

US BANK FAILURES SPRING 2023

Part Two: Real risks, (mis)diagnoses, (mis)recommendations

Júlia Király – András Mikolasek¹

ABSTRACT

In March 2023, a banking panic hit the US market and affected Europe. The panic proved short-lived with no lasting real economic consequences, which would justify a complete overhaul of the current banking model. In the first part of our study, we set out the details of the three selected US banks' paths to failure. In the current second part, we analyse the three cases by digging deeper into the risks for banks. We show that the sophisticated risk indicators could not reliably predict such a panic and its consequences. Rather, it was the banks' flawed business models and corporate and risk management cultures that played a key role in the failure, and their inability to manage the risks arising from rapid growth and interconnected customer networks. Future supervisory investigations need to focus on this rather than mechanical indicator analysis.

JEL codes: E4, E5, G21, G28, G33

Keywords: bank crises, bank failures, bank panic, Silicon Valley Bank, Silvergate Bank, First Republic Bank

1 INTRODUCTION

In the first part of this paper, published in *Economy and Finance* 2023, issue 3, we summarised the brief history of the series of bank failures. We highlighted the three major US banks, Silicon Valley Bank (SVB), Signature Bank and First Republic Bank (FRB), which are mainly based in California, and analysed their business models and development history, with a special focus on the last three years. We showed that prior to COVID, the banks were seemingly healthy, profitable and safe. We described the big shift that Covid triggered, the emergence of an abundance of liquidity, accompanied by a rapid increase in bank deposits, followed by the steepest cycle of interest rate rises in forty years, which triggered

¹ Júlia Király, IBS Budapest. E-mail: jkiraly@ibs-b.hu.

András Mikolasek, Budapest Corvinus University. E-mail: andras.mikolasek2@uni-corvinus.hu.

a contraction in liquidity and deposits and a rapid depreciation of fixed rate assets. This surge has also been a major factor in the subsequent stalling of the tech sector recovery. We have analysed the response of the banks under review to the big shift, the unexpected and extremely rapid growth in their size, the surge in deposits and the problems triggered by the surge in interest rates. We showed that, although many of their financial indicators continued to show the picture of a healthy bank, the panic in the markets knocked these banks off their feet because their closed customer base, the concentration and interconnectedness of their customers and the high proportion of uninsured deposits made them the most vulnerable of similarly poorly managed banks.

The series of bank failures in the spring was the first major systemic threat to financial stability since the global financial crisis, so it is not surprising that almost every banking analyst in almost every country reacted immediately. Various diagnoses were made, with a wide range of therapeutic proposals. Almost all the major banking experts have spoken out in one form or another (e.g. *Bair*, 2023; *Cecchetti–Schoenholtz–White*, 2023; *Kelly*, 2023; *Véron*, 2023; *Admati–Hellwig–Portes*, 2023; *Danielsson–Goodhart*, 2023; *Dewatripont–Praet–Sapir*, 2023; *Tucker*, 2023; *Wolf*, 2023a; 2023b). A long debate has unfolded on one of the most popular European economic blogs, *VoxEU.org*², and the New York Stern Business School has published an online volume on lessons from the crisis with the help of world-renowned banking experts (*Acharya et al.*, 2023), and a number of excellent analyses have been published on the Bank Policy Institute, the platform for the most prominent US banks, and on the *BanReg* blog site, which provides excellent analysis.

In May 2023, the Clark Center, known for its surveys on economics, asked only US academic economists two questions on the essence of banking (CCF, 2023a), and in September 2023 it asked both US and European economists on the economic policy steps needed after the crisis (CCF, 2023b; 2023c). As we will return to the results of the survey several times later, we have summarised the questions and the distribution of responses in a table (*Table 1*):

2 <https://cepr.org/voxeu-debate-lessons-recent-stress-financial-system>

Table 1
Clark Center Forum (CCF) survey of academic economists
in the US and Europe*

	Where, when	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree	
Since maturity transformation is an inherent feature of commercial banks' business model, some duration mismatch between assets and liabilities is unavoidable.	US 2023 May	22%	45%	4%	28%	0	99%
The response to recent bank failures should be to: Expand central banks' lender of last resort facilities for banks.	US 2023 September	0%	52%	14%	34%	0%	100%
	Europe 2023 September	0%	26%	39%	27%	9%	101%
The response to recent bank failures should be to: Substantially increase the limit on bank deposit insurance.	US 2023 September	0%	46%	22%	33%	0	101%
	Europe 2023 September	2%	29%	14%	42%	13%	100%
The response to recent bank failures should be to: Substantially increase bank capital requirements.	US 2023 September	13%	79%	8%	0	0	100%
	Europe 2023 September	24%	49%	14%	9%	5%	101%
For the purposes of capital regulation, banks should be required to mark their holdings of Treasury and Agency securities to market at all times (even though their loans are not marked to market).	US 2023 May	21%	43%	28%	8%	0%	100%
The response to recent bank failures should be to: Use market values of all traded assets to compute banks' regulatory capital.	US 2023 September	27%	29%	31%	13%	0	100%
	Europe 2023 September	9%	39%	30%	23%	0	101%

Note: * Responses were weighted according to the degree of conviction of the respondents. In total, 30 US and 35 European economists answered the questions.

All the bodies with some interest in the supervision, oversight or evaluation of banks have produced their own reports, which will be quoted several times in later chapters (CRS, 2023; DFPI, 2023; DFS, 2023; FDIC, 2023a; 2023b; Fed, 2023b; GAO, 2023; OIG, 2023). The full transcripts of the hearings held in the US by the relevant Senate and Congressional committees, which were not free of political demagoguery, are available at³ (a good summary is provided by *Meade, 2023*). The

3 <https://www.banking.senate.gov/hearings/examining-the-failures-of-silicon-valley-bank-and-signature-bank>; <https://www.banking.senate.gov/hearings/strengthening-accountability-at>

testimonies of former bank executives are very instructive (*Becker, 2023; Roffler, 2023; Shay, 2023*).

Last but not least, there are good analyses in Hungarian that go beyond the newspaper reports (e.g. *Király, 2023; Mérő, 2023; Nagy, 2023; Zsiday, 2023a; 2023b*). Half a year after the banking crisis, we can see that this panic has remained an isolated phenomenon, has not spread, and has not resulted in measurable losses to the real economy. But it has eaten up taxpayers' money on both sides of the ocean. In the US, the losses are realised by the FDIC (Federal Deposit Insurance Corporation), it is not yet possible to see exactly how large (estimated at around 30 billion *Acharya et al., 2023:167*). The FRB was bought almost entirely by JPMorgan after a quick tender. SVB's remaining deposits were taken over by First Citizen Bank, and Signature's by a subsidiary bank of New York Community Bancorp. The buyers bought some of SVB's and Signature's assets at a very depressed price (20-30 percent of book value⁴), with the bulk remaining in FDIC custody for the time being⁵. The result of the mergers and acquisitions is quite clear: the purchase at depressed prices has already this year caused the bidding banks to make billions in attributable profits and capital gains, not only for the US banks but also for UBS, which is absorbing the Credit Suisse (*Indaap, 2023*). This has meant billions in losses for the taxpayers. It is therefore not surprising that criticism of the banking system as a whole has intensified.

In this paper, we delve into the history of the three US banks, but avoid delving too deeply into specific US banking market anomalies that are much better known by our US colleagues, such as the inevitably recurring liquidity disruptions in the sovereign debt market (*Duffie, 2023*), the liquidity disruptions affecting the US banking system as a whole (*Acharya–Rajan, 2023*) or the role of the FHLB shadow central bank (*Cecchetti et al., 2023*).

We do not discuss the debate on deposit insurance, despite the fact that a high proportion of uninsured deposits was one of the reasons for the failure. We do not believe that changing the deposit insurance limit would have resulted in a substantially different situation. We agree with the academic researchers on this point: on neither side of the Atlantic is it considered necessary to raise the deposit

the-federal-reserve-lessons-and-opportunities-for-reform; <https://www.banking.senate.gov/hearings/oversight-of-financial-regulators-financial-stability-supervision-and-consumer-protection-in-the-wake-of-recent-bank-failures>; <https://financialservices.house.gov/calendar/eventsingle.aspx?EventID=408768>;

4 Some even suspected that the whole bank run was in fact just a staged prelude to a hostile (cheap) takeover (*Indaap 2023*).

5 <https://www.fdic.gov/news/press-releases/2023/pr23023.html> and <https://www.fdic.gov/news/press-releases/2023/pr23021.html>

insurance limit. In the Clark Center survey, 46% of US economists and only 31% of Europeans thought that raising the limit was a proposal worth considering (despite the much lower limit in Europe, at just €100,000 compared to \$250,000). We also do not enter the debate on whether it was a good move to pay off the uninsured deposits of the SVB and Signature, agreeing with the arguments of former FDIC head *Sheila Bair* (Bair, 2023) and two prominent banking researchers (Rajan and Zingales, 2023) that it was a bad idea, although it did seem to mitigate panic at the time.

