



SVB and Beyond: The Banking Stress of 2023

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“The real purpose of the scientific method is to make sure Nature hasn’t misled you into thinking you know something you don’t actually know...One false deduction about the machine and you can get hung up indefinitely.”

– John Pirsig (1974) in *Zen and the Art of Motorcycle Maintenance*

Prelude

A bank should be something one can bank on.

This is best understood by the etymology of the word “bankruptcy,” which originates from the Italian “banca rotta,” literally a “broken bench.” Such an unpleasant end was the fate of many a money lender in Siena’s Piazza del Campo some 800 years back if one could not produce enough specie to repay depositors.

Today such violent behaviour is by and large ruled out. Yet, economically and financially disruptive withdrawals of depositors and wholesale financiers still occur. In the latest incarnation, they are electronically engineered and propagated via social media.

Starting in March 2023, such depositor runs quickly led to the failures of Silicon Valley Bank (SVB), Signature Bank, and First Republic Bank. In the wake of higher interest rates, their uninsured depositors had lost confidence in the business model of taking in deposits and investing the proceeds in long-term securities to generate a term-spread carry. Many other banks, some smaller and some bigger replicas of these three banks, experienced slower depositor runs or are still experiencing deposit outflows.

While the largest, likely too-big-to-fail, banks - even those with business models seeking interest-rate risk - have gained in part at the expense of the troubled banks, the systemic risk indicator at NYU Stern VLAB (SRISK) suggests that the market-implied capital shortfall of the aggregate banking system has risen from \$457 billion in February 2023 to \$926 billion at present, that is, by more than \$450 billion.

What next?

Will depositor outflows from smaller and regional banks stop anytime soon? Is there regulatory and supervisory capacity to deal with a large number of bank failures were they to materialise? Will regulators respond with alacrity and raise confidence in bank solvency and liquidity, or will they kick the can down the road? Can banks deal with the added complication in the form of a tsunami of impending commercial real estate losses, perhaps even auto loan and credit card delinquencies, as a likely economic recession finally arrives? Or will there be a credit crunch, some bad zombie loans, and a disappointing recovery?

In short, less than 15 years after the collapse of Lehman Brothers and other large financial institutions, and despite promises of never-again rules and regulations, once again there have been ominous signs of an enduring banking malaise. Policy seemed to have fought the last war well and responded with significant reforms, but it also fell into the trap of believing that all bank risks were now well-addressed only to discover a new set of short-term bank liabilities, viz., uninsured deposits, run in response to a risk that was generally thought to be well-understood, viz., interest-rate risk. In the face of the challenging and complex situation created by large-scale bank runs, and the consequent model risks that abound, sound banking sector policy should aim to remain adaptive, nuanced and robust.

This book, with interdisciplinary contributions from several faculty members at the New York University Stern School of Business (NYU Stern) - and Stephen G. Cecchetti of Brandeis University (our friend and former colleague), Sehwa Kim of Columbia University (also our friend and prior coauthor), and Seil Kim of Baruch College (PhD in Accounting from NYU Stern) - attempts to provide a balanced diagnosis and organising framework to understand the banking stress of 2023 (Chapters 1-5), as well as a collection of policy proposals to ensure financial resilience in its wake (Chapters 6-10).

In the course of preparing the book, it was clear that the multiple lenses of economics, regulation, and accounting are needed to understand the complex functioning of banks (and more generally, bank holding companies and similar financial institutions) and, in turn, to assess the efficacy of their business models from a societal or systemic risk standpoint.

At one level, banks are simply maximising economic profits and value for their shareholders. That would naturally give them some incentives to manage risks and protect their franchise of valuable loan relationships and stable deposits.

At another level, however, it is difficult (if not impossible) to separate the economic value creation by banks from their rent-extraction from government guarantees. Some of their non-equity liabilities are explicitly backed by the state, others are implicitly so when they experience disruptive runs that threaten the system as a whole. Bank outperformance then is often just due to taking on leveraged aggregate risks.

In turn, the 'good times' prudential safeguards against such rent-extraction - for instance, capital adequacy requirements - create a regulatory aspect to banking activity. A form of predator-prey game comes into play where banks keep evolving organically within the regulatory perimeter in which they function and around which they optimise through their "capital-efficiency"

departments. Understanding a bank's economic performance in conjunction with its regulatory manoeuvres, including activities such as shadow-banking forays and lobbying for deregulation, can help better understand their underlying risk-taking and leverage-seeking incentives.

Finally, the banking informational contract with depositors and investors is also evolving. In a view of the world that ignores guarantees to a bank's non-equity liabilities, delayed recognition of losses should create consternation in shareholders about bank management. Conversely, lack of such consternation might suggest a breakdown of shareholder governance. However, when the ubiquitous and near-certain nature of such guarantees is recognised, it becomes necessary to also recognise them as a valuable part of bank franchise values. Since this part of franchise value increases with leverage and aggregate risk, shareholders may, up to a point, favour what appears otherwise to be questionable accounting. An equally perverse outcome is that depositors also may postpone their day of reckoning, so that bank runs morph into "sudden stops" when they could otherwise have been gradual exits. The upshot is that economic and regulatory incentives affect a bank's accounting choices, even as its accounting discretion can influence economic and regulatory incentives.

It is thus our contention that a reasonable working model to understand banks and banking must triangulate a comprehensive understanding of these aspects: namely, economics, regulation, and accounting. Focusing on just one and ignoring others can explain data well some of the times, but not all; help rationalise bank choices, profits and stability when things are calm but not under stress; and, in turn, lead to imperfect diagnoses of and remedies for banking crises, including the ongoing banking stress of 2023.

Another insight from the preparation of this book was that the history of banking crises is replete with risk management, policy, and cognitive failures. Despite the best intentions, and usually also due to complacency induced by economic booms, agents - academics like us included - are regularly blindsided by risks that *ex post* seem too obvious to be missed.

In this round of banking stress, interest rate risk appears to have spooked us. It seems that at each point of time we face the risk that risks will change. And yet, there are undoubtedly follies in banking and bank regulation that echo mistakes of the past, from the Continental Illinois saga, via the Savings and Loan debacle, up to the Global Financial Crisis of 2007-2009. It is our hope that this book - with its eclectic approach that relies on theory as well as data, normative policy as well as its practice, and historical context as well as focus on the present - serves as a useful guide to recover from the ongoing banking stress and prevent a repeat of these follies in future.

While similar issues lurk in the nonbanking sector (see the Appendix), they are too rich and varied to address properly in this book. Leaving that aside, to ensure that we have more banks that one can bank on, either by implementing remedies proposed here or better alternatives that might emerge, policymakers will have to demonstrate a far greater focus on financial stability, the courage to abandon failed approaches of the past, and a willingness to embrace comprehensive reforms. We probably will need a bit of luck too, for macroeconomic shocks do not always respect the timetable of policy plans.

1 OVERVIEW OF RECENT BANKING STRESS

Viral V. Acharya, Stephen G. Cecchetti and Kermit L. Schoenholtz¹

The banks that ran into trouble were those with both a large capital shortfall (presumably due to losses on their fixed-income security holdings and fixed-rate loans induced by higher interest rates) and a large share of uninsured deposits. The erosion of capital at these banks led to potentially large losses for uninsured depositors and threatened a systemwide run. In response to calls for depositor bailouts, the central bank, the deposit insurance agency and the Treasury quickly stitched together a patchwork of over-the-weekend resolution strategies.

The recent episode of banking system stress was the culmination of a years-long buildup of risks. Some of the sources of risk are deeply structural: Most important, any institution engaged in liquidity and maturity transformation is subject to a run. Other sources involved peculiarities of accounting that allow a bank to appear solvent when it is not. Yet others resulted from lax regulation and ineffective supervision that allowed some banks to grow rapidly on the basis of extraordinary risk-taking.

These weaknesses came to a head in March 2023, when both Silicon Valley Bank (SVB) and Signature Bank faced a run that started a panic for midsized US banks. In this chapter, we first discuss the frailties of SVB, Signature and other midsized banks. We highlight the *compound error* of holding long-term assets that can threaten a bank's capital when they lose value, and funding those assets with highly volatile, short-term funding.² We subsequently show how these frailties were apparent well in advance of the panic. Without in any way diminishing the responsibility of the failed banks' leaders for their remarkably poor management, we go on in Chapter 2 to discuss how both monetary and fiscal macroeconomic policies facilitated and encouraged such extraordinary risk-taking.

¹ The authors are grateful to Rahul Singh Chauhan of University of Chicago Booth School of Business for excellent research assistance.

² Jiang, et. al. (2023).

Overview of the Banking Failure and Resolution Story of 2023

The banking saga of 2023 begins with the astonishing shortcomings of SVB, whose leaders failed to manage the most obvious and basic banking risks.³ To fund its assets, SVB relied almost exclusively on uninsured deposits, which constituted over 90% of its total deposits. The concentration of these deposits in a small number of clients added to their vulnerability: The top ten depositors alone accounted for \$13 billion of the \$173 billion in total deposits at the end of 2022.⁴ Moreover, since 2011, less than 1% of SVB's deposits were time deposits, which tend to be “stickier” (less run-prone) than demand or savings deposits.

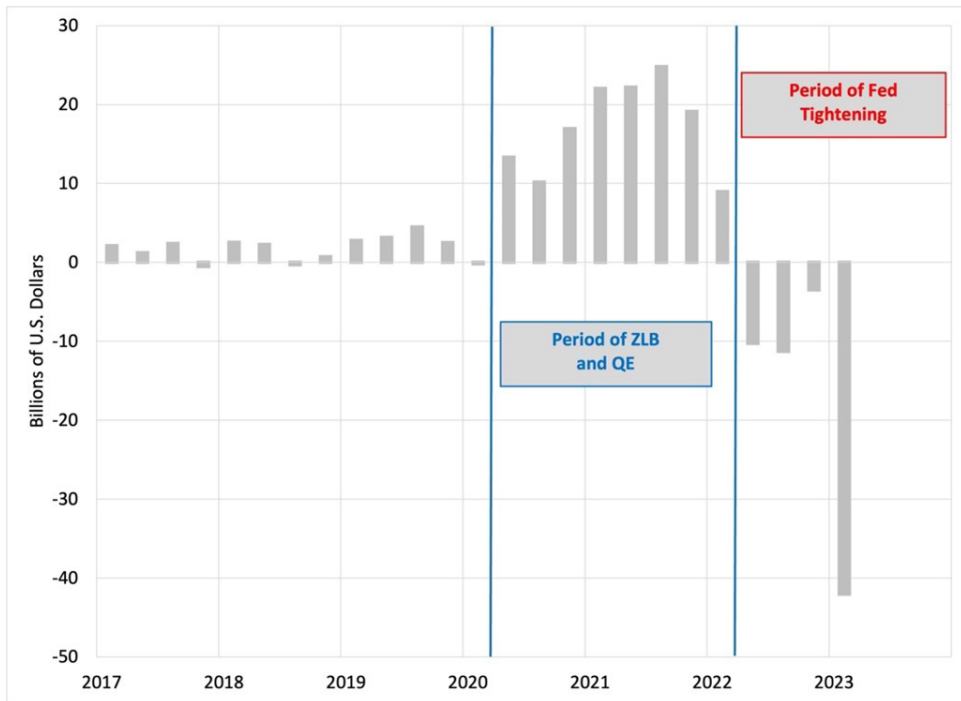
The rapid growth of SVB's deposits during a period of monetary and fiscal policy accommodation also foreshadowed their volatility: As Figure 1 shows, SVB's deposit inflows surged from only \$5 billion in the third quarter of 2019 to an average of \$14 billion per quarter starting in March 2020, the period of unprecedented monetary and fiscal stimulus. Two years later, when the central bank started reducing its securities holdings and raising policy interest rates to combat high inflation, these inflows began to reverse.

Like SVB, about 90% of the deposits of Signature Bank were uninsured. Moreover, a substantial portion of both banks' deposits came from their borrowers (in the tech and crypto sectors, respectively, for SVB and Signature), so that their fortunes were tied to those of the underlying sectors. Not surprisingly, the monetary policy tightening that began in 2022 slowed activity in these highly speculative sectors, leading stressed clients to start withdrawals.

3 For a March-May 2023 timeline of events related to the failure and resolution of SVB, Signature and First Republic banks, see Chapter 5.

4 Gruenberg (2023a).

FIGURE 1 SILICON VALLEY BANK: QUARTERLY CHANGE IN DEPOSITS (BILLIONS OF US DOLLARS), 2017-1Q 2023



Source: Call Reports. The estimate for 1Q 2023 is based on Silicon Valley Bank's mid-quarter update.

On the asset side, SVB failed to manage interest rate risk. By the end of 2022, it held nearly 57% of its assets in fixed-income securities such as Treasuries and agency mortgage-backed securities (MBS). Even as inflation rose and the Federal Reserve hiked interest rates in 2022, SVB boosted its exposure to interest rate risk by allowing the duration of these assets to rise by nearly two full years to 5.6 years.⁵ To be sure, the duration of MBS rises with interest rates, so some of that increase may have occurred passively. Nevertheless, management could have acted to resist this extension of duration. Instead, SVB managers unwound their meagre interest rate hedges, booking the gains as income.

⁵ SVB Financial Group (2022), page 66.

At the same time, SVB managers did little to extend the duration of their deposits: From 2011 through 2022, time deposits (which tend to be less run-prone than demand and savings deposits) remained *less than 1%* of SVB's total deposits. Amid rising interest rates and deposit outflows in 2022, SVB managers might have revised upward their expectations for deposit outflows, effectively shortening the anticipated duration of their liabilities. Against this background, SVB's actual asset management appears like a desperate effort to gamble for redemption as the bank's capital rapidly eroded.

Indeed, rather than manage risk to protect its *actual* capital, SVB used its discretion under US Generally Accepted Accounting Principles (GAAP) to limit the impact of its unrealised losses on the *regulatory* measure of capital. Specifically, the bank opted to hold 43% of its total assets in the held-to-maturity (HTM) bucket that is not required to be marked to market unless there is a sale of any security from that bucket. In addition, under the 2019 revision of the "AOCI (accumulated other comprehensive income) filter," SVB chose to "opt out" of the GAAP obligation to reflect unrealised losses in regulatory capital that arose from securities designated as available-for-sale (AFS).⁶

Had SVB's unrealised losses been included in regulatory capital measures, the bank might have appeared insolvent by the third quarter of 2022. Yet, depositors, investors, and supervisors turned a blind eye to the routine quarterly disclosure of these losses until the run started in March 2023.

In banking, attitudes change quickly. Most depositors are ill-equipped to monitor the financial well-being of their bank. Even depositors holding very large, uninsured deposits usually treat these assets as safe and information-

6 Chapter 7 details the key changes in these accounting standards and how they influenced the behaviour of midsized banks, including SVB.

insensitive. Yet, if something happens that makes people question the soundness of the bank, they may suddenly look to shift their uninsured deposits to a more trustworthy intermediary or to a safer instrument. Since customers often communicate with each other – especially those as interconnected as SVB’s venture capital and tech startup customers – what starts as the misgivings of a few can turn quickly into a widespread and rapid (electronic) rush for the exit.

The trigger for the run on SVB was the March 8 announcement in which the bank’s management reported the sale of securities at a loss and an associated effort to raise capital that soon failed. At that point, everyone started to pay attention, triggering a run of unprecedented speed. Unsurprisingly, the news that withdrawals were forcing SVB to realise losses on a large portion of their assets led everyone to ask whether the bank was viable and if it would be prudent to withdraw their assets.

On the morning of Friday, March 10, the California Department of Financial Protection and Innovation closed SVB and appointed the Federal Deposit Insurance Corporation (FDIC) as its receiver. On that day, Signature Bank suffered \$10 billion in deposit outflows, while withdrawals from First Republic reached \$25 billion.⁷ The failures of SVB and Signature were quickly evolving into a panic at banks that shared their fragilities.

Over the weekend, with the approval of the President, Treasury Secretary and Federal Reserve Board, the FDIC invoked the “systemic risk exception” to protect all deposits (including those that were not insured) at the two banks. To stem the panic, policymakers also left the strong impression that

⁷ According to Gruenberg (2023b), withdrawals from First Republic Bank reached \$25 billion on March 10 and an additional \$40 billion on March 13.

all depositors at other banks would be similarly protected.⁸ These actions – the takeover of the two troubled banks combined with the appearance of a broader deposit guarantee – largely quelled the turmoil. However, in late April, when First Republic Bank revealed the scale of its deposit withdrawals, a renewed run compelled its supervisors to close that bank and the FDIC to sell it, using a traditional resolution tool that again protected *all* depositors.

To summarise the broad impact of the mid-sized banking panic and the policy responses on the flow of funds, it is useful to look at aggregate information for the US banking system during the month of March 2023. The picture is one of large deposit outflows from mid-sized and foreign banks, and modest inflows to the largest banks. To sustain their assets, banks facing deposit withdrawals vastly increased their borrowing, especially from the Federal Reserve's lender of last resort facilities. It also appears that funds that flowed from the banks to government money market funds were largely recycled to the banks through the Federal Home Loan Bank (FHLB) system.⁹

Recognising the Frailties

The key frailty in the banking system arose from the *combination* of large exposure to risk on the asset side (primarily, but not exclusively interest rate risk) and the dependence on volatile, short-term liabilities to fund it. Most of these liabilities were in the form of uninsured deposits. Put simply, very large

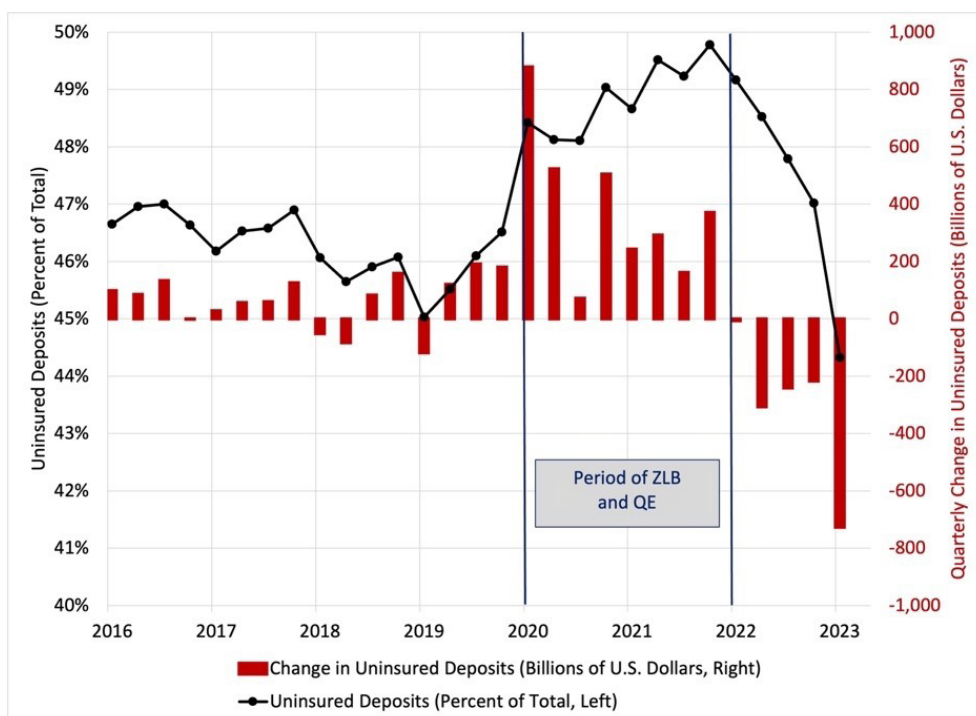
8 For example, Yellen (2023). In her testimony on March 23, 2023, Treasury Secretary Janet Yellen stated, "The strong actions we have taken ensure Americans' deposits are safe. Certainly, we would be prepared to take additional actions if warranted."

9 During March 2023, total deposits (including those at foreign-related institutions) plunged by \$312 billion. This decline was split between domestic banks with less than \$160 billion in assets and foreign-related institutions. In contrast, the largest 25 banks experienced modest inflows (less than \$20 billion). At the same time, banking system borrowing rose by over \$400 billion, more than offsetting the aggregate decline of deposits. Large banks increased their borrowing by \$288 billion, while smaller banks' borrowing rose by \$154 billion. The primary source of this borrowing was the Federal Reserve, which increased its lending by \$328 billion. Completing the picture, government money market fund balances jumped by more than \$300 billion – roughly equal to the deposit outflows from the banking system. It appears that the bulk of these additional money market funds found its way back to the banks through the FHLB system. That is, banks received advances from FHLBs, which in turn issued paper that was purchased by the money market funds. Indeed, in the first quarter of 2023, FHLB advances jumped by a record \$225 billion to surpass \$1 trillion for the first time. See Federal Home Loan Banks (2023), page F-1. For an analysis of the role of the FHLBs in this episode, see Chapter 9.

losses on a bank's assets can deplete a banks' capital sufficiently to diminish confidence in its viability and trigger the rapid withdrawal of uninsured deposits.

By 2022, this vulnerability was widespread in the US banking system. Starting with bank liabilities, total uninsured deposits had surged from about \$5.5 trillion at the end of 2019 to over \$8 trillion by the first quarter of 2022. As Figure 2 shows, this sharp rise implied an average quarterly increase in uninsured deposits of over \$300 billion (and close to \$900 billion in the first quarter of 2020). According to the FDIC's *Quarterly Banking Profile*, the share of uninsured deposits in total deposits (including foreign deposits) rose from less than 47% to nearly 50%, the highest proportion in decades.

FIGURE 2 UNINSURED DEPOSITS: QUARTERLY CHANGE (BILLIONS OF US DOLLARS) AND THE SHARE OF TOTAL DEPOSITS (PERCENT OF TOTAL), 4Q 2016-1Q 2023

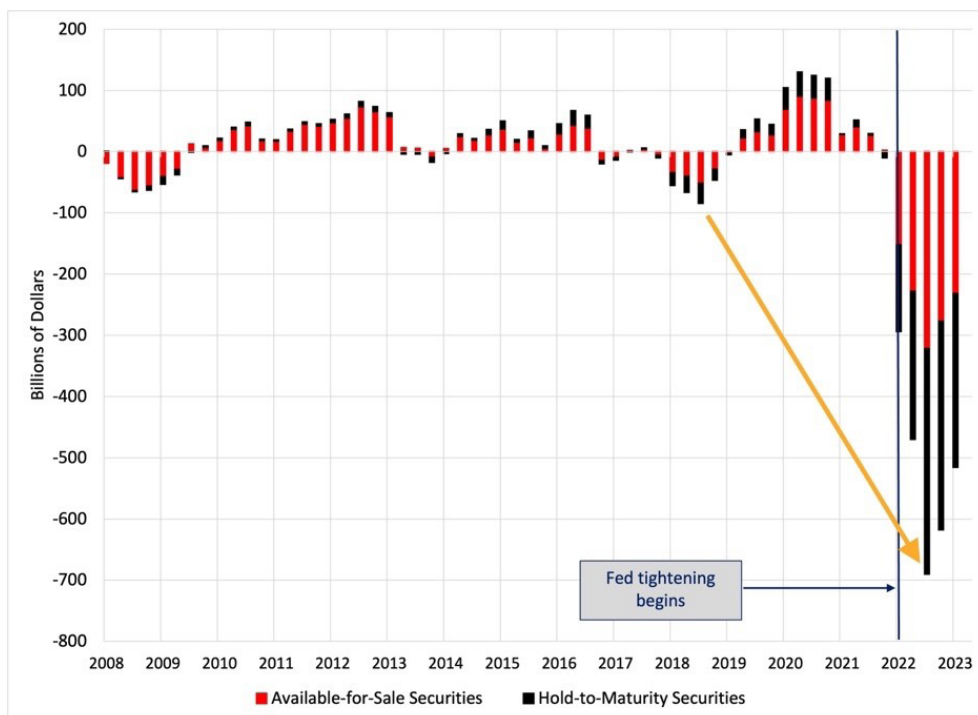


Notes: The line (left axis) shows the ratio of uninsured deposits to total deposits of FDIC-insured banks. The total includes foreign deposits, none of which are insured. The bars (right axis) show the changes in uninsured deposits in billions of US dollars.

Source: FDIC Quarterly Banking Profile.

Turning to the asset side, banks had previously experienced episodes of rising central bank policy rates and slow contraction of the Federal Reserve’s balance sheet. Yet, the extraordinary growth of bank assets and deposits that began in early 2020, combined with the extensive maturity mismatch at many banks, amplified the impact of the 2022 policy tightening. Figure 3 illustrates the consequences. During the monetary policy tightening of 2017-19, the unrealised losses on banks’ securities peaked at less than \$85 billion. By the third quarter of 2022, these losses were about eight times larger, approaching \$700 billion.

FIGURE 3 FDIC-INSURED BANKS: UNREALISED GAINS/LOSSES (BILLIONS OF US DOLLARS) ON INVESTMENT SECURITIES BY ACCOUNTING CATEGORY, 2008-1Q 2023

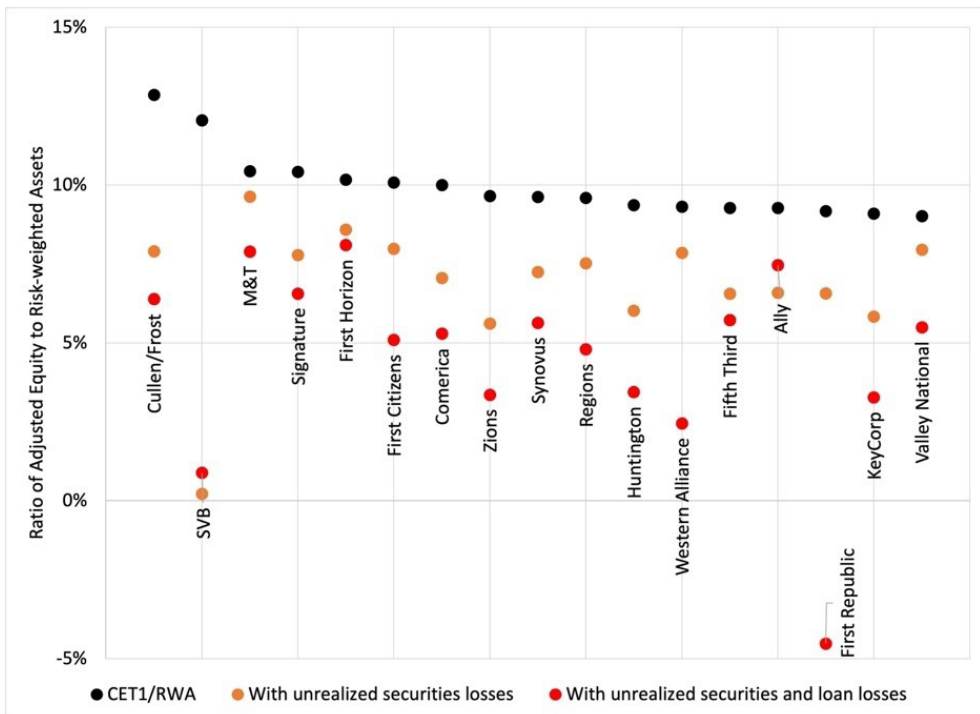


Notes: Total unrealised gains (or losses when negative) on investment securities.
 Source: FDIC Quarterly Banking Profile (First Quarter 2023), Chart 7.

Against this broad background of fragility in the banking system, which banks were likely to come under stress?

Two approaches help to identify the most vulnerable banks. First, using balance-sheet data from the US Securities and Exchange Commission (SEC) filings of publicly traded banks, we can adjust regulatory capital for unrealised losses on HTM assets and on losses on AFS assets and loans that are excluded in the computation of regulatory capital. These adjustments produce a more accurate picture of the impact that liquidation at market price would have on each bank’s capital buffer. Figure 4 shows the year-end 2022 impact of adjusting for these unrealised losses on the risk-weighted capital ratios of various midsized banks.

FIGURE 4 IMPACT OF UNREALISED LOSSES ON MIDSIZED BANKS’ CAPITAL RATIOS (PERCENT OF RISK-WEIGHTED ASSETS, RANKED BY UNADJUSTED CET1/RWA RATIO), 4Q 2022



Note: CET1/RWA (black dots) is the ratio of “common equity tier 1” capital (a widely used regulatory accounting measure) to risk-weighted assets. Without the adjustments shown, this regulatory measure does not reflect unrealised losses on securities or loans.

Source: SEC 10-K reports. The authors are grateful to Michael Cembalest (JPMorgan Asset Management) for providing the data.

The following seven of the 17 banks had adjusted capital ratios (red dots) below 5%: First Republic (-4.5%), Huntington (3.4%), KeyCorp (3.3%), Regions Financial (4.8%), SVB (0.9%), Western Alliance (2.5%), and Zions (3.4%). The figure shows the difference among the three banks that failed. SVB's insolvency resulted entirely from losses on its securities portfolio. By contrast, First Republic's fragility arose from losses on mortgage loans. And Signature Bank, which failed at virtually the same time as SVB in March 2023, looked comparatively healthy with an adjusted equity to risk-weighted assets ratio of 6.6%.

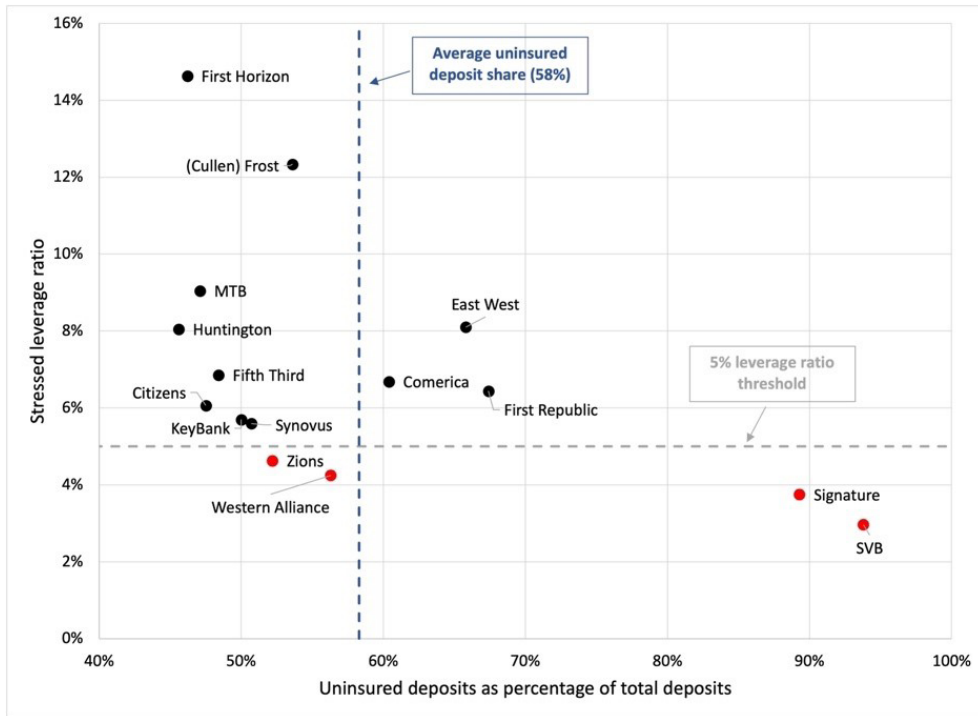
A second way to gauge the asset-side vulnerability of midsized banks is to use the NYU Stern V-Lab's estimates of *SRISK* – a high-frequency, market-based measure of a financial intermediary's capital shortfall under stressed conditions.¹⁰ For example, using this V-Lab approach, we ran a simple stress test at the end of 2022. Specifically, we examined the impact on each bank's leverage ratio of a large (40%) decline in the global equity market.

Figure 5 shows the results of combining information about the vulnerabilities on both the asset and liability sides of midsized banks. The vertical axis measures the banks' stressed leverage ratios (defined in the note below the chart) from the *SRISK* exercise, while the horizontal axis shows the fraction of each bank's deposits that were uninsured. Looking at Figure 5, we see that SVB and Signature – the banks that regulators closed on March 10 and 12 – are outliers in the lower right of the chart (in red). That is, using their equity

10 Formally, $SRISK = E_0 [k(D_t + E_t) - E_t | Crisis] = k \cdot D_0 - (1 - k) \cdot (1 - LRMES) \cdot E_0$ where Crisis is taken to be an aggregate market stress scenario (e.g., a 40% correction to the S&P 500 or the MSCI Global index over a six-month period from time 0 to t), D denotes all non-equity liabilities assumed to be constant between time 0 and t for simplicity, E denotes market equity of the bank or bank holding company (more generally, financial institution), $LRMES$ is the long-run marginal expected shortfall, i.e., the percentage loss in market value of equity of the bank in the crisis scenario, which is estimated using dynamic conditional beta econometrics, and k is a prudential capital ratio relative to which the capital shortfall *SRISK* is computed, e.g., 8%. *SRISK* is updated on a weekly basis at vlab.stern.nyu.edu/welcome/risk.

market valuations at the end of 2022, their stressed leverage ratios were less than 4% of assets, while their deposits were almost entirely uninsured.

FIGURE 5 US MIDSIZED BANKS: STRESSED LEVERAGE RATIO VERSUS UNINSURED DEPOSIT RATIO, DECEMBER 2022



Note: For each bank, the stressed leverage ratio is computed as 5% times the year-end 2022 book value of assets minus *SRISK*, all divided by the book value of assets.

Sources: NYU Stern V-Lab, S&P, and authors' calculations.

Figure 5 also points to other potentially vulnerable banks. Some, like Western Alliance and Zions, appear undercapitalised, with their stressed leverage ratios below the 5% threshold for being well-capitalised. Others, like First Republic, appeared to have only a modest capital cushion and depend significantly on uninsured deposits. As we know, First Republic also faced a massive run, leading to its sale by the FDIC to JPMorgan Chase on May 1 (for details of the First Republic Bank resolution, see Chapter 5).

Conclusion

The evidence of widespread banking system vulnerability in 2022 raises the following questions: Why did the authorities appear unconcerned? Why didn't supervisors take stronger actions to prevent the panic that ensued? Why were banks like SVB and Signature treated as systemic in death but not in life?

Indeed, we know from theory and experience that the presence of a widespread shortfall of capital makes the entire banking system vulnerable to a run on the weakest banks. The simple analogy to a lightning strike in a drought-burdened forest is compelling. Chapter 4 presents a detailed inquiry into the regulatory and supervisory failures in the case of SVB, while Chapter 10 proposes reforms for the regulation and supervision of banks.

The larger conclusion is that – despite the extensive financial system reforms since the financial crisis of 2007-2009 – important parts of the banking system remain fragile. Moreover, the 2023 panic led policymakers to take emergency actions – invoking systemic risk exceptions to protect all depositors of the two failed banks and encouraging the perception of a blanket protection for uninsured depositors elsewhere. In the absence of credible countermeasures, these emergency measures seem sure to encourage further risky behaviour by banks in the future. This moral hazard problem is the essence of the inevitable trade-off between crisis mitigation and crisis prevention that policymakers face.

In the second part of this book (chapters 6 through 10), we focus on the options for reform that policymakers will need to implement to ensure that the banking system – and the financial system more broadly – is both safe and efficient. Where a consensus exists among the authors, we make specific recommendations from among these various options. But first, we need to

understand better the macroeconomic context that set up the banking failures. This is the subject of Chapter 2.

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2 UNDERLYING MACROECONOMIC CAUSES OF RECENT BANKING STRESS

Viral V. Acharya, Stephen G. Cecchetti, Kermit L. Schoenholtz, and Lawrence J. White

Stimulative fiscal and monetary policies after the pandemic contributed to increased risk-taking by banks and others. Low-for-long interest rate promises of central banks made securities investments attractive, while monetary expansion fuelled deposit growth, especially of uninsured deposits. Eventually, higher inflation led to rising market rates and, with a lag, to aggressive central bank rate hikes. Within a year, several banks failed, with the costs of their resolution approaching the annual record set during the Global Financial Crisis of 2007-2009.

In this chapter, we examine the relationship between the unprecedented macroeconomic stimulus initiated in March 2020 in response to the COVID pandemic and bank risk-taking ahead of the mid-sized banking turmoil of 2023. On the monetary policy side, these policies include two forms of stimulus that the Federal Reserve provided: its commitment to low-for-longer interest rates at the zero lower bound (ZLB), often referred to as “forward guidance,” and its large-scale asset purchase programme, commonly known as quantitative easing (QE). On the fiscal policy side, the US federal government’s response to COVID constituted a record peacetime fiscal expansion, resulting in the largest federal deficit (as a percentage of gross domestic product, or GDP) since 1945.¹¹

While we are agnostic about whether these policies were the dominant cause of bank risk-taking during the 2020-2022 period, together they surely helped to fuel expansion of banks’ balance sheets. As we made clear in Chapter 1, regardless of their nature or magnitude, these stimulus policies do not excuse the astonishingly poor risk management that led to the failures of the weakest mid-sized banks in 2023. To put it simply, every qualified bank executive

¹¹ For the history of the US federal deficit (as a percentage of GDP), see the FRED chart [here](#).

knows that rising inflation (as experienced already in 2021) eventually will be associated with rising interest rates. They also generally know the impact that rising interest rates will have on both their assets and their liabilities.

So, did the policy stimulus that started in 2020 fuel risk-taking? We see three key channels through which the pandemic-related monetary and fiscal policies could influence banks' risk-taking – the first on the asset side and the next two primarily on the liability side.

First, the Federal Reserve purposely used forward guidance at the ZLB to lower long-term interest rates and encourage risk-taking to boost aggregate demand. For example, the Fed's commitment to keep rates low naturally encourages banks to increase interest rate risk by "riding the yield curve." Furthermore, sustained QE added to the credibility of the low-for-longer forward guidance because central bankers indicated that policy interest rates were unlikely to rise before asset purchases stopped.¹²

Second, in addition to enhancing the credibility of forward guidance, QE (measured as the addition to central bank reserves) appears to be associated with a rise of uninsured deposits. As we emphasise in Chapter 1, this type of short-term funding adds to the vulnerability of bank liabilities.

Third, large fiscal transfers not only further boosted aggregate demand, but also likely added to uninsured deposits (for example, when government funds were transferred to the bank accounts of nonfinancial businesses).

Once banks chose to take on greater interest rate risk funded with volatile uninsured deposits, the stage was set for a painful reversal when interest rates across the yield curve rose in 2021-22.

¹² For example, Reuters Staff (2021a).

Turning to the details of the story, we focus here on the monetary policy channels. Moreover, because the idea that low interest rates fuel risk-taking is well known, our focus here is on the link between inflation and rising interest rates, and especially on the link between QE and uninsured deposits, which has received less attention. Because so much of the 2023 crisis relates to interest rate risk (associated with the largest increase of inflation in four decades), we conclude this chapter with a section comparing recent developments with those in the savings and loan crisis of the 1980s and early 1990s. One broad takeaway from this comparison is that price stability is a precondition for securing financial stability.

QE and the Growth of Uninsured Deposits

Figure 2 in Chapter 1 shows that from the end of 2019 to the first quarter of 2022, US commercial bank uninsured deposits increased by a quarterly average of more than \$300 billion, rising from \$6.8 trillion to more than \$9.8 trillion. This accounted for more than half of the rise in banking system deposits, which climbed from \$14.5 trillion to \$19.9 trillion.

What explains this spectacular growth in the size of commercial bank balance sheets and their uninsured deposits? In normal times, deposit creation is a natural outcome of growing economic activity and the associated extension of bank credit. But during the pandemic, from 2020 to 2022, several other forces were at work. Unprecedented peacetime fiscal and monetary stimulus played an important role. The fiscal response was over \$5 trillion, or nearly one-fourth of 2020 GDP, while the Fed's asset purchases were of similar size. Here we describe how the sustained QE during the pandemic can lead to an expansion of uninsured deposits.

Figure 1 illustrates that a Fed open-market purchase typically increases bank deposits (insured and uninsured). QE involves such open-market purchases on a very large scale. Typically, the central bank acquires highly liquid securities in exchange for its own reserves (a cash liability that it can create in unlimited amounts). In practice, as nonbanks (including insurance companies, pension funds, hedge funds, mutual funds, family offices, and high net-worth individuals) tender securities via brokers, their bank deposits swell, and the Fed credits their banks' reserve accounts in exchange for the securities.¹³ From March 2020 to the end of the first quarter of 2022, Fed assets jumped from around \$4 trillion to close to \$9 trillion, while commercial bank reserves increased by \$2.5 trillion.¹⁴

13 While purchases of securities from banks do not mechanically expand commercial bank balance sheets, as practiced, QE typically involves purchases from dealers (not all of which are banks). On a net basis, we also know that banks' holdings of securities rose during the QE episode that began in March 2020.

14 The remaining \$2.5 trillion increase in Fed liabilities is split between a \$450 billion rise in currency, a \$1.8 trillion increase in reverse repurchase agreements (primarily with money market funds) and a variety of smaller items.

FIGURE 1 IMPACT OF A FEDERAL RESERVE ASSET PURCHASE ON THE BALANCE SHEETS OF THE BANKING SECTOR AND THE PUBLIC

Initial Balance Sheet Conditions

FEDERAL RESERVE	
Assets	Liabilities
Treasury securities	Reserves held by banks Cash held by the Treasury

BANKING SECTOR	
Assets	Liabilities
Treasury securities	Deposits
Reserves at the Fed	Capital

PUBLIC	
Assets	Liabilities
Deposits	Net Worth
Treasury securities	

The Fed Purchases Assets from the Public
Balance Sheet Effects

FEDERAL RESERVE	
Assets	Liabilities
Treasury securities +1\$	Reserves held by banks +1\$ Cash held by the Treasury

BANKING SECTOR	
Assets	Liabilities
Treasury securities	Deposits +\$1
Reserves at the Fed +1\$	Capital

PUBLIC	
Assets	Liabilities
Deposits +\$1	Net Worth
Treasury securities -1\$	

Bank balance sheets expand, financed with deposits (typically wholesale or uninsured)

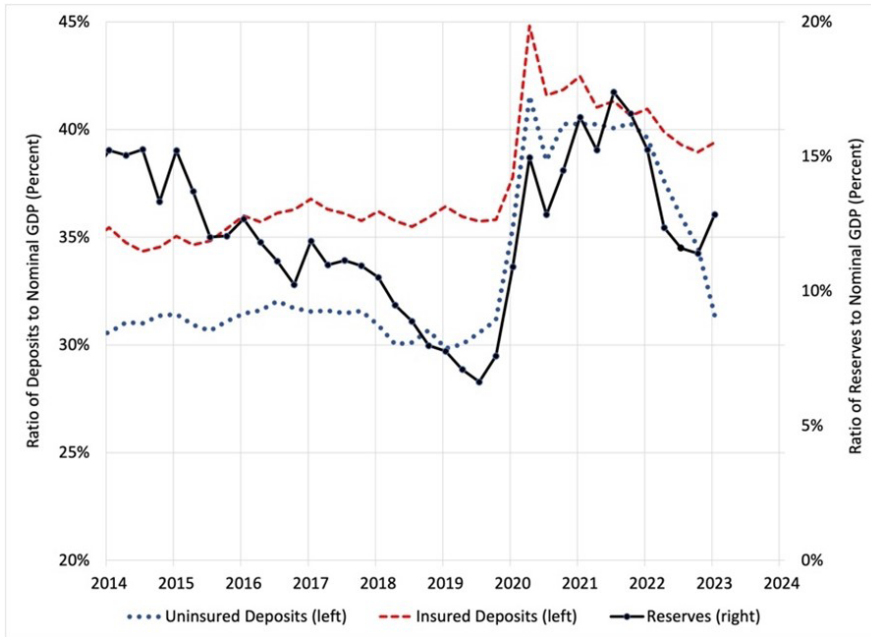
Source: Leonard, Martin and Potter (2017).

