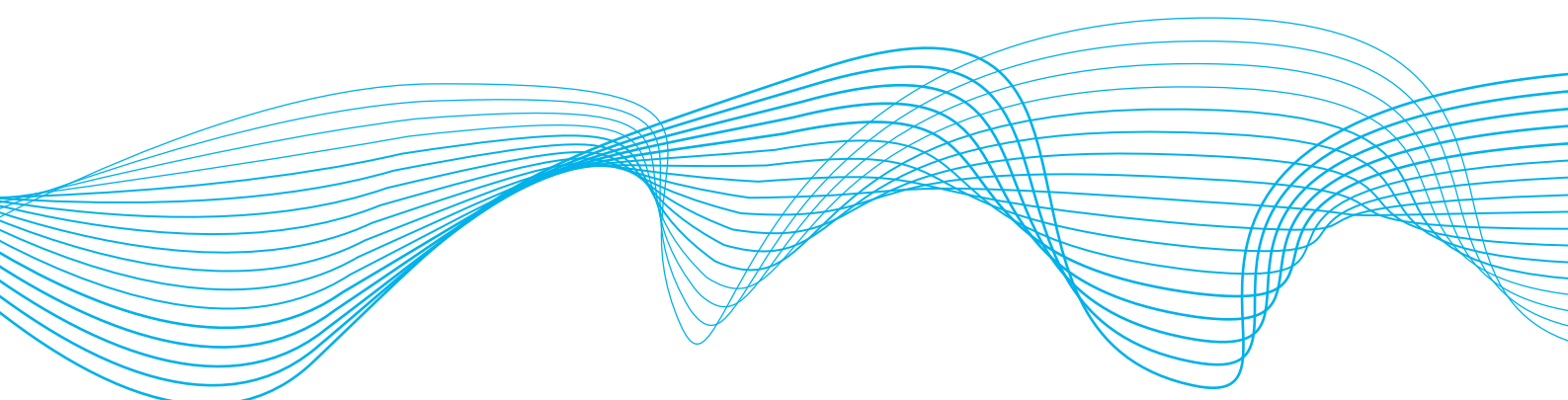# Advisory Scientific Committee

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Addressing banks' vulnerability to deposit runs: revisiting the facts, arguments and policy options

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European Systemic Risk Board
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Executive summary

The recent banking turmoil was a stark reminder of the fragility associated with banks' funding structures, especially when they rely on an insufficiently diverse uninsured deposit base. Concerns about unrealised losses, triggered by the rapid shift in monetary policy, played a clear role in the run on Silicon Valley Bank. The forced merger of Credit Suisse with UBS showed what happens if a large bank's legacy and viability problems are left unresolved for a lengthy period. This may also crystalise in the need for sudden intervention by the authorities when investors' confidence breaks down, deposits are withdrawn on a massive scale and access to market funding is lost. The episodes of bank distress in the United States in March 2023 did not result in losses for uninsured deposits, signalling that these may effectively enjoy the same level of protection as explicitly insured deposits.

Deposit runs almost always result from a combination of weak fundamentals (concerns about the solvency or liquidity position of a bank or the banking system) and the strategic considerations of depositors who may withdraw funds in response to information they receive. In the recent episodes of bank distress, depositors worried about the solvency of their banks started to run, triggering the need for immediate policy action. These runs unfolded much more rapidly than previous ones, fuelled by the concentration of the depositor base, the role of social media and the feasibility of making fast (instant) payments and transfers from the accounts of the banks affected. All of this forced supervisors to intervene much more rapidly than in previous crises.

Deposits are the primary source of funding for European banks, although their importance varies substantially across EU Member States, with insured deposits accounting on average for 37% of total deposits and 92% of depositors being completely covered. At the onset of the high inflation period, banks in both the European Union and the United States had record levels of overnight deposits from households and non-financial corporations. However, the trend reversed as interest rates began increasing in 2022, especially for non-financial corporations. In this tightening cycle of monetary policy, the pass-through of policy rates to deposit rates was incomplete, varied across different types of deposits and was slower than in previous cycles.

Deposit runs are a major source of bank fragility. The risk of deposit runs is real, and current guarantees (explicit or not) are not equivalent to fully credible, legal, 100% deposit insurance coverage. Otherwise, there would be no deposit runs. According to evidence from the academic literature, during a run formally insured and uninsured deposits behave differently. When bank solvency problems are widespread, depositors seek refuge in banks that, because of their size or systemic importance, are more likely to ensure their depositors are fully protected or at least more favourably treated in the resolution process. Formal deposit insurance is effective in making deposits attractive to depositors and providing a stable base of "information-insensitive" funding for banks. However, it may come at the cost of moral hazard if individual banks are willing (and able) to compete for deposits more aggressively, especially when they are weak, and therefore take excessive risks.

Exposure to interest rate risk is a direct consequence of banks' involvement in maturity transformation. There is evidence of a natural interest rate hedge for banks due to the "deposit franchise" (i.e. the capacity of banks to finance a part of their activities with deposits that pay interest rates that are lower and react significantly less than one-to-one with reference market rates). But individual banks or business models may fail to be effectively hedged against interest rate risk, as the bank failures witnessed in the United States in early 2023 illustrate. These failures also show that the franchise and hedging value of deposit funding is vulnerable to any force that leads depositors to withdraw their funds or suddenly requires banks to pay much higher rates to roll over their deposits.

The optimal prudential treatment of interest rate risk might interact with banks' funding structure. The larger and more stable a bank's deposit franchise, the lower the minimum capital necessary for it to remain solvent when interest rates spike unexpectedly. Thus, if the system can guarantee the stability of a greater fraction of deposits during crises, the minimum capital needed to ensure a bank stays solvent declines. Authorities interested in preserving financial stability when confronting interest rate risk in the banking book therefore face a trade-off between requiring more capital of banks and extending the coverage of the safety net for their deposits. Alternatively, imposing a minimum fraction of highly liquid assets provides an immediate buffer so that a bank can cope with outflows without the need to sell longer-term or less liquid assets. But holding more liquidity reduces banks' expected net interest income and may result in them being less able to accumulate loss-absorbing capacity. In sum, since there are multiple ways along which interest rate risk interacts with banks' funding structure, the funding structure should be considered in conjunction with the safety guarantees and the capital and liquidity position of each bank, rather than with a single-dimensional tool.

This report of the Advisory Scientific Committee (ASC) of the European Systemic Risk Board (ESRB) reviews an extensive list of existing and potential policy tools that could be considered for addressing banks' vulnerability to runs and the underlying causes of this vulnerability.[1] This report should not be misinterpreted as calling into question the benefits of the regulatory reform after the global financial crisis (i.e. Basel III). In the discussion, we pay specific attention to (i) how each option affects the allocation of potential losses across agents, (ii) the implications of each option for risk-taking, (iii) the effectiveness of each option in reducing bank funding fragility, and (iv) the likely impact of each option on the cost of intermediation. We are aware that even the options considered to have the greatest merit would need further careful technical assessment and refinement before being adopted. We order the policy options into two lists of categories. The first includes options that could be further considered without major structural changes to the current regulatory and supervisory framework, and which might be implemented in the form of adjustments within the margins of discretion of Basel III. These options are as follows:

1.   improvements to the supervision of bank liquidity and funding positions (e.g. increasing the frequency of monitoring of the banks found to be more vulnerable to runs);

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[1]   This ASC report is an intellectual contribution to potential future policy debates. It does not represent the official stance of the ESRB and should not be taken as a list of recommendations for policy action. The discussion of the pros and cons of a range of policy options does not represent a formal assessment or endorsement of the options by the ESRB.

2. Amendments to liquidity requirements (particularly concerning the run-off rates of uninsured deposits);

3. Amendments to capital requirements (e.g. concerning the level of the requirements or the treatment of interest rate risk in the banking book);

4. Amendments to the pricing of deposit insurance (e.g. making it more risk-based);

5. Increasing going concern recapitalisation capacity (e.g. enabling early recapitalisation through the timely conversion or write-down of contingent convertible debt).

The second list of categories includes those with policy options that would entail a deeper structural transformation of the institutional setup or of the banking industry. These are options which we do not promote as the most desirable or which would require further analysis. They are as follows:

6. Narrow banking;

7. Pre-positioning collateral at the central bank;

8. Tightening convertibility conditions for uninsured deposits (e.g. charges or gates);

9. Extending deposit insurance coverage (e.g. to cover larger balances from all or specific classes of depositors);

10. Extending mark-to-market accounting to broader asset classes in the banking book.

There are clear differences between the options in terms of both desirability and feasibility.
We do not regard proposals to move towards narrow banking or expand deposit insurance coverage as either desirable or feasible. We see proposals to recalibrate liquidity requirements, enhance the supervision of banks' liquidity positions and incorporate funding fragility into the computation of Pillar 2 liquidity and capital guidance as options that can be implemented relatively quickly. Contingent measures ensuring credible recapitalisation and favouring recovery over resolution are worth considering as additional supervisory tools, with the specific intention of overcoming the current bias for forbearance. While there are arguments in favour of contingent liquidity measures to prevent withdrawals from escalating into runs, such as redemption charges triggered by large outflows, the introduction and design of such measures would require a very careful assessment before moving forward with it, as they would fundamentally change the nature of deposits as money-like instruments. Several proposals would require legislative changes and thus only be feasible in the medium term.

1　Introduction

The failures of Silicon Valley Bank and Signature Bank in the United States in March 2023 were a stark reminder of the fragility associated with banks' funding structures, especially when they rely on an inadequately diverse uninsured deposit base.[2] These cases also provided new evidence of the speed at which, in a world of digital banking and social networks enabling the rapid flow of information, adverse news on a bank's solvency or liquidity position can put it on the brink of failure in a matter of weeks, if not days or even hours.[3] A few days after the Silicon Valley Bank and Signature Bank failures, the forced merger of Credit Suisse with UBS showed how the legacy and viability problems of a larger bank, if left unresolved for a long period, may also crystalise in the need for a sudden intervention by the authorities when investor confidence breaks down, deposits are withdrawn on a massive scale and access to market funding is lost.

Deposit runs almost always result from a combination of weak fundamentals (concerns about the solvency and/or liquidity position of a bank or the banking system) and the strategic considerations of depositors, who may decide to withdraw deposits in response to the information they receive.[4] The potential for a bank run when bad news arrives is aggravated by coordination problems arising from the complementarity between depositors' withdrawal decisions. In the cases of Silicon Valley Bank and Signature Bank, the trigger for the runs was the accumulation of losses on securities holdings (largely US Treasury bonds) due to the rise in interest rates. These banks had invested in long-maturity debt securities in the banking book during the time of low interest rates and were insufficiently hedged against a reversal in rates.[5] As securities continued to be measured at amortised cost, the losses suffered during the gradual but rapid increase in interest rates from early 2022 remained unrecognised. In addition, the relatively light supervision of smaller and medium-sized banks in the United States meant it was not possible to detect and act in time to address the underlying capital deficits. To make things worse, the latent hedging (and franchise value) potentially provided by relatively interest rate-insensitive deposit funding quickly evaporated as depositors started to run for the exit.

Despite pledges made in the aftermath of the global financial crisis on the absorption of losses during bank resolution, the episodes of bank distress witnessed in March 2023 involved a significant bailout component, signalling that uninsured deposits might de facto enjoy the same level of protection as explicitly insured deposits. In March 2023 the US authorities extended ad hoc guarantees to the depositors of the failing banks, while the solution the that the Swiss authorities found for Credit Suisse also involved the effective full protection of its

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[2]   Lagunoff and Schreft (2001) define "financial fragility" as the susceptibility of the financial system to large-scale financial crises caused by small, routine economic shocks. See also Allen and Gale (2004).

[3]   See Cookson et al. (2023).

[4]   See, for example, the findings of a recent study by Correia et al. (2024) on the US banking system covering the period between 1863 and 2023.

[5]   Recent empirical studies (Greenwood et al., 2022; Jimenez et al., 2023) suggest that tightening monetary policy after long periods of loosening is associated with an elevated risk of banking crises. An example of this dynamic is the series of events that led to the savings and loans crisis in the United States in the 1980s. Historical accounts of this crisis also mention increased competition, excessive risk-taking, fraud, deregulation and supervisory deficits as root causes of the debacle (see, for example, Barth, 1991).

deposits. These are examples of a classical time inconsistency problem: while keeping deposits uninsured in principle may be desirable in order to maintain market discipline and avoid moral hazard, when confronted with a crisis of potentially systemic dimensions authorities prefer to extend de facto protection to all flighty bank liabilities. By doing so they maximise franchise value and the prospects of completing the sale of a business in resolution, as in the US cases, while minimising contagion and spillover effects. Time inconsistency issues are generally heightened if bank supervisors do not intervene in troubled banks until it is too late (and a run is already underway). In the recent episodes in the United States and Switzerland, delays in supervisory intervention may have been driven by fears of escalation and contagion at an earlier stage, but may have also led to larger losses at a later stage.[6]

The EU banking system was not significantly affected by the banking turmoil in March 2023, but this does not mean that it is not exposed to vulnerabilities stemming from the liabilities side of the balance sheet. The banking turmoil involving the US mid-sized banks and Credit Suisse did not spill over to the EU banking system. Deutsche Bank was under stress stemming from its credit default swaps, but this faded away after a few days. While prudential regulation in the EU applies to all banks regardless of their size and is complemented by an effective supervision, this should, however, not lead to any complacency; these episodes served as a reminder of the vulnerabilities associated with the liabilities side of banks' balance sheets. The existence of these vulnerabilities is the main reason for this report. At the same time, it is clear that when extrapolating the stress in the US and Swiss banking systems to the EU, significant differences in business models, as well as in regulation and supervision across the three jurisdictions, have to be taken into account. This is illustrated by the importance given to microprudential supervision in the official reports on the episodes (Basel Committee on Banking Supervision, 2023; Board of Governors of the Federal Reserve System, 2023; Swiss Financial Market Supervisory Authority, 2023) and by the tailored regime of bank supervision adopted in the United States.[7]

The increased speed with which deposit withdrawals may occur during a run implies that, all else being equal, there is greater complexity in dealing with deposit runs than in the past. Assuming similar business models, balance sheet structures and circumstances, Chart 1 is a stylised illustration showing what happens if past deposit outflows of differing intensity and speed from specific banks are applied directly to the EU banking sector, given the available liquidity. It shows the share of the EU banking system (in terms of total assets) that would be unable to withstand deposit outflows such as those observed during past runs experienced by UK and US banks, given EU banks' holdings of liquid assets (cash, central bank deposits and demand deposits) and debt securities as of June 2022.[8] The horizontal axis in each panel refers to the number of days into a run with the intensity of those seen in each of the four historical episodes covered by the analysis. The results rely on the assumptions that banks do not obtain any support from the central bank during those days and that they are as vulnerable as the banks concerned in each of the run episodes shown in Chart 1. The vertical axes show, for each day into the run, the

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6   See, for example, Admati et al. (2023) and Cecchetti and Schoenholtz (2023).

7   For further details on the tailored regime in the United States, based on the size and complexity of individual banks, see Sablik (2018).

8   The results shown in Chart 1 do not take into account the redistribution of deposits that usually occurs across the banking system during a bank run. It also does not take account of the underlying causes of these historical deposit outflows, such as the nature of the banks' business model, the reliance or concentration of these banks on certain types of deposits or depositors, and the inherent fragilities or reputation of the banks concerned.

percentages of bank assets in the system belonging to banks that would be unable to withstand each episode. Despite its methodological limitations, this hypothetical exercise shows that a large part of the EU banking system would be able to cope with deposit outflows like those witnessed during the global financial crisis (e.g. Northern Rock in 2007), but only a very small proportion would be able to withstand runs like those at Silicon Valley Bank or First Republic.[9]

Chart 1

Application of some of the largest historical deposit outflows to the EU banking sector

(percentages)
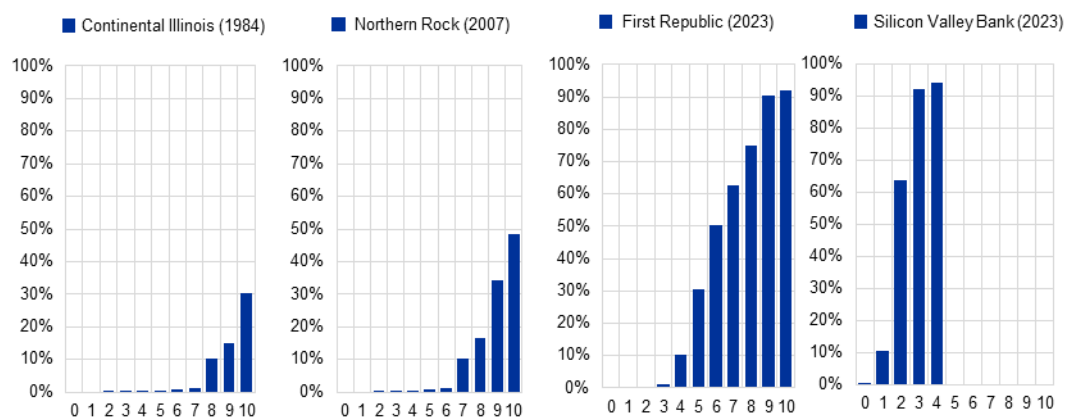
Source: ESRB Secretariat calculations based on the EBA's 2022 Transparency Exercise.
Notes: The x-axis shows number of days into the run and the y-axis shows the share of total assets in the total assets of the EU banking system of those banks that would not have enough liquid assets (cash, central banks and demand deposits) and debt securities to compensate for outflows of household and non-financial corporation deposits under different deposit outflow scenarios. To arrive at the percentages along the y-axis, we follow two steps. First, each individual bank participating in the EBA's 2022 Transparency Exercise is assumed to experience the same path of deposit outflows (in proportional terms) as the banks that suffered each of the runs shown, and we assess whether each of the banks would have enough liquid assets to cope with these outflows. Second, the total assets of those banks unable to cover deposit outflows with existing liquid assets are computed as a share of total assets of the EU banking system. The path of deposit withdrawals associated with each run is extracted from the data reported in Rose (2023) and HM Treasury (2009). Balance sheet data for the sample of EU banks are taken from the EBA's 2022 Transparency Exercise, which has a reference date of June 2022.