In principle, we will refrain from deeper analysis of the US regulatory and supervisory environment, as our US colleagues who live in it are much more knowledgeable (see for example Acharya et al 2023, Cecchetti–Schoenholtz, 2023; or the Bank Reg Blog analyses). However, we should still mention the US regulatory and supervisory environment in the context of risk analysis, and this is the subject of the short *Chapter 2*. We then look at the “two Achilles heels”, of banks: liquidity and interest rate risk. In *Chapter 3*, we look in great detail at the features of liquidity risk measurement, management and mitigation in failed banks’ practices, and reflect on what could have been done differently, and then in *Chapter 4* we do the same with interest rate risk in the banking book (IRRBB). In *Chapter 5*, we discuss the corporate governance issues related to risk management. *Chapter 6* meditates on the size and measurement of regulatory capital and, in this context, the valuation of bank assets. In *Chapter 7* a few proposals that can be called corner solutions will be outlined, which go beyond the nowadays banking model. Finally, in *Chapter 8* we briefly summarise our main findings.

2 THE US BANKING REGULATORY AND SUPERVISORY ENVIRONMENT COMPARED TO THE EU

In Europe, even the smallest banks are regulated and supervised on the basis of the Basel principles, and within the European Union there are not only more and more *regulations* that cannot be changed by individual countries, but there are also fewer and fewer differences in the implementation of directives between countries. One of the most important lessons of the global financial crisis has been the transformation of the European supervisory system: the European Central Bank supervises the big banks that pose a systemic risk in Europe, the three largest banks the countries that have joined the Banking Union (including all euro area countries). For the other banks and for banks in countries outside the Banking Union, responsibility lies with the national central banks or independent national supervisors. The European Banking Authority (EBA) sets supervisory guidelines uniformly in Europe and these are generally applied uniformly in

all countries. This is not to say that European banking regulation and supervision is flawless, but it is an indication that this time the US banking panic did not spread to the European single banking market, as Credit Suisse was *not* a bank in a member state of the Banking Union. It should be noted here that Hungary is not a member of the Banking Union.

In the US, both regulation and supervision are much more fragmented. The Bank Regulation blog (Bank Reg Blog, 2023a; 2023b) provides an excellent summary of this and the changes that are expected in the near future.

Regarding the regulation, the short point is that the regulation (the famous Dodd-Frank Act), which was introduced uniformly after the global financial crisis, was significantly relaxed for small and regional banks, especially during the *Trump* administration in 2018⁶, as a result of which, for example, none of the banks we examined participated in the federal stress tests, but they did not have to calculate the liquidity and interest rate risk ratios as redefined in the Basel guidelines, and in their case the requirements for the organisational system of risk management were also relaxed. This illustrates the classic theorem of banking theory that the next banking crisis always starts with a relaxation of the rules adopted during the previous crisis. In the wake of the March bank panic, it is expected that the relaxation will be withdrawn, at least for banks with a balance sheet total of more than USD 100 billion.

The weaknesses in regulation may be counterbalanced by a very strong professional supervision. However, in the US, the work of banking supervision is even more complex than regulation, and despite efforts to simplify and concentrate after the global financial crisis, it remains fragmented among several supervisory bodies. Among the banks we examined, Signature Bank and FRB were federally chartered banks (essential: not bank holding companies) that were not part of the federal banking system by choice, and thus were supervised not by the Fed, but by the FDIC. Accordingly, it was the FDIC, not the Fed, that prepared the examination report on the failure of these banks (FDIC, 2023a and 2023b). Although SVB was originally a regional bank, also incorporated in the State of California, it was subject to supervision by the Fed as a major bank holding company with foreign (British) interests, and the Fed prepared the examination report on its failure (Fed 2023b). Banks supervised by the Fed are divided into four groups by size, and as banks grow in size they face increasingly rigorous supervisory procedures. This is similar to the organizational structure of the ECB's Supervision Department. The SVB was transferred at the end of 2021 from the Fed's RBO (Regional bank-

6 <https://www.congress.gov/bill/115th-congress/senate-bill/2155>. The law was signed into law by President *Trump* on 24 May 2018.

ing organizations) department, which supervises regional banks, to the LFBO (Large and foreign banking organizations) department, which is responsible for large banks. The supervisory requirements for the SVB have changed radically, to the extent that the SVB has hired an advisor (E&Y) to meet the changed requirements. The fragmentation of supervision is also characterised by the secondary supervisory powers of special state institutions⁷, which have the take possession of banks and appoint the FDIC as receiver for sale or liquidation.

Both the Fed's RBO department and the FDIC still rely on the traditional CAMELS analysis for rating banking risk. This rating system (although still often the only one used in textbooks) generally indicates a lower level of risk than reality, so it is no coincidence that 97 percent of the supervised banks have consistently satisfactory or excellent supervisory ratings (Bank Reg Blog, 2023a). It is therefore not surprising that the CAMELS ratings of all three banks under review were satisfactory, or even excellent, until the very last moment: until SVB was transferred to LFBO, i.e. until 2022, Signature until Q3 2022 and FRB until the moment of failure, spring 2023(!). SVB had virtually no supervisory warning before 2021.⁸ Looking at the supervisory reports of the individual banks, it is striking how different the supervisory culture is from the Fed LFBO department, which has the expertise and resources to examine the big banks. If the failed banks had been examined with the same thoroughness and professionalism as the SVB in its last year, it is possible that problems would have been detected earlier.

The US practice of having local businessmen, including bank executives, on the boards of Federal Reserve Banks is unusual, at least from a European perspective. It is odd, to say the least, that SVB CEO Greg Becker, representing the sector, sat on the FRBSF (Federal Reserve Bank of San Francisco) board from 2019 until the bank's demise, and *Jim Herbert*, the founding president of the FRB who resigned shortly before the crisis, has been a member of the advisory board since 2019. While neither function allows for interference in supervisory work, or even insight into supervisory investigations, there is some conflict of interest in the practice, as the OIG report (OIG, 2023) points out.

Before we consider the supervisors to be completely irresponsible and incompetent, it is worth pointing out that on 14 February 2023, the supervisors presented a summary to the Fed Board on the possible negative effects of sudden interest rate hikes on the banking system and the expected financial turbulence, in which

7 The California Department of Financial Protection and Innovation (DFPI) for SVB and FRB, and the New York State Department of Financial Services (DFS) for Signature.

8 After 2019, the number of supervisory recommendations requiring immediate or non-immediate „attention” (54 in total), MRAs and MRIAs (MRIA - measures requiring immediate attention, MRA - measures requiring attention).

they specifically drew attention to the seriousness of the situation around the SVB (Fed, 2023a:5).

3 MEASUREMENT, MANAGEMENT AND MITIGATION OF LIQUIDITY RISK

Indeed, the simplest way to *measure liquidity risk* is to define the simple liquidity ratios known from CAMELS – liquid asset ratio, deposit funding ratio, external funding, cash ratio, etc. As the banks under examination had a high ratio of liquid assets, were essentially deposit-funded, had a negligible reliance on the money market and a cash ratio in line with the sector average, it is not surprising that they received an excellent rating from their supervisors. There is no risk threshold for these indicators, it cannot be said that 70 per cent deposit funding is “less risky” while 60 per cent “risky”. It is possible to compare the indicator to the average of the sector or peer group, but then all that can be said is that the bank is riskier or less risky on the basis of the indicator. This comparison is meaningless if the benchmark group or the banking sector as a whole has built up severe liquidity risks, e.g. such as before the global financial crisis.

In the CAMELS rating, banks are generally rated better or worse according to band limits defined as a rule of thumb, but this is not supported by deeper mathematical statistical analysis. The traditional CAMELS-based risk measure is therefore imperfect in two respects: a bank’s liquidity risk can be high even for so-called ‘good’ values, and there is no statistical or other analysis to determine what is a ‘good’ value. In other words, these indicators give an indication, but only a very imprecise indication.

The share of uninsured deposits is not included in the CAMELS analysis measuring simple liquidity risk. If it were, the question arises – as with traditional CAMELS indicators – what is a “good” value. The sector average? In the US, the sector average for large banks was 41 percent in 2022 (Fed, 2023b) – how much liquidity risk does this indicate for the sector as a whole? There is no doubt that the ratio was high for SVB and Signature, as it was more than double of the sector average, but does this indicate twice as much risk or a little more? As with uninsured deposits, the ratio of the largest one, three, five or ten deposits to total deposits is an indicator of liquidity risk, but not well calibrated.

There is no need to throw out the ratio indicators, it is just clear that they alone cannot be used to calibrate or manage risk well. One classic liquidity indicator is the loan-to-deposit ratio, which had a rule-of-thumb limit of 90 percent in the 1980s (it was even in textbooks), and then in the 2000s, under the spell of modern liquidity management, this limit rocketed to as high as 150 percent. After the

global financial crisis, no textbook limit was set but banks are trying to keep the ratio much below 90 percent to achieve a good credit rating, and to ensure an adequate volume of long-term customer funding.

