓	✓	✓
Time FE	F × T	F × T	F × T	F × T	F × T	F × T	F × T	F × T

Note: This table reports results for regressions at the instrument level (see Equation (4)). The dependent variable is the log of the interest rate in columns (1)–(4) and the interest rate in columns (5)–(8). The variable *LCR gap* is defined as the *required LCR* minus the *pre-regulation LCR* (see Equation (2)). Columns (1) and (5) drop observations with an *LCR gap* < -1; columns (2) and (6) as well as (3) and (7) use alternative *LCR* measures defined under less optimistic scenarios (see [Hong et al. \(2014\)](#)). Columns (4) and (8) assume that banks with ex-ante negative *LCR* gaps are untreated (i.e. setting their gaps to 0). The dummy *post* takes on a value of one for observations in the period after 2013Q1 and zero otherwise. Standard errors are clustered at the bank and fund level. “F × T” denotes fund × time fixed effect. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5%, and 10% levels.

Table 8: **Robustness – market power**

VARIABLES	(1) Bank MP ln(rate)	(2) Fund MP ln(rate)	(3) Bank MP (FF) ln(rate)	(4) Fund fam MP ln(rate)
LCR gap × post	-0.086*** (0.023)	-0.075*** (0.026)	-0.071*** (0.023)	-0.083*** (0.026)
Market power	0.196** (0.093)	-0.231 (0.181)	0.274* (0.145)	-0.275* (0.141)
LCR gap × market power	-0.075 (0.074)	-0.002 (0.078)	-0.093 (0.098)	-0.023 (0.062)
Market power × post	-0.229** (0.096)	0.133 (0.230)	-0.442*** (0.148)	0.299** (0.125)
LCR gap × market power × post	0.113 (0.092)	0.035 (0.107)	-0.002 (0.109)	0.103** (0.050)
Observations	246,478	246,478	246,478	246,478
R-squared	0.560	0.560	0.561	0.560
Bank controls	✓	✓	✓	✓
Contract controls	✓	✓	✓	✓
Bank x Fund FE	✓	✓	✓	✓
Time FE	F x T	F x T	F x T	F x T

Note: This table reports results for regressions at the instrument level (see Equation (4)). The dependent variable is the log of the interest rate. The variable *LCR gap* is defined as the *required LCR* minus the *pre-regulation LCR* (see Equation (2)). The dummy *post* takes on a value of one for observations in the period after 2013Q1 and zero otherwise. The variable *Market power* measures fund, bank, and fund family market power at the bank-fund (family)-time level. Standard errors are clustered at the bank and fund level. “F × T” denotes fund×time fixed effect. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5%, and 10% levels.

Table 9: **Aggregation**

VARIABLES	(1) Bank-Fund ln(rate)	(2) Bank-Fund ln(rate)	(3) Bank ln(rate)	(4) Bank-Fund Fam ln(rate)	(5) Bank-Fund Fam ln(rate)
LCR gap $\times$ post	-0.079** (0.031)	-0.064** (0.026)	-0.117*** (0.041)	-0.092** (0.036)	-0.096** (0.036)
Observations	76,067	75,715	1,256	26,769	26,675
R-squared	0.631	0.744	0.709	0.606	0.690
Bank controls	✓	✓	✓	✓	✓
Bank FE	-	-	✓	-	-
Bank $\times$ Fund FE	✓	✓	-	-	-
Bank $\times$ Fund Family FE	-	-	-	✓	✓
Time FE	✓	F $\times$ T	✓	✓	FF $\times$ T

Note: This table reports results from Equation (4) at different levels of aggregation. The dependent variable is the log of the interest rate. The variable *LCR gap* is defined as the *required LCR* minus the *pre-regulation LCR* (see Equation (2)). The dummy *post* takes on a value of one for observations in the period after 2013Q1 and zero otherwise. “F  $\times$  T” denotes fund  $\times$  time fixed effect. “FF  $\times$  T” denotes fund family  $\times$  time fixed effect. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5%, and 10% levels.