The bank failures observed in March 2023 revived old debates about the role of deposit funding for banks, the best way to address the fragility inherent in deposit funding (if this should be done at all), and more general policy reflections on the need to adjust banks' regulatory and supervisory frameworks in the light of the lessons learned from these episodes.[10] The recent discussions on policy options have mainly concerned the treatment of the fragility inherent in uninsured deposit funding with regard to multiple aspects of the current framework, including liquidity requirements and the supervision of banks' liquidity positions. Discussions have also covered the regulatory treatment of interest rate risk in the banking book (currently addressed under Pillar 2), potential changes in capital requirements, deposit guarantee

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[9]   The level of liquid reserves held by EU banks appears reassuring. Data from ECB Banking Supervision, significant institutions had unadjusted Level 1 liquid assets of €4.72 trillion in the second quarter of 2023, compared with €2.68 trillion in the third quarter of 2016.

[10] These reflections have also taken place among regulatory and supervisory authorities; see, for example, Basel Committee on Banking Supervision (2023), Financial Stability Board (2023) and International Association of Deposit Insurers (2023).

scheme reforms and bank recovery and resolution frameworks, and the strengthening of supervisory powers to overcome the current bias for forbearance. Some proposals have also touched on more structural changes to banks' business models, including moving in the direction of narrow banking or reconsidering whether deposits should remain demandable at par in all contingencies. In the EU, the reminder of banks' vulnerability to runs provided by the turmoil of March 2023 has helped to reignite discussions on the need to establish the proposed European Deposit Insurance Scheme (EDIS), the third pillar of the banking union.[11] Despite abundant proposals for the design of EDIS (Alessi et al., 2017; Veron and Schnabel, 2018; Gómez Fernández-Aguado et al., 2022; Tümmler, 2022), political negotiations on the topic have advanced little since 2015, even though in April 2024 the European Parliament adopted its report on the regulatory proposal to establish EDIS.[12]

In the light of the episodes of bank distress witnessed in March 2023, this report focuses on factors that may influence deposit runs. We document the importance and evolution of deposit funding for EU banks, review the academic literature on bank runs and discuss a broad set of existing or potential policy tools that could be used or adapted to address the vulnerability to runs or its underlying causes. We discuss the pros and cons of the options without implying whether we consider them desirable;[13] in fact, we assess some proposals as impractical or too costly, while we believe some others would require further analysis to consider whether they are viable or desirable.

This report discusses a range of possible policy options from an academic perspective, with the objective of fostering discussion. As with all reports by the ESRB ASC, the views expressed in this report do not represent the official stance of the ESRB. They should not be interpreted as calling into question the benefits of the regulatory reform after the global financial crisis (i.e. Basel III). On the contrary, we consider that the policy options discussed here should take as a starting point the full and sound implementation of Basel III global standards. The most reasonable and feasible of them would in any case require the fine-tuning of existing tools and practices or should be seen as potential improvements to be considered in the medium or longer term.

The report is organised as follows. To provide background for the more analytical and policy contents, Section 2 documents recent patterns in the role of deposit funding for EU banks. Section 3 summarises the main findings from the academic literature on bank runs. Section 4 addresses the more specific issue of the interaction between the fragility of deposit funding and interest rate risk, which played an important role in the demise of Silicon Valley Bank and Signature Bank in the

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[11] As this report is focused on drawing general lessons from the recent turmoil, it does not elaborate on EU-specific issues, such as EDIS, which have been extensively discussed elsewhere. It also does not include a review of the improvements to the bank crisis management framework contained in the crisis management and deposit insurance (CMDI) legislative proposal of April 2023; see European Commission (2023a).

[12] **Report on the proposal for a regulation of the European Parliament and of the Council amending Regulation (EU) 806/2014 in order to establish a European Deposit Insurance Scheme.**

[13] In addition, the discussion of the pros and cons of the policy options does not represent any formal assessment or endorsement of the options by the ESRB.

United States.[14] The policy discussion comes in Section 5, which considers one by one a broad set of policy options organised around two lists of policy categories: one containing options that could be implemented by fine-tuning existing regulations and institutions, and another with options involving deeper structural transformations. Section 6 provides concluding remarks.

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[14] Interest rate risk can affect the balance sheet and value of a bank in many different ways. Its impact on banks' profits and losses may be direct or indirect, since interest rate fluctuations can not only influence the interest earned and the interest paid on debt assets and debt liabilities respectively, but can also affect the bank via credit risk, market risk and liquidity risk. Assessing the detailed implications of interest rate risk for banks is beyond the scope of this report, and references to interest rate risk in the report should not be taken to imply that interest rate movements in one direction or the other are necessarily good or bad for banks' profitability or resilience. In fact, the heterogeneity of business models possibly implies considerable variation in the extent of the positive or negative effects that interest rate fluctuations can have on banks. For comprehensive assessments of the impact of interest rates on financial stability, see ESRB (2016) and ESRB (2021).

2 The role of deposit funding for EU banks

Deposit funding is crucial to banking. Deposits are the main source of funding for banks, a central element in their maturity and liquidity transformation functions, a source of positive intermediation margins and, most of the time, a cheaper and more stable form of short-term funding than market alternatives. At the same time, their "demandability" at par creates exposure to run risk, which has historically been partly addressed by insuring most retail deposits up to certain limits. This section provides an overview of the importance and evolution of deposit funding for EU banks, the proportion of deposits that are insured, and how deposit rates respond to changes in reference interest rates.

Deposits are the primary source of funding for European banks, although their importance varies substantially across EU Member States (Chart 2). In 2022, the average share of EU banks' total deposits in total liabilities was 65%. Banks in eastern European countries, such as Bulgaria, Croatia, Latvia and Slovenia, rely almost exclusively on deposit funding, with shares at around 90% or higher. Conversely, in Nordic countries (Denmark, Finland, Sweden and Norway) deposit shares are much lower, ranging from 32% to 49% of total liabilities, while bond funding (which is much less important elsewhere) accounts for over 30% of total liabilities.

Chart 2

Importance of deposits in the liability structure of EU banks – second quarter of 2023

(percentages)
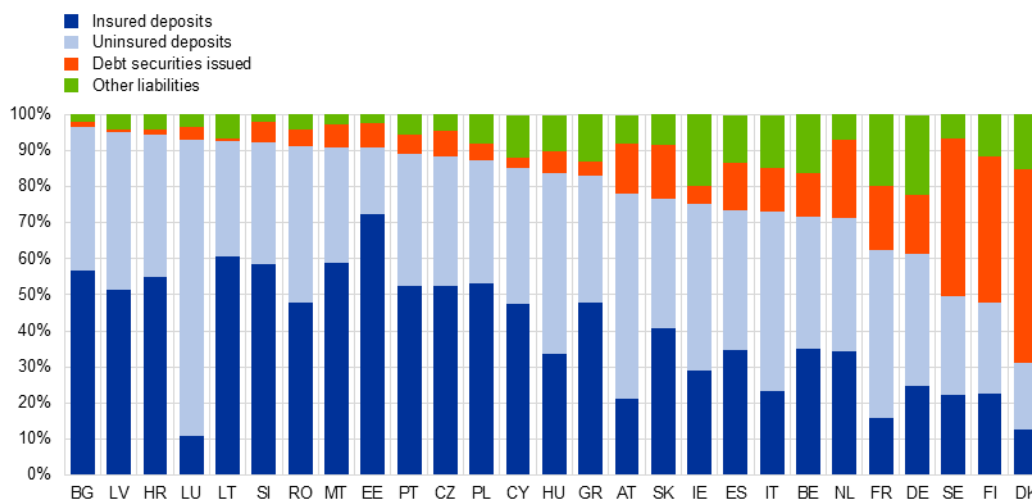
Sources: ESRB Secretariat calculations based on EBA (Risk Dashboard), ECB (BSI Statistics), Българска народна банка (the Bulgarian National Bank), Česká národní banka, Danmarks Nationalbank, Magyar Nemzeti Bank, Narodowy Bank Polski, Banca Naţională a României, Sveriges Riksbanks, and Haver Analytics.
*Notes: The shares of deposits, debt securities issued and other liabilities are taken from the EBARisk Dashboard. Countries are ranked by the share of deposits in their total bank liabilities (highest to lowest). The split between insured and uninsured deposits is estimated as follows. First, the share of insured deposits in total deposits is calculated as the sum of insured deposits as reported to the EBA for the **database of deposit guarantee schemes** divided by total deposits at the end of 2022, taken from the ECB BSI dataset (euro area countries) and national central banks (non-euro area countries). Second, the resulting share of insured deposits at the end of 2022 is applied to the sum of the shares of deposits of households, deposits of other financial institutions, deposits of non-financial corporations and other deposits, as reported in the EBA Risk Dashboard.*

In the EU, insured deposits account for 37% of total deposits on average, but with significant variation across countries (as shown by the y-axis of Chart 3). Several countries have shares of insured deposits close to or even higher than 50% of total deposits, with Estonia, Lithuania, Malta and Slovenia having shares above 60%. Most countries with shares below the EU average, such as Austria, Italy and France, hover not too far below it. The only exception is Luxembourg, with a share of insured deposits close to 10%.[15] In addition, countries where the share of deposits in total liabilities is high (the x-axis of Chart 3) tend to have high shares of insured deposits. So, while heavy reliance on deposit funding could indicate a larger threat of runs, in most countries deposit insurance coverage operates as a significant mitigant, insofar as the existing deposit guarantee schemes are considered credible.

Chart 3

Share of insured deposits in EU Member States, end of 2022

(percentages)
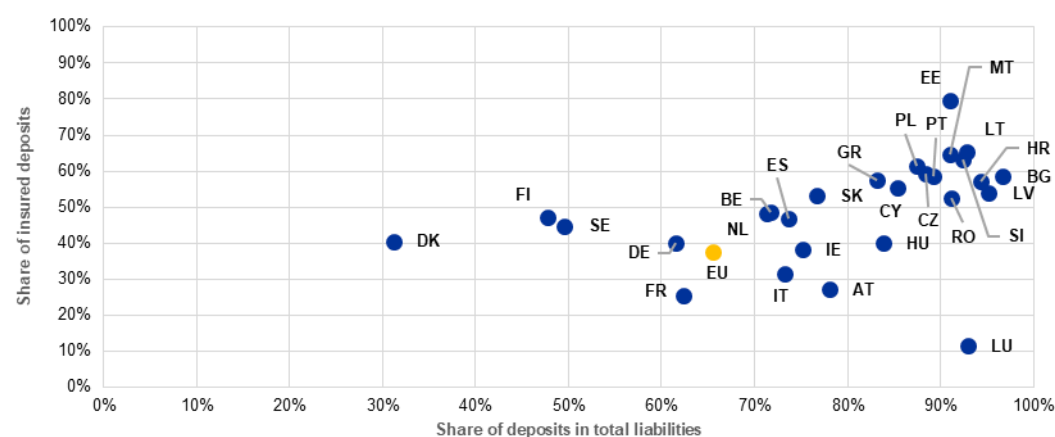
Sources: ESRB Secretariat calculations based on EBA (database of deposit guarantee schemes), ECB (BSI Statistics), Bulgarian National Bank, Българска народна банка (the Bulgarian National Bank), Česká národní banka, Danmarks Nationalbank, Magyar Nemzeti Bank, Narodowy Bank Polski, Banca Naţională a României, Sveriges Riksbank and Haver Analytics.
*Notes: The share of insured deposits is calculated as the sum of insured deposits as reported to the EBA for the **database of deposit guarantee schemes** divided by total deposits at the end of 2022, taken from the ECB BSI dataset (euro area countries) and national central banks (non-euro area countries).*

EU banks' reliance on deposit funding has increased in recent years (Chart 4, panel a) while the share of insured deposits in total deposits has remained fairly stable over time at around 40% (Chart 4, panel b).[16] Panel a) of Chart 4 shows that deposits of both households and non-financial corporations as a proportion of total assets grew strongly in the period following the global financial crisis (between 2011 and 2017) and remained at these higher levels until the end of the

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[15] Interbank deposits represent around 50% of the total assets of banks in Luxembourg.

[16] According to a survey conducted by the European Banking Authority in 2023 covering 28 European Economic Area countries and 33 deposit guarantee schemes, 44.4% of deposits were covered by deposit guarantee schemes (European Banking Authority, 2023b).

sample period in 2023.[17] Panel b) of Chart 4 shows the shares of insured deposits in total deposits in the EU and the United States. Both shares have been fairly stable over time (especially in the EU), with a small temporary decrease during the coronavirus (COVID-19) pandemic. Notably, the average share of insured deposits in the EU is also consistently lower than in the United States (35-40% compared with 55-60%), which can be explained by the lower importance of alternative investment vehicles, such as money market funds, in the EU. All other things being equal, this factor would expose EU banks to a higher risk of deposit runs.

Chart 4

Deposits of households and non-financial corporations as a share of total assets, and estimated insured deposits

(percentages)
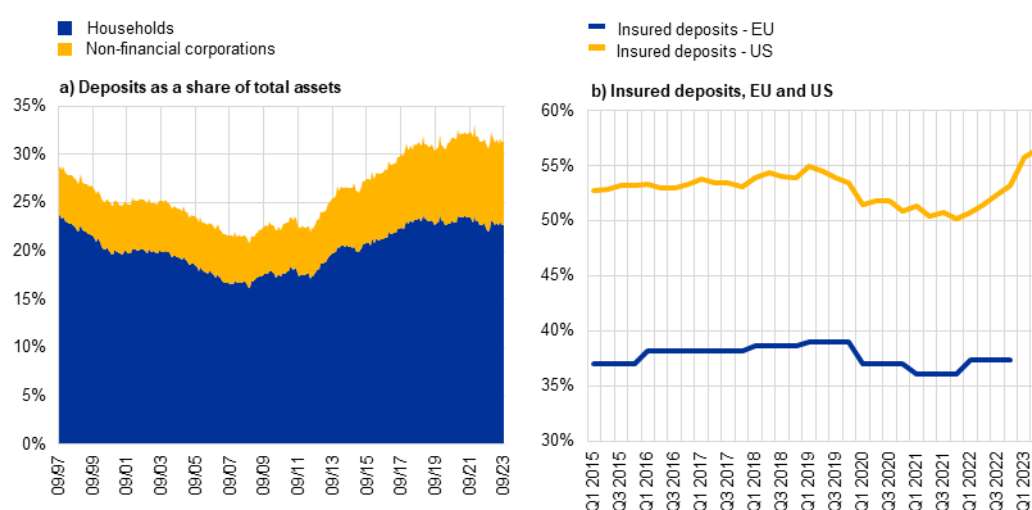
Sources: ESRB Secretariat calculations based on EBA (database of deposit guarantee schemes), ECB (BSI Statistics), Българска народна банка (the Bulgarian National Bank), Česká národní banka, Danmarks Nationalbank, Magyar Nemzeti Bank, Narodowy Bank Polski, Banca Naţională a României, Sveriges Riksbank, Haver Analytics and Federal Deposit Insurance Corporation (FDIC).
Notes: Panel a) shows deposits of households and non-financial corporations as a share of total bank assets in the EU. Panel b) shows the evolution of the share of insured deposits in the EU and in the United States since 2015.

In the first quarter of 2022, when the recent period of high inflation began, banks in both the EU and the United States had record levels of overnight deposits from both households and non-financial corporations (Chart 5). The share of household overnight deposits as a percentage of total deposits in the euro area had been steadily increasing over the past two decades, rising from approximately 58% in 2000 to 84% by the beginning of 2022 (Chart 5, panel a). The trend was evident not only for household deposits but also for deposits of non-financial corporations. Panel b) of Chart 5 shows a similar increase in the United States. In both cases the trend was probably

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[17] The rise in bank deposits may reflect the global "savings glut" and the growing significance of intangibles-intensive firms retaining cash reserves (see Doettling et al., 2022; Vuillemey, 2023) as well as the general equilibrium implications of large-scale quantitative easing programmes since the global financial crisis (see, for example, Acharya et al., 2023a).
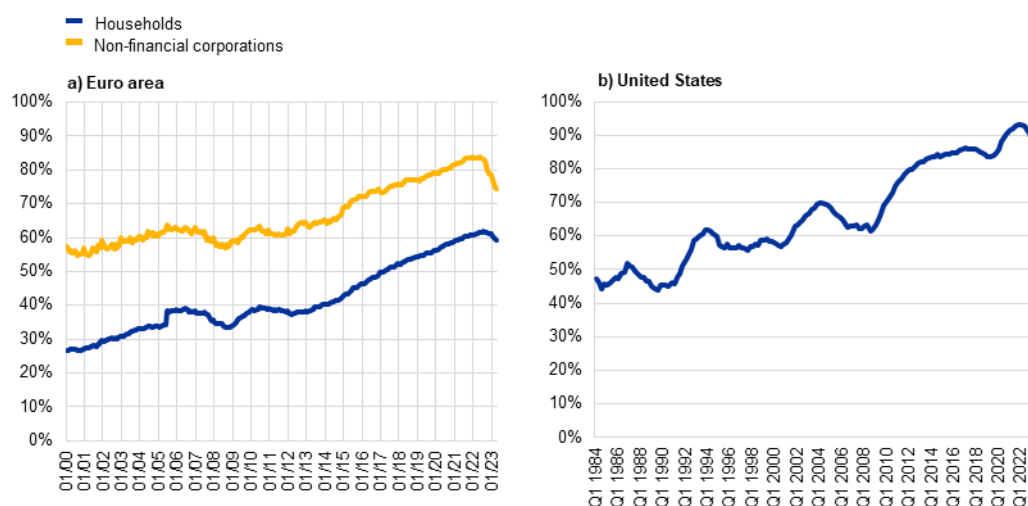
driven by the ultra-low interest rate environment, which compressed the yields and term premia on alternative low-risk investments (such as money market fund shares and time deposits).

Chart 5

Share of overnight deposits in total deposits by holding sector

(percentages)

Source: ESRB Secretariat calculations based on ECB (BSI Statistics) and FDIC.
Notes: Each line shows the share of overnight deposits of households (non-financial corporations) in total deposits of households (non-financial corporations). For the United States, the share of overnight deposits is calculated as (1 – share of time (or term) deposits in total deposits), as reported by US banks to the FDIC.

The increasing trend in overnight deposits reversed as interest rates began increasing in 2022 (Chart 5). As can be observed in panel a) of Chart 5, the trend in the share of overnight deposits changed as central banks started increasing interest rates at the beginning of 2022. This reversal is seen for both households and non-financial corporations but is more pronounced for the latter, which tend to be more price-sensitive. Overnight deposits in the United States underwent a similar trend reversal (Chart 5, panel b).

