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Keep calm, but watch the outliers: deposit flows in recent crisis episodes and beyond

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Contents

Abstract

Since the March 2023 banking turmoil, a policy debate has emerged concerning the unprecedented scale and speed of the observed deposit outflows. Have recent stress episodes and developments in technology structurally changed depositors' behaviour? Are the Basel III liquidity coverage ratio (LCR) run-off assumptions for cash outflows still fit for purpose? Leveraging on monthly liquidity reporting for a sample of 110 significant institutions (SIs) between 2016 and 2024, we shed light on some stylised facts pertaining to the composition of deposit flows in the banking union. Overall, we find limited evidence of a structural change in the statistical behaviour of deposit flows to date. For all but one of the deposit classes included in the analysis, more than 90% of observable net outflows remained below the LCR run-off assumptions during the whole sample period. Some extreme deposit outflows recorded during the COVID-19 pandemic and for a few SIs assessed as failing or likely to fail (FOLTF) remain rare tail events for which the LCR standard was not designed.

Keywords: liquidity risk, deposit outflows, bank runs, LCR run-off assumptions, bank regulation.

JEL codes: G20, G21, G28.

Non-technical summary

Since the March 2023 banking turmoil, policymakers have been discussing the potential long-term implications of the unprecedented speed and scale of deposit withdrawals observed during that episode. The March 2023 events have shed light on new and existing risk factors which may have potentially longer-lasting effects on depositor behaviour. These include, among other things, a highly concentrated customer base holding largely uninsured deposits, the increasingly widespread use of online banking and the rapid dissemination of news via social media. Another question raised by the turmoil is whether the calibration of the assumed outflow factors in the Basel III liquidity standard is still fit for purpose. While caution is needed in drawing policy conclusions from events centred around idiosyncratic bank problems or specific business models, it is useful to explore deposit flows in the banking union and over a longer sample period to complement and inform the policy debate.

This paper aims to shed light on the behaviour of deposits at banks directly supervised by the European Central Bank (ECB), with a focus on deposit flows included in supervisory liquidity reporting. We provide insights into the general distribution of deposit flows and potential trends in depositor concentration since 2016. We also examine the behaviour of deposit flows during normal times (business as usual) and during system-wide crisis episodes. We zoom in on individual stress episodes experienced by banks which were subsequently assessed as failing or likely to fail (FOLTF). The supervisory liquidity reporting templates allow actual deposit withdrawals to be compared with the deposit outflow assumptions embedded in the Basel III liquidity standard. In addition, this paper looks at survey-based evidence on the share of digital customers in banks subject to European banking supervision and connects it with bank-specific deposit flows to explore whether banks with a more digitalised customer base tend to be more exposed to extreme deposit withdrawal behaviour.

First, this paper confirms that retail deposits continue to remain among the most stable funding sources for significant institutions (SIs) in the banking union. The data surveyed for this paper do not provide strong evidence of a widening distribution of net deposit flows over time. Instead, the overall distribution looks more centred around zero, with a slightly higher share of severe flows in recent years. The system-wide reliance on insured deposits, as opposed to uninsured deposits, has slowly increased since 2018, fluctuating around 52% more recently. The majority of SIs in the banking union had net inflows of retail deposits during the COVID-19 pandemic.

Second, this paper confirms that the most significant movements in banks' deposits took place during the pandemic, rather than during subsequent episodes such as the onset of Russia's invasion of Ukraine or the March 2023 banking turmoil. The data display a sharp downward trend in deposits of non-financial corporations (NFCs) around the first quarter of 2020, when the pandemicinduced recession hit. NFC deposits slowly started recovering again only one year later, around the first quarter of 2021, during the post-pandemic economic expansion. By comparison, the pandemic-related “dash for cash” was reflected in a spike in total retail deposits during the first half of 2020, which then stabilised and grew at moderate pace from the second half of 2021 onwards, until they peaked at the end of 2022.

Third, this paper finds that at least 90% of net outflows remained below the assumed liquidity coverage ratio (LCR) run-off rates for all but one of the deposit classes under review. The March 2023 banking turmoil was largely uneventful for SIs in the banking union. Other crisis episodes were more relevant than the March 2023 events. This paper also finds that the assumed outflow rates for uninsured deposits were particularly conservative, on average, across all crises and depositor classes, while observed outflow rates for insured deposits during the pandemic were relatively closer to the assumptions underlying the Basel III liquidity metrics. In addition, the data highlight that, so far, extreme deposit outflows have been outlier tail events. During idiosyncratic bank failures in the banking union, net deposit outflow rates were in many cases significantly higher than the assumptions underlying the Basel III liquidity metrics, although bank-specific liquidity issues are not necessarily evidence or sufficient cause of FOLTF status.

Fourth, based on the descriptive evidence provided, any long-lasting structural effect of social media and digitalisation are hard to isolate. A bank-specific indicator of (negative) sentiment on X (formerly Twitter) fluctuates in crisis periods but is not highly correlated with monthly deposit flows. Available survey-based evidence for banks directly supervised by the ECB suggests that deposit outflows may be higher for banks with a higher share of digital customers, although historical data on trends in digitalisation would be needed to validate this finding. Notwithstanding the evidence presented in this paper, it should be borne in mind that the sample period under review neither includes a system-wide liquidity crisis, nor a major banking crisis in the banking union. As such, the LCR run-off rates as well as the potential impact of social media and digitalisation may have not yet been fully tested.

1 Introduction

The extraordinary speed and scale of bank deposit withdrawals that occurred in the United States and Switzerland over the span of only a few days in March 2023 has once again put a spotlight on liquidity risk. The March 2023 banking turmoil triggered a general debate among policymakers and central bankers about the evolution of depositor behaviour and deposit stickiness in an ever more digital world. In the case of certain US lenders and one Swiss bank, even though the affected banks were different in nature (e.g. with regards to G-SIB status, full application of Basel III rules), one common theme underpinning the bank failures and rescues that followed massive deposit outflows was a lack of sound internal governance and risk management.[1] A concentrated and tech-savvy depositor base holding largely uninsured deposits resulted in rapid and sudden outflows in the case of Silicon Valley Bank (SVB), which culminated in the bank's failure, as the institution was operationally unable and unprepared to access central bank liquidity in distress.[2] In the case of Credit Suisse, the bank's depositor base reacted quickly to the rapid dissemination of news via social media.[3] Since then, the central banking community has started to review the available regulatory toolkit for safeguarding liquidity conditions and financial stability.[4] In particular, this includes discussions on whether specific features of the Basel Framework, including liquidity risk, performed as intended during the March 2023 banking turmoil.[5]

This paper contributes to this debate by taking stock of deposit flows for banks directly supervised by the European Central Bank (ECB) in recent crisis episodes and beyond. We start by looking at the distribution of all net deposit inflows and outflows that are relevant for Basel III liquidity regulation to gain a better understanding of potential structural changes across different deposit types (e.g. insured versus uninsured) and over time (e.g. crisis episodes versus business as usual). Net deposit outflows are more relevant from a financial stability perspective, given their potentially destabilising effect on a bank's liquidity provision. The paper reviews monthly net deposit outflows at SIs since 2016 against the run-off assumptions for cash outflows underlying the Basel III liquidity coverage ratio (LCR).[6] Supervisory information on the share of digital customers in individual banks is used to investigate the role of digitalisation in amplifying deposit withdrawals.

For credit institutions directly supervised by the ECB, available evidence confirms that the run-off rates used to calculate the LCR were consistent with most of the significant net deposit outflows during stress episodes between 2016 and 2023. The LCR aims to ensure that banks maintain a liquidity buffer on

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1 See Enria (2023).

2 See Board of Governors of the Federal Reserve System (2023).

3 See FINMA (2023).

4 See BCBS (2023a); Financial Stability Board (2023); BCBS (2023b); BCBS (2022).

5 See BCBS (2023a).

6 Basel III defines run-off rates for "cash outflows", although the transfer of a deposit to another bank is still an LCR-relevant outflow. Thus, "cash outflows" are not limited to cash withdrawals. See BCBS (2013).

their balance sheets which can be liquidated quickly during a period of liquidity stress. The calculation of the LCR is based on specific outflow rates for certain depositor classes in a 30-day liquidity stress scenario. With the exception of one deposit class, around 93% of all observed net outflow rates between 2016 and 2023 were within the LCR assumptions. In the case of the one outlier, it may be useful to review the current classification and assumed run-off rate of certain types of operational deposits. Being conscious that the banking union has not undergone a system-wide liquidity or banking crisis during the sample period, this paper aims to draw conclusions from three periods of stress in global financial markets and from idiosyncratic bank failures. In particular, the analysis shows that other stress episodes since 2016, specifically the pandemic, were more relevant in terms of the size of net deposit outflows than the March 2023 turmoil. However, during idiosyncratic bank failures that occurred in the banking union, significantly higher deposit withdrawals than foreseen by the LCR run-off factors were recorded. The analysis of supervisory information on the share of digital customers in individual banks provides some indication that the volatility of deposit flows is higher for banks with a high share of digital customers. To date, based on the descriptive evidence presented in this paper, we cannot however find any conclusive evidence that either (i) social media, (ii) the digitalisation of banking or (iii) the recent crisis episodes have persistently changed the behaviour of LCR-relevant deposit flows for SIs. Further analytical work is needed to empirically identify these potential channels.

Regulators must stay vigilant in a changing digital world. That said, to date, from a banking union perspective, far-reaching changes to the Basel III liquidity standard do not appear necessary. The findings presented in this paper suggest overall that severe deposit withdrawals represent tail events for which the LCR was not calibrated.[7] Consequently, the ongoing discussion should shift towards the need for better supervisory metrics to detect such tail risks. To enhance the pre-emptive and early identification of these tail events during normal times, more suitable, more granular and higher-frequency supervisory reporting and monitoring under Pillar 2 may be required. This could include, for example, additional indicators capturing the rapid dissemination of bank-relevant news via social media. In addition, various trends in digitalisation (e.g. a higher share of digital bank customers or technological advances in the accessibility and processing of bank deposits via smartphones) have already been ongoing for years, but neither the (still relatively scarce) existing academic literature nor this study finds compelling evidence of a broad-based or longer-lasting impact on the speed and scale of deposit withdrawals. Work on suitable indicators should nevertheless continue in order to prepare supervisors and regulators for the manifestation of any such trends in the data.

The remainder of this paper is structured as follows. Section 2 provides a review of related literature on the potentially changing nature of depositor behaviour since the March 2023 banking turmoil and recent trends in digitalisation and social media. Section 3 presents the unique data used in this study, featuring supervisory bank-level information available at monthly frequency. Section 4 presents stylised facts on the overall distribution of deposit flows that are relevant for the Basel III LCR.

[7] See Wildmann et al. (2023).

Section 5 evaluates deposit outflows at banking union SIs during crisis episodes and beyond, benchmarking them against the run-off assumptions for deposit outflows in the Basel III liquidity standard. Section 6 concludes.

2 Related literature

Like any significant crisis episode, the March 2023 banking turmoil sparked a global debate among policymakers and academics about how to avoid similar crises in the future.[8] While various stakeholders are discussing national and international policy options, the academic literature has focused on the banking sector's resilience, with a view to assessing causes, effects and potential remedies to the criticalities that created the bank vulnerabilities (Adrian et al., 2024; BCBS, 2023a; Choi et al., 2023). We contribute to these discussions by providing data-based inferences on the resilience to recent shocks of banks under the ECB's direct supervision and provide our perspective on whether the current regulatory framework pertaining to liquidity outflows is still fit for purpose in the banking union.

While the speed of adoption of technology and social media-based information in the financial sphere may have intensified with the pandemic (Amankwah-Amoah et al., 2021; Avalos et al., 2023), the March 2023 banking turmoil was an indication of its potential for facilitating disruptive deposit outflows. In the past, a key trigger for contemporaneous deposit withdrawals was seeing a queue of people outside a bank trying to withdraw their money. This is what happened during the Great Depression in the 1930s (Stevenson and Slater, 2008). Since the beginning of the 2000s, with online banking we have had money transfers "at our fingertips", first with computers and then with smartphones, boosting the speed of withdrawals in the context of a bank run (Rose, 2023). While online banking already played a role as a catalyst during the 2008 global financial crisis (GFC), technology today has yet another channel to spread crises: social media. While evidence in the literature is not ample, many authors have built on the banking turmoil experience to investigate the role of social media. Today social media has become a crucial coordination device. The increased speed of dissemination of information on the perceived health of a bank, however obtained, may lead to coordinated responses by depositors and, consequently, increased speed of outflows (Shakina and Angerer, 2018).