In addition to expanding the size of the central bank balance sheet, QE typically is associated with an increase in the overall size of the balance sheet of the banking system. Figure 2a shows that uninsured bank deposits at commercial banks jumped immediately when the Fed began QE in March 2020.¹⁵ To be sure, insured deposits also rose at this stage. Thereafter, however, insured deposits fell and did not keep pace with the ongoing expansion of reserves. In contrast, uninsured deposits grew more steadily until QE ended. Figure 2b highlights the univariate association between quarterly changes in bank uninsured deposits and quarterly changes in bank reserves (even when the large outlier of the first quarter of 2020 is excluded). In terms of magnitude, the regression line in the figure shows that for each billion-dollar increase in reserves, uninsured deposits rose by roughly \$450 million. Over the entire period from mid-2019 to early 2022, uninsured deposits increased by \$3.2 trillion, roughly a third of which appears related to the increase in reserves.¹⁶ As explained in Chapter 1, this heightened stock of uninsured deposits became a source of bank vulnerability after interest rates began to rise in 2022.

15 Figure 2a is based on Acharya et al. (2023).

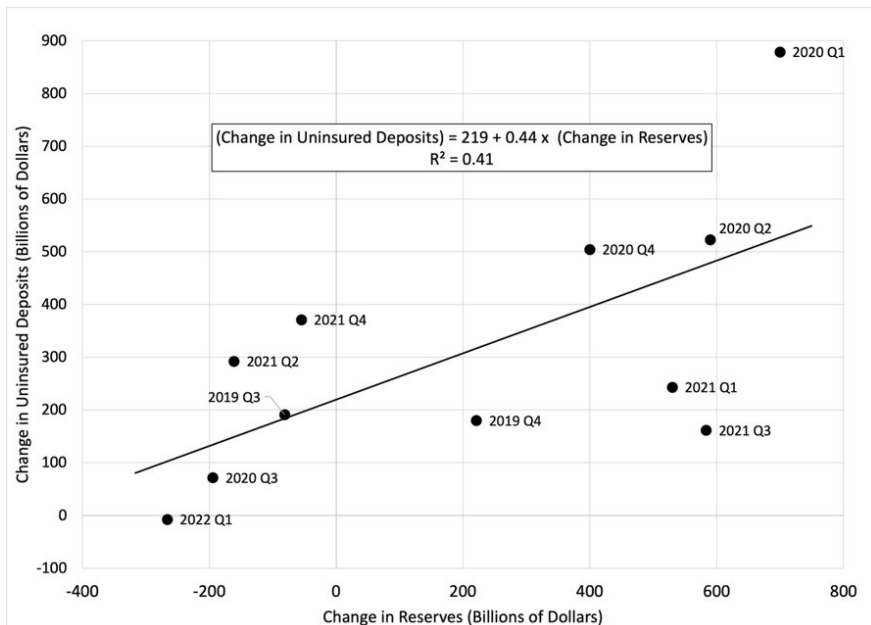
16 The division is as follows. From Q2 2019 to Q1 2022, reserves rose by \$2.34 trillion and uninsured deposits rose by \$3.22 trillion. The constant term in the regression in Figure 2b is equal to \$219 billion. Cumulatively, this implies that the change in reserves accounted for \$1.0 trillion, while unobserved factors that are in the error term accounted for the remainder.

FIGURE 2A BANK DEPOSITS (INSURED AND UNINSURED) AND CENTRAL BANK RESERVES (PERCENTAGE OF GDP), 2014-1Q 2023



Sources: FDIC Quarterly Banking Profile, FRED and authors' calculations.

FIGURE 2B QUARTERLY CHANGES IN UNINSURED DEPOSITS VERSUS QUARTERLY CHANGES IN CENTRAL BANK RESERVES (BILLIONS OF US DOLLARS), 3Q 2019-1Q 2022



Sources: FDIC Quarterly Banking Profile, Federal Reserve H.4.1, and authors' calculations.

For banks that experienced a large inflow of uninsured deposits, the interpretation of forward guidance as a commitment to keep interest rates low for an extended period of time encouraged them to take interest rate risk. Put differently, the central bank's public statements for much of 2021 that rising inflation was expected to be "transitory" may have diminished risk managers' willingness to pay for insurance against a future rise of interest rates.¹⁷ Such hedging would have reduced the short-run profitability of positive "carry" in the form of an interest rate spread between assets and liabilities. In the end, as the saying in the financial sector goes, "the road to hell is paved with positive carry." Their behaviour shows that many banks failed to anticipate that sustained inflation eventually would lead to a historic rise in long-term rates and compel the Fed to reverse course.

Bankers also underestimated the impact of improving returns on short-term, liquid investments that compete with deposits. Even bank managers that were adept at estimating deposit runoff rates to manage funding risk may have relied too heavily on prior episodes of depositor complacency. The challenge was that the history of depositor behaviour in the decades before 2020 reflected a long period of price stability with low opportunity costs for holding transaction deposits. Once the interest rates on close substitutes (like money market funds) rose substantially, as they did during 2022, the pressure on banks to compete for funds, i.e., the so-called "deposit beta," rose in ways that they had not experienced since at least 2008. In some cases, the pressures on net interest margin even threatened their solvency.¹⁸

Once again, the failures of individual banks like Silicon Valley Bank (SVB), Signature Bank and First Republic Bank are no doubt a result of their poor

17 It was not until November 30, 2021, when the core price index of personal consumption expenditures was rising by 4.8% from a year earlier, that Federal Reserve Chair Powell proposed to "retire" the term transitory as a description of the ongoing inflation. See Reuters Staff (2021b).

18 For example, Drechsler et. al. (2023).

risk management. Yet, the entire banking system became more vulnerable as the stock of uninsured deposits increased and as rising interest rates boosted the opportunity cost of holding low-paying transactions deposits. Moreover, the combination of forward guidance and massive QE that added to the credibility of the guidance almost certainly boosted banks' willingness to take on interest rate risk.

The Rapid Tightening of Monetary Policy

The sudden large rise of interest rates – both short-term and long-term – was the key driver of bank losses from the long-term securities and loans that banks held in 2021-22. Furthermore, as explained above, on the liability side of banks' balance sheets, the rapid uptick in rates raised the opportunity cost of holding bank deposits to an extent not seen in several decades. These developments exposed fragilities in the business models of several mid-sized banks and led many people to question the viability of all but the largest institutions. The latter had better risk management, more diversified business lines, or a stronger appearance of being too big to fail. In a few cases, they had all three.

All we need to do to understand the rationale for the 2022 shift in monetary policy is note the surge of inflation to multi-decade highs. In the 30 years from 1991 to 2020, annual inflation (measured by price index for personal consumption expenditures) averaged 1.9% per year. In only one year – 2007 – did inflation exceed 3%. Not surprisingly, both central bank and financial market participants grew accustomed to this remarkable price stability.

In the context of both this history and the belief that the pandemic-induced inflation was largely a consequence of supply disturbances, when inflation rose well above this 30-year range in 2021, many observers – including the leadership of the Federal Reserve – judged the increase to be transitory. At

the time, policymakers were far less focused on factors that boosted aggregate demand, namely the unprecedented peacetime fiscal and monetary stimulus we described earlier.

So, rather than receding in 2021 and 2022 as Fed officials initially thought it would, inflation rose further. Russia's invasion of Ukraine temporarily drove food, energy and commodity prices sharply higher, propelling overall inflation further upward. At the same time, the robust policy-driven recovery from the COVID pandemic combined with rigidities in labour supply resulted in what remains the tightest US labour market since the 1960s.¹⁹

By the time the Federal Reserve began to raise its policy rate target in March 2022, policymakers were clearly far behind the rise of trend inflation, which exceeded 5% (measured by the price index of personal consumption expenditures excluding food and energy). Thus, a simple Taylor rule that aims at keeping inflation near the central bank's 2% target called for a policy rate above 7%.²⁰ To catch up, over the 14 months to May 2023, the Federal Reserve raised its federal funds rate target by five percentage points – the most rapid increase since the Volcker disinflation in the early 1980s.

Unsurprisingly, the sustained increase in inflation and accompanying rise in policy rates drove long-term bond yields sharply higher. Like policymakers, investors took more than a year to recognise that the post-COVID rise of inflation would be more persistent than the experience over prior decades. So, for example, at the end of 2020, the 10-year US Treasury yield was less than 1%. A year later, it was still only 1.5%. Most of the increase occurred during 2022: by October, the yield was 4.2%.

19 Cecchetti et al. (2023).

20 Cecchetti and Schoenholtz (2022).

For banks holding long-duration securities, this large rise in long-term yields meant a plunge in the market value of their assets. However, accounting rules allow some banks to value these assets at cost.²¹ As a result, reported regulatory capital came to sharply exceed what shareholders would receive in a liquidation. Indeed, the Federal Deposit Insurance Corporation (FDIC) reported that – at the end of September 2022 – the unrealised losses on investment securities held by insured depositories totalled \$690 billion. Compared to 2008, at the height of the Global Financial Crisis, this 2022 aggregate loss was larger by nearly an order of magnitude.²²

In our view, by delaying the policy response to rising inflation, the Federal Reserve had little choice but to hike rates rapidly in 2022 if it wished to preserve price stability. But the policy delay, accompanied as it was by strong forward guidance and QE, almost surely lured some banks to take more interest rate risk than they otherwise would have. Indeed, that outcome was intended as a feature of the Fed’s extraordinary post-COVID accommodation. Put differently, delaying the monetary policy response to surging inflation likely amplified the most aggressive risk-taking practices of the banking sector. Moreover, the rapid 2022 central bank policy turnaround gave bank risk managers that had failed to prepare little chance to correct their dangerous choices.

That said, it remains difficult to imagine that either a competent risk manager or an attentive supervisor would have viewed the interest rate risk taken by banks like SVB as consistent with sound practice.

21 See Chapter 7 for a discussion of how banks can categorise their assets as “available for sale” or “held to maturity”, the latter being held at cost. The chapter also details how most banks, other than the largest, are not required to reflect in regulatory capital the unrealised gains or losses on assets in either of these accounting categories.

22 Note that beginning with the Q1 2022 edition, published on June 21, 2022, the FDIC’s Quarterly Banking Profile has included an estimate of unrealised losses as Chart 7. Notably, however, these estimates, including that of \$690 billion for Q3 2022, do not include unrealised losses on loans.

A Flashback - The Savings and Loan Debacle and the SVB Debacle

In this section, we discuss parallels and differences between the SVB debacle and the experience of the Savings and Loan (S&L or thrift) industry in the 1970s and 1980s.²³ A major part of the story in both instances is the taking of interest rate risk and the subsequent adverse consequences of sharp increases in interest rates. Lax prudential regulation also played a role in both instances, as did the absence of market value accounting. But these similarities need to be drawn carefully because there are also important differences between the two episodes.

Background on the S&L Industry

Savings and loan institutions constituted an important category of depository institution between the 1940s and the 1990s. Figure 3 shows the relevant industry size comparisons. The S&Ls were originally solely state chartered; but in 1933, Congressional legislation authorised a federal charter and lodged the concomitant prudential regulatory powers in the Federal Home Loan Bank Board (FHLBB), which had been created a year earlier along with a set of 12 regional banks (the Federal Home Loan Bank System) that could provide finance, or advances, to the member S&Ls. And 1934 legislation (one year after the FDIC was established) created the Federal Savings and Loan Insurance Corporation (FSLIC) to administer a deposit insurance regime for S&Ls that paralleled the FDIC deposit insurance system.²⁴

The explicit purpose of S&Ls was to provide residential mortgage finance for single-family home buyers and for multi-family construction and ownership. Thus, until the early 1980s, S&Ls were tightly restricted as to the other kinds of loans that they could originate. Further, until 1979 federally chartered

²³ The discussion of the experience of the S&L industry draws heavily on White (1991).

²⁴ There were also "mutual savings banks" that were state chartered - mostly in New England, but also in the state of Washington - that were insured by the FDIC but that generally had characteristics similar to S&Ls.

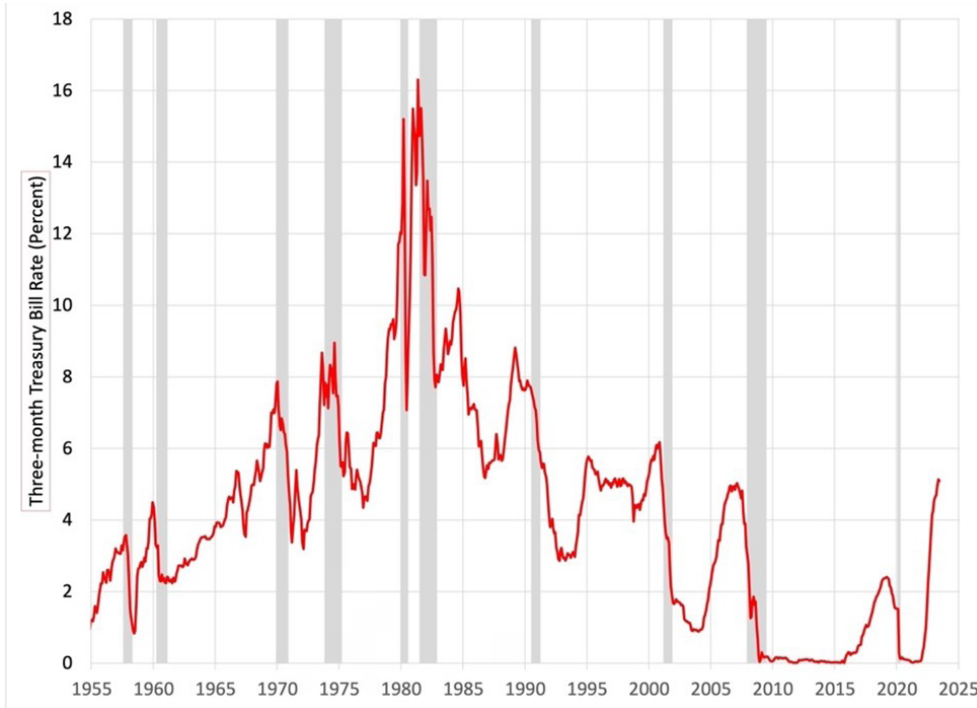
S&Ls were explicitly prevented from originating adjustable-rate mortgages (ARMs), and this was true for most state-chartered S&Ls, as well. S&Ls were thus restricted largely to making fixed-rate long-term residential mortgage loans, while financing these loans with relatively short-term deposits: They were borrowing short and lending long.

FIGURE 3: S&LS AND COMMERCIAL BANKS: NUMBERS AND ASSETS (BILLIONS OF US DOLLARS), 1940-1990

YEAR	S&LS*		COMMERCIAL BANKS	
	NUMBERS	ASSETS	NUMBERS	ASSETS
1940	8,061	\$17.6	13,442	\$70.7
1950	6,521	39.3	13,446	166.8
1960	6,835	112.1	13,126	256.3
1970	6,063	255.2	13,511	570.4
1980	5,052	799.3	14,434	1,855.7
1990	2,987	1,267.1	12,345	3,388.9

* Includes federally chartered S&Ls, state-chartered S&Ls and mutual savings banks.

This asset/liability structure was not a problem for the S&L industry until the mid-1960s, when interest rates began to rise (see Figure 4). In response, to restrict competition among S&Ls for deposits (which would otherwise increase the interest rates that they would have to pay to retain deposits), Congress in 1966 extended the interest rate ceilings of “Regulation Q” – which beginning in 1933 applied only to commercial banks – to S&Ls. Further, in 1970, the Treasury made it more difficult for S&L depositors to switch into Treasury bill investments by raising the minimum denomination of Treasury bills from \$1,000 to \$10,000.

FIGURE 4 US THREE-MONTH TREASURY BILL RATES (MONTHLY, PERCENT), 1955-2023

Note: Grey shading denotes recessions. Source: FRED.

These “patches” worked through most of the 1970s in the sense that they kept deposits within the S&L industry and restricted price competition among S&Ls for deposits. But at the end of the 1970s, as interest rates again rose – this time more sharply – the S&L industry began to haemorrhage: The long-term mortgages on their books lost value, and their deposit costs increased. The deposit “patches” no longer worked, because money market mutual funds, which had come into existence only in 1972, now provided an alternative way for depositors to receive a close-to-market interest return on liquid deposit-like investments. The S&Ls’ capital positions declined; some were insolvent even on the basis of the standard Generally Accepted Accounting Principles (GAAP) accounting system; many more would have been insolvent if they had been required to report their financial statements on a mark-to-market basis (which they were not).

In response, in 1979, the FHLBB authorised S&Ls to originate ARMs. In 1980 and 1982, Congress authorised major changes for S&Ls and for banks: Regulation Q would be phased out²⁵ for banks and S&Ls, and banks and S&Ls were authorised to offer interest-paying checking accounts to households; the deposit insurance limit per account was increased to \$100,000 from \$40,000; and S&Ls could make loans to a wider category of borrowers, as well as even taking limited equity positions in some enterprises.

Interest rates began to decline in mid-1981. But most of the S&L industry was still in relatively poor shape. Consequently, hundreds of S&Ls embraced the new lending and investing opportunities that the 1980 and 1982 legislation authorised, as well as the expanded capabilities for funding (e.g., the increased deposit insurance amount, the phasing-out of Regulation Q, and the authorisation of the interest-paying checking account). And they had stronger incentives for risk-taking, since their diminished (or, for some negative – especially on a mark-to-market basis) net worths meant that they had less to lose in the event that the risks didn't pan out.

Unfortunately, the expanded opportunities, capabilities, and incentives for risk-taking by S&Ls were not accompanied by expanded resources for prudential regulation. Instead, the opposite occurred: The number of FHLBB examination and supervisory staff was stagnant between 1980 and 1984; the absolute number of S&L examinations declined during the same years; the number of examinations per S&L fell; and the examinations per-dollar-of-assets fell by over a half.²⁶ And, to make matters worse, beginning in 1981, the FHLBB reduced the required capital levels for S&Ls and began to modify the

25 One vestige of Regulation Q – a prohibition on paying interest on commercial bank checking accounts – remained in place until it was repealed by the Dodd-Frank Act of 2010.

26 In addition, there were special administrative problems that accompanied the movement of the FHLBB's Ninth District regional regulatory office from Little Rock, Arkansas, to Dallas, Texas, in September 1983; this was the field office that was responsible for examinations and supervision for S&Ls in Arkansas, Louisiana, Mississippi, New Mexico, and Texas. It is worth noting that the S&Ls that were located in Texas accounted for an outsized fraction – about a third – of all of the S&Ls that became insolvent and had to be closed during the debacle.

required accounting rules, so as to make S&Ls' balance sheets look stronger – with higher apparent levels of capital – than GAAP would have otherwise indicated.

As a result, the S&L industry embarked on a path of rapid growth between 1982 and 1985. Much of this growth took the form of excessively risky – from a credit risk perspective – loans and investments. Although the FHLBB began to tighten prudential regulation in 1984 and 1985, these measures were initially too timid and definitely too late. The damage had been done, and hundreds of S&Ls subsequently became insolvent. The accumulated losses of these insolvencies greatly exceeded the capacity of the FSLIC, which was abolished and absorbed into the FDIC in 1989. The eventual cost, which was covered largely from general federal revenues, was estimated to be about \$150 billion.

The Parallels and the Differences

The main parallel is the borrow-short/lend-long strategy that was at the centre of the S&L and SVB experiences. However, for SVB it was a strategic choice; for the S&L industry, it was a legal requirement until the early 1980s.²⁷

Another parallel is the presence of weakened prudential regulation. However, for SVB, the lax prudential supervision failed to restrict SVB's interest rate risk "bets"; for the S&L industry, lax regulation allowed the industry to engage in excessive credit risk bets.

As noted above, the absence of market value accounting allowed SVB – and the S&L industry – to appear to be far better capitalised than a mark-to-market framework would have revealed. This allowed both SVB and the S&L

²⁷ Also, the opportunities in the 1970s for S&Ls to hedge their interest rate risk – if they were interested in doing so (which for most S&Ls was unlikely) – were much more limited than was true a few decades later.

industry to present to the public a better picture of themselves—and this likely reduced the pressure on the regulators to act sooner.

Both SVB and the S&L industry grew rapidly during a crucial period. Whether measured by assets or by deposits, SVB tripled in size between 2019 and 2021. Though not nearly as extreme, the S&L industry's annual growth rates in 1983 and 1984 (18.6% and 19.9%, respectively) were more than twice the annual rates of growth of the previous three years, which averaged 7.4%.

Finally, there is one major difference between the two experiences: The S&L depositor base was well over 90% insured, so depositor runs were largely not an issue. By contrast, around 90% of SVB's deposits were uninsured, and it was a massive depositor run on March 9, 2023 – and the prospect of an even larger run the next day – that forced the closing of SVB. As we have noted, the rapid growth of uninsured deposits was in part associated with the unprecedented scale of QE by the Federal Reserve in its post-pandemic stimulus.

To sum up this comparison with the S&L episode, there are important parallels between the recent experience of SVB and of the savings and loan industry in the 1970s and 1980s – of which the most important are the centrality of interest rate risk in the difficulties that both faced and the role of lax prudential regulation. But there are important differences as well, so care should be taken in drawing the lessons that can be learned. Perhaps the most notable difference is that runs did not play an important role in the S&L episode, because the depositor base was largely insured.

Conclusions

As we argued in Chapter 1, the failures of midsized banks largely reflected their poor risk management. In this chapter, we highlighted macroeconomic

factors that contributed to banks' willingness to take interest risk (including the central bank's commitment to low-for-longer interest rate policies at the ZLB), as well as to the prevalence of risky uninsured deposits on the liability side of their balance sheets (notably the observed association between the rise and fall of uninsured deposits and the size of central bank reserves). We also underscored how rapid increases in interest rates can threaten the viability of banks that assume an extraordinary level of interest rate risk funded by volatile liabilities (such as uninsured deposits).

While the stimulative macroeconomic policies that we highlight were neither necessary nor sufficient to cause the increased fragility of the banking system, they almost certainly contributed to it. And, since the Fed's eventual tightening of policy was necessary to restore price stability (both in 2022 and in 1981-82), the 2023 banking panic reminds us how critical the maintenance of price stability is to ensuring stability in the banking system. Indeed, while it is difficult to prove even with the benefit of hindsight, we believe that a pre-emptive Fed policy response to rising inflation in 2021 would have contributed both to price and banking stability.

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3 BANKS, INTEREST RATE RISK AND SYSTEMIC RISK - THEORETICAL AND HISTORICAL PERSPECTIVES²⁸

Matthew P. Richardson, Alexi Savov and Philipp Schnabl

33

Under certain conditions, the business model of banks - in particular, the stability of their deposit franchises - can help manage interest rate risk at prudential levels. However, under other conditions, it can also produce systemic risk due to an over-hedging of interest rate risk with unstable, uninsured deposit franchises. The banking strains of 2023 posed such a threat. A comparison with recent crises (Savings and Loans in the late 1970s and early 1980s, Continental Illinois in 1984, and the Global Financial Crisis) identifies some common elements, such as the lack of adequate banking capital against systemic risk, that can help guide regulatory reform.

In this chapter, we describe the business model of banks; the nature of systemic risk and how this business model can lead to it; and, given this description, we analyse how systemic risk has emerged in the current episode of banking stress. In a way this chapter takes a step back from the details and specifics of Chapters 1 and 2 and focuses more generally on the systemic risk of banks. We draw on these chapters, however, to lay out systemic risk lessons from the current banking episode. Of particular note, we compare and contrast the current banking stresses to those of the three most recent banking crises – the Savings and Loans (S&L) institutions in the late 1970s and 1980s (which led to systemwide S&L failures in this sector); the collapse of Continental Illinois in 1984 (the largest failure of a US bank at the time since the Great Depression); and the Global Financial Crisis (GFC) of 2007-2009, which was the most severe financial sector crisis since the Great Depression, leading to large externalities for the global economy.

²⁸ We would like to thank Viral Acharya, Itamar Drechsler, Kim Schoenholtz and Bruce Tuckman for many helpful comments and suggestions.

The Business Model of Banks

Most depository institutions have fairly simple business models even though they appear to fail in rather complex ways. They take in deposits and make loans (consumer, commercial and real estate) or purchase securities (mostly mortgage-backed securities or Treasuries).²⁹ From this business model, banks create value through two major functions.

The first is its deposit franchise value. The aforementioned loans are not particularly attractive to households to make directly to the borrowers: Many of these loans require monitoring, are illiquid and risky. Banks serve as an intermediary by purchasing these loans and issuing more “attractive” financial claims to households and other sectors in the form of deposits. Customers’ deposits provide instant liquidity, alongside a stream of bank services. On the one hand, the deposit franchise is costly for the bank, such as the cost of running branches, including real estate, providing secure payments, offering transactions online and via an app, salaries, marketing, etc. On the other hand, deposits are – most of the time – a stable source of funding and “low-cost” in nature. The interest paid out on deposits is below that of the risk-adjusted rates banks earn on their lending and investment activities. Indeed, as lending rates rise, deposit rates tend to rise less, creating a source of continuing profit. The deposit franchise value of the bank represents the present value of the spread earned on these deposits minus the costs of running the deposit business.³⁰

29 For sake of this exposition, we will abstract from the fact that banks are special (also) in their function of providing lines of credit to households and corporations (see, for example, Kashyap, Rajan and Stein (2002)), which can be run upon just the way that deposits can be demanded with immediacy.

30 Different types of deposits have different spreads and costs. Checking deposits have the highest spreads and costs, followed by savings, small time, and large time deposits. Historically, uninsured deposits were primarily large time deposits with low spreads and costs. However, during the zero-lower bound period and Covid, uninsured deposits migrated toward checking and savings deposits (see Drechsler, Savov and Schnabl (2023b)).

The second source of value is the bank's role as a delegated monitor.³¹ Because banks have collected substantial funds from depositors and these deposits tend to stay at the bank, banks have the resources to collect information and better monitor actions of the borrowers. This allows them to mitigate agency costs that arise due to the presence of asymmetric information between borrowers and lenders. Importantly, banks develop products, such as bank loans and other securities, that help produce information that reduces the asymmetry, leading to more efficient use of capital in the overall economy. While part of this value creation accrues to the borrowers, some of the rents go to the banks most familiar with these borrowers.

On the liability side, banks have a stable source of funding, and, on the asset side, banks can achieve a high level of diversification across their portfolio of loans (e.g., residential and commercial mortgages and corporate loans). It is reasonable therefore to believe that banks face little idiosyncratic risk on their portfolios, even though less diversified banks may retain concentrated exposures to specific sectors (such as Silicon Valley Bank and Signature Bank did to the tech and the crypto sector, respectively).

With respect to systematic risk, however, there are three main types of risk. Even though there is always a nexus of some of these risks at play when banks come under stress, it is useful from a pedagogical standpoint to view them as isolated risks to start with.

The first systematic risk is the credit risk of their loans, which is affected by economywide shocks. Banks are required to set aside provisions for expected losses and to have sufficient net worth (equity) to meet unexpected losses

31 For a theoretical discussion of banks' delegated monitor function, see Diamond (1984), Winton (1997), Blickle, Parlatore and Saunders (2021), and Paravisini, Rappoport, and Schnabl (2023).

from these potential shocks. Much of the focus of regulators in setting capital requirement for banks is on this type of risk.

The second is liquidity risk. Many bank loans are not easily traded in secondary markets and cannot be sold off quickly. Indeed, this is the primary motivation for as many of the loans as possible to be sold off in a securitisation post origination of loans. Banks manage to remove the risk from their books, and investors are able to hold these risks in a more liquid form. Banks often buy securitised loans themselves, taking advantage of their greater liquidity. As described above, many of the liabilities are short term and can be demanded with immediacy, leading to a liquidity mismatch between assets and liabilities. Regulation is focused on this risk of the banking system too. For instance, liquidity coverage ratios (LCR) and net stable funding ratios (NSFR) are aimed at ensuring banks have adequate stocks of high-quality liquid assets (HQLA) against typical run-off rates on deposits and other runnable wholesale liabilities.

The third is interest rate risk. As described in Chapters 1 and 2, banks are exposed to interest rate risk due to the maturity mismatch of the loans they make versus the deposits they receive. As a result, banks are seemingly long the bond market. With respect to the ongoing banking stress, a number of recent papers have pointed out that losses on the asset side due to the rapid rise in rates exceed \$1.5 trillion, leading to a majority of banks being substantially below their “safe” effective capital levels.³² A potential offset to these losses arises from the corresponding increase in the value of the deposit franchise business due to the increase in value of future spreads between higher loan rates and sticky deposit rates. In particular, Drechsler, Savov and Schnabl

32 For a recent analysis of bank losses on their security holdings, see, for example, Drechsler, Savov, and Schnabl (2023a), Jiang, Matvos, Piskorski, and Seru (2023a) and Flannery and Sorescu (2023).

(2021) argue that the deposit franchise naturally hedges the long duration of the banks' loans.³³ This argument may seem surprising given the short duration of deposits.

To better understand this argument, note that when interest rates are low, banks' profits are also low. Because the cost of running the deposit business is mainly fixed and deposit rates are of a similar magnitude to market rates when rates are low, low interest rates are associated with periods of a high net cost of running the deposit business. This is compounded by the fact that low interest rate environments are also associated with economic downturns, leading to enhanced credit risk of the loan portfolio. If low interest rates persist, banks can therefore come under stress. As a result, holding safe long-term duration securities, such as Treasuries or guaranteed mortgage-backed securities (MBS), provides a natural hedge of these costs when interest rates fall. Of course, the problem of holding these securities is that they lose value when interest rates rise, causing losses on the asset side of the balance sheet. As Drechsler, Savov and Schnabl (2021) point out, if deposits remain sticky with "deposit betas" closer to zero than one as observed until recently,³⁴ then banks do well in high interest rate environments as they make an excess spread on their loans versus the low interest rates paid out on deposits.^{35,36} Thus banks with low deposit betas and long-duration assets are insulated from interest rate changes.

33 McPhail, Schnabl and Tuckman (2023) document that banks do not use interest rate swaps to hedge the duration of their assets.

34 The deposit beta is defined as the sensitivity of a bank's deposit rate to changes in short-term market interest rates.

35 In support of their theory, Dreschler, Savov and Schnabl (2021) document a number of stylised facts. First, over the past 60 years, deposit rates are usually below the market interest rate. Second, while fed funds rates have varied substantially over the past 60 years, banks' net income margins (NIM) have changed little with interest rates, i.e., the change in interest income (from loans and securities) is similar to the change in interest paid on deposits. Third, Dreschler, Savov and Schnabl (2021) perform a regression of bank stock returns on interest rate changes around Federal Open Market Committee (FOMC) meetings and compare their results to other industries. Given the leverage of banks and their long duration on the asset side, one might expect a very large negative coefficient due to the duration mismatch. In contrast, while the coefficient is negative, it is relatively small and not particularly different from most other industries.

36 For a discussion of this point, see Drechsler, Savov and Schnabl (2023a). As an illustration, in December 2021, while the average deposit rate was close to 0%, it had only increased to 0.35% by February 2023. Yet, during this time, the Federal Reserve raised short-term interest rates from 0% to 4.75%. With savings deposits of \$12.5 trillion at the end of 2022, banks earned approximately \$550 billion in interest costs.

Costs of financial distress are relatively high for banks. Once a bank comes under stress, it is difficult for it to have ready access to capital and perform its intermediation services. It is therefore in the bank's objective function of maximising shareholder value to manage its risks. As described above, while diversification substantially reduces risk, banks face credit, liquidity and interest rate risk with each risk reduced, respectively, through holding loan loss reserves, less runnable deposits (e.g., insured through the Federal Deposit Insurance Corporation, or FDIC) and holding liquid securities, and the implicit hedging of duration risk by the deposit franchise. This way, even though banks are highly leveraged institutions, banking crises can, in principle, be rare events.

However, even if banks manage risks well on an individual basis, there is an emerging consensus that the banking system is not guaranteed to be collectively safe.³⁷ Systemic risks by their very nature are in the tails of underlying risk distributions. Managing such tail risk is inherently difficult. Moreover, given limited liability or due to high-powered incentives or simply behavioural reasons, bank incentives to manage these adverse tail risks tend to be weak when proximate risks are around the central tendency of distributions. Furthermore, systemic risk realisations involve general equilibrium price effects that with incomplete markets can feature externalities that individual banks do not fully internalise. Finally, when these externalities manifest, regulators and politicians face a time-inconsistency problem and end up extending the safety net to banks – explicit government guarantees (e.g., deposit insurance), implicit guarantees (e.g., potential bailouts), and access to liquidity through the Federal Reserve system – in order to manage the spillovers within the financial sector and to the real economy.

37 For a detailed analysis and discussion of this feature of the financial system, see Acharya (2009).

Due to the extension of this safety net, regulators impose capital and liquidity requirements, along with bank supervision, to mitigate the mispriced risk-taking incentives of banks. However, even without the mispricing of agency costs in government guarantees and/or inconsistent regulatory requirements, the negative externality of excessive leverage and correlated asset risk at the aggregate level can suffice to produce socially inefficient levels of systemic risk, i.e., the risk that banks may fail *en masse* – in these rare states. In other words, systemic risk is only compounded by mispriced government guarantees, whereby the costs in these states are not borne by the banks themselves, but the taxpayers.

The next two topics of discussion are the theory for how such systemic risk emerges and the implications for the ongoing banking stress.

The Systemic Risk of Banks³⁸

With respect to systemic risk management, the objective of a regulatory body can be formulated as ensuring that stress on the financial system does not prevent any given financial firm (say, a bank) from carrying out its ordinary intermediation functions where those functions are critical to the functioning of the real economy. In general, a financial firm can be described as systemically risky if it has the potential under stress conditions to cause, or contribute to, harm to the broader economy. A conclusion that a firm is systemically risky is different from a conclusion that it is likely to go into financial distress: A firm can be systemically risky but healthy (or can be in poor health but not a significant source of systemic risk). A regulator concerned with systemic risk should ask whether a firm's financial activities could potentially contribute to a systemwide event such as the financial crisis that struck the US economy in

38 This description is taken from Acharya, Philippon and Richardson (2016).

late 2008. That can happen when a firm is so positioned in the market that its distress is likely to cause distress in other firms – directly to its counterparties, creditors, or customers, or even indirectly (via second-order effects) to parts of the economy not connected to it.

Acharya, Pedersen, Philippon and Richardson (2016) argue that such adverse transmission of a financial firm's distress occurs when there is an aggregate capital shortfall in the financial sector.³⁹ Intuitively, systemic risk arises when there is a breakdown in aggregate financial intermediation – that is, a collapse in the ability of financial firms in the economy as a whole to obtain funds from depositors or investors, and to provide financing to other firms. If one financial firm becomes unable to perform intermediation services, but all other financial firms continue to have ready access to capital, the consequences for the economy as a whole are likely to be minimal – the other firms can simply step into the breach. When capital is low in the aggregate, however, that is not possible.⁴⁰ Based on this intuition, Acharya, Pedersen, Philippon and Richardson (2016) build a simple model of systemic risk and show that each financial institution's contribution to systemic risk can be measured as its systemic expected shortfall (SES), i.e., its propensity to be undercapitalised when the system as a whole is undercapitalised.⁴¹ Thus, it is not the individual institution's capital shortfall per se, but its contribution to aggregate capital shortfall that matters when attempting to assess its systemic importance. In the academic literature, using alternative measures

39 Formally, an aggregate capital shortfall of the financial sector occurs when the market value of the equity in the sector as a whole falls below a certain fraction of the market value of the assets of the sector as a whole. It can be described as financial firms generally being under stress.

40 On the theoretical side, see, for example, Thakor (1996) and Holmstrom and Tirole (1997), and for empirical observations, see Bernanke (1983), Slovin, Sushka and Polonchek (1993) and Gibson (1995).

41 This SES measure of systemic risk has been analysed in a variety of papers. For example, see Acharya, Engle and Richardson (2012)'s *SRISK* measure for an early analysis, and the website documenting this measure, <https://vlab.stern.nyu.edu/srisk>.

of systemic risk, the importance of such co-movement is common to most approaches.⁴²

An alternative, but not entirely unrelated perspective, is that financial crises can occur when the economy is hit by shocks if financial firms rely sufficiently on short-term financing so that there is a risk the financing of these firms does not get rolled over (e.g., Diamond and Dybvig (1984), Allen and Gale (2000) and Diamond and Rajan (2001, 2005)). If a sufficient “run” on a number of financial firms’ liabilities takes place, these firms will potentially be forced to sell assets to cover the financing at potentially fire-sale prices. Moreover, absent the availability of long-term capital in the economy, even small shocks can lead to runs on the liabilities (Acharya, Gale and Yoralmazer (2009)). These “runs” can lead to a reduction in financial activities of the firm and fire sales that amplify throughout the financial sector, not dissimilar from the impact of an aggregate capital shortfall of the financial system.⁴³

Acharya, Philippon and Richardson (2016) provide an extension to the model of Acharya, Pedersen, Philippon and Richardson (2016) that incorporates externalities arising from both an aggregate capital shortfall in the economy and fire sales as results of runs on financial firms’ liabilities. Intuitively, a financial firm contributes to systemic risk through its contribution to the aggregate capital shortfall and the loss of future financial intermediation in the real economy (i.e., as a “going concern”), and through its liability structure which impacts the likelihood of runs and forced fire sales (i.e., leading to a loss of “current activities” in the real economy). The model points to relevant

42 Biais, Flood, Lo and Valavanis (2012), Brownlees and Engle (2010); Adrian and Brunnermeier (2016); Billio, Getmansky, Lo, and Pelizzon (2011); De Jonghe (2009); Huang, Zhou and Zhu (2009); and Goodhart and Segoviano (2009).

43 For example, consider the following impact of fire sales described by Diamond and Rajan (2005, 2011). When fire sales of financial assets occur, the return on capital for these assets is high relative to real assets in the economy. In general equilibrium, fire sales therefore increase the required return on capital for real investments, producing rationing on the real side of the economy. This negative externality that lowers real investment only gets corrected when real and financial returns to capital are equilibrated.

parameters that drive the systemic risk of banks, such as the amount of the firm's assets, the systematic risk of those assets, the leverage of the firm, and the firm's liquidity mismatch – that is, the extent to which the firm employs short-term runnable liabilities or engages in fragile shadow-banking activities.

An important corollary for the discussion to follow is that if (i) banks' loans and security holdings are long duration in nature, that is, exposed to movements in interest rates, and (ii) bank liabilities, besides being short-term, are runnable, such as uninsured deposits or sale-and-repurchase (repo) agreements, then a significant rise in interest rates could become a source of vulnerability to “runs” for the most exposed parts of the banking system. In turn, if the vulnerability materialises, it could impose a negative externality on the rest of the financial system and the economy. Because (incomplete) markets do not necessarily price negative externalities adequately, these externalities can get produced in excess. One efficient solution preferred by economists is to tax this externality. The nature of the tax aside, the purpose of the tax is for banks to internalise the systemic costs they impose on the financial system. Without some mechanism (i.e., a systemic risk tax or other form of regulation), a financial firm will continue to maximise the value of its institution, leading to too much systemic risk being produced in aggregate. Interest rate risk might be the case in point for the banking stress of 2023.

Systemic Risk and the Ongoing Banking Stress

The current banking stress arose when interest rates increased rapidly starting in 2022, exposing banks to large losses on their securities, mainly Treasuries and MBS.⁴⁴ These losses exceeded \$1.5 trillion, which in theory

44 Chapters 1 and 2 provide a detailed analysis of the causes of the current banking crisis.

was enough to wipe out significant amounts of banks' regulatory capital (if these losses were included in regulatory capital). As explained above, historically, such losses have been covered by future income gains due to the rates on new securities (and loans) exceeding low sticky deposit rates. Indeed, the banks had kept their finances afloat during the previous low interest rate environments of 2009-2014 and 2020-2021 precisely because of this spread. So, what went wrong this time?

Throughout this book (see especially Chapter 7), we discuss banks' holdings of securities designated as available-for-sale (AFS) versus hold-to-maturity (HTM) as they are treated differently for financial accounting purposes. But independent of their accounting (or even regulatory) treatment, because most of these securities are liquid and have observable prices, the losses on these securities when interest rates rise are relatively plain to see given banks' financial statements. Banks also have losses on fixed-rate loans, which are harder to see because many loans are not traded, but since their duration is often disclosed, losses due to interest rates on these loans are also relatively transparent. In contrast, the offsetting increase in the value of banks' deposit franchise business does not have a market price except for implicitly through the valuation of the bank's market equity value. This offsetting value depends on (i) the (risk-adjusted) spread between future securities and loans remaining higher than the deposit rate (i.e., the deposit rate remaining sticky), and, more importantly, (ii) the deposits remaining in the bank during this period of catch-up. After all, if deposits leave the bank when the value of the offset would be the highest, i.e., when interest rates rise, then a deposit franchise-based interest rate hedge for banks has a "wrong-way" exposure in that the hedge fails precisely when it is potentially most valuable.⁴⁵

⁴⁵ Viewed this way, equity markets may reflect both the present value of the deposit franchise as well as its risks (e.g., in implied volatility in options markets, see Chapter 6).

With respect to this latter point, a distinguishing characteristic of bank deposits in historical data has been the large negative correlation between the level of short rates and deposit growth (see, for example, Dreschler, Savov and Schnabl (2017)). That is, some existing depositors do leave and put their money elsewhere (e.g., money market funds, Treasury bills, etc.) when short-term rates rise. This creates some uncertainty about bank valuation during periods of large interest rate moves. Aside from the sharp rise in interest rates and normal deposit decay as a result of this rate rise, there are a few additional characteristics of regional banks specific to the current episode of banking failures and stress.

The first, and most important, is the rapid growth in systemwide uninsured checking and savings deposits prior to and during the pandemic (and thus prior to the interest rate rise). Chapter 2 argues this was related closely to Fed's quantitative-easing (QE) stimulus.⁴⁶ The zero-lower bound period was likely also a factor. During the 2016-2019 interest rate cycle, which was relatively shallow, these uninsured checking and savings deposits appeared "sticky" and remained in banks despite historically low deposit betas. Banks may have assumed these low betas would persist during the current cycle. This is risky because uninsured deposits can become unstuck and their betas can rise quickly. This can lead to a self-fulfilling run on the deposit franchise. Thus, one of the key parameters describing systemic risk from a bank's liquidity mismatch would be its stock of low-beta uninsured deposits.⁴⁷ These deposits present a clear and present danger to the financial system because they are

46 Specifically, Chapter 2 links unprecedented fiscal and monetary stimulus more broadly to bank risk-taking and to overall deposit growth (including both insured and uninsured deposits). On the QE-uninsured deposit link, the chapter reports an estimate that about one third of the increase of uninsured deposits (from year-end 2019 to early 2022) appears related to the increase of central bank reserves (QE).

47 In contrast, high-beta uninsured deposits (e.g., large time deposits and wholesale funding) do not contribute to the bank's deposit franchise. A run on these deposits damages the bank only if its assets are illiquid. Runs on low-beta uninsured deposits are damaging even if assets are liquid because they destroy the bank's deposit franchise.

runnable. And because there is little cost in running and switching over to a safer bank or a money market fund, it does not take much to start the run.⁴⁸

A case can be made that the first run in the ongoing banking stress occurred when Silicon Valley Bank (SVB) tried to raise additional capital to cover some of its realised security losses.⁴⁹ When SVB was not successful, this likely put into question the value of SVB's deposit franchise business, which consisted largely of uninsured checking and savings accounts. This initiated a self-fulfilling run on the deposit franchise. While other banks that subsequently failed (such as Signature Bank and First Republic Bank, along with others that ran into trouble) all had their own idiosyncratic characteristics, a similar feature of all of them was a relatively high magnitude of security losses due to interest rate increases coupled with a relatively high level of low-beta uninsured deposits.