A breakdown of deposits by type of account reveals that, as interest rates began increasing in 2022, both households and non-financial corporations began shifting away from overnight deposits and towards time (or term) deposits in search of higher yields (Charts 6 and 7). Beginning in mid-2022, the share of time deposits in total deposits for both households and non-financial corporations started to grow rapidly, particularly in the case of non-financial corporations (Chart 6). During the same period, interest rates on time deposits for both households and non-financial corporations also began to rise, moving from negative or near-zero territory in mid-2022 to around 2% by 2023 (Chart 7). There were also increases in interest rates on overnight deposits, particularly for non-financial corporations, although the extent of the increases was much less than for the interest rates on time deposits. These patterns suggest that as interest rates began increasing, depositors in general and non-financial corporations in particular started looking for higher-paying alternatives (both within, and possibly outside, the banking sector).

Chart 6

Deposits of households and non-financial corporations in the euro area: year-on-year growth rates

(percentages)
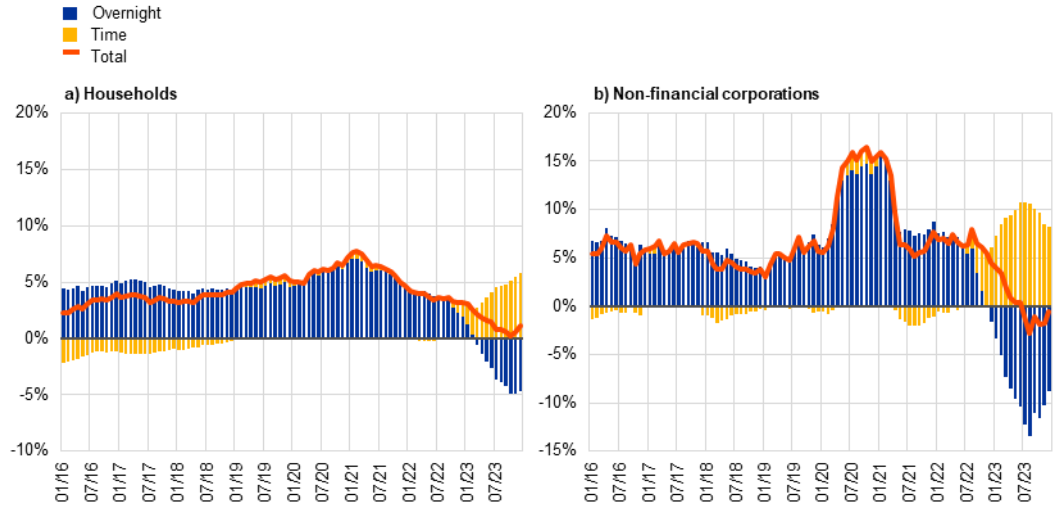
Source: ESRB Secretariat calculations based on ECB (BSI Statistics).
Notes: The latest observation is for December 2023. Time (or term) deposits include deposits with agreed maturity and deposits redeemable at notice. The red line shows the yearly growth rate of deposits, and the blue and yellow bars represent the contribution of overnight and time deposits respectively.

Chart 7

Overnight and time deposit rates for households and non-financial corporations

(percentages)
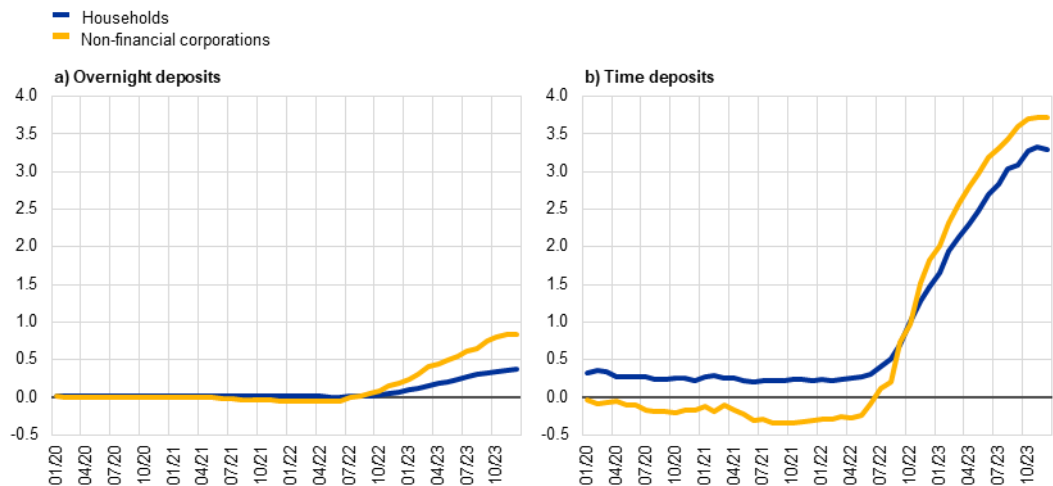
Source: ESRB Secretariat calculations based on ECB (MIR Statistics).
Notes: Annualised agreed rate (AAR)/narrowly defined effective rate (NDER). The latest observation is for December 2023.

In the euro area, the pass-through of higher rates to the remuneration of overnight deposits (the largest category of deposits) was incomplete and slower than for loans (Chart 8). To illustrate this, we calculate the ratio between the change in the official interest rates and the interest rate on deposits for each month since the start of the current cycle (from July 2022 to August 2023):[18]

$$y_t = \frac{\Delta(Int.Rate\ on\ Deposits)_{t,start}}{\Delta(Official\ Int.Rate)_{t,start}} \tag{1}$$

Values of y_t significantly below 1 indicate that the pass-through of higher interest rates is incomplete, meaning the increase in the remuneration of deposits is lower than the increase in the official rate. We calculate y_t for each of the four classes of deposits (i.e. overnight or time deposits of non-financial corporations or households), and for loans to non-financial corporations and households for home purchases. Additionally, we compute the corresponding values of y_t during the previous interest rate hike cycles in the euro area (i.e. 2000-01 and 2005-07). The results are presented in panels a) to f) of Chart 8. The x-axis in each of the six panels measures the number of months since the start of each of the ECB's interest rate hiking cycles (i.e. February 2000, December 2005 and July 2022). We observe that the pass-through of higher interest rates into the remuneration of deposits and loans is typically incomplete, both in this and in previous cycles, with the pass-through of deposit rates slower than that of loan rates.

Pass-through in this tightening cycle varied across different types of deposits and loans and was slower than in previous cycles. When comparing the four classes of deposits, we find that pass-through is lowest for overnight deposits of households (Chart 8, panel a), while time deposits of non-financial corporations have the highest pass-through (Chart 8, panel d). In addition, the pass-through to household loans (Chart 8, panel e) is generally smaller than to loans to non-financial corporations (Chart 8, panel f), which may be connected to the typically longer maturity of the former and the differences in the market power of the two segments. Finally, the increase in the remuneration of overnight deposits is slower in the current interest rate hiking cycle than in previous cycles.

Overall, at least until the end of the sample period (December 2023), incomplete interest rate pass-through has enhanced banks' profitability through increased net interest rate margins, accompanied to date by moderate outflows from deposits. However, this situation could change in the future, as depositors may want to seek higher-yielding alternatives elsewhere.

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[18]   This ratio is similar to the concept of "deposit beta" used in the academic literature.

Chart 8

Pass-through of interest rate increases to the interest rates of deposits and loans

(percentages)
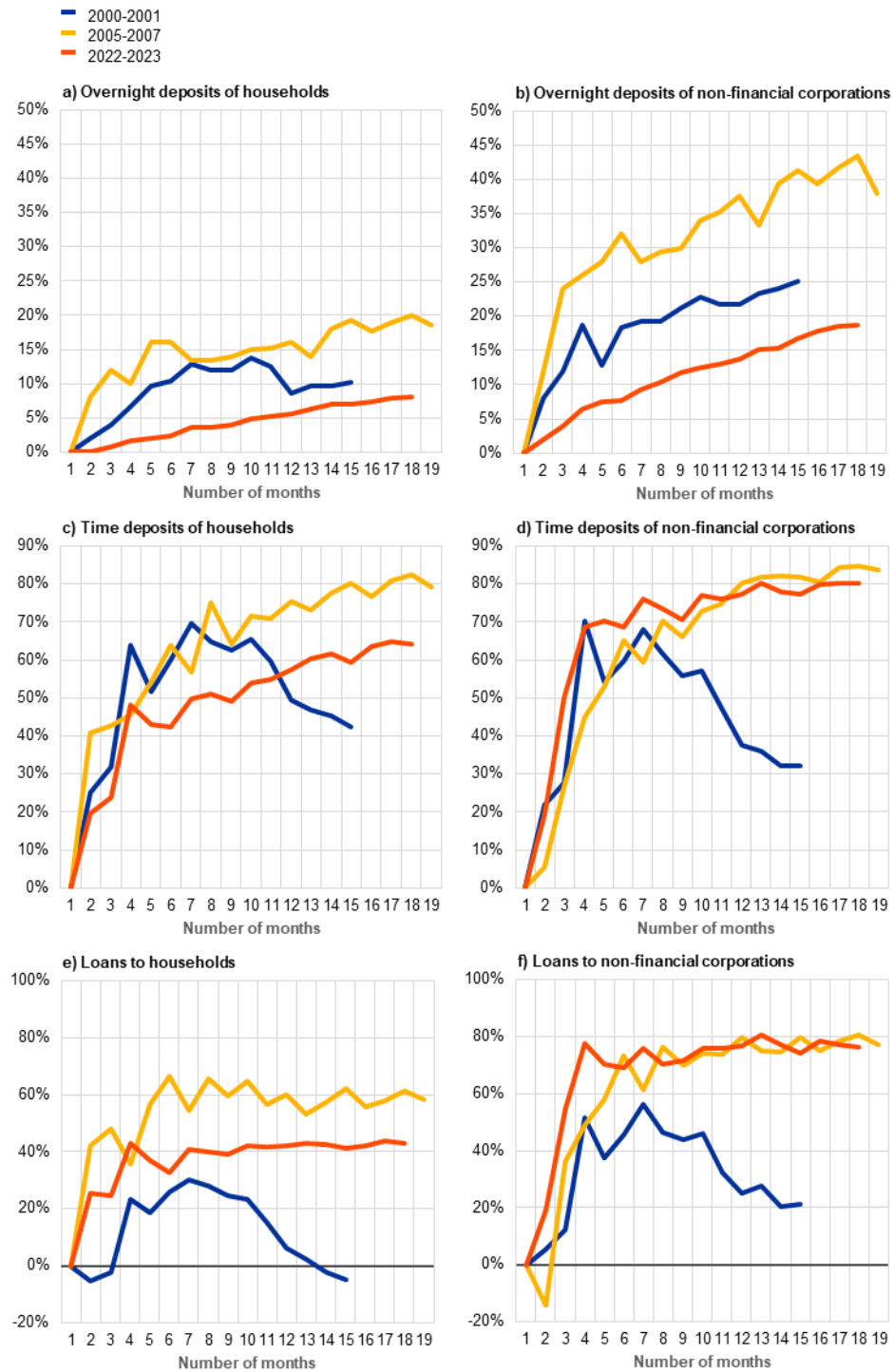
- 2000-2001
- 2005-2007
- 2022-2023

a) Overnight deposits of households

b) Overnight deposits of non-financial corporations

c) Time deposits of households

d) Time deposits of non-financial corporations

e) Loans to households

f) Loans to non-financial corporations

Source: ESRB Secretariat calculations based on ECB (MIR Statistics).
Notes: The latest observation is for December 2023. The official interest rates are the ECB's deposit facility rates.

There is evidence that households are increasingly exploring higher-yield investments outside the banking sector. Data from the Quarterly Sectoral Accounts (QSA) reveal a shift towards government and corporate bonds. As shown in Chart 9, by the first half of 2023, the net change in household and non-financial corporations deposits in the euro area is at its lowest level since 2014, while assets such as government bonds are becoming a more important part of household and corporate portfolios.

Chart 9

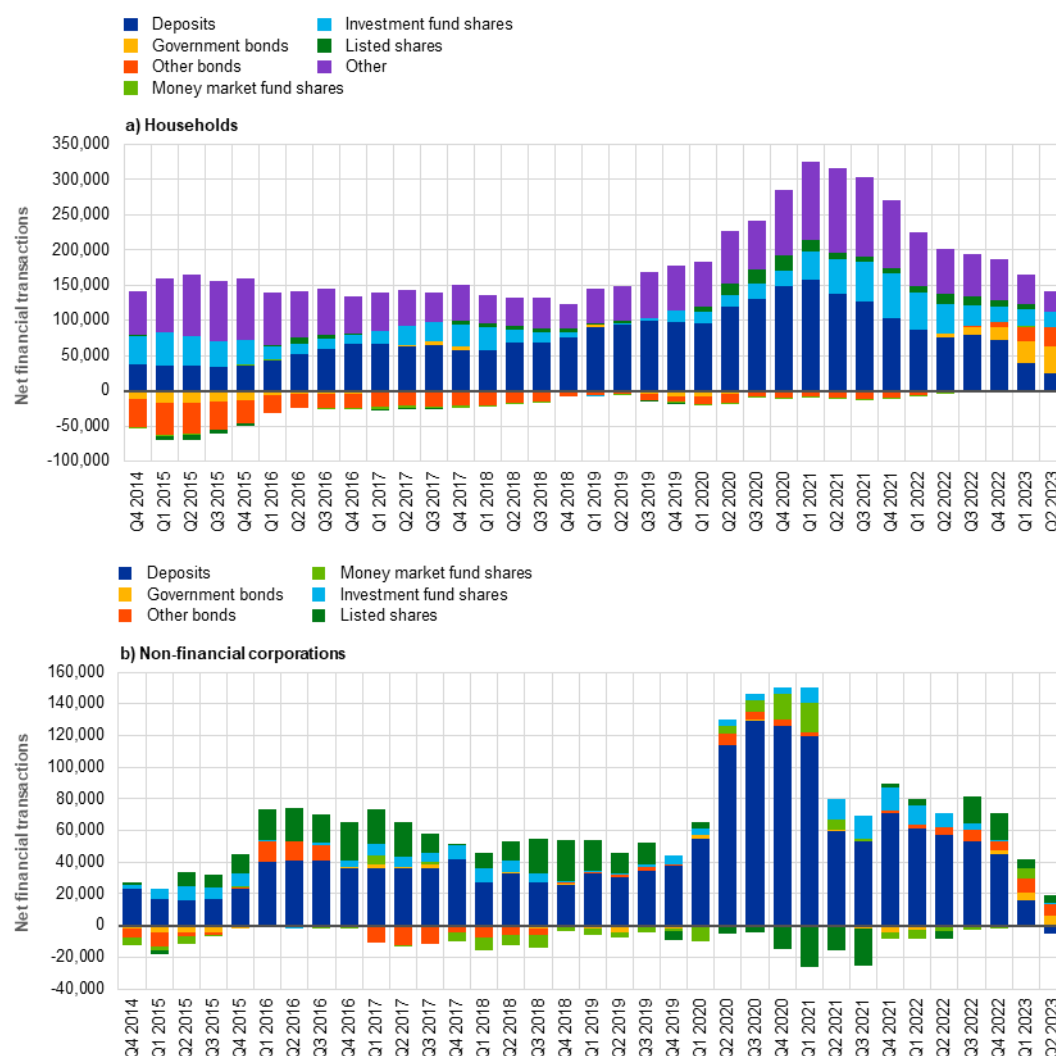**Main categories of financial transactions involving financial assets held by households and non-financial corporations in the euro area**

(EUR millions)

Source: ESRB Secretariat calculations based on ECB (Quarterly Sectoral Accounts).
Notes: Data from the ECB Quarterly Sectoral Accounts for households and non-financial corporations, showing four-quarter moving averages. Financial transactions cover all transactions involving change of ownership of financial assets, including the creation and liquidation of financial claims. The category "other" (mainly comprising transactions with unlisted shares) is excluded from panel b) for presentational reasons. In panel a), "other" mainly comprises life insurance and pension entitlements.

Banks that saw a decline in deposits from households and non-financial corporations between the third quarter of 2022 and the second quarter of 2023 also decreased their lending over the same period. According to data from the EBA's 2023 Transparency Exercise, banks saw an aggregate decline of €10 billion in household and non-financial corporations deposits between the third quarter of 2022 and the second quarter of 2023 (equal to just 0.04% of their total assets). As shown in Chart 10, most of the banks that experienced declines in these deposits also experienced declines in their lending.

Chart 10

Changes in household and corporate deposits and changes in lending of banks from the EBA's 2023 Transparency Exercise

(percentages of total assets)
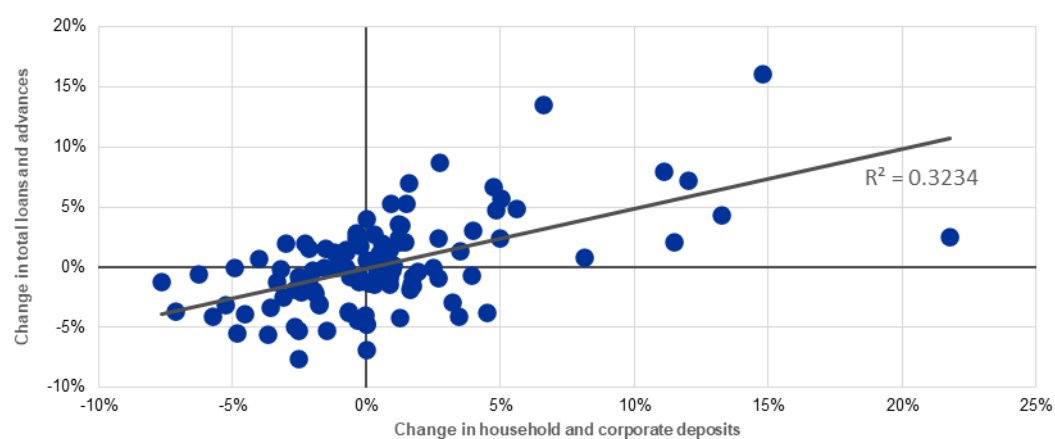
Source: ESRB Secretariat calculations based on the EBA's 2023 Transparency Exercise.
Notes: The x-axis shows the change (as a share of total assets) in deposits of households and non-financial corporations between the third quarter of 2022 and the second quarter of 2023. The y-axis shows the changes in total loans and advances at amortised cost over the same period. Each dot represents a bank reporting to the EBA's 2023 Transparency Exercise.