Deposits may either shift across banks as a result of competitive forces if the transmission of monetary policy rates is different across banks or move out of the banking sector. An environment of high monetary policy rates may affect deposit flows through fears of insolvency stemming from unrealised losses due to interest rate risk in the banking book, but also through the competition channel. When the pass-through rate of policy rates to deposits is imperfect, meaning that deposit rates do not rise consistently with central bank interest rates, depositors have an incentive to switch to better-remunerated savings options. The literature has defined "deposit stickiness" as the extent to which depositors hold deposits at their current bank, even in the face of deposit rates lower than policy rates (Drechsler et al., 2017). Digitalisation potentially reduces the stickiness of deposits and increases the sensitivity of deposits to interest rates ("deposit beta") by making it easier to

8 See BCBS (2023a); and Financial Stability Board (2023).

compare alternative options and easier to transfer savings across banks or to non-bank financial institutions (NBFIs) (Koont et al., 2023).[9] As described in detail in Bindseil and Senner (2024), the financial stability implications of deposit outflows depend crucially on where bank deposits can flow to (e.g. other banks, central bank liabilities, or liabilities of other financial intermediaries, such as money market funds and investment funds). Money market funds and investment funds are NBFIs and are not licensed as credit institutions, and as such may have looser regulatory requirements. In a context of monetary policy tightening, if credit institutions fail to pass on higher interest rates to depositors at sufficient levels, a substantial increase in the funds administered by NBFIs carries the risk of exacerbating the fragility of the financial system (Aramonte et al., 2022; Franceschi et al., 2023). On the other hand, depositors switching to competing banks or other investment options offering better conditions suggests a healthy functioning of the financial system, with demand responding to supply as a result of competitive dynamics. This competition for deposits, however, makes banks more vulnerable to interest rate risk as they are less able to control their funding costs. This may eventually result in stress, which could affect a bank's ability to perform its maturity transformation function, as was the case for SVB in 2023 (Board of Governors of the Federal Reserve System, 2023). It should be noted, however, that the pass-through of interest rates during the 2022 to 2023 policy rate hiking cycle in the euro area was perceived as particularly "sluggish", which may have been caused by high levels of excess reserves (Messer and Niepmann, 2023).

There is also limited empirical evidence (mostly for the United States) on how the composition of the deposit base influences the dynamics of outflows.[10] Using the 1931 banking crisis in Germany, Blickle et al. (2022) find that deposits decline by around 20% during the run and that there is an equal outflow of retail and non-financial wholesale deposits from both failing and healthy banks. At the same time, retail depositors appear to be essentially uninformed about the state of health of the bank, while interbank markets have forward-looking information.[11] Previously, Iyer et al. (2013) found that, in response to a public announcement of financial troubles at a specific bank, depositors with uninsured balances, depositors with loan linkages and staff of the bank are far more likely to run. The composition of the depositor base is a key focus of this paper since the profile of the "typical depositor" is likely to be very important for the dynamics of flows. Furthermore, a common denominator of the four regional banks that failed in the United States during the March 2023 banking turmoil was the concentration of corporate depositors with very similar or correlated interests and ventures. It seems that, in this context, the more interconnected and similar depositors are, the stronger is the coordination channel for deposit withdrawals (BCBS, 2023a; Rose, 2023).

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9 In addition, Greenwald et al. (2023) have recently shown that the relationship between deposit rates and central bank policy rates is non-linear and *convex*, i.e. the "deposit beta" is larger the higher the level of the policy rate is. Erel et al. (2023) find that online banks increase the rates they offer on deposits significantly more than traditional banks in the wake of a monetary policy tightening. In addition, while traditional banks experienced deposit outflows during the monetary policy tightening of 2022, online banks experienced inflows.

10 See, for example, Carlson and Rose (2019) in the case of Continental Illinois.

11 Boyle et al. (2022), however, find that in terms of depositor responses to a banking crisis, finance professionals are not special compared with other depositors.

Finally, there is abundant literature on theoretical models of bank runs, starting with the seminal contribution of Diamond and Dybvig (1983). He and Manela (2016) is a more directly relevant theoretical study, as it focuses on information acquisition and dynamic withdrawal decisions when a spreading rumour exposes a solvent bank to a run. In their model, uncertainty about the bank's liquidity and potential failure motivates depositors who hear the rumour to acquire additional noisy signals, and private information acquisition about liquidity can expose solvent but illiquid banks to runs. More generally, unlike the classical Diamond-Dybvig (1983) model where the bank run is an exogenous "sunspot" event, there is increasing recognition that runs are complex and are often triggered by (noisy) solvency signals and in almost all cases there is an interplay between solvency and liquidity.

3 Data

The present analysis mainly relies on supervisory data for banks directly supervised by the ECB. The main variables used are selected deposit categories that are relevant within the LCR framework, combined with balance sheet data and data from non-reporting sources (e.g. survey data for proxies of the digitalisation of payments and Bloomberg data for the social media indicators). The final dataset used in the main analysis comprises a balanced sample of monthly observations for 110 SIs at the highest level of consolidation across all countries participating in the Single Supervisory Mechanism (SSM), spanning the period from September 2016 to February 2024 on a monthly basis.[12] Details of the sources and the content of the database used are described in Section 3.1, and the data cleaning process is described in Section 3.2.

3.1 LCR templates under COREP

Supervisory reporting templates contain the financial data that banks are required to disclose periodically to competent authorities. In the supervisory template that we focus on, banks report, among other metrics, the stock of deposits at the month-end, broken down into retail deposits, NFC deposits, operational deposits, non-operational deposits and excess operational deposits. For each deposit class the Basel III LCR standard defines an assumption regarding the run-off rate for the purposes of the LCR.[13] The run-off rate is the rate at which deposits belonging to a certain class would be withdrawn in a theoretical 30-day window during a stress scenario. Such assumptions vary depending on the customer type and the presence of insurance, i.e. a deposit guarantee scheme (DGS).[14] The dedicated supervisory templates require banks to compute the assumed deposit outflows by multiplying the reported stock of deposits by the assumed run-off rate for the respective deposit class.[15]

This analysis takes information on banks' deposits from the relevant Common Reporting Framework (COREP) template for the LCR framework. Reported overnight deposits and deposits with a maturity of less than 30 days are used to compute month-on-month changes in the stock of outstanding deposits by class, which yields a value for monthly net deposit flows. We assume that a value greater than zero indicates, for the specific deposit class and month, that customers have deposited an overall amount greater than the overall amount withdrawn. The

12 The SSM refers to the system of banking supervision in Europe. It comprises the ECB and the national supervisory authorities of the participating countries.

13 See BCBS (2013).

14 In particular, the assumptions break deposits down (per definition) into the following classes: derogated stable retail deposits, stable (insured) retail deposits, less stable (uninsured) retail deposits, insured and uninsured operational deposits, insured and uninsured non-operational deposits, excess operational deposits by financial customers, insured and uninsured excess operational deposits by NFCs, plus a number of other minor classes.

15 Information on deposits relevant to the computation of the LCR is reported in COREP template 73.00.a.

opposite is true for a value lower than zero. Monthly data may, however, conceal high net outflows which would have been observable in higher-frequency data, but which were reversed over the course of the month.

3.2 Data cleaning and generation of the final sample

Our analysis focuses on SIs owing to their central role in preserving the stability of the financial system. Our study concentrates on SIs to ensure a more comprehensive understanding of their impact on the financial landscape. Nonetheless, less significant institutions (LSIs) may also experience substantial crises and deposit withdrawals to an extent that may jeopardise financial stability. We acknowledge that our analysis may not encompass all instances of deposit outflows, but we aim to provide a robust foundation for future research by examining a reliable sample covering a large part of the banking sector in the banking union as measured by total assets.

To ensure data accuracy, we performed a thorough cleaning process, excluding extreme outliers that could distort the identification of significant deposit outflow episodes. The original dataset comprised 3,122 individual banks (173 SIs and 2,949 LSIs), including entities at various levels of consolidation and hierarchical positions within corporate groups. We selected non-subsidiary credit institutions at the highest level of consolidation to prevent data duplication and ensure data consistency. Our sample period spans from September 2016 to February 2024. We excluded prior data owing to reporting inconsistencies and gaps created by multiple changes in the reporting frameworks. In the selected sample period, the cleaned data for the selected SIs do not present gaps in the time series of total deposits.

We reconstructed the time series of total deposits of the SIs where the bank was subject to either (i) a corporate group restructuring, (ii) a reclassification of its significance status, or (iii) a reconsolidation. A few banks in the sample were subject to corporate group restructuring in the form of mergers or acquisitions. Banks may also change their significance status, from SI to LSI and vice versa. Group restructurings in the form of reconsolidations change the top entity within a banking business group that reports at the highest level of consolidation, as well as some entities moving from subsidiary to parent and vice versa. For these banks, we reconstructed the time series backwards or forwards where the numbers had consistent magnitudes. For instance, this would be the case where the magnitude of total deposits of two pre-merger entities was in line with the magnitude of total deposits of the post-merger entity.

To achieve a balanced sample, we excluded banks that failed or whose banking licence was withdrawn, as well as new entrants, including some of the UK-headquartered banks that relocated to the European Union following the final Brexit agreement. We excluded new banks and banks that ceased reporting during the sample period from the final sample used in the main analysis. A number of “Brexit banks” that relocated their key business units to the European Union following the entry into force of the final Brexit agreement were also excluded as they either entered the sample later or presented significant jumps or breaks in their reporting. Finally, one bank was excluded from the final sample because it did not report any of the selected deposit classes in the COREP LCR template.

3.3 Sample description

Our final dataset includes almost 10,000 monthly observations for a cleaned and balanced sample of 110 SIs from September 2016 to February 2024. The final sample includes the eight global systemically important institutions (G-SIIs) in the banking union and is closer to the full SI sample for recent years, as the number of banks directly supervised by the ECB has decreased over time since 2016. The sample covers more than 97% of the total deposits reported by banking union SIs in the LCR template in February 2024. Looking at total retail deposits, the sample accounts for around 84% of euro area households' deposits reported in balance sheet statistics published by the ECB for February 2024.[16] At jurisdiction level, the countries with the highest number of SIs in the sample are Germany, Italy, Spain and France (**Table 1**).

Table 1
Number of reporting SIs in the final sample by country, 2016-2024

Country	AT	BE	BG	CY	DE	EE	ES	FI	FR	GR
Number of banks	7	6	1	2	24	3	11	2	9	4

Country	IE	IT	LT	LU	LV	MT	NL	PT	SI
Number of banks	7	11	4	3	3	2	6	3	2

Sources: Supervisory data and authors' calculations.
Notes: Number of SIs by country in the final balanced sample used in the main analysis. The total number of banks included in the sample is 110. One bank switched from reporting in Estonia (EE) to Lithuania (LT) in 2017 and is listed in the table under Lithuania.

The final dataset used for the analysis of SI deposits includes bank-specific information and the stock of deposits reported for selected deposit classes. As discussed in Section 3.1, this paper focuses on the categories of deposits and maturity classes that are relevant within the context of the LCR framework. Deposit classes of particular interest are insured (stable) and uninsured (less stable) retail deposits, insured and uninsured operational deposits, and insured and uninsured NFC deposits. Not all the banks in the final sample report each of the above deposit classes every month. The most volatile deposit type (having more jumps in the monthly reporting) is operational deposits.

Insured retail deposits are the largest deposit class. Retail deposits represent the largest reported item amongst all deposit classes considered, with stable insured

16 The main figures for key balance sheet statistics items, in particular deposits of households and corporations, are published on the ECB Data Portal.

deposits being substantially larger than less stable uninsured deposits (see summary statistics in **Table A.1**).