Let's look at more sophisticated liquidity risk measures that go beyond simple ratio indicators.

One of the simplest “models” to measure liquidity risk is the so-called *maturity ladder*, which measures banks' short-term and longer-term liquidity needs under very simple assumptions. The maturity ladder is the simplest static model, at its core a cash flow forecast: it predicts how much liquidity the bank will need or have in surplus the next day, week or month if it does nothing. The liquidity demand – to which the treasury must respond in any case – can also be assessed according to a kind of rule of thumb, whether it is “small” or “large” relative to the bank's balance sheet as a whole or to the expected bank activity in the coming days. If the maturity ladder of the three banks for any day in 2022 were available, we would probably not see any liquidity risk, as normal business entry does not assume that banks will be run. When the maturity ladder is compiled, 80-90% of the bank's demand deposits are normally considered stable deposits, they are not accidentally included in the “liabilities maturing tomorrow” category, and are more often than not considered to be of infinite maturity. The model gives an indication of the liquidity position in a stress-free situation, and does not include the assumptions of a withdrawal of deposits in a stress situation or a shutdown of financial markets.

The global financial crisis, in particular the severe liquidity shortage after Lehman Brothers led to a rethinking of the way liquidity risk is understood and measured: it became clear that bank liquidity should be examined in stress situations. Banks' reliance on the money market should be reduced, stable funds should be relied on, and liquidity squeeze should be covered by high quality liquid assets. Mandatory liquidity stress tests for banks and new liquidity risk indicators have been introduced. This led to the development of the two basic risk measures in use today, the LCR (Liquidity Coverage Ratio) and the NSFR (Net Stable Funding Ratio). The LCR is supposed to show whether banks have sufficient high-quality liquid assets to survive a 30-day stress situation, and the NSFR is supposed to show whether they have sufficient stable funding to finance their longer exposures.

The NSFR could have been a problem for FRB, which is stuck in long mortgage loans, if it had mattered, but it probably would not have been a serious funding problem for it either, given its stable deposit base. In the case of Signature Bank, which has mostly short-term securities and bonds, and SVB, which has significant customer funding, it is unlikely that the NSFR would have indicated a long-term liquidity risk. However, this is only an assumption, as there is insufficient

data in the financial reports to calculate the NSFR, and to our knowledge no one has reconstructed the NSFR ratios.

From a construction point of view, the LCR can even be seen as the inverse of the well-known capital adequacy ratio. In the case of the capital adequacy ratio, certain capital elements, defined by the regulator and classified in different categories, are divided by some risk-weighted value of the assets, where the risk weights can be considered as a loss of value in an extreme scenario. The LCR is calculated by dividing certain liquid assets of different categories, defined by the regulator as high quality, by the weighted value of the liability side (adjusted by expected cash inflows), where the *run-off ratio* is in principle a measure of the rate of outflow of funds in a stressed situation. However, while the risk weights used in the calculation of the capital adequacy ratio are now backed up by empirical research using sound statistical methods, the calculations behind the determination of the run-off factors used in the LCR calculation are not – as yet – based on such calculations, which are much more tentative. The calculation seems to be sophisticated, taking into account that the household behaves differently from the firm, the outflow rate of insured and uninsured deposits is different, but on what basis has the regulator determined that in a stress situation the outflow factor for stable, fully insured household deposits is 3-5 percent, while for uninsured deposits it is more than 10 percent? In the case of SVB, for example, the outflow rate of insured deposits was also well above 10 percent, i.e. the outflow parameters calibrated for the LCR calculation seem to be rather *ad hoc* values. Liquidity indicators are unable to measure the rate of deposit outflows during a banking panic, if they did, they would show all banks as being in a liquidity crisis all the time. In other words, a bank panic is worse than a simple market stress situation. And even the LCR indicator does not take into account the closed, interconnected nature of the deposit base.

In calculating the indicator, there is a wide margin for interpretation by banks and supervisors. This is illustrated by the fact that, although the SVB was not required to calculate the LCR, two US researchers tried to reconstruct the calculations based on the December 2022 public statements and obtained quite different results. Both researchers' estimate of high-grade assets was \$53 billion based on cash, government securities and the proportion of mortgage-backed securities. The difference came from the net cash flow estimates, where there was a huge difference between the two calculations: 50.3 billion *versus* 71 billion, due to different assumptions on the outflow factors applicable to different types of deposits and the calculation of revolving loans, which was again based on *ad hoc* assumptions. Thus, for one researcher (Nelson, 2023), the SVB would not have violated the LCR rule ($LCR = 53/50.3 = 106$ percent), while the other researcher (Feldberg, 2023) would have reported a severe liquid asset shortage ($LCR = 53/71 = 75$ percent). The

latter is more in line with the Fed final report, which finds that the high-quality assets (HQLA) shortage was 9 percent in December 2022 and had reached 17 percent in February 2023 (Fed, 2023b). However, the supervisory follow-up report itself highlighted that even if the SVB had passed the LCR test, it would not have had sufficient liquidity to withstand the effects of the banking panic, as its deposits would have declined at a much higher rate than the assumed outflow rates for the LCR outflow weights in response to the panic. The LCR, which in principle assumes a stressed market situation, is also not suitable for predicting the impact of a bank run.

The liquidity stress tests assess, under different scenarios, whether the bank has sufficient liquidity and its ability to raise funds from the market (quality of collateral). From 2021, when the SVB moved to the large banks group, it was required to perform internal liquidity stress tests. The supervisory follow-up highlights that SVB failed its own internal liquidity stress test, but instead of implementing the liquidity risk mitigation measures required by the supervisor, it modified the boundary conditions of the stress test – arbitrarily increasing the probability of cash inflows and decreasing the probability of cash outflows – and tried to get this new result accepted by the supervisor. The supervisor was then more critical, but did not yet consider the liquidity risk in SVB to be tragic. In any event, it ordered further risk-mitigation measures. However, before this dialogue between the two had come to an end, SVB was swept away by the panic.

Regulators will most certainly step in; liquidity ratios will improve and expand. Some researchers have linked the evolution of branch density in the US to the size and speed of deposit withdrawals (*Benmelech et al.* 2023), pointing out that if a bank has a small branch density, it is more likely to have digitally banked customers and to accumulate uninsured deposits. *Claudia Buch*, the new chair of the European Banking Authority, alluded to this at a conference in Stockholm at the end of August, in the context of a survey on the impact of high-quality liquid assets and social media and digital banking. She also mentioned the need to monitor the concentration of deposits – and we hope that this will include the interconnectedness of depositors too – using appropriate indicators and more frequently. However, network theory measures of depositor concentration and interconnectedness have not yet been proposed.

We fear that even the most perfect measure of liquidity risk, with the fewest ad hoc assumptions and case-by-case calibrations, cannot predict a bank run. The bank, as a maturity transformer, always has and always will have liquidity risk – this is a fundamental characteristic of banking. If it is hit, it will always be perceived as insufficient. Banks can be required to have a money stock equal to their total deposits, i.e. at least as large as their central bank deposits (Tucker, 2023), but meeting this condition would mean the demise of the current money-crea-

tion banking model that performs maturity transformation. We return to this in *Chapter 7* when we discuss corner solutions.

4 MEASUREMENT, MANAGEMENT AND MITIGATION OF INTEREST RATE RISK

The interest rate risk in the banking book (IRRBB) has always been measured in two ways: through the impact of interest rate changes, or more precisely the shift in the yield curve, on the bank's short term (interest) income and on the economic value of bank equity. Accordingly, the indicators Δ NII (change in net interest income, or Δ NI, change in net total income) and DEVE (change in the economic value of equity) are used.

In the case of a static balance sheet and parallel yield curve changes, the calculations are extremely simplified. It is then sufficient to calculate the balance sheet gap, i.e. the difference between the volume of interest-sensitive assets and liabilities, or to calculate the duration gap, i.e. the difference in the duration of assets and liabilities. Δ NII and DEVE will be proportional to the balance sheet gap and the duration gap.

Over time, the measurement has changed in that different yield curve scenarios (parallel and non-parallel shifts) are used to determine the expected change in income or value. In order to do this, bank risk managers, regulators and supervisors try to develop scenarios that are stressful but not fatal. Following the global financial crisis, the latest Basel guidelines (Mérő, 2023; BIS, 2016; BIS, 2019) have been developed along these lines. In general, the simple gap method can no longer be applied, but the change in income or value of a balance sheet item must be shown on a line-by-line basis using the corresponding point on the yield curves for the different scenarios. It can be seen that this does not require any more complex mathematics than the four basic operations and the net present value formula to show the change in value. However, it is also conceivable that the more detailed the procedure is, the longer the methodological manual describing this relatively simple calculation will be; for example, the BIS 2016 manual details the exact procedure in 50 pages (BIS, 2016).