The second characteristic also arguably unique to this period was the growth of FinTech, and, in particular, mobile banking. On the one hand, the services a bank can provide the customer via FinTech ties the customer closer to the bank. On the other hand, the increased competition from FinTech puts pressure on deposit rates and FinTech also makes it easier to move funds. Specifically, the FinTech trend has made it easier for depositors to leave the bank and go elsewhere. If one reason “sleepy” depositors have previously stayed put when rates increase is due to the hassle of switching, then presumably digital banking has lowered the “switching costs” of such a move. Like money market funds, digital banks tend to offer higher rates than

48 For example, in Diamond and Dybvig (1981), depositors can run for the mildest of reasons, e.g., due to self-confirming prophecies about other depositors. As described here, with negative information about the bank's going concern, the run is that much more likely.

49 As shown in Chapter 1, SVB had suffered an initial drop in deposits starting in the second quarter of 2022, possibly due to reasons unrelated to its security losses. SVB served as a bank to technology companies and their executives, as well as to venture capital firms. Due to the difficulty in raising capital in this sector, firms had begun to draw down their deposits to make payroll and other expenses during this period. It should be noted though that the start of deposit loss coincides with the Federal Reserve's raising of its policy rate.

traditional depository institutions because their operating costs are much lower. In addition, even within traditional depository institutions, which offer online banking, moving funds is much simpler and faster. Indeed, the speed of SVB's fatal run during March 2023 has been well-documented.

As described above, the loss in deposits presents two main problems for the systemic risk of the regional banking sector.

The first problem is a bank's contribution to the aggregate capital shortfall. Here, because depositors have left the bank, the exposure to interest rates on the asset side is now naked as the bank is no longer short duration via the franchise deposit business. In other words, some of these banks face insolvency with a steep rise in interest rates.

The second problem is that the liquidity of the banking system's loans comes into play because to pay back the deposit funds, the loans might have to be sold. Of course, many banks held liquid Treasury and MBS securities, which triggered the losses in the first place. But once the bank has run through these liquid securities, the run quickly leads to the banks' loan book. In the current banking stress, however, all of the large regional banks that failed (SVB, Signature Bank and First Republic Bank) were eventually bought by other banks, albeit at an estimated loss of \$31.5 billion to the FDIC. These bank sales helped prevent fire sales of the assets, and the potential for a full-blown crisis seems to have been averted. That said, the interest rate losses of the banks remain, and the risk of deposits leaving the system remains with high interest rates. Potential issues with commercial real estate loom on the horizon. Thus, whether the banking stress spreads further, resulting in fire sales and future systemic risk, remains an open question.

Even if rational from the viewpoint of an individual bank, the coupling of interest rate sensitive security holdings and a high level of uninsured deposits

– a common feature of a large part of the banking system – would suffice to produce too much unpriced systemic risk in aggregate. With the rapid rise in inflation-driven interest rates starting in 2022, the systemic risk materialised. In the conceptual framework discussed above, the regulatory solution would have been for banks to internalise this aggregate systemic risk via an ex-ante systemic risk tax. The implication of such a tax would have been for banks to hold less interest rate duration and/or fund it with less uninsured deposits in systemic risk states (i.e., high interest rate environments). In lieu of a tax for being exposed to such risks on assets and liabilities, direct regulation such as a higher capital requirement tied to higher interest rates would have helped mitigate the systemic risk.

To this point, in an extension to their earlier model, which shows how banks hedge the interest rate risk of their assets with their deposit franchise, Dreschler, Savov, and Schnabl, and Wang (2023) derive what this regulation might look like in a framework when deposits are less “sticky” at high interest rates. Because of the higher probability of deposits leaving at high interest rates, the bank should act as if its “deposit beta” is higher than it really is, leading the bank to shrink the duration of its assets to avoid insolvency. However, if interest rates fall, then shortening duration also exposes the bank to insolvency because the costs of running the deposit franchise exceed its revenue. This reflects the low spread between rates on loans and securities versus deposits. Given this asymmetry, Dreschler, Savov, Schnabl and Wang (2023) show that an optimal regulatory policy would be for banks to purchase

interest rate options, either floors on interest rate loans or swaptions, and/or have a higher capital buffer as interest rates rise.^{50,51}

Practically, supervisors are, however, unlikely to raise capital requirements in a pro-cyclical manner, typically proceeding slowly over a period of years to provide banks with a long adjustment interval. Nevertheless, the work of Dreschler, Savov, Schnabl and Wang (2023) shows the importance of supervisors' taking into account interest rate levels when designing capital and liquidity requirements. Specifically, when interest rates rise, there can be a sudden move to a new equilibrium of bank runs as asset losses increase and the situation for uninsured deposits deteriorates. This deposit instability calls for some form of joint capital-liquidity regulation and supervision (even if it's not feasible to make capital requirements meaningfully interest rate sensitive). Theoretically, the optimal joint capital and liquidity requirements can be achieved organically through a systemic risk tax, or alternatively imposed as direct capital and liquidity regulation on banks.⁵² Importantly, the optimal regulation would need to "intensify" for banks holding longer duration assets and/or with a large uninsured deposit franchise. This is because these banks contribute the most to the systemic risk as their sources of risk are common across the financial system.

This analysis ignores regulatory distortions, such as mispriced government guarantees (e.g., deposit insurance and too-big-to-fail) with corresponding inadequate regulation (e.g., poorly designed or weakly enforced capital-liquidity requirements and supervision). These distortions serve to amplify

50 For an analysis of the asymmetric relationship between the deposit franchise valuation and interest rates, see also Haddad, Hartman-Glaser and Muir (2023).

51 The key point of their paper is that the likelihood of a deposit run increases as rates increase. And because deposit duration vanishes in a deposit run, a bank's interest rate "bets" are naked and need protection in that scenario. In a theoretical model, there will be a single interest rate where the break occurs, so the bank can hedge with a single swaption. More generally, there is a nonlinear increase in the risk of a run as rates increase, which can be dealt with by dynamic hedging, portfolios of options, or state-contingent capital.

52 Chapters 6 and 8, respectively, discuss detail possible capital regulation (with the recognition of a liquidity nexus) and deposit insurance reform as a response to the interest rate risk-based bank failures.

the resulting systemic risk because financial firms (and their liability holders) do not bear all the costs of failure when taxpayers are the residual claimant. In this world, banks and other financial firms take on common systemic tail risk of rapidly rising interest rates because, by its nature, this risk – synthesised by holding Treasuries and MBS – requires almost no regulatory capital, but offers an additional term spread over the cost of short-term deposits. The problem, of course, is that this risk is systemic in nature because so many banks are exposed to it at the same time – albeit in low probability stressful periods.

It is important to note that with respect to the ongoing stress, a pure focus on uninsured deposits is not sufficient. Banks, even those that are wholly funded by insured deposits, still contribute to systemic risk by taking on too much interest rate duration due to mispriced government guarantees. In particular, their asset-side losses would prevent them from re-intermediating the troubled banks, for example, by being hesitant to acquire their assets along with potentially unstable uninsured deposits (known as the “purchase-and-assumption” method of FDIC sale of a troubled bank). Such hesitancy can aggravate the runs on troubled banks with systemwide consequences. Theoretically, the practice of guaranteeing the deposits but not adequately charging for insurance distorts the allocation of capital as banks can raise funding at a lower cost and take on interest rate risk on the asset side. And, if these interest rate “bets” earn a risk premium, then banks have an incentive to hold an excess of interest rate risk to capture these premia relative to the optimal hedge associated with the deposit franchise.

Interestingly, Jiang, Matvos, Piskorski and Seru (2023b) provide evidence that during the monetary tightening of 2022, banks increased, not shortened, the duration of their holdings and decreased their use of interest rate swaps

for hedging purposes. This was even more so for banks with a larger share of uninsured deposits as their source of funding. This latter result is surprising and deserves additional future empirical analysis.

From a theoretical perspective, on the one hand, one might have expected that banks with more fragile funding (i.e., uninsured deposits) would have reduced their interest rate sensitivity given the greater risk of losing deposits (presumably due to higher opportunity costs as a result of increasing interest rates). On the other hand, if uninsured deposits had implicit guarantees (as it turned out to be the case, at least *ex post*), then the risk-taking incentives of banks may have superseded these hedging demands. Jiang, Matvos, Piskorski and Seru (2023b) describe this behaviour as “gambling for resurrection.” This point aside, note that because insured deposits provide the most explicit guarantee, banks with a greater share of insured funding should have even greater moral hazard to capture interest rate premiums. However, due to the stickiness of insured deposits, perhaps banks forgo excess risk-taking (and future supervisory discipline) and maintain the value of the deposit franchise (Keeley (1990)). As interest rates increase, the loss on the duration-based securities is offset by the gain on the stable insured deposit franchise business. In contrast, with an unstable uninsured deposit franchise, a bank might have stronger incentives to gamble for resurrection, especially as rates rise and its assets incur higher and higher losses. In any event, this important question about bank’s risk-taking incentives funded by either uninsured or insured deposits remains unresolved, and merits further study.

As a final comment, note that current accounting practices ignore the impact of valuation changes of HTM designated securities on a bank’s balance sheet (Kim, Kim and Ryan (2023)). During the monetary tightening period of 2022, a considerable number, i.e., \$0.75 trillion, of AFS designated securities (which

are recognised as income) were relabelled as HTM, thus avoiding accounting, though not economic, losses (Granja (2023)). Moreover, this reclassification was more likely for banks with low capital ratios, higher duration-based assets, and a greater share of uninsured depositors. While it is not clear whether these actions play any significant role (as both supervisors and sophisticated market participants can back out such information), it nevertheless describes the mindset during this period, namely that banks were viewing the losses on the asset side as relevant.⁵³ Whether this had increased their risk-taking incentives in a world of moral hazard, or was a reaction to changes in the underlying deposit betas of their deposit franchise business, remains an open question. In Chapter 7, the authors argue persuasively that such discretionary accounting choices made by banks appear more consistent with underinvesting in capital provision on the liability side than with any economic incentive to hedge the rate risks.⁵⁴

Comparison with Other Recent Crises

It is highly informative to compare the emergence of systemic risk in the current banking stress to other recent financial crises: specifically, the Global Financial Crisis of 2007-2009 (GFC), the failure of Continental Illinois in 1984, and the Savings and Loans (S&L) crisis during the 1980s.

53 As an illustration, consider the review of the Federal Reserve's supervision and regulation of SVB, April 28, 2023. On page 57, the review provides a figure documenting a presentation by SVB's management to its Board on November 2022, in which SVB management explicitly says that any reclassification/mark-to-market of securities would cause a "very negative" reaction by investors.

54 As Kim, Kim and Ryan note in Chapter 7: "We present evidence that banks exercise accounting discretion over the classification of securities as HTM versus available for sale (AFS) to obtain preferred accounting and regulatory capital treatments, rather than this classification being driven by a distinct economic motivation." They further propose that hold-to-maturity accounting, as well as the delayed recognition in regulatory capital of losses on available-for-sale, securities - both of which could be justified by a deposit-franchise economic hedge viewpoint - simply be eliminated going forward.

*The Global Financial Crisis of 2007-2009*⁵⁵

When a large part of the financial sector is funded with fragile, short-term debt and is hit by a common shock to its long-term assets, there can be *en masse* failures of financial firms and disruption of intermediation to households and corporations. As an illustration, in the fall and winter of 2008-2009, the worldwide economy and financial markets fell off a cliff – global stock markets fell by more than 40%, global gross domestic product (GDP) fell by 0.8% (the first contraction in decades at that point of time) with the decline in advanced economies a sharp 3.2%, and international trade fell by over 12%. There is virtually universal agreement that the fundamental cause of the global economic and financial crisis of 2007-2009 was the combination of a credit boom and a housing bubble on the back of poor mortgage underwriting and funded with wholesale runnable liabilities.

Putting aside a broken global financial architecture that took years to unravel, the start of the trouble likely began in 2004 when global large, complex financial institutions (LCFIs) sought out large capital flows by engaging in short-term borrowing, increasingly through uninsured deposits and interbank liabilities, or via wholesale-financed shadow-banking (unregulated) vehicles – at historically low interest rates. They began to “manufacture tail risk” in huge quantities, that is, synthesised bets on events of small likelihood but with extreme outcomes. Possibly, the best examples were the so-called safe assets (such as the relatively senior AAA-rated tranches of subprime-backed MBS) that would fail only if there was a secular collapse in the housing markets and/

55 For a detailed discussion and analysis, see Acharya, Cooley, Richardson and Walter (2009, 2010). Some of the description here is taken from these works.

or an extreme liquidity crisis (in which case these assets could not be sold). As LCFIs were willing to pick up loans from originating mortgage lenders and pass them around or hold them on their own books after repackaging them, a credit boom was fuelled in most of the advanced economies where they operated.

Given their focus on the individual financial institution's risk, micro-prudential regulatory and supervision standards ignored the risk of an entire financial system manufacturing such tail risk, and arguably even encouraged it through lower-risk weights on AAA-rated mortgage-backed tranches. The net result of all this was that the global banking balance sheet grew twofold from 2004 to 2007, but its risk appeared small (regulatory capital requirement hardly rose), as documented in the Global Financial Stability Report of the International Monetary Fund (IMF) in April 2008.

The LCFIs had, in effect, taken a highly undercapitalised one-way bet on the housing market, joined in equal measure by the US government's own shadow banks (FNMA and FHLMC) and American International Group (AIG), the world's largest insurer. While these institutions seemed individually safe, collectively they were vulnerable. And as the housing market crashed in 2007, the tail risk materialised, and shadow banks and LCFIs tied to the housing markets began to fail. This is precisely what happened in September 2008. Some of the largest global financial institutions – the government-sponsored enterprises (GSEs) (FNMA and FHLMC), Lehman Brothers, AIG, Merrill Lynch, Washington Mutual, Wachovia, and Citigroup – effectively failed. With the securitisation market already frozen from the previous year, other key parts of the capital markets, such as short-term financing via money markets and commercial paper, also froze with a dramatic widening of spreads in the loan and public debt markets as a result.

At the heart of the problem were the risk-taking incentives of the LCFIs and the systemic risk they produce. The risk-taking activity of these institutions manifested itself in a specific way in this crisis. Firms exploited loopholes in regulatory capital requirements to take an undercapitalised \$2 trillion to \$3 trillion highly leveraged, one-way bet on credit portfolios, particularly tied to residential real estate but also to commercial real estate and other consumer credit. For the most part, this bet was safe, except in the case of a severe economic downturn.

Why did these financial firms take those bets? They had access to cheap financing because of either implicit guarantees (e.g., too big to fail) or explicit guarantees (e.g., in case of the GSEs and depository institutions) by the government. And because credit bets with market risk offer higher returns, these firms piled on market risk. All the benefits of the bets accrued to the shareholders of the firm in peacetime, but the external cost of the firm's collapse – which led to failures of others and/or the freezing of capital markets – was ultimately borne by society and taxpayers.

There are obvious similarities to the current banking stress:

- Similar to the global banking balance sheet growing twofold from 2004 to 2007, the regional banking sector in the US grew dramatically during the pandemic period of 2020-2021, as flight-to-safety during COVID, fiscal stimulus programmes, and QE “created” large amounts of uninsured deposits, and fiscal and monetary stimulus contributed to the creation of both insured and uninsured deposits (see Chapter 2).
- During the GFC, this growth came mostly from safe assets; similarly, the growth in assets here was almost all driven by credit-free, interest rate-based assets in the Treasury and MBS sectors. In both cases, almost

no additional capital for these assets was required, so they were mostly funded through short-term runnable liabilities (collateralised short-term loans during the GFC versus uninsured deposits during 2023). When the aggregate shock hit (i.e., housing prices in the GFC, interest rates in 2022), there was enough uncertainty about banks' financial health that some funding was pulled. In the GFC, when the underlying collateral lost value, even if the assets' fair value may have been above water, with some investors no longer rolling over the funding (e.g., repos, asset-backed commercial paper, wholesale funding of investment banks), the lack of liquidity of the assets led to a further reduction in their market values, which in turn led to greater rollover risk and more funding being pulled. In the current episode, when interest rates rose and some deposits (insured or uninsured) left the bank for "greener" pastures, the interest rate driven losses on the asset side were less likely to be covered by the spreads earned on the now smaller deposit base, causing uninsured depositors to question solvency and "run," which in a self-fulfilling way led to more "runs" and insolvency due to the interest rate losses.

- In both episodes of banking stress and failures, the Federal Home Loan Bank (FHLB) system, designed in the Depression era to support housing loans, appears to have acted as a lender-of-next-to-last-resort (Ashcraft, Beck and Frame, 2010) for the troubled banks facing depositor or wholesale finance rollover risks. The FHLB loans provide these banks government-sponsored financing without any strings attached. Effectively, the FHLB support represents an *ex post* but pre-failure government backstop of sorts that appears to delay the day of reckoning of the systemic risk implications of stressed banks.⁵⁶

56 For a detailed discussion and proposed reforms to the FHLB support of stressed banks, see Chapter 10.

The major difference is:

1. In the GFC, the LCFIs made naked “bets” on seemingly “safe” assets tied to risky residential mortgages. Once these mortgages lost considerable value, losses on the LCFIs began to pile up without any underlying capital as a buffer. As described above, even if the value of these “safe” assets was theoretically higher, the loss of liquidity led to fire sales, which led to the same outcome. As these losses began to spread, systemic risk emerged throughout the system. In the current episode of banking stress, the banks’ “bets” were not naked to the extent they were a hedge against the deposit franchise’s theoretical change in value due to interest rate movements. As described above, in the current stress, a large spike in interest rates led to large losses on Treasuries and MBS. While these losses in theory should have been offset by increases in the value of a bank’s deposit franchise, this is only true if the deposits stayed within the bank. As depositors left, however, these “bets” essentially became naked, leading to losses, which in turn caused more depositors to “run.” While the mechanism was somewhat different, the losses spread from bank to bank, giving rise to systemic risk, bringing down somewhat unrelated firms (like the troubled, global LCFI, Credit Suisse).

*The Failure of Continental Illinois*⁵⁷

In the early 1980s, the seventh largest bank in the United States, Continental Illinois, had invested alongside Oklahoma-based Penn Square Bank, an aggressive bank specialising in oil and gas sector loans. In addition to other loans to the energy sector, Continental Illinois had also expanded its business risk by lending large amounts to developing countries. In 1982, federal

⁵⁷ This description is taken from Acharya, Cooley, Richardson and Walter (2009).

regulators closed Penn Square bank due to losses resulting from the fall in oil prices in 1981, and Mexico was forced to renegotiate its syndicated bank debt, triggering additional losses for Continental Illinois.

While many other US commercial banks followed a similar lending strategy, Continental Illinois' credit exposures were compounded by a funding strategy that was unusual at the time. Traditionally, banks fund growth in their lending activities by attracting larger volumes of savings from retail depositors. Continental Illinois, however, had a limited retail presence, due in part to federal and local banking regulations. The bank depended heavily on funding from the wholesale money markets. Indeed, by 1981, Continental Illinois gained most of its funding through federal funds and by selling short-term certificates of deposit on the wholesale money markets. Only 20% of its funding came from traditional retail deposits.

When the energy sector turned sour and the developing countries renegotiated their debt, Continental Illinois was unusually vulnerable to a revision in the views of the wholesale funding markets about its solvency. In 1984, investors and creditors lost confidence, and in a precursor to the crisis of 2007-2009, Continental Illinois was quickly shut out of its usual sources of funding in the domestic and Eurodollar interbank markets. In May 1984, Continental Illinois experienced what the FDIC described as a high-speed electronic bank run. To stem the panic, regulatory agencies and the banking industry arranged massive emergency funding for the bank. The fear was that a failure of Continental Illinois would undermine the entire banking system. As a matter of fact, more than 2,300 banks had correspondent accounts with Continental Illinois. In an extremely controversial decision, the FDIC tried to stop the bank run by extending a guarantee to uninsured depositors and creditors at the bank.

Indeed, the notion that some banks should be considered “too big to fail” initiated with Continental Illinois. It signalled to unsecured creditors that they were likely to be fully protected against losses by the government under systemic risk circumstances. Market discipline was not eroded in the case of shareholders, who were wiped out, but it was eroded in the case of creditors, thereby creating moral hazard for the future risk-taking, especially by large banks. The Continental Illinois story provides a classic example of how a sharp drop in confidence can lead counterparties in the wholesale markets to suddenly withdraw funding from a damaged bank, spinning the institution into a funding liquidity crisis as potentially fatal as any nineteenth-century run on a bank by retail depositors.

The main similarity to the current banking stress is as follows:

- Continental Illinois suffered a run on its runnable liabilities when there were questions about its solvency due to credit losses across its portfolio. As a result, to prevent the crisis from spreading, regulators took (at the time) unprecedented action by guaranteeing these liabilities. In the ongoing stress, a number of regional banks facing losses on their interest rate-based assets with uncertainty about the offsetting value of their deposit franchise too suffered runs on their runnable liabilities, i.e., uninsured deposits. And, also in response to bank failures of 2023, regulators guaranteed these uninsured deposits to prevent further runs in the system in the hope of the runs not spreading.

The major difference is as follows:

- The run on Continental Illinois’ liabilities was of a different form than the run on regional banks in the current stress. For Continental Illinois, there was a question of solvency due to its portfolio of loans in the energy

and emerging market sector. There was no question of a deposit franchise and sticky deposit rates – Continental Illinois operated in the wholesale funding market. Starting in 2022, regional banks faced losses on the asset side due to interest rate increases with the expectation they would be covered by the now higher value of the deposit franchise business also due to interest rate increases. When some depositors began to leave the regional banking sector, this ironically put in question the solvency of the regional banks due to the decline in the deposit franchise, which in turn caused uninsured depositors to run.

*The Savings and Loans Crisis*⁵⁸

The most serious postwar crisis in the United States banking sector was the S&Ls crisis of the late 1980s. US S&Ls, as distinct from commercial banks, were also a product of the Great Depression. They were created to serve the public policy goal of encouraging home ownership. The Federal Home Loan Bank Act of 1932 created the FHLB System to provide liquidity and low-cost financing for S&Ls, and importantly, S&Ls had access to deposit insurance similar to what the FDIC provides for commercial banks.

S&Ls had a narrowly defined role in the intermediation sector – they took in household savings, on which they paid relatively low interest rates, and lent at attractive interest rates on 30-year fixed-rate mortgages. This model began to change with the high inflation of the 1970s, when interest rates soared in response to accelerating inflation. S&Ls had a guaranteed deposit franchise due to Regulation Q, which put hard ceilings on deposit rates. Deposits began to flee the S&Ls in pursuit of higher returns when Congress weakened Regulation Q and lifted caps on deposit interest rates in the late 1970. S&Ls

58 Some of the description here is taken from Acharya, Cooley, Richardson and Walter (2009). For a more detailed discussion, see Chapter 2.

were still being squeezed on the other end by their portfolios of 30-year fixed-rate mortgages.

They needed to find other sources of income. Many economists view this as the period when S&Ls moved more toward a risk-shifting model, exploiting their federal deposit insurance backstop. To accomplish this, the S&Ls needed to circumnavigate or erode existing regulations, with policymakers and regulators allowing for a more diversified portfolio of assets, along with lower capital requirements. These changes all led to massive growth in the industry in the early to mid-1980s. However, when inflation was brought under control, with an accompanying severe recession, S&Ls ran into trouble as their newly purchased assets, such as commercial real estate lending, came under stress. The sector was effectively insolvent and was only sorted out with a resolution authority in the early 1990s and the reinstatement of some of the regulations that had earlier been removed.

There are again similarities to the current banking stress:

- The S&L crisis started with a steep rise in interest rates in the 1970s, leading to losses on the value of their holdings of 30-year mortgages. If S&Ls were liquidated, many of them would have been insolvent. There was a belief, however, that the future franchise value of the S&Ls (due to low deposit rates under Regulation Q) would more than offset the loss on the mortgages. Though once Regulation Q was weakened, and there was increased competition from elsewhere in the finance sector, this – even insured – deposit franchise value was not materialising as depositors fled. Of some note, these deposits fled even though they were insured. As a result, policymakers and regulators allowed S&Ls to move into other asset classes. In the current episode, there was also a steep rise in interest rates, leading to losses on the value of fixed-rate securities and

loans of regional banks. These losses were also assumed to be covered by the regional bank's deposit franchise in the form of higher spreads between future securities and loans versus sticky deposit rates. And, so too in this episode, depositors fled the regional banks for a variety of reasons, leading to naked losses on their assets.

- Though of a different form, the S&L sector eventually failed in a major way not because of its losses due to interest rates, but rather due to its rapid growth as a sector and its delving deeply into other assets, such as commercial real estate lending. While the current stress is not yet (entirely or mostly) about commercial real estate (though it very well might be in some end games that are being projected), and the preceding balance sheet growth was driven by credit-free securities, the crises have commonalities as they show the danger of rapid growth in the financial sector without guardrails against emerging systemic risks.

The major difference is as follows:

- The S&L depositor base was almost entirely insured, so full-on depositor runs were not an issue per se. S&Ls, however, still lost depositors due to their base being less “sleepy” than otherwise thought. This was partly due to financial innovations occurring at that time. This arguably did not lead to the S&L crisis. In the current episode, many of the deposits were uninsured and thus fully runnable. As interest rates rose and depositors began to leave the system in search of either higher rates, also potentially due to financial innovation (i.e., mobile banking), or just the need for corporations to access capital, the losses on the asset side were no longer necessarily covered by the deposit franchise. Solvency was in question, albeit slightly. The standard finance adage – “never panic, but if you do panic, panic first” – came true, and, as a result, just to be prudent, some

depositors pulled their funds. Other depositors, knowing that depositors are thinking this way, followed suit. And the run ensued.

To conclude, when it comes to systemic risk and banking crises, history does not exactly repeat itself, but rhymes. There are always parallels but also key differences. Financial institutions, including banks, keep evolving organically to changing regulations, and government and central bank policy in response to large shocks such as the pandemic often sows the seeds of future stress.

Concluding Remarks

This analysis suggests that the current episode of banking stress is not anomalous from a systemic risk viewpoint. While some of the systemic risk emergence is unique to this period, there are common elements with past crises. This point begs the question: Did policymakers get systemic risk regulation wrong or is it that systemic risk cannot be avoided and future regulation should be mostly about resolution?

If it's the latter, then one can look to the reforms post-GFC and see some rationale for the huge effort put into resolution mechanisms for a banking system in crisis. That said, in this current episode, most of these reforms were ignored, and regulators relied on bailouts and government guarantees. Perhaps there is an understanding that the reforms would have not worked, or, cynically, that there is no "stomach for them." Apparently, the famous Austrian economist Joseph Schumpeter's discussion of creative destruction and why it may not be implemented rings true here as well.

As a result, policymakers may have to rely on preventive reforms, albeit (possibly) second best.

Three reforms stand out here:

- In three of the past four crises, including the current one, financial institutions suffered asset losses while being funded by short-term, runnable liabilities: in the GFC, assets backed by residential real estate funded by short-term collateralised loans; in Continental Illinois, assets backed by troubled sectors like energy and commercial real estate funded by wholesale markets; and in the current episode, long duration assets funded by uninsured depositors. Consistent with the systemic risk theory discussed early, these crises show a fundamental link between the asset and liabilities side. Indeed, for the current banking stress, this link is explicit, as uninsured deposits represent both a source of funding but also a source of value due to the deposit franchise business. Capital and liquidity regulation can therefore not be treated independently but should be thought of as two levers to pull at the same time. In the context of the current episode, Chapter 6 describes one explicit way to measure capital and liquidity requirements together, while Chapter 8 discusses deposit insurance reform in recognition of the runnable nature of uninsured deposits. Chapter 9 also makes suggestions about capital and liquidity regulation.
- In the past 45 years, there have been two periods of “runaway” inflation – in the late 1970s through the early 1980s and, more recently, in late 2021 through today. Both of these episodes are associated with a banking crisis. In both periods, the banking sectors faced asset losses due to sudden increases in interest rates and an erosion of the deposit franchise value due to depositors’ fleeing. While the reasons for this flight are different (financial innovation during the S&L crisis compared to uninsured depositor runs, also along with financial innovation, in the current

one), the need to explicitly build in interest rate risk into the regulatory framework seems obvious. Chapter 6 suggests a stagflation stress test in order to recognise interest rates in stress scenarios to perform asset quality review. Indeed, the need to jointly think about credit and interest rate risk, along with liquidity, seems paramount. In addition, these two crises highlight not only the differences between insured and uninsured deposits in terms of running, but also the moral hazard associated with guarantees. In the S&L crisis, S&Ls received “permission” to engage in ever riskier activities on the credit side in an attempt to get out of their interest rate loss predicament. Arguably, they were able to do this because of government guarantees, i.e., deposit insurance. We now know that this “bet” made matters worse. One might hope that the solution to the current banking stress will not follow in the same footsteps. With this in mind, Chapter 8 discusses the pros and cons of a variety of deposit insurance reforms.

- As described in Chapters 4 and 5, supervision failed miserably in the current episode of banking stress. The same could have been said about the GFC. With respect to supervision, one of the common elements of both crises seems to have been regulatory capital / supervisory “arbitrage” in which, due to various accounting rules, banks manage to engage in the same activity, albeit with quite different accounting treatment. In the current episode, as Chapter 7 describes, banks used accounting discretion to manipulate capital measurement rather than reflecting the economics of the deposit franchise hedge. That chapter makes several recommendations on this front. Chapter 9 discusses supervisory fixes more generally.

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4 SILICON VALLEY BANK: FAILURES IN “DETECTIVE” AND “PUNITIVE” SUPERVISION FAR OUTWEIGHED THE 2019 TAILORING OF PREVENTIVE SUPERVISION

Bruce Tuckman⁵⁹

One common narrative of this episode is that changes to preventive bank supervision known as the 2019 Tailoring of the Dodd-Frank Act of 2010 played an important role. However, using SVB as an illustration, the evidence (including the Federal Reserve’s review of this period) points much more to egregious failures of detective and punitive supervision rather than primarily those of preventive supervision.

Supervision clearly failed to avert the failure of Silicon Valley Bank (SVB).

“Supervision” includes a broad range of regulatory actions. For the purposes of this chapter, therefore, it is useful to divide supervision into “preventive,” “detective,” and “punitive.”⁶⁰

“Preventive” supervision refers to imposing specific rules across all banks or across particular subcategories of banks, e.g., capital and liquidity ratios, supervisory stress tests, and standards of governance, controls, and risk management. Preventive supervision aims to remove from managerial discretion swaths of behaviour that are deemed inconsistent with the safety and soundness of individual banks and with the safety of the financial system.

“Detective” supervision refers to scrutinising individual banks not only for compliance with the rules of preventive supervision, but also for behaviour that - while not explicitly violating preventive rules - is inconsistent with safety and soundness or with systemic stability. For example, detective supervision includes a determination not only of whether a bank conducts and is in compliance with its own internal liquidity stress tests (ILST), but

⁵⁹ The author would like to thank Viral Acharya and Kermit Schoenholtz for helpful comments and suggestions.

⁶⁰ See Acharya (2018) and Patel (2018).

also of whether those stress tests capture the idiosyncratic nature of the bank's liquidity profile. This latter aspect of detective supervision is a crucial part of the supervisory toolkit because fixed, preventive rules cannot foresee and anticipate all sources of risk and bank business plans. In fact, systemic risks have often arisen precisely from business plans that have migrated toward high-return and high-risk activities that are not adequately addressed by preventive supervision.

Finally, "punitive" supervision refers to compelling banks to alter behaviour in response to the findings of detective supervision. To continue with the example of the previous paragraph, after finding that a bank's liquidity profile is unsound, punitive supervision compels corrective action, e.g., forcing a bank to arrange for contingent credit lines, forcing a bank to sell assets, etc.

This chapter discusses two specific issues with respect to this failure of supervision. The first section describes the egregious failures of detective and punitive supervision of SVB as documented by Federal Reserve Board (2023). The second section describes the impact on SVB of changes to preventive supervision known as the 2019 Tailoring, which refers to the combination of the Economic Growth, Regulatory Relief, and Consumer Protection Act of 2018 (EGRRCPA) and its subsequent, implementing regulations. Note that none of the analysis in this chapter is intended to excuse the failures of SVB's managers.

The findings and conclusions with respect to detective and punitive supervision, can be summarised as follows:

- Detective supervision was overly focused on SVB's compliance with governance, controls, and risk management processes and insufficiently focused on assessing SVB's idiosyncratic risks.

- Detective supervision was managed so poorly that regulators did not flag SVB's violation of basic and well-established principles of risk management and control.
- To the extent that detective supervision did reveal unacceptable risks at SVB, punitive supervision failed to compel corrective action with appropriate urgency.
- These findings reveal the importance, in the current regulatory regime, of significantly improving the culture and practice of detective and punitive supervision so as to discover and contain idiosyncratic bank risks that escape preventive supervision.

The findings and conclusions with respect to the 2019 Tailoring, can be summarised as follows:

- The 2019 Tailoring shifted responsibility for the regulation of intermediate-sized banks from preventive supervision to detective and punitive supervision.
- The fact that the failure of SVB - with about \$200 billion of assets - was regarded by the authorities (rightly or wrongly) as likely to have systemic repercussions means that the size and risk thresholds of the 2019 Tailoring did not succeed as metrics of systemic risk.
- The reliance of the 2019 Tailoring - and even of the Dodd-Frank Act of 2010 (DFA) - on detective and punitive supervision was not justified. As described below, supervisors had a mixed record in uncovering SVB's vulnerabilities and failed to take timely corrective actions. Allegations of an enervating cultural shift in supervision concurrent with the 2019 Tailoring are hard to assess.

- There does not seem to have been any specific rule of the DFA loosened by the 2019 Tailoring that would likely have averted SVB's failure. Specifically, i) SVB could have adjusted its portfolio of assets to comply comfortably with the liquidity coverage ratio; ii) supervisory stress tests did not encompass the rising interest rates that ultimately inflicted losses on SVB assets; iii) including unrealised losses on available-for-sale (AFS) assets for capital purposes would have only marginally reduced SVB's capital ratio; and iv) the filing of a resolution plan by SVB's holding company would not have been additive to the plan filed by its bank subsidiary.
- This analysis of the 2019 Tailoring suggests two improvements to the current supervisory regime.
 - First, to better regulate systemic risk without unduly burdening banks with assets of between \$100 billion and \$250 billion, require the Federal Reserve to make periodic affirmative determinations as to whether these intermediate-sized banks should or should not be subject to enhanced prudential regulation.
 - Second, the current practice of regulating capital and liquidity in isolation should change to reflect SVB-like scenarios in which capital losses spark runs and liquidity shortfalls.

All in all, then, in explaining the failure of supervision in the case of SVB, failures of detective and punitive supervision are far more significant than changes to preventive supervision from the 2019 Tailoring. This conclusion leaves unanswered the larger question of whether the current, overall design of preventive, detective, and punitive supervision is up to the task. Some aspects of this larger question are addressed in other parts of this book.

Failures of Detective and Punitive Supervision

The Focus of Detective Supervision of SVB

In broad terms, SVB failed because its investments in long-term fixed-income assets were financed by an insufficiently stable deposit franchise. The focus of detective supervision at SVB, however, was overwhelmingly on compliance with specific rules rather than on the bank's interest rate and liquidity risks. As evidence of this supervisory focus, Federal Reserve Board (2023), Table 2, lists 31 open or unresolved Federal Reserve "supervisory findings" with respect to SVB as of year-end 2022, 19 of which were classified as MRAs (matters requiring attention) and 12 of which as MRIAs (matters requiring immediate attention). None of these MRAs or MRIAs addressed interest rate risk. While six of the supervisory findings (four MRAs and two MRIAs) related to liquidity risk, these were about planning, design, and frameworks rather than about exposures. More specifically, these six findings were opened in November 2021, but as of August 2022, regulators believed that "*actual and post-stress liquidity positions reflect a sufficient buffer.*" Furthermore, as of early 2023, "*supervisors had limited concerns on the liquidity position,*" and "*Only concerns with liquidity risk management practices were communicated to [SVB], not the substantive liquidity positions.*"⁶¹

Federal Reserve Board (2023) comes to the same conclusion about the focus of detective supervision: The SVB experience "*suggests a supervisory program that was overly focused on oversight requirements rather than underlying risks.*" Even worse, SVB management might have responded in kind, by "*only addressing issues in response to supervisory findings rather than being proactively focused on safe and sound operation of the firm.*"⁶²

61 Federal Reserve Board (2023), pp. 55, 59, and 51.

62 Federal Reserve Board (2023), p. 97.

Detective Supervision of SVB Missed Basic and Well-Understood Red Flags

Three basic and well-understood principles of risk management are the following: First, rapid growth is often accompanied by increased risks, both because rapid growth is often made possible by increased risk-taking and because expertise, controls, and operational capabilities often do not keep pace with rapid growth. Second, high profitability is often the result of increased risk-taking. Third, changes to risk metrics that result in lower measured risks often signal wishful thinking or worse, namely, a purposeful obfuscation of risk.

The Federal Reserve supervisory system somehow failed to account for these red flags. With respect to rapid growth, supervision was perversely designed to be less adept for rapidly growing banks. Banks with assets between \$10 billion and \$100 billion were supervised by the Regional Bank Organization (RBO), while banks with more than \$100 billion of assets that are not designated as global systemically important banks (G-SIBs) are supervised by the Large and Foreign Banking Organization (LFBO). Furthermore, transitioning a bank from the RBO to the LFBO portfolio *“lacked a defined plan and process... supervisory plans and staffing of the new team came after the transition, rather than in the period leading up to it.”* Hence, the supervisory process was particularly weak when detective supervision was particularly important, that is, when a bank like SVB was growing rapidly.⁶³

With respect to the second red flag, profitability, supervisors in May 2021 maintained satisfactory ratings for management and for risk management *“given the strong financial performance of the firm at the time and the lack*

63 Federal Reserve Board (2023), p. 35. SVB crossed the \$100 billion mark in 2020. The problem of responding quickly to rapid growth is compounded by the regulatory measurement of assets as an average of the prior four quarters. Federal Reserve Board (2023) puts some blame on the Federal Reserve's implementation of the 2019 Tailoring for creating “stark differences” between the RBO and LFBO supervisory programmes. Little direct evidence seems to exist to support or contradict this claim.

*of realized risk outcomes...*⁶⁴ As mentioned above, however, strong financial performance on its own may very well signal significant risk-taking.

Finally, with respect to the third red flag, changing risk metrics, supervisors failed to be alarmed by changes SVB made to metrics of both interest rate and liquidity risks. As for interest rate risk, SVB breached its own internal limits on the Economic Value of Equity (EVE), that is, the change in the value of equity for given changes in interest rates. Rather than take corrective action, however, management reduced measured EVE in April 2022 by increasing the assumed duration or interest rate sensitivity of deposit liabilities. This “*poorly supported*” change was “*unsubstantiated given recent deposit growth, lack of historical data, rapid increases in rates that shorten deposit duration, and the uniqueness of [SVB’s] client base.*” As for liquidity risk, the firm’s liquidity buffer was inadequate as measured by its own ILST. Once again, rather than take corrective action, SVB changed model assumptions to reduce its measured liquidity shortfall.⁶⁵

The Failure of Punitive Supervision at SVB

It is arguably inappropriate to fault supervisors, with the benefit of hindsight, for failing to see that the combination of rising interest rates, SVB’s relatively long-term fixed-income assets, and SVB’s particular deposit franchise would lead to the bank’s failure. But the Federal Reserve system can be faulted with failures of punitive supervision, that is, failing to take timely enforcement actions based on identified findings of detective supervision.

Examples of such failures of punitive supervision include SVB’s breaches of interest rate and liquidity risk limits described earlier; the August 2022

64 Federal Reserve Board (2023), p. 47.

65 With respect to interest rate risk, see Federal Reserve Board (2023), p. 63. Supervisors knew about EVE limit breaches in the preparation of their ratings reports in 2020, 2021, and 2022. With respect to liquidity risk, see Federal Reserve Board (2023), p. 58. Supervisors were aware of the model change mentioned in the text but took no action.

supervisory rating on Governance and Controls as “Deficient-1;” and SVB’s not having a chief risk officer. Additional and particularly prescient findings of detective supervision, which were part of MRAs and MRIAs from November 2021 but that were not acted upon with sufficient urgency, were the following:⁶⁶

“The independent liquidity risk function and internal audit provide insufficient oversight... [SVB’s] liquidity risk profile has evolved, with recent inflows being concentrated in uninsured deposits...”

“The primary ILST scenario... relies on assumptions that are not appropriate for the firm. Deposit assumptions rely on incomparable peer benchmarks...”

“The approach to assessing risk in deposits... does not appropriately consider key risk attributes (e.g., product and customer type), which limits the ability to differentiate deposit risks in stress...”

As a final, and again prescient example, a July 2022 ILST shortfall remediation plan “cited the need to expand capacity and options for repo funding, including bilateral relationships, FICC direct membership, tri-party, and the Federal Reserve’s Standing Repurchase Agreement facility, among other sources.” Punitive supervision, however, did not compel completion of this plan before SVB’s failure.

Federal Reserve Board (2023) gives a number of excuses for failures in punitive supervision, which include: supervisors’ fear of not being supported by higher-level officials; burden-of-proof or due-process considerations; reluctance to overturn recent ratings; and implicit or explicit requirements that supervisors at Federal Reserve banks obtain pre-approval by the staff of

66 Federal Reserve Board (2023), pp. 42-43, 49, and 54.

the Board of Governors. But the Federal Reserve system had the power to order corrective actions for all of the SVB violations described here. Hence, punitive supervision can - and does - need to be improved by better management at the Federal Reserve. Along these lines, Newell (2023) suggests a number of specific reforms and calls for further disclosures about the supervision of SVB to assess more precisely the current state of bank supervision.

Summary

The fixed rules of preventive supervision (e.g., capital requirements, supervisory stress tests, and the liquidity coverage ratio) were not sufficiently well-suited to the idiosyncratic risks of SVB's business model and to the financial backdrop leading up to SVB's failure. In this sense, SVB's failure illustrates the importance of detective and punitive supervision. While the Federal Reserve's detective supervision of SVB did not foresee exactly how events might unfold, it did uncover several very much related and very serious violations. Punitive supervision, however, failed miserably. It is possible that, had supervisors required timely and corrective action of violations that were uncovered, SVB's failure might have been of smaller magnitude if not averted altogether.

The 2019 Tailoring

The DFA and its subsequent implementing regulations established enhanced prudential standards for banks with more than \$50 billion of assets. The 2019 Tailoring raised the threshold for mandatory enhanced prudential standards to \$250 billion in assets, while giving the Federal Reserve broad discretion to apply enhanced standards to banks with more than \$100 billion in assets.⁶⁷

⁶⁷ This discussion uses the term "bank" loosely. Most notably, regulations of the Federal Reserve apply to bank holding companies rather than to their bank subsidiaries. The distinction is particularly unimportant in the case of Silicon Valley Bank, for which 98% of the holding company's assets were in the bank subsidiary. See Federal Reserve Board (2023), p. 91.

Note that defining “the 2019 Tailoring” as the combination of the EGRRCPA and its implementing regulations is not necessarily standard usage; some commentators use the term to refer to the implementing regulations alone.⁶⁸

There have been some academic studies about the impacts of the 2019 Tailoring. For example, Powell (2022) finds that the changes lowered regulatory compliance costs for banks with less than \$10 billion of assets, and Chronopoulos et al. (2023) find that the changes resulted in higher risk-weighted assets for banks with between \$50 billion and \$250 billion of assets. In light of the failure of SVB, however, debate about the 2019 Tailoring has intensified. Against this backdrop, this section juxtaposes SVB’s failure on the 2019 Tailoring.

The Use of Bank Size as a Measure of Systemic Risk

The DFA took a bank’s size as a proxy for its systemic risk. The Federal Reserve was instructed, for banks with more than \$50 billion of total consolidated assets, to establish “enhanced prudential standards” that

*are more stringent than the standards and requirements applicable to ... bank[s]... that do not present similar risks to the financial stability of the United States.*⁶⁹

Together with its implementing regulations, the DFA essentially established additional rules for banks within three size-based tiers. Banks with more than \$10 billion of assets were subject to risk-committee requirements and internal capital stress tests. Banks with more than \$50 billion of assets were subject to enhanced prudential standards that included capital, leverage, liquidity, stress testing, and resolution planning. The \$50 billion threshold, by the way,

68 The definition here has been chosen for two reasons. First, the goal of this section is explicitly to assess the impact on SVB of the combination of the statutes and its implementing regulations. Second, the very beginning of the EGRRCPA describes itself as an act to, among other things, “provide tailored regulatory relief.”