3 Insights from the literature on bank runs

This section provides a (non-exhaustive) review of the literature on bank runs, including the role of competition and spillover effects, to inform the discussion of policy options in Section 5.

Deposit runs are a major source of bank fragility. Earlier contributions to the theoretical literature on runs emphasised the distinction between "speculative runs" and "fundamental runs". Speculative runs are those caused by coordination among depositors, which can lead even fundamentally solvent banks to fail (Diamond and Dybvig, 1983); fundamental runs are those caused by signals indicating fundamental insolvency risk (Chari and Jagannathan, 1988; Gorton, 1988; Jacklin and Bhattacharya, 1988). More recent formulations combine elements from both approaches, focusing on the role of incomplete information and resulting in a specific probability of banks experiencing runs when a sufficiently large fraction of their depositors receive negative signals about their fundamentals (Rochet and Vives, 2004; Goldstein and Pauzner, 2005; Matta and Perotti 2023). Indeed, while the empirical literature has identified cases of purely self-fulfilling runs (see, for example, Iyer and Puri, 2012), most runs of systemic relevance are of this hybrid nature. They are triggered by news reports questioning the solvency of a bank (or a banking system) and are amplified by the incentive for depositors to withdraw their deposits if they anticipate that many others will also do so.

The demandability of bank deposits is also a source of market discipline. Deposits offer their holders the option to withdraw on demand, meaning immediate conversion at face value into cash. This distinct characteristic of deposits plays a key role in both the maturity and liquidity transformation functions of banks and their exposure to the risk of runs. Banks operate under the principle of sequential service when they provide liquidity on demand either in the form of deposits that can be withdrawn or credit lines that can be drawn down (Kashyap et al., 2002). Thanks to the partial "diversifiability" of the liquidity demands of their customers, banks are able to fund opaque and illiquid long-term loans with demand liabilities and short-term debt, as long as it is steadily rolled over. Several authors argue that demandability can also work as a disciplining and commitment device, providing managers with an incentive to protect bank asset values (Calomiris and Kahn,1991; Flannery, 1994; Diamond and Rajan, 2001), while the right of financing providers to withdraw their funding or stop rolling it over helps ensure discipline and prevent excessive bank risk-taking (Perotti and Terovitis, 2023).[19] This view provides an important argument against excessive deposit insurance coverage, which, while potentially effective in preventing runs, might have a cost in terms of excessive risk-taking by banks.[20]

Types of deposits, depositors' willingness to pay and "compensation needed to remain". Empirical evidence indicates that, faced with uncertainty and solvency concerns, depositors withdraw both demand deposits and time deposits – even though withdrawing time deposits means

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[19] Carletti et al. (2023) test the empirical relevance of these two sets of theories and provide empirical support.

[20] It is important to note that different traits of the deposit insurance scheme interact with each other. As discussed by Beck (2002), the voluntary deposit insurance scheme run by privately-owned banks in Germany is characterised by very high insurance limits. At the same time, it also provides a strong incentive for member banks to monitor each other and plays a strong role in the supervision and resolution of failing members. However, such a scheme might not necessarily work in a more open and competitive banking system.

incurring significant monetary costs (Artavanis et al., 2022; Carletti et al., 2021).[21] When depositors are concerned about the safety of their funds, the "compensation needed to remain" at the bank is high. During periods of heightened uncertainty about bank solvency, early withdrawals increase substantially. To illustrate this, we cite an example from Greece during the sovereign debt crisis: Artavanis et al. (2022) find that the deterioration of bank fundamentals increases early withdrawals by 200% relative to "quiet times", and news reports associated with strategic considerations (i.e. announcements that other depositors are withdrawing) increase withdrawals by 70%.[22] Based on their estimates, avoiding those abnormal withdrawal rates during a three-week period would have cost the bank about 2.4% of the value of deposits, equivalent to an annualised cost of capital of about 50%. The authors of the study argue that these costs are small compared with the large social costs of bank runs (Laeven and Valencia, 2012; Reinhart and Rogoff, 2014). However, these estimates refer to an episode of heightened uncertainty, and it is unclear whether the experience of the induced slow-moving run can be extrapolated to fully fledged and much speedier runs such as those witnessed in early 2023 in the United States.

It is important to note that deposit insurance and implicit government guarantees influence not only how depositors respond in a crisis, but also the ex ante allocation of deposits within and across banks. Evidence shows that uninsured depositors are much more likely to withdraw deposits during a bank run than insured depositors (Iyer and Puri, 2012; Martin et al., 2024), although insured deposits are also subject to abnormally high withdrawals during sustained runs, especially those with larger balances (Iyer et al., 2016). However, there is clear evidence of "bunching" at the insurance limit, particularly in the case of banks that are not systemically important (Iyer et al., 2019; de Roux and Limodio, 2023). This implies that even if recent experience suggests that deposit insurance coverage might de facto be 100% in many crisis episodes, the implications would be different in alternative scenarios with a 100% de jure coverage.

Increasing the availability of risk-insensitive funding, deposit insurance and implicit government guarantees could give banks a greater incentive to increase ex ante risk-taking (see, for example, Hovakimian and Kane, 2000; Demirgüç-Kunt and Detragiache, 2002; Ioannidou and Penas, 2010; Anginer et al., 2014). At the same time, both deposit insurance and implicit guarantees could positively contribute to banks' franchise values, which could have the opposite effect by lowering risk-taking incentives (see the discussion in Section 4 below).

Runs have important distributional implications. Evidence indicates that when depositors start a run, they reallocate their funds towards systemically important or state-owned banks, thus seeking shelter in the banks that enjoy (higher) explicit or implicit government guarantees (Iyer et al. 2019; Acharya et al., 2023b).[23] Evidence in Carletti et al. (2024) from the idiosyncratic failure of large regional banks in Italy in 2016 indicates that when concerned about the solvency of their banks, non-financial corporations run before households, and run simultaneously on the asset and liability sides, taking their lending business elsewhere in search of new stable lending relationships.

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[21] Evidence for the United States in Martin et al. (2024) shows that demand deposits are generally more stable than time deposits.

[22] The study explores early withdrawals of time deposits during an episode of heightened uncertainty in Greece in 2014, which led to a 30% decline in deposits in the Greek banking system. It finds that even in "quiet periods" early withdrawals of time deposits are frequent.

[23] In addition, these banks may have features (e.g. better diversification of assets and liabilities, more sophisticated risk management or greater classes of less senior liabilities) that make their depositors feel better protected against the risk of failure.

Low-risk non-financial corporations and non-financial corporations with single lending relationships are the first to go, endogenously deteriorating banks' loan portfolios. This leads on to a second larger and faster wave of runs by both households and non-financial corporations and in turn to the eventual default of the distressed banks. Importantly, the study finds that the behaviour of households is quite different from that of non-financial corporations. Households run towards large systemically important banks, while non-financial corporations seem to run towards banks with stronger fundamentals (e.g. better capitalised banks). In addition, recent evidence shows that the growing use of "reciprocal deposits" by small and medium-sized banks in March 2023 allowed them to sidestep the deposit insurance limit of USD 250,000, reducing large banks' too-big-to-fail advantage (Kim et al., 2024).

Sectoral concentration and social networks matter for the dynamics of bank runs. Silicon Valley Bank's failure shows that sectoral concentration in funding and social networks increases the speed of runs. Early evidence on the importance of social networks is reported by Iyer and Puri (2012). This study finds that depositors are more likely to run if others in their social network do so. This is true both for runs motivated by fundamentals and those triggered by panic. Factors under a bank's control can mitigate panics. For example, stronger bank-client relationships, such as those that are long-lasting or underpinned by loan linkages, are found to mitigate the likelihood of panics, emphasising the importance of relationship-building and trust for banking stability.

There is also recent evidence that retail fast payment systems, online banking and social media may aggravate bank runs. Fast retail payment systems, also known as instant payments, along with payment apps, allow depositors to make payments and transfers at any time and on any day, making it easy to remove funds from a deposit account. Bindseil and Senner (2023) argue that, as a result of their wider use, bank deposits may become less stable and more prone to runs. Instant payments were found to have played an important role in the runs on Silicon Valley Bank and Credit Suisse (Financial Stability Board, 2023). Benmelech et al. (2023) find that banks with large uninsured deposits attracted through digital banking experienced larger outflows in the first quarter of 2023 than those with traditional branches. Erel et al. (2023) also find that deposits taken through online banking tend to be less sticky than traditional deposits. Turning to social media, Cookson et al. (2023) find that during the period of the run on Silicon Valley Bank, banks that were in the top tercile of "Twitter exposure" before the run lost 6.6 percentage points more stock market value than those in the bottom tercile, an effect that could not be explained by mark-to-market losses and uninsured deposits alone. This study also finds that negative-sentiment tweets on specific banks were associated with greater outflows of uninsured deposits from those banks in the first quarter of 2023. Consistent with the idea that digitalisation and social media may have increased the speed of bank runs, Rose (2023) finds that the daily outflows of deposits during the runs of March 2023 were generally higher than in past runs, as already discussed and illustrated in Chart 1.

Competition for deposits interacts with financial fragility. Systemic expectational contagion across banks linked through competition for a pool of deposits can lead to potential instability (Matutes and Vives, 1996). Problems in one bank may spill over to others via competition for deposits, as shown by the examples seen in Portugal and Spain (Section 7.3.2 in Vives, 2016) and

in the United States (Egan et al., 2017) following the global financial crisis.[24] As a distressed bank may offer high interest rates on insured deposits, since the deposit insurance fund will bear the cost of failure,[25] rival banks may be forced to raise rates to compete with the distressed bank, negatively affecting their funding costs and risk profile.

Deposit insurance introduces a negative side effect, as it makes depositors' supply of funds more elastic to the interest rate, inducing banks to compete more aggressively for them (Matutes and Vives, 2000).[26] Imposing fair and risk-based deposit insurance premiums helps reduce banks' aggressiveness when setting deposit rates. However, the premiums charged in practice have commonly been insufficiently risk-based, as well as procyclical and punitive for sound institutions (i.e. the survivors after a crisis pay the bill, and healthier banks subsidise riskier ones). This means that the premiums may work in exactly the opposite direction to that intended. While pre-funded insurance schemes are by definition less procyclical, they may, when faced with a sufficiently severe crisis, also call on support (and have their funds replenished) from the surviving banks through extraordinary contributions.

Trust in deposit insurance and the banking system is key to banking stability. Brown et al. (2017) show that after the banking crisis in Cyprus in 2013, which involved a significant bail-in of depositors and capital controls limiting the access of all depositors to all accounts in Cyprus, households reallocated their savings away from bank deposits to cash. As the authors show, the "flight to cash" was equally strong regardless of whether households suffered a bail-in of deposits or of bonds, indicating that their loss of trust was largely determined by the experience of the crisis itself rather than the personal experience of a bail-in. One factor that may have further undermined households' trust in both the banking system and the deposit insurance scheme was that the initial proposal to resolve the crisis included a levy on all deposits (insured and uninsured), which was later rejected by the Cypriot Parliament (see further discussion in Michaelides, 2014).

To sum up, the risk of deposit runs is real, and prevailing guarantees (explicit or not) are not equivalent to fully credible de jure 100% deposit insurance coverage. During a run, formally insured and uninsured deposits behave differently. When bank solvency problems are widespread, depositors seek refuge in banks that, because of their size, systemic importance or other associated management and supervisory features, are less likely to fail or more likely to see their depositors fully protected in the event of failure. Formal deposit insurance is effective in making deposits attractive to investors and providing a stable base of "information-insensitive" funding for banks, providing greater stability of funding during a run. At the same time, as with any form of insurance, it may come at the cost of moral hazard. For banks this means excessive risk-taking, including in the form of willingness (and capacity) to compete more aggressively for deposits, especially when a bank is weak. This explains why, although deposit insurance schemes exist in many jurisdictions, most of them offer limited formal coverage (thus leaving it to uninsured depositors to exercise market discipline) and are accompanied by regulation and supervision

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[24] Egan et al. (2017) test a model related to that of Matutes and Vives (1996) with US bank data for 2002-2013 and confirm that systemic expectational contagion among banks linked through competition for a pool of deposits leads to multiple equilibria. Across equilibria, the survival probabilities of banks and deposit interest rates differ substantially.

[25] Using daily account-level data, Martin et al. (2024) find that banks are able to offset a large portion of the losses on uninsured deposits with insured deposits.

[26] In general terms, however, deposit insurance can be seen as beneficial for the banking system. This is because it makes deposits stickier and raises confidence in banks, thus limiting speculative attacks.

intended, among other things, to control the associated distortions in risk-taking incentives (Kareken and Wallace, 1978; Dewatripont and Tirole, 1994).

4   The interaction between the stability of bank funding and interest rate risk

This section discusses how the implicit natural interest rate hedge based on the deposit franchise can break down in the event of depositor runs. We will discuss trade-offs for different regulatory options.

Exposure to interest rate risk is a direct consequence of banks' involvement in maturity transformation. The effective yields that assets and liabilities earn or pay may not react to an equal extent or at the same speed to changes in reference interest rates, even if these assets and liabilities have a similar maturity structure. For example, if a bank has a portfolio of ten-year loans, the point at which reference interest rates increase the underlying value of those loans will differ depending on whether the loans pay (i) a frequently revised floating rate or (ii) a fixed rate until maturity or a relatively distant revision date.[27] Similarly, on the liabilities side, even if a bank relies heavily on short-term debt, the situation is very different depending on whether such debt (i) consists mainly of deposits with interest rates that tend to react little or only very gradually to increases in interest rates (and thus tend to remain significantly lower than market rates when interest rates increase) or (ii) consists mainly of commercial paper or certificates of deposit placed in a highly competitive market whose rates track reference rates more closely.

In banks with an excessively large unhedged position in long-term bonds, a rise in interest rates can lead to an increase in the probabilities of failure and illiquidity due to the decrease in the value of the bond portfolio and the rise in the cost of funding.[28] The effect will be reinforced by more flighty deposits (see, for example, Rochet and Vives, 2004). If a regulator wants to find the least costly way of keeping the probabilities of insolvency and illiquidity of a bank with such an exposure to interest rate risk below a target threshold, they will have to consider capital and liquidity requirements as being partially substitutable (Vives, 2014). While a decrease in bond values and more flighty deposits may call for an increase in the liquidity ratio and a decrease in the capital ratio, an increase in the remuneration of deposits may call for an increase in the capital ratio. In addition, an increase in disclosure or transparency may call for an increase in the liquidity buffer, since higher transparency of this kind plays a role in enabling depositors to carry out coordinated runs. The substitutability argument may therefore call for a reduction of the capital ratio.

The overall exposure to interest rate risk is modified by the off-balance sheet positions of each bank. On top of the sensitivity to market interest rates of the cash flows associated with the assets and liabilities that appear in a bank's balance sheet at a given point in time, banks often have exposures to interest rate derivatives that imply offsetting or augmenting changes in their cash flows when interest rates vary. These exposures and their implications for the overall

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[27]   What this means is that, other things being equal, floating-rate loans have a lower duration (meaning that their market value is less sensitive to interest rates) than fixed-rate loans.

[28]   See Jiang et al. (2023) for an estimate of the mark-to-market losses in the United States due to the recent monetary tightening.

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sensitivity to interest rates of banks' cash flow streams are not easy to gauge in standard accounting reports.[29]

The importance of the deposit franchise. In an influential paper Drechsler et al. (2021) argue, based on evidence for US banks over a long period, that the presence of a deposit franchise (i.e., banks' capacity to finance a part of their activities with deposits that pay interest rates that are lower and react significantly less than one-to-one with reference market rates) allows banks to effectively hedge against the impact of fluctuations in interest rates on the rest of their balance sheet. When deposit betas (the sensitivity of deposit rates to market rates) are lower than one, the intermediation margins earned on deposits (i.e. the differences between market rates and deposit rates) help offset potential declines in the intermediation margins earned on bank assets (i.e. the differences between the rates paid by those assets and market rates). The lower the deposit betas, the stronger these hedging effects.

Banks seem naturally hedged. Drechsler et al. (2021) find that the estimated beta of interest rate expense (0.34) is similar to the estimated beta of interest rate income (0.35), implying that banks are able to offset the interest rate risk of their assets with the interest rate risk of their liabilities, in spite of the maturity mismatch between aggregate bank assets (which have an estimated average maturity of 3.7 years) and aggregate bank liabilities (0.3 years). The study also finds that interest rate sensitivities of assets and liabilities are strongly correlated across banks, which suggests that they tend to adopt business models where their interest rate risk is to a large extent "naturally" hedged in normal times by matching the interest rate sensitivities of their assets and liabilities.

However, this implicit interest rate hedge is likely to break down at the worst possible moment. Individual banks or business models may fail to be effectively hedged against interest rate risk, as the bank failures witnessed in the United States in early 2023 clearly illustrate. These failures also show that the franchise and hedging value of deposit funding is vulnerable to any force that leads depositors to withdraw their funds or suddenly requires banks to pay much higher rates to roll over their deposits. Another specific challenge when interest rates rise (albeit normally operating at slower motion) is the emergence of competing products offering better yields (e.g. deposits at other banks or alternatives such as money market funds).

When the risk of runs materialises, the banks affected face the need to replace the fleeing deposit funding with more expensive funding sources or significantly increase their remuneration on deposits. Having to find alternative sources of funding in a rush presents a challenge in the event of fully fledged runs, since it is improbable that deposit withdrawals mainly motivated by fears about the solvency of the bank can be offset by simply offering a higher rate. From this perspective, interest rate risk and deposit run-off risk may be more closely connected than commonly thought, at least before the recent panics. There might therefore be a trade-off between interest rate and liquidity risk hedging (Drechsler et al., 2023). In times of rising interest rates, the outflow of depositors seeking higher yields (e.g. non-financial corporations that substitute deposits for money market funds or other alternatives when interest rates were low) can interact with fears about the viability of the banks and lead to an escalation of run incentives.