While Δ NII, the change in short-term net interest income, is a well understood indicator, DEVE, the change in the economic value of equity, is less so. The EVE is intended to express the long-term income generating capacity of the bank, "the higher the EVE the greater the potential for future earnings generated from the

equity base”⁹ If, for example, a bank holds a fixed rate asset and interest rates rise, that asset will generate less income, which is most easily measured by the change in the net present value, or fair market value, of the asset – in the market today, that security or loan is worth less because its income-generating capacity has declined. For deposits, the interpretation is more difficult: when interest rates rise, the cost of an unchanged interest-bearing deposit alternative does fall, but is this really well measured by the net present value of the deposit’s cash flow? Net present value can of course be calculated for all cash flows, but what is the theoretical meaning of the net present value of a deposit? Is it the fair market value of that deposit? No, because the *fair market value* of the deposit is always the *nominal value* of the deposit. Calculating the net present value of a deposit is a mathematical operation that does not make much economic sense. Thus, the EVE cannot express the fair market value of the bank. The logic of calculating the EVE derives from a kind of link between interest rate risk and liquidity risk: the value of the bank’s license implies that a significant part of its demand deposits do not move, so that their (non-existent) change in value can be contrasted with the change in value of fixed rate assets, i.e. in a way the value of the bank’s license is estimated by calculating the net present value of deposits (Drechsler et al., 2023). Even if we accept EVE in theory as an approximation of the long-term income-generating capacity (and the value of the banking licence), its practical definition is difficult to establish because banking operations are fraught with a number of hidden risks (e.g. early loan repayments, premature withdrawal of fixed deposits, etc.), that the regulator has to come up with new ad hoc parameterised approximations to deal with (e.g. the BIS (2016) IRRBB Handbook contains a number of such ad hoc approximations). Of course, this does not exempt banks from determining the change in the value of economic equity (DEVE) required by regulators using the methodology prescribed at the time.

A further problem with interest rate risk indicators is that Δ NII and DEVE may have different signs. Consider a bank that finances its long-term fixed-rate loans or securities with short term deposits (as in the case of the SVB or the FRB). At first sight, both risk measures may have the same sign: if interest rates rise, the net interest income of the banks fall, since their interest expense increases, while their net interest income remains unchanged. The economic value of equity also decreases, as the net present value of short-term deposits is approximately equal to their nominal value, while the value of long-term fixed-rate assets decreases due to high duration. However, what happens if the beta of the bank’s deposits is low, i.e. the interest expense on deposits does not increase in line with the increase

9 <https://www.investopedia.com/terms/e/economicvalueofequity.asp>

in market interest rates, which is typically the case at the beginning of the interest rate hike cycles. Δ NII will show that the bank's net interest income does not change, or even increases, if the balance sheet is not static. However, the EVE will decline stubbornly. The situation is further complicated by the fact that Δ NII is calculated using a dynamic balance sheet, while DEVE is calculated using a static one. Thus, it is not surprising that, banks rather focus on Δ NII than on DEVE, taking the opposite view to their regulators (see, for example, BIS, 2016).

Once the bank has finally calculated the IRRBB, it must be compared with some predetermined limits. If either Δ NII or DEVE exceeds this predetermined limit, the bank's management must intervene in some way. However, limits usually are rather arbitrary indicators, no matter whether the bank or the regulator sets it up. There is no mathematical statistical method that provides a 'good' limit. Not surprisingly, the reaction of bank management to a limit-breach is very often to change the limits. If a bank's lines of defence are well in place, this is not easy: such a limit change requires the approval of several committees, and it is not always easy to prove them, why the original limit was „wrong". The best defence is the bank's risk management culture, a business-wide risk management system.

The banks under review calculated both Δ NII and DEVE indicators, however, ignored, in part or in full, the Fed's recommendations for IRRBB. The Fed guidelines were elaborated after the global financial crisis (Fed, 2010), and are very close to the most recent Basel guidelines. In fact, banks have tried to make the calculations as simple as possible based on a moderate stress scenario and supervisors have not objected.

The FRB had a mature risk measurement system, according to the FDIC report (2023b), with internal risk limits applied to both Δ NII and DEVE under different scenarios. The income-based limits were not violated by the bank. The problem was with the limits on the DEVE, which the bank had already breached in the second half of 2022 (FDIC, 2023b), but neither the management nor the Board of Directors considered any additional measures were necessary in that regard.

Signature Bank's interest rate risk measurement system was deemed inadequate by the regulator, but the FDIC report contains only very vague findings on this (FDIC, 2023a). The bank's annual report shows that it examined the impact of interest rate changes both on NII and EVE, but limits or breaches of limits or hedging techniques were not mentioned.

According to the supervisory report, the SVB measured the interest rate risk by both Δ NII and DEVE, but in its decision making they took into account only the internal limits on Δ NII, and ignored the limits on DEVE (Fed, 2023b). The interest rate risk measured in this way showed that the increase in interest rates had a markedly positive impact on the bank's income. The SVB's strategy from

then on was based on fear of a fall in interest rates. This implied that although the Δ EVE repeatedly exceeded the bank's internal limit, the bank did not take this into account in its decision-making (Fed, 2023b:64). The two measures suggested a contradictory strategy. The SRB focused exclusively on short-term changes in income and ignored the risk of asset depreciation, which is particularly risky in the case of large uninsured deposit holdings, because the probability of a bank failure increases (Drechsler et al., 2023).

It cannot be ruled out that the supervisory warning about the limit violation was also ignored because the supervisory authority did not have the right to convert the warning into a request for additional capital. Suppose that the supervisor had the right to increase the bank's capital requirement under Pillar 2 in accordance with the Basel guidelines! However, it would not have made a material difference because of the *lag*: by the time the supervisor reacts, by the time it warns the bank of the need to increase capital, it will probably be too late, especially if a market panic has already developed.

Finally, let's talk about banks' strategies to mitigate interest rate risk. For a long time, the FRB has tried to manage interest rate risk by increasing the growth of loans and thus lending at higher rates. This particular risk management strategy has not been challenged by the supervisor. And why were interest rate derivatives not used to hedge the risk? This is explained in a very strange way in the FDIC report (2023b:18): 'consistent with its overall philosophy of not engaging in overly complex strategies or transactions, FRB did not engage in hedging activity'. This explanation was accepted by the supervisors, as hedging interest rate risk would have been complex and expensive for the bank.

The SVB was aware of and used interest rate swaps (IRS) to hedge interest rate risk, as it entered into IRS for the AFS portfolio in 2020. In 2022, however, the bank unwound the hedge, assuming that the interest rate risk was over-hedged, and the interest rate swaps could have a significant negative impact on the bank's income (Acharya et al., 2023).

It is likely that if the supervisory analysis had been more rigorous, if the supervisor had been able to better explain why the EVE measure is important and why exceeding the limit is a problem, or if the excess over the limit had led to an increase in capital requirements (as is the case with the application of the Basel principles), banks would have hedged their open positions more accurately.

Suppose banks had reacted sensitively to the EVA overshooting and hedged their interest rate risk very prudently. However, we know that, on the one hand, there is no perfect hedge and, on the other hand, even if hedge accounting is used by the bank, the different accounting treatment of the underlying transaction and the hedge could cause – albeit temporary – income shocks. The combined risk meas-

urement of the underlying and hedging positions under current Basel principles is also problematic. Let us take a simple example. Suppose that our imaginary bank is extremely prudent and risk-conscious, i.e. it performs a total cash flow match (as if the SVB had hedged its HTM portfolio, or the FRB its total loan portfolio, etc.). According to the EBA recommendation, the capital requirement under the second pillar is a kind of weighted sum of the change in net income sensitivity and ΔEVE . ΔEVE is obviously zero in this case, since there is full coverage, the net cash flow position is zero in each maturity band, and it remains zero no matter how it is revalued. In the net income sensitivity calculation, however, there is a significant excess risk, and hence a significant excess capital requirement under the second pillar. Indeed, if the interest rate level is low, the net interest income is low and the calculation of the IRRBB will be determined by the revaluation margin of the interest rate swaps subject to fair valuation, which could be significant. The management of the hypothetical bank may therefore be surprised to find that, although it assumes that the bank's interest rate position is perfectly matched, it may nevertheless incur a capital charge, which may even exceed the value of the hedging transactions. This anomaly can only be eliminated if the bank introduces hedge accounting both for each item in its balance sheet and for the interest rate swaps, as well. This is extremely cumbersome, almost impracticable, especially for a large loan / security portfolio consisting of many elements. The bank may also choose to reduce the interest rate swap portfolio, which does take on a risk on the EVE side, but as long as this is less than the income effect of the revaluation, the interest rate risk on the bank's books will be reduced. Although this sophisticated approach was not the reason why SVB Bank terminated the swaps on its AFS portfolio, our example shows that the more sophisticated the risk and capital calculation, the more pitfalls and anomalies can be introduced into the system.

Most studies have identified interest rate risk, poorly managed by banks, as the root cause of failure. Indeed, the interest rate risk of all banks has increased, but this has not led to losses that would have caused banks to fail in the absence of a bank run.

