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The relevance of stress testing in the banking system: the SVB case

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INTRODUCTION

The recent bankruptcy of the SVB was an unexpected event that helped to raise once again great concerns about the stability of the financial system: the long period of relative financial calm, that had set in following the GFC, had made its collapse, the second largest in US history, unthinkable. This episode, however, represents a tangible evidence of how modern finance is a complex and difficult world to decipher: the Silicon Valley Bank, until shortly before its collapse, had experienced exceptional growth, both from a reputational point of view, becoming the reference point for many successful start-ups in the technology and life sciences sectors, and in terms of size, so much so as to become the sixteenth largest banking institution within the US system. Yet, its failure, although unique in terms of its characteristics and mode of manifestation, highlights an important paradox, one that has proven itself time and again in the past: it is during times of prosperity that great vulnerabilities tend to accumulate.

In periods of apparent calm, actors such as banks often take decisions without considering the potential consequences of their choices: this attitude, however, contributes to accentuating the structural weaknesses already present, which remain imperceptible until the sudden onset of a negative shock.

A concrete example of this is the financial crisis of 2007-2008, which hit the financial sector so hard that some big banks, most notably Bear Stearns and Lehman Brothers, failed or went bankrupt. To cope with this global emergency, the supervisory authorities had, however, found a solution for restoring confidence in the banking system in an instrument with great potential for application, but whose use had until then been almost non-existent: the stress test.

In the United States, the SCAP exercise, conducted by the Federal Reserve on a sample of nineteen large banks with more than $100 billion in assets, was a great success: the stress test, through the definition of hypothetical but plausible scenarios that the banks might have faced, not only had the merit of capturing the capital shortfalls experienced by the major US banking institutions, but also allowed the publication of credible results, reassuring market participants about the potential future developments of the banking system and thus fostering economic and financial recovery through the adoption of appropriate corrective measures. The positive effects produced by the SCAP prompted US regulators to permanently include these procedures within their supervisory schemes: in this context, the enactment of the Dodd-Frank Consumer

and Protection Act in 2010 provided for the institutionalisation of the SCAP, introducing two types of stress tests, the DFAST and the CCAR, which are both conducted by the Federal Reserve with the aim of assessing the resilience of the financial system as a whole. These procedures have since become permanent tools within the US banking supervisory regime.

Within the EU, on the other hand, system-wide stress exercises are currently conducted by two different supervisory authorities: the EBA, which is responsible for conducting the EU-Wide Stress Tests, and the ECB, which leads annual stress exercises feeding into SREP (Supervisory Review Evaluation Process), thematic stress tests and comprehensive assessments, the results of which are part of even broader global evaluation.

Regardless of the type of approach selected for the supervisory procedures, constrained bottom-up for the EBA's EU-wide test and top-down for DFAST, the key aspect concerns the assessments that take individual banks as reference to check the stability of the financial system as a whole: constant communication between individual banks and supervisory authorities is therefore fundamental for the realisation of effective procedures and the production of reliable results. And conducting periodic stress tests ensures a high standard of interaction between the authority and individual institutions, enabling them to respond effectively to the constant challenges that can arise within today's dynamic, complex and uncertain financial system: the constant evolution that characterises modern finance continually generates information gaps, which testing programmes can help fill.

The information of a hypothetical nature that stress tests can generate can be decisive, especially in crisis contexts: in the initial phase, for a preliminary assessment of the type and size of the recession, increasing awareness among supervisors and banks of the difficulties they are experiencing; in an advanced phase of the crisis, because the greater clarity of the context allows the tests to be modelled in accordance with the current reality, thus making it possible to formulate more credible forecasts on the future of the financial system. The predictive capacity of this tool proved useful during the Covid-19 pandemic crisis, an event that initially manifested itself within the real economy, but later generated consequences within the banking sector as well. In this context, the Federal Reserve didn't suspend the stress exercises and defined two rounds of tests within a few months: February 2020 tests, which provided a framework for the characteristics of the crisis itself, and the September 2020 tests, which, relying on the information generated by the first round of tests, were structured on the basis of

scenarios aligned with the reality of the time, thus producing reliable results and restoring the conditions of stability and confidence within the sector.

However, all crises start from a long way back and very often some events may only produce material effects years later. This reflection prompts one to look for the possible reasons behind the collapse of the Silicon Valley Bank within its heyday, in which ineffective supervision and underestimation of the risks taken may have played a key role in its failure. In this context, the EGRRCPA (Economic Growth, Regulatory Relief, Consumer and Protection Act) deserves a mention: enacted in 2018, this regulatory reform excluded all banks with less than $100 billion in consolidated assets from the supervisory stress test exercise, with the aim of relieving small and medium-sized firms from the regulatory burden of testing, which was deemed too onerous for such entities.

The objective of this research is therefore to assess whether the SVB was removed from the stress exercise because of the 2018 regulatory reform, and if it was, to analyse whether the regulatory stress tests could have saved the Californian bank from collapse.

This work is divided into four chapters, with the intention of providing a preliminary overview of the stress procedures, followed by an in-depth assessment of the collapse of Silicon Valley Bank in the context of the tests.

The first chapter presents the main aspects of the financial system, to which network theory can offer important support in the analysis. The chapter continues with a comprehensive introduction of stress testing procedures from a regulatory perspective, and then identifies the main types of stress tests currently present in the US and EU supervisory systems.

The second chapter instead highlights the dynamics of the GFC and the importance of the SCAP in restoring stability within the financial system. The analysis then focuses on the role of stress tests during the Covid-19 pandemic crisis, which allows us to grasp some key elements of these procedures.