69 Dodd-Frank Act, Section 165(a)(1)(A).

might be defended either by the view that banks of that size pose systemic risks or by the view that concurring defaults of several banks of that size can pose systemic risk. In any case, the third DFA tier of banks, those with more than \$250 billion of assets or with more than \$10 billion of on-balance sheet foreign exposure, were subject to “advanced approaches” to capital rules and to a more stringent or “supplementary” leverage ratio. Note that the inclusion of banks with \$10 billion of foreign exposure in this DFA tier turns out to be significant in the case of SVB. Note also that G-SIBs were subjected to both risk-based and leverage-based capital surcharges.

The DFA recognised that size was not a perfect proxy for systemic risk and authorised the Federal Reserve to tailor or differentiate among banks, “*taking into consideration their capital structure, riskiness, complexity, financial activities... size, and any other risk-related factors that [it] deems appropriate.*”⁷⁰ The Federal Reserve characterised its implementing regulations as incorporating tailoring not so much by the size tiering just described, but by the way in which individual rules impose stricter requirements on riskier banks. For example, capital requirements under stress conditions subject a bank “*to more stringent standards as the leverage, off-balance sheet exposures, and interconnectedness... increase.*”⁷¹

Office of Financial Research (2017) empirically investigated the relationship between bank size and systemic risk as measured by existing, multi-factor metrics. The paper computed the systemic risks of banks of various sizes using the methodology regulators use worldwide to identify G-SIBs. This methodology derives a score for systemic risk using 12 quantitative indicators that are grouped into the following five broad categories: size (in terms of

70 Dodd-Frank Act, Section 165(a)(2)(A).

71 Federal Reserve System (2014), p. 17242.

risk exposures, not assets); interconnectedness; substitutability (of one bank's services by other banks); complexity; and cross-jurisdictional activity. Not surprisingly, the paper found that, for all but the handful of the largest banks, bank size is a very imperfect measure of rank with respect to systemic risk. The paper also suggested additional metrics that might be incorporated into measures of systemic risk, including reliance on short-term funding, CoVaR, DIP, and SRISK.⁷²

The 2019 Tailoring took the view that DFA regulations were too cumbersome on banks that contributed little to systemic risk. The threshold for enhanced prudential standards was raised from \$50 billion to \$250 billion, with regulations for banks with between \$100 billion and \$250 billion of assets tailored to their presumed lower relative risk profiles, as measured by size, cross-jurisdictional activity, nonbank assets, wholesale funding, and off-balance sheet exposure.

SVB grew to more than \$100 billion in assets by the end of 2020 and to more than \$200 billion by the end of 2021, which placed it into the 2019 Tailoring's newly created Category IV, for banks between \$100 billion and \$250 billion of assets. For these banks, the 2019 Tailoring somewhat reduced capital and liquidity requirements and reduced the frequency of supervisory stress tests from annual to every other year. Internal capital stress tests were no longer required, although capital planning requirements - along with other supervisory expectations - were unchanged. Resolution plans at the bank holding company level were no longer required by the Federal Reserve, although resolution plans at the bank level were still required by the Federal Deposit Insurance Corporation (FDIC). Regulatory changes for Category IV

72 For CoVar (Conditional Value-at-Risk), see Adrian and Brunnermeier (2016). For DIP (Distress Insurance Premium), see Huang, Zhou, and Zhu (2012). And for SRISK (Systemic Risk), see Acharya et al. (2017) and Brownlees and Engle (2017).

banks with respect to liquidity risk management are discussed in more detail below.

While the 2019 Tailoring mandated enhanced prudential standards only for banks with more than \$250 billion in assets, it gave the Federal Reserve discretion to apply enhanced prudential standards to any bank with assets greater than \$100 billion. More precisely, should the Federal Reserve determine that the application of such standards is “appropriate” to “prevent or mitigate” systemic risk or to “promote the safety and soundness” of a bank, it may apply such standards “by order or rule.”⁷³

Taken as a whole then, with respect to Category IV banks like SVB, the 2019 Tailoring shifted responsibility of regulation from preventive to detective and punitive supervision. This shift eases the regulatory costs imposed on these banks but exposes individual banks and the financial system to the risk that preventive rather than detective or punitive supervision might have prevented the failure of a “small” but systemically risky bank.

In hindsight, the 2019 Tailoring does seem to have underestimated the systemic risk of Category IV banks: Rightly or wrongly, the authorities treated the failure of SVB as sufficiently disruptive to merit extraordinary action. However, this section concludes that the 2019 Tailoring does not seem to have weakened or eliminated any particular rule that would have averted SVB’s failure.

The fact that the Federal Reserve did not use its discretion to subject SVB to heightened scrutiny suggests at least one potential improvement to the 2019 Tailoring: The Federal Reserve might be required at least periodically to make affirmative findings for each bank in its Large and Foreign Banking

73 Economic Growth, Regulatory Relief, and Consumer Protection Act (2018), Section 401(a)(1)(C).

Organization portfolio as to whether or not that bank should be subjected to enhanced prudential standards.

Liquidity Stress Testing and Buffer Requirements

Banks are in the business of providing liquidity, most notably by making deposits available on demand and by lending according to the terms of pre-negotiated credit lines. Liquidity risk management is supposed to ensure that a bank can meet these and other liquidity obligations with its available sources of liquidity, such as reserves held at the Federal Reserve and securities that can either readily be sold or readily posted as collateral in secured funding transactions. And liquidity risk management is typically conducted by means of liquidity stress tests - which quantify required and available liquidity across challenging liquidity scenarios - and by means of liquidity buffers - which are sources of liquidity held in quantities deemed sufficient to survive these challenging scenarios. Pursuant to the DFA, banks with more than \$50 billion of total consolidated assets were subject both to some form of the liquidity coverage ratio (LCR) and to the liquidity provisions of Regulation YY, which include internal liquidity stress tests.⁷⁴

The LCR attempts to ensure sufficient liquidity buffers by comparing a bank's high-quality liquid assets (HQLA) to its Total Net Cash Outflows. The DFA and its implementing regulations created somewhat different rules for banks of different sizes. For banks with more than \$250 billion of total consolidated assets or with more than \$10 billion of foreign exposure, HQLA must exceed Total Net Cash Outflows, that is, the LCR must exceed 100%. For other banks with more than \$50 billion of assets, the LCR had to exceed 70%. In any case, the components of the numerator of the LCR, HQLA, are divided into three levels. Level 1 HQLA are the most liquid, including assets such as reserves at

⁷⁴ For a primer of liquidity risk management in the context of some well-known case studies, see Tuckman (2017).

the Federal Reserve and sufficiently liquid securities that are guaranteed by the United States, like US Treasuries and GNMA mortgage-backed securities (MBS). Level 2A HQLA are the next most liquid, including assets such as investment-grade securities of government-sponsored entities, like MBS of FNMA and FHLMC, which count towards HQLA at 85% of value. And Level 2B HQLA are the least liquid, including assets such as sufficiently liquid investment-grade, non-financial corporate bonds, which count toward HQLA at 50% of value. Note, too, that Level 1 assets must be at least 60% of total HQLA, and Level 2B assets may be at most 15% of total HQLA.

Turning to the components of the denominator of the LCR, Total Net Cash Outflows are computed by making specific assumptions about cash outflows and inflows in a liquidity stress scenario over a 30-day horizon. For example, an outflow rate of 10% is assumed to apply to uninsured retail deposits, while an outflow of 25% is assumed to apply to uninsured corporate operational deposits.

The LCR is a component of preventive supervision: Its stress scenario is the same across all banks and, therefore, is more of a generic backstop and common metric than a tool for managing liquidity risk at any particular bank. To take a pertinent example, the LCR was not designed to and could not have been expected to incorporate the consequences of the concentration of SVB's deposit base in venture capital firms. By contrast, bank-specific risks, like this one at SVB, can and should be incorporated into a bank's internal liquidity models and the liquidity stress tests and buffer requirements of Regulation YY. Along these lines, the text of Regulation YY requires that a bank's liquidity stress scenarios be "based on its financial condition, size, complexity, risk profile, scope of operations, or activities."⁷⁵

⁷⁵ 12 CFR §252.35(a)(3)(ii).

The 2019 Tailoring exempted SVB and other Category IV banks with less than \$50 billion of “weighted short-term wholesale funding” from the LCR.⁷⁶ For the most part, the 2019 Tailoring left Regulation YY unchanged for SVB and other Category IV banks, although it did reduce the frequency of liquidity stress testing from monthly to quarterly. Therefore, it is reasonable to examine the extent to which SVB’s failure might have been detected earlier or averted had the bank not been exempted from the LCR by the 2019 Tailoring.

Implicit in the 2019 Tailoring was the view that the liquidity risks of banks in the same regulatory bucket as SVB were adequately supervised by Regulation YY. This view was justified *ex post*, however, in only the most limited sense. Discussions at the Federal Reserve did note that Regulation YY’s internal liquidity stress tests had assumed heightened importance in light of the 2019 Tailoring. Also, SVB was in no sense flying under the supervisory radar: SVB was one of the two largest banks for which the Federal Reserve Bank of San Francisco had primary supervisory responsibility. And finally, as discussed earlier in this chapter, supervisors did uncover several fatal flaws of liquidity risk management at SVB. Ultimately, however, detective and punitive supervision of liquidity risk failed because none of the prescient supervisory findings resulted in timely and sufficiently corrective action by the bank or its regulators.

Given this failure of detective and punitive supervision, it might be argued that, absent the 2019 Tailoring, a clear violation of the LCR would have triggered a more timely and effective response than the findings of bank examiners. Indeed, according to Federal Reserve Board (2023), Feldberg

76 Weightings are assigned so as to penalise shorter-term funding from less reliable sources and reward longer-term funding from more reliable sources. For examples, two-week funding secured by relatively illiquid securities has a weight of 75% in the calculation of short-term wholesale funding, while a two-month brokered deposit from a retail customer has a weight of only 10%. See 12 CFR §217.406.

(2023), and Nelson (2023), SVB's balance sheet as of the end of 2022 showed a deficient LCR of between 75% and 100%.

It is simplistic to conclude, however, that SVB's complying with the LCR - either on its own or in response to supervisory and public pressure - would have prevented its failure. As described earlier, the LCR does not measure and would not have detected SVB's fundamental error of funding long-term fixed-income securities with insufficiently stable deposits. More precisely, SVB could have made relatively straightforward adjustments to its portfolio of assets that would have resulted in compliance with the LCR but that would not have averted failure. First, SVB could have invested in fewer foreign and more US assets so as to be subject to and in compliance with a 70% rather than 100% LCR requirement. Second, SVB could have invested more in US Treasuries - which count 100% to HQLA - and less in FNMA and FHLMC MBS - which count 85% toward HQLA. For example, had SVB bought long-term US Treasuries instead of about half of its year-end 2022 holdings of FNMA and FHLMC MBS, its LCR would have been comfortably in compliance at between 115% and 155%.⁷⁷

In summary, the 2019 Tailoring left SVB subject to Regulation YY but exempted it from the LCR. Regulation YY seems to have been more than sufficient for supervisors to detect flaws in the bank's liquidity risk management, but not sufficient for them to fully internalise and compel correction of these flaws. Furthermore, had SVB not been exempted from the LCR, it could have straightforwardly adjusted its asset portfolio to be in compliance without

⁷⁷ According to Nelson (2023), at the end of 2022, SVB's net cash outflows were either \$51.4 billion or \$69.9 billion, depending on assumptions made. At the same time, SVB held \$31.7 billion Level 1 assets and \$52.4 billion Level 2A assets for a total of \$84.1 billion assets, but only \$52.8 billion of HQLA, because Level 1 assets must comprise 60% of total HQLA. If, instead, SVB had \$57.9 billion Level 1 assets and \$26.2 billion Level 2A assets, then its HQLA would have been \$57.9 billion plus 85% of \$26.2 billion or \$80.2 billion, which would give an LCR of $\$80.2/\69.9 , or 115%, or of $\$80.2/\51.4 , or about 156%.

deviating from its flawed business model of buying long-term fixed-income instruments with insufficiently stable deposits.

Supervisory Stress Tests

The 2019 Tailoring reduced the frequency of supervisory stress tests of capital adequacy for Category IV banks from annual to every other year. The motivation behind this change was to address the perceived costliness of conducting stress tests relative to their benefits, particularly for smaller banks. Critics of the change, however, pointed to the danger of allowing such a lengthy period to pass between tests of capital adequacy for banks that may, in fact, turn out to pose systemic risk.

Over the past several years, stress tests may very well have identified and helped cure vulnerabilities at systemically important banks. In isolation, however, SVB's failure strengthened the argument that the benefits might not be worth the costs because pre-determined stress scenarios can easily miss scenarios that prove to be the most relevant *ex post*. More specifically, the scenario used for the 2022 stress tests of capital adequacy was a severe recession in which longer-term interest rates fall for a few quarters and then return to their starting levels. This scenario turned out to be irrelevant for SVB, which experienced steeply increasing rates and an unstable deposit base.⁷⁸

In contrast with the supervisory stress test, supervision uncovered many aspects of SVB's ultimately fatal exposure to interest rates. As mentioned above, supervisors knew that SVB was in breach of an internal limit on EVE. More generally, a Federal Reserve report in June 2022 included SVB in a list of banks with the highest ratios of unrealised losses to capital. And in the

⁷⁸ The "severely adverse scenario" is used for the determination of capital requirements. The 2022 "baseline" scenario, which is also run, had the 10-year Treasury rate increasing mildly, from 1.5% to 2.5% over 13 quarters.

fall of 2022, supervisors reported that SVB's interest rate risk simulations of interest income were inconsistent with actual performance and met with senior management to "*express concern with the bank's interest rate risk profile.*" However, as in the case of liquidity risk, these supervisory findings did not result in timely corrective action. "Sensitivity to Market Risk" at SVB was rated by supervisors as a two out of five through November 2022, at which time it was planned to downgrade the rating to three. SVB failed before this downgrade was finalised.⁷⁹

The costs and effectiveness of supervisory stress tests relative to supervision was recently highlighted by Jamie Dimon, CEO of JPMorgan Chase & Co.:

[S]tress testing... has become an enormous, mind-numbingly complex task about crossing t's and dotting i's... the Fed's stress test focuses on only one scenario... A less academic, more collaborative reflection of possible risks that a bank faces would better inform institutions and their regulators about the full landscape of potential risks.⁸⁰

Stress tests, broadly conceived, are the bread-and-butter of risk management. The failure of SVB, however, has highlighted issues with respect to the relative utility of preventive supervision, in the form of supervisory stress tests, and detective supervision, in the form of bank-specific analysis that is conceived and conducted by individual bank managers and their supervisors. The SVB experience has also highlighted the weakness of the current regulatory approach of stressing capital and liquidity separately: The most adverse scenarios might be most likely to arise from a correlation between portfolio losses and liquidity drains.

79 Federal Reserve Board (2023), pp. 64-67, and Barr (2023), p. 5.

80 JPMorgan Chase & Company, CEO Letter, 2022 Annual Report to Shareholders, p. 23.

Gains and Losses of Available-for-Sale Securities

Before the 2019 Tailoring, banks with more than \$250 billion of assets or with more than \$10 billion of foreign exposure had to include for the purposes of capital calculations the gains and losses of securities classified as AFS. The 2019 Tailoring raised the relevant threshold for the inclusion of these gains and losses to banks with more than \$700 billion of assets or with more than \$75 billion of cross-jurisdictional activity.

In the second quarter of 2020, SVB's foreign holdings exceeded \$10 billion. In the absence of the 2019 Tailoring, therefore, SVB would have had to include losses in its AFS portfolio for computing its capital requirements starting in 2021. It is natural to ask, therefore, whether SVB's fate would have been averted without the 2019 Tailoring.

As in the discussion of liquidity requirements, the counterfactual is complicated by the possibility that SVB could have changed behaviour to avoid the resulting treatment of AFS losses. More specifically, it could have reduced its foreign exposures or classified fewer securities as AFS and more as held-to-maturity (HTM). As it turns out, however, any ultimate inclusion of AFS losses would not have resulted in deficient or even near-deficient capital ratios. Covas (2023) estimates that the inclusion as of year-end 2022 would have reduced SVB's common equity tier 1 capital ratio from about 12% to above 10%, which would still have been very comfortably above its required ratio of 7%. Put another way, the problem of unrealised losses at SVB were its HTM portfolio, which had unrealised losses as of year-end 2022 of more than 90% of book equity. See Chapter 7 for policy recommendations with respect to these accounting issues.

Resolution Plans

The 2019 Tailoring exempted Category IV bank holding companies from submitting resolution plans to the Federal Reserve, but SVB's bank subsidiary, with more than \$100 billion of assets, was required to submit a resolution plan to the FDIC. Ironically, because SVB's assets first crossed this threshold in 2021, the bank's first resolution plan was filed in December 2022, not long before the bank failed.

According to Government Accountability Office (2023), staff at the FDIC typically take between five and six months to review resolution plans. Preliminary findings, however, were that SVB's plan was deficient in failing to identify potential buyers for either the whole or parts of the bank.

In her dissent from the 2019 Tailoring, Fed Governor Lael Brainard was sympathetic to reducing the costs of producing resolution plans, but thought that the 2019 Tailoring went too far in several ways, including eliminating the requirement completely for bank organisations with assets between \$100 billion and \$250 billion.⁸¹ As it turned out, this critique was not relevant for SVB because the bank holding company, which was exempt from filing, was essentially the same as the bank, which did file. Perhaps the most important lesson from the SVB episode, however, is that resolution plans that take five to six months to review can easily prove to be of little use to authorities through a fast-paced bank failure.

Supervisory Culture

No argument has been made that particular statutory or rule changes in the 2019 Tailoring were directly responsible for delinquencies in detective and punitive supervision surrounding the failure of SVB. However, Federal

81 Brainard (2019).

Reserve Board (2023) alleges that “cultural” changes at the Federal Reserve, concurrent with the 2019 Tailoring, emphasised due process and high burdens of proof and, consequently, discouraged supervisors from taking actions based on their findings.

It is not possible for an outside observer to assess these allegations because they are presented through aggregated accounts of anonymous interviews and because they are disputed by other accounts. For example, Federal Reserve officials at the time of the 2019 Tailoring claim that supervisors were urged to focus more on major, consequential issues and less on minor, technical infractions, and other former officials and observers claim that the Federal Reserve system’s culture of delaying action in an effort to gather extensive evidence and build consensus “has been endemic” for years.⁸²

Any significance of a cultural shift in supervision around 2019 must also compete with a long list of other factors listed in Federal Reserve Board (2023), which include: insufficient or misdirected resources; suboptimal allocation of staff across tasks; operational difficulties through the COVID pandemic; poor management of transitioning SVB as it grew rapidly from one supervisory group to another; and the strong financial performance of SVB leading up to the relatively sudden onset of its difficulties.

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5 EVALUATION OF THE POLICY RESPONSE: ON THE RESOLUTION OF SILICON VALLEY BANK, SIGNATURE BANK, AND FIRST REPUBLIC BANK

Richard Berner, Kermit L. Schoenholtz, and Lawrence J. White

Supervisors had substantial warning about the frailties of these banks. Yet, despite the post-Global Financial Crisis focus on large bank resolution, neither supervisors nor banks seemed prepared in March to resolve the three failed banks without creating large spillover costs. To contain the panic, policymakers invoked their emergency authority to protect uninsured depositors. Enhancing banks' capacity to absorb losses would have reduced, or potentially eliminated, those costs.

Introduction

In this chapter, we describe the resolutions of the three key midsized bank failures during the first half of 2023: First Republic Bank, May 1; Silicon Valley Bank (SVB), March 10; and Signature Bank, March 12. With assets of \$212 billion, \$209 billion, and \$110 billion, respectively, at the end of 2022, these were the second-, third-, and fourth-largest bank failures in US history.⁸³ A detailed timeline listing the key dates and actions in these resolutions is provided at the end of this chapter.

A key message of the chapter is that supervisors had substantial warning about the frailties of these banks. Yet, when the banking panic started in March 2023, neither supervisors nor banks were prepared for a smooth resolution that would proceed without large spillover costs to other banks and to the credibility of the authorities. To contain the panic, policymakers felt compelled to exercise their emergency authority to protect the uninsured depositors of SVB and Signature Bank. And, while the eventual resolution of First Republic avoided the use of such emergency authority, it still proved

⁸³ The largest bank failure was that of Washington Mutual, which had assets of \$307 billion when it failed in 2008. According to the FDIC, as of April 13, 2023, First Republic Bank had assets of \$229.1 billion. See Federal Deposit Insurance Corporation (2023a).

highly costly to the Deposit Insurance Fund (DIF). Enhancing banks' internal capacity to absorb losses could have meaningfully reduced, or even eliminated, those costs.

Background

Well before these three banks collapsed, their key vulnerabilities – and those of other midsized banks – were well-known to their principal federal regulators. Above all, these included a combination of large unrealised losses on assets (due to rising interest rates) and heavy reliance on highly runnable, uninsured deposits (see Chapter 1). Moreover, these banks moved a large portion of their securities holdings into the held-to-maturity (HTM) accounting category (see Chapter 7 for details). While this shift shielded their regulatory capital from unrealised losses, it did not reduce the fundamental risks of the securities in the banks' portfolios. It also meant that even a portion of these HTM assets could not be sold to meet liquidity needs without triggering a potentially alarming markdown of capital by the mark-to-market losses on *all* HTM assets. Similarly, while a portion of assets held as available for sale (AFS) could be sold without triggering a markdown of all AFS assets, even a partial sale/markdown could lead to expectations of future AFS sales/write-downs.⁸⁴

At the same time, the evidence of regulatory and supervisory *concern* about a hazardous capital shortfall in the banking system is abundant, even if supervisory *action* was absent. For example, the [Quarterly Banking Profile](#) of the Federal Deposit Insurance Corporation (FDIC) began to highlight the scale of banks' unrealised losses on securities already in the first quarter

⁸⁴ SVB management was clearly aware of these risks. For example, in its internal presentation to the SVB Board on November 8-9, 2022, management warned: "Investor reaction is expected to be very negative to any large securities portfolio restructuring as it will put the entire unrealised loss into focus on the AFS ["available for sale"] portfolio." See Federal Reserve Board (2023b), Figure 20, p. 57.

of 2022, and continued to do so throughout the year.⁸⁵ In November 2022 testimony, then-Acting FDIC Chairman Martin Gruenberg anticipated a growing challenge “*especially if banks need to sell investments to meet liquidity needs*” [emphasis added].⁸⁶ That month, the [Financial Stability Report](#) of the Federal Reserve noted the decline in banks’ tangible equity due to unrealised losses on a subset of securities holdings.⁸⁷ And, on February 14, 2023, Fed supervisors briefed the Board of Governors regarding the “*impact of rising rates on certain banks*,” noting that, as of end-September 2022, “*722 banks reported unrealized losses exceeding 50% of capital*,” while 31 of these reported *negative tangible equity* [emphasis added]. The Fed staffers also singled out SVB, noting that its unrealised losses exceeded capital and highlighting supervisory concerns arising from “*weaknesses in market risk management and high IRR (interest rate risk) exposure*.”⁸⁸

With regard to SVB’s broader frailties, the Fed provides a timeline of financial, market, regulatory, and supervisory developments starting with the firm’s 2018 assessment and concluding with its closure on March 10, 2023.⁸⁹ Along the way, the events include SVB’s January 2021 shift of securities into the HTM category, the surge in venture capital (VC) deal-related client deposits through mid-2022, the rapid increases of unrealised losses during 2022, the decline of VC activity in the second half of 2022, the early-2023 outflow of deposits to support the cash needs of VC-backed clients, and the March 8, 2023, announcement of asset sales and plans for equity issuance.

Finally, with regard to reliance on uninsured deposits, the FDIC noted in its review of Signature Bank supervision that it had downgraded the bank’s

85 Federal Deposit Insurance Corporation (2022) Chart 7. While unrealised losses on securities declined in the final quarter of 2022, Federal Deposit Insurance Corporation (2023b) notes that they remained elevated, p. 1.

86 Gruenberg (2022).

87 Federal Reserve Board (2022), p. 32, regarding losses on available for sale securities.

88 Federal Reserve Board (2023a), pp. 6 and 9.

89 Federal Reserve Board (2023b), Figure 1, p. 15. For more details on SVB’s egregious failures, and on those of SVB’s supervisors, see Chapter 4.

CAMELS⁹⁰ liquidity component rating already in 2019, stating: “*The board needed to strengthen funds management practices to better identify, measure, monitor, and control the bank’s daily funding needs to cover both expected and unexpected deviations from normal operations, including its reliance on the uninsured deposit funding concentration.*”⁹¹

Assessment of the 2023 Large Bank Resolutions

Several key questions are useful for assessing these large, regional US bank resolutions:

1. Was the resolution sufficiently timely to avoid a bank run and contagion in the form of a broader panic?
2. Did the resolution diminish the DIF?
3. Did the resolution employ a systemic risk exception to cover the uninsured deposits of banks that were *not* previously identified as posing a systemic risk?
4. Did the FDIC follow procedures consistent with its statutory obligation to seek a resolution that poses the least cost to the DIF?

The answers to questions 1, 2, and 3 are straightforward: no, yes, and yes. The answer to the fourth question is more complex: Given the resolution framework that was in place for these regional banks, the FDIC procedures probably satisfied the requirements.⁹² From a broader perspective, however, and as discussed in Chapter 10, changes in the resolution framework could have lowered costs to the DIF substantially.

90 CAMELS is an acronym for Capital adequacy, Asset quality, Management capability, Earnings, Liquidity, and Sensitivity to market risks.

91 Federal Deposit Insurance Corporation (2023c), p. 20.

92 The authors are not attorneys, so we leave it to others to judge whether the legal requirements are, indeed, met.

More detailed answers to these questions follow:

Question 1. The March 9 run on SVB spilled over almost immediately to other regional banks with similar characteristics: those with large unrealised losses that relied heavily on uninsured deposits for their short-term funding. For example, deposit outflows at First Republic reached \$25 billion on March 10 and about \$40 billion on March 13.⁹³ Importantly, these strains also went well beyond those of the three large banks that failed: For example, the [S&P Regional Banks stock index](#) plunged by more than 20% from March 8 to March 13 - the day after the resolution of SVB and Signature Bank - and, as of May 17, remained more than 30% below the March 8 level. Arguably, as discussed in Chapter 10, some reforms to the Fed's discount window might have enabled those other regional banks better to meet their liquidity needs and reduce the contagion.

Question 2. The DIF represents a call on the resources of other banks and, potentially, of the Federal Government. It places the burden on healthy banks - and potentially on taxpayers - to cover the losses of the riskiest banks that failed. The FDIC used DIF funds to cover the losses in all three large bank resolutions of 2023. As of May 15, the estimated cost to the DIF fund totalled \$31.5 billion (see timeline below), somewhat less than initially estimated because of the favourable impact of lower interest rates on the asset values of the failed banks. Adjusted to 2022 prices, this total cost represents the second-largest annual loss to the DIF, modestly below the record losses of 2009.

As we note in Chapter 8, following its March 2023 use of a systemic risk exception to cover the uninsured deposits of both SVB and Signature Bank,

93 Gruenberg (2023b).

the FDIC was obliged soon to impose an assessment on insured banks to restore the DIF to its statutory threshold of 1.35% of insured assets (see Resolution Timeline, May 11, below). Similar temporary, pro-cyclical hikes of the DIF premium occurred following the waves of bank failures of the early 1990s and of 2008-09.

Question 3. As mentioned, the FDIC employed a systemic risk exception on March 12 to cover the uninsured deposits of both SVB and Signature Bank. As noted in Chapter 4, these “Category 4” banks were not subject to the strict supervisory scrutiny imposed on larger banks, such as the global systemically important banks (G-SIBs). Because it was able to find a buyer for virtually all the assets and liabilities of First Republic Bank on May 1, the FDIC did not need to invoke a systemic risk exception to protect First Republic’s uninsured depositors.

Question 4. Despite knowledge of their vulnerabilities, the FDIC appears to have been unprepared to address in a timely way the failures of these large banks when the March 9 run on SVB quickly became a regional banking panic.

Since 2000, more than 85% of FDIC resolutions have been *purchase and assumption (P&A) transactions*, under which a healthy bank purchases the assets and assumes the obligations of the failed bank. Yet, the FDIC was unable to find buyers for SVB and Signature Bank before re-opening them as FDIC bridge banks on March 13.⁹⁴

One factor that may have hindered FDIC preparedness to resolve SVB and Signature Bank using the traditional P&A method was that the resolution

⁹⁴ One question that has been raised is whether the FDIC provided equal treatment for bank and nonbank bidders. Establishing a “level playing field” in the auction would seem necessary to minimise the cost to the DIF of any sale. The Wall Street Journal Editorial Board (2023).

plans required for such banks either were under review or not submitted. In June 2021, following a COVID-related moratorium on the submission of bank resolution plans, the FDIC established a three-year submission frequency for banks with more than \$100 billion in assets.⁹⁵ SVB submitted its first and only plan on December 1, 2022, while Signature Bank was due to submit only in June 2023, so it had no active plan when it failed.⁹⁶ According to the Government Accountability Office (GAO), on a preliminary basis, FDIC staff viewed SVB's resolution plan as "not thorough," noting that it "did not list potential acquirers for a whole bank purchase, specific portfolios, and franchise components." The plan also did not "detail crisis communication, liquidity needs, liquidity resources, or processes for determining liquidity drivers."

The combination of an ongoing panic and the lack of a buyer (at a price in excess of the bank's liquidation value) probably was sufficient to motivate the authorities' decision to invoke a systemic risk exception to protect all the depositors of SVB and Signature Bank. In such circumstances, it is doubtful whether any policymakers would risk a broader banking collapse by failing to exercise such discretion when they have the authority to do so.

The unprecedented speed of the run is *not* a compelling justification for a *lack of preparedness*. For example, in the case of SVB, unrealised losses on its securities already exceeded its capital as of September 30, 2022. And the concentration of uninsured deposits among a relatively small number of highly interconnected clients should have come as no surprise to SVB's supervisors.⁹⁷ As a result, the authorities had several months during which

95 Federal Deposit Insurance Corporation (2021).

96 Government Accountability Office (2023), Appendix I, pp. 36-37. In its April 2023 review of the Signature Bank failure, the FDIC does not mention the bank's lack of a resolution plan: FDIC (2023c). While First Republic submitted its third resolution plan on December 1, 2022, we have access only to the public portion of the plan, which does not include critical resolution information - such as potential acquirers. First Republic (2022).

97 Recall that, when it failed, SVB's top ten depositors alone held \$13 billion in deposits. Gruenberg (2023a).

they should have assessed SVB's potential losses, identified the lowest-cost means of cleaning up the bank, and begun to identify a list of potential buyers of a "good bank" with the goal of being able to conduct an effective auction on very short notice.

The issue of preparedness also arises with respect to the resolution of First Republic Bank, although it occurred seven weeks *after* the failures of SVB and Signature Bank. Surely, First Republic's supervisors could have tracked its deposit outflows on a daily basis starting on March 10, when SVB was closed. When First Republic reported its first-quarter results on April 24, the world learned what supervisors presumably knew: More than \$100 billion of deposits – 58% of the year-end 2022 total – had exited during the quarter (see the timeline below).⁹⁸ Not surprisingly, the run on First Republic soon resumed, leading to the FDIC auction and resolution the next weekend.⁹⁹

Given the circumstances that they faced in the final week of April, the FDIC's description of its actions to set the stage for and to conduct an effective auction of First Republic is consistent with its least-cost statutory requirement. As the timeline makes clear, the FDIC invited more than 40 banks and nonbanks to participate in a multi-stage auction. At the last step, the top four bidders were invited to make "best and final offers," with the FDIC selecting as the winner the bid that would incur the smallest loss to the DIF.

However, as discussed in more detail in Chapter 10, different "circumstances" could have reduced the cost to the DIF significantly further. For example, despite their potential for systemic risk, none of the three banks that failed had been required to issue a particular kind of subordinated debt- known

98 To boost confidence in First Republic, a consortium of 11 banks acted publicly on March 16 to deposit \$30 billion with the bank, so while the gross decline of other deposits (excluding the 11 banks' deposits) during the quarter was approximately \$102 billion, the net decline of deposits was \$72 billion. First Republic Bank (2023).

99 Gruenberg (2023b).

as Total Loss-Absorbing Capital (TLAC) debt in the case of G-SIBs. A layer of this subordinated debt would have served as a contingent equity buffer to protect deposits when the three banks' existing equity was wiped out.¹⁰⁰ It also would have reduced or eliminated the incentive of US regulators to exercise their systemic risk discretion to protect uninsured depositors and could have eliminated the need to tap the DIF.¹⁰¹ Finally, as discussed in Chapter 8, TLAC debt would have created a group of stakeholders with the capacity to monitor and the incentive to limit these banks' propensities to take risk. Linking management compensation to TLAC debt, rather than equity, also would reduce their incentive to promote highly risky practices.

Given the time that the FDIC potentially had to prepare, it also could have simplified the auctions by writing off the "bad parts" of the banks in advance and offering a "good, clean bank" for sale. For example, in the SVB and Signature Bank resolutions, the FDIC kept some of the loans and securities in receivership to be marketed separately (see April 3 and April 5 in the timeline). In theory, the FDIC had better information about the riskiness of these banks' portfolios than potential buyers can quickly obtain over a weekend. Segregating those risks can reduce the need for loss-sharing arrangements and help expand the potential pool of bidders and raise their bids by reducing uncertainty.

Resolution Timeline for SVB, Signature Bank, and First Republic Bank: Key 2023 Events

March 8. Silvergate Capital, holding company of Silvergate Bank, announces that it will liquidate the bank and shut down operations.¹⁰²

100 Bank for International Settlements (2015).

101 According to the FDIC Chairman, "the agencies are considering issuing in the near future a proposed rulemaking to implement resolution-related long-term debt requirements for banking organizations with at least \$100 billion in assets." Gruenberg (2023b). As noted, such a TLAC requirement already exists for G-SIBs.

102 Silvergate Capital (2023).

March 8. SVB announces completed sale of available-for-sale securities – a \$1.8 billion loss on book value of \$24 billion – and plans to raise equity capital totalling \$2.25 billion.¹⁰³

March 9. SVB experiences more than \$40 billion of deposit withdrawals, and management anticipates more than \$100 billion of withdrawals will occur on March 10.¹⁰⁴

March 10. California Department of Financial Protection and Innovation (CADFPI) closes SVB and appoints FDIC as receiver. FDIC creates Deposit Insurance National Bank of Santa Clara (DINBSC), transfers all insured deposits to the new bank, announces plans to pay an advanced dividend to uninsured depositors, and creates a potential bidder list of 24 bidders to market DINBSC.¹⁰⁵ First Republic Bank begins to experience large deposit withdrawals.¹⁰⁶

March 11. FDIC initiates marketing process for DINBSC, with bids due March 12.¹⁰⁷

March 12. Treasury, Federal Reserve and FDIC announce a “systemic risk exception” to protect all depositors of Silicon Valley Bank and Signature Bank.¹⁰⁸ To protect all depositors, FDIC transfers assets of SVB and Signature Bank to FDIC-operated bridge banks, after the New York State Department of Financial Services closes Signature Bank and appoints FDIC as receiver.¹⁰⁹ The Board of Governors of the Federal Reserve announces the Bank Term Funding Program (BTFP). The BTFP offers loans of up to one year against

103 Wang, et. al. (2023) and Silicon Valley Bank (2023).

104 For comparison, the largest previous run occurred in 2008 when Washington Mutual faced \$16.7 billion in withdrawals over the ten days prior to its shutdown on September 25. Office of Thrift Supervision (2008). For the size of SVB withdrawals on March 9-10, see Son (2023).

105 For most of the agency actions in this timeline, see Government Accountability Office (2023), Appendix II, p. 38.

106 According to Gruenberg (2023b), deposit outflows from First Republic Bank reached \$25 billion on March 10 and another \$40 billion on March 13.

107 Gruenberg (2023a)..

108 Treasury, Federal Reserve and FDIC (2023a).

109 Federal Deposit Insurance Corporation (2023c), p. 20.

the *par value* of Treasury, agency and mortgage-backed securities posted as collateral, with a backstop of up to \$25 billion from the US Treasury Exchange Stabilization Fund.¹¹⁰

March 13. Silicon Valley Bridge Bank and Signature Bridge Bank open.

March 16. US Treasury, Federal Reserve and FDIC announce that a consortium of 11 banks will put \$30 billion in deposits into First Republic Bank.¹¹¹

March 19. FDIC enters a purchase and assumption agreement for “substantially all the deposits and certain loan portfolios” of Signature Bridge Bank with Flagstar Bank, a subsidiary of New York Community Bancorp, Inc. The FDIC estimates the cost to the DIF of Signature Bank’s failure at \$2.5 billion.¹¹²

March 26. FDIC announces sale of all deposits and loans of the Silicon Valley Bridge Bank to First Citizens Bank & Trust Company, keeping about \$90 billion of securities in the receivership. The buyer acquired about \$72 billion of assets at a discount of \$16.5 billion. The agreement included a loss-share arrangement for commercial loans. The FDIC estimates the losses to the DIF from SVB’s failure at \$20 billion.¹¹³

April 3. FDIC announces the framework for marketing the Signature Bank loans that were retained in receivership.¹¹⁴

April 5. FDIC retains BlackRock Financial Market Advisory to liquidate the securities that it retained from the resolutions of SVB and Signature Bank.¹¹⁵

April 24. First Republic publishes first-quarter results, revealing gross deposit outflows since the end of 2022 of more than \$100 billion (or 58%),

110 Federal Reserve Board (2023c) and (2023d).

111 US Treasury, Federal Reserve, and FDIC (2023b). Gruenberg (2023b) notes that withdrawals and then stabilised in the week ending March 24.

112 Federal Deposit Insurance Corporation (2023d).

113 Federal Deposit Insurance Corporation (2023e).

114 Federal Deposit Insurance Corporation (2023f).

115 Federal Deposit Insurance Corporation (2023g).

after adjusting for bank consortium injection of \$30 billion. Significant withdrawals soon resume (more than \$10 billion from April 26 to April 28).¹¹⁶

April 27-30. After informal discussions and an initial request for indicative bids, the FDIC (seeking a least-cost option for the DIF) invites 42 banks and nonbanks to join a formal bidding process for First Republic, ultimately leading to a “best and final offers” request from the top four bidders with a deadline of 7:00pm on April 30.

April 28. FDIC and CADFPI downgrade First Republic to “problem bank” status, shifting it to “secondary credit” status at the Federal Reserve and “eliminating capacity to meet liquidity demands.”¹¹⁷

May 1. CADFPI closes First Republic Bank and appoints FDIC as receiver. FDIC announces that it sold most of the assets and deposits of First Republic to JPMorgan Chase.¹¹⁸ JPMorgan Chase reports that it has a loss-share agreement with the FDIC for select mortgages and loans, that it will receive \$50 billion of five-year, fixed-rate funding, and that it will repay the March 16 deposits from 11 banks of \$30 billion.¹¹⁹

May 11. FDIC Board approves notice of proposed rule to impose a special assessment to recover DIF losses due to the systemic exception provision of protection to uninsured depositors of SVB and Signature Bank.¹²⁰

May 15. Updated estimates, partly reflecting the impact of lower market interest rates, indicate that the cost to the DIF of the resolutions of SVB, Signature Bank, and First Republic Bank will be \$16.1 billion, \$2.4 billion, and \$13 billion, respectively.¹²¹

116 First Republic Bank (2023).

117 Gruenberg (2023b).

118 Federal Deposit Insurance Corporation (2023h).

119 JPMorgan Chase (2023a) and (2023b).

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6 RESTORING CONFIDENCE IN THE BANKING SYSTEM WITH A STAGFLATION STRESS TEST¹²²

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Viral V. Acharya

Illiquid banks with bigger shares of uninsured deposits should be asked to finance a larger share of their assets with equity. In the short run, the central bank should adopt its rulebook from the confidence-building stress tests of 2009, undertake a stagflation stress test that reviews banks' asset quality, and restore capital adequacy as needed.

It is often said that the most reliable early warning signal of a financial crisis is being in the midst of one. When runs occur on a significant part of the banking sector, it is therefore usually a mistake to underestimate the risk and the cost of allowing a further erosion of confidence in financial stability. Leaving aside regulatory or supervisory mistakes and private sector excesses that might have led to the point of fragility, the need of the hour when inside a storm is to restore confidence in the financial system. In modern times, given the multiplicity of bank liability types and the complexity of economic functions that banks perform, this requires more than simply guaranteeing bank depositors. Confidence in the banking system has to be restored more universally.

With this objective in mind, we first make the case for a stress-test based asset quality review of the US banking system. We then explain why such a stress test should feature a stagflation scenario and provide a straightforward way to build in the interaction of bank solvency and liquidity risks. To ensure that the regulatory stress test does not fail the market test, we propose market-data based alternative stress tests that can be used as benchmarks to assess the regulatory stress-test outcomes. Finally, we lay out the action plan that

¹²² Based in part on Acharya (2023). I thank Kathryn Judge (Columbia Law School) for her advice regarding the legal foundations for stress testing, Kermit L. Schoenholtz and Bruce Tuckman for valuable inputs, and Stefano Pastore for excellent research assistance.

would have to follow for raising capital at banks that are identified to be weak in the stress tests, including equity issuance, bank mergers, and government equity injections.

The Case for a Stress-Test based Asset Quality Review

Bank runs happen slowly at first, then fast. The bank failures of Silicon Valley Bank (SVB) and Signature Bank in March 2023 seem no different.¹²³ These banks' rapid asset growth over the past three years, mostly in long-term bonds, was fuelled by unsecured deposits tied to their undiversified base of loan clients. The unprecedented scale of Federal Reserve (Fed) and government stimulus following the pandemic clearly contributed to the explosion of bank deposits.¹²⁴ These factors combined with the promise of low-for-long rates, poor interest rate risk management at banks and weak regulatory supervision to induce a "search for yield" in several banks. The resulting maturity mismatch went too far, eventually manifesting as runs of uninsured depositors on balance sheets on which the asset side featured disproportionately large investments in long-term bonds.

Effectively, banks "manufactured tail risk"¹²⁵ again, either due to poorly managed interest rate risk in the context of an unstable deposit franchise,¹²⁶ or to the impact of mispriced government guarantees that encouraged banks to take greater interest rate risk, or both. This time around, tail-risk manufacturing arose from interest rate risk, not from underwriting risky mortgages as was the case in the buildup to the global financial crisis of 2007-2009.

123 For details on runs of these banks and their resolution, see Chapters 1 and 5.

124 For the link between the Fed's quantitative easing and the growth of uninsured deposits at banks, see Chapter 2.

125 Acharya, Cooley, Richardson and Walter (2010).

126 Drechsler, Savov, Schnabl and Wang (2023).

As of early June 2023, regulators seem to have arrested depositor runs by implicitly extending guarantees to uninsured deposits that no longer have sufficient private bank capital backing them. Even as some calm has been restored in measures of financial stress, market uncertainty remains high. Investor expectations of the economy have switched within a couple of months from soft landing to no landing to a possible hard landing in the form of a recession. Some of these scenarios can add to structural (e.g., work-from-home related) problems in the commercial real estate (CRE) sector and can fuel credit card and auto loan delinquencies.

Regional banks tend to come under strain when interest rates rise and local economies are hit, notably their CRE loans,¹²⁷ but business models of many large global banks have also been found wanting as the era of easy money came to an end. Credit conditions are tightening in response to this strain, at banks (especially regional banks), but also in capital markets.