5 CORPORATE GOVERNANCE

A bank's culture is key both for measuring and managing liquidity and interest rate risk. A risk-sensitive, long-term thinking bank management will seek to adhere to the spirit, not the letter, of regulation, not merely to comply with the rules, but even to impose stricter internal rules if it deems it the bank norm. It sets risk limits not because it is compulsory but because it seeks to avoid excessive risk-taking and, although the limits are *ad hoc* figures, it seeks to avoid limit changes.

In a risk-sensitive responsible bank, three lines of defense for risk management¹⁰ are in place: risk management built into the business process, appropriate control units (risk management, controlling) and, of course, risk management at the executive (management and board) level. The Basel guidelines have sought to bring risk managers on a par with business decision-makers in the wake of the global financial crisis, but the formal implementation of an organisational solution may not at all be in the spirit of the law.

According to the FDIC report (FDIC, 2023b), the FRB had an organisationally sophisticated risk management system, with appropriate risk management committees and a multi-level decision-making process. At Signature, risk management was not an integral part of the business culture, and in congressional hearings the bank's founding chairman emphasized customer orientation rather than risk sensitivity (Shay, 2023). At SVB, a restructuring of the risk management system began in 2021, when it was transferred to LFBO. This was accompanied, among other things, by the dismissal of the former senior risk manager (CRO), who had an inadequate professional background, and the bank was without a senior risk manager for almost a year. The CEO deflected all questions about risk at the congressional hearing, saying it was the responsibility of the 'competent risk committee', claiming to have been unaware of the hedge decisions taken by the ALCO committee, namely the hedging of the AFS portfolio and its subsequent termination. Clearly, the bank lacked the three lines of defence of risk management.

The inadequacy of the banks' risk management systems is illustrated by the fact that none of the banks' annual reports mention the three lines of defence for risk management, and there was no real built-in-process risk management. Public reporting by banks has not been very helpful in understanding internal operations and in providing insight into the details of risk measurement and management, i.e. disclosure is not a strong requirement in the US system. While there is a section of the report where they list the most important bank risks, all three banks do so in almost verbatim the same order of risks, in effect providing an irrelevant list. The banks' management did not react adequately to the risks that emerged, and risk management in their decision-making systems remained in the 'back room', with no clear responsibility for who should take the risk and how much. The inadequacy of the bank's risk management systems was aligned with weaknesses in supervisory controls.

¹⁰ See for example: <https://www2.deloitte.com/us/en/pages/advisory/articles/modernizing-the-three-lines-of-defense-model.html>

In all three banks risk sensitivity was not properly incorporated into the bonus system. In all banks the management bonuses for 2022, the year after a so-called successful year, were paid in full, in the SVB just on the day of the bank run.

Overall, weaknesses in corporate governance and risk management systems, and the lack of a risk management culture, were a key factor in banks' mismanagement of the rapid deposit during the pandemic and their failure to consider the additional risks arising from their specific, concentrated business model. The OIG report analysing the role of supervisors highlighted the same point, suggesting that by redesigning supervisory work, supervisors should be able to properly analyse the specialised or concentrated business model of supervised institutions and the additional risks arising from rapid growth (OIG, 2023)

6 IS THERE A GOOD DEFINITION OF SUFFICIENT BANK CAPITAL?

Based on the previous chapters, it cannot be ruled out that there is no reliable risk measure that works well in all cases and yet is simple and easy to interpret. Risk measurement often has to rely on highly *ad hoc* parameters and procedures and complex approximations. At the end of the 1990s, it seemed that a perfect solution had been found: the concept of value at risk was born. The concept itself was conceived to measure market risk in the trading book, but it had attractive features beyond that: it did not require the examination of different scenarios, but allowed the potential loss to be determined with a predefined probability. If the potential loss threatens the available capital, the risk is severe and steps must be taken to mitigate it. The new capital adequacy requirement in Basel II guidelines was based on this concept: a bank must have at least as much capital as necessary to cover its losses from credit risk, market risk and operational risk with a given probability (99.9 per cent).

The illusion that potential losses can be measured accurately, that the measurement itself can be left to the bank and that it is only necessary to check that banks are measuring correctly, has led to a radical reduction in bank capital requirements and a loss of stability in the banking system. This has been one of the key lessons of the global financial crisis. The value at risk turned out to be determined by calibrating equally *ad hoc* parameters and procedures. It has proved to be a theoretically imperfect concept, as it is not a coherent measure of risk, i.e. it only gives a reliable result in the case of a normal distribution and cannot be used in the case of exceptionally large losses ('black swans'). It also turned out that the interest rate risk in the banking book and many other risks happened to be excluded from Basel II. It is quite certain that Basel II would have been revised even if there

had not been a global financial crisis. But it did, so the review clearly pointed in one direction: Basel III should be one that imposes substantially higher capital requirements on banks. This added even more ad hoc parameters to the calculations and made the guidelines and handbooks even longer.

Since real economic losses caused by a crisis are fairly high, thus, after the crisis there is always a cry for higher regulatory capital. This was no different this time, even though the 2023 March banking crisis did not turn into a systemic crisis and no real economic losses could be identified. Because of their position, the regulators, *mutatis mutandis*, have drawn the conclusion that capital adequacy requirements must be raised – as you can see in the comments made, for instance, by a Fed executive responsible for bank supervision (Barr 2023). The same conclusion can be drawn from the survey of academic economists mentioned in the introduction: 92%(!) of Americans and 73% of Europeans think it is time to radically raise capital requirements.

According to the supervisory report “while the proximate cause of SVB’s failure was a liquidity run, the underlying issue was concern about its solvency” (Fed, 2023b:2). Why did this “solvency concern” arise? Why did many analysts write that the March banking crisis was clearly caused by banks insolvency? Why do many analysts treat it as almost conclusive that the failed banks were undercapitalised and that is why they went under? The market panic, as we recall (see Part I of the paper), was heightened after an article in the Financial Times which claimed that many banks, including the SVB, had huge *unrealised losses that were eating up their capital*. The term ‘unrealised losses’ has entered the public discourse and professional analyses as a shuddering catchword. This is why the capital purist Admati et al. (2023), analysing the causes of failure, have described how bank failures are in fact all due to insolvency and the only solution is to radically increase capital requirements.

If only the unrealised losses on the banks’ AFS portfolios had been considered, the word insolvency would not have been used, because none of the banks had such a large AFS portfolio that any loss of value would have jeopardised their capital. But analysts did not only mean AFS bonds when talking about unrealised losses, but also fixed rate HTM bonds booked at nominal value (or to be more exact, amortised value). What is more, they later included all fixed rate assets including fixed rate loans in their calculations of so called “hidden losses” – which was bad luck for FRB.

If one wanted to consider all the loss on the market value of all assets, then deposit holders would have had a run not only on those banks but also on the Bank of America, for instance (Kelly, 2023), or, on the whole sector of Hungarian banks considering their peculiar balance sheet structure.

An economic policy proposal to include all non-realised losses on securities in the regulatory capital requirement would meet with almost unanimous approval on both sides of the ocean. The Clark Center Forum asked US economists this question (a little bit rephrasing) in both May and September (CCF 2023a; 2023b): 64% in May and 56% in September agreed with the proposal (with a slight increase in the undecided camp). Europeans were asked only in September, with only 48% agreeing and 13% rejecting the proposal. The Americans are not as confident as the numerical results suggest, with some commenting that it would only make sense if there were sufficient capital to cover losses from currency fluctuations, and others noting that it is not a panacea either, as only securities that are actually traded on the market have a real valuation, and the 2008 crisis was caused by the unexpected loss of value of CDOs that were not actually traded on the market but had a high rating and were therefore highly valued. In an exciting study, some US researchers (Drechsler et al., 2023) have pointed out that the probability of a bank failure is multiplied by the presence of large uninsured deposits on the liability side as opposed to fixed-rate assets. In such a case, interest rate risk is more easily converted into liquidity risk and the bank becomes truly insolvent in the event of a bank run. This is the situation that the Fed sought to address when, following the collapse of the SVB, it introduced its new liquidity facility (BTFP), which accepts bonds at par as eligible collateral. The programme is in place until March 2024 – we will see if there is an extension. If so, it will greatly simplify the ‘unrealised loss’ debate – interest rate risk cannot be converted into liquidity risk.

We believe including the loss on AFS securities in regulatory capital is a proposal increasing clarity. However, if the change in value of the HTM portfolio should be included in regulatory capital, why not the entire fixed rate loan portfolio? If we consider this argument consistently, the safest solution seems to be for the bank not to issue deposits that can be withdrawn at any time at nominal value, i.e. not to create money. This can certainly be easily solved by imposing a 100 percent capital requirement (Admati and Hellwig 2010), but this solution is already a corner solution, which we will return to in *Chapter 7*.