In the third chapter, after a brief introduction on the historical evolution of Silicon Valley Bank, the results of the CAMELS analysis of the bank's conditions for the period 2019-2021 are reported. The novelties introduced by the implementation of the EGRRCPA regarding stress tests are then analysed in detail: the delineation of the updated banking supervisory framework, following the regulatory reform, will allow for preliminary accounting assessments

concerning the SVB, which will prepare the ground for a more in-depth investigation on the relevance of stress tests in relation to the Californian Bank.

The fourth chapter will instead present a parallel with the European situation, to understand whether a similar case to the SVB might exist within the EU. It will then discuss the potential information that the ad-hoc stress test procedures available to the ECB could provide for specific assessments. Some considerations in light of the collapse of the Californian Bank and food for thought for the future of stress testing will conclude the work.

CHAPTER 1

The financial system and the stress testing: an analytical perspective

1.1 The financial system: a mix of complexity, dynamism and uncertainty

The bankruptcy of SVB in July 2023 was an unexpected event that shook the banking world after a long positive period of growth and stability, raising the concerns over aspects that had emerged with great intensity during the 2008 Global Financial Crisis (GFC), first and foremost the complexity of the dynamics and relationships within the financial system. This recent episode has been the culmination of a process of risk accumulation that had been going on for years, in which the growing interdependence of relationships between multiple actors and on multiple levels contributed to the rapid contagion of consequences on the entire global ecosystem.

The modern financial system is a much more complex system than in the past, characterized by increasing interactions among multiple actors, such as banks, insurers, hedge funds and dealers, whose behaviours are strongly interconnected with the real economy and the broader environment. In addition to this complexity, dynamism and uncertainty play a key role in making the financial system unpredictable and ever-changing[1]: these three aspects, even though they are identified separately, represent the most difficult points with which financial regulation is currently fighting. Certainly, the speed of the innovation process has contributed significantly to the dynamism of the financial sector, through the introduction of new technologies, such as the recent Financial Technology (or Fintech) and the development of new products, financial markets and services, forcing regulators to continuously adapt and introduce updated rules to meet the new challenges; at the same time, the market participants will in turn have to constantly adapt, changing their market strategies in a timely manner to seek a higher level of prosperity[2].

In order to explain the uncertainty characterizing the current financial structure, however, it is necessary to start with the diametrically opposite aspect of financial stability: throughout history, it has been observed that, during periods of financial stability, there has been a certain cyclical nature to the economy, characterised by periods of prolonged expansion and sustained

[1] D.AWREY, K. JUDGE (2020), Why Financial Regulation Keeps Falling Short, cit., p. 2302 ss,
[2] J.D. FARMER, Market force, ecology and evolution, in Industrial and Corporate Change, 11, 2002, pp. 895-953

economic growth, booms in business cycles and the consequent financial developments, leading the various actors present in the system to ignore the first alarm signals coming from outside and to avoid adopting preventive behaviour to possible crisis situations, because they were mistakenly convinced that the positive situation of the financial ecosystem would continue without interruption. This observation highlights that financial stability is a dynamic concept, as the cyclical nature of the economy often represents the main driver behind systemic financial crises: in fact, during these periods, banks have the tendency to engage in riskier behaviours, accumulating risks which could undermine stability within the banking sector[3]. In the face of such a vicious circle, we can therefore state that the systemic equilibrium is constantly changeable and that the ability of the main economic agents to adapt rapidly to the constant evolution affecting such a complex structure is crucial to the system's smooth functioning.

Network theory in finance can make an important contribution to the understanding of the interconnected structure that characterises modern finance, offering valuable insights into the development of supervisory policies capable of capturing the complementary aspects of crises. In particular, this theory can be analysed on two different levels: a more general level, which examines the structural and constitutive aspects of a network, and a more specific level, which analyses the characteristics of financial networks. In this context, the financial system can be represented as a complex structure characterised by a high degree of intertwining of nodes and connections, where the nodes are represented by financial institutions, such as banks and other financial intermediaries, while the connections between the different nodes are ensured by financial flows, social networks and other types of interactions within the network.

To analyse the characteristics of the financial system's networks, it is necessary to mention two fundamental aspects that allow for a deeper appreciation of its internal complexity and heterogeneity: the centrality of a node within the network, which provides a measure of the importance of banks and other financial intermediaries in the financial system; the density, which instead describes the degree of interconnectedness.

The first aspect relates to the centrality of a node, which enables the identification of those financial institutions that most frequently rely on liquidity provided by other banks. These financial institutions are thus assigned a central position within the network, reflecting their

[3] C. BORIO, M. CREHMANN (2010), Toward an operational framework for financial stability: 'fuzzy' measurement and its consequences, p.75

potential to generate serious damage to the entire financial system[4]: banks taking this position necessarily require increased monitoring by regulators and supervisors, so as to prevent vulnerabilities experienced by one institution from having a negative impact on the stability of the entire sector.

The second aspect, i.e. the density of a network, expresses the number of possible internal connections. In the financial context, this concept becomes relevant for assessing the resilience of both individual banks and the entire banking systems to the possible different shocks: in particular, within the sector, networks may have zero density, when there are no connections between different nodes, or high density, when nodes are strongly interconnected[5].

Recently, some researches have analysed the relationship between the density of interconnections in the financial sector and the resilience of the system. In this context it has been shown that a financial crisis can have different consequences on the financial ecosystem, depending on the degree of connectivity characterising the network. A financial system characterised by a high level of interconnection between nodes generally exhibits greater resilience to small shocks, which are shared within the network through an effective distribution of losses and risks[6]. While it is true that the robust interconnectedness within the system helps to mitigate the impact of small shocks, the same consideration cannot be valid for large-scale negative events: in these contexts, the high density facilitates the rapid proliferation of risks within the network, resulting in devastating consequences for the entire financial system[7].