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[29] While this is information that bank supervisors would certainly like to have, the lack of transparency towards outside investors would be consistent with the view in Dang et al. (2017) that opaqueness contributes to banks' capacity to expand their supply of "information-insensitive" liabilities.

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The optimal prudential treatment of interest rate risk may interact with banks' funding structure. This raises the question of the prudential treatment of interest rate risk in the banking book from the perspective of a fundamentally solvent bank financed with demandable claims. The bank may become insolvent owing to the value-destroying effect of self-fulfilling bank runs. Suarez (2023) discusses the prudential regulatory treatment of interest rate risk in the banking book using a bank run model in the tradition of Diamond and Dybvig (1983) and introduces the concept of "supersolvency" to characterise the set of regulatory choices that could make banks solvent even under the hypothetical realisation of a run. Specifically, the analysis allows a comparison between (i) the set of regulatory choices according to which banks are fundamentally solvent but "fragile" (that is, vulnerable to self-fulfilling runs) in an adverse interest rate scenario, and (ii) the set of regulatory choices that would make them immune to runs. A fragile bank would be solvent in the absence of a run as it benefits from its deposit franchise over time but would become insolvent if a panic run led to it losing its deposits.

Different funding structures result in trade-offs relevant for the regulatory treatment of interest rate risk. The analysis in Suarez (2023) shows that the larger and more stable a bank's deposit franchise, the lower the minimum equity buffers required for it to remain solvent when interest rates spike unexpectedly. If the system can guarantee the stability of a greater fraction of deposits during crises (e.g. by extending the fraction covered by deposit insurance), the minimum capital that ensures that a bank is supersolvent declines. This means that authorities interested in preserving financial stability when confronting interest rate risk in the banking book face a trade-off between requiring more capital of banks and extending the coverage of the safety net on their deposits (or short-term liabilities more generally). The exact terms and optimal resolution of the trade-off would depend on cost-benefit considerations, such as the effect of guarantees on banks' temptation to shift risk and the distortions to competition for deposits and other short-term funding sources.[30] The net benefits of relying on deposit insurance are greater when the intermediation margins associated with deposits are large and when banks' access to outside equity funding is impaired or very costly.

Liquidity requirements are another important policy tool, but come at a cost. Imposing a requirement to hold a minimum proportion of highly liquid assets creates an immediate buffer so that banks can cope with outflows without the need to sell longer-term or less liquid assets. Additionally, a liquidity requirement ensures that banks hold a minimum proportion of assets which are not affected (or affected very little) by unexpected changes in interest rates. However, holding more liquidity reduces banks' expected net interest rate income and may result in a reduced capacity to accumulate loss-absorbing capacity. Thus, imposing higher liquidity requirements comes at a cost. It is also unclear whether liquidity requirements are superior to capital requirements as a prudential measure directed at guaranteeing banks' solvency in the face of interest rate risk. Overall, the relative effectiveness of these requirements will vary across business models and depending on the economic context. Liquidity (capital) requirements will tend to be superior when the expected term premium earned on long-term assets is small (large) and the

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[30] This calls for a comprehensive quantitative assessment of any reform proposal. If the extension of deposit insurance coverage entails a sizeable adverse ex ante effect on risk-taking, there will be less or even no room to accompany such a measure with a reduction in capital requirements without causing a net increase in bank failure risk.

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excess social cost of demanding that banks be funded with equity or equivalent loss-absorbing liabilities is large (small).

Altogether, this analysis suggests there is no simple, one-size-fits-all solution to the prudential regulation of interest rate risk in the banking book. The preferred prudential measure and its specific calibration depend on the value of a bank's deposit franchise, the stickiness of its deposits, the cost of increasing loss-absorbing capacity and the term premium earned on long-term assets. One potential approach to the problem that would offer the flexibility to cope with this heterogeneity would be to allow banks to choose their preferred combination of capital, liquidity and safety net coverage tools (e.g. by relying more or less on insured deposits for their funding), provided that they demonstrate their capacity to resist sufficiently adverse interest rate scenarios under their equilibrium choices. This solution points to a framework broadly consistent with treating interest rate risk in the banking book within Pillar 2 of the current microprudential framework, requiring banks to regularly prove their capacity to pass suitably designed interest rate variability stress tests. If a bank's capacity to withstand adverse interest rate scenarios is regarded as insufficient by the supervisor, enforcement action should follow to restore the required level of resilience. One possibility in line with current supervisory practice is for the supervisor to require the bank to immediately plan to cover the projected shortfall with additional capital (a mandatory buffer) and, if appropriate, subsequently take corrective measures (e.g. on distributions) similar to those already envisaged under current regulations when a buffer requirement is not met (e.g. the maximum distributable amount approach under Basel III).[31] Another option (albeit significantly more complex) is to request that the bank provides a plan to restore its resilience to interest rate risk through a combination of the above-mentioned tools (capital, liquidity and safety net coverage).

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[31] For further details on the current supervisory framework for interest rate risk in the banking book, see Basel Committee on Banking Supervision (2016).

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5   Policy discussion

The purpose of this section is to reflect on lessons learned from the recent episodes of bank fragility and their implications for regulation, supervisory practices and safety net provisions aimed at addressing structural funding vulnerabilities, especially in scenarios of elevated interest rate risk. We will draw on the discussion in the previous sections to inform the debate on different policy options.

The bank failures observed in March 2023 in the United States and Switzerland, as well as the subsequent response by authorities, highlight the importance of taking a holistic approach to addressing vulnerabilities associated with deposit funding and interest rate risk. Even under a well-developed set of regulatory requirements, proper risk management by the individual banks and prompt detection of trouble and corrective interventions by supervisors remain crucial for preventing disorderly failures triggered by deposit runs. As well as considering the contribution of, and interaction between, standard prudential tools such as capital and liquidity requirements, and setting up credible deposit insurance schemes and resolution frameworks, the holistic approach also means considering (i) ways for authorities to encourage earlier interventions in troubled banks (promoting their effective recovery before liquidation or resolution becomes the only way out) and (ii) alternatives to contain uninsured deposit withdrawals from those banks (which, in a world of digital banking and increasingly socially connected investors, can occur at an alarmingly higher speed than in the past, especially where the depositor base is concentrated).

The failures in 2023 revealed the idiosyncratic weaknesses of each of the banks affected. In the case of the large regional US banks that failed, imprudent exposure to interest rate risk in the context of a peculiar business model was compounded by (i) optimistic views on the size and speed of the uninsured deposit outflows that might occur in a phase of distress, (ii) a lack of supervisory oversight, and (iii) the failure of investors to effectively exercise market discipline until it was too late. Exempting these banks from Basel III liquidity and capital requirements and the resolution framework (which applied only to the largest institutions) was a costly mistake, as it meant they were subject to less stringent requirements and more cursory supervision in the run up to their crises.[32]

The case of Credit Suisse is different, even though its failure was triggered in the context of the turbulence caused by the failure of the US banks. Credit Suisse was designated a global systemically important bank and hence subject to the entire Basel III framework. It was known to have suffered management and asset quality problems dating back to well before March 2023, but its supervisors were not effective in enforcing recovery until it was too late. Its failure exposed the trade-offs with which authorities are confronted when such a large bank gets into trouble (Lengwiler and Weder di Mauro, 2023). Concerns about triggering a run led to a long period of inaction in the

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[32]   There is controversy as to whether Silicon Valley Bank would have complied with the reduced domestic liquidity coverage ratio requirement in the period leading up to its run (Nelson, 2023; Feldberg, 2023). Based on liquidity data reported by the bank itself, it would have failed to comply with the fully fledged LCR ratio provided for in the Basel standards, and would have only complied with the reduced liquidity coverage ratio requirement (multiplying the required amount of liquid assets by 70%, in line with its status as a Category IV firm in the US regulatory framework) – although an internal stress test run in the third quarter of 2022 revealed that the bank did not have a sufficient balance of highly liquid assets that could be readily sold or "monetized" (Board of Governors of the Federal Reserve System, 2023).

hope of a less traumatic solution. Although Credit Suisse had convertible capital that the Swiss Financial Market Supervisory Authority (FINMA) could have used preventively, FINMA hesitated to activate it until the run in March 2023 prompted the enactment of an explicit emergency legislative support for the required action.[33]

The experience suggests that stricter regulations and supervisory practices in the treatment of interest rate risk in the banking book helped to maintain trust in EU banks during the March 2023 episodes and their aftermath. Deposit outflows among EU banks were not abnormally high or worrying.[34] That said, uncertainty about the macroeconomic outlook poses challenges for all banks, although the impact of any new episode would probably vary quite considerably.

An additional consideration relates to the benefits of a supervisory response to early signs of distress, as shown by the savings and loans crisis in the United States. The banks that failed in March 2023 may have been fundamentally insolvent at the time their runs occurred. However, there is widespread agreement that more timely supervisory intervention would have been beneficial. In particular, it would have helped to contain losses and prevent the messy collapses that raised fears of system-wide panic and pushed authorities into taking support measures such as temporarily extending blanket guarantees on bank deposits (Admati et al., 2023).[35] The problems witnessed in the US banking industry in March 2023 had elements in common with the savings and loans crisis of the 1980s. On that occasion, an incorrect supervisory response exacerbated the crisis and added to its final cost.[36] Owing to the increase in interest rates during the 1970s, the market value of the assets of savings and loans institutions (mainly long-term mortgages) declined dramatically, making the net worth of the whole sector negative. US supervisory authorities then decided to take deregulatory action, including (i) encouraging solvent institutions to absorb insolvent institutions by removing the depreciation requirement for goodwill, (ii) removing the cap on deposit rates, and (iii) increasing deposit insurance, so that savings and loans institutions entered a race to attract deposits by offering above-market interest rates. However, the loans on the assets side of the balance sheet did not generate enough profits to compensate for the expenses from deposits. As a result, a few years later the sector collapsed, imposing higher losses on taxpayers than would have been the case had the troubled institutions been resolved in good time.

At present, supervisors have few tools to use if uninsured deposit withdrawals from a viable bank escalate. Depending on the scale of latent banking book losses, even banks with a valuable deposit franchise and a viable business model may suffer a run that threatens their survival. Activating ad hoc extended guarantees as a measure of last resort (as US authorities did) may contain contagion but raises significant concerns in terms of moral hazard. Alternatives would include acting pre-emptively via bank recovery tools such as early recapitalisation based on

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[33] See Martino and Perotti (2024) for a description of the elements that meant the features of contingent convertible bonds in the Swiss framework added flexibility relative to the EU framework for conversion.

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

[35] This was the case even though decisions conducive to these bailouts were taken according to the governance arrangements in the US framework.

[36] See, for example, Shoven et al. (1992) and Moysich (1997).

contingent convertible debt. Additionally, it might be worth considering whether there would be alternative ways to reduce uninsured deposit withdrawals in periods of distress.

In the rest of this section, we review an extensive list of options, paying specific attention to (i) their likely effect on the allocation of potential losses across agents, (ii) their implications for risk-taking, (iii) their effectiveness in reducing bank funding fragility, and (iv) their likely impact on the cost of intermediation. We also consider the main challenges to the implementation of the different options, as well as their credibility and complexity. Simple and transparent policy measures help limit regulatory arbitrage and ambiguity.[37] We recognise that no single solution stands out, and that the different tools and institutions considered below interact with one another (Vives, 2014, 2016). As such, they should be considered jointly rather than on a stand-alone basis. For example, capital and liquidity requirements are partially substitutable, and prudential regulation should not be set independently of financial reporting standards (e.g. mark-to-market accounting). In addition, as previously discussed, factors such as the stability of the deposit franchise and the coverage of the deposit insurance scheme make a difference to the capital and liquidity requirements necessary to contain the risk of runs.

In setting out the range of possible policy options, some which are mutually exclusive, we group them into two lists of categories. The first list contains categories with policy options that could be implemented by fine-tuning existing regulation and supervision. The second contains categories with policies whose implementation would entail a major structural change to the financial system. These policy options are the following:

Policy options entailing a fine-tuning of existing regulation and supervision:

1. Improvements to the supervision of bank liquidity and funding positions (e.g. increasing the frequency of monitoring of banks found to be more vulnerable to runs);

2. Amendments to liquidity requirements (particularly concerning the run-off rates of uninsured deposits);

3. Amendments to capital requirements (e.g. concerning the level of requirements or treatment of interest rate risk in the banking book);

4. Amendments to the pricing of deposit insurance (e.g. making it more risk-based);

5. Increasing going concern recapitalisation capacity (e.g. enabling early recapitalisation through timely conversion or write-down of contingent convertible debt).

Policy options entailing a major structural change to the financial system:

6. Narrow banking;

7. Pre-positioning of collateral at the central bank;

8. Tightening convertibility conditions for uninsured deposits (e.g. charges or gates);

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[37] For a broader discussion on the contribution of regulatory complexity to systemic risk, see Gai et al. (2019) and Cecchetti and Schoenholz (2023).

9. Extending deposit insurance coverage (e.g. to cover larger balances from all or specific classes of depositors).

10. Extending mark-to-market accounting to broader asset classes in the banking book.

5.1. Policy options entailing a fine-tuning of existing regulation and supervision

Since March 2023, EU supervisory authorities have stepped up their work in the area of bank funding and liquidity. European banking supervision decided to start collecting liquidity information weekly on an ad-hoc basis (Enria, 2023), and some national authorities are even requesting it daily. The SSM supervisory priorities for 2024-2026 focus, among others, on strengthening the resilience of banks to macroeconomic shocks by ensuring that liquidity, funding and interest rate risks are covered.[38] In January 2024 the EBA published the findings of its assessment of interest rate risk in the banking book, identifying priority areas for the short, medium and long term.[39]

In addition to the increased intensity of supervisory work, we discuss five policy options that would entail relatively minor amendments to the existing regulatory framework and address similar situations to those witnessed in March 2023. As mentioned earlier, they are presented as a contribution on the basis of the academic and policy reflections of the report's authors and do not necessarily represent wider views within the ESRB or an indication of the official stance of the ESRB on any of the matters covered.

Improvements to the supervision of bank liquidity and funding positions

The bank runs in the United States in March 2023 provided evidence of the increased speed with which deposits can move across banks and the role of social media and fast payments in accelerating these runs. In these circumstances, regulatory and supervisory authorities may have little time to react. Timely intervention would require increased frequency of reporting and, possibly, new supervisory powers to intervene ahead of run escalations. Under existing bank regulation in the EU, authorities have powers to intervene early in distressed banks. These powers (including changes to the bank's business strategy, preventive measures, activation of a recovery plan and other early intervention measures, and options such as precautionary recapitalisations) will be reinforced by the proposed crisis management and deposit insurance (CMDI) package. The real challenge will therefore be to ensure these powers are used on a timely basis and with enough legal certainty when needed.

The supervisory reporting framework in the EU requires information on the liquidity position of banks to be submitted monthly, with the possibility for the microprudential supervisor to

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[38] See **ECB Banking Supervision: SSM supervisory priorities for 2024-2026**.

[39] See European Banking Authority (2024).

increase the reporting frequency on an ad hoc basis.[40] By contrast, in the United States, bank deposit data from a sample of 850 banks (representing around 90% of total bank assets in the United States) are published in aggregated form on a weekly basis,[41] suggesting the existence of an underlying supervisory reporting system with at least weekly frequency. [42]

Monthly regular supervisory reporting of liquidity positions in the EU may not enable authorities to assess deposit outflow risk in the cross-section of banks under their supervision and react appropriately. Increasing the frequency of the regular reporting of core information on bank deposits to microprudential authorities so that it is carried out on a weekly basis would therefore be a welcome measure.[43] In addition, supervisory reporting does not currently include uninsured deposits for all banks on a monthly basis, as small banks, i.e. "small and non-complex institutions" as defined by the Capital Requirements Regulation (CRR),[44] are excluded from reporting EBA template C68.00 (additional monitoring metrics).[45]

Amending the supervisory reporting framework to provide clearer information on the structure of banks' deposit funding (and in particular to implement regular weekly reporting for the largest banks and further granularity on the concentration of funding by business sector) would be a welcome development in this area. However, disclosure of this information to the public would probably be counterproductive (as in the case of Silicon Valley Bank, whose depositors could easily see the bank's steady losses on a weekly basis) and should not be the primary objective of this measure. Instead, it would be best if public disclosure of the information collected were carried out on an aggregated basis or with a substantial delay.

Besides, it is worth noting that while Silicon Valley Bank and Credit Suisse were already reporting their rising losses in the banking book before the end of 2022, their last published capital ratios remained above the regulatory minimum levels when they failed. Crucially, the unrealised losses from their debt securities measured at amortised cost were not reflected in the numerator of their capital ratios. In addition, the combination of loss disclosure and insufficient buffers contributed to coordinate uninsured depositors to run.[46] Lengwiler and Weder di Mauro (2023) argue that the measured capital levels of Credit Suisse did not properly reflect the proximity of its failure. According to the Swiss FINMA (2023), Credit Suisse clearly met the regulatory requirements for capital adequacy and leverage at a consolidated level.[47] Cecchetti and Schoenholtz (2023) consider that the holding of debt securities at amortised cost for the

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[40]   See Commission Implementing Regulation (EU) No 680/2014 of 16 April 2014 laying down implementing technical standards with regard to supervisory reporting of institutions according to Regulation (EU) No 575/2013 of the European Parliament and of the Council Text with EEA relevance (OJ L 191, 28.6.2014, p. 1).

[41]   See **the Board of Governors of the Federal Reserve System's H.8 release entitled "Assets and Liabilities of Commercial Banks in the United States**.

[42]   The Federal Reserve's H.8 release mentioned above is based on data reported by the 25 largest banks and a sample of other banks.

[43]   Banks in the Single Supervisory Mechanism have been reporting liquidity information on a weekly basis since September 2023, as decided on an ad-hoc basis (see Enria, 2023).

[44]   **Regulation (EU) No 575/2013 of the European Parliament and of the Council of 26 June 2013 on prudential requirements for credit institutions and amending Regulation (EU) No 648/2012 (OJ L 176, 27.6.2013, p. 1).**

[45]   The relevant reporting templates for additional monitoring metrics are available **here**, while further information regarding the framework can be found **here** and **here**. Meanwhile, the templates for the liquidity coverage ratio are available **here**, with methodological information provided in **Annex 25 of the ITS on supervisory reporting**.

[46]   As discussed in Section 2 and formalised in Vives (2014).