Table 10: LCR gap, maturity, and amounts

VARIABLES	(1) ln(Amount)	(2) ln(Amount)	(3) ln(Amount)
LCR gap $\times$ post $\times$ log(maturity)	0.002*** (0.001)		
LCR gap $\times$ post $\times$ maturity		0.000*** (0.000)	
LCR gap $\times$ post $\times$ maturity 2-30 days			0.003 (0.003)
LCR gap $\times$ post $\times$ maturity 31+ days			0.012*** (0.004)
Observations	246,463	246,467	246,463
R-squared	0.978	0.978	0.978
Bank controls	✓	✓	✓
Contract controls	✓	✓	✓
Bank $\times$ Fund FE	✓	✓	✓
Time FE	FxT + BxT	FxT + BxT	FxT + BxT

Note: This table reports results for regressions at the instrument level (see Equation (4)). The dependent variable is the log of the loan amount. The variable *LCR gap* is defined as the *required LCR* minus the *pre-regulation LCR* (see Equation (2)). The dummy *post* takes on a value of one for observations in the period after 2013Q1 and zero otherwise. We interact the LCR gap and post dummy with the following three measures: the log of maturity (columns 1 and 4), maturity in days (columns 2 and 5), and three buckets for instruments with 1-day maturity, 2-30 days maturity, and maturity greater 30 days (columns 3 and 6). Standard errors are clustered at the bank and fund level. “F  $\times$  T” denotes fund  $\times$  time fixed effect. “B  $\times$  T” denotes bank  $\times$  time fixed effect. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5%, and 10% levels.

Table 11: **Bank borrowing from MMFs**

VARIABLES	(1)	(2)	(3)
	Bank-Fund $\Delta$ Value	Bank-Fund $\Delta$ Value	Bank-Fund $\Delta$ Value
LCR gap $\times$ post	0.007* (0.003)	0.012* (0.006)	0.014** (0.007)
Observations	67,316	67,316	66,954
R-squared	0.022	0.022	0.165
Bank controls	-	✓	✓
Bank $\times$ Fund FE	✓	✓	✓
Time FE	✓	✓	F $\times$ T

Note: This table reports results from Equation (4), aggregated to the bank-fund-month level. The dependent variable is the log difference in total amounts borrowed by bank  $b$  from fund  $f$ . The variable *LCR gap* is defined as the *required LCR* minus the *pre-regulation LCR* (see Equation (2)). The dummy *post* takes on a value of one for observations in the period after 2013Q1 and zero otherwise. Standard errors are clustered at the bank and fund level. “F  $\times$  T” denotes fund  $\times$  time fixed effect. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5%, and 10% levels.



Table OA.1: **Bank characteristics by positive/negative LCR gap**

	<b>Gap &lt; 0</b>		<b>Gap ≥ 0</b>		<b>mean diff.</b>
	mean	sd	mean	sd	t
log(assets)	17.18	(3.39)	17.98	(2.44)	-1.81
non-interest income	0.39	(0.22)	0.31	(0.13)	2.73
securities/assets	0.22	(0.19)	0.19	(0.10)	1.24
return on assets (%)	0.14	(0.21)	0.19	(0.35)	-1.05
capital ratio	0.12	(0.04)	0.17	(0.15)	-2.41
loans/assets	0.40	(0.21)	0.53	(0.17)	-4.30
Observations	80		95		175

Note: This table reports average quarterly bank characteristics for banks with an average LCR gap below or above zero in our sample over 2011 to 2012.

Table OA.2: Baseline results – maturity (full table)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	ln(rate)	ln(rate)	ln(rate)	ln(rate)	ln(rate)	ln(rate)
LCR gap × post	-0.033*	-0.048**	-0.050**			
	(0.018)	(0.022)	(0.022)			
ln(Maturity)	0.570*			0.568*		
	(0.292)			(0.303)		
ln(Maturity)	-0.417			-0.413		
	(0.291)			(0.302)		
LCR gap × log(maturity)	0.022***			0.023***		
	(0.005)			(0.006)		
Post × log(maturity)	-0.018			-0.022		
	(0.014)			(0.014)		
LCR gap × post × log(maturity)	-0.015***			-0.018***		
	(0.005)			(0.006)		
Maturity		0.004***			0.004***	
		(0.001)			(0.001)	
LCR gap × maturity		0.001***			0.001***	
		(0.000)			(0.000)	
Post × maturity		-0.001**			-0.001**	
		(0.001)			(0.001)	
LCR gap × post × maturity		-0.001***			-0.001***	
		(0.000)			(0.000)	
Maturity 2-30 days			0.224***			0.247***
			(0.050)			(0.056)
Maturity 31+ days			0.511***			0.528***
			(0.075)			(0.080)
LCR gap × maturity 2-30 days			0.010			0.024*
			(0.011)			(0.014)
LCR gap × maturity 31+ days			0.055***			0.068***
			(0.019)			(0.023)
Post × maturity 2-30 days			-0.041			-0.052
			(0.040)			(0.047)
Post × maturity 31+ days			-0.070			-0.084
			(0.055)			(0.060)
LCR gap × post × maturity 2-30 days			-0.021			-0.035**
			(0.013)			(0.015)
LCR gap × post × maturity 31+ days			-0.050***			-0.067***
			(0.014)			(0.017)
Observations	246,474	246,478	246,474	246,463	246,467	246,463
R-squared	0.616	0.593	0.594	0.631	0.608	0.611
Bank controls	✓	✓	✓	✓	✓	✓
Contract controls	✓	✓	✓	✓	✓	✓
Bank × Fund FE	✓	✓	✓	✓	✓	✓
Time FE	F × T	F × T	F × T	F×T + B×T	F×T + B×T	F×T + B×T