In networks characterised by a limited number of interconnections, we can make the opposite considerations with respect to the previous situation: in the face of small shocks, these environments present greater vulnerability because of the impossibility of distributing their effects within the network; on the other hand, the limited existing connections among nodes becomes an advantage in case of large-scale crisis since weak connections hinder the

[4]B. Jiang, R. Rigobon & M.A. Dahleh (2024). Contingent linear financial networks in *Handbook of Financial Integration*, p.19 ss., p.48

[5] V. BEVIVINO (2022), Gli Stress test bancari. Inquadramento e regolazione, p. 79-80

[6] X. Freixas, B. M. Parigi, & J. C. Rochet, (2000). Systemic risk, interbank relations, and liquidity provision by the central bank. *Journal of money, credit and banking*, p. 613

[7]L.BLUME, D. EASLEY, J. KLEINBERG, R. KLEINBERG, E. TARDOS, Network Formation in the Presence of Contagious Risk, in ACM Transactions on Economics and Computation, 1, 2013, Article 6, p.1 ss.

propagation within the system, ensuring a better containment of the distribution of related risks and losses and limiting the manifestation of potential damage at a local level[8].

The structure of financial networks thus has a significant impact on the development of financial activity, an aspect underlining how the problem facing regulators, and the economy is to identify a trade-off between the requirements of financial system stability and the efficiency of individual institutions.

Taking into consideration a highly interconnected financial network, such as today's financial system, risk can no longer be analysed solely in relation to the individual institution, because the negative shock of an individual institution could generate negative consequences on the stability of the entire financial network: the decisions that are taken by individual banks during the normal lending activities, which might be prudent if considered in isolation, actually might contribute to creating risks at the systemic level, since the combination of choices taken individually by each financial institutions might be qualitatively different from the ones made by the main supervisory institutions to ensure the soundness of the entire financial sector.

Systemic risk is thus a phenomenon that arises from the non-linear interaction of individual actors within the system and that can jeopardise financial stability and the health of the entire network, with detrimental effects on economic growth and welfare.

Depending on the context, systemic risk can take on different characteristics: in the modern economy, it is often associated with credit risk, liquidity risk and, albeit with lesser consideration despite its importance, interest rate risk[9]. In the vast majority of crisis and stress situations that affect the entire financial ecosystem, there is a strong interconnection between the different categories. However, for a better understanding of the different aspects that systemic risk can take on, it is more effective to proceed by analysing the different categories individually.

The first type of systemic risk is credit risk, which may affect individual loans or the entire loan portfolio. This risk typically arises when borrowers are unable to meet their debt obligations and tends to increase during sudden economic downturns or periods of financial instability, as

[8] L. Enriques, A. Romano & T. Wetzer (2019). Network-sensitive financial regulation. *J. Corp. L.*, p.22
[9] V. V. Acharya, M. P. Richardson, K. L. Schoenholtz, B. Tuckman, R. Berner, S. G. Cecchetti, …& L. J. White, (2023). SVB and beyond: The banking stress of 2023, p. 37-38

was the case during the 2008 GFC: indeed, on this occasion, regulators and authorities were able to appreciate its danger to the financial system if it is not kept under control.

On the other hand, the second risk that can materially undermine financial stability is liquidity risk, which generally arises due to the formation of a structural mismatch in the bank's balance sheets because the institution doesn't have sufficient Available-For-Sale (AFS) assets to meet withdrawal requests from its depositors: this situation can prove to be very critical for individual banks, because it could undermine market participants' confidence in its soundness and could foster the manifestation of dangerous bank run phenomena.

Another potential threat to which the financial system is exposed is interest rate risk, which typically related to the investments choices made by the single institutions: banks often adopt investment strategies characterised by long positions on the bond market, which contribute to reducing the diversification of their portfolios and increasing their exposure to interest rate fluctuations. Moreover, bond instruments are inherently sensitive to changes in interest rates: in fact, an increase in interest rates could lead to a significant decrease in the value of these assets, resulting in a devaluation of banks' portfolios.

And the changes in interest rates can also influence the other types of systemic risk we've identified before, namely credit risk and liquidity risk, highlighting how the interconnectedness that characterizes the current financial system also extends to the risks present within it.

In today's ever-changing environment, the effective management of systemic risk becomes critical to maintaining the stability and resilience of the broader financial system. And in this context, the implementation of stress tests can play an important role in this endeavour, as we shall see starting from the next section, by significantly contributing to the prevention and identification of potential systemic risk situations that may emerge within the financial environment.

1.2 Stress testing procedure: a preliminary definition

The stress test is an instrument that has brought about a profound structural change within the financial system, especially since the GFC. This tool has not only improved the resilience of institutions but has also fostered the development of other regulatory mechanisms. To establish a preliminary framing of this tool, it is interesting to consider the stress tests within a broader regulatory context.

Stress tests can be placed within the so-called 'regulation by hypothetical'[10], a new type of supervision that banking regulation has introduced into the supervisory frameworks and that proved fundamental in overcoming the 2008 financial crisis. The novelty of this regulation, based on a hypothetical regime, can be assessed in two respects: from a methodological point of view, due to the peculiar characteristics that distinguish stress tests from all other supervisory instruments; and in terms of effects, because the hypothetical analysis provided by testing programmes is requested and managed by supervisory authorities and can determine regulatory responses of various kinds.

Thus, the ability of stress tests to make assumptions about crises that might occur can provide a range of insights that can be used in a variety of ways and may prove useful in filling those information gaps that inevitably characterise modern finance, providing important support in making certain regulatory choices (such as capitalisations) and in informing the public authorities and economic agents for future choices.