4 Stylised facts about deposit flows

4.1 Characteristics of deposit flows across depositor types and over time

The following section concerns stylised facts about deposit flows in the banking union that are relevant for the LCR supervisory reporting. The focus on non-maturity deposits originates in the 30-calendar day window envisaged by the short-term regulatory metric. A better understanding of observable trends in deposit flows may help distinguish a deposit holder's desire to transfer, deposit or withdraw money from statistical noise such as seasonal effects or statistical breaks. On this basis, we can explore the potentially changing nature of depositor behaviour owing to current trends in digitalisation and social media.

Overall, retail deposits remain one of the most stable funding sources for banks. The distribution of deposit flows appears inversely T-shaped, and deposit flows, in particular retail deposits, are primarily centred around zero (**Chart 1**). As anticipated, the distribution is wider for deposits not covered by a DGS and for deposit classes characterised by higher activity, such as deposits of NFCs and operational deposits (not shown in the chart). The variability of insured deposits is lower than that of uninsured deposits and skewed towards positive values. Compared with retail deposits, deposits from NFCs exhibit longer tails, with a lower share of observations near zero and a greater number of observations extending towards extreme values.

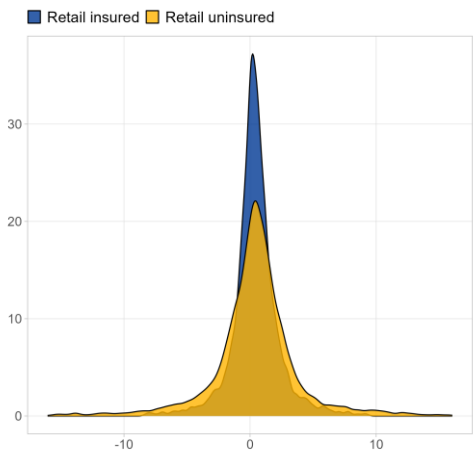
Chart 1

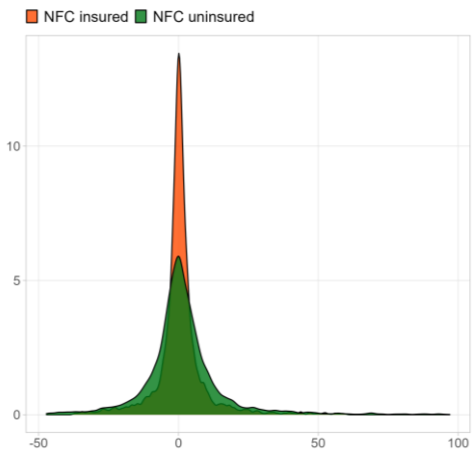
The distribution of net deposit flows is concentrated around zero, but comes with long tails

(x-axis: month-on-month change in deposit stocks, percentages; y-axis: share of observations, percentages)

a) Retail deposit flows

b) NFC deposit flows





Sources: Supervisory data and authors' calculations.
Notes: The chart plots the distribution of month-on-month changes in deposit stocks for retail customers (panel a) and NFCs (panel b) for 110 banking union SIs over the whole sample period. Observations are cut at the 96th percentile (2% cut on both tails) to allow readability of the plots.

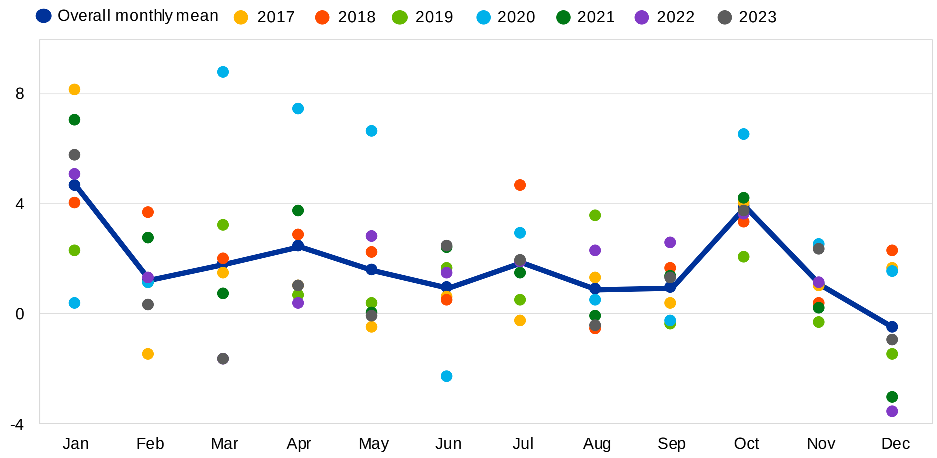
Deposit flows appear to be subject to a moderate degree of seasonality. Higher fluctuations of deposit flows around the monthly average can be observed for the Christmas and New Year period, potentially caused by elevated purchase behaviour, but remain within a similar range for the rest of the year (**Chart 2**). The onset of the COVID-19 pandemic can be considered an outlier, given the associated dash for cash by retail depositors, in particular in the period from March to May 2020.[17]

[17] Occasional large jumps in the data may not necessarily indicate sudden deposit withdrawals and could also be the result of base effects or statistical breaks. Depending on the size of the bank concerned, we may observe large fluctuations that are not necessarily driven by corresponding changes in depositor behaviour. The data cleaning process described in Section 3.2 aims to improve data quality by, among other things, taking mergers and acquisitions into account, but the possibility of intermittent statistical outliers remaining in the sample cannot ultimately be ruled out. For this reason, a conservative truncation of the data at the 1% tail is performed.

Chart 2

Total deposits exhibit moderate seasonality around the turn of the year

(month-on-month change in deposit stocks, percentages)



Sources: Supervisory data and authors' calculations.
Notes: Mean flows by period. Observations for years that are not fully in the dataset (2016 and 2024) are excluded for consistency. Observations are cut at the 99th percentile (0.5% cut on both tails) for the average computation owing to implausible flow values for some banks.

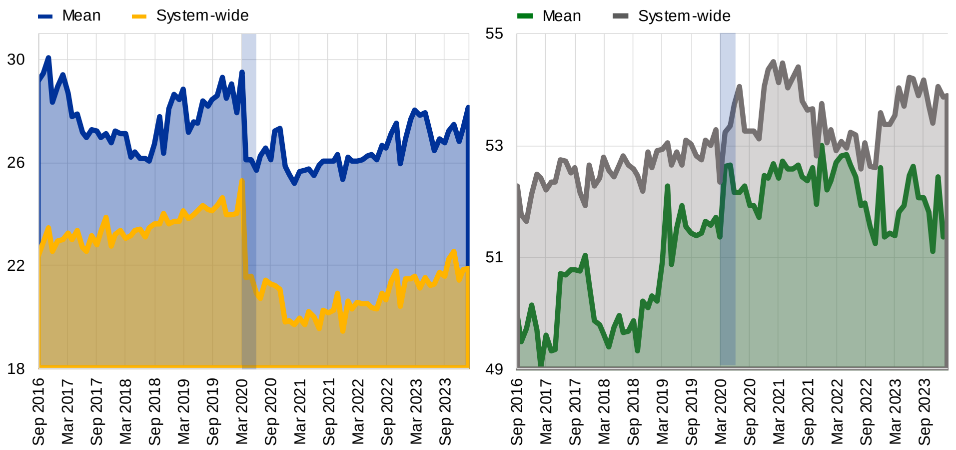
Since 2016 a few structural trends in deposit flows have been observed. Overall, the system-wide reliance on insured deposits (as a share of total deposits) has slowly but steadily increased since 2016, fluctuating around 52% more recently (grey line in **Chart 3**, panel b). One possible explanation is that increased uncertainty among market participants since the onset of the pandemic in 2020 may have resulted in higher precautionary holdings of safe deposits ("flight to safety" or "dash for cash"). However, the substantial amount of fiscal spending may also have shown up more in insured deposits. Thus, it remains unclear whether this structural increase in insured deposits reflects increased demand for the safest deposit class or is an effect of fiscal spending.

Chart 3

The NFC deposit share dropped during the pandemic, while reliance on insured deposits has slowly increased since 2018

(percentages)

a) Share of NFC deposits in total NFC and retail deposits
b) Share of insured deposits in total deposits



Sources: Supervisory data and authors' calculations.
Notes: Mean values are ratios first computed at bank level and then averaged (simple mean) across all banks. System-wide values are computed by summing all values across all SIs in the sample. The denominators in panels a) and b) differ because panel a) focuses on the share of NFC deposits in NFC and retail deposits, while panel b) looks at the share of insured deposits in total insured and uninsured deposits. The vertical blue shaded area marks the onset of the pandemic (March, April and May 2020).

In addition, the share of NFC deposits in total NFC and retail deposits dropped during the pandemic and has not yet returned to pre-pandemic levels.[18] As can be seen from **Chart 3**, the system-wide share of NFC deposits (yellow line in panel a) dropped from around one quarter before the outbreak of the pandemic in March 2020 to around one fifth two years later and has recovered only slowly since then. The considerable drop in NFC deposits related to a significant but short-lived decline in business activity, a finding also confirmed by the analysis of the corresponding outflow rates (see **Chart 4** and Section 5.3).

4.2 The behaviour of deposit flows during the pandemic

In terms of aggregate value, total deposits in the banking union increased steadily between the end of the third quarter of 2016 and the third quarter of 2022, in particular during the recessionary phase of the pandemic.[19] The observed trends in deposit flows suggest that the pandemic was the most significant event for deposits at SIs since 2016 (**Chart 4**). On aggregate, only a few banks saw net retail deposit outflows in the months after March 2020 (not shown in the chart). In

[18] For the purposes of the LCR supervisory reporting templates, retail deposits are defined as "deposits placed with a bank by a natural person" (Basel LCR40.5). Unsecured wholesale funding provided by small business customers is included within the retail deposits category in the LCR reporting templates provided that "the total aggregated funding raised from one small business customer is less than €1 million" (Basel LCR40.23). Under the Basel LCR, retail deposits and small business customer deposits are assumed to share the same or similar liquidity risk characteristics.

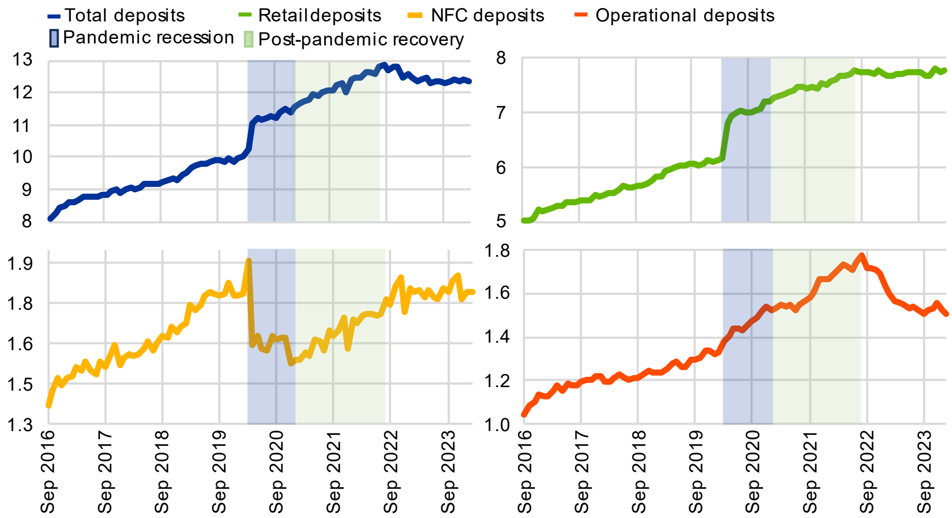
[19] The split is based not only on euro area GDP, which contracted in the first and second quarters of 2020 and expanded again as of the third quarter of 2021, but also on other indicators of economic and financial activity. See De Santis and Stoevsky (2023).

the recessionary phase of the pandemic, the uncertainty and elevated risk sentiment may have contributed to precautionary current account holdings, in particular for total retail deposits in the first half of 2020. During the various lockdowns people saved more as there were less opportunities to spend and fiscal stimuli supported wages for workers in distressed industries. In terms of magnitude, the increase in aggregate retail deposits was, at around €1 trillion, much larger than the increase for the other two classes (NFC and operational deposits).