Higher capital requirements are not only protested by banks, but also by academics, who are concerned that too high capital requirements discourage lending, make financial intermediation more expensive and hamper economic recovery. This was recently summed up in a thoughtful and reflective paper by Danielsson and Goodhart (2023), who cannot be accused of being capital-unfriendly.

For the three banks we examined, we saw that all three banks were adequately capitalised under the existing rules immediately before the panic (note that the capital adequacy of Credit Suisse, which failed in Switzerland, was perfectly in line with that of UBS, which absorbed it). If the Basel principles had been applied, supervisors might have required some additional capital to be held under the sec-

ond pillar because of interest rate risk, and might have required an increase in the level of liquid assets, but in essence there would not have been much more capital or much more liquid assets available to banks. As noted crisis scholar Stephen Kelly¹¹ put it, “Say it with us: More capital would not have saved the SVB!” (Kelly, 2023). These banks failed not because of a lack of capital, but because of their flawed business models and the resulting market panic. If the business model had been capitalised, i.e. credible, there would have been no run. As the outgoing chairman of the Single Supervisory Council of the European Banking Union (the ECB’s Banking Supervisory Council), André Enria, put it, “Capital cannot fix a broken business model, nor can it remedy deficient internal governance” (Enria, 2023).

7 CORNER SOLUTIONS

When analysing the banks in crisis, the vast majority of experts made recommendations for improving the risk management culture, improving regulation, improving supervision, etc., within the framework of the current banking model. Several of these suggestions have been discussed in previous chapters.

After major banking crises, such as the Great Depression (1929–33) or the global financial crisis (2007–2010), the need for radical institutional reform always arises (e.g. King, 2016; Admati and Hellwig, 2013). Although the current crisis is nowhere near them in depth, scope and real economic impact, different corner solutions have again emerged. Indeed, most of the analyses were carried out in the immediate aftermath of the crisis, when it was not yet possible to see that the March wave of bank failures would be an isolated series of events rather than an explosion similar to the global financial crisis. These solutions have been referred to in earlier chapters of this thesis. At the end of *Chapter 3 on liquidity risk*, we referred to the former UK central bank vice-president who suggested that banks should hold their deposits exclusively in central bank money, which is essentially the equivalent of a 100 per cent reserve ratio requirement (Tucker, 2023). In *Chapter 6 on capital*, we referred to Admati and Hellwig’s book (2010), in which the 100 per cent capital requirement is seriously mooted. If proposals like this were adopted, the banking system would change substantially, creating a financial intermediation system fundamentally different from today’s. The institution that would emerge in this type of solution is commonly referred to as a “narrow bank”.

11 Steven Kelly is associate director of research at the Yale Program on Financial Stability. The program based on deep personal interview with decision makers summarizes the lessons from the previous crises, as e.g. the global financial crisis.

An excellent overview of similar proposals after the March 2023 banking panic is provided by *Martin Wolf* (Wolf, 2023a; 2023b), but readers can also consult a number of blogs and websites.¹²

The narrow bank proposals were first formulated in the so-called Chicago Plan following the Great Depression (*Bossone*, 2001). At that time *Irving Fisher's* book “100% Money” (Fisher, 1937), which compiled the proposals into a consistent theory, was published. Fisher had already sketched a beautiful vision on the title page of his book, stating that his system is “designed to keep checking banks 100%; to prevent both inflation and deflation, largely to prevent depressions; and to wipe much of the National Debt”.¹³ Despite Fisher’s grand vision and the Chicago Plan, no narrow bank system has been established in the United States or elsewhere. Perhaps not by accident.¹⁴

It is not difficult to see that the narrow bank idea is actually much older: it appeared as early as the 19th century in England in the debate between the banking and currency schools, where the latter insisted on the need for 100 per cent reserve banking.

Narrow bank keeps its customers’ deposits one-to-one in the central bank, in central bank reserve, i.e. it has a reserve ratio of 100 percent, there is no money creation outside the central bank. Narrow bank only provides payment services.

Side by side with a narrow bank à la Fisher, there is in the economy a financial enterprise offering loans whose potential failure will not result in a bank panic, there will be no bank run as there are no deposits. There are some who identify narrow banks like that (e.g. capital purists). This financial enterprise has only equity capital in strict cases, and can issue bonds in more lenient cases.

There are views that can imagine these two institutions (the deposit taker and the lender) even within a single narrow bank but separating the two types of activity with a strict Chinese wall. Strict followers of the narrow bank idea would

12 For example: <http://www.narrowbanking.org/>; <https://www.cato.org/regulation/summer-2023/it-finally-time-narrow-banking#>; <https://www.marketplace.org/2023/05/12/one-way-to-make-banks-safer-make-them-narrower/>; <https://marginalrevolution.com/marginalrevolution/2023/05/are-we-evolving-toward-narrow-banking.html>.

13 Much later, after the GFC, two US researchers, mesmerised by Fisher’s theory, tried to prove in a DSGE model that ‘100% money’ works, i.e. assuming only narrow banks, the economy will be more balanced, there will be no banking crises and even the average level of inflation will be lower (BENES and KUMHOF, 2012).

14 *John Cochrane* describes an interesting case: in 2017, a bank in the United States was intended to be established specifically as a narrow bank (TNB Bank – The Narrow Bank) but was ultimately denied a license by the Fed, so it submitted an appeal against the Fed decision (Cochrane, 2018). Unfortunately, we do not know the sequel, but TNB Bank is not yet operational, according to the internet.

not allow a narrow bank to invest into securities, and would not let the narrow bank any external funding, i.e. these institutions would provide loans from their equity.

Finally, there are more lenient narrow bank concepts (often called *core bank*) that allow the bank to invest in ultra-safe government securities in addition to central bank reserves (for an excellent overview of the different approaches, see Bossone, 2001).

In all cases, the essence of the narrow bank is the same: *lending and money creation should be separated, and private banks should not have the right to create money*. There is no money-creating lending, only money-redistributing lending, in the terminology used in Hungarian textbooks.

Ironically, the SVB happened to be a lenient narrow bank, it hardly created money through lending, and its customer deposits financed “super-safe” bonds and central bank reserve. Its holdings of highly liquid, marketable government securities exceeded its loan portfolio by almost 50%. Thus, the SVB was not really creating money, it was operating as a classical financial intermediary, it was rather redistributing money. Yet it was attacked, yet it triggered a wave of bankruptcies. Remember: money market funds, which do not create private money at all, were attacked in 2008 in the same way as the SVB in 2023, and only effective government intervention could stop the panic then. So, only 100% Money, the extreme narrow bank concept would have been the solution during the SVB run.

In a banking system consisting only from narrow banks, maturity transformation is eliminated, which undoubtedly reduces the chances of a bank run. In this case, it is also advisable to eliminate maturity transformation in the economy as a whole, i.e., the regulation of investment funds and money market funds should probably be reviewed, because in a narrow bank system the probability of a run on investment funds (especially money market funds) will increase, as already experienced during the global financial crisis. The question is how and by what institution the problem raised in the Nobel prize-winning *Diamond–Dybvig* study (1983) of matching the immediate (and unpredictable) liquidity needs of depositors with the long-time requirements of investment will be addressed, and whether this tendency will lead to under-investment.

The modern version of the narrow bank vision is based on the Central Bank Digital Currency (CBDC).¹⁵ If there is central bank digital currency available to everyone, there is little need for a narrow bank, as payment services are instantaneous through the central bank. Lending will remain a task for financial companies

¹⁵ For example: <https://www.google.com/search?client=firefox-b-d&q=cdbc+is+the+solution+for+bankin+crisis>; <http://www.zsiday.hu/blog/mikor-lesz-mar-digitalis-jegybankpenz>

using only equity, but it is easy to see that central banks can do it more effectively, themselves. The CBDC can make both the banking systems as we know them and the narrow banks redundant. There are few advocates of this corner solution today: the single-tier banking system in the so-called socialist systems has proved neither to provide sustainable growth nor an efficient solution.

In his famous book, Fisher cites as a major advantage that narrow banks significantly restrain lending compared to the nowadays banking intermediation, and indeed, narrow banks would not generate large amplitude credit cycles with huge real economic losses. The only question to be answered is: who will provide the economy's financing needs and how. This is not usually addressed by proponents of the narrow bank system. We do not know who, and in what way, assumes the role of delegated observer in this 100% reserve – 100% capital system, and how the asymmetric information problems can be resolved (Diamond, 1984). It is not clear how the proponents of the corner solution can answer the question of the efficiency loss and social cost of not having the two sides of the liquidity provision (private credit and private money) on the two sides of the balance sheet of the same institution (Diamond–Rajan, 2001).

So, in fact, the risks are not going down, they are going up.

8 SUMMARY

A strange banking panic emerged in the US in March 2023. At the beginning of the year, market analysts focused on a specific side-effect of the Fed's determined interest rate hikes, the so-called unrealised losses of banks' assets. Newspaper articles and analyses reporting on the frightening figures were reflected not only in the fall in the share price of banks suffering such unrealised losses, but also in the growing sense of panic among depositors. Three banks in California, SVB, Signature Bank and FRB, were particularly vulnerable and the panic that ensued led to a severe liquidity crisis within days, resulting in insolvency.