The financial crisis started the process of institutionalising the hypothetical regime, which from being an internal aspect of company management, progressively became an integral part of supervisory regulation, due to the increasing use of stress tests both with reference to individual entities and to the entire system[11]: the forecasts made by these procedures represented the basis for subsequent regulatory interventions both by individual banks and by supervisory authorities, thus fostering a process of adjusting the conditions of individual institutions to the results of the exercises to which they were subjected.

Although the predictions provided by regulatory models for hypotheses such as stress tests can be considered speculative, their contribution becomes crucial to ensure greater resilience

[10] M. BARADARAN (2014), Regulation by Hypothetical, p.1250

[11] V. CONSTANCIO (2016). The role of stress testing in supervision and macroprudential policy. *Stress Testing and Macroprudential Regulation*, *p. 26*

within the financial system, vis-à-vis future events that could materialise and undermine its stability.

It is important to emphasise, however, that there is currently no unambiguous definition that can identify these exercises. Nonetheless, US and European legislation has intervened to regulate various aspects of stress testing procedures, with the aim of defining a sufficiently comprehensive regulatory framework in terms of the information production process and the notion of evidence.

US law first seeks to frame stress testing as a process that attempts to examine the fundamental characteristics of a financial institution, such as the capital and liquidity condition at the start of testing, the potential risks and exposures to which the entity may be subject, and any weaknesses in the risk management strategies currently in place. Once these characteristics of the supervised institution have been examined, the stress tests take on a forecasting function, attempting to determine what the evolution might be, over a well-defined time horizon, of the selected scenarios on some specific items of the balance sheet of the bank under review, such as earnings, losses and consolidated capital[12].

On the other hand, with regard to European legislation, Article 177 of the CRR, in its first paragraph, emphasises that stress tests aim first and foremost to identify those potentially adverse events that could generate risky consequences for the health of the entire system, with the objective of determining the possible implications on the exposures of individual banks and on their ability to effectively absorb losses, so as to ensure the smooth conduct of their business even in situations of economic fragility.

Putting together the different aspects examined by US and European regulation, we can thus define stress testing as a process that produces information on both the health of individual banks and the financial system as a whole, through a predictive assessment of the ability of individual institutions to be resilient in the face of severe but plausible macroeconomic shocks and thus ensure the smooth functioning of the entire sector[13].

“Regulation by hypothetical” thus aims to ensure a better detection of systemic risk, which would consequently be more consistently addressed and more rigorously modelled by banking supervision than banking firms would do on their own. In this context, the use of stress tests by

[12] BCBS, Stress testing principles, October 2018, p.6

[13] V. BEVIVINO (2022), Stress test bancari. Inquadramento e regolazione; also see B.P.M. Joosen, M. Lamandini, T.H. Tröger (ed. by), Capital and Liquidity Requirements for European Banks, Oxford, 2022, p.548 ss., p. 549

supervisory authorities becomes crucial to understanding the potential risks that could impact individual banks and the financial stability of the entire ecosystem: the contribution of the procedures might be considerable, as it allows the risk management framework to be extended, analysing risk exposure in a more complex and incremental landscape. What is important to emphasise, however, is the compulsory nature that results from the use of hypothesis-based regulation, because banks are required to adhere to a regulatory system imposed by the supervisory authorities, based on hypothetical risk modelling.

At present, banking supervision invests significant resources in promoting the development of hypothesis-based regulation, by enhancing the analytical capabilities of stress tests in order to gain a deeper understanding of systemic externalities and their implications within the banking sector[14], as well as the interconnections between the financial environment and the rest of the economy[15].

The regulators' commitment to optimising stress exercises is a testimony to the impossibility of configuring a universal model applicable to all banks, and that, given the complexity of today's financial system, it should focus on capturing a group of risks that could expose the system to various negative outcomes.

One of the aspects making the stress testing particularly valued is its ability to challenge the fundamental assumptions of stakeholders and their positions, as well as to stimulate a reflection on the financial system from different angles, thus proposing an integrated perspective: given the speed of evolution of today's financial system and the changing nature of the balances within it, the information gaps that form can lead economic actors to make errors of assessment, which the information produced by the stress tests can help recalibrate in the right direction.

From a practical point of view, the usefulness of stress procedures is also to be found in their ability to provide a complementary view to that already offered by some famous statistical performance models (such as the Value at Risk[16], the Extreme Value Theory and Maximum Loss approaches, which, however, will not be analysed in this paper), which limit themselves to

[14] M. QUAGLIARELLO, Stress Testing the Banking Systems: Methodologies and Applications, Cambridge, 2009, pp. 3-15, p.9

[15] P. BOLOGNA, A. SEGURA, Integrating Stress Tests within the Basel III Capital Framework: A Macroprudentially Coherent Approach, in Journal of Financial Regulation, 3, 2017, pp. 159-186, p. 160.

[16] R.F. WEBER, New Governance, Financial Regulation, and Challenges To Legitimacy: The Example Of the Internal Models Approach To Capital Adequacy Regulation, in Administrative Law Review, 62, 2010, p.783

providing an essentially quantitative perspective, identifying in a fairly precise manner the probability of the occurrence of so-called tail risks, with a rather limited estimation error.

Therefore, the" Regulation by Hypothetical" is a distinctive regulatory approach compared to traditional models, using stress tests to provide regulators, supervisors and individual banks with a programmable and adaptable framework. This approach makes it possible to address the limitations imposed, at a general level, by the increasing complexity of social organisations and, at a specific level, by the inherent complexity of the financial system. And in today's dynamic and uncertain environment, bank stress tests represent an indispensable element of banking supervision because of their modelling ability to adapt to continuous change, a feature that the recent banking crisis has helped to underline, raising many doubts about the regulatory choices made in recent history by the major authorities.

1.3. The stress tests: features and approaches

After analysing the stress tests within the broader regulatory context, it is pertinent to examine aspects related to the structures of these procedures by considering the main typologies currently embedded in the banking supervisory framework, as dictated by regulatory requirements.