Note: This table reports results from regressions at the instrument level (see Equation (4)). The dependent variable is the log of the interest rate. The variable *LCR gap* is defined as the *required LCR* minus the *pre-regulation LCR* (see Equation (2)). The dummy *post* takes on a value of one for observations in the period after 2013Q1 and zero otherwise. We interact the *LCR gap* and *post* dummy with the following three measures: the log of maturity (columns 1 and 4), maturity in days (columns 2 and 5), and three buckets for instruments with 1-day maturity, 2-30 days maturity, and maturity greater 30 days (columns 3 and 6). Standard errors are clustered at the bank and fund level. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5%, and 10% levels.

Table OA.3: **Baseline results – maturity and the level of interest rates**

VARIABLES	(1) Rate	(2) Rate	(3) Rate
LCR gap $\times$ post	0.008 (0.006)	-0.005 (0.008)	-0.006 (0.008)
LCR gap $\times$ post $\times$ log(maturity)	-0.012*** (0.003)		
LCR gap $\times$ post $\times$ maturity		-0.000*** (0.000)	
LCR gap $\times$ post $\times$ maturity 2-30 days			-0.010** (0.005)
LCR gap $\times$ post $\times$ maturity 31+ days			-0.037*** (0.008)
Observations	246,474	246,478	246,474
R-squared	0.537	0.528	0.520
Bank controls	✓	✓	✓
Contract controls	✓	✓	✓
Bank $\times$ Fund FE	✓	✓	✓
Time FE	F $\times$ T	F $\times$ T	F $\times$ T

Note: This table reports results from regressions at the instrument level (see Equation (4)). The dependent variable is the level of interest rate. The variable *LCR gap* is defined as the *required LCR* minus the *pre-regulation LCR* (see Equation (2)). The dummy *post* takes on a value of one for observations in the period after 2013Q1 and zero otherwise. We interact the LCR gap and post dummy with the following three measures: the log of maturity (columns 1 and 4), maturity in days (columns 2 and 5), and three buckets for instruments with 1-day maturity, 2-30 days maturity, and maturity greater 30 days (columns 3 and 6). Standard errors are clustered at the bank and fund level. "F  $\times$  T" denotes fund  $\times$  time fixed effect. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5%, and 10% levels.

**Table OA.4: Baseline results – maturity and the level of interest rates (full table)**

VARIABLES	(1) Rate	(2) Rate	(3) Rate
LCR gap × post	0.008 (0.006)	-0.005 (0.008)	-0.006 (0.008)
ln(Maturity)	0.474** (0.179)		
ln(Maturity)	-0.415** (0.177)		
LCR gap × log(maturity)	0.011*** (0.003)		
Post × log(maturity)	-0.021*** (0.006)		
LCR gap × post × log(maturity)	-0.012*** (0.003)		
Maturity		0.002*** (0.000)	
LCR gap × maturity		0.000** (0.000)	
Post × maturity		-0.001*** (0.000)	
LCR gap × post × maturity		-0.000*** (0.000)	
Maturity 2-30 days			0.088*** (0.017)
Maturity 31+ days			0.207*** (0.034)
LCR gap × maturity 2-30 days			0.006 (0.005)
LCR gap × maturity 31+ days			0.031*** (0.010)
Post × maturity 2-30 days			-0.039** (0.016)
Post × maturity 31+ days			-0.085*** (0.025)
LCR gap × post × maturity 2-30 days			-0.010** (0.005)
LCR gap × post × maturity 31+ days			-0.037*** (0.008)
Observations	246,474	246,478	246,474
R-squared	0.537	0.528	0.520
Bank controls	✓	✓	✓
Contract controls	✓	✓	✓
Bank x Fund FE	✓	✓	✓
Time FE	F x T	F x T	F x T

Note: This table reports full results for regressions at the instrument level (see Equation (4) and Table OA.3). The dependent variable is the level of the interest rate. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5%, and 10% levels.