Chart 4

Deposit stocks across banking union SIs varied significantly during the pandemic

(EUR billions)



Sources: Supervisory data and authors' calculations.
Notes: Total deposit stocks for 110 banking union SIs by month and category. The blue shaded area indicates the pandemic recession (from Q2 2020 to Q1 2021). The green shaded area indicates the post-pandemic economic recovery (from Q1 2021 to Q2 2022).

During the post-pandemic economic recovery, spending picked up again and depositors switched to more digital means of payment for consumer goods. The pandemic also triggered a digitalisation shock for countries traditionally more reliant on cash (like Germany). Throughout the pandemic, depositors increasingly switched to making payments digitally for consumer goods, rather than using cash, which stemmed partly from habits formed during the various lockdowns.[20] The growth rate of retail deposits flattened out from the first quarter of 2021 onwards as economic activity resumed and expansionary policies were slowly phased out (**Chart 4**).

Following the pandemic and as interest rates began to rise, depositors started shifting from low-remuneration deposits to alternative investment opportunities. Since the second half of 2022, a flat trend in retail deposits may have incentivised shifts from overnight deposits and other low-remuneration deposits to higher-remunerated instruments, as well as to other NBFIs (e.g. asset management and insurance companies).[21]

[20] European Central Bank (2022), "Study on the payment attitudes of consumers in the euro area (SPACE) – 2022", December. See also Zamora-Pérez, Marini and Honkkila (2024).

[21] See Adalid et al. (2023).

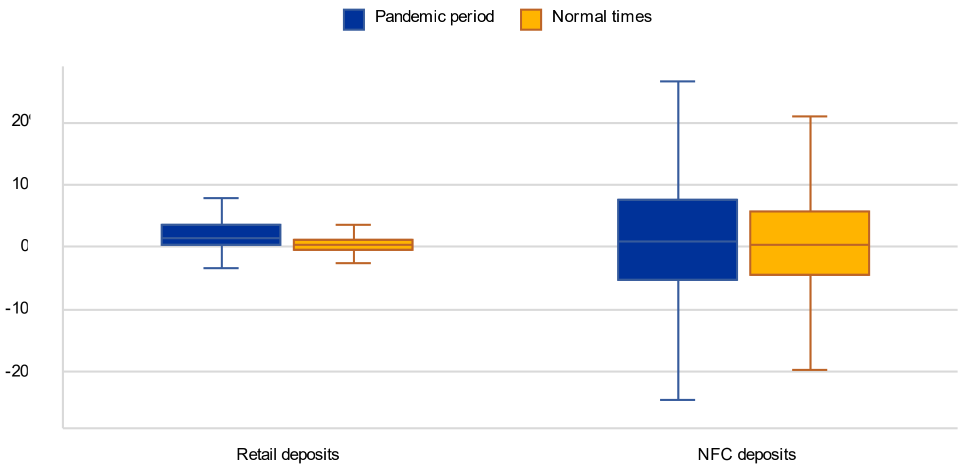
NFC deposits dropped sharply in the first quarter of 2020 and only started rising again with the onset of the post-pandemic financial and economic recovery one year later. In total, a €0.3 trillion drop in NFC deposits was observed between February and March 2020 (**Chart 4**). Since this is based on net flows, the main cause of the drop in NFC deposits is likely to have been business being put on hold, with the result that firms did not receive the usual inflows, but still had fixed outflows (wages, fixed costs). The observable outflow rates for NFC deposits during this period were above the assumed LCR run-off rates (see Section 5), but NFC deposits have stabilised since then and, more recently, have recovered to pre-pandemic levels.

Both NFC and retail deposit flows showed a higher variance during the pandemic in comparison with normal times. Chart 5 shows boxplot distributions of deposit inflows and outflows and compares retail and NFC deposits during the pandemic and in normal times. In aggregate terms, the pandemic period saw more inflows than outflows in total deposits. For retail deposits, the distribution of deposit flows was significantly more skewed during the pandemic than in normal times, with at least 75% of observations being net inflows during the onset of the pandemic. By comparison, NFC deposits remained more evenly dispersed across inflows and outflows during the pandemic, although net outflows reached more extreme values.

Chart 5

A majority of SIs had net inflows of retail deposits during the pandemic

(month-on-month change in deposit stocks, percentages)



Sources: Supervisory data and authors’ calculations.
Notes: The boxplots are built on the whole distribution of net deposit flows (no outliers are cut in the computation of the percentiles). Outliers beyond the whiskers are not shown for simplicity. The pandemic period includes March, April and May 2020. Normal times exclude all crisis periods.

5 Deposit flows in recent crisis episodes

5.1 The LCR standard and run-off assumptions for cash outflows

The Basel Committee on Banking Supervision (BCBS) established the LCR standard in 2013. The LCR is a forward-looking measure which requires banks to hold a sufficient stock of high-quality liquid assets that can be converted into cash easily and immediately to survive a period of significant liquidity stress lasting 30 calendar days (see **Chart 6**).[22] The EU implemented the LCR in line with the Basel Framework requirements and applies it to all credit institutions in the EU, at both consolidated and individual level. Following a three-year phase-in period, the minimum LCR requirement of 100% came into effect on 1 January 2018.[23]

Chart 6

LCR computation and assumptions regarding run-off factors for deposit outflows

$$\frac{Liquidity\ buffer}{Total\ net\ \mathbf{cash\ outflows}\ over\ next\ 30\ days} > 100\%$$

Run-off factor * outstanding amount (per item)
= **Expected cash outflows**

Type	Run-off factor
Retail deposits	
- Stable deposits	5%
- Less stable deposits	>=10%
Unsecured wholesale funding not covered by eligible DGS	
- Operational deposits	25%
- NFC deposits	40%
Unsecured wholesale funding covered by eligible DGS	
- Operational deposits	5%
- NFC deposits	20%

Sources: BCBS (2013) and author's elaborations.
Notes: The figure displays a stylised representation of the LCR computation and the assumed run-off rates for selected depositor types. Retail deposits also include deposits and other extensions of funds made by non-financial small business customers. Operational deposits relate to activities that lead to corporate customers needing to place deposits with a bank in order to facilitate their access to and ability to use payment and settlement systems and otherwise make payments where the customer has a substantive dependency on the bank and the deposit is required for such activities. "NFC deposits" also includes sovereigns, central banks, multilateral development banks and public sector entities (without operational relationships).

The liquidity buffer is required to cover at least the total net cash outflows over the next month. Total net cash outflows are defined as total expected cash outflows minus total expected cash inflows in the specified stress scenario for the subsequent 30 calendar days. To arrive at the expected cash outflow, the Basel standard uses "run-off factors", i.e. amounts by which deposits in a particular depositor class are expected to be drawn down within the next month.[24] The Basel III LCR standard, including the assumed run-off rates, have been calibrated on the basis of the experience with severe deposit withdrawals during the 2008 GFC.

22 See BCBS (2013).

23 See Wildmann et al. (2023).

24 See BCBS (2013).

The march 2023 banking turmoil raised the question of whether the LCR works as intended. In light of the unprecedented speed and scale of the March 2023 banking turmoil, the BCBS is currently examining whether specific features of the Basel Framework, including liquidity risk, performed as intended during the turmoil.[25] This is especially warranted in an environment in which higher and more rapid outflow rates may also be expected in future owing to the digitalisation of banking and the potential sentiment-amplifying impact of social media.

5.2 The March 2023 banking turmoil

The following sections focus on observed net deposit outflows, abstracting from net inflows. This conservative approach is useful to benchmark the observed net outflows against the LCR run-off factors defined by the LCR standard. As the recent experiences at SVB and Credit Suisse have triggered a debate among policymakers on the magnitude and speed of deposit outflows, this section starts with a review of how SIs were affected by the March 2023 turmoil. Next, we present evidence from other recent crisis episodes, such as the pandemic and the Russian invasion of Ukraine, and we find that these were more relevant for banking union SIs. Lastly, given that deposit outflows appear to be rare tail events, we investigate net outflows observed for banks which were assessed as failing or likely to fail (FOLTF) in the banking union during our sample period.

A net deposit outflow rate is defined as a negative month-on-month percentage change in the deposit stock of a bank. Net flows are made up of intra-month gross inflows and outflows. Gross deposit outflows would be the preferred measure for observing causal changes in depositor behaviour (e.g. relating to a bank's solvency or asset quality as well as more recent trends related to digitalisation or the impact of social media). However, as gross flows are not available in supervisory statistics, our empirical analysis uses negative month-on-month changes as a proxy for gross outflows.[26]

The March 2023 episode saw substantial deposit outflows from the affected banks in the United States and Switzerland. For instance, SVB lost 85% of its total (mostly uninsured) deposits over a two-day period. For First Republic Bank and Credit Suisse, total (mostly NFC) deposit outflows stood at 57% and 21% respectively over a 90-day period.[27]

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25 See BCBS (2023a).

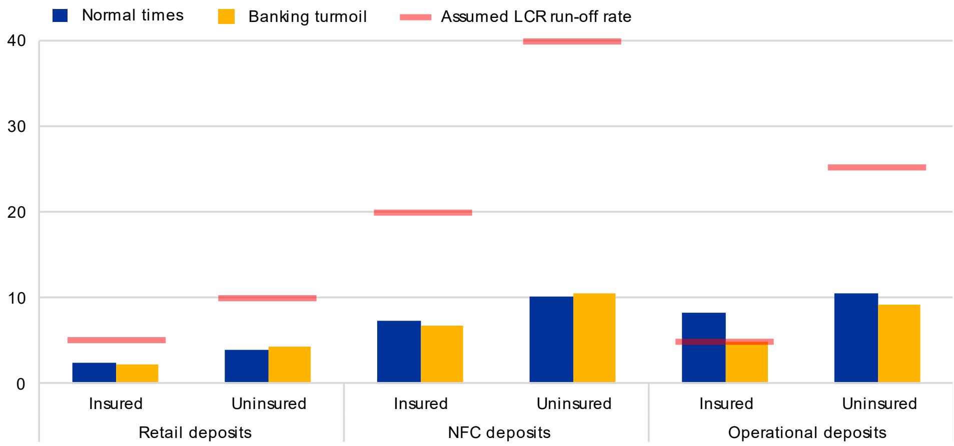
26 For instance, particularly high net outflow rates (e.g. higher than the assumed 5% for stable retail deposits) are likely to be a better proxy for gross deposit outflows when a bank experiences a stress episode, as in this case it is rather unlikely to experience significant deposit inflows. However, it should be kept in mind that this measure is not perfectly correlated with gross deposit outflows.

27 See BCBS (2023a).

Chart 7

The March 2023 banking turmoil was largely uneventful for SIs experiencing net outflows

(month-on-month change in deposit stocks, percentages)



Sources: Supervisory data and authors' calculations.
Notes: Bars represent averages for banking union SIs that experienced net outflows in the selected deposit class and period. Average values are computed by including only negative deposit flows (net outflows) and excluding four banks with implausible deposit flow behaviours. The banking turmoil period includes March, April and May 2023. "Normal times" exclude all crisis periods (i.e. the banking turmoil in March, April and May 2023; the onset of the pandemic in March, April and May 2020; and the onset of the Russian invasion of Ukraine in February, March and April 2022).

Overall, the March 2023 banking turmoil was largely uneventful for those SIs in the banking union that recorded net deposit outflows. Chart 7 compares the average deposit net outflow rates observed during the March 2023 turmoil with the average for normal times. Average net deposit outflows during the March 2023 turmoil were not significantly higher than in normal times for most deposit classes. For some categories (e.g. NFC insured and operational uninsured deposits), the observed average was even lower during the months following the March events than in normal times. Unlike in US banks affected by the turmoil, the behaviour of insured versus uninsured deposits by counterparty in banking union SIs in March 2023 was not observably different from normal times.