We argue that the failure of the three banks under review was not caused by the so-called unrealised losses (i.e. interest rate risk) often mentioned in earlier studies, nor by their perceived liquidity risk. Neither one nor the other were outliers compared to the sector as a whole. While the risk metrics did indicate a risk, the magnitude of the measured risk was not blatant for any of the banks examined. The three failures were also special in that the credit risk, which is the most important factor in banking crises, was not present at all.

We have shown in line with the supervisors' reports (Fed 2023b; OIG, 2023), that banks' broken business models, weak corporate governance and risk management systems have led to their failure. In this they differed from other banks

with similar interest rate and liquidity risks. All three banks were characterised by a closed and concentrated customer base, a close network of depositors and a high proportion of uninsured deposits, which posed a continuous liquidity risk that was heightened in times of panic. The business model made possible the extremely rapid growth of deposits during the pandemic, during which the banks did not prepare themselves for the equally rapid withdrawal of deposits. Inadequate risk management systems, corporate governance, business and risk management cultures contributed to the failures. Supervision of banks was also weak, but the reasons for and consequences of this are not discussed in detail in this paper.

In parallel with the analysis of banks, we examined the liquidity and interest rate risk indicators currently in use. We have found that reliable risk measures that work well in all cases, that anticipate risks in good time and yet are simple and easy to interpret have not yet been developed. Measuring risk often requires the use of highly *ad hoc* parameters and procedures, and complex approximations. The definition of risk limits at both banking and supervisory level tends to follow rules of thumb. However, risk management and supervision that fully assesses risks according to their weight and content can prevent the emergence of exposures that are in themselves sufficient to trigger a bank run. This conclusion has serious implications for supervisory examination methodology, as is well reflected in the OIG report (OIG, 2023).

The capital adequacy ratio of the banks examined was adequate. Even if they had perfect risk measurement systems, and if the excess capital and excess liquidity needs had been captured in time, they would not have been able to withstand the run that occurred in a few days. The market's confidence in the business model is shaky, there is no protection for banks with a narrow, concentrated, interconnected customer base in times of panic.

In the analyses following the crisis of March 2023, the need for a radical transformation of the current banking models was implicitly or explicitly expressed, and the corner solutions, the various narrow-banking models, which were always used during crises, reappeared. The perfectly liquid bank is the one that does not create money and keeps all its deposits in central bank reserve. There is no maturity transformation, no money creation – but there is evidence that many of the investments needed to make the economy work are not made.

In our view, the bank failures of March 2023 do not justify a focus on corner solutions, and there are few economic arguments in favour of corner solutions at the moment.

REFERENCES

- ACHARYA, V. – RICHARDSON, M. P. – SCHOENHOLTZ, K. L. – TUCKMAN, B. (eds.) (2023): *SVB and beyond: The banking stress of 2023*. NYU Stern School of Business. <https://drive.google.com/file/d/1Mo67WVllogboJtrsl33ggpbHlAtVjR6/view> (last accessed 18.08.2023).
- ADMATI, A. – HELLWIG, M. (2013): *The banker's new clothes. What's wrong with banking and what to do about it*. Princeton University Press.
- ADMATI, A. – HELLWIG, M. – PORTES, R. (2023): When will they ever learn? The US banking crisis of 2023. VoxEU.org, 2023.05.18., <https://cepr.org/voxeu/columns/when-will-they-ever-learn-us-banking-crisis-2023> (last accessed 23.08.2023).
- BAIR, S. (2023): US regulators are setting a dangerous precedent on SVB. *Financial Times*, 2023.03.14. <https://www.ft.com/content/b860ebb6-f202-4ec6-a80c-8b1527c949f4> (last accessed 28.08.2023).
- Bank Reg Blog (2023a): Assorted Thoughts on SVB. 14.03.2023, <https://bankregblog.substack.com/p/assorted-thoughts-on-svb> (last accessed 08.09.2023).
- Bank Reg Blog (2023b): The Biden Administration's Fact Sheet on the Regulation of Large Regional Banks. 2023.04.01., <https://bankregblog.substack.com/p/the-biden-administrations-fact-sheet> (last accessed 08.09.2023).
- BARR, M. (2023): Holistic Capital Review. Remarks at the Bipartisan Policy Center. Washington DC, 10.07.2023., <https://www.federalreserve.gov/newsevents/speech/files/barr20230710a.pdf> (last accessed 28.08.2023).
- BECKER, G. W. (2023): Written Testimony before the U.S. Senate Committee on Banking, Housing, and Urban Affairs. Silicon Valley Bank. 16.05.2023, <https://www.banking.senate.gov/imo/media/doc/Becker%20Testimony%205-16-23.pdf> (last accessed 28.08.2023).
- BENES J. – KUMHOF, M. (2012): The Chicago Plan revisited. IMF Working Paper WP12/202, <https://www.imf.org/external/pubs/ft/wp/2012/wp12202.PDF> (last accessed 12.09.2023).
- BENMELECH, E. – YANG, J. – ZATOR, M. (2023): Bank branch density and bank runs. NBER Working paper 31462, 2023 July, <http://www.nber.org/papers/w31462> (last accessed 12.09.2023).
- BIS (Bank of International Settlements) (2016): Standards. Interest rate risk in the banking book. <https://www.bis.org/bcbs/publ/d368.pdf> (last accessed 12.09.2023).
- BOSSONE, B. (2001): Should banks be narrowed? IMF Working Paper WPO1/159, <https://www.imf.org/external/pubs/ft/wp/2001/wp01159.pdf> (last accessed 12.09.2023).
- BUCH, C. (2023): Rethinking the prudential regulation of banks. Panel remarks prepared for the DNB – Riksbank _Bundesbank Macroprudential Conference. Stockholm, 2023.08.31., <https://www.bis.org/review/r230901h.pdf> (last accessed 12.09.2023).
- CECCHETTI, S. G. – SCHOENHOLTZ, K. L. (2023): Making banking safe. CEPR Discussion Paper 18302, <https://cepr.org/publications/dp18302> (last accessed 2023. 28.08.2023).
- CECCHETTI, S. G. – SCHOENHOLTZ, K. L. – WHITE, L. (2023): The dangerous role of America's weird lenders-of-next-to-last resort. Inside a byzantine corner of the US financial system. *Financial Times*, 17.08.2023, <https://www.ft.com/content/1ca4240b-e1c3-44ec-9033-f9217ddd4fae> (last accessed 18.08.2023).
- Clark Center Forum (CCF): (2023a): Banks' business model. US survey. 2023.05.17., <https://www.kentclarkcenter.org/surveys/banks-business-model/> (last accessed 2023.08.18.).
- Clark Center Forum (CCF): (2023b): Policy Responses to Recent Bank Failures. US survey. 2023.09.14., <https://www.kentclarkcenter.org/surveys/policy-responses-to-recent-bank-failures/> (last accessed 16.09.2023).