Table OA.5: Aggregation: Spread relative to maturity-matched risk-free rate

VARIABLES	(1) Bank-Fund Spread	(2) Bank-Fund Spread	(3) Bank Spread	(4) Bank-Fund Fam Spread	(5) Bank-Fund Fam Spread
LCR gap $\times$ post	-0.033* (0.017)	-0.036** (0.017)	-0.052*** (0.015)	-0.049* (0.024)	-0.050** (0.023)
Observations	54,434	53,837	1,232	20,732	20,636
R-squared	0.563	0.674	0.784	0.547	0.657
Bank controls	✓	✓	✓	✓	✓
Contract controls	✓	✓	✓	✓	✓
Bank FE	-	-	✓	-	-
Bank $\times$ Fund FE	✓	✓	-	-	-
Bank $\times$ Fund Family FE	-	-	-	✓	✓
Time FE	✓	F $\times$ T	✓	✓	FF $\times$ T

Note: This table reports results from variants of Equation (4) at different levels of aggregation. The dependent variable is the spread of the value-weighted average interest rates on bank borrowing from MMFs over duration-matched, interpolated OIS rates. We restrict the sample to instruments at or over 7 days left to maturity – the shortest tenor with OIS rate available. The variable *LCR gap* is defined as the *required LCR* minus the *pre-regulation LCR* (see Equation (2)). The dummy *post* takes on a value of one for observations in the period after 2013Q1 and zero otherwise. “F  $\times$  T” denotes fund  $\times$  time fixed effect. “FF  $\times$  T” denotes fund family  $\times$  time fixed effect. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5%, and 10% levels.

Table OA.6: **Additional robustness: LCR gap, interest rates, and maturity**  
(Dropping contracts issued before the treatment date)

VARIABLES	(1) ln(Rate)	(2) ln(Rate)	(3) ln(Rate)	(4) ln(Rate)	(5) ln(Rate)	(6) ln(Rate)
LCR gap × post	-0.035* (0.018)	-0.050** (0.022)	-0.052** (0.022)			
LCR gap × post × log(maturity)	-0.015*** (0.005)			-0.018*** (0.006)		
LCR gap × post × maturity		-0.001*** (0.000)			-0.001*** (0.000)	
LCR gap × post × maturity 2-30 days			-0.021 (0.013)			-0.036** (0.015)
LCR gap × post × maturity 31+ days			-0.051*** (0.014)			-0.067*** (0.018)
Observations	243,817	243,821	243,817	243,806	243,810	243,806
R-squared	0.617	0.594	0.595	0.632	0.609	0.611
Bank controls	✓	✓	✓	✓	✓	✓
Contract controls	✓	✓	✓	✓	✓	✓
Bank × Fund FE	✓	✓	✓	✓	✓	✓
Time FE	F × T	F × T	F × T	FxT + BxT	FxT + BxT	FxT + BxT

Note: This table reports results from regressions at the instrument level (see Equation (4)). The dependent variable is the log of the interest rate. For the robustness exercise, we exclude observations after the treatment date (2013M1) corresponding to contracts issued before the treatment date that remain outstanding after the treatment date, to prevent these contracts from mechanically driving the results. The variable *LCR gap* is defined as the *required LCR* minus the *pre-regulation LCR* (see Equation (2)). The dummy *post* takes on a value of one for observations in the period after 2013Q1 and zero otherwise. We interact the LCR gap and post dummy with the following three measures: the log of maturity (columns 1 and 4), maturity in days (columns 2 and 5), and three buckets for instruments with 1-day maturity, 2-30 days maturity, and maturity greater 30 days (columns 3 and 6). Standard errors are clustered at the bank and fund level. “F × T” denotes fund × time fixed effect. “B × T” denotes bank × time fixed effect. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5%, and 10% levels.