Most importantly, during both crisis and non-crisis periods the observed average outflow rate was substantially below the assumed LCR run-off rate for most depositor categories (the red lines in **Chart 7**). Given that the assumed LCR run-off rates were calibrated on the basis of experience gained during the 2008 GFC, it is not surprising that the average values for normal times remain far below the assumed rates. In the case of the March 2023 banking turmoil, one potential explanation is that the average LCR for SIs in the banking union has remained above 150% since the pandemic, which, coupled with solid bank fundamentals, helped to contain the fallout from the banking stress in the United States and Switzerland. Consequently, contagion fears remained short lived.

5.3 Other recent crisis episodes in the banking union

The assumed LCR run-off rates covered most net deposit outflows at SIs over the whole period between 2016 and 2023. As can be seen from **Chart 8**, the assumed LCR run-off rates covered more than 90% of observed deposit outflows across depositor classes and over time, with the exception of insured operational deposits, for which the coverage fluctuates at only around 60%. The coverage of this deposit class can be considered an outlier (see below for a detailed discussion). The expected (gross) outflow is computed by multiplying the outstanding amount of deposits per depositor category at the month-end by the respective assumed LCR run-off rate.[28] Gross deposit outflows are not available in supervisory data reported by banks. Therefore, to benchmark assumed outflows against real outflows, this analysis uses the percentage month-on-month change in the outstanding amount as a proxy for (non-observable) gross outflows. Such month-on-month change can be considered a net flow, determined by both inflows and outflows. By benchmarking only negative month-on-month percentage changes against the assumed LCR run-off rates, this analysis aims to take a conservative approach.[29]

Insured retail and insured operational deposits are subject to the same assumed run-off rate, but the coverage for the more volatile operational deposits is significantly lower. For example, during the pandemic the average outflow rate for insured operational deposits was three times as large as its assumed run-off rate. A potential reason could be related to technical classification issues, for example if certain deposits are not properly defined to fall in the operational deposits category. For our sample of SIs, the assumed LCR run-off rates seem particularly conservative for uninsured deposits according to the metrics used in this study (see also **Chart 9**).

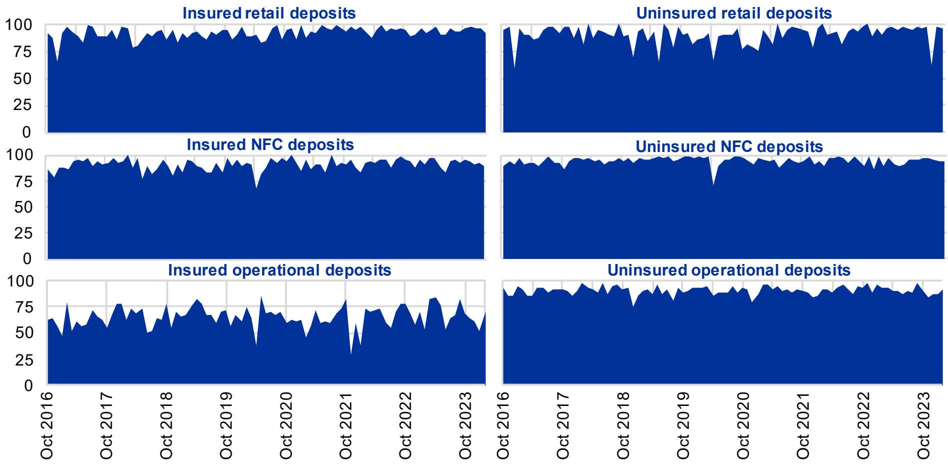
[28] See LCR40 – Cash inflows and outflows.

[29] Benchmarking only negative month-on-month percentage changes against the assumed LCR run-off rates may result in a conservative assessment as, in a given month, a bank may have withstood a gross deposit outflow much greater than recorded on a net basis, if the bank also received some inflows in the same month. As such, the liquidity needs necessary to withstand a net deposit outflow may understate the real liquidity needs necessary to withstand the gross underlying deposit outflow.

Chart 8

The calibration of assumed LCR run-off rates appears particularly conservative for uninsured deposits

(net outflows below the respective LCR assumption, percentages)



Sources: Supervisory data and authors' calculations.
Notes: The chart plots the share of net outflow observations (negative month-on-month relative changes) in our sample falling below the assumed LCR run-off rate for each deposit class. For aggregate numbers, see **Table A.2**. A value of 100% indicates that the assumed LCR run-off rate achieves full coverage, i.e. no observed outflow breaching (having a value greater than) the respective run-off rate. Values below 100% indicate the presence of outflows breaching the assumed LCR run-off rate in a given month. For example, in December 2016 around 51% of net outflows for insured operational deposits were below 5% (the assumed LCR run-off rate for such deposits).

For banks directly supervised by the ECB, other stress episodes since 2016 have been more relevant in terms of net deposit outflows than the March 2023 turmoil. Table 2 displays average net outflow rates by depositor class across the various crisis episodes. It compares these with the Basel standard by computing the distance (in percentages) from the respective assumed LCR run-off rate. Overall, the observed rates at which deposits are withdrawn fall well within the LCR calibration for most of the categories. This finding gives sufficient comfort that the calibration of the Basel III liquidity standard is still prudent. To ensure robustness, the same analysis was also conducted for the unbalanced sample and gave comparable results. Still, bearing in mind that the sample period under review neither includes a system-wide liquidity crisis, nor a major banking crisis in the banking union, it should be noted that the LCR run-off rates as well as the potential impact of social media and digitalisation may have not yet been fully tested.

Table 2

For banking union SIs, other crisis episodes were more relevant than the March 2023 turmoil

	Insured			Uninsured		
	Stable retail deposits	NFC deposits	Operational deposits	Less stable retail deposits	NFC deposits	Operational deposits
Assumed LCR run-off rate (%)	5	20	5	10	40	25
Pandemic average (%)	4.0	20.0	14.9	4.1	21.2	11.6
Distance from LCR (pp)	1.0	0.0	-9.9	5.9	18.8	13.4
Distance from LCR (%)	20.8	0.0	-198.2	59.1	47.0	53.7
Russian invasion average (%)	2.8	5.3	3.4	4.7	10.8	9.5
Distance from LCR (pp)	2.2	14.7	1.6	5.3	29.2	16.5
Distance from LCR (%)	44.4	73.6	32.1	53.3	72.9	62.0
March 2023 average (%)	2.1	6.7	4.8	4.2	10.4	9.3
Distance from LCR (pp)	2.9	13.3	0.2	5.8	29.6	15.7
Distance from LCR (%)	57.7	66.6	3.5	57.8	73.9	62.9

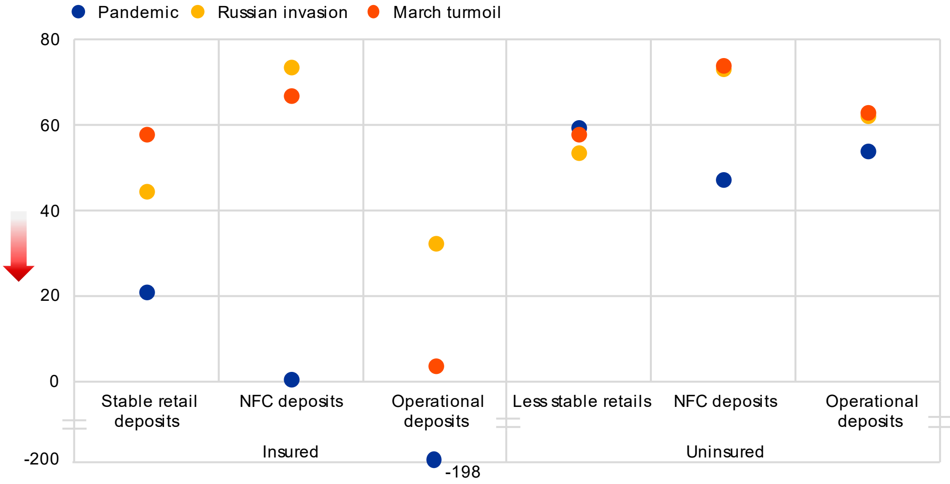
Sources: Supervisory data and authors' calculations.
Notes: The table reports (i) the assumed LCR run-off rates per deposit class; (ii) the average outflow for banking union SIs that experienced net outflows in the respective deposit class and period in percentages; and (iii) the distance from the assumed LCR run-off rate for the deposit class in both percentage points (pp) and percentages (%). The distance from the assumed LCR run-off rates in pp is calculated as the run-off rate minus the average value for the crisis period and deposit class. The absolute distance is divided by the assumed LCR run-off rate to compute the percentage distance. Average values only include observations for SIs that experienced net outflows and exclude four banks with implausible deposit flow behaviours. Each crisis period covers three months (the onset month and the following two months). The outflow rates and run-off rates are expressed as percentages (rounded to one decimal place); the distance from the run-off rates in percentage points is rounded to one decimal place; the percentage distance is also rounded to one decimal place.

The relative distance to the assumed LCR rate may shed some light on depositor behaviour around crisis episodes for different categories of deposits. Chart 9 provides a visualisation of the data in **Table 2**. Each dot marks the relative distance (in percentages) between the observed outflow rate (averaged for each crisis episode and for each depositor class across banks experiencing net outflows) and the respective LCR run-off rate. A lower relative distance indicates an observed outflow rate closer to the assumed LCR rate (and vice versa). For instance, banks experiencing net outflows of insured NFC deposits during the pandemic (blue dots) reported an average outflow rate of 20%, which coincides with the assumed LCR run-off rate. Overall, most other crisis periods and depositor classes remained far away from the assumed benchmarks (with distances of around 40% or higher). For uninsured deposits, banks experienced net deposit outflows that remained, on average, between 50% and 75% below the assumed LCR run-off rates. A few outliers observed across crisis periods and depositor categories are discussed below.

Chart 9

Insured deposit outflows were closer to assumed LCR run-off rates during the COVID-19 pandemic

(distance from the assumed LCR run-off rate, percentages)



Sources: Supervisory data and authors' calculations.
Notes: The chart plots the distance from assumed LCR run-off rates by deposit class in percentages. Average values only include observations for SIs that experienced net outflows and exclude four banks with implausible deposit flow behaviours. Each crisis period covers three months (the onset month and the following two months). A robustness check against different lengths of the "crisis episode" does not alter our findings. Higher values indicate an outflow rate lower than the LCR assumption; lower values indicate an outflow rate closer to the LCR assumption (i.e. more extreme).

The pandemic period saw higher outflows relative to the LCR assumptions than either the Russian invasion of Ukraine or the March 2023 turmoil. Across almost all depositor classes, the distance between the observed outflow rates and the assumed LCR rate was lower during the pandemic (blue dots in **Chart 9**) than during the other crises (except for less stable uninsured retail deposits). Insured operational deposits were an extreme case: the observed outflow rate during the pandemic was much higher than the assumed rate. As mentioned above, based on anecdotal supervisory experience, this could be related to technical classification issues of specific types of operational deposits.

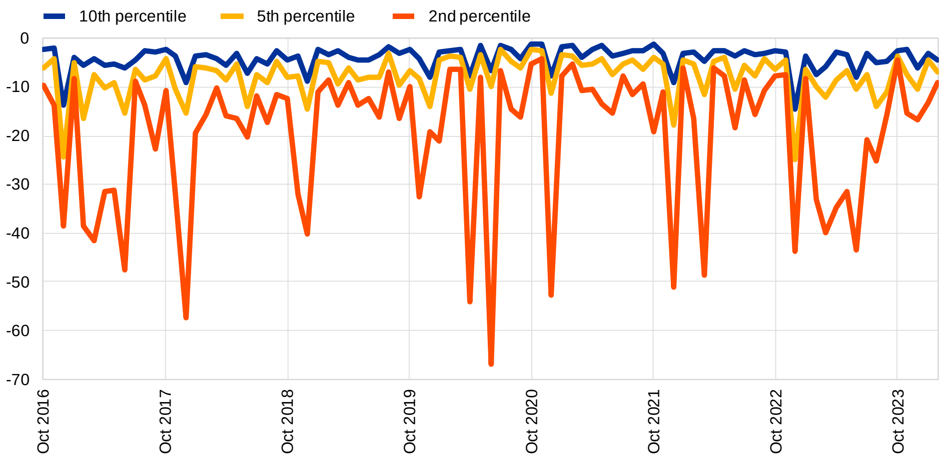
The LCR calibration for uninsured deposits was particularly conservative, on average, across crises and deposit categories. By comparison, the outflow rates for insured deposits across all classes (retail, NFC and operational) appear to have been relatively closer to the assumed run-off rates during the pandemic period, when compared to the observed run-off rates for uninsured deposits. In absolute terms, however, the observed run-off rate for both stable and less stable retail deposits was 4% during the pandemic.