[47]   At the end of 2022, Credit Suisse reported a capital ratio of 14.1% CET1, a going concern capital ratio of 19.9% and a going concern leverage ratio of 7.7%.

computation of capital requirements played a part in temporarily hiding the solvency issues affecting the failed US banks.[48]

These findings suggest there is a need to incorporate market-based information into the (confidential) supervisory assessment of banks. This would complement the existing framework, which continue measuring some assets and liabilities at amortised cost.

Finally it is important to consider the interaction between liquidity and capital requirements, since these are partially substitutable tools. For example, if the supervisory review and evaluation process (SREP) found there to be fragility in funding, it would call for more liquidity than that prescribed according to the liquidity coverage ratio (LCR) requirement, as interest rate risk in the banking book belongs to the capital block of Pillar 2. Therefore, a deficit in the latter may call for an increased Pillar 2 capital requirement. However, funding fragility and interest rate risk in the banking book are related and, to control the probabilities of insolvency and illiquidity in the least costly way, the interaction between regulatory instruments should be considered, as discussed in Section 4. This calls for an integrated assessment of the risks faced by the institution as well as the regulatory instruments to deal with them. A final point concerns the frequency with which information is disclosed to market participants, as official public signals may become focal points and lead to a coordinated response by depositors, potentially raising the likelihood of runs.

Amendments to liquidity requirements

A distinguishing factor of the banking turmoil in March 2023 affecting mid-sized banks in the United States was the speed at which uninsured deposits were withdrawn.[49] In a single day, Silicon Valley Bank lost 25% of its deposits while Signature Bank lost 20%, something not seen in previous bank runs. Designing liquidity requirements able to withstand similar deposit withdrawals would take the system close to the extreme concept of narrow banking. However, amendments recalibrating the uninsured deposit outflows that banks should be able to withstand without assistance might help contain smaller-scale distress (e.g. similar to that experienced by First Republic; Chart 11), buying additional time for bank management and authorities to react.[50]
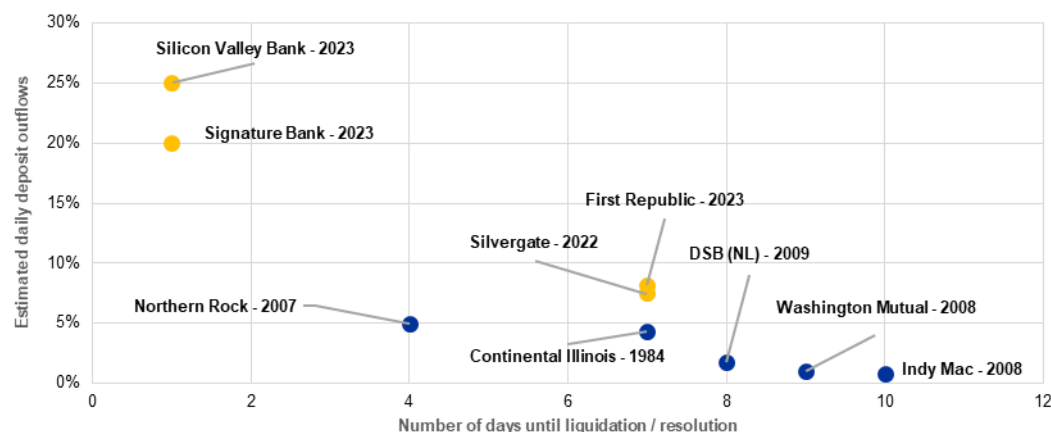
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48   See also Admati et al. (2023).

49   Credit Suisse lost 38% of its deposits in the last quarter of 2022 (see Admati et al., 2023), resembling a "slow motion" run by comparison.

50   This is consistent with the view of liquidity requirements taken in Santos and Suarez (2019).

Chart 11

Deposit outflows in selected bank runs

(percentages)

Sources: For US banks, Rose (2015 and 2023); for Northern Rock, HM Treasury (2009); for DSB, annual statements in the **Financial Report 2009** and Pruyt and Hamarat (2010).
Note: The estimated daily outflow of deposits is computed as the total outflow of deposits divided by the total number of days the run lasted.

The striking speed of the runs observed in March 2023 calls for an amendment of the way the risk of deposit outflows is considered in the computation of the LCR, especially for uninsured deposits.[51] The current prudential liquidity requirements, namely the LCR and the net stable funding ratio (NSFR), were proposed in the aftermath of the global financial crisis as part of the Basel III package. When calibrating them the Basel Committee on Banking Supervision looked at the evidence at the time on the "runnability" of the different sources of bank funding. Currently, the LCR is computed assuming outflow rates of 3% and 10% for stable (i.e. insured) and less stable (i.e. uninsured) household deposits respectively over a period of 30 days. Outflow rates for corporate deposits range from 5% (operational insured wholesale deposits) to 40% (non-operational uninsured wholesale deposits). While the LCR is not designed to cover all tail events, including bank runs, the greater speed with which liquidity stress has unfolded recently suggests that these outflow assumptions should be revised.

In addition, supervisors might also consider the fragility associated with the concentration of funding counterparts and whether quantitative concentration limits should be defined. One of the distinguishing features of Silicon Valley Bank was that its depositor base was quite small and concentrated. The sharing of information among a few very large depositors had a multiplying effect when the run started. In view of the vulnerability that resulted from this situation, regulators and supervisors could consider introducing concentration limits on the funding side, specifically for uninsured deposits or similarly flighty liabilities, similarly to the large exposures regime applied on

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[51]   See also Acharya et al. (2024).

the asset side.[52] These quantitative limits could, for example, refer to the overall share of uninsured deposits or the share of the top ten largest short-term funding counterparties.

Another way to improve or reinforce the liquidity requirements could be to require that all debt securities qualifying as liquid assets be measured at fair value in the financial statements. For the calculation of the LCR, all assets qualified as liquid are measured at fair value. However, in their financial statements, banks are allowed to measure liquid assets at amortised cost. While this would not affect the LCR calculation, it seems illogical to classify some securities as "held-to-maturity" for accounting purposes and at the same time consider them as available to cover sudden liquidity needs for prudential purposes.[53] However, one can also argue that, according to prudential regulation, securities qualifying as liquid assets do not necessarily need to be sold, as they can be used in repo transactions.[54]

Amendments to capital requirements

It is obvious that higher capital buffers increase bank resilience in the face of a sudden materialisation of various risks, but there are trade-offs. Recent reassessments of the risks associated with uninsured deposit funding and fluctuations in nominal interest rates (and the interaction between them) call for banks to be even better capitalised than under the full and faithful implementation of the latest Basel III standards (see, for instance, Cecchetti and Schoenholtz, 2023; Admati and Hellwig, 2024). This view is consistent with higher minimum benchmark requirements or regulatory buffers, either in terms of capital ratios (i.e. according to the usual risk-weighted assets metric), or in terms of leverage ratios (i.e. on an unweighted basis).

However, a one-size-fits-all solution is not optimal, because the ratio necessary to protect the most vulnerable banks may be excessively high for (and unduly penalise) the more cautious funding strategy of those which are less vulnerable. The Basel III framework is explicitly risk-based and, as discussed in Section 4, to address bank funding fragility and interest rate risk in the banking book we need to take into account heterogeneity in funding structures that cannot be summarised solely in the simple ratio of capital to assets (or to risk-weighted assets). Factors that influence a bank's funding fragility for any given capital or leverage ratio include (i) the insured and uninsured fractions of deposits, (ii) the features of the deposit insurance scheme, (iii) contractual features and investor characteristics affecting the stability of deposit balances, (iv) the sensitivity of deposit flows to interest rates, and (v) the effect news or rumours can have on banks' financial health.

The view that a one-size-fits-all solution is not optimal is consistent with the way interest rate risk in the banking book is currently addressed under Pillar 2. Specifically, banks' capacity to resist sudden movements in interest rates is assessed in the regular SREP using a stress test methodology. Supervisors take into account the results of the underlying scenario analysis to decide the size of the Pillar 2 requirement. In doing so, they may complementarily also address perceptions of capital weaknesses stemming from this and other risks by following Pillar 2

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[52] For further details on the large exposures framework in Basel III, see Financial Stability Institute (2022).

[53] Section 5.2 discusses the pros and cons of moving to a balance sheet fully measured at market prices in greater detail.

[54] This would prevent any crystallisation of unrealised losses on securities accounted for as "held to maturity".

guidance, which takes the form of recommendations (or "supervisory expectations") on capital levels.

In addition to ensuring full and faithful implementation of the whole Basel III framework, there may be room for a more explicit and dedicated treatment of interest rate risk in the banking book or funding fragility risks in Pillar 2.[55] Reaching global consensus on the proper way to codify any new element of Pillar 1 may be much more difficult than improving the treatment of these risks in Pillar 2 in Europe.[56] The latter could entail having separate and perhaps methodologically more transparent blocks for these risks within the SREP, and having explicit and unbounded components of the Pillar 2 requirement associated with them. One policy option that would bring the Pillar 2 treatment closer to Pillar 1 would be to establish a more direct link between the results of regular interest rate risk-specific stress tests and corrective actions (e.g. in the form of capital and liquidity planning and potential restrictions on the maximum distributable amount). This more direct link would ensure the restoration of each banks' capacity to withstand sudden movements in interest rates.[57]

Amendments to the pricing of deposit insurance

Discussions about the pricing of deposit insurance typically combine two perspectives: funding and incentive.[58] From a funding perspective, deposit insurance fees are seen mainly as one of the instruments deposit insurance schemes use to finance their activity. Actuarially fair deposit insurance premia would allow a scheme to cover, on an expected and properly discounted basis, the payments it would have to make to insured depositors if a bank failed, plus any relevant operating costs.

From an incentive perspective, deposit insurance fees can influence banks' incentives to raise insured deposits and, if risk-based, can also influence the accompanying risk-taking decisions of the bank (such as its leverage or the risk profile of its lending). Under ideal informational conditions, risk-based deposit insurance fees might be a perfect substitute for the market discipline lost when a deposit is fully insured, mimicking the risk premia that hypothetical uninsured depositors would require. The key issue from this perspective is the extent to which the premium properly prices bank risk-taking at the margin. In the presence of externalities, such pricing might need to include not just the marginal direct cost of the insured deposits to the deposit insurance scheme but also any relevant externality caused by the exacerbation of the risk of contagion or any negative contribution to financial stability, thus granting a macroprudential dimension to the pricing of deposit insurance.

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[55] See also International Monetary Fund (2023) and Acharya et al. (2024).

[56] However, the proposal by several supervisory agencies in the United States to raise capital requirements for banks may signal a change in the way international capital standards are applied in the United States, in turn facilitating further discussions at a global level.

[57] See also Acharya et al. (2024).

[58] Early academic references to deposit insurance pricing include those in Merton (1977), Pennacchi (1987), and Allen and Saunders (1993). After the initial focus on the characterisation of actuarially fair premia, other studies argued that fair pricing may not be feasible (Chan et al., 1992) or even not necessary or sufficient for efficiency (Matutes and Vives, 2000; Dávila and Goldstein, 2023). For a review adopting a policy perspective, see Hoelscher et al. (2006).

Flat deposit insurance fees (which have historically been the norm, but have been replaced in the EU by risk-based fees) can be actuarially fair "on average" but not on a bank-by-bank basis, as they fail to reflect cross-sectional heterogeneity in bank risk, and will never properly price risk at the margin (as this would require fees to be explicitly contingent on bank-level indicators of each bank's risk profile). However, pursuing deposit insurance fees that are on average at least as high as the actuarially fair fees seems a reasonable objective. When this condition is not met, the deposit insurance scheme is underfunded and banks may receive an implicit subsidy to insured deposit taking, which may engender further distortions such as excessively large banks and, indirectly, excessive intermediation or subsidised lending.

However, since most major bank failures typically occur around infrequent banking crises, deposit insurance fees collected during normal times may appear sufficient and make deposit insurance funds grow beyond a size that is "actuarially fair" according to short-term calculations. In some cases, fees have been reduced after a long period of calm, with the explanation that the deposit insurance system was over-funded. Typically, however, as soon as the next banking crisis comes along, it turns out that the opposite was true. A common reaction is then to increase the fees levied on the surviving banks, which is not only "actuarially unfair" but also inadequate from the point of view of incentivising prudence during normal times and is clearly procyclical. It would therefore appear logical to guarantee that deposit insurance premia are at the very least "actuarially fair", under proper accounting of the probability of a severe banking crisis. In addition, even if there is a possibility that a deposit insurance fund might reach a certain target size, participants in the scheme should still continue to be charged sufficiently high fees.[59]

Implementing risk-based deposit insurance pricing is more challenging given the informational and enforceability issues that limit the capacity of regulatory formulae to capture the relevant dimensions of risk without making the system overly complex, dependent on internal models and/or potentially vulnerable to manipulation and regulatory arbitrage. This is the context in which, after the devastating experience of the savings and loans crisis in the late 1980s, the US authorities established that the Federal Deposit Insurance Corporation (FDIC) would charge risk-based deposit insurance premia in the form of fees varying across banks according to a system of supervisory ratings known as the CAMELS ratings.[60]

Currently, EU banks pay a (risk-based) levy into a national deposit guarantee scheme every year and deposit guarantee schemes ensure that money remains available if there is a need to protect deposits in the event of a bank failure.[61] In the EU, Directive 2014/49/EU requires banks' contributions to deposit guarantee schemes to be based on the amount of covered deposits and the degree of risk incurred by each member institution.[62] More recently, the EBA published revised guidelines for the calculation of the contributions to deposit guarantee schemes (European

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[59] That being said, a simulation of payout needs shows that a deposit guarantee scheme would hardly be in a position to cover every payout from the scheme without a significant increase in its available financial means (Eule et al., 2022). Therefore, if deposit guarantee scheme premia were to be calibrated in order to cover any possible payout need, this would entail a significant change to the existing framework.

[60] See **the Deposit Insurance Assessments page of the FDIC's website** for a description of the current assessments (fees per dollar of deposits) that the FDIC charges to US banks.

[61] See also Laeven (2013).

[62] **Directive 2014/49/EU of the European Parliament and of the Council of 16 April 2014 on deposit guarantee schemes (OJ L 173, 12.6.2014, p. 149).**

Banking Authority, 2023a).[63] According to these, a bank's contribution in a given period should be a function of the amount of deposits covered, adjusted by the risk posed by the institution (measured by an aggregate risk weight). The EBA guidelines identify five risk categories for computing the aggregate risk weight (capital, liquidity and funding, asset quality, business model and management, and potential losses for the deposit guarantee scheme), with specific indicators for each risk category (Table 1). At the same time they grant enough flexibility to national authorities to use additional indicators. indicators of risks arising from money laundering, poor governance and poor quality of single-customer-view files.

Table 1

Core indicators for computing the contribution to EU deposit guarantee schemes

Indicator name	Formula/description	Sign	Minimum weight
1. Capital			20%
1.1. Leverage ratio	Leverage ratio as stated in Article 429 of Regulation (EU) No 575/2013	(-) A higher value indicates lower risk	10%
1.2.a. Common Equity Tier 1 ratio (CET1 ratio)	CET1 ratio as stated in Article 92(2) of Regulation (EU) No 575/2013	(-) A higher value indicates lower risk	10%
1.2.b. Capital coverage ratio	Actual CET1 ratio/required CET1 ratio or Actual own funds/required own funds	(-) A higher value indicates lower risk	
2. Liquidity and funding			15%
2.1. LCR	LCR as stated in Article 412 of Regulation (EU) No 575/2013	(-) A higher value indicates lower risk	5%
2.2. NSFR	NSFR as defined in Article 428a-428az of Regulation (EU) No 575/2013	(-) A higher value indicates lower risk	10%
3. Asset quality			12.5%
3.1. Non-performing loans ratio (NPL ratio)	NPL ratio as specified in Article 11(2) sub-paragraph (g) point (ii) of Commission Implementing Regulation (EU) 2021/45114[64]	(+) A higher value indicates higher risk	12.5%
4. Business model and management			15%
4.1. Total risk exposure amount (TREA)/total assets ratio	TREA / total assets	(+) A higher value indicates higher risk	5%
4.2. Return on assets (RoA)	Net income/total assets Deposit guarantee schemes should calculate the RoA as an average over at least two years to avoid including one-off events and to avoid procyclicality in contributions	(-) / (+) Generally, a higher value indicates lower risk, but values that are too high can also indicate higher risk	10%

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[63] Directive 2014/49/EU enshrines the principle of risk-based contributions to deposit insurance schemes and gives the EBA a mandate to issue guidelines on specify methods for calculating the contributions to deposit guarantee schemes. The EBA issued these guidelines in September 2015 and they had to be implemented by 31 May 2016 (European Banking Authority, 2015). They already set out risk-based criteria for the contributions to deposit guarantee schemes. Directive 2014/49/EU further requires the EBA to conduct a review of these guidelines every five years.

[64] **Commission Implementing Regulation (EU) 2021/451 of 17 December 2020 laying down implementing technical standards for the application of Regulation (EU) No 575/2013 of the European Parliament and of the Council with regard to supervisory reporting of institutions and repealing Implementing Regulation (EU) No 680/2014 (OJ L 97, 19.3.2021, p. 1).**

Indicator name	Formula/description	Sign	Minimum weight
5. Potential losses for the deposit guarantee schemes			12.5%
5.1. Covered deposits/ unencumbered assets	Covered deposits/unencumbered assets	(+) A higher value indicates higher risk	12.5%

Source: European Banking Authority (2023a).

Following their successful implementation across the EU and the experience gained over the first few years, the EBA guidelines may undergo limited enhancements.[65] For example, banks with higher shares of uninsured deposits (which could be more prone to runs) could be required to pay more per insured euro into the deposit guarantee scheme or they could be asked to pre-position central bank collateral.[66] Indicators considered in the assessment could also be expanded to capture the contribution of each bank to systemic risk, for example using the SRISK indicator proposed by Acharya et al. (2010). This would capture the cost that a bank's failure would cause to the whole banking system as a result of its size, interconnectedness or correlated exposures. However, having more indicators means that each of them contributes less to the adjustment of the deposit guarantee fees. Therefore, it could be beneficial to keep a relatively short list of indicators rather than a long, abstractly developed one. Additionally, the use of specific features contributing to effective risk adjustment could be considered, such as a stock-based calculation (currently an option under the EBA guidelines). It may also be worth considering whether to complete the market for deposit insurance by enabling banks to opt for expanded coverage to specific categories of deposits (for example those held by non-financial corporations for operational purposes) by the payment of a differentiated fee; this is already in place in some jurisdictions.