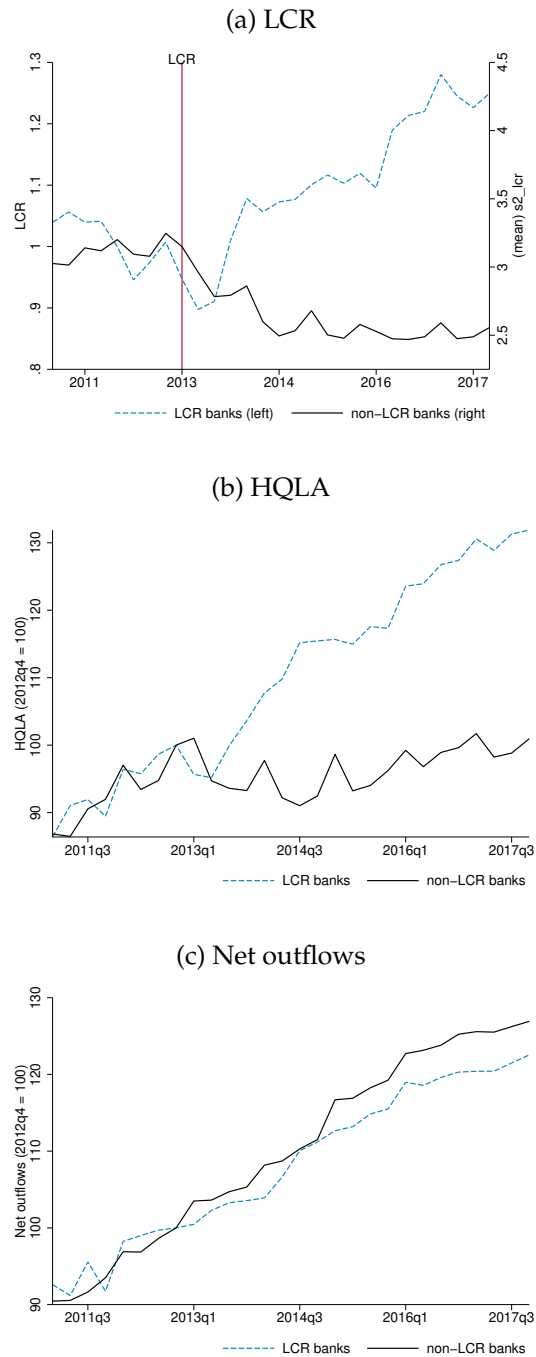
Table OA.7: LCR gap, maturity, and amounts (full table)

VARIABLES	(1) ln(Amount)	(2) ln(Amount)	(3) ln(Amount)	(4) ln(Amount)	(5) ln(Amount)	(6) ln(Amount)
LCR gap × post	-0.013*** (0.004)	-0.010** (0.004)	-0.013*** (0.005)			
ln(Maturity)				0.143** (0.068)		
ln(Maturity)				-0.152** (0.069)		
LCR gap × log(maturity)				-0.003*** (0.001)		
Post × log(maturity)				0.006** (0.002)		
LCR gap × post × log(maturity)				0.002*** (0.001)		
Maturity		-0.000*** (0.000)			-0.000*** (0.000)	
LCR gap × maturity		-0.000*** (0.000)			-0.000*** (0.000)	
Post × maturity		0.000 (0.000)			0.000 (0.000)	
LCR gap × post × maturity		0.000** (0.000)			0.000*** (0.000)	
Maturity 2-30 days			-0.024** (0.011)			-0.027** (0.011)
Maturity 31+ days			-0.036*** (0.013)			-0.038*** (0.013)
LCR gap × maturity 2-30 days			-0.007*** (0.002)			-0.007*** (0.002)
LCR gap × maturity 31+ days			-0.014*** (0.003)			-0.015*** (0.003)
Post × maturity 2-30 days			0.027** (0.010)			0.030*** (0.010)
Post × maturity 31+ days			0.032*** (0.010)			0.034*** (0.011)
LCR gap × post × maturity 2-30 days			0.004 (0.003)			0.003 (0.003)
LCR gap × post × maturity 31+ days			0.012*** (0.003)			0.012*** (0.004)
Observations	246,474	246,478	246,474	246,463	246,467	246,463
R-squared	0.978	0.978	0.978	0.978	0.978	0.978
Bank controls	✓	✓	✓	✓	✓	✓
Contract controls	✓	✓	✓	✓	✓	✓
Bank × Fund FE	✓	✓	✓	✓	✓	✓
Time FE	F × T	F × T	F × T	FxT + BxT	FxT + BxT	FxT + BxT