A first significant distinction is made between macroprudential and microprudential stress tests, which differ in the scope and objectives of their respective procedures, due to the different profiles and reference levels analysed.

Macroprudential stress tests aim at examining the stability of the financial sector as a whole, assessing its ability to effectively withstand the evolution of adverse macroeconomic situations: the results produced by the tests allow the impact of potential future shocks on individual banks to be assessed, and at the same time they can support the design and definition of ad-hoc macroprudential policies to reduce systemic risk and strengthen the conditions of individual banks and the banking system as a whole. These procedures can thus be integrated into an overall assessment of financial stability, which is carried out by supervisors and economic institutions through an in-depth macroprudential analysis.

By contrast, microprudential stress tests are performed at the level of individual banking institutions, emphasising the importance attached to the specific situation of each institution. Within the analysis perspective offered by these procedures, one includes both tests conducted independently by individual banks, which provide a valuable tool for internal risk management, and those initiated by supervisory authorities, which aim instead to assess institutions' resilience and capital adequacy in the face of potential adverse market developments. The results of these stress tests contribute to strengthening the Supervisory Review Process (SRP), which was initially introduced by the Basel II regulation in 2004 and subsequently expanded by the Basel III Accords of 2011.

A further important distinction relates to the reference context of the tests: in this regard, it is possible to differentiate between stress test procedures focused on individual banking institutions and those which consider the entire financial system as a reference in their analysis, although still conducted in relation to the individual institutions. Existing disciplines only regulate bank-level tests, while a better understanding of the underlying structure of system-wide stress tests can be obtained by referring to the competences assigned to banking authorities.

The distinction between system-wide stress tests and those conducted by individual banks provides a clearer representation of the different analysis profiles that the tests may adopt: in particular, system-wide stress testing procedures can be conceived as both micro- and macro-prudential analysis programmes, implemented by central banks and supervisors, with the purpose of assessing the resilience of banks and the financial sector as a whole in adverse stress situations; on the other hand, bank-level programmes, conducted by individual banks, focus on identifying potential vulnerabilities to the health of the institution in stress situations, due to excessive risk exposure of particular assets held in the trading book, which could compromise its normal business activities[17].

Internal exercises are therefore used to assess the impact of adverse scenarios on an individual institution's financial condition. The results of these tests are of fundamental importance, both in assessing the effectiveness of internal risk management practices in relation to bank governance and the business model currently in use, and in feeding into the review processes, which, based on the information derived from the tests, may result in the implementation of risk containment policies or the formulation of mitigation strategies in the event of vulnerabilities emerging. The usefulness of the application of bank-level tests is manifested both in the internal assessments made by bank management and the various divisions of the institution, as well as in the considerations made by external parties, such as supervisory authorities, which integrate the results obtained in a broader context relating to the financial stability of the entire sector.

As mentioned earlier, system-wide stress tests aim to assess the resilience of banks and the financial system with respect to macroeconomic stress scenarios[18]: these procedures adopt a macro perspective that integrates micro elements related to individual banks, allowing for the exploitation of feedback effects[19] generated between these two dimensions of analysis. Systemic stress tests are also outlined with the objective of promoting exchanges on risk management practices at the level of the governing body. The perspective of these exercise is thus broader, and their use may prove advantageous and fundamental in correcting certain assessments that

[17] T. Schuermann (2014). Stress testing banks. *International Journal of Forecasting*, *30*(3), p.8

[18] C. Borio, M. Drehmann, K. Tsatsaronis, (2014). Stress-testing macro stress testing: does it live up to expectations? *Journal of Financial Stability*, *12*, 3-15, p.5; also see K. Pliszka (2021). System-wide and banks' internal stress tests: Regulatory requirements and literature review. Discussion Paper, Deutsche Bundesbank, No 19/2021 p. 1

[19] K. Pliszka (2021). System-wide and banks' internal stress tests: Regulatory requirements and literature review. Discussion Paper, Deutsche Bundesbank, No 19/2021 p. 15

are made by internal stress tests, which, taking the individual institution as a reference, may not be able to capture certain aspects that only the adoption of a systemic view could allow.

Despite the different reference context, it is important to emphasise that the approaches for system-wide stress tests and bank-wide stress tests respectively follow the same process steps: the first step consists of scenario selection; the scenario chosen for the application of the procedures is then modelled on the basis of bank-specific risk factors; once the risk factors to be considered for testing have been chosen, the impact of these factors on the metrics of interest for testing within the scenario selected in the first step is calculated; a follow-up exercise concludes the process.

In the first phase, all those aspects that contribute to defining the scenarios and that must be included within the systemic or internal tests are therefore gathered: in this context, the identification of the core assets on which to focus the examination is of great importance in order to draw a perimeter of analysis, thus ensuring a greater degree of contextualisation and precision by the procedures. The scenarios considered in the stress exercises, implemented by supervisory authorities or individual banks, assume abnormal developments in a number of economic and financial market variables, which, taken together, could generate significant losses that could undermine banks' business models and potentially threaten the stability of the entire financial system.

Generally, testing programmes include a baseline scenario and one to five stress scenarios, with the number of scenarios tending to increase as the number of banks in the test sample decreases.

At this early stage, two types of problems tend to arise, which concern the assessment of the plausibility of the selected scenarios and the specification of the time frame within which the scenarios can unfold.