At the same time, the US job market remains tight, and inflation is still well above the Fed's target, so that policy interest rates may have to rise somewhat further or stay elevated for some time. One hopes that disinflation will take hold without disturbing financial stability, but hope is not a desirable macroprudential strategy, and it is better to be prepared for further stress.

So, what can the Fed and other regulators do if confidence in the banking system erodes further?

What worked to restore financial stability in the aftermath of the earlier global financial crisis can provide a useful starting point. The policy goal is to ensure confidence in the banking system, so that banks can perform their critical

127 Cole and White (2012).

functions in implementing payments, providing credit to healthy borrowers, and serving as a reliable counterparty in other transactions.

Lessons from the Stress Test (Supervisory Capital Assessment Program) of 2009

Experience from rescue measures adopted in the fall of 2008 following the collapse of Lehman Brothers suggests that simply guaranteeing deposits and backstopping bank creditors is insufficient to achieve broad financial stabilisation. Depositors may flee to better-capitalised banks providing better transaction services than capital-starved banks, and corporate clients and households borrowing from banks can also engage in such a “flight to safety.”

Figures 1-3 show that key market barometers of financial instability – such as bank credit default swap (CDS) spreads and option implied volatilities – remained abnormally high following the failure of Lehman until March 2009. What restored confidence was the successful *ad hoc* stress test of the largest 19 banks that the Federal Reserve began in February and disclosed in May 2009.

By examining the impact of further adverse conditions on these banks’ balance sheets, the Fed’s Supervisory Capital Assessment Program (SCAP) provided transparent estimates of each bank’s capital shortfall and incentivised them to raise equity. The basis for the SCAP exercise appears to have been the Fed’s supervisory authority over the stress-tested entities. There is now a debate, especially in legal scholarship, as to the desirability of “regulation by hypothetical” – reflecting that stress-test projections inherently involve some, even if informed, speculative modelling.¹²⁸ Nevertheless, the basis for an emergency stress-test exercise such as the SCAP becomes less about the

¹²⁸ Baradaran (2014).

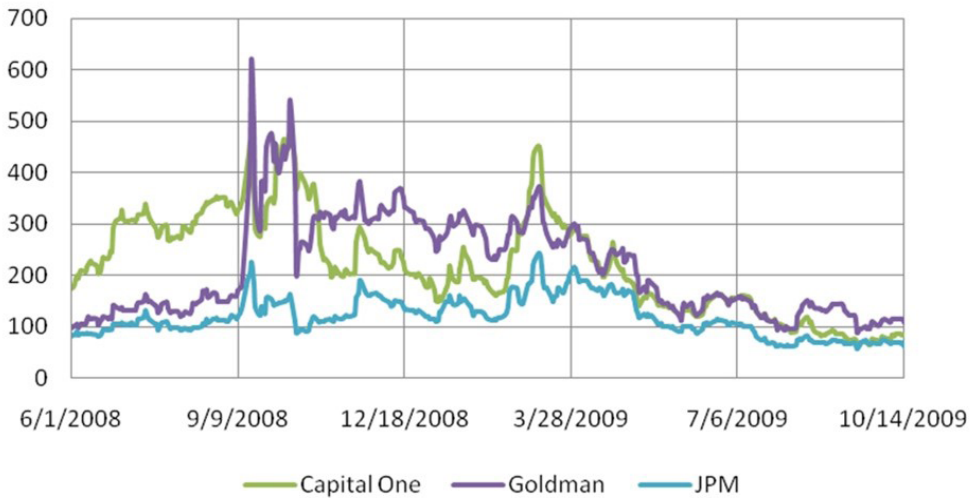
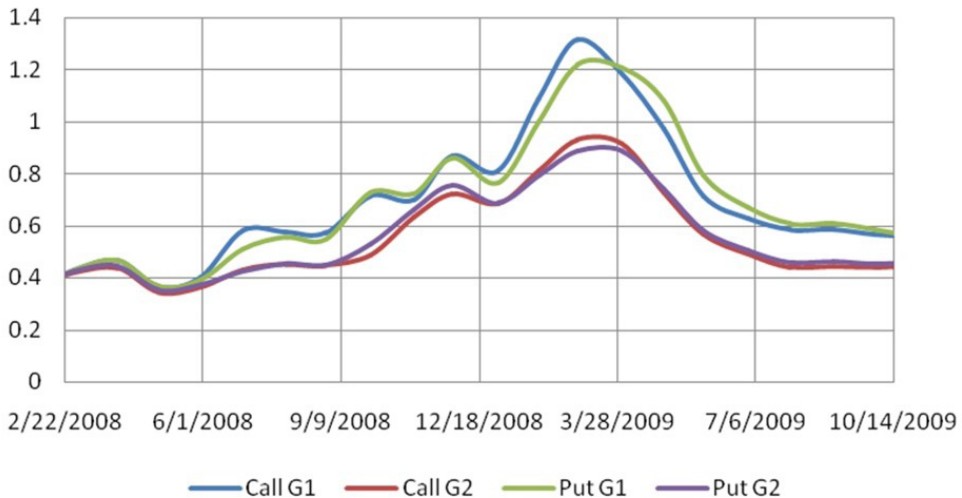
hypothetical when crisis-driven bank failures have already materialised (as in 2007-2009 and as is the case now).

Importantly, knowing that the Fed had backup funds from Treasury that could be used to recapitalise banks as needed, observers treated the Fed's capital shortfall estimates as credible, helping to restore equity market confidence. Until the SCAP disclosure in May, banks had not issued new equity since Lehman's failure in September 2008. Shortly after the disclosure, they were able to raise around \$75 billion of private capital, diminishing fears of further financial fragility without further use of the Treasury's recapitalisation fund. Put simply, SCAP served as an extraordinary and credible disclosure mechanism that altered the macroeconomic state.

FIGURES 1-3 PERSISTENT MARKET STRESS (CDS SPREADS IN BASIS POINTS AND IMPLIED VOLATILITY) FOR VULNERABLE BANKS, FALL 2008-FALL 2009

Figure 1: 5-year Maturity Senior CDS Spreads G1



Figure 2: 5-year Maturity Senior CDS Spreads G2**Figure 3: Average Groupwise Implied Volatilities**

Group G1: Required to raise capital after stress test of Feb-May 2009, Group G2: Not required to raise capital after stress test. Source: Figures 4.1-4.3 Acharya, Brownlees, Engle, Farazmand and Richardson (2011).

Stagflation Stress Test

This successful regulatory playbook from 2009 can serve as a basis today for rebuilding confidence in the banking system. The goal should be to test and credibly disclose any capital shortfalls that exist (or are likely to arise) in the

banking system. For this purpose, the Fed can use its existing stress-testing framework (based on the Dodd-Frank Act of 2010) to perform a one-off *asset quality review* like the SCAP of 2009. In this case, the review could be simpler because – aside from specific credit risks like CRE that do require scrutiny – 2023 losses on the banking system’s assets reflect the product of their asset duration and the rise of market interest rates, as well as the losses on credit card and auto loans that are likely to occur in a typical recession.

A key complication, however, would be that the Fed ideally should stress test the risk of a *stagflation* scenario in the *entire* banking system, or at least a large part of the banking system, and certainly not just the largest banks. While not recommending a specific cutoff or other means of determining the universe of banks to stress test, it is important to point out the trade-off between including a large set of banks to restore confidence and the operational difficulty and costs, both for the Fed and the banks, of broadening the coverage.

For instance, setting a threshold of assets above \$10 billion would imply stress-testing 158 banks. The bulk of the interest rate risk resides in this group of banks. Below the \$10 billion threshold, however, there are more than 4,500 banks. The largest of these community banks that have substantial exposure to CRE loans, in some cases over 30% of their lending book, may also need to be included in a stagflation stress test. While these banks may not be as systemic in a financial contagion sense as the largest banks, their debilitating health could nevertheless induce a credit crunch with substantial spillovers to the real economy.

Furthermore, regulators have effectively announced implicit guarantees for all uninsured depositors and thereby acknowledged that even smaller banks – as a herd or due to information contagion or their special role in CRE and

small-business lending – may be systemically important. Smaller banks may also be politically too important to be left out of the government safety nets presently being extended to the larger banks. This could impose undue burden on the Federal Deposit Insurance Corporation (FDIC)'s Deposit Insurance Fund (DIF) if there are too many banks to fail. This is another reason why it is crucial that regulators encompass a larger part of the banking system than was covered during the SCAP exercise of 2009 when only the largest 19 banking institutions were included in stress tests.

To make such broad coverage feasible, regulatory authorities besides the Fed, such as the FDIC and the Office of the Comptroller of the Currency (OCC), might also have to be involved in the exercise to cover banks that only they supervise. Perhaps more importantly, supervisory capacity and experience may lack the depth and breadth to apply stress-test methodology well to several hundred or more banks. For all these reasons, the test would have to be simpler and more practical (say, with a further increase of interest rates by 200 basis points and with region-specific loss assumptions that apply to broad categories of assets such as CRE, e.g., around a base case of 30% loan loss) than the detailed, elaborate and costly stress tests that are typically applied only to the largest banks.

In particular, the stagflation stress test could have the following important features:

1. **High rates in the stress scenario:** In currently employed regulatory stress scenarios, economic recessions are associated with low interest rates that boost the value of banks' securities investments. This is, however, counterfactual at present. Reflecting reality, the stress scenarios need to feature instead an economic slowdown with a high

level of rates and possibly even further hikes that may be essential to arrest above-target inflation.

2. **Marking to market in the stressed regulatory capital:** Given their proximate role in causing fears of bank insolvency during the banking stress of 2023, mark-to-market losses on investment securities of banks (available-for-sale or held-to-maturity) should be transparently recognised and made to flow into stressed capital calculations (i.e., no “filter” to be applied to unrecognised gains/losses).
3. **Capital and liquidity nexus:** A key question that regulators are likely to contend with is whether banks with truly stable (e.g., insured) deposit bases should receive some recognition while making estimated losses flow into the stressed regulatory capital. Some concession in marking to market could be considered formulaically based on whether the bank has a stable, insured retail deposit base.¹²⁹ While in general we are not in favour of such accounting dispensations (see Chapter 7), this approach would recognise the nexus of bank liquidity and solvency assessment, i.e., that an assessment of a bank based on mark-to-market consideration is likely to arise if it relies heavily on unstable deposits.

Do Regulatory Stress Test Results Line Up with Market Stress Tests?

As was the case with runs during the global financial crisis of 2007-2009, some banks that had to file for bankruptcy continued to meet regulatory standards even as their ability to secure market funding dried up. Put differently, these banks failed the *market* capital stress test. Usually, when regulatory capital exceeds the market value of capital for a prolonged period, it suggests that

¹²⁹ For example, the size of a bank's investment portfolio that is assumed to be held-to-maturity and not marked to market would be limited to 80% of the size of its fully insured deposits. Another alternative would be to simply cap the hold-to-maturity portfolio to be a fixed share (say 25%) of the total investment securities portfolio, as is common in bank regulation in some other countries.

the regulatory measure is overstated.¹³⁰ To create a safety valve against such divergence persisting in the regulatory stress test, supervisors can compare stressed capital ratios of banks against market-data based measures of capital shortfall (for the set of stress-tested banks that are publicly traded). The idea would not be to weave in market-based measures into the stressed capital estimates but rather to use the divergence between regulatory and market-based stress measures to identify possible gaps and weaknesses in assumptions of the regulatory stress test.

For instance, NYU Stern's *SRISK*¹³¹ measure, which is publicly available, is calculated as:

$$SRISK = E_o [k(D_t + E_t) - E_t | Crisis] = k \cdot D_o - (1 - k) \cdot (1 - LRMES) \cdot E_o$$

where *Crisis* is taken to be an aggregate market stress scenario (e.g., a 40% correction to the S&P 500 or MSCI Global index over a six-month period from time 0 to t); D denotes all non-equity liabilities assumed to be constant between time 0 and t for simplicity; E denotes market equity of the bank (or financial institution); *LRMES* is the long-run marginal expected shortfall, i.e., the percentage loss in market value of equity of the bank in the crisis scenario, which is estimated using dynamic conditional beta econometrics; and k is a prudential capital ratio relative to which the capital shortfall *SRISK* is computed, e.g., 8%.

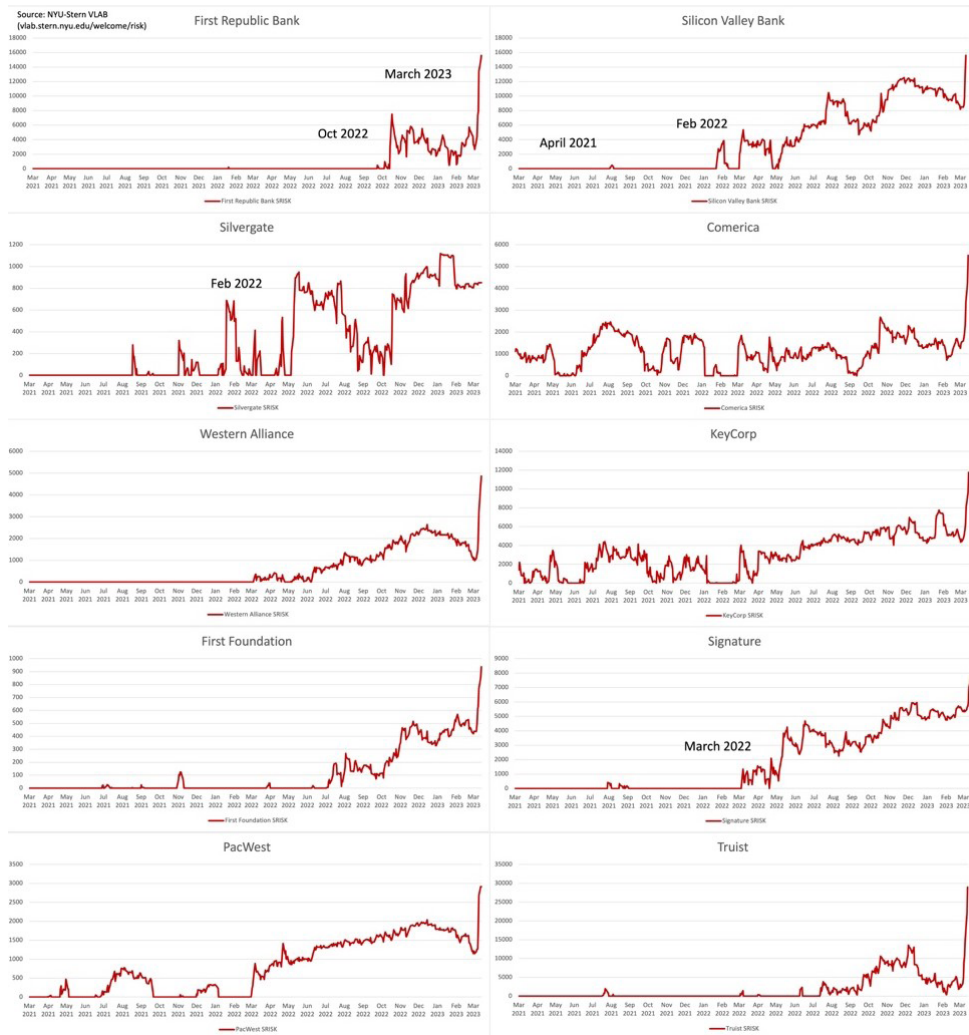
Figure 4a shows the *SRISK* for ten stressed or failed banks during 2023 (First Republic Bank, Silicon Valley Bank, Silvergate, Comerica, Western Alliance, KeyCorp, First Foundation, Signature Bank, PacWest, and Truist). These institutions typically relied on uninsured deposits to finance longer-maturity

130 A classic case in point here is the failure of Dexia Bank within months of being ranked among the best-capitalised banks in 2011 by the Eurozone regulators. Yet, Dexia ranked among the weakest banks on the basis of NYU Stern's *SRISK* measure or even simply by using its equity market-to-book ratio. For more details on the generality of this problem, see Acharya, Engle and Pierret (2014).

131 Acharya, Engle and Richardson (2012).

securities and loans. In some cases, their assets exposed them to the downturn of technology, crypto or CRE sectors. Benchmarking regulatory stress tests to such market-data based stress tests can thus create a point of supervisory validation and a basis for inquiry into divergences.

FIGURE 4A SRISK OF STRESSED OR FAILED US BANKS, JANUARY 2021-MARCH 2023



Source: NYU Stern V-Lab (vlab.stern.nyu.edu/welcome/risk).

Note also that it is straightforward to amend such market-based capital shortfall estimates to recognise the capital-liquidity nexus. For instance,

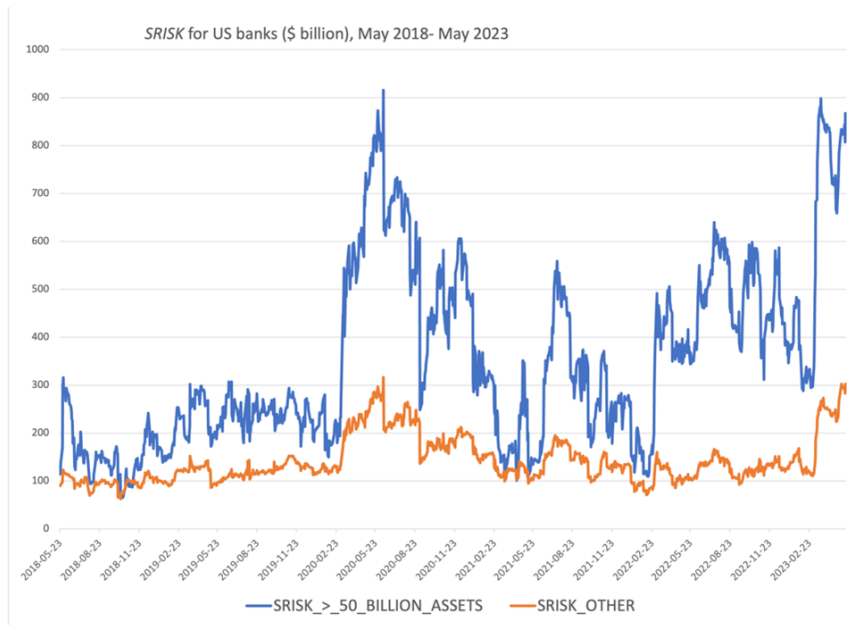
SRISK can be modified to $SRISK^{liq}$ by simply subtracting from non-equity liabilities the insured deposits component, rewarding banks that have stable deposit franchises, all else being equal:

$$SRISK^{liq} = k \cdot (D_o - D_o^{ins}) - (1 - k) \cdot (1 - LRMES) \cdot E_o$$

Similarly, as regulators assess how much additional capital would be adequate to raise for large and small banks, *SRISK* changes since the onset of the banking crisis in March 2023 can again provide useful information. For instance, Figure 4b shows that *SRISK* for US banks with assets greater than \$50 billion (as of the end of the first quarter of 2023) more than doubled from \$394 billion at the end of 2022 to \$867 billion as of May 18, 2023). For other banks and non-bank financial institutions, the percentage rise in *SRISK* was even larger (from \$124 billion to \$302 billion). Combining all banks, the rise of *SRISK* during this brief interval exceeded \$650 billion.

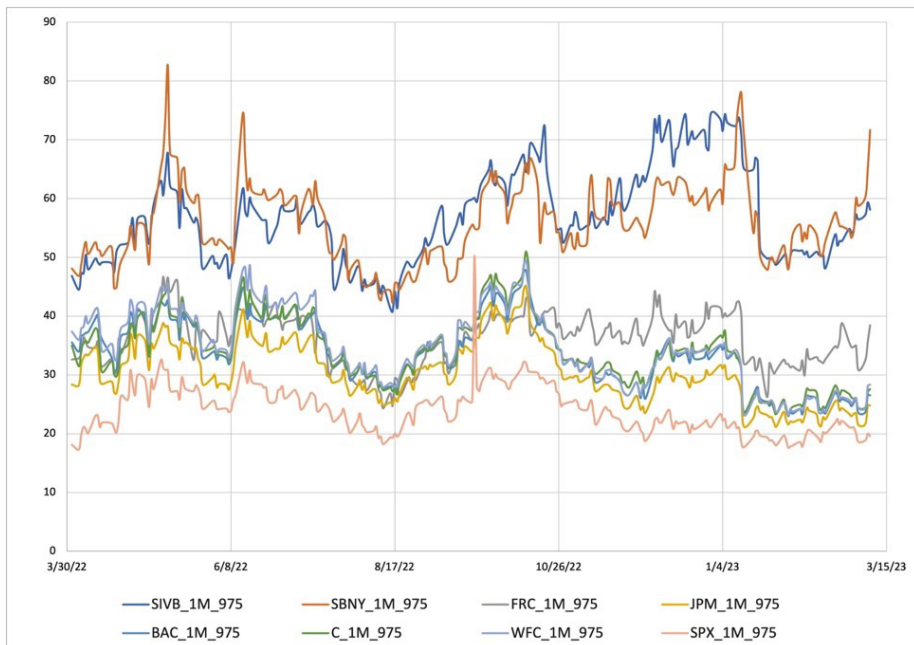
Other market-based alternatives might also come in handy. For instance, Figure 5 shows that near at-the-money implied volatilities from bank stock options revealed in advance of their failure the greater vulnerability of SVB, Signature Bank and First Republic Bank relative to the top four banks (JPMorgan Chase, Bank of America, Citigroup, and Wells Fargo). In particular, SVB's and Signature Bank's implied volatility is significantly higher than that of the other banks throughout April 2022 to March 2023, diverging especially since the fourth quarter of 2022, at which point First Republic Bank also seems to break out from the top four banks (which, in turn, are always trading at higher implied volatility than the S&P 500 index). In other words, options markets seem to have reflected early warning signals as to the location of risks in the banking sector.

FIGURE 4B SRISK OF US BANKS AND FINANCIAL INSTITUTIONS. (BILLIONS OF US DOLLARS), MAY 2018-MAY 2023



Source: NYU Stern V-Lab (vlab.stern.nyu.edu/welcome/risk).

FIGURE 5 IMPLIED VOLATILITY (ANNUALISED PERCENTAGE) OF FAILED US BANKS (SIVB, SBNY, FRC) RELATIVE TO TOP FOUR BANKS (JPM, BAC, C, WFC), APRIL 1, 2022-MARCH 23, 2023



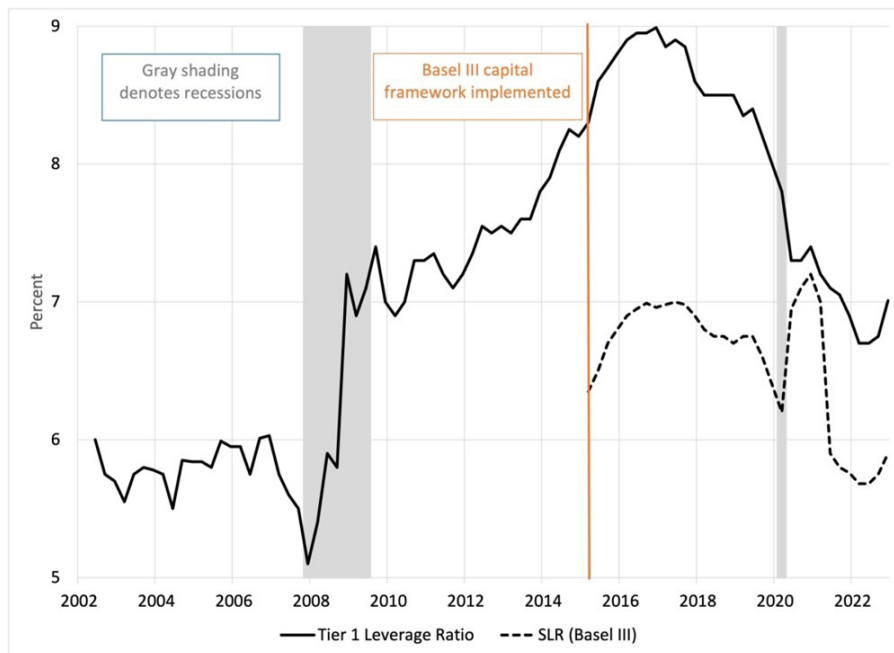
Source: Bloomberg. 1M_975 refers to implied volatility from one-month, near at-the-money (strike price / forward price = 0.975) put options on the bank stock. S&P 500 implied volatility is shown as a benchmark. The pattern is similar for implied volatility based on out-of-the-money put options (e.g., strike price / forward price = 0.8).

Finally, yet another simple market metric for benchmarking regulatory stress tests is the market-to-book ratio of bank equity.

Regulatory Actions Following from Stress Tests

The largest banks with high asset quality and diversified lines of business will likely fare well in a stagflation stress test along the lines proposed above, given that regulatory and supervisory standards were better applied to them. However, there might be some surprises as in the summer of 2009 given that some large banks also seem to have significantly invested in low-yielding mortgage-backed securities during the 2020-2021 period and given the general reduction in prudential capital standards for the G-SIBs since 2017 (see Figure 6).

FIGURE 6 REGULATORY CAPITAL RATIOS (PERCENT) FOR US BANKS, 2002-2022¹³²



Note: The brief increase of the SLR between March 2020 and June 2021 reflects a temporary change in the denominator. Source: Interpolation of Chart 1 from Pellerin (2022).

132 This is based on Chart 1 from Pellerin (2022).

How should banks that appear vulnerable in terms of stressed capital ratios be treated?

1. Banks that have invested more heavily in long-term bonds may be capital deficient and should be asked to raise public equity without further ado. The required absolute amount of capital to be raised should bring stressed capital ratios back to prudential standards. These banks should be incentivised to do so, within a pre-specified time period, following the stagflation stress test, by providing that Treasury would inject capital otherwise by diluting bank equity holders. Of course, Congress would need to authorise this in advance, as they did for the Troubled Assets Relief Program (TARP) in October 2008.
2. The most exposed banks might even look entirely decapitalised and may have to be sold to healthier banks that are willing to pay to “purchase-and-assume” their deposit and loan franchises. Some banks sales may require some backstop from the authorities (FDIC), as seen in bank resolutions of 2023 to date (see Chapter 5).
3. Small or mid-sized capital-deficient banks may not be able to access public markets and may have to be handled by the FDIC’s prompt corrective action (PCA) and/or orderly resolution authority (OLA) frameworks.

If done right, the capital-raising and asset-and-deposit reallocation measures would stabilise the system as well as the economy. As in 2009, government guarantees might not be utilised in the end, reducing the burden to the taxpayer.

Conclusion: Bank Capital - Mark It, Stress It and Where Needed, Raise It

In summary, bank capital is a form of private deposit insurance. If economywide risks from bank runs are not to be entirely socialised, then bank capital will have to play a substantial role in restoring confidence following the banking stress of 2023 when regulators seem to have embraced blanket guarantees of runnable liabilities at an early stage of the stress. Given the present juncture of above-target inflation and high policy rates, existing stress-test scenarios are asynchronous and therefore need to be modified to reflect the risk of a stagflation scenario – a recession amidst high inflation and rates. Marking capital honestly, stressing it plausibly, and raising it adequately, in a credible manner that builds upon and repeats the success of the 2009 asset quality review and stress test, appears to be a feasible regulatory plan of action. This would help to ensure that concerns about bank solvency do not resurface in the near future.

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7 EXPANDING MARK-TO-MARKET ACCOUNTING FOR BANKS' DEBT INVESTMENT SECURITIES AND REGULATORY CAPITAL

Sehwa Kim¹³³, Seil Kim¹³⁴, and Stephen G. Ryan

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For capital adequacy norms to work well, policymakers should undertake accounting reforms that ensure that mark-to-market losses flow into capital in a timely through-the-cycle manner. Accounting rules should not grant banks discretion that adds little to economic value and, worse, contributes to fragility.

We propose two related policy recommendations regarding banks' accounting for unrealised gains and losses on debt investment securities and the inclusion of these gains and losses in regulatory capital. Specifically, we propose that both the held-to-maturity (HTM) classification for debt investment securities and the regulatory accumulated other comprehensive income (AOCI) filter be eliminated. We present evidence that banks exercise accounting discretion over the classification of securities as HTM versus available for sale (AFS) to obtain preferred accounting and regulatory capital treatments, rather than this classification being driven by a distinct economic motivation.¹³⁵ We further find that the applicability of the AOCI filter affects banks' exercise of discretion. Lastly, we show that the AOCI filter induces banks to accept greater risk in their AFS securities. Collectively, our findings make a strong case for our proposed recommendations.

Introduction

Due to sharp increases in interest rates beginning in the second half of 2021, banks have experienced very large unrealised losses on fixed-rate debt investment securities (hereafter "securities") (Jiang et al. 2023b; McPhail,

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135 For example, one possible economic motivation for HTM classification is that the stickiness of banks' core deposits in most circumstances provides banks with the intent and ability to hold securities to maturity. None of our results suggest that this possibility, which relates to the deposit franchise theory evaluated elsewhere in this book, drives banks' classification choices.

Schnabl, and Tuckman 2023). As this occurred, many banks transferred AFS securities, which are recognised at fair value with unrealised gains and losses recorded in AOCI, a component of owners' equity, to HTM securities, which are recognised at amortised cost with no recognition of unrealised gains and losses (Granja 2023). Reflecting these events, the allowed classification of securities as HTM has yet again come into question for both the nonrecognition of unrealised losses and the unverifiability of firms' asserted intent and ability to hold securities to maturity (Peters 2023; Mahoney 2023).

Related concerns have been expressed about the regulatory AOCI filter, which removes AOCI, the largest and most variable component of which typically is cumulative unrealised gains and losses on AFS securities, from the calculation of banks' Tier 1 regulatory capital (Barr 2023).¹³⁶ The AOCI filter applied to all US banks from 1995 to 2013. Then, on January 1, 2014, under the initial US adoption of Basel III, the AOCI filter was phased out over five years for "advanced approaches" banks with assets above \$250 billion or foreign exposures above \$10 billion. As of December 31, 2019, under the Federal Reserve's 2019 tailoring rules implementing certain provisions of the Economic Growth, Regulatory Relief, and Consumer Protection Act of 2018 (EGRRCPA), the AOCI filter was reinstated for previously advanced approaches banks with assets between \$250 billion and \$700 billion and foreign exposures below \$75 billion if the banks chose to opt out of the inclusion of AOCI in regulatory capital. All five affected banks – American

136 Michael S. Barr, the Federal Reserve's Vice Chair for Supervision, in the cover letter to the Federal Reserve's April 2023 post-mortem review of Silicon Valley Bank, states "we should require a broader set of firms to take into account unrealized gains or losses on available-for-sale securities, so that a firm's capital requirements are better aligned with its financial positions and risk" (Barr 2023, p. 3).

Express, Capital One, Charles Schwab, PNC Financial, and US Bancorp did. We thus refer to these five banks as the “opt-out” banks.¹³⁷

The common feature of the classification of securities as HTM and the regulatory AOCI filter is the disregard for unrealised gains and losses on securities. Two reasons for this disregard are often invoked, both of which are largely spurious.

First, unrealised gains and losses are said to be meaningless if the holder has the ability and intent to hold securities to maturity, because the holder will receive the promised return. For adequately marketable securities, which banks’ securities generally are, this reason makes little, if any, economic sense. A bank or other firm that holds fixed-rate securities that, due to post-purchase interest rate changes, pay a below (or above) market return has lost (or won) regardless of whether the holder sells the securities immediately, receiving fair value, or holds them to maturity, receiving fair value.

Second, for banks, the interest rate risk of securities typically is economically hedged by deposits that have no contractual term but are sticky (or sleepy) due to depositor behaviour. Under Generally Accepted Accounting Principles (GAAP), deposits with no contractual term must be recognised at amortised cost.¹³⁸ Hence, the argument goes that the hedged item in this economic hedge – securities – should also be allowed to be recognised at amortised cost. While this argument holds water in sufficiently favourable circumstances, this economic hedge fails whenever, and to the extent that, deposits lose stickiness,

¹³⁷ Four of the opt-out banks were advanced approaches banks subject to the AOCI filter phaseout beginning on January 1, 2014: American Express, due to its foreign exposure, and Capital One, PNC, and US Bancorp, due to their size. Schwab became an advanced approaches bank subject to the AOCI filter phaseout in the second quarter of 2018 when its assets first exceeded \$250 billion. Under our definition, Truist is not an opt-out bank even though it is larger than three of the opt-out banks, because Truist was formed in the December 2019 merger between BB&T and SunTrust, and neither of these banks were at that time separately large enough to be advanced approaches banks. Truist would have been an advanced approaches bank without the tailoring rules.

¹³⁸ In particular, a bank cannot select the fair value option for deposits that are withdrawal upon demand (Accounting Standards Codification, i.e., ASC, 825-10-15-5).

such as occurred in the rapid deposit runs recently experienced at Silicon Valley Bank (SVB), Signature Bank, and First Republic Bank. These deposit runs were motivated largely by the banks' unrealised losses on securities. A hedge that fails when the hedged item experiences sufficiently large losses is a bad hedge – in banking parlance, a “wrong-way exposure” – and thus it is a poor reason to allow suboptimal accounting for the hedged item, in this case to recognise HTM securities at amortised cost. It is a similarly bad rationale for the regulatory AOCI filter.

In this chapter, which draws heavily on Kim, Kim, and Ryan (2019, 2023), we provide evidence that banks classify securities as HTM rather than as AFS when HTM classification provides them with preferred financial accounting and regulatory capital treatments, not because they have a distinct economically motivated intent and ability to hold the securities to maturity. While Kim et al. (2019, 2023) show that this evidence holds generally across banks, for concreteness we focus on the five opt-out banks for which the regulatory AOCI filter was reinstated under the tailoring rules. Four of these banks first transferred securities to HTM around the AOCI filter phaseout to reduce regulatory capital volatility and then transferred substantially all their HTM securities to AFS when the filter was reinstated. Moreover, three of the banks transferred significant amounts of AFS securities back to HTM to insulate their owners' equity and tangible common equity from future unrealised losses as interest rates increased beginning in late 2021. Like many other banks, the opt-out banks may have been concerned that their tangible common equity – a non-GAAP measure that excludes most intangible assets but includes AOCI – would become negative as interest rates increased, because a Federal Housing Finance Agency rule restricts the Federal Home Loan Banks from extending new advances or renewing existing advances to a bank with negative tangible equity unless the bank's primary

regulator provides a waiver (Berry, 2022; American Bankers Association and Independent Community Bankers of America, 2022).¹³⁹ To summarise, the opt-out banks effectively first indicated they had the intent and ability to hold securities to maturity, then that they did not have this intent or ability, and finally that they had this intent and ability again!

In contrast to the security reclassifications by the opt-out banks, Kim et al. (2019, 2023) find that advanced approaches banks for which the AOCI filter was phased out in 2014 but not reinstated continued to increase HTM securities through 2022, and that banks for which the AOCI filter was never removed changed their HTM securities modestly and gradually until 2022, when they also reclassified significant amounts of securities to HTM. Collectively, this evidence undercuts banks' asserted intent and ability to hold securities to maturity as a rationale for amortised cost accounting for HTM securities. We thus propose that the HTM classification and associated amortised cost accounting for securities be eliminated.

Consistent with Acharya and Ryan's (2016) position that accounting requirements or discretion that suppresses or misstates unrealised gains and losses could facilitate excess risk-taking by banks, we show that the AOCI filter encourages risk-taking by banks. Again, focusing on the opt-out banks, we show that these banks reduce the weighted-average maturity of AFS securities as the AOCI filter is phased out beginning in 2014, but then increase the weighted-average maturity of AFS securities when the AOCI filter is reinstated under the tailoring rules. Again in contrast to behaviour by the opt-out banks, Kim et al. (2019, 2023) show that advanced approaches banks for which the AOCI filter was phased out and not reinstated reduced

¹³⁹ This rule is codified in 12 CFR 1266.4 (b)(1): "A [Federal Home Loan] Bank shall not make a new advance to a member without positive tangible capital unless the member's appropriate federal banking agency or insurer requests in writing that the Bank make such advance. The Bank shall promptly provide the FHFA with a copy of any such request."

securities risk from the phaseout through 2022 in isolation and relative to non-advanced approaches banks for which the AOCI filter always remained in place.

Collectively, this evidence helps explain the behaviour of the three large, but not advanced approaches, regional banks that recently failed. With their regulatory, but not economic, capital protected by the AOCI filter, these banks did very little to reduce or hedge the interest rate risks of their AFS securities as interest rates began to rise in the second half of 2021. For example, Silicon Valley Bank almost completely eliminated its limited hedges of the interest rate risk of its AFS securities as interest rates rose during 2022.¹⁴⁰ Based on this evidence, we further propose that the AOCI filter be eliminated to induce banks to properly manage the risk of their AFS securities.

Background

Increases in Interest Rates Beginning in the Second Half of 2021

The Federal Reserve's Federal Open Market Committee raised the target federal funds rate by five percentage points in ten increments from 0% to 0.25% on March 16, 2022 to 5% to 5.25% on May 3, 2023. Market expectations about the target federal funds rate influence interest rates throughout the economy. The medium-to-long maturity interest rates that most affect the value of banks' assets began rising at various points in the second half of 2021.¹⁴¹ As relevant market interest rates rose, the values of fixed-rate financial assets fell substantially. To illustrate, for a fixed-rate asset with a duration of five years and no interest rate optionality, the 3.8 percentage point increase in the five-year Treasury bond yield from 0.65% in August 2021 to

140 SVB Financial Group's 2022 Form 10-K filing (p. 145) reports that it engaged in fair value hedges of AFS securities with amortised cost basis of \$15.3 billion at the end of 2021 and only \$563 million at the end of 2022.

141 Interest rates for US Treasuries of longer maturities typically began to increase further before the first increase in the target federal funds rate in March 2022. For example, three-month US Treasuries started to rise in early January 2022, while five-year US Treasuries started to rise no later than August 2021.

4.45% in October 2022 yields a decrease in the value of the asset of almost 19%.

Accounting for Securities

The accounting guidance for debt investment securities stems primarily from FAS 115, a 1993 standard written in the wake of the thrift (or Savings and Loan “S&L”) crisis of the 1980s (see Chapter 2). The political environment that led to FAS 115 provides context for the accounting issues arising from the current turmoil in the banking industry. The thrift crisis was primarily attributable to thrifts’ holdings of long-duration fixed-rate assets financed by demand and savings deposits with no contractual duration. These assets experienced large economic losses as interest rates rose sharply during the 1970s, peaked in 1981, and remained persistently high through the remainder of the 1980s. Due to the use of amortised cost accounting, these large losses initially were unrealised and thus not recognised by thrifts. Over the long lives of the assets, however, the losses were gradually realised and thus recognised. As this occurred, numerous thrifts invested in risky assets in gambles for resurrection, worsening the crisis (White 1991).

Motivated by this history, during 1990, the Securities and Exchange Commission’s (SEC) Chair (Richard Breeden) and top accounting personnel (Edmund Coulson and Robert Bayless) publicly argued that market value accounting should be required for marketable securities. For example, in a September 14, 1990, speech, Breeden quotes a letter written by Coulson and Bayless to the AICPA stating “[w]e are familiar with the argument that market-based valuation will introduce additional volatility to reported earnings of banks and thrifts, but we find that argument unpersuasive. Any volatility is a product of the behavior of a financial institution’s investment portfolio. Accounting standards ought not conceal the reality they are

established to portray. Certainly, financial statements should not ignore the reliable valuation furnished by liquid markets” (Breedon 1990, p. 8).

The banking and insurance industries and their regulators pushed back against the SEC’s position. For example, in a November 1, 1990, letter to Breedon, Alan Greenspan, the Federal Reserve chair, wrote “[t]he adoption of market value accounting for a portion of the bank balance sheet...could result in volatility in reported earnings and capital that is not indicative of the bank’s true financial condition...Moreover, these reported measures would fail to reflect certain positions that institutions may have taken to minimize interest rate sensitivity, such as funding arrangements that match the maturities and repricing frequency of the investment securities portfolio” (Johnson and Swieringa 1996, p. 159). FAS 115 essentially is a political compromise that reflects aspects of the divergent preferences of the SEC versus the banking and insurance industries and their regulators (Johnson and Swieringa 1996, pp. 166-172).

As of 2009, FAS 115 and its amendments are codified in Accounting Standards Codification (ASC) 320, which allows distinct accounting treatments for securities based primarily on the holder’s asserted intent regarding the securities. Consistent with the expressed preferences of the banking and insurance industries and their regulators, securities for which the holder asserts the intent and ability to hold to maturity are classified as HTM and recognised at amortised cost. Partly consistent with the expressed preferences of the SEC, securities for which the holder asserts no intent are classified as AFS and recognised at fair value on the balance sheet, but with realised gains and losses recorded in net income and unrealised gains and losses recorded in AOCI.

Because credit losses typically are recognised to a significant extent (e.g., under impairment rules or now for HTM securities under the current expected loss accounting model), generally unrealised gains and losses on HTM and AFS securities primarily reflect the effects of interest rate movements on the value of fixed-rate securities.

The AOCI Filter, Phaseout for Advanced Approaches Banks, and Reinstatement for Opt-out Banks

FAS 115's main accounting innovation was to require AFS securities to be recognised at fair value, with cumulative gains and losses recorded in AOCI. Prior to the imposition of the AOCI filter in January 1995, AOCI was included in banks' Tier 1 regulatory capital. Hence, to avoid volatility in regulatory capital, upon their adoption of FAS 115, many banks classified sizeable portions of their securities as HTM, thereby maintaining the prior amortised cost accounting.¹⁴²

This classification choice quickly turned out to be a poor one for banks, because, much like the recent interest rate increases described above, from early 1994 to early 1995, interest rates rose sharply, yielding large unrealised losses on banks' HTM securities subject to restrictions on sale and transfer. To mitigate this problem, bank regulators implemented the AOCI filter in January 1995, reducing banks' incentive to classify securities as HTM.¹⁴³ Similarly, in November 1995, the Financial Accounting Standards Board (FASB) provided a moratorium enabling firms to sell or transfer their HTM securities without tainting their HTM portfolios. Many banks used this moratorium to substantially reduce their classification of securities as HTM.

142 Hodder, Kohlbeck, and McAnally (2002) report that the median bank holding company in their sample classified 51% of its securities as AFS upon the adoption of FAS 115. As the median bank holding company does not hold any trading securities, that bank classified 49% of its securities as HTM.

143 Hodder et al. (2002) report that the median bank in their sample raised the proportion of securities classified as AFS from 51% prior to the moratorium to 85% afterwards.

The implementation of the AOCI filter and the moratorium on transfers out of HTM are examples of how regulatory and financial accounting rules are often rewritten when necessary or convenient for the industries involved. These rule changes can later cause problems of the sort that our proposals address. (Of course, our proposals, if adopted, could be subject to the same sort of time inconsistency in accounting rules.)

The AOCI filter applied to all banks until December 31, 2013. Under the initial US implementation of Basel III, the AOCI filter was phased out for advanced approaches banks over five years beginning on January 1, 2014. Under the tailoring rules, the AOCI filter was reinstated for the five opt-out banks effective December 31, 2019.

Transfers of Securities from HTM to AFS, in General and in Response to the Tailoring Rules

Except in allowed circumstances, firms cannot sell HTM securities or transfer the securities to other categories without tainting their HTM portfolios. When a firm's HTM portfolio is tainted, ASC 320-10-35-9 requires that the firm transfer the entire HTM portfolio to AFS. The firm generally cannot classify any securities as HTM for two years.¹⁴⁴

Two sets of guidance in ASC 320 specify when firms may sell HTM securities or transfer them to another category without tainting their HTM portfolios. First, ASC 320-10-25-6 allows firms to transfer securities out of HTM in six

¹⁴⁴ The two-year tainting period reflects SEC guidance from the previously described period of increasing interest rates in 1994 and 1995 when banks found themselves holding too many HTM securities, specifically, a January 10, 1995, speech by Tracey C. Barber of the SEC staff at the 22nd Annual National Conference on Current SEC Developments that is not available online, as well as subsequent accounting practice. The idea behind the tainting period is the firm needs to develop policies and procedures that reestablish the credibility of its assertions regarding the intent and ability to hold securities.

specified circumstances.¹⁴⁵ These circumstances clearly do not apply to the three opt-out banks' transfers of securities from HTM to AFS for which they invoke the tailoring rules. Moreover, ASC 320-10-25-7 states that it is not appropriate for firms to analogise to these six circumstances.