Another way of examining the severity of deposit outflows is to look at the tail of the distribution. Looking at the tail of the distribution also serves as a robustness check, as average outflows may obscure stressed outflows in individual banks. However, there is no single approach that is reliable enough to identify severe deposit outflows which are not classified as a bank run. Since only a small number of bank runs have been observed in the banking union since 2016, a range of different measures are considered to portray and study the combined idiosyncratic and market-wide stress scenario envisaged in the LCR (as described above).

Chart 10

The more extreme behaviour in deposit outflows happens at the tails

(month-on-month change in deposit stocks, percentages)



Sources: Supervisory data and authors' calculations.
Notes: Observations have been truncated at the 99th percentile, implementing a 0.5% trim on both distribution tails, to remove implausible outflow values. The three percentiles are computed for each period. Deposits plotted are net outflows of total deposits.

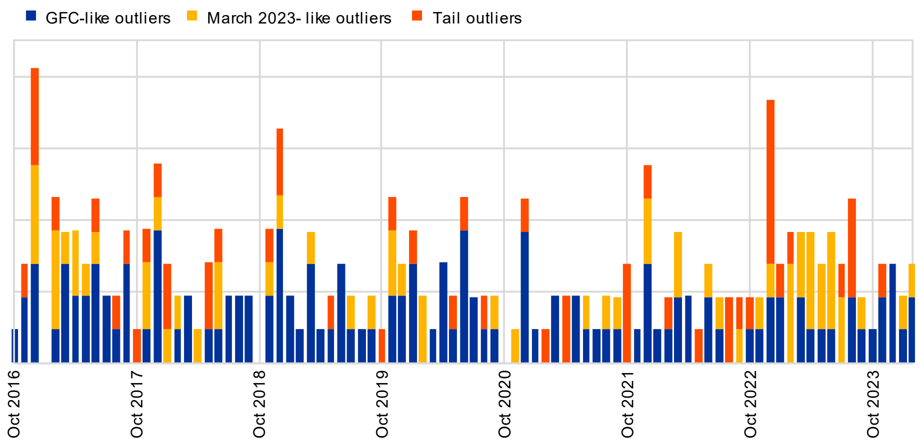
It turns out that extreme deposit outflows are rare tail events. Considering net deposit outflows only (i.e. again abstracting from net inflows), **Chart 10** shows the 2nd, 5th, and 10th percentiles of the distribution of total deposits over time. We observe that the 10th percentile of net outflows corresponds to a monthly outflow rate below 10% between 2017 and 2023. More severe net outflows were identified in the 2nd percentile of the distribution, particularly during the pandemic, with monthly net outflows up to 70%. From a policy perspective, based on the available evidence, it is reassuring to observe that the vast majority of outflows would have been covered by the assumed LCR run-off rates (see **Chart 8**). It should again be noted that the LCR was not designed to cover all tail events involving deposit outflows, such as bank runs, but to ensure that banks can withstand a certain liquidity stress scenario that entails a combined idiosyncratic and market-wide shock.[30]

Reassuringly, the number of severe crisis-like outflows in the banking union between 2016 and 2023 was very low. Chart 11 compares observed net outflows with extreme outflow events observed during the 2008 GFC and for Credit Suisse during the March 2023 turmoil. We observe that only a very small fraction of banks experienced severe crisis-like outflows during our sample period. Overall, around 1.3% of all net outflow observations were as high as those recorded during the GFC, while there were lower shares of March 2023-like outliers and tail outliers (not shown in the chart).

30 See Wildmann et al. (2023).

Chart 11
A marginal share of banks experienced substantial crisis-like outflows over the sample period

(share of banks experiencing an outflow greater than the benchmark, percentages)



Sources: Supervisory data and authors' calculations.
Notes: Yellow and blue bars plot the percentage of banks in the sample that, in each period, experienced an outflow of total deposits that was greater than the assumed 30-days outflow rate recorded in each benchmark event (see Rose (2015) for GFC, and BCBS (2023a) for Credit Suisse). Orange bars plot the percentage of banks in the sample that, in each period, experienced an outflow of total deposits that was greater than the value of the lowest 2.5 percentile in the distribution of total deposit flows (around 20%), defined by pooling together all observations (all banks in the sample and all periods). Across the whole sample period, we identify 241 observations with outflows higher than one of the three benchmarks applied.

In summary, an analysis of net deposit outflows for banking union SIs between 2016 and 2023 suggests that extreme net outflow episodes (i.e. exceeding the corresponding LCR run-off factors) were rare events. While the results need to be interpreted carefully owing to the use of net outflows as a proxy for deposit run-offs, it appears that the Basel LCR run-off assumptions broadly covered most of the stress episodes analysed. The observed outliers were mainly recorded during crisis episodes other than the March 2023 turmoil. Our findings suggest that there could be merit in strengthening the supervisory toolkit to address idiosyncratic liquidity risk factors, for example by employing more relevant and higher-frequency early warning indicators (particularly in times of liquidity stress).

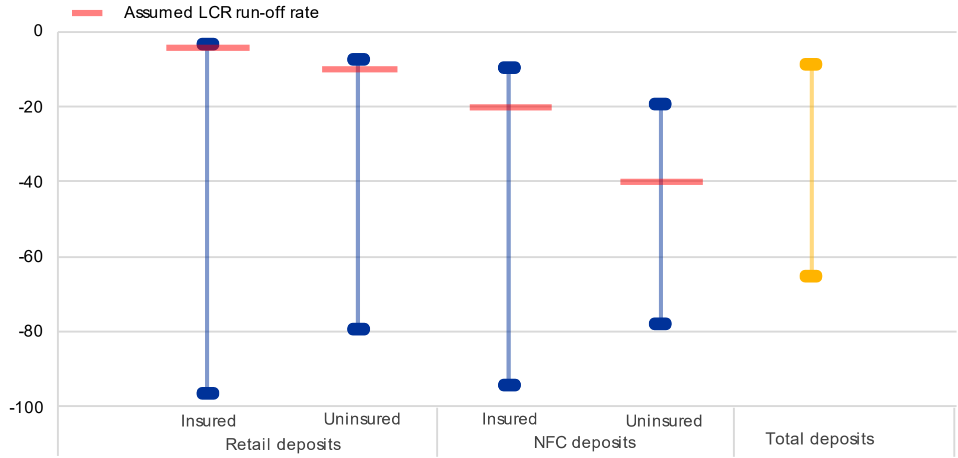
5.4 FOLTF banks and other idiosyncratic outliers

To examine run-off rates during bank failures, we use the last regulatory reporting data vintage(s) on deposit flows prior to a bank being assessed as FOLTF. While there has not been a broad-based banking crisis in the banking union during our sample period, a few banks have been assessed as FOLTF by supervisors owing to idiosyncratic factors, including sanctions related to Russia's war of aggression against Ukraine. The failed banks identified in this sub-sample are Banco Popular (FOLTF on 7 June 2017), ABLV (FOLTF on 24 February 2018), Sberbank (FOLTF on 27 February 2022), and Amsterdam Trade Bank (ATB), a subsidiary of Russia's Alfa Bank (assessed bankrupt on 22 April 2022). As intra-month data are not available, we rely on the end-of-month net flow when the bank was still operational. This data limitation is, for example, relevant for banks that failed in a matter of days (e.g. ABLV, Sberbank and ATB), as the monthly outflow rates may understate the true scale of the outflows. In addition, since this analysis relies on net flow data, a net outflow at the end of the month may further understate actual gross outflows.

Banks in the banking union assessed as FOLTF or bankrupt displayed net outflow rates comparable to those seen among US and Swiss banks during the March 2023 turmoil. Deposit outflows for banks assessed as FOLTF between 2016 and 2023 varied substantially. Outflow rates ranged from 3.7% to 97.1% for stable retail deposits, from 7.4% to 79.7% for less stable retail deposits, from 0.6% to 47.8% for operational deposits and from 19.5% to 78.3% for uninsured NFC deposits (**Chart 12**). The upper part of these ranges is comparable to the run-off rates during bank failures in other jurisdictions. For instance, SVB lost 85% of its total (mostly uninsured) deposits over a two-day period.[31] For First Republic Bank and Credit Suisse, total (mostly NFC) deposit outflows stood at 57% and 21% respectively over a 90-day period.[32] We conclude that, in the banking union, deposit outflows above LCR run-off factors are largely related to bank-specific tail events.

Chart 12

Deposit outflows for FOLTF banks display high variability



Sources: Supervisory data, LCR run-off factors and authors' calculations.
Notes: The sample includes Banco Popular (FOLTF on 7 June 2017), ABLV (FOLTF on 24 February 2018), Sberbank (FOLTF on 27 February 2022), and ATB, a subsidiary of Russia's Alfa-Bank (assessed bankrupt on 22 April 2022). For each deposit type, the chart shows the lowest and highest net outflows recorded by any of the four banks. Since intra-month data are not available, the ranges shown refer to the minimum and maximum end-of-month net outflow when each bank was still operational. Therefore, it cannot be ruled out that the outflow rates shown may somewhat understate the true scale of the outflow.

While liquidity issues can be identified as a common theme in FOLTF assessments in the banking union, the high variability of deposit outflows for FOLTF banks may also point to factors other than illiquidity as underlying causes of a bank's failure. The wide range of outflow rates for FOLTF banks in the banking union indicates that some banks failed despite having outflow rates below the LCR outflow assumptions. While analysing the reasons for these failures is beyond the scope of this paper, a review of the corresponding supervisory assessments on FOLTF status confirm that bank-specific liquidity issues were not

[31] See also Acharya et al. (2023).

[32] See BCBS (2023a).

always a necessary or sufficient cause of FOLTF status. It should be noted, however, that the absence of intra-month data somewhat limits the analysis.

5.5 Effects of social media and the digitalisation of banking

As emphasised throughout this paper, the effects of the digitalisation of banking and social media on the speed of deposit outflows are hard to isolate. There are several reasons for this. First, the concept of digitalisation is broad and multifaceted, and the digitalisation of finance, including online banking, is not a recent phenomenon with a clear-cut event date (Solé, 2024). Second, there is a lack of relevant indicators on the level of digitalisation of a country, of deposit account holders, and of individual financial institutions, and authors regularly revert to proxy variables to estimate the level of digitalisation in banking.[33] Third, as the relation between banking digitalisation and deposit outflows acts via numerous channels, finding appropriate control variables to account for these factors is often challenging or unattainable.

This section nevertheless aims to contribute to the existing literature on the digitalisation of banking and deposit outflows, employing new data sources to investigate the impact, if any, of digitalisation and social media on the speed of deposit outflows. To identify this relationship, we complement the LCR deposit data used in previous sections with additional supervisory reporting on the number of "digital customers" obtained during the 2023 Supervisory Review and Evaluation Process (SREP). These data allow us to calculate the ratio of digital customers to total customers in 2023 for 75 of the 110 banks in the sample by dividing the number of digital customers (customers who used the bank's digital channels to perform at least one action or transaction within the last 12 months) by the total number of customers who performed at least one action or transaction within the last 12 months.[34] We then split the 75 banks into two groups: nine "highly digitalised" banks (where 85% or more of customers are "digital customers") and 64 "less digitalised" banks (where less than 85% of customers are "digital").[35]

As can be observed in Chart 13 , the outflows of highly digitalised banks follow a wider distribution, with more observations in the tails, than the outflows of less digitalised banks. We observe this both when looking at the full data sample (panel a) and when looking at the monthly outflows in 2023 only (panel b). These results provide an indication that banks with a highly digitalised customer base may be exposed to speedier outflows and inflows than less digitalised banks. If we assume that banks reporting a highly digitalised customer base in 2023 also had a (relatively) high number of digital customers over the full sample period (2016-

33 See, for instance, Koont et al. (2023) and Xiang and Jiang (2023).

34 Digital channels exclude ATMs, while digital actions also include logging-in. Total customers also include customers that have a current loan or guarantee.