The plausibility of a scenario is assessed in relation to the appropriateness of its design and its severity, aspects on which supervisors and banks may have divergent views based on the interests of each party, frequently becoming an inherent point of conflict: in the presence of a severe test, or in any case an unfamiliar shock, institutions tend to challenge the selected scenarios, considering them implausible or too stressful and capable of generating results that would require an increase in capital or liquidity positions or other more far-reaching supervisory actions; conversely, the definition of scenarios that are implausible and incapable

of capturing the critical issues at the bank level could undermine the validity of the test, preventing the supervisor from truly understanding the level of stability of the financial system. The plausibility criterion is thus a key element in ensuring reliability in the testing exercise, but at the same time makes it complicated for supervisors to introduce new shocks into the scenarios or to verify the tail events. For this reason, systemic and internal stress tests need to be modelled differently and include plausibility elements that can be assessed according to different parameters.

The stress scenarios that are generally selected in the tests conducted by supervisors and banks generally extend over a number of years, as many shocks take a long time before they have a material impact on bank balance sheets, with the exception of mark-to-market portfolio shocks, which need to be modelled separately because of their ability to generate immediate effects on banks' income statements and balance sheets. In this context, the problem is related to the selection of the time frame within which the stress scenarios are to be developed: while the assessment of the impact of shocks on bank balance sheets is more meaningful when longer periods are considered, modelling the evolution of these balance sheets becomes more uncertain the longer the period within which the projections are to be made, given the need to continuously model the behavioural responses of banks and market participants and interactions with the real economy[20].

The scenarios that are selected for systemic and internal testing may consist of shocks to multiple risk factors, but also to a single risk factor. However, in the latter case, the assessment would be insignificant: the manifestation of a shock is in fact often the result of a combination of several risk factors, and banks' positions inevitably differ depending on the risks considered.

Within the scenarios chosen for testing, the main macroeconomic metrics that are stressed are GDP, inflation, unemployment, consumption, government rates, equity and volatility indices, credit spreads, real estate price indices and exchange rates[21]. The problem of choosing risk factors becomes even more relevant in relation to global banks that, operating worldwide, are exposed to risk factors that go beyond national borders.

Thus, in selecting the factors to be considered in the scenarios, a trade-off must be struck between the objective of considering the full range of potential risk factors to which banks may

[20] V. BEVIVINO (2022), Stress test bancari. Inquadramento e regolazione, p. 156

[21] C. BORIO, M. DREHMANN, K. TSATSARONIS (2014), Stress-testing macro stress testing: does it live up to expectations? *Journal of Financial Stability*, p.5

be exposed and the need to minimise the operational complexity and the test management costs.

The process of scenario selection is to be considered one of the most difficult, and probably most contentious, aspects in the definition of stress test methodologies, given the need to simultaneously consider different aspects while at the same time having to find certain trade-offs in the design of the tests that can satisfy different needs.

In the next step, the supervisory authority or the bank, depending on the type of analysis envisaged, is responsible for modelling the selected scenario on the specific risk parameters of the individual bank: generally, the projections focus mainly on the risks linked to the size of the individual institution, such as credit risk, market risk, interest rate risk, and liquidity risk, although this doesn't preclude the consideration of other types of risks.

Quantitative measurement, on the other hand, takes place in the third phase, during which the outcomes of the tests conducted by supervisory authorities and banks are determined. These results feed into the last stage of the stress testing process, namely the follow-up phase, which probably represents one of the most differentiating aspects between internal and system-wide tests[22]: while in bank-level stress tests, the results of the exercise feed into the internal capital adequacy assessment process (ICAAP)[23] and have to be disclosed only to the governing bodies, for the information produced instead by systemic stress tests, in addition to proving useful for supervisory authorities for an assessment of the expected capital requirements on the basis of the identified shortcomings, public disclosure is instead envisaged.

Although they may differ in terms of references, internal and system-wide stress tests remain inextricably linked and can be conceived as two aspects of a single expression that assumes a relevant role within the banking supervision framework provided by the major regulatory systems.

In addition, systemic stress tests can involve at least two different approaches in the design and execution of tests for assessing the impact of macroeconomic outcomes on banking variables: depending on the orientation adopted by supervisors and central banks in the execution of stress tests, bottom-up and top-down methodology procedures can indeed be identified. The first modality entails that the tests are conducted by the banks, which are asked to map a

[22] K. PLIZKA, System-wide and banks' internal stress tests: Regulatory Requirements and Literature Review., Discussion Paper, Deutsche Bundesbank No 19/2021, p.2

[23] BCBS (2019), Overview of Pillar 2 Supervisory review practices and approaches, p. 3 ss.

scenario, either defined internally or prepared by the macroprudential supervisory authority, onto the risk parameters and key relevant metrics of the institution itself, using their own models developed in-house. Since this is a methodology based on the use of specific information relating to each bank, the level of granularity that is required for the data used in these tests turns out to be potentially high.

Supervisors are then responsible for assessing the quality and adequacy of the data and calculations made by the banks, presenting any challenges to the correctness of the work: in this sense, the examinations carried out by the authorities can cover either the institution as a whole or specific portfolios, depending on the reference selected for the exercise of the tests. The results that are produced by this methodology, however, have a high degree of detail and make it possible to identify the potential impact of certain events, such as concentrations of exposures, institution-level linkages, and the probability of contagion, that are directly related to the institution's loss rates.

System-wide procedures involving a top-down approach, on the other hand, are generally conducted by the authorities overseeing financial stability and are based on a high degree of aggregation of available information: in fact, such exercises consider aggregate data from individual institutions to assess the impact of macroeconomic variables on the resilience of the banking sector as a whole. However, performing procedures with a top-down approach may also arise from the interest of the relevant authorities to simultaneously assess the impact of exogenous variables on the resilience of many banks, using balance sheet data that are publicly available[24].

Stress tests using a top-down methodology require supervisors to prepare models with general or systemic assumptions or scenarios, so that these can be applied to assess their impact on banks' risk parameters.