Increasing going concern recapitalisation capacity

In all cases of bank distress during 2023, delays in supervisory intervention led to forbearance over poor capitalisation and weak risk controls, resulting in even larger losses.[67] One of the aims of reforming the recovery and resolution framework could be to achieve a smoother resolution process on bank default while ensuring efficient recovery proceedings.[68] This would mean ensuring that supervisors were better able to intervene in distressed banks in a timely fashion.

The resolution framework in the EU is still not fully operational at present, nor has it proved effective in containing bailouts when banks fail (see Dewatripont et al., 2021; Acharya et al., 2024).[69] Few banks have been resolved, and in most cases alternative solutions, such as

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[65]   The revised EBA guidelines are expected to enter into force in July 2024.

[66]   Pre-positioning means that potential borrowers post eligible securities in advance and the central bank then has time to determine the collateral's value and assign a haircut.

[67]   For further details, see Acharya at al. (2024).

[68]   In some rare cases, however, authorities may prefer resolution over recovery.

[69]   For the latest assessment of the resolvability of EU banks, see Single Resolution Board (2023).

insolvency proceedings involving funds from deposit guarantee schemes or precautionary recapitalisation by the government,[70] have been used.[71] Alongside a robust resolution framework, timely intervention to facilitate going concern recovery and prevent distress is also crucial. Offering new powers to supervisors to intervene in a timely fashion in weak but potentially viable banks may prevent subsequent runs (when the situation of a weak bank further deteriorates and becomes evident). The analysis in Section 3 suggests that the criteria for assessing whether weak banks are viable (determining whether a weak bank moves to resolution, if it is not viable, or to recovery) should include a valuation of its deposit franchise, together with the overall sustainability of its business model.

In addition to standard liquidity support, contingent convertible debt (CoCo bonds) were introduced to respond early to the solvency concerns that drive most episodes of abnormally high deposit withdrawals, but they do not seem to be working as intended. One of the main recovery options under Basel III, CoCo bonds were intended to ensure going concern deleveraging, alleviating solvency concerns ahead of runs. CoCo bonds enable capital to be raised in times of stress when other options are impossible, either owing to unfavourable market conditions or because the other options are unattractive to shareholders (Pazarbasioglu et al., 2011).[72] Some evidence on the market values of EU CoCo bonds and subordinated debt credit default swap spreads suggests that the investors perception of CoCo bonds as going concern capital is diminishing (Fiordelisi et al., 2020), or do not perceive them as a credible measure (Neuberg et al., 2018).[73] Goncharenko et al. (2021) discuss how CoCo bonds affect riskier banks' incentives to issue new equity, as their conversion to equity would distribute losses among CoCo investors too. Allen and Golfari (2023) report that recent CoCo issues have conversion ratios of zero, as they are set to absorb losses through principal write-downs, and do not mitigate risk-taking by banks. Not a single EU CoCo bond has ever been converted except in the case of insolvency, nor has any coupon been suspended (Glasserman and Perotti, 2017).

There are marked differences in the way authorities around the world have incorporated CoCo bonds into their toolkits. In the United States, banks usually issue preferred shares, which are recognised as Additional Tier 1 (AT1) instruments, since the early 1990s in response to the savings and loans crisis.[74] US banks have therefore not issued any CoCo bonds (Glasserman and Perotti, 2017). By contrast, in the EU, banks issue CoCo bonds as AT1 instruments, which, depending on their design, may absorb losses or be fully or partially converted into equity.[75] The Swiss authorities were among those that adopted CoCo bonds most forcefully, introducing a discretionary trigger based on a "viability event", in particular if extraordinary government support is granted.[76] This trigger was activated in 2023 when Credit Suisse was granted extraordinary liquidity

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[70] For further details, see European Commission (2023b).

[71] This may be due to the complexity of applying resolution to small and medium-sized banks that turn out to be too big to liquidate.

[72] In normal conditions, capital is the best form of loss-absorbing capacity and the most appropriate tool for safeguarding and improving the stability of banks (Deutsche Bundesbank, 2018).

[73] Lindstrom and Osborne (2020) provide evidence pointing to a more positive assessment, showing that the level and risk sensitivity of spreads on senior bail-in bonds are higher than those of comparable non-bail-in bonds.

[74] Preferred shares and CoCos are the main financial instruments included in AT1 capital. For further information on the characteristics of AT1 instruments, see Basel Committee on Banking Supervision (2020).

[75] For a description of the main features of AT1 instruments across world jurisdictions, see Coelho et at. (2023).

[76] See **FINMA's press release of 23 March 2023, "FINMA provides information about the basis for writing down AT1 capital instruments"**.

assistance loans secured by a federal default guarantee and when the merger of Credit Suisse with UBS was arranged.[77] In the EU, meanwhile, CoCo conversion mostly relies on a book equity trigger, usually set by CoCo issuers at a very low level (most often at a CET1 to risk-weighted assets ratio of 7%, compared with the minimum regulatory level of 5.125%).[78] In practice this means that conversion would be triggered when the bank was already insolvent.

A more robust implementation of CoCo bonds would restore supervisory credibility for preventive intervention and have a disciplining effect on risk creation. Credible intervention to reduce leverage could alleviate concerns about undercapitalised banks and restrict risk incentives (Martynova and Perotti, 2017; Perotti, 2023). Avdjiev et al. (2020) find that CoCo bonds have the strongest strengthening effect on bank balance sheets when they absorb losses by converting to equity and have a mechanical trigger. Activating the conversion of CoCo bonds by means of a regulatory trigger after a thorough stress test, a higher trigger based on risk-weighted assets or a trigger determined by market prices could therefore increase their usefulness during episodes of banking stress (see also Calomiris and Herring, 2013).

One major concern is that authorities may still be reluctant to force timely debt conversion (or even simple coupon suspension) for fear of triggering runs by uninsured depositors. A credible recovery policy would thus work best in combination with measures to contain run incentives, such as contingent charges on uninsured outflows or enhanced liquidity backstops.

5.2. Policy options entailing a major structural change to the financial system

The discussion of the pros and cons of the policy options below does not represent a formal assessment or endorsement of the options by the ESRB. These policy options have emerged or re-emerged, mostly in the academic domain, following the banking turmoil in March 2023 and are discussed to foster a longer-term debate on alternatives that would entail a major structural change to the financial system, probably resulting in the transfer of risks from banks to less regulated parts of the financial system. Consequently, any policy step in their direction should be supported by a careful technical assessment, including both theoretical and empirical ex ante analyses, to accurately weigh up the costs and benefits of each option. These cost-benefit analyses should be approached in a comprehensive manner. In particular, they should additionally take into account the implications of a major departure from the current regulatory environment and how it could benefit or hamper financial stability. We also note that in some cases there is a lack of consensus in the academic literature on these policy options. As in Section 5.1 the assessments contained in this section provide no indication of the official stance of the ESRB on any of the matters covered.

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[77] See Bolton et al. (2023) for a detailed discussion on the treatment of CoCo bonds during the merger of Credit Suisse.

[78] These triggers are set out in each specific instrument's contract.

Narrow banking

Narrow banking proponents posit that deposit taking institutions should invest exclusively in safe and liquid short-term assets, in which case there would be no need for deposit insurance or capital requirements. Narrow banking proposals are usually brought to the fore after banking crises (Bossone, 2001) and may take several forms, from subjecting banks to a 100% reserve requirement (that is, fully backing their deposits with central bank reserves) to milder forms equivalent to imposing stricter versions of existing liquidity requirements.

The strongest argument against imposing a full version of narrow banking by regulation is that it would force a separation between the deposit taking and loan making activities of banks or, more broadly, eliminate their maturity and liquidity transformation functions. A likely effect would be to shift most lending and all credit risk to less regulated shadow banks (see, for example, Section 5.4 in Vives, 2016).[79] It would also diminish banks' role in the transmission of monetary policy. These considerations explain the limited practicality of narrow banking proposals in recent reforms. The Volcker rule and Basel III reforms took steps in the spirit of these proposals by reducing banks' incentives to engage in securities trading (e.g. by imposing larger prudential requirements on that activity). However, no reform has sought to discourage banks from mixing deposit funding with traditional lending activities.

Pre-positioning of collateral at the central bank

A related alternative to narrow banking is to require banks to have their flighty (uninsured) deposit funding fully backed (after applying appropriate haircuts) by collateral pre-positioned at a central bank discount facility. This idea was first formulated as the "pawnbroker for all seasons", proposed by King (2016).[80] Rather than completely eliminating liquidity risk, this proposal suggests a form of self-insurance where banks would use collateral to obtain liquidity from the central bank, enabling them to cope with deposit outflows. If the central bank accepts only collateral of the highest quality, then the proposal comes near to the narrow banking concept. If the central bank were to refinance less liquid and risky assets such as loans at a haircut, it would commit to act as lender of first resort, effectively ensuring full coverage of all short-term liabilities and hence removing the risk of runs. Provided the central bank had a suitably prudent collateral policy, this approach would resemble a strong version of the current NSFR, since stable funding would be required to finance the proportion of each asset value not recognised as collateral (i.e. the haircut).

As in the case of narrow banking, this alternative could be a partial substitute for deposit insurance and current liquidity requirements, but in contrast to narrow banking it would allow banks to remain involved in lending activities. Under this proposal, banks would need to cover their runnable liabilities with collateral pre-positioned at the central bank, but they could still

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[79]   Those "non-banks" might not formally be allowed to take "deposits" but might rely on short-term funding strategies aiming to replicate the properties of deposit funding. The underlying sources of fragility might be the same as in traditional banks, but the non-banks would not have the explicit protections associated with the safety net and the submission to bank regulation and supervision.

[80]   The G30 Working Group on the 2023 Banking Crisis (2024) has made a related proposal requiring banks to pre-position collateral at the central bank to ease refinancing.

undertake lending operations because one part of the lending could be accepted as collateral and the other part funded with stable liabilities.

One downside to this arrangement, especially if loans were accepted as collateral, is that central banks' collateral frameworks would have to play a central role in determining the provision of bank credit to the economy.[81] Nyborg (2016) discusses in detail how the collateral framework of central banks may distort the pricing of the assets affected. What is more, an extended collateral framework of this kind could interfere with central banks' current core competencies regarding price stability and financial stability and reopen the debate on the proper treatment of sovereign bonds (e.g. the haircuts to be applied to them in the arrangement).[82]

Tightening convertibility conditions for uninsured deposits

Bank runs can be triggered by concerns about the fundamental solvency of banks, but also by fears that massive deposit withdrawals themselves may push a bank into insolvency. In a run, most withdrawals do not reflect a need for immediate liquidity but a fear of not being paid in full if the bank becomes insolvent. In this context, early withdrawers impose an externality on late withdrawers, since the bank may become insolvent (and unable to pay the remaining deposits in full) once a sufficient number of depositors have withdrawn their deposits.

A similar concern arises for investors in money market funds, the closest alternative to uninsured deposits. Recent experience in the regulation of money market funds offers valuable lessons. After the sector suffered huge runs in 2008 and had to resort to fire sales, it had to be backstopped by a temporary public guarantee (just as with US banks in 2023). The Securities and Exchange Commission in the United States and the corresponding authorities in the EU adopted new regulations in 2016, introducing a liquidity requirement for money market funds and imposing gates (temporary suspensions) on funds whose liquid reserves fall below a minimum amount. A major concern raised at the time was that anticipation of a suspension may lead to pre-emptive withdrawals by investors who fear being trapped at a later stage. This was the case for money market funds subject to gating during the March 2020 "dash for cash" episode (Kashyap et al., 2021). In practice, fund managers proved reluctant to trigger the activation of gates and preferred to sell less liquid claims to avoid suspending redemptions.

An important lesson is therefore that reliable access to funds is valued very highly by investors in these financial instruments. In recent years US and EU money market fund regulators have favoured the use of contingent charges (or swing pricing), to be automatically activated or quantitatively adjusted to the size of the outflows taking place. In the United States,

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[81]   For further discussion of this policy option, see Acharya at al. (2024).

[82]   In addition, in some cases pre-positioning requirements would not reduce depositors' incentives to run when they were concerned about a bank's viability. As recoveries in insolvency depend on a creditor's ranking in the creditor hierarchy, short-term creditors such as uninsured depositors may still expect to absorb losses when their bank fails, regardless of the pre-positioning requirements. When short-term creditors are concerned that their bank may fail, pre-positioning requirements may allow the bank to withstand the run for longer. While this can be beneficial in giving authorities more time to prepare, it may lead to an outcome where many short-term creditors withdraw from the bank, so that losses are instead imposed on the longer-term creditors and the deposit guarantee scheme if insured depositors are stickier. This implied preferential treatment of flighty short-term creditors would be inconsistent with their ranking in the creditor hierarchy.

automatic fixed charges on net asset value are now activated once daily outflows pass a 5% threshold (Securities and Exchange Commission, 2023).[83]

Imposing temporary redemption charges on uninsured deposit outflows would target the one-sided incentive to withdraw at par, directly reducing run incentives. Critically, charges may also shift expectations of further withdrawals by others, avoiding escalation driven by fear of dilution rather than solvency concerns. Contingent charges would operate as a Pigouvian tax on early withdrawers, inducing them to internalise the liquidity externality they would otherwise impose on later withdrawers and the rest of the financial system (Perotti and Suarez, 2011). Compared with the imposition of quantity constraints (such as redemption gates or suspensions of convertibility), redemption charges should involve a lower risk of pre-emptive withdrawals due to the risk of facing unsatisfied liquidity needs.

Measures that discourage or slow withdrawals in scenarios where there is a risk of deposit runs would buy time and reduce supervisory concerns about triggering unstoppable runs by activating timely recovery measures. This time could be especially valuable for dealing with banks that are undercapitalised but viable. As undercapitalised banks suffer from a debt overhang, their shareholders are often reluctant to undergo a private recapitalisation without a credible threat of intervention by the authorities (Martynova et al., 2022). Restricting run incentives could reduce expected forbearance and therefore work alongside a credible strategy, ensuring timely recognition of losses and better chances of recovery for weak banks.

The strongest argument against such measures is that departing from the par value conversion of uninsured deposits would entail a fundamental change in the nature of this monetary instrument. Adopting charges or gates would assuage concerns about investors being prevented from having reliable and ready access to their own money.[84] However, it would mean a deviation from par value conversion. This type of reform could also have implications for the pricing and attractiveness of uninsured deposits. These would have to be carefully assessed before adopting this type of reform. In addition, very high charges might be needed to affect run incentives, as illustrated by the example from the Greek crisis discussed in Section 3. Tightening convertibility conditions for uninsured deposits could simply fail to stop the outflows if the depositor were asked to choose between paying a fee and losing access to their entire deposit upon failure of the bank.

Extending deposit insurance coverage

Based on findings from the academic literature, deposit insurance fosters confidence and stability in the banking system but may act as an incentive for banks to take excessive risks. Deposit insurance is a key characteristic of the financial system architecture and aims to foster confidence and stability in the banking system by assuring depositors their funds are protected, thereby preventing bank runs. Like it happens with most other insurance arrangements, its key drawback is potential moral hazard. Access to insured deposit funding undermines the discipline that market forces impose on banks, which in turn increases their incentives to take excessive risks. Banks with access to insured deposit funding may expand the scale and riskiness of their

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[83] For an EU perspective on proposed reforms of money market funds, see European Systemic Risk Board (2013 and 2022).

[84] See also Matta and Perotti (2023).

activities without depositors themselves caring about the potentially lower likelihood of being paid back. Therefore, unless the sum of deposit insurance pricing, prudential regulation and supervision fully offset the implicit subsidisation of risk-taking at the margin (Kareken and Wallace, 1978; Matutes and Vives, 2000), banks may end up taking excessive risk.[85] Hence, while deposit insurance can play a key stabilising role in times of crisis, there is a considerable body of theoretical and empirical work (reviewed in Section 3) suggesting that it can also undermine financial stability by encouraging the build-up of risk in the financial system.[86] This trade-off between the role of deposit insurance in normal times and in crisis times is clearly set out in Anginer et al. (2014), whose results suggest that the presence of deposit insurance increased bank risk and systemic fragility in the years leading up to the global financial crisis, but reduced them during the crisis.[87]

Most deposit insurance schemes try to strike a delicate balance between providing depositor confidence and protection on the one hand and containing the associated moral hazard on the other. The traditional view is that this can be achieved by focusing protection on relatively small, dispersed and unsophisticated investors while limiting the protection provided for larger and presumably more sophisticated ones (Dewatripont and Tirole, 1994). In practice this can be achieved by limiting the coverage to a certain amount per individual, as most deposit insurance schemes do.[88] In the EU, for example, the coverage limit is harmonised at €100,000 per depositor per bank (Directive 2014/49/EU).[89] As shown in Chart 12, other European countries, such as Switzerland and the United Kingdom, have a similar coverage limit. The United States, Australia and Norway have much higher coverage limits, while Canada and several Asian countries have lower limits.[90]

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[85] For evidence on this moral hazard problem, see, for example, Karels and McClatchey (1999), Gropp and Vesala (2004), Ioannidou and Penas (2010) and Karas et al. (2013).

[86] This would be the case in particular when the deposit insurance scheme is poorly designed, or the regulatory and supervisory framework is not intrusive enough.

[87] These results complement the finding in Demirgüç-Kunt and Detragiache (2002) that the presence of deposit insurance is associated with a greater likelihood of banking crises.

[88] Some deposit insurance systems also include co-insurance arrangements or deductibles. However, the partial coverage provided by the UK deposit insurance scheme prior to the global financial crisis was regarded as a factor leading to generalised panic among the depositors of Northern Rock in 2008 and was subsequently removed.

[89] According to Directive 2014/49/EU, deposits linked to life events (such as marriage, divorce, retirement, redundancy, invalidity or death) may be protected at above €100,000 for a limited period of time (at least three months and no more than 12 months). In addition, deposits of small local authorities are also covered by deposit insurance in the EU.

[90] In Australia and the United States, interbank government deposits are included in deposit insurance, while they are generally excluded in the EU. In the United States, certificates of deposit and certified drafts of checks are also included. If US depositors sufficiently diversify their portfolios, the guaranteed amount can reach up to USD 1,250,000. In Japan, payment accounts are guaranteed without any limit.