Second, ASC 320-10-25-10 allows firms to transfer securities out of HTM without taint upon the occurrence of an event that meets four conditions: the event is *“isolated...nonrecurring ...unusual for the reporting entity...[and] could not be reasonably anticipated.”* ASC 320-10-25-11 states that *“Other than extremely remote disaster scenarios (such as a run on a bank or an insurance entity), very few events would meet all four of these conditions.”*

Three opt-out banks invoked the tailoring rules to transfer \$212 billion of securities out of HTM at the end of 2019 or early 2020. As ASC 320-10-25-6 clearly does not apply, they must have done so based on ASC 320-10-25-10. In our view, changes in regulatory capital definitions such as the tailoring rules – which do not directly affect banks' economic capital, occur with considerable frequency, and are subject to regularly changing political influences¹⁴⁶ – do not meet any of the four conditions, not to mention all four of them. These changes most certainly do not constitute anything approaching an “extremely remote disaster scenario.” None of the three opt-out banks indicated that their HTM portfolios were tainted by these transfers, a conclusion that, in our view, would have prevented the banks from transferring securities back to HTM once interest rates started rising in the second half of 2021 due to the two-year tainting period discussed previously. Regardless of whether our view

¹⁴⁵ These circumstances are (1) a significant deterioration in the creditworthiness of the issuer of the security; (2) a change in tax law that eliminates or reduces the tax-exempt status of the security; (3) a major business combination or disposition that requires the firm to rebalance its securities portfolio to maintain the desired interest rate or credit risk exposure; (4) a significant regulatory change regarding the type or magnitude of permissible investments; (5) a significant increase in capital requirements that requires the firm to downsize; and (6) a significant change in regulatory risk weights for securities.

¹⁴⁶ For example, the Trump-era EGRRCPA unwound provisions of the prior Obama-era Dodd Frank Act and regulations implementing that Act. Such politically motivated changes in regulatory accounting requirements are an example of time-inconsistency in bank regulation discussed elsewhere in this book.

is correct, the banks' transfer of securities first into HTM, then out of HTM, then back into HTM illustrates that their intent to hold securities to maturity is both fluid and primarily motivated by their preferred financial accounting and regulatory capital treatments, rather than by a distinct economically motivated intent and ability to hold the securities to maturity.

In addition, the FASB periodically writes standards that affect the accounting for HTM securities in some way. When this occurs, the FASB often provides firms with one-time options to transfer securities out of HTM without tainting their HTM portfolios. The FASB issued three Accounting Standards Updates (ASUs) with effective dates close to the effective date of the tailoring rules that provided such options. ASUs 2017-12 and 2019-04, which allow hedge accounting for last-of-layer hedges of portfolios of prepayable assets, allowed any firm to transfer securities that are eligible to be the hedged item in a last-of-layer hedge out of HTM without taint upon the adoption of the ASUs, even if the firm had no intention to engage in such a hedge.¹⁴⁷ ASU 2020-04, which provides accounting expedients and exceptions regarding the replacement of LIBOR with other reference rates, provided banks with a one-time option to transfer securities that referenced rates affected by reference rate reform and were classified as HTM before January 1, 2020, out of HTM at any time from the first quarter of 2020 to the end of 2022. Three of the four opt-out banks invoked one or more of these ASUs as the basis for transfers of \$34 billion of securities out of HTM.

¹⁴⁷ For regular adopters with December 31 fiscal year ends, the effective date of ASU 2017-12 is January 1, 2019, and the effective date of ASU 2019-04 is January 1, 2020. A firm could transfer securities out of HTM upon the adoption of ASU 2019-04 only if it had not previously made such a transfer upon the adoption of ASU 2017-04.

The Opt-Out Banks' Transfers of Securities In and Out of HTM

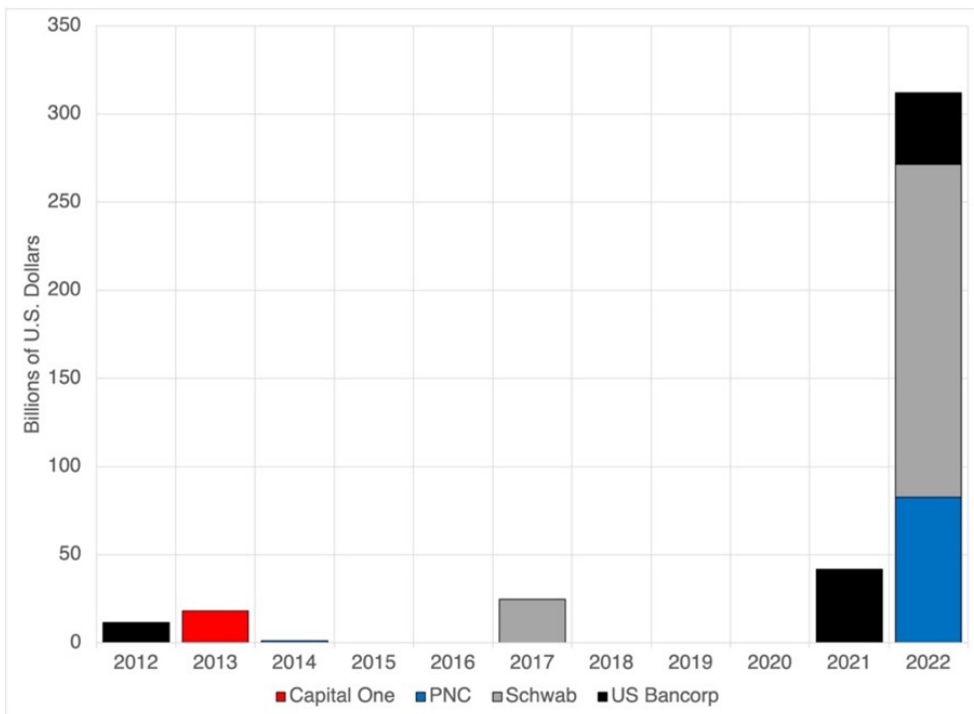
In this section, we describe the timing and amounts of opt-out banks' transfers of securities between AFS and HTM from 2012 to 2022. This period covers the initial phase out of the AOCI filter for advanced approaches banks beginning in 2014, the reinstatement of the AOCI filter for the opt-out banks at the end of 2019, and the increase in interest rates beginning in the second half of 2021.

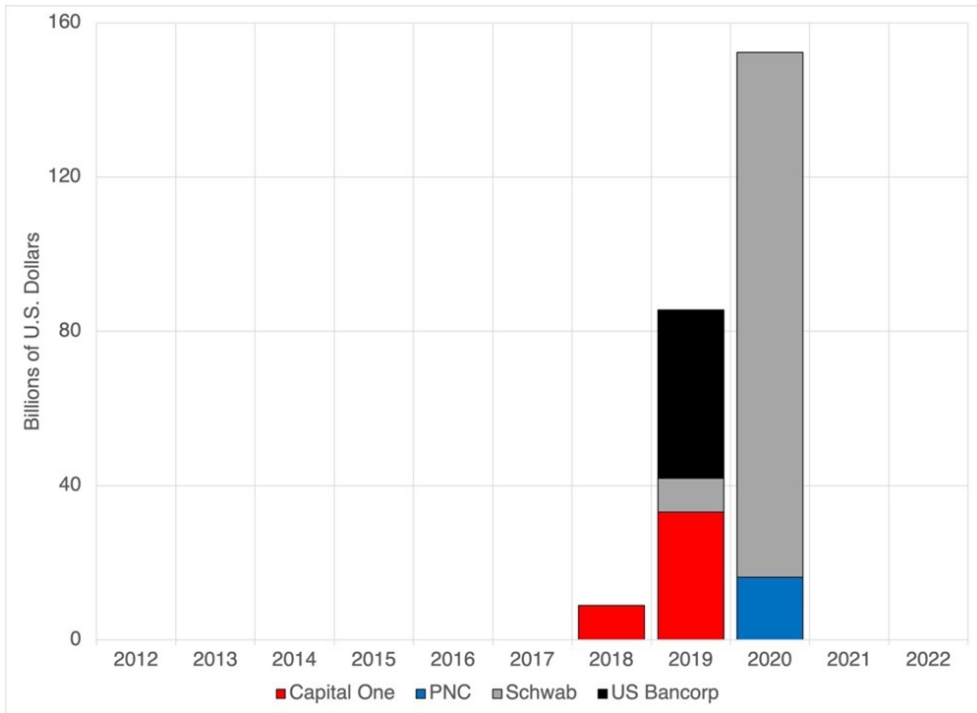
As discussed in more detail below, the opt-out banks solely transferred securities from AFS to HTM prior to the tailoring rules, consistent with the behaviour of advanced approaches banks after the AOCI filter phaseout. At the end of 2019 and early in 2020, around the effective date of the tailoring rules, the opt-out banks transferred substantially all their HTM securities to AFS. As interest rates rose late in 2021 and throughout 2022, opt-out banks transferred substantial amounts of securities from AFS to HTM.

Figure 1 depicts the two types of security transfers by opt-out banks, distinguishing the four opt-out banks that engaged in such transfers. Two of these banks made the predicted transfers around each of the phase-out of the AOCI filter, tailoring rules, and increase in interest rates. US Bancorp transferred securities from AFS to HTM in 2012 in advance of the phase-out of the AOCI filter, then transferred securities from HTM to AFS in 2019 around the tailoring rules, and finally transferred securities from AFS to HTM in 2021 and 2022 as interest rates rose. Schwab transferred securities from AFS to HTM in 2017 in advance of becoming an advanced approaches bank, then classified securities from HTM to AFS in 2019 and 2020 around the tailoring rules, and finally transferred securities from AFS to HTM in 2022 as interest rates rose. The other two opt-out banks made the predicted transfers only at two of these times. Capital One transferred securities from

AFS to HTM in 2013 in advance of the phase-out of the AOCI filter and then classified securities from HTM to AFS in 2018 around its adoption of ASU 2017-12 and again in 2019 around the tailoring rules, but it did not transfer securities from AFS to HTM in 2021 and 2022 as interest rates rose. PNC transferred securities from HTM to AFS in 2019 around the tailoring rules, and it transferred securities from AFS to HTM in 2021 and 2022 as interest rates rose, but it did not transfer securities from AFS to HTM around the AOCI filter phase-out.

FIGURE 1 TRANSFERS OF INVESTMENT SECURITIES BETWEEN AFS AND HTM CLASSIFICATIONS BY INDIVIDUAL OPT-OUT BANKS (BILLIONS OF US DOLLARS), 2012-2022





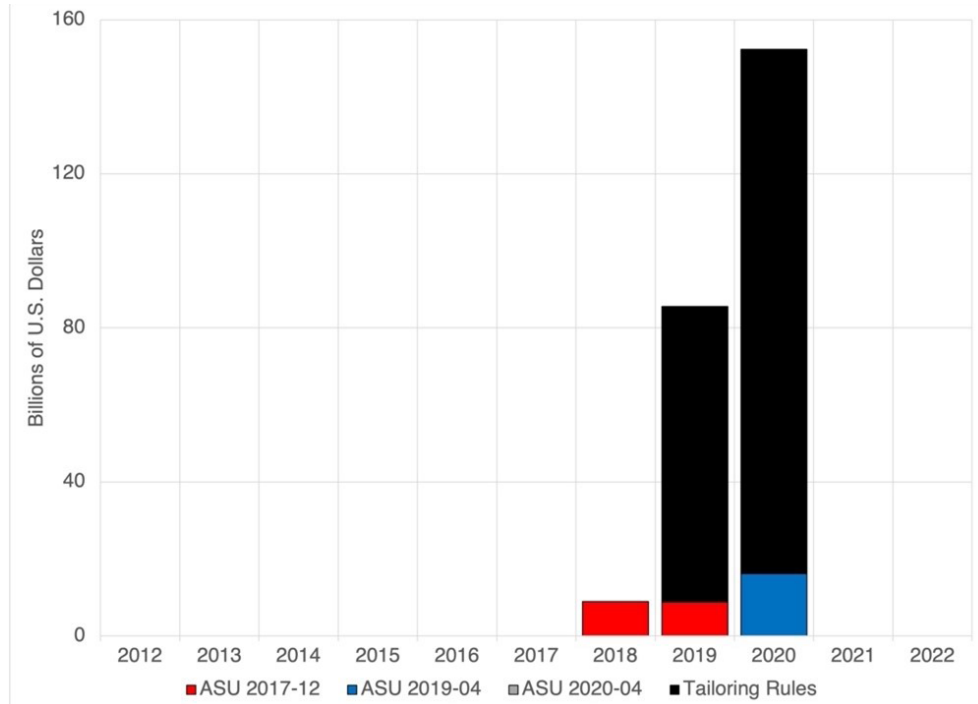
Source: Kim, Kim, Ryan (2023, Figure 3).

Figure 2 breaks out the transfers of securities from HTM to AFS by opt-out banks from 2018 to 2020 depicted in Figure 1, distinguishing the rationales for these transfers provided by each of the four opt-out banks that engaged in such transfers. The tailoring rules are the predominant rationale in total across the three years. In addition, Capital One invoked ASU 2017-12 in 2018, Schwab invoked ASU 2017-12 in 2019, and PNC invoked both ASU 2019-04 and ASU 2020-04 in 2020.

Kim et al. (2019, 2023) show that the advanced approaches and non-advanced approaches banks make equally predictable transfers of securities from 2012 to 2022. Reflecting the full phase out of the AOCI filter by the end of 2018, the advanced approaches banks consistently reclassify securities from AFS to HTM, ending up with 57 percent of their securities classified as HTM in 2022. In contrast, the non-advanced approaches banks change the proportions

of their AFS and HTM securities modestly and gradually from 2012 until interest rates begin rising in the second half of 2021, after which they transfer AFS securities to HTM.

FIGURE 2 TRANSFERS OF INVESTMENT SECURITIES FROM HTM TO AFS CLASSIFICATIONS BY OPT-OUT BANKS DISTINGUISHING BASES FOR TRANSFERS (BILLIONS OF US DOLLARS),¹⁴⁸ 2012-2022



Source: Kim, Kim, Ryan (2023, Figure 4).

From this evidence, we conclude that banks' classification of securities as HTM rather than AFS is fluid and primarily reflects their desire to obtain preferred financial and regulatory accounting treatments, rather than a distinct economically motivated intent and ability to hold the securities to maturity. In other words, banks' asserted intents change when financial

¹⁴⁸ The opt-out banks transferred securities from HTM to AFS only from 2018 to 2020. While not visible in Figure 2 due to the small amount involved, in 2020, PNC Financial transferred \$49 million of securities from HTM to AFS without tainting its HTM portfolio as allowed by ASU 2020-04 (Reference Rate Reform).

and regulatory accounting treatments change. For this reason, ASC 320's classification of securities based primarily on the asserted intent of the holder, with distinct accounting for different classifications, is based on a foundation of sand. In our view, the political compromise that led to FAS 115 and ASC 320 should be renegotiated in favour of recognising all securities at fair value, eliminating the category of held to maturity. Ideally, unrealised gains and losses would also be included in net income rather than in AOCI, but that is a separate issue that is conceptually related to the undesirability of the AOCI filter, which we discuss next.

The AOCI Filter and Banks' Risk

Kim et al. (2019) show that advanced approaches banks reduce the risk of both AFS and HTM securities around the AOCI filter phaseout beginning in 2014. We expect the opt-out banks to behave similarly to advanced approaches banks prior to the tailoring rules, but then to increase the risk of their AFS securities around the reinstatement of the AOCI filter. Unlike Kim et al. (2019), we do not examine the risk of HTM securities because only one of the opt-out banks holds any HTM securities during the tailoring rule period after the second quarter of 2020, and this bank (PNC) holds only a small amount of these securities. Hence, the level and change in the risk of opt-out banks' HTM securities during the tailoring rule period cannot be reliably interpreted.

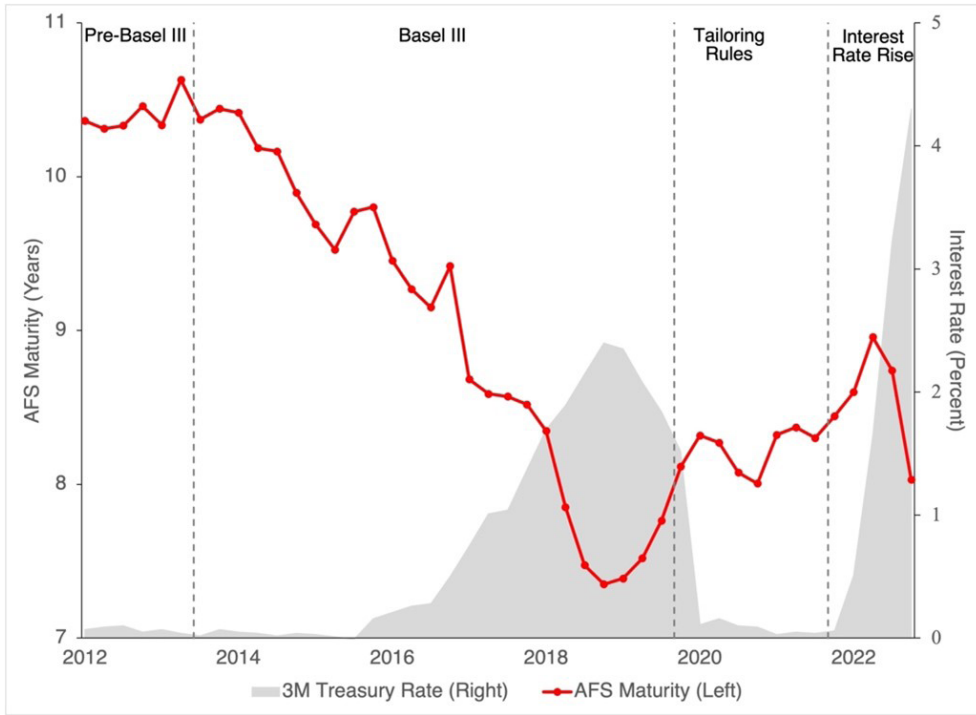
We calculate the weighted-average maturity of AFS securities, a measure of the securities' interest risk, using data from banks' Form 10-Q and 10-K filings, because this data is less aggregated than that in regulatory filings. ASC 320 requires quarterly disclosure of the amounts of each of AFS and HTM securities maturing in four bins: 1 year or less, 1-5 years, 5-10 years, and over 10 years. We use XBRL to collect the separate amounts of AFS and HTM

securities in these bins, and fill in missing data with hand collection from the filings.

Figure 3 depicts the weighted-average maturity of AFS securities for the opt-out banks from 2012 to 2022. The weighted-average maturity of these securities is quite flat at approximately 10.3 years until the second quarter of 2014, shortly after the beginning of the phaseout of the AOCI filter. At that point, the weighted-average maturity drops steadily to approximately 7.4 years in the fourth quarter of 2018, consistent with the removal of the AOCI filter increasing opt-out banks' incentive to reduce the interest rate risk of AFS securities. The weighted-average maturity then rises steadily to approximately 9 years in the second quarter of 2022, consistent with the reinstatement of the AOCI filter for opt-out banks under the tailoring rules, reversing the banks' prior incentive to reduce the risk of AFS securities. In contrast to behaviour by the opt-out banks, Kim et al. (2023) show that the weighted-average maturity of advanced approaches banks' AFS securities falls sharply from 2016 to 2022. The weighted-average maturity of opt-out banks' AFS securities then drops in the final two quarters of the sample period to approximately 8 years, as these banks reduce the maturity of AFS securities as interest rates rise.

Collectively, these results are consistent with the phaseout of the AOCI filter leading advanced approaches banks (including the opt-out banks prior to the tailoring rules) to reduce the interest rate risk of their AFS securities, and with the reinstatement of the AOCI filter for the opt-out banks under the tailoring rules reversing this effect. The results thus support recent calls to eliminate or restrict the applicability of the AOCI filter to incentivise banks to manage the risk of their AFS securities properly (Barr 2023).

FIGURE 3 WEIGHTED-AVERAGE MATURITY OR TIME TO FIRST REPRICING OF AFS SECURITIES FOR OPT-OUT BANKS, 2012-2022



Source: Kim, Kim, Ryan (2023, Figure SM.2).

Conclusion

We provide evidence that banks classify securities as HTM rather than as AFS when HTM classification provides them with preferred financial accounting and regulatory capital treatments, not because they have a distinct economically motivated intent and ability to hold the securities to maturity. We focus on five banks for which the regulatory AOCI filter was phased out from 2014 to 2018 under the initial US implementation of Basel III and then reinstated at the end of 2019 under the Federal Reserve’s “tailoring rules.” Four of these banks first transferred securities to HTM around the AOCI filter phaseout to reduce regulatory capital volatility and then transferred substantially all their HTM securities to AFS when the filter was reinstated. Moreover, three of the banks transferred significant amounts of AFS securities

back to HTM to insulate their owners' equity from future unrealised losses as interest rates increased beginning in late 2021. That is, these banks effectively first indicated they had the intent and ability to hold securities to maturity, then that they did not have this intent or ability, and finally that they had this intent and ability again. We further find that banks for which the AOCI filter was reinstated increased the risk of their AFS securities. Our findings provide strong support for our proposals to eliminate the HTM category, the associated amortised cost accounting for securities, and the AOCI filter.

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8 REVISITING THE DESIGN OF DEPOSIT INSURANCE

Policymakers should reform deposit insurance to make resolutions less costly and to reduce the incentives for bank depositors to run. One option would be to expand coverage for critical business transaction accounts, while eliminating the existing regulatory arbitrage that permits coverage far in excess of per-account limits.

Stephen G. Cecchetti, Thomas Philippon, Kermit L. Schoenholtz, and Lawrence J. White

Introduction

In this chapter, we discuss four proposals to reform US deposit insurance (DI). Three of the proposals correspond closely to the reform options recently identified by the Federal Deposit Insurance Corporation (FDIC).¹⁴⁹ The fourth – the “Pawnbroker for all Seasons” (PFAS) –) is a more radical change that would function as a wholesale replacement for DI.¹⁵⁰

The history of banking is punctuated by episodes of runs that disrupt banking services. In the presence of imperfectly informed depositors, a run on a single bank can quickly become a widespread panic that undermines both financial activity and the economy that depends on it. Just as a carbon tax aims to address the consequences of pollution, economic analysis seeks remedies to limit the potential spillovers (the negative externality) from bank fragility. Put simply, the goal is to make banking services and the firms that provide them both safe and efficient.

DI is one traditional remedy to address banking runs and panics. If DI is both credible and unlimited (100% coverage for all deposits), depositors would be fully protected and have little incentive to run even if their bank were insolvent. Other conventional remedies include regulation and supervision

149 Federal Deposit Insurance Corporation (2023a).

150 King (2016), where NYU Stern Professor and former Bank of England Governor Mervyn King proposed the PFAS.

(which aim to ensure that banks manage their risks prudently and have buffers to absorb losses) and a lender of last resort (LOLR, which provides credit against good collateral to support *solvent* banks that face temporary *illiquidity* of their assets).

No remedy for bank fragility is without costs. In the case of DI, increasing coverage diminishes the incentive of depositors to monitor their banks' activities and well-being. As monitoring wanes, banks have an incentive to take greater risk, a form of moral hazard. When DI is funded by banks and the government, it compels them to bear the risks that (other) banks take (if deposit insurance premiums are not properly risk-based on an *ex ante* basis or other prudential regulatory measures are inadequate). In other words, risky bank behaviour places a potential burden on other, safer banks and on taxpayers.

To address this moral hazard and to limit the potential fiscal burden, virtually all economies that provide DI limit its scale, typically by capping the value of deposits that are insured.¹⁵¹ In practice, however, the high fixed costs of monitoring banks means that only a very small fraction of depositors (with the largest deposits) can do so efficiently. From that perspective, protecting *most* depositors – as distinct from most deposits by value – in a way that limits their incentives to run need not aggravate moral hazard severely.

In the United States, the current deposit account cap of \$250,000 (per depositor, bank and ownership category) appears to be the highest among advanced economies.¹⁵² In practice, this cap is sufficient to cover 99% of accounts, ensuring the safety of most depositors even if many banks

¹⁵¹ To compare deposit insurance across countries, see the World Bank Deposit Insurance Dataset.

¹⁵² The most recent World Bank data is for 2013. At that time, Norway's cap exceeded \$300,000 in dollar terms. However, at current exchange rates, it is less than \$200,000 per depositor per bank (see here). Following the 2007-2009 crisis, Australia temporarily raised its DI limit to A\$1 million, but subsequently lowered it to A\$250,000.

experience material financial distress.¹⁵³ Moreover, deposit brokers – who distribute deposits across banks for a fee – make it easy even for multi-million dollar depositors to obtain protection in excess of the per-bank cap.¹⁵⁴

In practice, policymakers also often opt to backstop all deposits even in the absence of a legal obligation. Indeed, the FDIC's [most frequently used tool for bank resolution](#) – the purchase and assumption (P&A) method – typically makes all depositors whole.¹⁵⁵ In crises, the authorities can go even further. In 2008, the FDIC guaranteed all fixed liabilities of US banks. In March 2023, the FDIC protected all the deposits of Silicon Valley Bank (SVB) and Signature Bank *prior* to finding a buyer for these banks. If, in a crisis, the authorities have an option to provide coverage beyond what is explicitly insured, their inability to commit credibly *not* to do so encourages lax monitoring by those with *implicit* protection and consequent risky behaviour by their banks.

The FDIC finances its insurance commitment in two ways. First, to maintain the Deposit Insurance Fund (DIF), the FDIC imposes fees on depository institutions based on the scale of their assets, minus the portion that is funded by equity. In effect, the DIF mutualises the run risk of insured deposits across banks, while the insurance premia that fund it are insufficiently risk sensitive to limit the subsidy from healthier banks to riskier ones. The most obvious evidence for a subsidy is that surviving banks are called on to replenish the DIF after the losses of failed banks deplete it. Second, the FDIC enjoys a federal government backstop that makes its insurance commitment credible even when many banks simultaneously face failure.

153 FDIC (2023b). Even in the case of one depositor at one bank, there are several ownership categories (e.g., single account, retirement account, trust account, employee benefit plan account, and corporation or partnership account) that each provide up to \$250,000 in coverage. As a result, for a *household* that has deposits in multiple names at more than one bank, the effective DI cap may exceed \$250,000 by 10 or even 100 times..

154 For example [IntraFi](#).

155 The FDIC used the P&A approach in its May 1, 2023, resolution of First Republic Bank, the second-largest bank failure in US history. Since 2000, [FDIC data](#) on bank failures and assistance indicate that more than 85% of resolutions employed the P&A approach.

Despite the comparatively high level of the US insurance cap, on average in 2022, nearly 45% of the dollar value of domestic deposits was uninsured and runnable. While concentrated in less than 1% of accounts, this uninsured proportion was the highest since the 1960s, and well above the 20%-30% range that prevailed for most of the 1980-2000 period.¹⁵⁶

Not surprisingly, uninsured deposits were a key ingredient in the US bank turmoil that began in March 2023. Like other runnable liabilities, they risk creating contagion across the financial system.¹⁵⁷ At the end of 2022, they also constituted the largest component – \$7.5 trillion – of the \$19.6 trillion total runnable liabilities in the US financial system. The 2023 turmoil also highlighted the special vulnerability to bank runs of small and medium-sized enterprises (SMEs) that rely on uninsured bank deposits to meet their payroll and other high-frequency operational needs. In light of these features of the regional bank panic of March 2023, there is a clear need to consider whether and how to reform bank deposit insurance.

At the same time, the role of deposit insurance cannot be analysed in isolation from other measures to stem bank runs or broader efforts to make the financial system safe. Indeed, even if it eliminates the incentive for bank runs, fixing deposit insurance does not make banks sound. For example, while 100% deposit insurance coverage protects all depositors, it puts the burden of ensuring bank prudence and efficiency on other policies and safeguards.

Four Options for Reform

On May 1, the FDIC issued a consultative report regarding [Options for Deposit Insurance Reform](#). The first three approaches that we consider here correspond closely to the three FDIC report proposals, albeit with

¹⁵⁶ See Figure 2.1 of FDIC (2023a).

¹⁵⁷ Table 4.1 Federal Reserve Board (2023a). This characterisation of “largest” depends, of course, on the categorisation scheme that the Federal Reserve uses.

some nuance. The fourth approach – making the Federal Reserve into a “Pawnbroker for All Seasons” (PFAS) – aims at several broad regulatory purposes but would render deposit insurance unnecessary by ensuring that all deposits – or, more broadly, all short-term runnable liabilities – are fully backed by central bank reserves.¹⁵⁸

These four options are as follows:

- **Option A: Maintain Limited Coverage.** Option A maintains (or modestly alters) current partial DI coverage, keeping it well below 100%. To make the \$250,000 cap binding and facilitate resolution, it would simplify coverage and end deposit brokering by introducing an FDIC deposit registry. DI coverage limits would apply per person (but not per bank or per Ownership category).
- **Option B: Targeted increase of coverage.** Option B would expand on Option A by raising the coverage cap for the transactions accounts of SMEs – what the FDIC calls “business payments.” Like Option A, it would simplify coverage and end deposit brokering by introducing an FDIC deposit registry.
- **Option C: 100% coverage.** DI will cover all deposits at insured depositories.
- **Option D: PFAS.** The PFAS would substitute for deposit insurance by altering the practices of the Federal Reserve as lender of last resort (LOLR). All short-term liabilities, including deposits, must be backed by cash or by a claim on reserves at the central bank. The LOLR guarantees the liquidity of all short-term liabilities at all times.

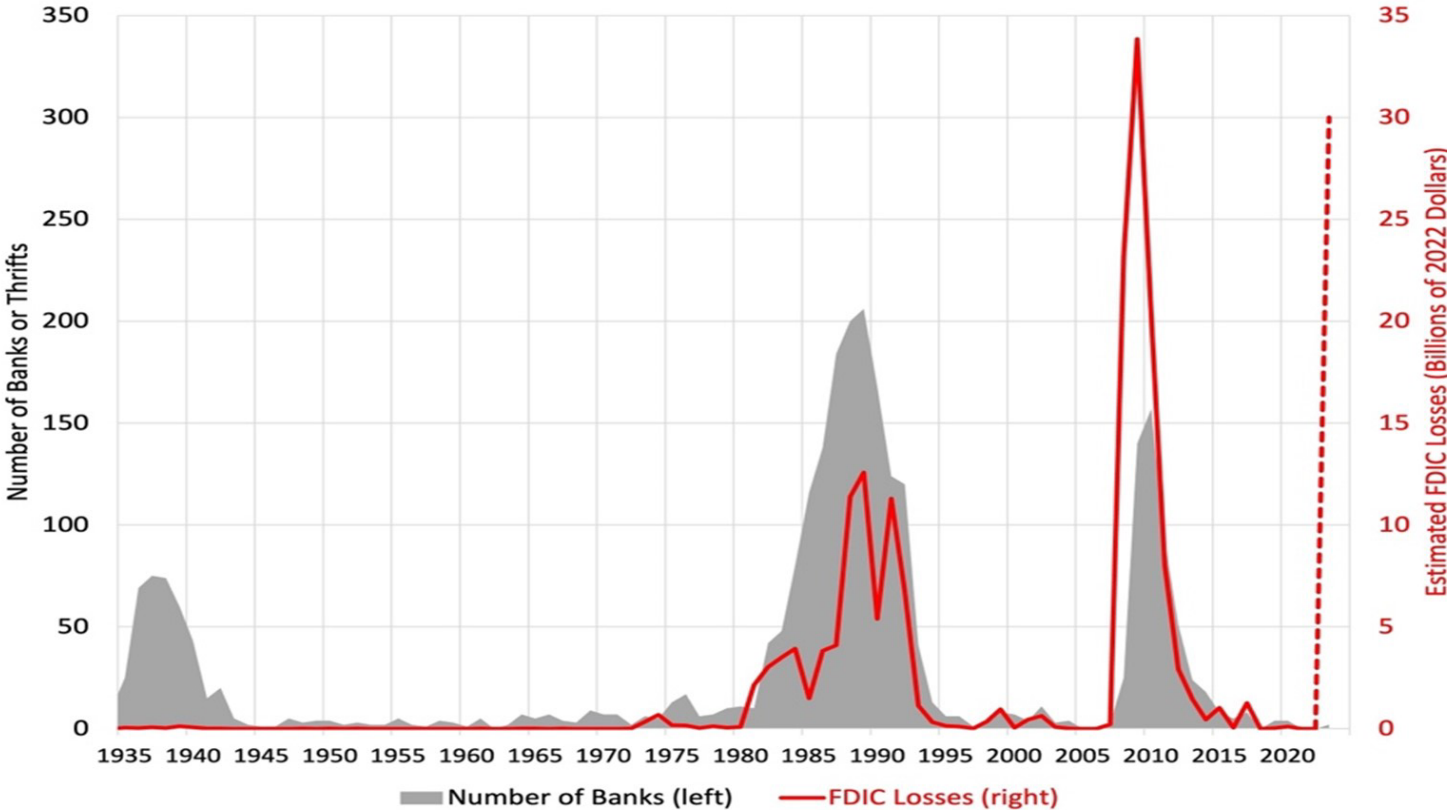
158 See King (2016), p. 271, for a description and analysis of the Pawnbroker for All Seasons (PFAS).

Going forward, we separate the analysis of options A, B, and C from that of option D, since the former vary by degree while the latter is a more radical reform that would replace deposit insurance altogether. We begin with considerations that apply to options A, B, or C, and then discuss issues that are specific to one or more of these three.

Before proceeding, it is useful to describe briefly the history of bank failures since the establishment of the FDIC in 1934. Figure 1 highlights key episodes of FDIC history: It shows the number of annual bank failures (grey shading, left scale) and the inflation-adjusted losses sustained by the DIF (red line, right scale). Both the savings and loan crisis (late 1980s and early 1990s) and the 2007-2009 financial crisis stand out. Notably, as of May 15, 2023, the estimated DIF losses for this year (the dashed red line) were only modestly short of the previous annual record.

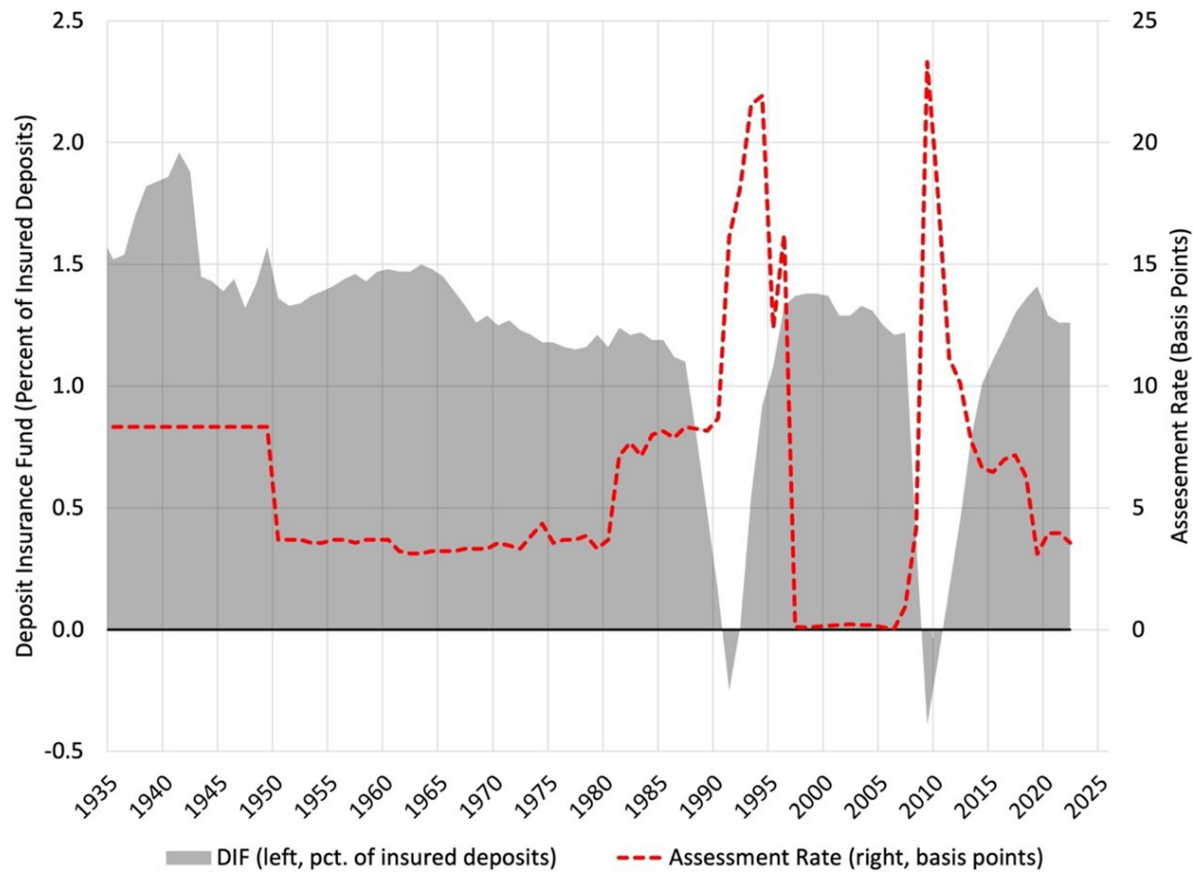
Options A, B, and C all involve some modification of the FDIC insurance framework. An essential part of any of these redesigns should be to make the bank assessment rate more *stable* through the cycle. Figure 2 shows the effective bank assessment rate (red line, right scale) and the DIF balance as a percentage of insured deposits (grey shading, left scale). Rather than maintaining a steady premium, the fees exhibit enormous procyclicality. In good times, when there are few failures, the insurance fund balance is relatively high, and the assessment rate is cut to an unsustainably low level. When a crisis occurs, the insurance fund balance plunges, and the assessment rate temporarily skyrockets. These fluctuations create badly misaligned incentives: By “taxing the survivors,” the FDIC’s post-crisis fees compel well-run institutions to bear the costs of resolving those poorly managed institutions that failed. Over time, such penalties can encourage a race to the bottom among banks.

FIGURE 1 BANK FAILURES AND DIF LOSSES (BILLIONS OF 2022 US DOLLARS), ANNUALLY, 1934-2023E



Note: The dashed red line is an estimate (as of May 15, 2023) of the 2023 DIF losses based solely on the expected resolution costs of First Republic Bank, Silicon Valley Bank, and Signature Bank. Losses are deflated using the Personal Consumption Expenditure (PCE) chained price index (2022=100). Sources: FDIC 2022 Annual Report, Gruenberg (2023b), FRED, and authors' 2023 estimate.

FIGURE 2 DEPOSIT INSURANCE FUN BALANCE AND EFFECTIVE ASSESSMENT RATE, 1935-2022



Source: FDIC 2022 Annual Report.

Another key element of DI framework redesign is to ensure that the DIF is sufficient to avoid relying on the taxpayer backstop over a long period of time. Estimating the appropriate level of the DIF for this purpose requires a model that uses the distribution of bank failures (both frequency and scale) to assess the “value at risk” to the DIF over a given period – say, 50 years. As far as we know, the FDIC has not published a study of this kind. Moreover, the DIF has never approached the 2.0% share of insured deposits that the FDIC has specified as its *designated reserve ratio* (DRR) since the Dodd-Frank Act (DFA) of 2010.¹⁵⁹

In recent years, the actual DIF ratio fluctuated near its *statutory minimum* of 1.35% set under the DFA. Having used a systemic risk exception in March 2023 to cover the uninsured depositors of SVB and Signature Bank (see Chapter 5), the FDIC is obliged in the near term to impose a special assessment on surviving banks to restore the DIF to its legal minimum. More broadly, any large DIF shortfall – like the one this year – can compel the FDIC to act procyclically to raise the assessment rate to restore DIF legal compliance. Put differently, the assessment rates approved by Congress have not built in any DIF buffer.

Finally, Acharya, Yorulmazer and Santos (2010) show how to structure DI premia to address systemic risk.¹⁶⁰ First, the premium should reflect not only a bank’s idiosyncratic failure risk but also its expected contribution to joint failure of financial intermediaries. The Stern Volatility Lab’s [SRISK](#) – the expected capital shortfall of a bank in an episode of widespread stress – provides a high-frequency measure of this contribution for each publicly traded bank. Second, because the failure of a large bank leads to a greater

159 FDIC (2022) and Federal Register (2010), Vol. 75, No. 243, p. 79286, December 20.

160 This approach to setting the DI premium can be viewed as helping to fill in the systemic risk cracks left by other regulatory tools. For example, if capital and liquidity requirements were sufficient to eliminate systemic risk, then making a bank’s DI premium sensitive to its expected contributions to the joint failure of financial intermediaries would have no effect.

fire-sale discount, the premium per dollar of insured deposits (*ceteris paribus*) should be higher for large banks.

The Pros and Cons of the Four Options

The next step is to compare the pros and cons of options A, B, and C. **Option A** is the simplest one to assess because it involves the smallest change from current practice. Clearly, the current level of DI coverage was insufficient to prevent the 2023 regional bank panic. Yet, as the FDIC notes in its *Options* report, a modest increase in the overall insurance cap probably would do little to reduce the incentive to run. The reason is that most uninsured deposits are in *very* large deposits. For example, when SVB failed, its top ten uninsured deposits alone accounted for over \$13 billion. This compares to the astonishing withdrawal of \$42 billion on March 9, the day before California authorities closed the bank, and with total deposits of \$173 billion at the end of 2022.¹⁶¹ At the same time, even a small expansion of coverage likely would require some increase of the DIF and of the premia needed to support it.

Option A includes a way to lower the cost of DI that could offset raising the cap: namely, to make the cap apply per person – rather than per bank and ownership category – and to simplify coverage. Per-person coverage would eliminate the ability of wealthy households and businesses to obtain DI in excess of the cap. In this way, it also would put an end to deposit broking.¹⁶² Streamlining coverage (say, by eliminating multiple ownership categories) would help the FDIC speed resolution of a failed bank, thereby reducing the

¹⁶¹ Silicon Valley Bank (2023), p. 95.

¹⁶² In contrast with the transparency of a simple DI cap, deposit broking is an opaque form of DI arbitrage that as the March 2023 runs revealed may not be understood by SMEs that lack professional cash managers. Dayen (2023). Importantly, the March runs on midsized US banks triggered a large increase in deposit broking. According to Gandel (2023), the volume of “reciprocal accounts” jumped by 40% to over \$220 billion during the first quarter of 2023, while one bank’s website offered up to \$175 million in insurance coverage per depositor [authors’ emphasis]. According to the FDIC’s Quarterly Banking Profile, the ratio of brokered to insured deposits rose to 9.8% in the first quarter of 2023, up from just 5.9% a year earlier.

risk of spillovers.¹⁶³ Importantly, to make per-person DI coverage feasible, the FDIC would need to introduce a common, secure registry of insured depositors, so that any bank could quickly determine whether and to what extent funds in a new or existing account qualify for DI.

Option B, which targets an increase of deposit insurance coverage for SME transactions accounts, aims at greater insurance efficiency than with Option A. As the FDIC's *Options* report highlights, the purpose is to get the greatest bang-for-the-buck in reducing run risk and the potential spillovers from a run per unit of increased insurance coverage and premia.

In the wake of the SVB run, the focus on SME payments is a natural one. One reason is that larger firms have sufficient scale both to manage their cash resources directly (for example, in the repo market) and to monitor the well-being of the banks where they hold transaction deposits. Neither consideration applies to most SMEs.