35 The nine banks in the sub-sample have diverse individual business models, including investment banking, corporate wholesale lending, consumer credit lending, custodian services, retail lending and small market lending.

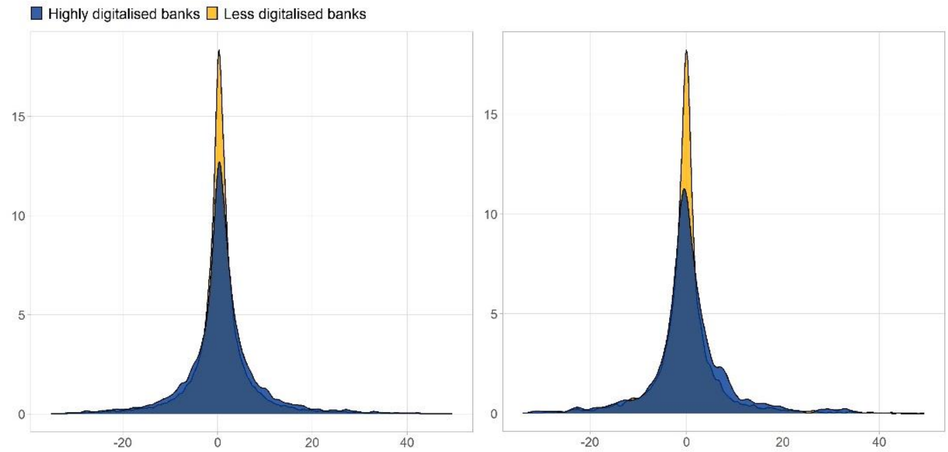
2024), we can compare the different time series of deposit outflows.[36] Similarly, when looking at the 5th and 10th percentiles of the distribution of outflows over the sample period (**Chart 14**), we observe that outflows appear more extreme in the tail for banks with a more digitalised customer base. In particular, withdrawals are non-negligible for the 10th percentile for highly digitalised banks during the pandemic.

Chart 13

Deposit outflows of highly digitalised banks appear to be more volatile

(x-axis: month-on-month change in deposit stocks, percentages; y-axis: share of observations, percentages)

a) Full sample period, 2016-2024 **b) 2023 only**



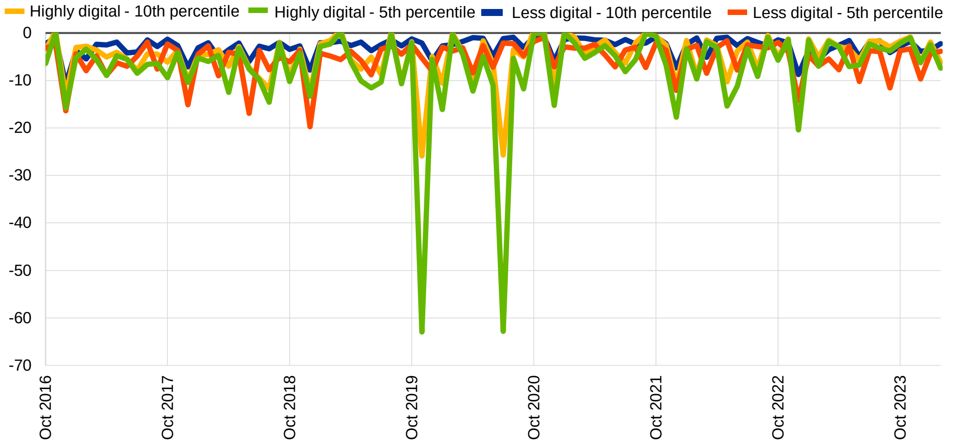
Sources: Supervisory data, SREP additional supervisory reporting and authors' calculations.
Notes: The chart plots the distribution of month-on-month changes in total deposits for the full sample period 2016-2024 (panel a) and for the year 2023 only (panel b) for 110 banking union SIs. Observations have been truncated at the 96th percentile, implementing a 2% trim on both distribution tails, to enhance readability.

[36] This can only be an assumption as we do not have data on the levels of customer digitalisation across the full sample period. It is possible that banks deemed highly digitalised in 2023 were less digitalised in the rest of the sample period.

Chart 14

More extreme deposit outflows in the tails are observable for highly digitalised banks

(month-on-month change in deposit stocks, percentages)



Sources: Supervisory data, SREP additional supervisory reporting and authors' calculations.
Notes: The chart shows net outflows of total deposits, at the tails, for two groups of banks (highly digitalised banks, yellow and green, and less digitalised banks, blue and orange). Observations are cut at the 99th percentile (0.5% cut on both tails), to remove implausible outflow values. The percentiles are computed for each period.

Highly digitalised banks also experience, on average, stronger outflows during crisis periods (Table 3). For retail deposits, we observe stronger average outflows during all crisis periods, and for operational deposits stronger average outflows are observed for all crisis periods except the pandemic. The evidence for NFC deposits is more mixed. The distinction between highly digital and less digital banks is weakest during "normal" times (especially for retail and NFC deposits), which may indicate that the level of digitalisation is most relevant during crisis episodes. These findings are robust to using different thresholds for the definition of a highly digitalised bank (i.e. using an 80%, 90% or 95% share of digital customers as the threshold). Our findings may provide an indication that banks with a larger digital customer base may be subject to deposits moving around at a faster pace, in particular in the tails, than banks with more customers that rely on traditional banking. Many factors, however, could be at play and the quality of the digitalisation data could be improved. In addition, it should be noted that customers with a more digital profile may in any case be more inclined to move deposits as they may, for example, be better placed to keep track of bank-related news and information.

Table 3

During crisis periods, digitalised banks experience stronger outflows on average

	Highly digitalised banks			Less digitalised banks		
	Retail deposits	NFC deposits	Operational deposits	Retail deposits	NFC deposits	Operational deposits
"Normal" times average	**2.2**	**8.8**	**9.5**	1.2	8.7	7.2
Pandemic average	**7.3**	**19.9**	3.8	1.8	14.9	**9.7**
Russian invasion of Ukraine average	**4.3**	7.0	**8.1**	0.8	**9.3**	6.1
March 2023 average	**2.0**	5.9	**10.1**	1.0	**8.8**	7.4

Sources: Supervisory data, SREP additional supervisory reporting and authors' calculations.
Notes: The table shows average percentage outflows for SIs that experienced net outflows in the selected deposit class and period. Averages exclude four banks with implausible deposit flow behaviours. Each crisis period covers three months (the onset month and the following two months). Bold highlighting indicates whether the respective figure is higher for less digitalised banks or for highly digitalised banks.

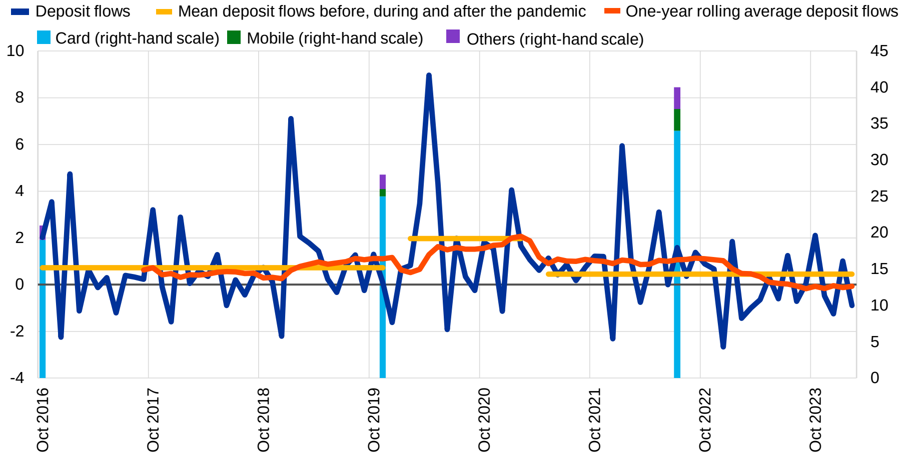
To further complement the analysis of the impact of digitalisation on deposit outflows, we also investigate the effect of a general increase in the level of digitalisation of consumer payment methods on deposit outflows for the full sample of banks. For this purpose, we use data from the ECB's Study on the use of cash by households (SUCH) and the ECB's Study on the payment attitudes of consumers in the euro area (SPACE) as a proxy for the level of digitalisation of the euro area retail banking sector.[37] Observations for 2016 (SUCH), 2019 and 2022 (both SPACE) on the payment methods used by euro area citizens distinguish between "card", "mobile", "cash" and "other" payment methods. **Chart 15** shows that the use of digital means of payments ("card", "mobile" and "other") by euro area consumers has been increasing since 2016, especially since the pandemic.[38] However, looking at deposit outflows across the full sample of banks – i.e. without splitting the sample into highly and less digitalised banks – we do not explicitly observe an increase in the speed of deposit flows in line with the increased levels of digitalisation. If anything, average outflows seem slightly less volatile at the time of the 2022 SPACE data collection, although it is difficult to draw conclusions. Furthermore, the increase in the use of digital payment methods does not necessarily imply increased overall digitalisation of the banking sector, nor does it necessarily provide information on the methods used for moving deposits.

37 See Esselink and Hernández (2017) for SUCH, ECB (2022) for SPACE.

38 See also Meyer and Teppa (2024).

Chart 15
The effects of social media and digitalisation are hard to isolate

(left-hand scale: month-on-month change in deposit stocks, percentages; right-hand scale: share of consumers using various digital payment methods, percentages)



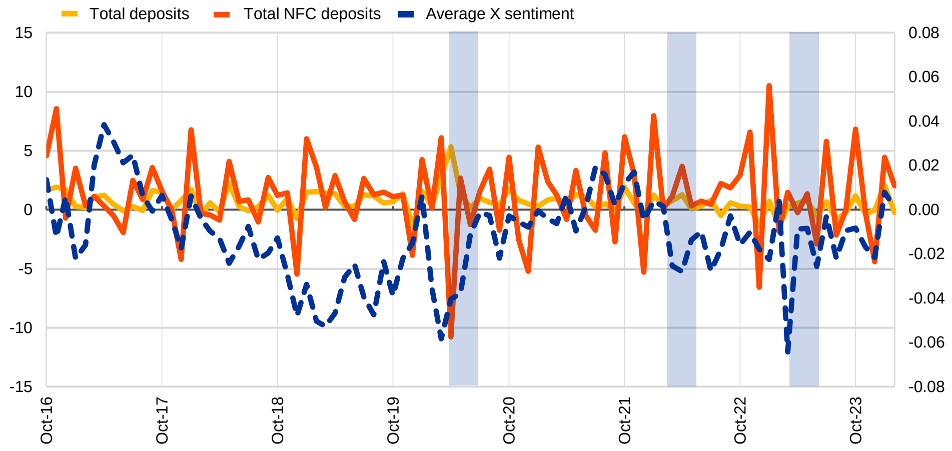
Sources: Supervisory data, SPACE and SUCH datasets and authors' calculations.
Notes: The chart plots the use of non-cash payment methods as indicated in the ECB's SUCH (2016) and SPACE (2019 and 2022) surveys, average monthly deposit flows (blue line), average total deposits during three periods (pre-pandemic, pandemic, and post-pandemic; yellow line), and one-year moving averages of total deposits (red line). The vertical bars indicate the use of card (blue), mobile (green) or other (purple) digital payment methods.