Chart 12

Guaranteed amounts in deposit guarantee schemes, 2021

(USD)
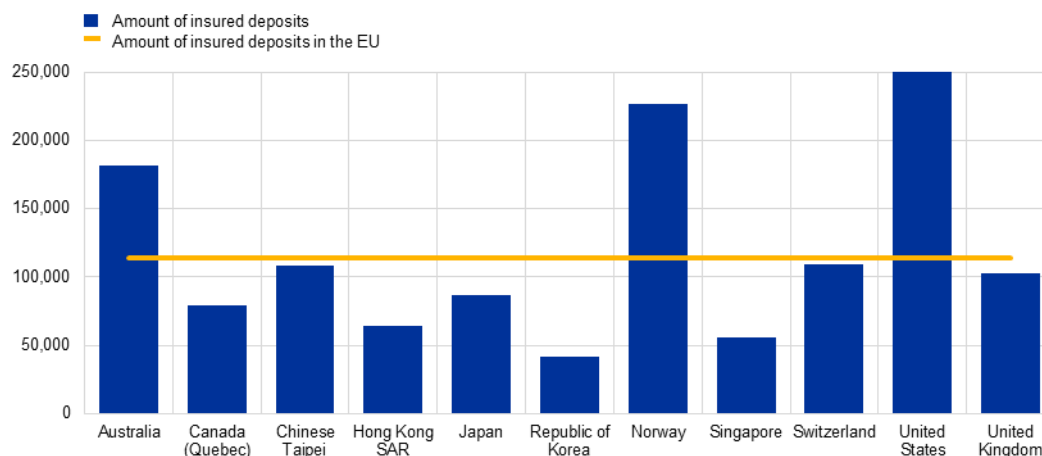
Sources: ESRB Secretariat calculations based on Financial Services Compensation Scheme (UK), International Association of Deposit Insurers.

Under the current EU limit, 96% of eligible depositors in the EU are completely covered (European Banking Authority, 2023b).[91] However, as shown earlier in Chart 3, an average of around 40% of EU deposit balances are insured, which shows that a relatively small proportion of depositors have very large or uncovered balances (including balances outside the scope of deposit insurance). This indicates that while the vast majority of depositors are protected by deposit insurance, EU banks are exposed to the risk of deposit runs (and deposit-related discipline) coming from the holders of relatively few accounts with very large or uncovered balances.[92]

Several commentators have added that in the United States there is a de facto 100% deposit insurance coverage, as no depositor has taken a loss since at least 2009 (Ohlrogge, 2023). Extending deposit insurance to all deposits would, in the view of these commentators, turn a de facto position into a legal one. The evidence on runs reviewed in Section 3 suggests, by contrast, that depositors do not regard insured deposits as equivalent to uninsured ones. This implies in turn that with the current partial legal coverage, some residual form of market discipline is in operation (namely, a limit on banks' capacity to attract funding at the risk-free rate and a residual risk of runs on obviously insolvent banks).[93]

Following the banking turmoil in the United States in March 2023, some authors have suggested extending the scope of deposit insurance to all deposits, regardless of their

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[91] For the whole world, an average of 95% of eligible depositors are fully covered (International Association of Deposit Insurers, 2021).

[92] While runs affecting a limited set of banks will largely entail a reallocation of the funds withdrawn across the rest of the banks in the system, the direct losses, fire sales, risk of contagion and general loss of confidence in the banking system will cause financial instability without necessarily being associated with a fall in aggregate deposits.

[93] This would mean that keeping partial legal coverage was similar to the practice of "constructive ambiguity" discussed in a "lending of last resort" context by, for example, Freixas (1999) and Goodhart and Huang (2005).

amount (see, for example, Heider et al., 2023).[94] The existing literature suggests that extending deposit insurance to all deposits will further increase the volume of large deposit accounts on bank balance sheets (attracting funds now outside the banking system), removing any incentive for the account holders to question the stability and risk profile of their chosen banks.[95] However, if riskier banks were to compete for such funding, this would also be likely to destabilise more prudent banks and encourage them to increase their risk-taking. As deposit insurance funds are relatively small, typically covering less than 1% of insured deposits, this would leave taxpayers and surviving banks (or their customers) to foot the bill for the increased risk-taking.[96]

Finally, a significant extension of deposit coverage is likely to increase opposition to creating a common deposit insurance scheme in the euro area, as it would raise concerns about the socialisation of losses due to excessive risk-taking. Having said that, a case could probably be made for cautiously expanding the deposit insurance coverage of non-financial corporation deposits used for strictly transactional purposes (e.g. accounts dedicated to paying operating expenses such as wages), especially if combined with additional measures to contain moral hazard, including the introduction of potentially differentiated and more risk-based deposit insurance premiums. However, such a change would also require the creation of a depositor registry to avoid a situation where corporations in search of extra coverage opportunistically split large balances into multiple transactional accounts at different banks.

Extending mark-to-market accounting

The market turmoil in the United States in March 2023 reignited the discussion on the benefits of applying mark-to-market accounting to as many bank assets as possible. Silicon Valley Bank had most of its debt securities measured at amortised cost. At the time of its demise, these holdings had generated large unrealised losses, but the losses only emerged in accounting terms when the bank had to sell the assets to meet deposit outflows. This made the bank formally insolvent (in accounting and regulatory terms) well after it had become economically insolvent. The episode revived the old debate in accounting and prudential circles on the benefits and costs of fair value versus amortised cost (or "historical cost") in the measurement of financial assets.[97]

Table 2 summarises the main conceptual arguments for and against fair value (historical cost) accounting.[98] Fair value accounting reflects changes in the market value of assets and liabilities and is closer to prevailing market conditions. It also enables changes in interest rates to have an immediate effect on balance sheet items, an issue which is particularly important for banks. Fair value accounting can also reflect vulnerabilities in the balance sheet of an entity at an

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[94] The argument put forward by Heider et al. (2023) focuses on the disciplinary effect that total loss-absorbing capacity (TLAC) requirement and the minimum requirement for own funds and eligible liabilities (MREL) have on banks' risk-taking incentives. If the concept of market discipline via TLAC/MREL works in practice, an increase in large deposits and more risk taking will come at a cost, for instance in the form of higher interest rates on MREL bonds,

[95] See also the discussion in Federal Deposit Insurance Corporation (2023).

[96] Deposit insurance schemes in the EU are aimed at covering 0.8% of the total amount of insured deposits (around €65 billion as at the end of 2022, with total insured deposits of €8.14 trillion).

[97] Mark-to-market accounting can be seen as a subcategory of fair value accounting. Market values are by default used to compute fair values, but models and other inputs can be used to determine the fair value of financial assets not actively traded in a market.

[98] See also the discussion in Cecchetti and Schoenholtz (2023).

earlier stage, as in the case of Silicon Valley Bank. As such, it can play a disciplinary role. Meanwhile, moving to fair value accounting could introduce considerable volatility into the balance sheet and profit and loss account. It can be argued that this type of accounting does not correctly measure the cash flows associated with long-term assets held for the purposes of collecting interest payments and principal. In addition, during periods of crisis, it can trigger fire sales to avoid recognition of a fair value loss, thus contributing to procyclicality.

Table 2

Arguments for and against fair value and historical cost accounting

Arguments against fair value (for historical cost)	Arguments for fair value (against historical cost)
Temporary changes in market value are not relevant for assets held for the collection of future cash flows. In particular, for longer term investments.	Temporary market value changes are relevant when determining whether assets can be held for the collection of their cash flows, especially if they are funded in the short term.
FVA produces increased volatility of equity and, if fair value changes go through profit or loss, in net income. The part of such volatility due to interest rate changes is "not relevant" if assets are held until maturity. There is a mismatch between assets measured at fair value and liabilities measured at historical cost.	Volatility under historical cost is artificially low as it does not reflect current market prices. Interest rate changes are relevant for banks, especially when facing refinancing needs. The mismatch between the measurement of financial assets and financial liabilities can be addressed by increasing the role of FVA on the liability side rather than reducing it on the asset side
Investors are misled by high volatility (and tend to overreact to negative news in a crisis and positive news in booms, feeding volatility). Fair value reveals critical information to competitors and other investors (e.g. proprietary trading strategies followed by the reporting entity).	Investors are misled by artificially low volatility. Market discipline suffers. Lack of information contributes to adverse selection in a crisis. Fair value increases transparency which is generally beneficial.
To reduce the impact of interest rate volatility, banks shift to securities with shorter maturities and reduce holdings of interest-sensitive available-for-sale securities, which might reduce market liquidity.	FVA reduces reluctance to sell holdings of risky, illiquid securities, in particular at the start of a crisis.
FVA contributes to procyclicality and results in fire sales in a crisis when assets become illiquid and decrease in value.	FVA encourages banks to take early corrective action at the onset of a crisis (e.g. sell assets or raise capital).

Source: European Systemic Risk Board (2017).
Notes: FVA stands for fair value accounting.

Moving to a fully marked-to-market balance sheet for banks requires a careful assessment of the pros and cons. The debate in the accounting community is still unresolved. In addition to the issues regarding the benefits of one measurement method versus the other, as outlined in Table 2 and in the previous paragraph, there are significant practical difficulties in extending fair value accounting to financial assets for which there is no active market (such as loans) and to the valuation of financial liabilities. For such liabilities, mark-to-market accounting could lead to a situation where a downgrade in the ratings of a bank's financial liabilities would result in a fair value gain. Overall, in the current debate as it stands there is no consensus on the benefits of promoting full (or as full as possible) mark-to-market accounting in banking. However, there may be room for more targeted changes. As outlined by Cecchetti and Schoenholtz (2023), there could be room for fine-tuning current accounting rules to ensure that changes in the market value of securities in

banks' balance sheets are reflected in the banks' capital requirements. In addition to the two targeted changes to accounting rules discussed in Section 5.1., under "Improvements to the supervision of bank liquidity and funding positions" and "Amendments to liquidity requirements", bank supervisors could take into consideration unrealised losses that might not have been fully reflected in the measurement of accounting and regulatory capital as part of the SREP. This would help ensure that such losses were not a hidden source of solvency problems or, if they were, would help make it possible to remedy the situation at an early stage.

6   Concluding remarks

The episodes of bank distress experienced in 2023 have focused attention on the stability of bank funding models in a period of swiftly changing monetary policy and high macroeconomic uncertainty. This report documents the importance, structure and recent evolution of deposit funding for EU banks, reviews the academic literature on bank runs, discusses the link between deposit funding and interest rate risk and then examines the main policy reform proposals put forward on these topics in the aftermath of the episodes. Table 3 provides an overview of the different options discussed. It sets out (i) their objectives, (ii) their likely effect on the allocation of risks and potential losses, (iii) their complexity and how they might be implemented in practice, (iv) their effectiveness in reducing the fragility of bank funding, (v) their implications for risk-taking, and (vi) their effect on the cost of financial intermediation.

A first conclusion is that we do not regard proposals to move towards a full version of narrow banking or an untargeted expansion of deposit insurance coverage as desirable, while other proposals (such as redemption gates or the pre-positioning of collateral) require further careful consideration of the pros and cons. Moving to a full narrow banking system would involve a major restructuring of the financial system and shift intermediation activities outside the regulated banking sector, while an expansion of deposit insurance coverage would involve high costs and a reduction in market discipline. As for the expansion of deposit insurance in the EU, the European Banking Authority has recently provided similar advice to the European Commission (European Banking Authority, 2023b). In Section 5 we presented arguments in favour of contingent measures to avoid the escalation of withdrawals into runs, such as redemption charges triggered by large outflows akin to those already applied in the money market fund sector. However, the introduction and design of such measures would require very careful assessment before any additional steps were taken, as they would fundamentally change the nature of deposits as money-like instruments.[99] Similarly, the proposal of pre-positioning collateral at the central bank must be holistically assessed, taking into account issues related to "safe assets" and central bank policies.

Second, we believe that proposals to amend liquidity requirements, enhance the supervision of banks' liquidity and funding positions, and incorporate funding fragility into the computation of Pillar 2 liquidity and capital guidance could be implemented relatively quickly. Proposed amendments to liquidity requirements include not only targeted changes in the rate of deposit outflows for the computation of the LCR but also a stronger focus on the concentration of funding counterparts (with the possibility of limits on the concentration of funding) and a requirement to measure debt securities qualifying as liquid assets at fair value for accounting purposes. Weekly regular reporting of liquidity positions to microprudential supervisors (with further granularity on the concentration of funding), along with the definition of a regulatory ratio with balance sheet items at market prices to complement the existing ones, would improve the way liquidity and funding risks are supervised. Over the short-term, the way funding fragility is currently captured by Pillar 2 capital requirements can also be improved to strengthen the link between the results of interest rate specific stress test and required corrective actions by banks.

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[99]   Ultimately, the business model of banks would then move closer to that of money market funds.

These proposals have the potential to increase banks' liquidity resilience, reduce their incentives to take risks aggressively, and provide supervisory authorities with the necessary information and possibly time to intervene in fragile banks. As already stressed, it is important (i) to consider the interaction among these policy adjustments holistically rather than in isolation, (ii) to consider their margins of substitutability, and (iii) to avoid unintended implications for the cost of bank intermediation. Among the other proposals discussed in Section 5, contingent measures to ensure credible recapitalisation and favour recovery over resolution are worth considering as additional supervisory tools, with the specific intent to overcome the current bias for forbearance.

Several proposals require legislative changes and are thus only feasible in the medium term. Changes to the pricing of deposit insurance would require data and modelling work to design better risk-based premiums. As the global capital agreements define a set of minimum requirements, EU authorities could decide to top up them as discussed in the report. Otherwise, changes to Pillar 1 capital requirements would require global regulatory agreements to be reopened and would thus only be feasible in the medium to long term. We argue that changes to the EU recovery and resolution frameworks, as outlined in this report, are desirable and could be included in discussions as part of the political process.

Table 3

Comparison of the different policy options

Policy measure	Objective	Allocation of risks and potential losses	Complexity and practical implementation	Effectiveness in reducing the fragility of bank funding	Implications for risk-taking	Effect on the cost of financial intermediation
Improvements to the supervision of bank liquidity and funding positions	Align prudential monitoring with the increased speed of deposit runs and liquidity stress	Supervisors would be able to intervene earlier in a troubled bank, probably resulting in lower costs for taxpayers	Feasible if implemented at EU level	It would make supervisors aware of potential fragilities in bank funding in a timelier manner	No direct impact on risk-taking incentives	Very small, limited to the cost of the required infrastructure to report positions on a weekly basis
Amendments to liquidity requirements	Enhance treatment of liquidity risk	General risk reduction through reduced risk of runs	It could first be adjusted at EU/euro area level, to avoid delays necessary for global coordination	This would increase banks' resilience and provide more time for intervention during bank runs	Ambiguous, as fewer options for risky investment, but banks might react to lower earnings with increased risk-taking	Higher holdings of liquid assets will increase the cost
Amendments to capital requirements	Capture all relevant risks (including run risks created by uninsured deposits) and ensure resilience	More risks would be shifted to bank owners (uninsured deposit funding would become more expensive)	Changes to Pillar 1 requirements would require major global coordination; Pillar 2 guidance could be easier to adjust	By reducing the risk of bank runs, this option should make bank funding less fragile	This would reduce risk-taking incentives	This will most likely increase the cost, but it will be more fairly distributed across both safer and riskier banks
Better pricing of deposit insurance	Address moral hazard of deposit insurance	Bank owners, as insured deposit funding will become more expensive in fee terms	Computing risk-adjusted premiums is not easy and could meet with intense opposition from banks	It would reduce fragility if less risk-taking	It would reduce risk-taking incentives	Perhaps higher on average but more fairly distributed across safer and riskier banks
Increasing going concern recapitalisation capacity	Promote the early recovery (versus late resolution) of troubled banks	Bank owners and other holders of loss-absorbing liabilities	Feasible in the medium term, but only at EU level	It would reduce fragility by reducing risk-taking and forbearance	Depends on design issues, should prevent bank owners from diluting bondholders	Might decrease, as residual claimants may be more able to clearly differentiate between going concern value and gone concern value

Policy measure	Objective	Allocation of risks and potential losses	Complexity and practical implementation	Effectiveness in reducing the fragility of bank funding	Implications for risk-taking	Effect on the cost of financial intermediation
Narrow banking	Avoid bank runs	Risks would be shifted outside the banking sector, possibly into non-regulated segments of the financial sector	This would require a major reform of banking sector regulation, more so in the case of narrow banking	Bank funding would be limited as depositors/investors would search for higher-paying alternatives and might become more volatile	Lower for banks, but risks would move outside the banking system, possibly into non-regulated areas	Costs would go up as intermediation would have to be funded by non-deposit funding
Pre-positioning of collateral at the central bank	Avoid bank runs	Certain activities could be moved outside the banking system (uninsured deposits)	Central banks would need to update their collateral framework frequently	It would penalise uninsured deposits, as banks would need to pre-position collateral	Given the lower returns of assets pre-positioned as collateral, banks may be encouraged to search for yield	Will increase (average funding cost of lending activities will increase and be dependent on collateral policy)
Tighter convertibility conditions for uninsured deposits	Slow down ongoing runs	Uninsured depositors will have to bear more liquidity risk	This would involve a major rethinking of the nature of large uninsured deposits as money	This would be positive under business-as-usual conditions, but unclear in a systemic panic situation	Ambiguous, as a lower risk of funding losses might provide incentives for higher risk-taking but might also bring increased market discipline by uninsured depositors	Will increase (uninsured deposits can become notably more expensive)
Extended deposit insurance coverage	Decrease incentives for bank runs	Additional costs for contributors to the funding of the deposit insurance scheme and/or taxpayers	Politically difficult to implement	It would reduce the likelihood and intensity of runs as long as deposit insurance is credible	Potentially increasing risk-taking due to reduced market discipline	Ambiguous, as higher insurance fees will increase costs but there might be less need for liquidity and capital buffers
Move to mark-to-market accounting	Increase transparency and remove unrealised losses in the banking sector	Losses would be immediately recognised and absorbed by bank owners	Would need to consider how to apply fair value to all financial assets and liabilities; potential increase in procyclicality	Unclear; literature on runs suggests nuanced effects of greater volatility in signals of bank performance	Banks may look for complex products delivering higher fair value gains in the short term	Uncertain

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