The choice of a top-down approach in conducting system-wide tests allows macroprudential authorities to be able to manage the process and determine the results of the stress test by providing for less involvement of banks than is generally the case in stress testing with a bottom-up approach. The perspective adopted thus ensures the establishment of a uniform and

[24] P. KAPINOS, O.A. MITNIK, A Top-down approach to Stress-testing Banks, in Journal of Financial Services Research, 49, 2016, p. 229 ss., p. 230

common framework, which at the same time allows for a comparative assessment of the impact of a given stress test on the health of the individual institution.

Regardless of the reasons that may push for the adoption of one typology over the other, what is important to emphasize in this context is that both approaches adopted for system-wide tests allow for the definition of forms of financial governance characterized by a high level of integration between regulators and regulated entities. And this integration manifests itself independently of and degree of interaction of the actors involved in the different supervisory systems.

1.4. Stress testing procedures in U.S. and EU

The presentation of the general aspects related to the characteristics and types of stress tests allows us to be able to institutionally frame the procedures that are provided for in the U.S. and European regulatory systems.

Currently, there are at least two system-wide stress tests in the United States, which were introduced by the Dodd Frank Consumer and Protection Act in July 2010: the Dodd Frank Act Stress Test (DFAST) and the Comprehensive Capital Analysis Review (CCAR). The Federal Reserve is responsible for coordinating these procedures, with the goal of minimizing duplicative requirements and minimizing the regulatory burden on banks from conducting the tests.

It is important to first point out that these two types of stress tests, while providing a system-wide benchmark, still remain focused on banking institutions.

With regard to DFAST, the key provision of the Dodd-Frank Act is Section 165(i), which initially required supervisors to conduct stress tests on an annual basis to assess the health of banks with total consolidated assets in excess of $50 billion, lowering the $100 billion size cut-off provided until the previous year: the size level established by the legislation was frequently designated as the SIFI (Systemically Important Financial Institutions), the attainment and exceedance of which justified the application of enhanced prudential standards because of the idea that the failure of banking institutions, which exceeded this threshold, could jeopardize the financial stability of the entire system.

The U.S. regulatory architecture has recently undergone changes due to the introduction of the Economic Growth Regulatory Relief Consumer and Protection Act (EGRRCPA) in 2018, which, as we shall see, helped to scale back the scope of the Dodd Frank Act of 2010[25], resulting in some major changes in stress testing, chief among them the gradual raising of the required threshold for testing programs to $100 billion, which resulted in a reduction in the number of institutions subject to the exercise of the number of scenarios, from three to two, to be modelled in the tests.

Although Section 165(i) appears to be rather both clear on the details, the substantive aspects of the DFAST were defined in 2012 within the so-called Regulation YY, which provides a supporting function to what was envisaged in the original act, providing more precision on the

[25] G.J MOORE, Pass or Fail? Grading the Effectiveness of Stress Tests a Decade After the Financial Crisis, in North Carolina Banking Institute, 23, 2019, p. 333 ss., p. 343

scope and applicability of the stress tests, but also on the possible different practical methodologies and time horizons that may characterize the tests in relation to the characteristics of the banking institutions that meet the requirement for the applicability of the tests[26].

Based on the requirements for the 2024 DFAST, banks that fell within the sample to be tested were required to conduct and complete stress tests over a nine-quarter time horizon using two macroeconomic scenarios provided by the FED[27], a baseline scenario and a severely adverse scenario, not including within the testing schedule the adverse scenario, which was initially included in the original act.

The procedure aims to assess the resilience of the large banks in the selection sample in the face of these hypothetical but plausible scenarios. The results of the tests also provide a risk-sensitive, forward-looking assessment of capital needs, which allows the Federal Reserve to set the capital requirements for large banks, with reference to the components of Common equity Tier 1: the minimum capital requirement, which is set at 4.5% and equal for all banks and the stress capital buffer requirement, which is subject to some variability and must be at least 2.5%. Although pass/fail modalities are not considered for passing the test, where applicable, there may be a capital surcharge for larger and more complex banks, which must be updated during the first quarter of each year to take into account the overall systemic risk of each bank[28].

The Federal Reserve, along with other financial regulators operating at the federal level, then adopted the Capital Plan Rule[29] in November 2011, which effectively enshrined the introduction into U.S. banking regulation of the other type of system-wide test parallel to DFAST , the Comprehensive Capital Assessment Review (CCAR), to examine the capital positions of the largest firms: the CCAR analysis aims to assess whether these firms have the capacity to be able to continue lending and absorb potential losses under severely adverse conditions and whether they have sound and forward-looking planning practices within the meaning of Regulation YY and the Capital Plan Rule.

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[26] Federal Reserve System (2012), Supervisory and Company-Run Stress Test requirements for Covered Companies, 12 C.F.R. pt. 252 III.C.

[27] Federal Reserve, Press Release, Federal Reserve releases the hypothetical scenarios for its annual stress test, February 15, 2024

[28] Federal Reserve, Press Release, "Federal Reserve Board Announces the Individual Capital Requirements for All Large Banks, Effective on October 1," press release, August 28, 2024; also see Federal Reserve, Press Release, "Federal Reserve Board Announces the Individual Capital Requirements for All Large Banks, Effective on October 1," press release, July 27, 2023

[29] Federal Reserve System (2012), Capital planning and stress capital buffer requirement.12 CFR pt. 225.8

This rule currently requires that a subset of the largest banks subject to DFAST with total consolidated assets of at least $250 billion, and no longer $50 billion as originally required by the original rules, submit detailed capital plans to the FED annually that are developed over a nine-quarter horizon and that consider assessments of the impacts of a range of stress scenarios on their specific capital conditions. Along with the Plan, banks are also required to send the Board a detail of the internal policies and procedures that are adopted to assess capital held.