Besides reviving debates on digitalisation and deposit outflows, several authors have also reflected on the role social media may directly play in increasing the speed of deposit outflows (Cookson et al., 2023). In this context, concerns have been raised that the very existence of negative sentiment on social media in relation to a specific financial institution or the financial sector as a whole, irrespective of underlying fundamentals, may cause increased deposit outflows. To understand the impact of social media on our sample, we therefore obtain daily average X (formerly Twitter) sentiment data from Bloomberg and compare it with deposit outflows for a sub-sample of 27 banks for which sufficient Bloomberg data are available. When aggregating the sentiment data on a monthly basis and comparing the data with deposit flows, we do not observe a strong correlation between outflows and significant negative or positive sentiment on X (**Chart 16**). The only notable exception is the significant increase in negative sentiment during the pandemic, which also saw a notable increase in the outflow of non-operational deposits. The significant increase in negative sentiment during the March 2023 turmoil was not accompanied by increased outflows. Results are robust to replicating the analysis using the Bloomberg X publication count and the Bloomberg daily news sentiment indicator, although the comparison of monthly LCR data with aggregated daily sentiment analysis may diminish the robustness of the findings.

Chart 16

Weak aggregate correlation between deposit outflows and negative X sentiment

(left-hand scale: month-on-month change in deposit stocks, percentages; right-hand scale: X sentiment indicator)



Sources: Supervisory data, Bloomberg X Sentiment Indicator and authors' calculations.
Notes: The chart plots average X sentiment (broken blue line) calculated using the Bloomberg X Sentiment Indicator (which ranges from -1 for most negative sentiment to +1 for most positive sentiment) for the sub-sample of 27 banks for which sentiment data are available. The chart also plots total deposits for the 27 banks (yellow line) and non-operational deposits for the same sub-sample (red line). The light blue shaded areas indicate crisis episodes (pandemic; Russia's invasion of Ukraine; March 2023 turmoil).

Our analyses are also subject to some conceptual limitations. First, our sample period neither includes a system-wide liquidity crisis, nor a major banking crisis in the banking union. The 2023 banking turmoil was restricted to specific US and Swiss banks. Even during the Covid-19 period, the most significant shock to the European economy in recent years, the wide-scale public support and additional measures taken by the ECB and SSM helped to contain the fallout of the restrictions. As such, the LCR run-off rates as well as the potential impact of social media and digitalisation may have not yet been fully tested in the banking union. The European banking system has been exposed to significant stress periods in the past, including severe bank runs. These include, for instance, the GFC of 2008-2009 and the Sovereign Debt Crisis of 2012. It was only in response to the GFC that the BCBS established the LCR standard in 2013 which became applicable in the European Union in 2015. In that sense, our benchmarking exercise that assesses the fitness of the LCR covers the relevant sample period. Second, gross deposit outflows would be the preferred measure to identify the relationship between severe deposit outflows and potential new risk drivers, such as the impact of social media. Gross outflows would allow deposit withdrawals to be identified more precisely because they are not netted against gross inflows. However, information on gross flows is not available in supervisory statistics. As a second-best option, we assume that particularly high net outflow rates are likely to be a good proxy for large gross deposit outflows, particularly when a bank experiences a stress episode, as in such cases the bank is rather unlikely to experience significant deposit inflows. Third, higher-frequency data would prove particularly handy for the analysis of liquidity metrics, in particular data on deposit outflows, which happen at high speed and can be obscured in monthly numbers. Fourth, our balanced sample may be subject to survivorship bias, as it excludes bank failures which may well be correlated with deposit outflows. Banks assessed as FOLTF or declared bankrupt are analysed separately in Sections 5.3 and 5.4. Re-running our analyses for an unbalanced sample yields similar results to those presented in this paper. We also checked the observable mergers and acquisitions in our sample, and most of them are due to reasons other than failure.

6 Conclusion

This paper evaluates the performance of the assumed Basel III LCR run-off rates for cash outflows against the empirical monthly deposit outflows for a sample of banks directly supervised by the ECB. We focus on those deposit classes that are relevant for the Basel III liquidity standards. Overall, our results show that, with the exception of one deposit class, more than 90% of all recorded net outflow rates between September 2016 and February 2024 were below the respective LCR assumptions. The findings indicate that the March 2023 banking turmoil was largely uneventful for SIs, while other crisis episodes have been more relevant in terms of deposit flows. In particular, the period around the pandemic was characterised by two opposite tendencies: while total retail deposits grew substantially amid the “dash for cash” around the onset of the pandemic, observable net outflow rates for NFC deposits were in some instances considerably higher than the assumed LCR run-off rates. Whereas the deposits affected during the March 2023 US and Swiss bank failures were mostly uninsured deposits, this paper finds that, during the pandemic, the outflow rates for insured deposits (across retail, NFC and operational deposits) were relatively closer to the respective assumed LCR run-off rates than those for the corresponding uninsured deposit classes. Finally, for some banks subject to ECB banking supervision that were assessed as FOLTF during our sample period, observed outflows were sometimes considerably higher than foreseen by the LCR run-off factors.

Overall, our findings confirm that the Basel III LCR calibration for cash outflows appears adequate to date to cover the combined idiosyncratic and market-wide stress scenario for which it has been designed. The LCR is meant to ensure that banks are able to withstand a combined idiosyncratic and market-wide liquidity stress scenario, but it is not designed to cover all tail events involving deposit outflows, such as bank runs. A key finding of our analysis is that the Basel III LCR calibration proved conservative enough, on average, across crisis episodes and deposit categories (with one exception). The lower coverage for more volatile insured operational deposits might require a targeted review of the current classification of certain types of operational deposits (see **Chart 8** and **Chart 9** and **Table A.2**). Some idiosyncratic instances of severe deposit outflows are acceptable from a financial stability perspective and should be monitored by effective bank supervision under Pillar 2. In the absence of a system-wide liquidity or banking crisis during the observation period, the assumed LCR run-off rates may have however not yet been fully tested in the banking union.

Regulators should “keep calm, but watch the outliers”. The empirical evidence presented in this paper overall suggests that the Basel III liquidity standard for the LCR performed well during normal times and recent crisis episodes. The assumed outflow rates for uninsured deposits were particularly conservative, on average, across all crises and depositor classes, while observed outflow rates for insured deposits during the pandemic were relatively closer to the assumptions underlying the Basel III liquidity metrics. In addition, should the growing relevance of social media and increasing digitalisation in banking prove to have a longer lasting and broader impact on depositor behaviour, this may require a careful review of the LCR calibration in future. In this regard, further analytical work on the potential relationship between the level of digitalization, social media and deposit flows for a selection of euro area SIs is ongoing. In any case, regulators and central bankers must remain vigilant and carefully monitor any potentially new risks emerging in this field.

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Appendix

Table A.1
Summary statistics of deposit stocks for 110 banking union SIs, 2016-2024

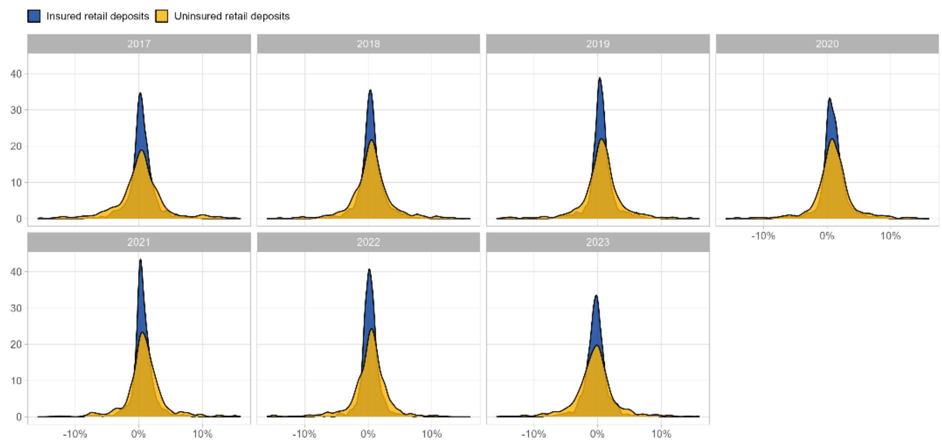
(EUR millions)

Deposit class		minimum	q1	median	mean	q3	maximum	st. dev.
Retail	**Insured**	0	2460	12537	45168	40656	440062	78727
	Uninsured	0	638	2977	12151	10085	165783	22390
NFC	**Insured**	0	33	162	797	854	13146	1481
	Uninsured	0	693	3439	14926	11621	241360	29197
Operational	**Insured**	0	1	61	610	485	7180	1282
	Uninsured	0	307	1933	14751	12230	326331	34396
Total		0	8561	27967	97377	74195	1033703	179341

Sources: Supervisory data and authors' calculations.
Notes: The table reports the following summary metrics: the minimum value, the value of the first quartile (25th percentile), the median (50th percentile), the mean, the value of the third quartile (75th percentile), the maximum value, and the standard deviation. No outlier is excluded in these calculations.

Chart A.1
Distributions of retail deposits over time

(x-axis: month-on-month change in deposit stocks, percentages; y-axis: share of observations, percentages)

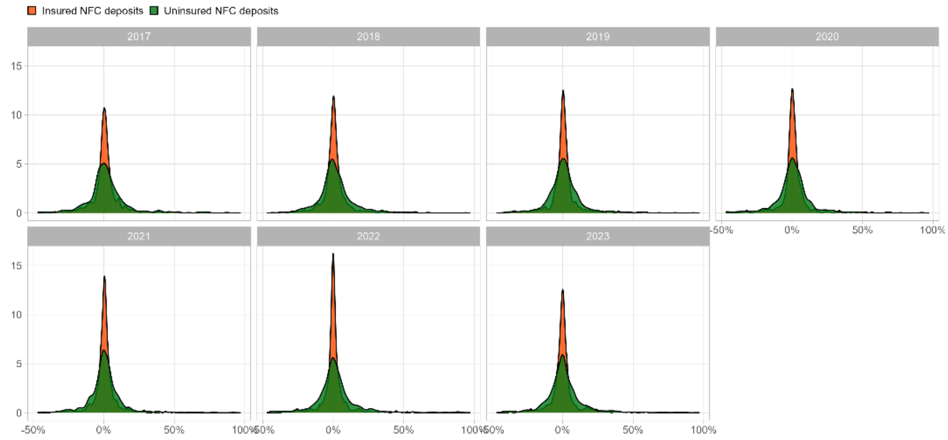


Sources: Supervisory data and authors' calculations.
Notes: The chart plots the evolution over time of the distribution of month-on-month changes in retail deposits for 110 banking union SIs over the whole sample period. Observations are cut at the 96th percentile (2% cut on both tails) to allow readability of the plots. Data for 2016 and 2024 are excluded owing to a low number of observations.

Chart A.2

Distribution of NFC deposits over time

(x-axis: month-on-month change in deposit stocks, percentages; y-axis: share of observations, percentages)



Sources: Supervisory data and authors' calculations.
Notes: The chart plots the evolution over time of the distribution of month-on-month changes in NFC deposits for 110 banking union SIs over the whole sample period. Observations are cut at the 96th percentile (2% cut on both tails) to allow readability of the plots. Data for 2016 and 2024 are excluded owing to a low number of observations.

Table A.2

Observed outflows had a lower relative distance to their respective assumed LCR run-off rate for insured deposits than for uninsured deposits

Deposit class		**LCR run-off rate (%)**	**Coverage (% of outflows below the LCR run-off rate)**	**Outflow episodes (% of all observations)**
Retail	**Insured**	5	92.4	36.8
	Uninsured	10	93.0	39.8
NFC	**Insured**	20	91.2	46.4
	Uninsured	40	95.5	47.4
Operational	**Insured**	5	65.1	45.3
	Uninsured	25	90.6	47.1

Sources: Supervisory data and authors' calculations.
Notes: The table reports: the assumed LCR run-off rate for each deposit class (third column); the total share of net outflow observations (negative month-on-month relative changes) falling below the respective assumed LCR run-off rate across the whole sample by deposit class (fourth column); and the total share of observations that recorded a net outflow across the whole sample by deposit class (fifth column). A value of the coverage metric (fourth column) of 100% indicates full coverage of the assumed LCR run-off rate, corresponding to no observed outflow breaching (i.e. having a value greater than) the respective assumed LCR run-off rate. A value of the coverage metric below 100% indicates the presence of outflow observations breaching the respective assumed LCR run-off rate in a given month. For example, we observe that for insured operational deposits 45.3% of observations recording negative changes in the stock of deposits (net outflows), of which 90.6% were greater than 5%, i.e. the respective assumed LCR run-off rate.

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