On top of that, the exposure of SMEs to a bank collapse makes bank supervisors wary of the damaging spillovers that can fuel contagion. Indeed, one of the key incentives for the US authorities to treat SVB's failure as a systemic threat – and to provide blanket coverage for its uninsured deposits – appears to have been concerns about the ability of the bank's business clients to make the payroll and other high-frequency payments needed to sustain their own operations.

Put differently, even temporarily impeding the ability of SMEs to meet their payrolls, etc., carries the risks of potentially large economic damage. In 2020, there were 245,000 medium-sized US firms (50 to 5,000 employees)

¹⁶³ For example, to limit uncertainty and run incentives of uninsured depositors in a bank resolution that does not fully protect them, the FDIC can nevertheless promise a partial dividend to these residual claimants. A simpler insurance framework would allow the FDIC to estimate this dividend more quickly and precisely.

that employed 52 million people and supported an annual payroll of almost \$3 trillion. Even if only one-tenth of these firms had weekly transactions exceeding \$250,000, the broader consequences of their bank accounts' becoming inaccessible for a few days could be substantial.

It is worth noting here that, as part of its [Temporary Liquidity Guarantee Program](#), the FDIC temporarily guaranteed all non-interest-bearing transaction accounts (NIBTAs) starting October 14, 2008 (immediately following the failure of Lehman). This Transaction Account Guarantee (TAG) programme, which was extended by the DFA to the end of 2012, was not limited to SMEs, but applied to all firms and households. At the end of 2011, TAG covered more than \$1.4 trillion in NIBTAs (about 20% of insured deposits).¹⁶⁴ The DFA removed the authority of the FDIC to establish a future guarantee programme without legislative action.

Why not also expand DI for *households*? One reason is that the current cap of \$250,000 per account appears more than sufficient for the transaction needs of *most* households and businesses. According to the 2019 [Survey of Consumer Finance](#), for all families, the median and mean holdings of transaction accounts were only \$5,300 and \$41,600, respectively. Even for the *top 10% of households* ranked by income, the median and mean holdings were only \$70,000 and \$229,000 respectively. A second reason, reflected in the 2023 experience of regional banks, is that uninsured household deposits may be somewhat less run-prone than those of SMEs.

At the same time, the challenges of targeting DI coverage for SMEs are complex. The first is to determine its appropriate scale: While the FDIC report does not propose a specific cap, it suggests that a limit of \$2.5 million

164 For details of the TAG programme, including its legal basis, premium pricing and scale, see Vergara (2022).

*“would likely cover payroll for a large proportion of small- and medium-sized business payment accounts.”*¹⁶⁵ With knowledge of the size distribution and usage characteristics of business payments accounts, the deposit insurer could estimate how large a cap would be needed to insure a specified share of these deposits. However, the provision of additional DI coverage could prompt changes in the size distribution.

The second, and much larger challenge, is to specify eligibility for a heightened SME cap in a way that limits access and allows efficient verification. A failure to do so would fuel a new form of DI arbitrage that undermines the purposes of targeting. While the FDIC report acknowledges this problem, it does not explore solutions. One possible strategy to verify eligibility is to rely on businesses’ past tax reports. However, other verification tools may also be needed – for example, in the case of start-up firms that have yet to earn a profit. Consequently, whether targeted DI is feasible and sustainable remains to be demonstrated.

Option C – unlimited coverage – goes as far as DI can to eliminate run risk. Even if a bank were insolvent, its depositors would have little incentive to withdraw their funds. Option C also is highly transparent and greatly simplifies coverage. There would be no need for per-person, per-bank, or per-ownership category rules. There would be no need to distinguish between accounts used for transactions (payments) and those for long-term savings. Unlike Options A and B, there also would be no need for a DI registry to limit access or to distinguish user types.¹⁶⁶

¹⁶⁵ FDIC (2023a), footnote 137 on pp. 56-57.

¹⁶⁶ In addition, Option C would allow bank supervision to become much more transparent. Currently, almost all of the details of a bank’s supervisory process (such as a bank’s CAMELS rating) are secretive and opaque, because of regulators’ fears that the open release of such information (if adverse) could cause runs. With unlimited DI, that justification disappears.

However, by removing the incentive even for the very largest depositors to monitor the bank's well-being, Option C places *all* the burden of limiting bank risk-taking on the authorities who design and enforce prudential rules. Indeed, with 100% DI, banks would have little reason to issue equity or debt unless they were required to do so.

Moreover, Option C's impact on DI premia and the size of the DIF would far exceed that of Options A or B. Based on year-end 2022 data, under Option C, the value of insured deposits would rise by more than 75%. Yet, deposits with unlimited DI coverage also would become *more* attractive relative to other financial instruments, causing some funds to shift to banks. As a result, insured deposits could double in the aggregate.

Finally, a blanket deposit insurance severely restricts the regulators from having depositors bear losses if such a contingency is desirable, given that such a move could be either seen as a sovereign default or at a minimum a sovereign breach of its contractual promises.

We now turn to **Option D**. The Pawnbroker for All Seasons (PFAS) eliminates the incentive during periods of strain to run on a bank (as in Option C), but it does so without *any* need for a separate DI regime. The reason is that the central bank as LOLR would guarantee the liquidity of every deposit (and, more broadly, of every short-term fixed liability). To make this LOLR guarantee feasible, the PFAS mechanism requires banks to pre-position at the central bank collateral sufficient to back their short-term funding.¹⁶⁷ The central bank determines the haircuts on the collateral and commits to maintain those haircuts even in a period of severe financial stress.

¹⁶⁷ The PFAS would apply not only to banks, but to all intermediaries that rely on short-term liabilities. This broad approach would be consistent with the general principle of "same activity, same risk, same regulatory treatment." As a result, it would limit the incentive for shifting risk-taking from banks to nonbanks. Under the PFAS, deposits and other uncollateralised short-term funding could replace various forms of collateralised borrowing, for example, from the Federal Home Loan Banks or through the repo market.

As designed by former Bank of England Governor Mervyn King, the PFAS aims broadly to ensure financial stability as well as to make intermediaries bear the social costs of private intermediation.¹⁶⁸ However, in the context of this chapter, it can be useful to think of the PFAS central bank as a deposit insurer that sets the haircuts on the collateral to establish a buffer against losses. It also may be helpful to view the haircuts as a form of invariant, asset-specific capital requirement that is set in *normal* financial conditions. By setting the haircut, the central bank influences the steady-state extent of liquidity and credit transformation based on private, short-term liabilities, allowing it to limit the frequency and amplitude of crises. Importantly, the central bank designs these haircuts to be “through-the-financial-cycle:” that is, they do not raise the haircuts in periods of financial stress. Otherwise, the central bank could not credibly commit to make all short-term liabilities liquid in a crisis.

In sharp contrast to Options A, B, and (especially) C, Option D also would reduce the need for significant elements of prudential oversight.¹⁶⁹ Moreover, unlike deposit insurance, it would not be limited to banks. The same PFAS framework would eliminate runs on any financial entity that promises to redeem short-term liabilities at par. Consequently, it is potentially a powerful tool to make the entire financial system safe.

One way to think about Option D is as a *hybrid* narrow banking system. In a narrow bank, all deposits are 100% backed by central bank reserves (equivalently, all risky assets are financed by equity or long-term debt). However, the PFAS provides greater leeway than a narrow banking system because the central bank has discretion in setting collateral rules: For

¹⁶⁸ King (2016), *op. cit.*, footnote 10.

¹⁶⁹ There would still be a role for a capital requirement to limit leverage (for example, to address operational risk) as well as for rules that limit self-dealing and the like. Moreover, PFAS collateral rules will need to take account of issues that prudential oversight currently addresses (for example, limits on loan concentration).

example, the haircut on a commercial loan need not be 100%, as it would be for a narrow bank.

In effect, under Option D, banks would be “narrower” but not “narrow.”¹⁷⁰ As a result, it has many of the advantages of narrow banking – including the simplification of prudential oversight and the elimination of deposit insurance – without the serious disadvantage of driving risky lending out of the regulated system and into runnable liabilities elsewhere.¹⁷¹ Ultimately, the way the central bank sets collateral rules determines the extent of intermediation: the transformation of risky, long-term assets into safe, short-term liabilities.

The key challenge under the PFAS is determining the collateral haircuts in a way that preserves a market, rather than central bank, driven allocation of credit. Because securities and loans with smaller haircuts will be cheaper to fund, the central bank’s influence will be profound.¹⁷² However, existing capital requirements (which apply different risk weights to various categories of loans, mortgages and securities) and stress tests already have a significant impact on the allocation of bank credit. Moreover, since the financial crisis of 2007-2009, central banks have been intervening extensively in asset markets, and are widely expected to do so in any serious episode of financial instability. As a result of this experience, central banks have improved their capacity to analyse and limit the market risk they wish to accept.

Over time, there also are political economy concerns associated with Option D that are not present in Options A, B, and C. The key problem is the concentration of enormous financial powers in the central bank. Over time, this could invite political interference in the allocation of credit that weakens

170 Cecchetti and Schoenholtz (2016) and Cecchetti and Schoenholtz (2022).

171 Cecchetti and Schoenholtz (2014) and Cecchetti and Schoenholtz (2018).

172 For the macroeconomic impact of haircuts, see Ashcraft, Gârleanu and Pedersen (2010).

market forces and prospects for economic growth. The concentration of power also could weaken support for the independence that central banks need to make monetary policy credible.

Finally, no country thus far has implemented Option D, while many countries have a DI scheme. Hence, it is not possible to assess how Option D has worked in practice.¹⁷³ As a consequence, there is a case for the United States to wait until other countries move in this direction, and then see how well they fare.

Policy Tools for Limiting Bank Risk-Taking

As previously indicated, the provision of deposit insurance protects depositors but fosters moral hazard. The more extensive the DI coverage, the greater the incentive for banks to take risk. Consequently, Options A, B, and (especially) C depend on other policy tools – including deposit insurance fees and a range of prudential requirements – to limit bank risk-taking.

As the FDIC's *Options* report notes, making deposit insurance fees accurately sensitive to risk is very difficult.¹⁷⁴ Current insurance pricing differentiates between banks of different size and sets the premium based on a scorecard of indicators to estimate the likelihood and scale of DIF losses. For large banks, the scorecard employs both confidential supervisory ratings (CAMELS) and measures of balance sheet risk.¹⁷⁵ For complex banks, the scorecard adds measures of market risk, counterparty credit risk concentration, and the bank's reliance on short-term funding.¹⁷⁶

Since Dodd-Frank, the FDIC has sharply raised the standard for making insurance premia risk sensitive, but there is almost certainly room for

173 According to the [International Association of Deposit Insurers](#), 146 jurisdictions had a deposit insurance system as of February 2023.

174 One reason is that banks can use off-balance sheet tools to make rapid changes in their risk profile that typical DIF risk models would not capture. Of course, similar challenges arise for setting risk-weighted capital requirements.

175 Garnett et.al. (2020), Table A.1.

176 Garnett et.al. (2020), Table A.2.

improvement. For example, frequent updating of the scorecard indicators and their weights could help improve the framework's accuracy in assessing risks to the DIF. The FDIC also could expand the scorecard to include any of the measures that regulators employ to assess the systemic risk of large banks.¹⁷⁷ Yet another possible refinement would be to utilize more detailed models of potential loss to the DIF.¹⁷⁸ Finally, in addition to pricing relative risks, such models could serve as a check on whether fees *on average* are adequate to ensure DIF sustainability.

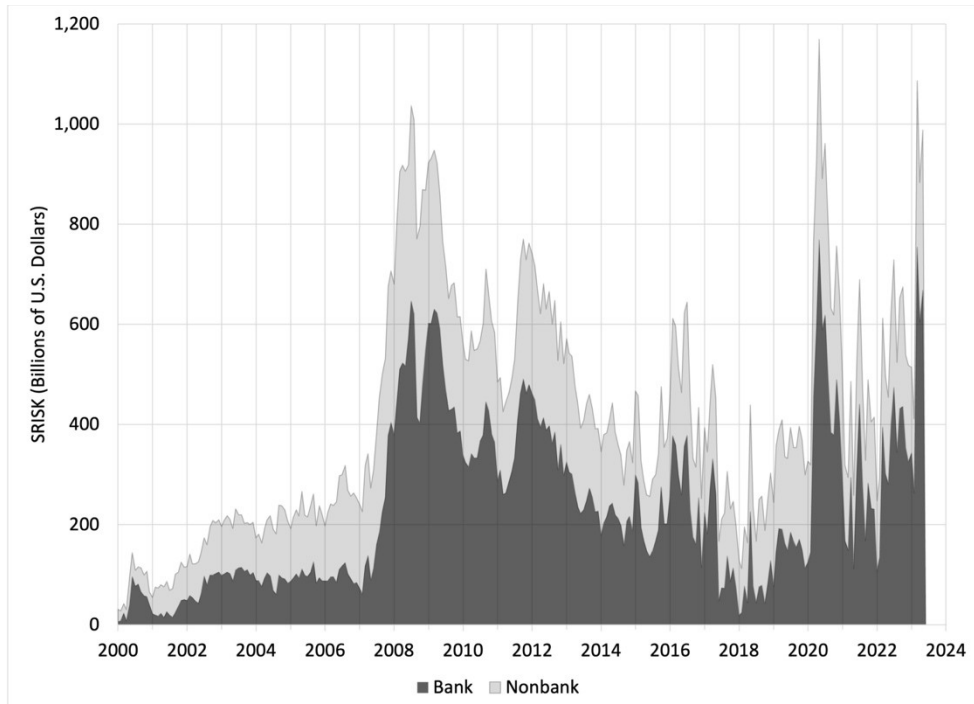
At current levels of deposit insurance (as in Option A), the 2023 regional banking panic highlights the need to strengthen both capital and liquidity regulation – especially for mid-sized banks. As of the third quarter of 2022, more than 700 banks reported unrealised losses that exceeded 50% of their capital, with 31 reporting negative tangible equity.¹⁷⁹ Moreover, in the aftermath of the March runs, the estimated aggregate capital shortfall in the US financial system approached the 2020 record (see Figure 3). Finally, the runs on regional banks reflected an untenable mix of asset risk that eroded their capital and a reliance on highly runnable, uninsured wholesale deposits.

177 For example, the Office of Financial Research [Bank Systemic Risk Monitor](#).

178 For example, Camara, Davidson and Fodor (2020).

179 Federal Reserve Board (2023b).

FIGURE 3 US AGGREGATE SRISK (END-OF-MONTH OBSERVATIONS, BILLIONS OF U.S. DOLLARS), 2000-MAY 2023



Source: NYU Stern Volatility Lab.

In addition to stronger capital and liquidity requirements, other ways to limit the risk-taking incentives of banks or the spillovers from their failures are discussed in Chapter 10. For mid-sized banks, these could include the following:

- A new requirement for the issuance of long-term, subordinated debt. The largest banks are already required to issue a large volume of such debt as part of Total Loss-Absorbing Capacity standard.¹⁸⁰ The idea is that subordinated debtholders would have both greater incentive to monitor the well-being of the issuer banks, and greater capacity to do so. In addition, because the subordinated debt would be long-term (and

¹⁸⁰ Financial Stability Board (2015).

laddered in maturities), the problem of runs with respect to this form of liability would be absent. Moreover, market pricing of an issuer's subordinated debt could help signal supervisors regarding concerns about the bank's well-being.

- Enhanced prudential oversight. This includes stress tests for both capital and liquidity. It also includes tools for prompt corrective action (PCA) and resolution (such as DFA's Orderly Liquidation Authority).
- Prioritisation of SME payments accounts (Options A and B only). Just as targeted DI aims to protect SME transaction accounts when a bank fails, prioritising any uninsured portion of those accounts could expand and speed their payouts in resolution.
- Introduction of Minimum Balance at Risk (MBR) (Options A and B only). Under an MBR scheme, a fraction of an uninsured deposit would be unavailable to the depositor for some period (say, 30 days) and could help absorb losses should the bank fail. In effect, a portion of every uninsured deposit becomes contingent capital that can only be withdrawn if the bank survives for a predetermined length of time. Put differently, an MBR compels those who withdraw early to bear at least some of the losses that their actions impose on more patient depositors.¹⁸¹
- Optional supplementary DI coverage (Options A and B only). The deposit insurer could offer banks or depositors the option to pay a fee for supplementary deposit insurance. However, managing the resulting adverse selection problem could require a complex set of pricing and quantity rules.

¹⁸¹ An MBR has two potential drawbacks. First, by making seniority dependent on past transactions, it is complex to administer. Second, it would compel all depositors with large gross flows through their deposit accounts to hold sizeable idle balances, making them *de facto* equity holders without the usual privileges of such ownership. Cecchetti, Philippon and Schoenholtz (2023). A variant on the MBR has been proposed by Gordon (2023).

Conclusions

We have discussed four options regarding DI reform.

The first three reflect varying degrees of change in DI coverage. Any of these options should be accompanied by an effort to stabilise the insurance assessment rate at a level sufficient to achieve the FDIC's 2.0% DRR (the DIF-to-insured deposits ratio). By establishing a DIF buffer in excess of the legal minimum ratio (1.35%), the FDIC can put an end to the pro-cyclicality of its assessment rate and the poor incentives that it creates.

While each of these three Options is favoured by at least one co-author, a majority of the co-authors shares the FDIC judgment that the most promising avenue for further exploration is Option B, a targeted increase of coverage for SME payments. The feasibility of such targeted insurance will depend on whether the FDIC can limit eligibility and prevent DI arbitrage.

There also is considerable support for *exploring* Option D, which would completely replace a separate DI regime and radically simplify prudential oversight. Instead of DI, under Option D all short-term liabilities of intermediaries – including bank deposits – would be backstopped by cash or a claim on reserves at the central bank. In turn, the Federal Reserve – in its role as lender of last resort – would require adequate collateral (using predetermined haircuts) for each of these short-term liabilities, thus limiting their aggregate supply. So far, however, while nearly 150 jurisdictions have instituted a form of DI, none has implemented Option D. If other countries move in this direction, US policymakers could gain insights from their experience, and should be prepared to act flexibly.

One important resolution approach that we did *not* discuss in this chapter would be an option to provide a guarantee *following* the first bank failure. Philippon and Wang (2023) show that this approach can mitigate the moral

hazard associated with a full bailout. In that connection, Acharya and Yorulmazer (2008) also demonstrate that a policy of providing liquidity to the purchasers of failed banks can reduce the incentive for banks to herd, making crises less likely. In our view, the greatest problem with this resolution approach is the temptation for policymakers who have bailout discretion to guarantee the first bank, too. In the aftermath of Lehman, that temptation seems overwhelming for the US authorities and probably contributed to the systemic risk exception that they applied to SVB and Signature Bank (see Chapter 5). Unless the commitment to let that first failure occur is *ex ante* credible, the moral hazard problem associated with a full bailout remains.

More broadly, history shows that a piecemeal approach to any aspect of financial regulation – including a DI mandate – either does not fully solve the intended problem or creates unintended consequences, such as incentives for regulatory arbitrage. While uninsured deposits constitute the largest single component of the aggregate runnables of banks and shadow banks, they are less than one-half of the total. Moreover, systemic risk extends beyond funding problems in the deposit market. Consequently, the authors urge a holistic approach to bank safety and soundness, including DI and other types of liquidity and capital regulations.

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9 THE FHLB ROLE IN THE SVB AND RELATED DEBACLES

Stephen G. Cecchetti, Kermit L. Schoenholtz, and Lawrence J. White¹⁸²

Policymakers should eliminate, or sharply reduce, the role of “lender-of-next-to-last resort” played by the Federal Home Loan Bank (FHLB) System, a government-sponsored enterprise. In its current form, FHLB lending undermines both market and supervisory discipline, delaying (and adding to the cost of) the resolution of weak banks.

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Introduction

The Federal Home Loan Banks of San Francisco (FHLB-SF) and New York (FHLB-NY) played an enabling role in delaying the regulatory reckonings and increasing the costs of the Federal Deposit Insurance Corporation (FDIC) resolutions for Silicon Valley Bank (SVB), Signature Bank, and First Republic Bank – each of which should have happened months earlier (see Chapter 5). As part of our review of what went wrong and our proposals for regulatory reform, the Federal Home Loan Bank System (FHLB or the System) should be included, and we provide specific proposals for reform of that system as well.

Background¹⁸³

The FHLB System is a nationwide set of 11 wholesale cooperative banks that jointly raise funds in debt markets¹⁸⁴ and that use the proceeds to make loans (which are termed “advances”) to their members.¹⁸⁵ Created by federal law in 1932, the FHLB System is a government-sponsored enterprise (GSE) in the same way that Fannie Mae and Freddie Mac are GSEs. As a GSE, the FHLB

182 During 1986-1989, Lawrence J. White was a Board Member of the Federal Home Loan Bank Board (FHLBB). In that capacity, he was also one of the three Board Members of the FHLB System.

183 More details and background on the FHLB System can be found in Flannery and Frame (2006), Frame and White (2010), Ashcroft et al. (2010), Frame et al. (2012), Frame (2016), and Parrot and Zandi (2023), among others.

184 The 11 banks jointly raise their funds through a single, centralised Office of Finance. The 11 banks are severally and jointly responsible for the debt that is issued.

185 An intermediary can be a member of one or more FHLB, depending on the geographic location of the member's offices. The members are required to buy stock in the FHLB to which they belong (which is an important source of capital for the FHLBs); and they must purchase additional stock as part of the terms of an advance.

System is considered by the debt markets to have the implicit support of the federal government.¹⁸⁶ Consequently, the System is able to borrow in those markets at rates that are better than corporate AAA rates but not quite as good as the rate at which the US Government can borrow.¹⁸⁷ In turn, the FHLBs are expected to pass these favourable borrowing rates through to their members in the form of lower interest rates on advances. The Federal Housing Finance Agency (FHFA) is the prudential regulator and mission regulator of the FHLB System.¹⁸⁸

Membership in the FHLB System is open to commercial banks, savings institutions, credit unions, insurance companies, and non-depository community development financial institutions (CDFIs). Large depositories are required to devote at least 10% of their assets to residential mortgage finance; insurance companies and CDFIs are required to devote at least 5% of their assets to residential mortgage finance; and small depositories must be involved in community lending (including residential mortgage finance). Advances to members are always over-collateralised.¹⁸⁹ It is up to each FHLB to establish a credit limit for each borrower, with limits typically in the range of 20% to 60% of the borrower's assets, but it is possible to exceed the limit with management or Board approval.¹⁹⁰ In the event that the borrowing member becomes insolvent and goes into receivership, the lending FHLB has a (statutory-based) super-lien on the borrower's assets – and thereby subordinates all other claimants, *including the FDIC*.

186 The FHLBs enjoy a number of special privileges that reinforce the belief that they are indeed special and have the implicit support of the federal government; see the sources that are listed in footnote 183 for more details.

187 The impact of the federal guarantee on FHLB credit ratings (and on the cost of funds) is substantial. For example, in the presence of federal support, the S&P rating of FHLB credit is the same as that of the federal government: AA+. Absent federal support, the rating would be BBB+, six notches lower. See Layton (2020, fn. 15) and S&P (2021).

188 Again, these arrangements parallel those that apply to Fannie Mae and Freddie Mac.

189 The FHLB System's collateral rules can be found in Federal Home Loan Bank System Office of Finance (2023, pp. 2-5). Collateral includes select mortgage loans and securities (including commercial real estate), federally backed debt, and cash. Collateral requirements vary with "borrower credit quality, financial condition and performance; borrowing capacity; collateral availability; and overall credit exposure to the borrower."

190 Federal Home Loan Bank System Office of Finance (2023, p. 3), which adds "Since 1932, no FHL Bank has incurred any losses on its credit products, including advances...."

The original 1932 mission of the FHLB System was to provide preferential wholesale lending for residential mortgage finance. At its founding, the System's eligible members were savings and loan institutions (S&Ls) and savings banks – both categories of depositories were largely restricted to making residential mortgage loans – and life insurance companies (which, in the 1930s, originated a significant portion of all residential mortgages). The restricted nature of the System's membership meant that – perforce – the System's advances were highly likely to be used for residential mortgage finance; and the favourable interest rates on the advances were expected to be passed through to residential mortgage borrowers.

In the 1980s and 1990s, legislation broadened both the eligible membership and the mission: Commercial banks, credit unions, and CDFIs were allowed to become members; and the mission expanded to include loans to support community development.¹⁹¹

As of March 31, 2023, the FHLB System had 6,484 members.¹⁹² The total assets of the system were \$1,564.2 billion, of which 67% (\$1,044.6 billion) were advances (loans) to members. Of special note is the following: During the 12 months that preceded March 31, 2023, the assets of the FHLB System more than doubled, driven largely by a near-tripling of the System's advances to its members. This asset growth was facilitated by the favourable regulatory treatment of FHLB liabilities, which count as high-quality liquid assets for banks and are treated as government paper for money market funds.¹⁹³

Figure 1 highlights this time pattern of advances. Figure 2 offers a longer perspective and illustrates that there was also a smaller, but significant rise

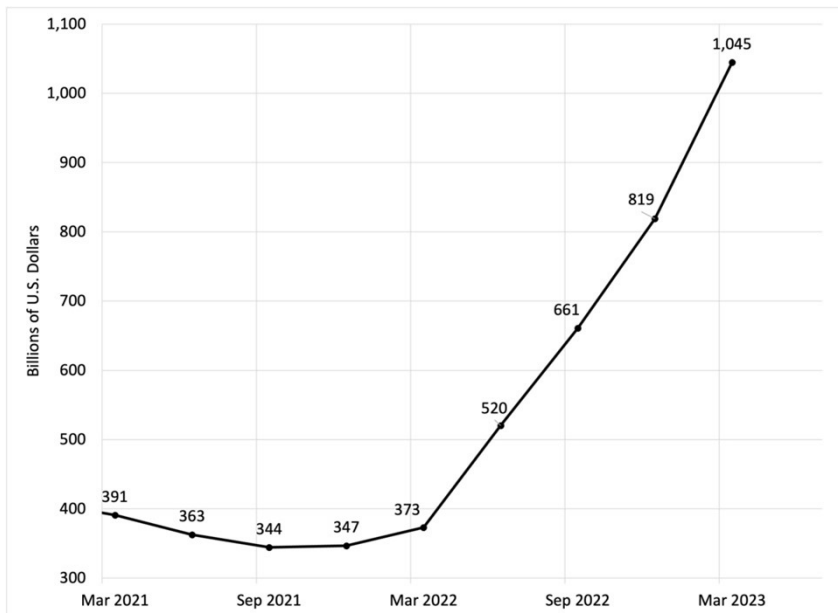
191 The details of and the justifications for this broadening can be found in the sources that are listed in footnote 183.

192 Of the total, there were: 3,702 commercial banks; 568 savings institutions; 1,580 credit unions; 564 insurance companies; and 70 CDFIs.

193 Cecchetti and Schoenholtz (2019). The haircut for FHLB bonds as high-quality liquid assets is 15%.

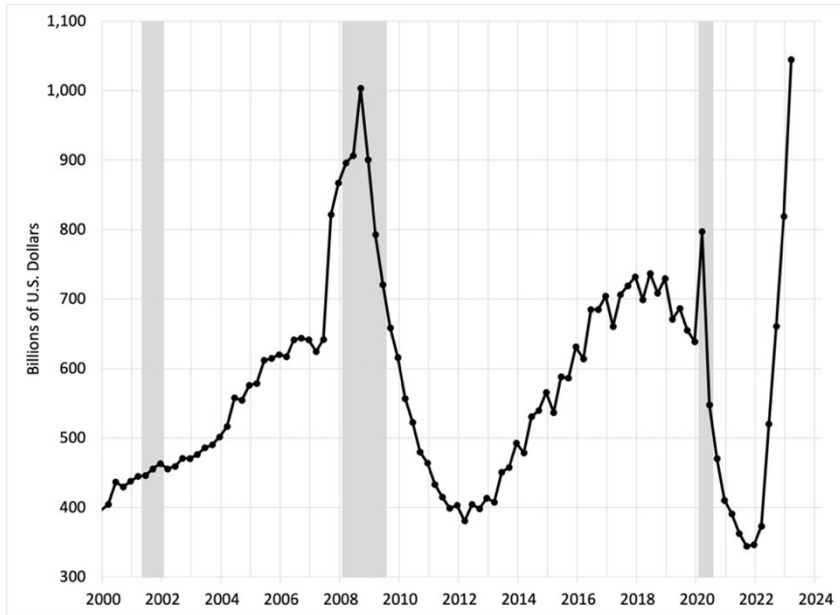
in the System's advances between early 2007 and mid-2008 (which at that point was indeed considered to be rather large). The general tendency of the System's members to use its advances as a tool under conditions of stress for liquidity management – and especially for accessing liquidity for quick, short-run needs – has become a central feature of the System that it highlights in its public descriptions of its purpose and mission within the overall US financial system. Ashcraft et al. (2010) characterise the FHLB System as the lender of next-to-last resort (LONTLR), making clear that the FHLB System is a close substitute for the Federal Reserve in the latter's role as the official US lender of last resort (LOLR).

FIGURE 1 FHLB ADVANCES TO FHLB MEMBERS, (BILLIONS OF US DOLLARS) Q1 2021-Q1 2023



Sources: Board of Governors, Financial Accounts of the United States, [BOGZ1FL403069330Q](https://www.federalreserve.gov/releases/BOGZ1FL403069330Q/).

FIGURE 2 FHLB ADVANCES TO FHLB MEMBERS, (BILLIONS OF US DOLLARS) Q1 2000-Q1 2023



Note: Grey shading denotes recessions.
Sources: Board of Governors, Financial Accounts of the United States, BOGZ1FL403069330Q.

The Use of the FHLB System by SVB, Signature Bank, and First Republic Bank

Figure 3 provides information for the advances of SVB, Signature, and First Republic from their respective FHLBs from the end of 2021 onward. As of year-end 2021, First Republic had \$3.7 billion in advances from the FHLB of San Francisco; it was the largest borrower from the FHLB-SF and accounted for over 20% of the FHLB-SF’s total advances.¹⁹⁴ SVB had no borrowing from the FHLB-SF; and Signature either had no borrowing or its borrowing was not large enough to be in the top five borrowers from the FHLB-NY.¹⁹⁵

¹⁹⁴ The largest Systemwide borrower at that time was MetLife, with advances of \$15.8 billion.

¹⁹⁵ In essence, the maximum advance (if any) that Signature Bank could have had would have been below the \$3.075 billion advance to the fifth-largest borrower from the FHLB-NY.

FIGURE 3: SVB, SIGNATURE BANK, AND FIRST REPUBLIC BANK-ADVANCES FROM THE FHLB SYSTEM (BILLIONS OF US DOLLARS)

Bank	Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022	Q1 2023
SVB	0	NA	NA	\$13.5	\$15.0	*
Signature Bank	NA	NA	NA	NA		*
First Republic Bank	\$3.7	\$3.7	\$11.0	\$11.0	\$14.0	\$28.1

* The bank was put into receivership.

NA Not [available/applicable].

Sources: FHLB System quarterly and annual financial reports; SVB, Signature Bank, and First Republic Bank annual financial reports. We note that the banks' quarterly reports do not reveal their FHLB advances; and SVB's 2021 annual report could not be readily accessed.

First Republic increased its borrowing from the FHLB-SF to \$11 billion by the middle of 2022 and to \$14 billion by the end of the year.¹⁹⁶ SVB borrowed \$13.5 billion from the FHLB-SF by the end of the third quarter (making it the eighth-largest borrower across the entire System) and increased that borrowing to \$15 billion by the end of the year.¹⁹⁷ And Signature Bank had borrowed \$11.3 billion by year-end (making it the fourth-largest borrower from the FHLB-New York). Finally, by the end of the first quarter of 2023, First Republic Bank had doubled its borrowing from the FHLB-SF to \$28 billion, while SVB and Signature Bank had been put into receiverships and then absorbed into other banks.

It is worth noting that SVB experienced a net outflow of deposits of \$15 billion between midyear and year-end 2022, so its advances from the FHLB-SF offset that deposit loss. While First Republic experienced deposit increases during 2022, in the wake of SVB's financial difficulties in early March 2023, it

¹⁹⁶ First Republic Bank thereby became the tenth-largest borrower across the entire FHLB System and was the second-largest borrower from the FHLB-SF.

¹⁹⁷ At year-end 2022, SVB was again the eighth-largest borrower across the entire FHLB System and was also the largest borrower from the FHLB-SF.

faced severe deposit outflows. From the end of 2022 to March 31, 2023, First Republic's deposits plunged from \$176 billion to \$104 billion.¹⁹⁸

Figure 4 provides a slightly broader perspective on FHLB lending at the end of 2022 and during the first quarter of 2023. For each of these dates, we report the 10 largest recipients of FHLB advances. For each case, we note the advances relative to end-2022 total assets, as well as the change in SRISK over the first quarter of 2023 (again relative to total assets).

We draw four conclusions from the information in Figure 4. First, total advances for the top ten rose sharply from year-end 2022 to the end of the first quarter of 2023 (from \$218.8 billion to \$326.0 billion).¹⁹⁹ Second, lending is quite concentrated and rising. The top ten borrowers accounted for 26.5% of advances at the end of 2022. And this rose to 31% three months later. Third, banks with assets in the range of \$500 billion to \$700 billion are quite prominent – especially at the end of the first quarter of 2023, when they constitute the top four and account for 17.2% of total FHLB advances. Of the eight banks on the year-end 2022 list, seven were still there at the end of the first quarter of 2023 (SVB isn't!).²⁰⁰

Finally, banks with larger increases in their capital shortfalls – higher change in SRISK relative to year-end 2022 assets – borrow more from the FHLBs: There is a positive correlation (about 0.3) between the last two columns of Figure 4.

198 The \$104 billion is inclusive of the \$30 billion in deposits from 11 large banks that occurred in mid-March. Without this \$30 billion, First Republic Bank's deposits would have been only \$74 billion, or only 42% of the amount three months earlier.

199 During the first three months of 2023, FHLB advances to US depository institutions rose from \$587 billion to \$802 billion, and now stand at their highest level since 2008.

200 Note that NY Community Bank owns Flagstar, which is the successor to Signature Bank.

FIGURE 4 TOP TEN HOLDING COMPANY RECIPIENTS OF FHLB ADVANCES (BILLIONS OF US DOLLARS), YEAR-END 2022 AND MARCH 31, 2023

Holding Company	Advances	Advances as a Pct. of Total FHLB Advances	Total Assets	Advances as a Pct. of Assets	Change in SRISK as a Pct. of Total Assets
Year-end 2022					
Wells Fargo	\$34.0	4.1%	\$1,881.0	2%	
PNC	32.1	3.9	557.3	6	
Truist	29.7	3.6	555.3	5	
US Bancorp	23.3	2.8	667.8	3	
NY Community	20.3	2.5	90.1	23	
Citigroup	19.3	2.3	2,415.7	1	
TIAA	16.2	2.0	39.4	41	
SVB	15.0	1.8	211.8	7	
MetLife	14.9	1.8	666.6	2	
First Republic	14.0	1.7	212.6	7	
Total	\$218.8	26.5%	\$7,297.6	3%	
March 31, 2023					
Truist	\$56.7	5.4%	\$555.3	10%	4%
US Bancorp	47.1	4.5	667.8	7	5
Charles Schwab	45.6	4.3	551.8	8	13
PNC	32.0	3.0	557.3	6	4
Wells Fargo	29.0	2.8	1,881.0	2	3
Bank of America	28.9	2.7	3,051.1	1	2
First Republic	28.1	2.7	212.6	13	6
NY Community	20.4	1.9	90.1	23	4
TD Bank	19.5	1.9	1,445.1	1	1
KeyCorp	18.8	1.8	189.9	10	4
Total	\$326.0	31.0%	\$9,202.0	4%	3%

Notes: Based on the FFIEC Large Companies Holdings list at the end of 2022, orange-shaded bank holding companies (BHCs) held assets between \$500 billion and \$700 billion, while yellow-shaded BHCs held between \$100 billion and \$500 billion.

Sources: Advances are from Federal Home Loan Banks (2023a) Table 12 and Federal Home Loan Bank (2023b) Table 7. Total assets are from FFIEC except for: MetLife, which is from the Annual Report (10K); First Republic Bank, which is for the bank and is from the Federal Reserve; and TD Bank, which is from the Annual Report and converts Canadian dollars into US dollars. The change in SRISK is from the NYU Stern V-Lab based on the default settings - a capital requirement of 8%, a global market decline of 40%, and including 40% of separate accounts for insurers.

From this we conclude that the FHLB borrowings by SVB, Signature Bank, and First Republic Bank were critical in keeping the banks afloat. Even though they were undercapitalised (or at risk of becoming undercapitalised) the FHLB advances allowed these banks to delay selling assets and/or raising equity. In effect, the banks were gambling for resurrection on the back of mispriced government-sponsored financing. In the end, the gamble failed. The attempt to raise capital (by SVB) came too late, uninsured depositors ran, and the bank failed.²⁰¹

There are strong indications that the FHLB system facilitated regulatory arbitrage during the recent period of bank stress. As noted earlier, FHLB bonds are eligible for purchase by government money market funds. In March 2023, as banking system demand deposits were shifting into government money market funds, FHLB advances increased to fill a significant part of the funding gap faced by banks. In effect, deposits became money market fund shares invested in the implicitly government-backed liabilities of the FHLBs, which took the proceeds and provided advances to the banks.

To put a few numbers to this, during March 2023, commercial bank deposits fell by \$307 billion, while borrowing and other liabilities rose by \$510 billion. That is, overall, the banking system balance sheet actually grew. In the same period, government money market fund shares rose by \$442 billion. While we do not have monthly data for the FHLB System, we know that during the first quarter of 2023, FHLB advances rose by \$216 billion, while FHLB bond liabilities increased by \$312 billion. Hence, significant increases in government money market fund shares essentially funded FHLB advances,

²⁰¹ Given that FHLB advances generally come without prudential preconditions, their availability encourages banks to increase leverage in a manner that raises the riskiness of their maturity and liquidity transformation activities. For a theoretical and empirical analysis of this point in the context of the Fed's LOLR facilities of 2007-2008, see Acharya and Tuckman (2014). However, unless a member's primary regulator grants a waiver, the FHLBs are not allowed to make new loans to members with negative tangible common equity (TCE) and existing FHLB loans can be renewed only for 30 days.

which, in turn, made up for much of the lost bank deposits. Or, put differently, the FHLB System became a recycling mechanism for bank deposits, while enhancing their credit quality.

Counterfactual: Suppose that the FHLB Advances Had Not Been Available

If the FHLB advances had not been available during 2022-2023, all three of the banks that failed would have experienced financial difficulties earlier. As Chapter 6 points out, these banks traded in the options markets at higher implied volatility than larger, safer banks. Without access to their respective FHLBs, liquidity needs might have compelled these banks to turn to private sector lenders, which would likely have been more concerned about the banks' precarious financial positions than were the FHLBs (which had the statutory seniority over all other lenders). At a minimum, private lenders would have charged higher rates for the loans. Either that, or SVB and First Republic Bank might have turned to the Fed.²⁰² Importantly, borrowing from the Fed would have been tied to prudential concerns and might have reduced the supervisory inertia that prevailed at the time (see Chapters 4 and 10). Moreover, depending on the behaviour of private lenders and the possible revision of the Fed's supervisory assessments, the FDIC might have become aware earlier that these banks were experiencing difficulties and would have had more time to prepare an orderly (and less costly) resolution process (see Chapter 5).

202 Since Signature Bank was not a Federal Reserve member, this route would not have been open to it.

Remedies to Scale Back the LONTLR

The existence of an LONTLR in the US financial system is highly counterproductive. To fix this, we should eliminate or sharply scale back the ability of the FHLB System to serve as an LONTLR.

For the most part, banks and other intermediaries rely on market sources of liquidity that impose a healthy discipline on the borrowers, helping to limit the risks that they take. However, in periods of financial stress, the market supply of liquidity can become dangerously scarce, which justifies the existence of an LOLR. Put simply, the LOLR addresses a well-known externality: that individual bank runs (or failures) can turn into systemwide panics and fire sales that threaten the payment system and/or the supply of credit to healthy borrowers. In contrast, we know of no such theoretical or practical foundation that can justify the creation of a GSE that functions as an LONTLR, substituting for market sources of liquidity when that supply is costly.²⁰³

Nor are we able to identify an externality that rationalises the existence of a US LONTLR; as we argue above, the current operation of the FHLB System delays and undermines market discipline. It expands the supply of low-cost, federally subsidised credit to severely troubled, and potentially insolvent, banks. It also undermines *supervisory* discipline, especially that of the LOLR. For example, an effective LOLR must commit *not* to lend to insolvent banks: In addition to subordinating other lenders, such lending makes other recipients of LOLR loans – those that are solvent, but temporarily illiquid –

²⁰³ The argument that the FHLB System provides useful liquidity services to its members (see, e.g., Parrot and Zandi, 2023) is not sufficient to justify its existence; after all, the financial markets provide those services as well, and there is an alternative, more appropriate, lender of last resort in the form of the Federal Reserve. Instead, there needs to be a clear market failure – that is, a significant externality, or asymmetric information, or market power – to justify having a GSE provide these services (over and above the Fed's LOLR).

suspect of insolvency. Moreover, lending to insolvent banks does not put an end to financial fragility.²⁰⁴

At a minimum, the considerations that apply to an LOLR should apply to an LONTLR. Yet, while the over-collateralisation of FHLB loans protects the FHLB, this does *not* mean that the borrower is solvent. When an FHLB provides credit to a weak bank that is or soon will become insolvent, its subordination of other creditors potentially increases the resolution cost that is borne by other banks and by taxpayers through the FDIC (see Chapters 5 and 8 for details on the Deposit Insurance Fund). Even worse, an LONTLR with few constraints will be tempted to sustain zombie banks (and their zombie clients) in a form of a stealth bailout that only delays and increases the eventual costs of resolving the insolvent institutions.

Unless a good justification can be provided, the ultimate policy goal should be to end the FHLB's role as US LONTLR. At a minimum, policymakers should consider ways to scale back that role:

1. One option is to require immediate disclosure by each FHLB of its advances (or, at least of advances beyond some size threshold) and of the lending conditions (including the collateralisation). In that way, other creditors would learn quickly about the potential strains that advance recipients may face, helping to focus scrutiny where it belongs. Given that this is materially relevant information for bank investors, it also should be straightforward to require the borrowing banks themselves to make this disclosure in their quarterly filings, rather than just in their annual filings.

204 The Federal Reserve did not lend to Lehman Brothers in September 2008 precisely because officials doubted its solvency. See Cecchetti and Schoenholtz (2016).

2. Alternatively, Congress could require that FHLB advances be tightly linked to housing credit, in line with the System's original mission.²⁰⁵
3. A third possibility is to limit the growth of advances by individual FHLBs and by the System as a whole, or to limit the growth or scale of advances to individual members (and to disclose those limits).
4. Finally, policymakers could impose limits on membership at multiple FHLBs or impose risk-based fees or credit risk transfer requirements (like those now in place for the services of Fannie Mae and Freddie Mac) that reduce the size of the government's subsidy.²⁰⁶

Conclusion

The FHLB System played an enabling role in delaying the three banks' receiverships and increasing the FDIC's resolution costs. The current spike in FHLB advances to many other banks could well be creating similar distortions.

If the FHLBs were ordinary market participants, then one might shrug and conclude that these were market judgments. But the FHLB System is special: It is a GSE, which means that it can fund itself more cheaply; and it has statutory seniority over all other creditors in the event that a borrower becomes insolvent. Both elements have the consequence of making the FHLBs less sensitive to their borrowers' financial positions and potentially adding to the burden of other federal agencies that are called on to resolve failed banks.