Note: This table reports results for regressions at the instrument level (see Equation (4)). The dependent variable is the log of the loan amount. The variable *LCR gap* is defined as the *required LCR* minus the *pre-regulation LCR* (see Equation (2)). The dummy *post* takes on a value of one for observations in the period after 2013Q1 and zero otherwise. We interact the LCR gap and post dummy with the following three measures: the log of maturity (columns 1 and 4), maturity in days (columns 2 and 5), and three buckets for instruments with 1-day maturity, 2-30 days maturity, and maturity greater 30 days (columns 3 and 6). Standard errors are clustered at the bank and fund level. “F × T” denotes fund × time fixed effect. “B × T” denotes bank × time fixed effect. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels.

## OA.1.2 The LCR gap and HQLA

Figure OA.2: The LCR, HQLA, and net outflows



Note: This figure shows the evolution of the LCR, HQLA, and net outflows for banks subject to the LCR as well as those not subject to the LCR. For HQLA and net outflows, we normalize the level at 2012Q4 to 100. Data are taken from [Sundaresan and Xiao \(2024\)](#).

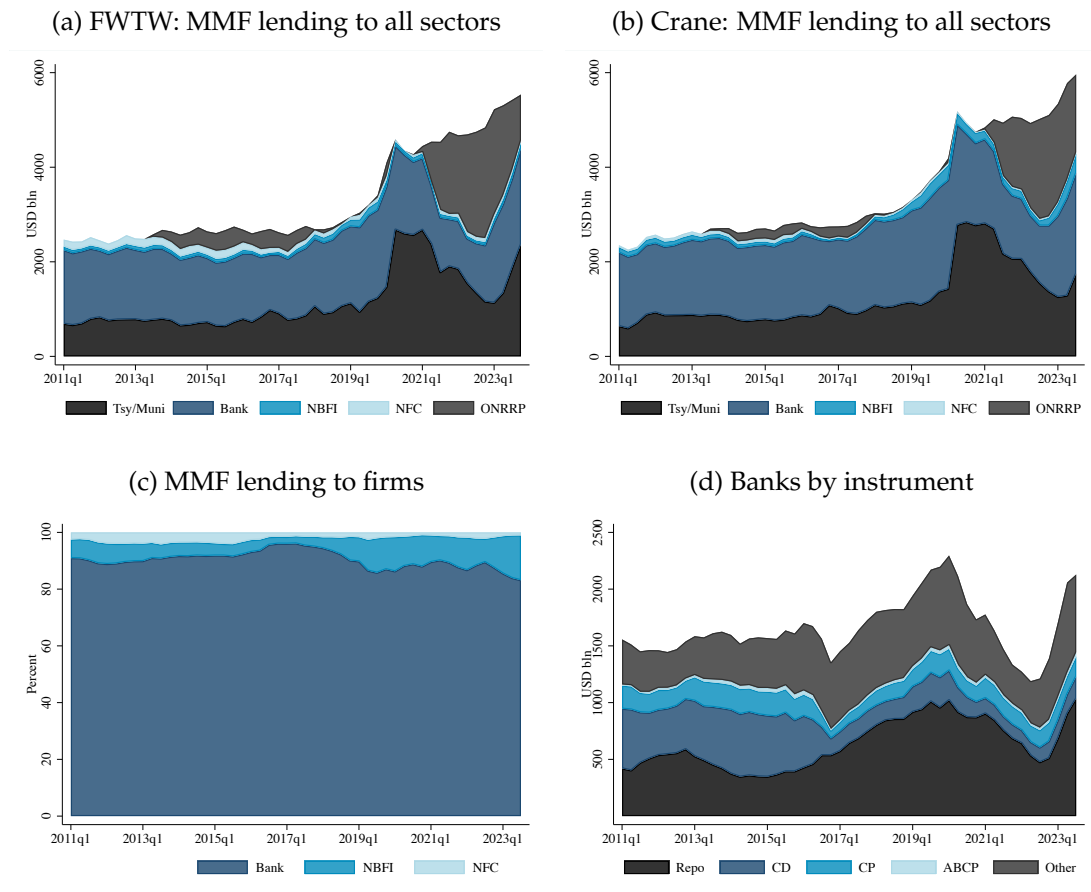
Table OA.8: LCR gap and bank HQLA

VARIABLES	(1) ln(LCR)	(2) ln(HQLA)	(3) ln(Net Outflows)	(4) ln(Outflows)	(5) ln(Inflows)
LCR gap $\times$ post	0.764*** (0.244)	0.700*** (0.216)	-0.064 (0.129)	0.067 (0.148)	0.284 (0.452)
Observations	832	832	832	832	832
R-squared	0.800	0.977	0.982	0.987	0.973
Bank controls	✓	✓	✓	✓	✓
Bank	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓

Note: This table reports results from bank-level regressions of the LCR and its major sub-components on the LCR gap interacted with the post dummy, which equals one from 2013Q1 onward and is zero otherwise. Bank controls include the log of total assets. In column (1), the dependent variable is the log of the LCR. In column (2), the dependent variable is the log of HQLA (i.e. the LCR's numerator). In column (3), the dependent variable is the log of net outflows (i.e. the LCR's denominator). In column (4), the dependent variable is the log of outflows. In column (5), the dependent variable is the log of inflows. Standard errors are clustered at the bank level. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5%, and 10% levels.

### OA.1.3 Who borrows from MMFs?

Figure OA.3: MMF portfolio allocation



Note: This figure traces the evolution of money market funds' portfolio allocation by counterparty type or instrument, based on both issuer-to-holder (From-Whom-to-Whom) data of the Financial Account (panel (a)) and Crane's granular data on money market fund lending (panels (b) to (d)). "Other" in panel (d) includes borrowing through short-term debt instruments by Federal Home Loan Banks (see [Aldasoro and Doerr \(2023\)](#)).

## OA.1.4 LCR computation

Table OA.9: The regulatory weights of LCR assets

<b>Asset type</b>	<b>Weight</b>
<b>Level 1 HQLA</b>	
Cash / Reserve	100%
U.S. government securities	100%
GNMA MBS	100%
Non-GSE agency debts	100%
Foreign sovereign debt securities	100%
<b>Level 2a HQLA</b>	
GSE debts	85%
GSE MBS	85%
Agency CMBS	85%
<b>Level 2b HQLA</b>	
Investment-grade corporate bonds	50%
Russell 1000 equities	50%
Investment-grade municipal bonds	50%
<b>Non-HQLA</b>	
Loans	0%

Note: This table shows liquidity weights for calculating the high-quality liquid assets (HQLA) under the revised LCR standards in 2013.

Table OA.10: The regulatory weights of LCR liabilities

Outflow/inflow type	Weight
<b>Expected cash outflows</b>	
<i>Deposits</i>	
Stable foreign deposits with a remaining maturity $\leq$ one month	5%
Less-stable foreign deposits with a remaining maturity $\leq$ one month	25%
Stable large-time deposits with a remaining maturity $\leq$ one month	20%
Less-stable large-time deposits with a remaining maturity $\leq$ one month	40%
Stable small-time deposits with a remaining maturity $\leq$ one month	3%
Less-stable small-time deposits with a remaining maturity $\leq$ one month	10%
Stable wholesale transaction deposits	5%
Less-stable wholesale transaction deposits	25%
Stable retail transaction deposits	3%
Less-stable retail transaction deposits	10%
Stable wholesale saving deposits	20%
Less-stable wholesale saving deposits	40%
Stable saving deposits	3%
Less-stable retail saving deposits	10%
<i>Wholesale funding</i>	
Secured by level 1 liquid assets	0%
Secured by level 2A liquid assets	15%
Secured by level 2B liquid assets	50%
Secured by other assets (with sovereigns and GSEs as counterparty)	25%
Secured by other assets (with other counterparty)	100%
Unsecured borrowing	100%
<i>Loan commitments</i>	
Negative fair value of derivatives	100%
Unused commitments for securities underwriting	100%
Unused commitments of commercial real estate	10%
Unused commitments of credit cards	5%
Unused commitments of home equity line of credit	5%
Other unused commitments	5%
Letters of credit	5%
Repo	30%
Repo offset	30%
Securities lent	30%
<b>Expected cash inflows</b>	
Securities borrowed	30%
Reverse repo	30%
50% of loans with a remaining maturity less than one month	100%
Positive fair value of derivatives	100%

Note: This table shows liquidity weights for calculating the expected cash outflows and the inflows under the revised LCR standards published in 2013.