- Clark Center Forum (CCF): (2023c): Policy Responses to Recent Bank Failures. Europe survey. 14.09.2023, <https://www.kentclarkcenter.org/surveys/policy-responses-to-recent-bank-failures-2/> (last accessed 16.09.2023).
- COCHRANE, J. H. (2018): The Safest Bank the Fed Won't Sanction ChicagoBooth.edu. 2018.11.30., <https://www.chicagobooth.edu/review/safest-bank-fed-wont-sanction>.
- DANIELSSON, J. – GOODHART, C. (2023): What Silicon Valley Bank and Credit Suisse tell us about financial regulations. VOXEU/CEPR, 2023.03.25., <https://cepr.org/voxeu/columns/what-silicon-valley-bank-and-credit-suisse-tell-us-about-financial-regulations> (last accessed 18.08.2023).
- DEWATRIPONT, M. – PRAET, P. – SAPIR, A. (2023): The Silicon Valley Bank collapse: Prudential regulation lessons for Europe and the world. VoxEU, 2023.03.20., <https://cepr.org/voxeu/columns/silicon-valley-bank-collapse-prudential-regulation-lessons-europe-and-world> (last accessed 28.08.2023).
- DFPI (California Department of Financial Protection and Innovation) (2023): Review of DFPI's Oversight and Regulation of Silicon Valley Bank. 08.05.2023, <https://dfpi.ca.gov/wp-content/uploads/sites/337/2023/05/Review-of-DFPIs-Oversight-and-Regulation-of-Silicon-Valley-Bank.pdf> (last accessed 08.09.2023).
- DFS (New York State Department of Financial Services) (2023): Internal review of the supervision and closure of Signature Bank. 28.04.2023, https://www.dfs.ny.gov/system/files/documents/2023/04/nydfs_internal_review_rpt_signature_bank_20230428.pdf (last accessed 07.09.2023).
- DIAMOND, D. W. (1984): Financial Intermediation and Delegated Monitoring. *Rev. Econ. Studies*, 51(3), 393–414. DOI: 10.2307/2297430, https://www.richmondfed.org/-/media/RichmondFedOrg/publications/research/economic_quarterly/1996/summer/pdf/diamond.pdf (last accessed 18.11.2022).
- DIAMOND, D. W. – DYBVIK, P. H. (1983): Bank runs, deposit insurance, and liquidity. *Journal of Political Economy*, 91, 401–419. DOI: 10.1086/261155, <https://www.journals.uchicago.edu/doi/pdf/10.1086/261155> (last accessed 18.11.2022).
- DIAMOND, D. W. – RAJAN, R. G. (2001): Liquidity risk, liquidity creation, and financial fragility: A theory of banking. *Journal of Political Economy*, 109, 287–327. DOI: 10.1086/319552, <https://www.journals.uchicago.edu/doi/epdf/10.1086/319552> (last accessed 18.11.2022).
- DRECHSLER, I. – SAVOV, A. – SCHNABL, P. – WANG, O. (2023): Banking on uninsured deposits. NBER Working Paper 31138, 2023 June, https://www.nber.org/system/files/working_papers/w31138/w31138.pdf.
- DUFFIE, D. (2023): Resilience redux in the US Treasury market. paper presented at the Jackson Hole Symposium. 13.08.2023, https://www.kansascityfed.org/Jackson%20Hole/documents/9726/JH_Paper_Duffie.pdf (last accessed 31.08.2023).
- ENRIA, A. (2023): Banking supervision beyond capital. Speech at the EUROFI 2023 Financial Forum organised in association with the Spanish Presidency of the Council of the EU. Santiago de Compostela, 14.09.2023, <https://www.bankingsupervision.europa.eu/press/speeches/date/2023/html/ssm.sp230914~c6cobeocc6.en.html> (last accessed 16.09.2023).
- FDIC (2023a): FDIC Supervision of Signature Bank. 28.04.2023, <https://www.fdic.gov/news/press-releases/2023/pr23033a.pdf> (last accessed 18.08.2023).
- FDIC (2023b): FDIC Supervision of First Republic Bank. 08.09.2023, <https://www.fdic.gov/news/press-releases/2023/pr23073a.pdf> (last accessed 18.09.2023).
- Fed (2010): Advisory of interest rate risk management. <https://www.ffiec.gov/pdf/pro10710.pdf> (last accessed 12.09.2023).
- Fed (2023a): Impact of Rising Rates on Certain Banks and Supervisory Approach. S&R Quarterly Presentation. February 14, 2023, <https://www.federalreserve.gov/supervisionreg/files/board-briefing-on-impact-of-rising-interest-rates-and-supervisory-approach-20230214.pdf>.

- Fed (2023b): Review of the Federal Reserve's Supervision and Regulation of Silicon Valley Bank. 28.04.2023, <https://www.federalreserve.gov/publications/files/svb-review-20230428.pdf> (last accessed 18.08.2023).
- FELDBERG, G. (2023): Lessons from Applying the Liquidity Coverage Ratio to Silicon Valley Bank. 2023.03.27., <https://som.yale.edu/story/2023/lessons-applying-liquidity-coverage-ratio-silicon-valley-bank> (last accessed 28.08.2023).
- FISHER, I. (1936): *100% Money*. New York: The Adelphi Company. Revised version. https://cdn.mises.org/100%20Percent%20Money_Fisher.pdf.
- GAO (Government Accountability Office) (2023): Bank regulation: Preliminary review of agency actions related to March 2023 bank failures. 11.05.2023, <https://www.gao.gov/products/gao-23-106834> (last accessed 28.08.2023).
- INDAAP, S. (2023): The \$44bn bank bailout bonanza. *Financial Times*, 05.09.2023, <https://www.ft.com/content/fe55c9d0-31de-44b8-840d-f972fcdefob9?shareType=nongift>.
- JACKLIN, C. J. (1987): Demand deposits, trading restrictions and risk sharing. In PRESCOTT, E. – WALLACE, N. (eds.) (1987): *Contractual arrangements for intertemporal trade*. University of Minnesota Press.
- KELLY, S. (2023): SVB and bank capital, revisited. Without Warning Blog, 31.08.2023, <https://www.withoutwarningresearch.com/p/svb-and-bank-capital-revisited> (last accessed 01.09.2023).
- KING, M. (2016): *The end of alchemy. Money, banking, and the future of the global economy*. W. W. Norton & Company.
- KIRÁLY, J. (2023): Ahol a pénz terem. Pánik a bankvilágban: a Silicon Valley Bank és a Credit Suisse csődje [Where money grows. Panic in banking: the bankruptcy of Silicon Valley Bank and Credit Suisse.] *Magyar Narancs*, 29.03.2023, <https://magyarnarancs.hu/kulpol/ahol-a-penz-terem-257463> (last accessed 28.08.2023).
- MEADE, D. (2023): Congressional Hearings On Bank Failures. Mondaq.com, 23.05.2023, <https://www.mondaq.com/unitedstates/financial-services/1318796/more-congressional-hearings-on-bank-failures-> (last accessed 28.08.2023).
- MÉRŐ, K. (2023): Shall we reconsider banking regulations? Some lessons drawn from the failure of Silicon Valley Bank and Credit Suisse. *Economy and Finance*, 10(2), 101–119, <https://bankszovetseg.hu/Public/gep/2023/101-119%20Mero%20E.pdf> (last accessed 26.08.2023).
- NAGY, A. (2023): Bankcsődök 2023: események, a bankrendszer kockázatai. Elemzési Központ blog [Bank failures 2023: events, risks to the banking system. Analysis Centre blog]23.05.2023, <https://elemzeskozpont.hu/bankcsodok-2023-esemenyek-bankrendszer-kockazatai> (last accessed 28.08.2023).
- NELSON, B. (2023): Silicon Valley Bank Would Have Passed The Liquidity Coverage Ratio Requirement. Bank Policy Institute Blog, 14.03.2023, <https://bpi.com/silicon-valley-bank-would-have-passed-the-liquidity-coverage-ratio-requirement/>.
- OIG (Office of Inspector General) (2023): Material loss review of Silicon Valley Bank. Evaluation Report. 2023-SR-B-013, <https://oig.federalreserve.gov/reports/board-material-loss-review-silicon-valley-bank-sep2023.pdf> (last accessed 01.10.2023).
- RAJAN, R. – ZINGALES, L. (2023): Riskless Capitalism? IMF Finance and Development. 2023. június, https://www.imf.org/en/Publications/fandd/issues/2023/06/POV-riskless-capitalism-rajan-zingales?utm_medium=email&utm_source=govdelivery (last accessed 28.08.2023).
- ROFFLER, M. (2023): Written Testimony before the U.S. Senate Committee on Banking, Housing, and Urban Affairs. First Republic Bank, 17.05.2023, <https://democrats-financialservices.house.gov/uploadedfiles/hhrg-118-ba20-wstate-rofflerm-20230517.pdf> (last accessed 28.08.2023).

- SHAY, S. A. (2023): Written Testimony before the U.S. Senate Committee on Banking, Housing, and Urban Affairs. Signature Bank, 16.05.2023, <https://www.banking.senate.gov/imo/media/doc/Shay%20Testimony%205-16-23.pdf> (last accessed 28.08.2023).
- TUCKER, P. (2023): Former BoE deputy calls for radical overhaul of bank funding. Laura Noonan interview with Paul Tucker. *Financial Times*, 08.05.2023, <https://www.ft.com/content/fofe6555-7929-4b4d-8739-028b3boaad4e> (last accessed 31.08.2023).
- VÉRON, N. (2023): The US and Swiss banking collapses could lead to better compliance with international bank capital standards in the European Union. PIIE blog, 27.04.2023, <https://www.piie.com/blogs/realtime-economics/us-and-swiss-banking-collapses-could-lead-better-compliance-international> (last accessed 31.08.2023).
- WOLF, M. (2023a): Banks are designed to fail – and they do. *Financial Times*, 14.03.2023, <https://www.ft.com/content/09bfb8d-22f5-4c70-9d85-2df7ed5c516e> (last accessed 31.05.2023).
- WOLF, M. (2023.b): Four ways to fix the bank problem. *Financial Times*, 21.03.2023, <https://www.ft.com/content/70ce4b8a-1310-4e3c-a891-3c34cd313841> (last accessed 31.05.2023).
- ZSIDAY, V. (2023a): Narancsvidék. Zsiday Viktor blogja [Orange Region. Zsiday Viktor's blog], 11.03.2023, <http://www.zsiday.hu/blog/narancsvid%C3%A9k> (last accessed 28.08.2023).
- ZSIDAY, V. (2023b): Mikor lesz már digitális jegybankpénz? Zsiday Viktor blogja [When will we have digital money? Viktor Zsiday's blog], 23.03.2023, <http://www.zsiday.hu/blog/mikor-lesz-m%C3%A1r-digit%C3%A1lis-jegybankp%C3%A9nz>.