Any reform of prudential regulation in the wake of the costly failures of SVB, Signature Bank, and First Republic Bank should consider also the role that

²⁰⁵ Because money is fungible, the fact that a member uses residential mortgages as collateral for an advance from the FHLB System does not imply that the proceeds of that loan will be used to fund more residential mortgages. For evidence that this fungibility is a reality with respect to FHLB System advances, see Frame et al. (2012).

²⁰⁶ Layton (2020) and Judge (2023). For credit risk transfers, see Federal Housing Finance Agency (2022).

the FHLB System played and consequently consider changes in the FHLB System that would diminish its enabling role.

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10 STRENGTHENING SUPERVISORY AND RESOLUTION FRAMEWORKS

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Richard Berner²⁰⁷

Policymakers should strengthen bank supervision by addressing the roles played by interest rate risk and uninsured deposits, by improving resolution regimes, and by enhancing banks' total loss-absorption capacity.

The recent failures in US large, regional banking organisations – Silicon Valley Bank (SVB), Signature Bank and First Republic Bank – resulted from an excessive maturity mismatch between fixed-income long-term assets and uninsured deposit liabilities, fuelled first by the post-pandemic stimulus and then brought to a point of loss of depositor confidence in banks by the rapid tightening of interest rates. However, as explained in Chapters 1 and 4, these bank failures were also rooted in failures of bank risk management, of governance and of supervision. Chapter 4, in particular, recounts the specific recent failures in bank supervision. In this chapter, we revisit some of these failures and offer recommendations to mitigate those, as well as some broader, weaknesses in the bank supervisory framework.

Background

Bank regulation and supervision are critical to the safety and soundness of banks and the banking system. Together, they are charged with ensuring that banks are managed in a safe and sound manner, and by reducing the risk of bank failures, that the risk to the taxpayer and to the financial system of systemwide bank failures is prudentially managed.²⁰⁸ Given the criticality of this financial stability objective, regulators and supervisors ought to ensure

²⁰⁷ Without implicating them, I am grateful for conversations with and suggestions from Bill Coen, Jeremy Newell, Pat Parkinson and Paul Tucker.

²⁰⁸ These safety and soundness supervisory goals are typically the mandate of *prudential* supervision; conduct supervision addresses market integrity and protection of consumers and investors.

that bank risk management, governance and market discipline are aligned with sustaining banks' health for supporting the real economy.

Bank regulation sets rules and guidelines by which banks operate under the laws governing them, for example, the Glass-Steagall Act of 1933 or the Dodd-Frank Act of 2010 (DFA). Bank supervision, in contrast, involves examining and evaluating banks' risk management systems, financial conditions, and compliance with laws and regulations, and enforcing the rules. Bank supervisors are granted several tools to carry out these responsibilities:

- Supervisory stress tests to assess and calibrate the capital and liquidity buffers needed to absorb loss and provide some liquidity in stress;
- Examination and reporting authority to investigate banks, assess the quality of management and internal controls, and obtain information from them;
- Authority to require banks to comply with regulations and supervisory standards; and
- A resolution regime to enable supervisors to wind down failed or failing firms.²⁰⁹

Bank regulation and supervision are complementary; regulation implements the legal framework established by laws for the financial stability objectives, while supervision looks at each bank's activities using tools granted to the supervisory personnel by law and regulation, and is responsible for enforcement. Neither is sufficient; both are necessary. Performing these tasks is often compared to functioning as referees in a sports match, as traffic

²⁰⁹ Some would separate resolution authority from supervision, but deciding if and when to resolve a firm is a critical part of the job; not only is it based on supervisory criteria, but, as discussed below, it is essential for inoculating the system against infection by the actions of failing firms.

police on roads, or as fire wardens in a community.²¹⁰ These similes also underscore a key point: Failures in judgment on the part of bank regulators and supervisors, like bad officiating or bad policing, can undermine trust and acceptance of banking sector outcomes with attendant consequences for economic growth and its stability.

Recent Supervisory Failures and Proposed Remedies

The discussion about failures in bank supervision that contributed to the banking stress of 2023 has been extensive in the Fed's and FDIC's recent reports.²¹¹ In this chapter, we review four areas of failure: interest rate risk, liquidity risk, supervisory activities of examination and enforcement, and the resolution regime. The first two are discussed under preventive measures, the last two are discussed separately, and finally, we suggest recommendations for improvement in each case.

“Preventive” Supervisory Activity (Stress Tests and Backstops)

Interest rate risk: Rising rates weren't in any *supervisory* (Dodd Frank Act Stress Tests, i.e., DFAST, or Comprehensive Capital Analysis and Review, i.e., CCAR) stress test scenario, so the fact that the recently failed banks were exempt from annual stress tests would not have unmasked their interest rate risk (see Chapter 4). Obviously, this is a flaw in the scenarios for all banks, not just the three that failed.

However, supervisors are indeed required to assess interest rate risk in other ways. For example, the Basel Committee on Bank Supervision (BCBS)

210 The Fed uses a sports analogy: “In supervision, banks are more like the sports team and supervisors in many ways resemble the referees.” See Federal Reserve (2023a). However, as Meg Tahyar of Davis Polk (2023) notes, referees make calls in public, but supervisors use confidential supervisory information to evaluate a bank. In Congressional testimony, Former Federal Reserve Bank of New York President Dudley (2014) characterised supervisors as “fire wardens” who “[m]ake sure that the institution is run well so that it is not going to catch on fire” and become a “threat to the rest of the financial system.”

211 Board of Governors (2023b), Federal Deposit Insurance Corporation (2023).

spells out global standards for managing interest rate risk in the banking book (IRRBB).²¹² The US regulators believe (and the BCBS has agreed) that the Fed's longstanding guidance on interest rate risk (IRR) management is consistent with the final IRRBB standard, so that nothing "new" was needed to implement it.²¹³ That guidance requires banks to incorporate Economic Value of Equity (EVE) measurement and risk limits into their IRR management framework, which is reviewed by supervisors. EVE is the present value of all asset and liability cash flows on the bank's balance sheet, plus those accruing to off-balance-sheet items. But EVE is hardly precise; for example, as well as reducing the present value of asset and liability cash flows, significant increases in interest rates will affect the stickiness of deposits – as witnessed recently with regional banks – which in turn affects the cash flow calculations. As dire as SVB's voluntary EVE disclosures appeared – indicating a 27% decline in 2021 – they apparently assumed a pace of deposit outflows in response to rising rates (or the response of the cost of raising deposits to rising market interest rates – the so-called "deposit beta") that was far too optimistic.

Regardless of the standard used, supervisors in this instance did not require the three failed banks and other US "regional" banks to adhere to the relevant disclosure requirements, and more important, did not impose heightened supervisory expectations for measuring, managing, and controlling interest rate risk in the climate of rapidly rising interest rates over the past year.

212 Basel Committee on Banking Supervision (2019). The banking book includes assets that are not traded and generally held to maturity; e.g., loans.

213 This guidance is spelled out in Federal Reserve (1996). US regulators considered but rejected imposing a capital requirement for interest rate risk based on a supervisory measure of IRR because they were concerned about the complexity of rate risk and the potential inaccuracy of applying a single standard like that of the Basel IRRBB measure.

Arguably, such oversight, had it been effective, could have forestalled or delayed these failures.²¹⁴

Recommendations for bank regulators and supervisors:

1. Include “stagflation” or similar scenarios – with economic growth declining, inflation high, and interest rates rising – to test for interest rate risk on both sides of the balance sheet, i.e., assets as well as liabilities, at least annually, and with immediate implications for capital and/or liquidity buffers.
2. Provide for transparency as to the deposit beta assumptions made by each bank for different types of deposits and in different interest rate scenarios. These details could be particularly informative regarding the bank’s risk management practices.
3. Require midsized banks (those designated by the Federal Reserve as Category IV, with assets between \$100 billion and \$250 billion) to disclose, measure, manage and control interest rate risk as specified either by the Fed’s SR 96-13 or by BCBS SRP 31 (the IRRBB Supervisory Review Process). It is reasonable to require, as does SRP 31, that *“When a review of a bank’s IRRBB exposure reveals inadequate management or excessive risk relative to capital, earnings or general risk profile, supervisors must require mitigation actions and/or additional capital.”* (author’s emphasis).

Liquidity risk: Funding and market liquidity risk represent time-honoured vulnerabilities in banks and across the financial system. Banking involves

²¹⁴ Rodrigo Coelho, Fernando Restoy and Raihan Zamil (2023) acknowledge the potential need for “Further guidance that supports supervisors’ ability and will to act [that] may help to provide structure and consistency to supervisory decision-making, while allowing room for judgment.”

funding illiquid assets with demandable deposits, which makes it inherently unstable.

Funding with runnable liabilities creates liquidity risks, and runnable, uninsured bank deposits have played a key role in the current banking turmoil (whereas it was wholesale runnable liabilities that played a similar role in the banking and non-bank financial institutions' turmoil of 2007-2008).

Liquidity risk management and provision of liquidity backstops are two defences for limiting liquidity risks at banks.

Liquidity risk management: Supervisors provide guidance and oversight for liquidity risk management through the Uniform Financial Institutions Rating System (CAMELS ratings; the L stands for liquidity).²¹⁵ Specifically, to assess a bank's liquidity, examiners are supposed to look at interest rate risk sensitivity, availability of assets that can easily be converted to cash, *dependence on short-term volatile financial resources and asset and liability management (ALM) technical competence* (italics added). Notwithstanding their concerns about key deficiencies in liquidity risk management for SVB, and that "volatile financial resources" includes uninsured deposits, "examiners assigned the highest available CAMELS rating for SVB's liquidity management practices from December 2018 to June 2022."²¹⁶ Moreover, the criteria for liquidity risk assessment weren't transparent, and [supervisors have been found slow to require improvement](#).²¹⁷

Furthermore, regulatory and supervisory liquidity requirements, especially for Category IV banks, are flawed: Liquidity requirements (the Liquidity Coverage Ratio (LCR) or the Net Stable Funding Ratio (NSFR)) do not apply to

215 The CAMELS system evaluates a bank's condition on six criteria: Capital, Asset quality, Management, Earnings, Liquidity, and Sensitivity to market risk, especially interest rate risk. See Jose Lopez (1999).

216 GAO (2023), p. 17.

217 The Barr Report noted that "When supervisors did identify vulnerabilities, they did not take sufficient steps to ensure that Silicon Valley Bank fixed those problems quickly enough." See Federal Reserve (2023b).

Category IV banks. Instead, those banks are required to file monthly reports on their liquidity profile on form FR2052a (Complex Institution Liquidity Monitoring Report). But none of these would likely indicate stress; the LCR, the NSFR and FR 2052a are all backward-looking because they are based on historical data and current economic and financial circumstances rather than on forward-looking, projected stress. Perhaps such backward-looking metrics were a part of the basis for complacency of the Fed's November 2022 *Financial Stability Report* (FSR), which argued that "*Funding risks at domestic banks are low.*"²¹⁸

On paper, as prescribed in Fed Regulation YY, supervisors require Category IV banks "*to conduct quarterly internal liquidity stress tests (ILSTs) that include an overnight, 30-day, 90-day, and one-year timeframe and hold a buffer of highly liquid assets to meet its projected net stressed cash flow need over a 30-day period.*" The required LCRs are based on the 30-day timeframe results.²¹⁹ In practice, they observed in the post-mortem of SVB's failure that

*"However, SVBFG did not maintain a sufficient liquidity buffer to meet its own ILST prior to its failure. It should be noted that for the time period displayed in table 11, SVBFG was not subject to the LCR requirement, and it is possible that SVBFG would have managed its liquidity position differently and had different ratios had it been subject to the LCR requirement, including quarterly public disclosures."*²²⁰

One might reasonably ask why supervisors weren't aware of these issues before SVB failed, and if they were, why they did not enforce more stringent liquidity requirements.

218 Federal Reserve (2022).

219 Board of Governors (2023c).

220 Board of Governors (2023b) pp. 83-84.

Provision of liquidity backstops: Deposit insurance and central banks' lender of last resort (LOLR) functions are two key components of the safety net aimed at reducing the chance of bank runs. Chapter 8 of this report addresses deposit insurance reforms needed to reduce the runnability of deposits exposed by recent turmoil. The LOLR counters banks' instability and limits spillovers to the rest of the financial system and the economy by providing backstop liquidity to solvent firms that may face a run under stress. Banks need to self-insure against liquidity risks, but only the central bank can provide the instant liquidity needed in stress.

Recommendations for two significant changes through law, regulation, and supervision:

1. Improve liquidity stress tests and their supervisory oversight. In order better to spot emerging vulnerabilities, liquidity stress tests should be made more frequent for Category IV banks – at least monthly if not more frequently. Under the Fed's Regulation YY, Category IV banks are required to conduct such tests at least quarterly. That means supervisors have discretion to increase stress test frequency. But quarterly testing (and basing LCR calculations on such tests) in an era where liquidity circumstances change rapidly is not likely either to spot all risks or to adequately size liquidity buffers.

Internal liquidity stress tests should also be subject to greater supervisory review. As noted above, liquidity stress tests under current regulations rely on bank internal models (so-called Internal Liquidity Stress Tests, or ILSTs) and there are no supervisory liquidity stress test arrangements. So it is up to banks to specify the scenarios and results, and up to supervisors to review the ILSTs. As the IMF noted in its 2020 Financial Sector Assessment Program, “the requirements [for liquidity

stress testing] included in the Regulation YY are not very prescriptive, as banking organisations are free to choose the scenarios' assumptions with minimal regulatory constraints." IMF (2020).

As part of improved supervisory oversight, the Federal Reserve should broaden its Comprehensive Liquidity Analysis and Review (CLAR) programme. The Fed notes that:

*"The LISCC liquidity program assesses the adequacy of LISCC firms' liquidity position and liquidity risk-management practices through both horizontal and firm-specific examinations, in-depth reviews, and analyses conducted throughout the year. The Comprehensive Liquidity Analysis and Review (CLAR) is the horizontal component of this program. CLAR and the firm-specific liquidity assessments are conducted on a forward-looking basis, analyzing the firms' liquidity risk-management practices and resiliency under normal and stressed conditions."*²²¹

Liquidity risk management is the responsibility of firms, their management and their boards. But by limiting CLAR to Large Institution Supervision Coordinating Committee (LISCC) firms – those that are already identified as systemically important – the Fed has limited its capacity to review liquidity risk management practices and developments at large firms like SVB. Expanding the CLAR programme to Large Banking Organisations and broadening the scope of CLAR topics to forward-looking and regular review of key liquidity

221 Board of Governors (2019a).

- developments would raise to the level of the Board of Governors the importance of appropriate liquidity monitoring of the banking system.
2. Reform the lender of last resort (discount window) function. LOLR functions also need reform; while the discount window was available to Silicon Valley Bank, the Fed did not appear ready to lend to it and the bank did not appear ready to borrow. To avoid such a coordination failure, preparation for stress events is essential. Banks (and, in turn, their supervisors) should be fully equipped to use discount window borrowing to counter runs, rather than relying upon converting their holdings of high-quality, liquid assets (government debt) into cash to meet heightened liquidity demand.

To this end, three closely related reforms should encourage and prepare banks to use the facility, the Fed to prepare to make it available, and bank examiners to include this contingent support when they assess a bank's liquidity position.²²²

- *Encourage and prepare banks to use the facility:* Pledging and pre-positioning collateral in advance of stress would possibly have enabled SVB to borrow quickly at the discount window under stress. But the incentives to do so are lacking; neither regulation nor examination gives banks credit for showing that they have such arrangements and the resultant discount window access. Assuming that supervisors would do so, banks should pre-pledge loans or other economic-growth-enhancing assets as collateral with the Fed.

²²² Similar recommendations can be found in Baer, et.al (2023).

- *Encourage and prepare the Fed to make it available:* The financial crisis of 2007-2009 forever changed the attitude of central banks to provide liquidity to banks and the financial system under stress; the lesson from the crisis was to be aggressive and quick. But a stigma for use of the window remains.²²³ The Fed can and should aggressively reduce the stigma, and encourage banks to use the facility, by conducting joint supervisor-bank exploratory liquidity stress scenarios like those used by the Bank of England (2019).

In order to implement supervisory approval of discount window access as part of liquidity regulation, the Fed could also explore the use of fee-based lines of credit – Committed Liquidity Facilities (CLFs) – to supplement the discount window. The Reserve Bank of Australia introduced a CLF when sufficient Australian government debt was lacking.²²⁴ Nelson (2022) explains:

“Currently, banks primarily satisfy their liquidity requirements by owning Treasury securities (loans to the federal government) and reserve balances (loans to the Fed that are, in turn, invested in Treasuries). If the Fed created a CLF, and if any line of credit extended under the facility were recognised as an HQLA [by regulators and under the Liquidity Coverage Ratio (LCR)], a bank could instead lend to a small business, a student or a farmer and use the loan as collateral to back its line of credit with the US central bank.”
(Underscore added.)

223 Carlson and Rose (2017).

224 Debelle (2011) and Brischetto and Jurkovic (2021).

Nelson argues further that CLFs would help address the stigma of borrowing at the discount window by institutionalising these facilities in liquidity regulations for all banks and all jurisdictions: “there could be significantly less stigma associated with a CLF. Banks would be paying for the privilege of maintaining CLF capacity and could view use of the facility as a right. CLFs would be knitted into liquidity planning by bank management, bank regulation and bank examiners, and would look and feel different to the discount window.”

Together with pre-pledging collateral, CLFs are similar in purpose to former Governor of the Bank of England Mervyn King’s “pawnbroker for all seasons” proposal (see Chapter 8 for more details on this approach).²²⁵ It is worth noting that since Australia wound down its CLF, no other country has implemented CLFs. Supervisors should consider whether any moral hazard that might be associated with institutionalising such facilities exceeds that in the extensions of the safety net that recurrent liquidity shocks have triggered since the financial crisis of 2007-2009.

- *Encourage bank examiners to include this contingent support when they assess a bank’s liquidity position:* This should be straightforward. On paper, supervisory guidance already specifically recognises the value of the discount window as a source of contingency funding.²²⁶ In addition, the Fed’s Regulation YY states that “A line of credit may qualify as a cash flow source for

²²⁵ King (2016), King (2023) and Tucker (2023).

²²⁶ Board of Governors (2016).

purposes of a stress test with a planning horizon that exceeds 30 days.”²²⁷

In addition, policy needs to assess what is the proper role of the FHLB System as an alternative source of bank liquidity.

“Detective” and “Punitive” Supervisory Activity (Examination and Enforcement)

The Fed’s SVB post-mortem notes that its supervisors failed to adjust their supervisory framework to midsized banks’ rapid growth as they grew to become Category IV banks (over \$100 billion). For example, even the size threshold for more frequent action under the current Fed procedures involves significant inertia, being based on a four-quarter average of bank size. Moreover, migrating coverage of banks that transition from one size category to another involves a wholesale change of supervisory teams. As a result, supervisory reports for some of the failed banks were not timely, and the process of changing ratings – even after observing deficiencies – was slow.

Along with supervisors at the Federal Reserve Bank of San Francisco, those at the Federal Reserve Board of Governors were aware of potential problems at some of the recently failed banks, notwithstanding the flaws in stress tests and other oversight. For instance, in the November 2022 Supervision and Regulation Report, the Fed noted:²²⁸

“As economic conditions evolve, supervisors will be monitoring the potential effect on the operations and financial condition of supervised institutions, including

- *exposure to leveraged positions in interest rate-sensitive markets,*

227 Board of Governors (2023c).

228 Federal Reserve Board (2022b) especially Box 3. Note that the “S” in the CAMELS rating system that bank examiners use to evaluate banks stands for interest-rate sensitivity.

- *changes in liquidity and capital,*
- *changes in the stability of customer deposits,*
- *investment securities valuations,*
- *increases in bank and customer borrowing costs,*
- *potential declines in collateral values,*
- *impacts to the financial condition of customers, and*
- *availability of credit and financial services.”*

Put simply, the Fed had authority and discretion to use its supervisory tools on risky banks but chose not to. Some critics thus argue that because supervision relies so heavily on discretion, it makes consistent monitoring, guidance and enforcement challenging. Moreover, it can disintegrate into a check-the-box exercise rather than one focused on what can go badly wrong. In this view, tougher regulation and simpler, easier-to-enforce rules and procedures would provide a surer path to resilience. The reality is that a combination of more effective regulation *and* more rigorous supervision to enforce the rules is critically needed. In short, the United States must up its game in supervision.

Recommendations, in addition to those noted in Chapter 4 based specifically on the circumstances around Silicon Valley Bank:

1. Revise and update (or replace) the CAMELS rating system, to reflect current bank risks. As noted above, the CAMELS system evaluates a bank's condition on six criteria: Capital, Asset quality, Management, Earnings, Liquidity, and Sensitivity to market risk, especially interest rate risk. For each, it assigns a judgmental composite rating, on a scale of 1 (the best) to 5. The CAMELS system was created in 1979 and has not been updated to reflect all that has transpired in the past 44 years

(the “S” component was added in 1966), including regulations and supervisory guidelines that have superseded it or that are far more specific.

2. Require FDIC’s Prompt Corrective Action (PCA) – the roadmap for supervisors to enforce safety and soundness by compelling remedial action – to be both prompt and corrective. In particular, the PCA should be modified to be forward-looking and to incorporate *noncapital triggers* into PCA invocation and remedial actions. That is, PCA should reflect *multiple* risk factors, not just regulatory capital shortfalls, which are lagging indicators of bank health.²²⁹ For example, noncapital triggers could be those identified in unsafe and unsound banking practices: Poor underwriting and credit monitoring, excessive concentration risk, reliance on unstable funding sources, compensation tied to short-term performance without regard for risks, and weakness in risk culture and governance.
3. If options a and b are not feasible, supervisors should consider increasing the risk-absorbing buffer for banks – in the form of stricter capital and liquidity requirements.

Resolution and Total Loss-Absorbing Capacity (TLAC)

A resilient and effective financial system includes safe and sound banking firms and excludes failing ones or prevents them from operating as undercapitalised entities (aka, zombies or ones that are prone to engage in zombie lending to undeserving borrowers, which constrains or even chokes the growth in healthier parts of the economy). Thus, the *resolution regime*,

229 GAO, 2023, op. cit.

i.e., resolving failing banks – large or small – is a key part of supervision that can enhance financial and economic resilience.

To reiterate, it matters for four related reasons:

- To reduce moral hazard, including too big to fail, too many to fail, too interconnected to fail, etc. A strong resolution regime therefore causes the externality of bank failures to be substantially internalised by the banking system and minimises risk to the taxpayer from the failures.
- To prevent official sector lending to failing or failed banks and to avoid keeping zombie banks, and in turn, zombie borrowers, afloat. A strong resolution regime therefore enables central banks in their LOLR capacity to say no to fundamentally bust banks: *“The legislators’ role...would be ...to provide a statutory resolution regime for handling irretrievably bankrupt banks so as to make “no” from the LOLR credible.”*²³⁰
- To receive more and better bids for a failed bank at higher prices if officials have written off its truly bad parts so prospective buyers will bid for the good ones; and,
- To ensure that to stay healthy, banks lend to healthy borrowers, and to avoid having insolvent banks acting to keep insolvent borrowers afloat.²³¹

Historically, when a bank failed, the FDIC typically would arrange a sale to a healthy bank after placing the failed bank into an FDIC receivership for resolution (or in the case of bank holding companies, using the bankruptcy code). Alternatively, the FDIC would directly pay the depositors up to the insurance limit. The experience of the financial crisis of 2007-2009 showed that it is hard to find buyers for failed large, complex banks, and especially for

²³⁰ Tucker (2016).

²³¹ Cecchetti and Schoenholtz (2016).

parts of bank holding companies (BHCs) that aren't banks. And the FDIC's Deposit Insurance Fund (DIF) is too small to pay off lots of depositors in the case of large BHC or *en masse* bank failures. So regulators around the world created (orderly) resolution regimes to deal with such failures. As a result, large banks in life must create *living wills* to explain how they will be resolved if they fail, and to add *contingent debt capital* that converts to equity to finance the wind down.

In the United States., Titles I and II of the Dodd-Frank Act of 2010 created a resolution regime for failing or failed systemic (Large, Complex, Interconnected) financial firms and tools to effect it. Under Title II, bankruptcy is the first resolution option. Title I requires that such institutions – then defined as those with assets greater than \$50 billion – submit plans for how they would be resolved under the bankruptcy code in an orderly way. Title II created an Orderly Liquidation Authority (OLA) for banks that could not be so resolved. Global authorities agreed on protocols for resolving global firms – “*institutions that are (otherwise) global in life but national in death.*”²³²

The OLA of Title II goes beyond the bankruptcy process in Title I to reduce risks to the taxpayer in several ways. The most important one is the requirement that firms subject to it must self-insure to minimise risk to the taxpayer and to the central bank. Minimising risk to the taxpayer is achieved by regulators requiring large financial holding companies to issue substantial amounts of debt, with the advance understanding that this debt can be zeroed out or converted to equity in a resolution. This extra debt – part of what regulators call the firm's “total loss-absorbing capacity,” or TLAC – provides

232 The FDIC and the Bank of England in 2012 developed resolution strategies for large global firms. See Bank of England and FDIC (2012).

a significant cushion of protection against losses. In short, under OLA, the firm's losses are borne by shareholders, managers, and creditors – they are not bailed out. There is no provision for the government to put capital into a failing firm, as was done under the Troubled Assets Relief Program (TARP) programme during the financial crisis of 2007-2009. In the case of recent bank failures, for instance of SVB, one might argue that TLAC was the most important missing ingredient, as it would have reduced the cost to the DIF.

When SVB failed, the FDIC and the Federal Reserve chose not to use their Title II resolution authority. A possible explanation for this decision was that the groundwork had not been laid for the top-down, single-point-of-entry OLA process. More specifically, there had been no implementable living will, no issuance of TLAC, and no other arrangements for loss-sharing.²³³

Consequently, the failure of SVB will cost the DIF about \$16 billion.²³⁴ If, in the future, holding companies with assets between \$100 billion and \$250 billion are subject to Title II resolution procedures, it would strengthen this untested part of DFA. It would enable the FDIC to separate the viable parts of the firm from the others, thus improving the bids from would-be buyers. It would reduce the risk to taxpayers from extending credit to shaky firms. Resolving a midsized firm would be far easier than doing one of the eight US Global Systemically Important Banks.

Recommendations to achieve agreement by competent authorities now to implement the work that was started a decade ago to strengthen the resolution regime and TLAC, including the ingredients discussed above:

233 The extent to which the willingness and ability of the authorities to use OLA was impacted by the Economic Growth, Regulatory Relief, and Consumer Protection Act of 2018 and its implementing regulations is a subject of debate. See GAO (2020) and Chapter IV.

234 Martin J. Gruenberg (2023).

1. Workable recovery and resolution plans for Category IV banks (including living wills that focus on critical risks and preparations firms would make to resolve them).
2. A thick layer of “bail-in-able” debt (TLAC) to provide funding for Category I-IV banks that fail. TLAC would raise the cost to the bank of taking risk and reduce the incentives of liability holders to run.
3. Implementation of cross border home-host resolution protocols for Category I-IV banks. For effective resolution of internationally active intermediaries, it is necessary to identify jurisdictional differences, to harmonise them, and to coordinate the process of resolution between or among authorities.
4. In the United States, the authorities should give the OLA a chance to work in practice by implementing the FDIC’s resolution strategy: apply a single receivership at the top-tier holding company, assign losses to shareholders and unsecured creditors of the holding company, and transfer sound operating subsidiaries to a new solvent entity or entities.

To sum up, improvements in bank supervision are required in at least four key areas: interest rate risk, liquidity risk, supervisory activities of examination and enforcement, and the resolution regime. Federal banking agencies have the authority to address them all, though some specific recommendations may require legislation. The agencies should ask Congress for those increased authorities. Finally, while the Barr Report²³⁵ is a welcome assessment of what went wrong, it is only a first step toward an effective bank supervisory framework.

235 Board of Governors (2023b).

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APPENDIX: LIQUIDITY RISK IN NONBANK FINANCIAL INSTITUTIONS AND IN SYSTEMICALLY IMPORTANT MARKETS

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Richard Berner

This Appendix documents that liquidity risk creates vulnerabilities outside the banking system similar to those recently encountered in the stress or failures at US banks described in the rest of the book. Whereas solvency risk was the main concern during the Global Financial Crisis (GFC) of 2007-2009, now liquidity risk tops the list for risk managers, regulators and supervisors. Here we address some of the unintended consequences for liquidity and market stability of monetary and other policies.

Vulnerabilities in Non-bank Intermediaries and in Markets

As noted in Chapter 2, a long period of low inflation, interest rates and easy credit in the wake of the financial crisis likely convinced a generation of market participants, businesses, households, and policymakers that inflation and interest rate risks were not material, that market volatility would stay low, and that liquidity would be available on favourable terms. These beliefs led to complacency in risk management and excessive risk-taking, creating vulnerabilities in the financial system²³⁶

A key vulnerability is that liquidity has grown more scarce in the global financial system.²³⁷ The pandemic shock of March 2020 and the resulting “dash for cash” threw that vulnerability into sharp relief. Other shocks, such as those triggering money market stress in September 2019, indicate that the 2020 “dash for cash” wasn’t unique.²³⁸ Such shocks have increasingly triggered severe financial market dysfunction – impairing price discovery and

236 For example, Federal Reserve Bank of Boston (2018), and Committee on the Global Financial System (2018).

237 For example, the discussion in Brookings (2021), and Lorie Logan (2021).

238 Kahn, et. al. (2023).

smooth matching of buyers and sellers – creating instability in key markets that spilled over into the financial system. Some of these tremors are potential sources of run risk – amplified by maturity and liquidity mismatches as well as leverage – that create fire-sale vulnerabilities.

The reform programme in 2009-2010 strengthened banks overall but paid far less attention to their interest rate risk. Compared with its assessment of banks' resilience, it also paid less attention to the resilience of and vulnerabilities in non-bank financial intermediaries (including those constituting financial market infrastructure) and systemically important markets.²³⁹ Shocks – both from the pandemic in March 2020 and the recent surge in interest rates – exposed vulnerabilities in banks, in non-bank firms and in systemically important markets, all of which are critical to the functioning of the financial system and, in turn, to economic activity.²⁴⁰

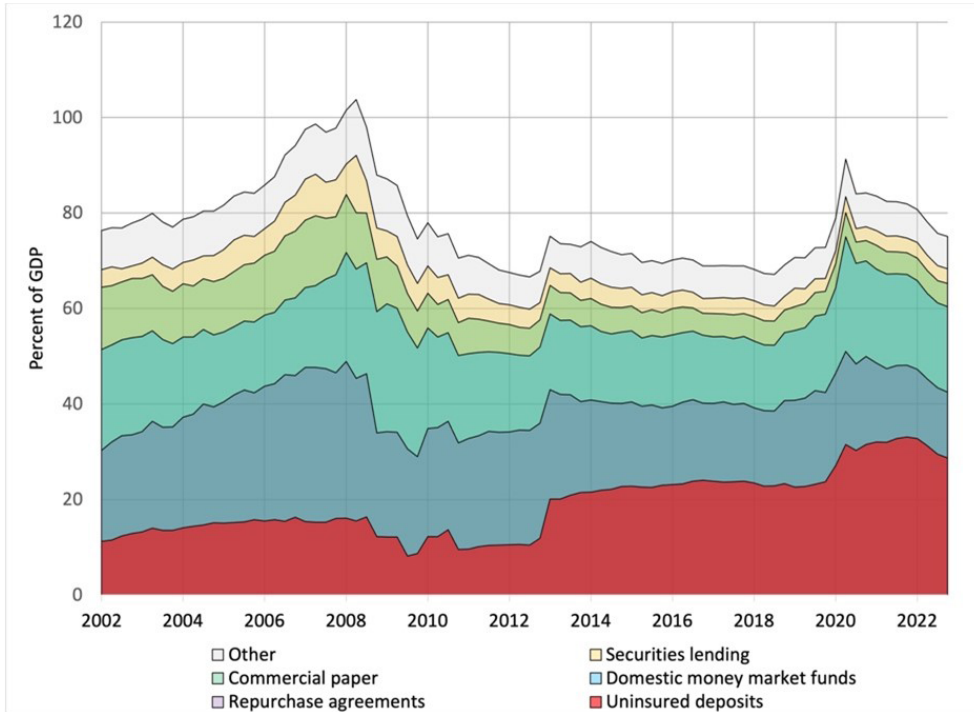
For example, the risks resulting from the runnability of banks' uninsured deposits apply equally to runnable, short-term non-bank financial liabilities such as repurchase agreements, securities lending and some money market mutual fund (MMF) assets – they are all so-called “runnables” and collectively amount to a significant amount of indebtedness of the overall financial sector (see Figure 1).²⁴¹

239 Systemically important markets include sovereign debt markets and the financing markets that enable transacting in them.

240 Berner (2022).

241 Bao, et. al. (2015). As of April 30, 2023, 77.7% of 'Domestic money market funds' shown in Figure 1 are government-only (including tax-exempt) funds.

FIGURE 1 "RUNNABLE" MONEY-LIKE LIABILITIES (PERCENTAGE OF GDP), 2002-2022



Source: Federal Reserve, *Financial Stability Report* Figure 4.1, May 2023.

Interest rate shocks can affect and create instability in a wide variety of assets. Although government-only MMFs are viewed as safer than uninsured deposits, even small shocks to the valuation of prime MMF assets can induce runs and spill over into banks as witnessed during the fall of 2008 and March of 2020. Furthermore, rising interest rates have reduced the value of assets on the balance sheets of not just banks but also of non-banks engaged in maturity and liquidity transformation. Indeed, in the United States, non-banks operating through securities markets account for more than half of intermediation. Finally, even in Europe, where the financial system remains bank-centric, the growth of such interest rate sensitive assets in balance sheets of non-bank financial intermediaries pose threats to financial stability.²⁴²

242 Schnabel (2021).

Although changes in macroeconomic circumstances can expose vulnerabilities, these vulnerabilities partly result from post-financial crisis changes in market structure that have changed the nature of liquidity demand and supply across markets. Identifying the sources of demand for and supply of liquidity under stress, and deciding how to reduce and improve them, respectively, are thus critical priorities for regulators, supervisors and risk managers.

What are the changes in market structure and other factors that have altered the nature of liquidity demand and supply across markets? A partial list of those factors is provided below:

- Massive issuance of sovereign and private debt has increased the demands on the balance sheets of broker-dealers, while these traditional providers of liquidity appear to be less able and willing to supply it. According to Bank of America, broker-dealers' share of Treasury market making has shrunk dramatically over the past 15 years: Before 2008, primary dealer volumes were equivalent to about 15% of the value of Treasuries outstanding; now that is just 2.5%.²⁴³ And, as noted in the Group of Thirty (2021, 2022), *"The root cause of the increasing frequency of episodes of Treasury market dysfunction under stress is that the aggregate amount of capital allocated to market-making by bank-affiliated dealers has not kept pace with the very rapid growth of marketable Treasury debt outstanding, in part because leverage requirements that were introduced as part of the post-global financial crisis bank regulatory regime have discouraged bank-affiliated dealers from allocating capital to relatively low-risk activities like market-making."*

243 Paul Davies (2022).

- The use of collateralised intermediation, especially in central clearing, reduces counterparty risk but transforms it into liquidity risk.²⁴⁴
- A combination of regulatory arbitrage and the rise of principal trading firms (PTFs) has shifted liquidity supply away from banks and shifted liquidity risk from intermediaries to asset managers and other investors. At least in one notable episode, activities by both PTFs and bank dealers appeared to result in a significant decline in market depth.²⁴⁵
- Securities financing transactions that involve “runnables” like repo with no proper liquidity backstop create fragilities that impair market liquidity and the functioning of securities markets.
- Leverage combined with procyclical vulnerabilities in “market-based finance” – part of which is shadow banking – amplify shocks, partly through the interplay among leverage, funding, and market liquidity.^{246, 247}
- Open-end fixed-income funds (bond mutual funds, loan mutual funds, exchange-traded funds, etc.) that take liquidity and maturity risk account for growing shares of fixed-income demand.²⁴⁸

These changes have altered the way systemically important markets respond to stress. Indeed, unlike the financial crisis of 2007-2009, in which solvency was the primary market and policy concern, the “dash for cash” during the

244 King et. al. (2020) and Breeden (2022).

245 US Treasury Department et. al. (2015). In the “flash rally” of October 15, 2014, there was a significant reduction in market depth. According to joint agency analysis, that “appears to be the result of both the high volume of transactions and bank dealers and PTFs changing their participation in the cash and futures order books. During the event window, bank dealers tended to widen their bid-ask spreads, and for a period of time provided no, or very few, offers in the order book in the cash Treasury market. At the same time, PTFs tended to reduce the quantity of orders they supplied, and account for the largest share of the order book reduction, but maintained tight bid-ask spreads. Both sets of actions prompted the visible depth in the cash and futures order books to decline at the top price levels.”

246 “Market-based finance refers to the system of markets (e.g., equity and debt markets), non-bank financial institutions (including investment funds, hedge funds, pension funds, and insurers) and infrastructure (such as central counterparties and payments providers) which, alongside banks, provide financial services to support the wider economy.” See Bank of England (2021).

247 See Brunnermeier and Pedersen (2008) and Adrian and Shin (2010).

248 See Falato et. al. (2021) and Bank of England (2021).

pandemic underscored fragilities in the functioning of funding and securities markets. The evidence includes spikes in secured, short-term funding rates rather than declines as in the 2007-2009 crisis; runs from non-government MMFs into government MMFs and from bond mutual funds; surging offshore dollar liquidity demands and sales of Treasury securities, especially from foreign official holders, that widened the foreign exchange (FX) swap basis, Treasury bid-ask spreads and the Treasury cash-futures basis; declines in market depth; and procyclical jumps in margins/haircuts at central counterparties (CCPs).²⁴⁹

Broadly, as noted by Hauser (2023), *“we face a new era of liquidity risk, originating outside the banking system, that can amplify shocks, destabilise core markets and undermine monetary and financial stability.”*

Policy Responses and their (Unintended) Consequences

Against this background, the responses to the pandemic shock of the Federal Reserve (Fed) and other central banks were appropriate in the short run. They also were decisive, with backstops to facilitate market functioning and programmes to limit the adverse consequences on asset prices and the supply of credit. However, these responses also created the unhealthy expectation that central banks will always be there to limit the effects of shocks on asset prices. As Hauser (2021) notes, *“...the use of ad hoc tools [while justified in the event of the Covid shock] risks embedding inappropriate expectations about how central banks might behave in future cases of market dysfunction.”* Worse, those responses masked the real vulnerabilities in non-bank intermediaries and markets that likely will threaten financial stability again.

249 For example, SEC (2020), Financial Stability Board (2020), Barth and Kahn (2021), Vissing-Jorgensen (2021), and Brainard (2021).

As central banks continue to raise rates and shrink their balance sheets, they are returning duration and convexity to the fixed-income markets.²⁵⁰ More generally, rising interest rates can diminish the confidence of holders of runnable liabilities that represent claims against exposed assets, raising the price of liquidity and tightening credit conditions.

In addition, the Fed's "ample reserves" monetary policy operating regime, involving the use of an Overnight Reverse Repo Facility (ONRRP),²⁵¹ combined with the reduction in the Fed's balance sheet since March 2022, may have amplified risks to bank deposits and to funding for non-banks.²⁵²

The Fed staff noted in 2015 that "*there may be adverse effects stemming from the possibility that such a facility – particularly if it offers full allotment [i.e., providing unlimited liquidity at a fixed price] – could allow a very large, unexpected increase in ON RRP take-up that might enable disruptive flight-to-quality flows during periods of financial stress.*"²⁵³

Indeed, as Figure 2 highlights, when interest rates began to rise in 2022, government-only money fund holdings of Treasury bills and private repo declined, while these funds sought returns in the ONRRP facility. In effect, ONRRP made it easier for money funds to earn competitive money market rates and effectively reduced bank market power over deposits.

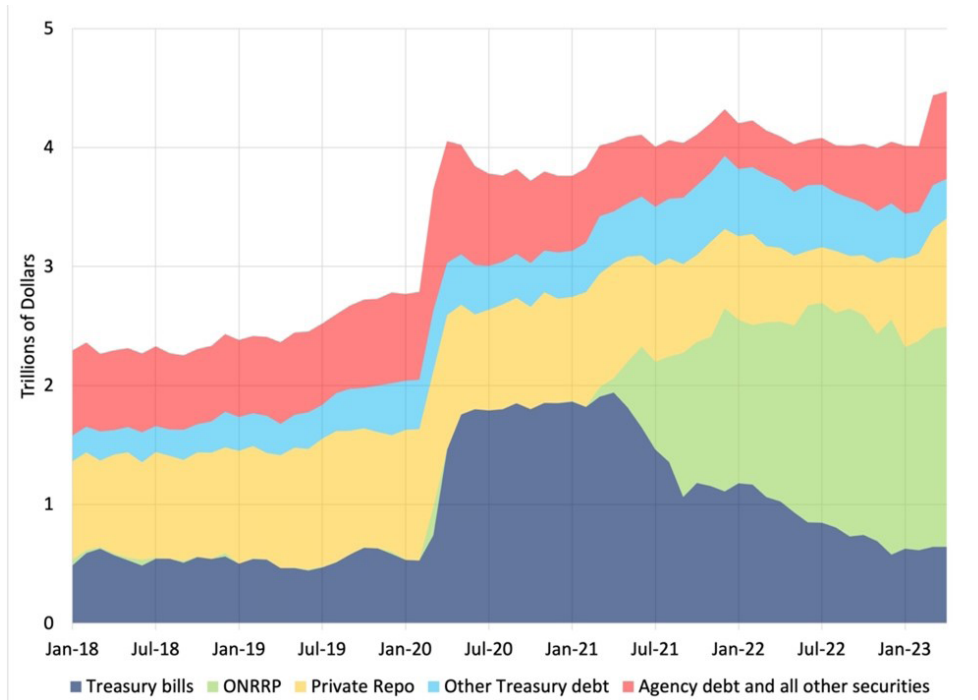
250 Duration measures the effect of interest rate changes on bond prices, measured in years. Convexity measures the nonlinearity or curvature of that relationship; i.e., how much duration will change with changes in interest rates.

251 The Fed's operating regime changed during the 2007-2009 financial crisis, when it pursued ultra-low interest rates and large-scale asset purchases, and began to pay interest on reserves. The combination reduced the central bank's control over its policy rate, so in response, the Fed introduced ONRRPs, and a facility to implement them.

252 Afonso et. al. (2023).

253 Frost et. al. (2015) and Federal Reserve (2015).

FIGURE 2 GOVERNMENT MONEY MARKET FUND HOLDINGS (TRILLIONS OF US DOLLARS), 2019-2023



Source: Reproduced from Chart 3 in Marsh and Sengupta (2022).

The overall implication is that the higher rates available in and the safety of the facility amplified the decline in bank deposits, especially in uninsured deposits. In the weeks following the emergence of recent banking stress in March 2023, usage of the ONRRP facility (green shading) rose by around \$300 billion. It appears that as depositors fled from uninsured deposits to MMFs, which are the major counterparties of the facility, the ONRRP absorbed a significant portion of the runoff. Figure 3 indicates that usage of the facility has risen steadily since mid-2021 and recently fluctuated around \$2.2 trillion.

FIGURE 3 OVERNIGHT REVERSE REPURCHASE AGREEMENTS (BILLIONS OF US DOLLARS), MAY 2021-JUNE 2023



Source: Federal Reserve Bank of New York.

A key lesson from the financial crisis of 2007-2009 is that a holistic, systemwide approach is needed to address vulnerabilities – especially now from liquidity risk – and to build resilience in the financial system. It would be unfortunate if the recent episode of banking turmoil deflected attention from that holistic approach and the critical need to address liquidity risk outside of banks – in non-bank financial intermediaries and systemically important markets – that can spill over to banking. Both require implementing the principle of “same activity, same risk, same regulatory outcome.”²⁵⁴

²⁵⁴ Carstens (2019) and Metrick and Tarullo (2021).

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