Based on the capital plans received, the FED then conducts a forward-looking analysis in relation to the financial condition and risk profile of each institution tested, as well as on the adequacy of capital on hand. The assessment made by the FED integrates a qualitative component and a quantitative component, which together help shape the stress exercise. Banks can fail both, or even just one of the two assessments. The main regulatory response if a quantitative or qualitative stress test fails is generally restrictions on banks in their dividend distribution and share repurchase policies, with the goal of increasing capital levels through retained earnings.

The quantitative exercise aims to assess, taking into consideration the results produced by DFAST, whether banks are able to maintain capital ratios above the minimum requirements even in a severe recession scenario. As a result of the recent banking crisis in 2023, the structure of the CCAR for 2024 was revamped from the previous year, with the introduction of two new exploratory macroeconomic scenarios (Exploratory Macro Conditions A and Exploratory Macro Conditions B)[30], which were added to the ordinary test. The programme of the previous year already contemplated the use of internally generated scenarios based on banks' forecasts for the baseline and adverse scenarios, in addition to the two stress scenarios planned for the 2024 DFAST. In contrast, the qualitative test of CCAR conducted by the FED examines the narrative aspects of the Capital Plan, focusing on the adequacy of internal processes and evaluating the plan for credibility.

Initially, under the provisions of the 2011 Capital Plan Rule, the Federal Reserve could object to the capital plan of a bank subject to CCAR based on a qualitative assessment conducted in accordance with the testing program. Beginning with CCAR 2021, however, this requirement

[30] A. Gil, Global Association of Risk Professionals, Stress Testing in 2024: Analyzing the Fed's Newly Released Scenarios

was revised, removing the ability for the Fed to raise a potential qualitative objection against banks that had successfully passed the various qualitative assessments[31].

Although they are separate procedures, capital planning and stress testing required by CCAR and DFAST, respectively, can be seen as somewhat complementary and often rely on similar processes and data. However, since CCAR includes the capital planning process as the benchmark of its procedure, it is possible that the regulatory judgment resulting from its execution has potentially greater impact than that of DFAST. In U.S. testing, the top-down approach prevails, although banks are required to conduct stress tests based on internal models using common scenarios selected by the FED and use institution-specific scenarios separately.

Within the U.S. supervisory framework, in addition to stress tests there is an additional tool that deals with analysing the general condition of banks, thereby supporting the supervisory function exercised by the Federal Reserve: the CAMELS rating system. This rating system was initially adopted in 1979 in the United States with the abbreviation CAMEL[32], as it provided for five areas of analysis, and was replaced in 1995 by the introduction of the current CAMELS system, due to the addition of a further assessment area to those already established by the previous method: capital adequacy, asset quality, management, earnings, liquidity ratios and sensitivity (to market risk).: capital adequacy, asset quality, management, earnings, liquidity ratios and sensitivity (to market risk). The CAMELS system then provides a rating scale for each area from 1 to 5, with a score of 1 being considered the best and a score of 5 being the worst.

The objective of the first factor of analysis, capital adequacy, is to analyse, through the calculation of various ratios, the institutions' ability to meet the risk-based capital requirements of the regulations. Asset quality assessment, on the other hand, focuses on analysing the risk factors for the investments that have been made by the individual institution. With reference to the third element of the CAMELS rating system, management's ability to ensure the institution's operation in accordance with internal and external financial sector regulations is examined. On the other hand, growth, stability, net interest margin and the quality of the institution's existing assets are considered in assessing the institution's earnings. The sixth area of analysis relates to the institution's liquidity, which focuses on assessing the ability of its assets to be converted into cash, a factor that, as we shall see, assumed significance in the SVB's collapse. The last

[31] Federal Reserve (2020), Comprehensive Capital Analysis and Review Summary instructions (p. 9)

[32] A. G. Christopoulos, J. Mylonakis, & P. Diktapanidis, (2011). Could Lehman Brothers' collapse be anticipated? An examination using CAMELS rating system. *International Business Research*, *4*(2), 11, p. 12

element of the CAMELS system, market risk sensitivity, is analysed in relation to credit concentration management. Thus, this rating system aims to analyse the efficiency of banks, proposing its evaluation both quantitatively, using a series of indices, and qualitatively, although in the latter case there is a certain margin of discretion related to the subjective elements that guide the institution's operations[33]. Another interesting aspect concerns the results of the evaluations carried out according to this system, since they are freely available within the institution, particularly to senior management, but are not, on the other hand, disclosed to the public. Although the CAMELS rating system provides an examination of all aspects of a bank, its perspective of analysis is decidedly more limited than that which a regulatory stress test could provide, given the almost exclusive concentration in assessing the health of the institution on the condition of the balance sheet and income statement.

The introduction of this alternative methodology of analysis to stress tests, although its in-depth study is beyond the scope of this paper, is relevant here, since its use with reference to Silicon Valley Bank will allow us to grasp those aspects of context useful for understanding the application potential of stress tests.

Shifting the focus instead to the EU context, system-wide stress tests can be distinguished according to the supervisory authority responsible for their exercise: in this sense, we can indeed identify tests conducted by the EBA and procedures performed by the ECB.

Every two years, the EBA is required to conduct EU-wide stress tests, which are procedures that are carried out at the highest level of consolidation and consider a sample of banks representing about 70% of the total assets present within the EU banking sector[34]. Although these systemic tests are conducted by the EBA, collaboration with other key European institutions, such as the ESRB, the ECB, the European Commission (EC), and the competent authorities of all national jurisdictions involved, is essential to ensure the effectiveness of their exercise: in this sense, support is most apparent when defining the scenarios of the tests, as the ESRB is required to prepare the common adverse macroeconomic scenarios, while the ECB is responsible for defining the common baseline macroeconomic scenario.

[33] R. Babu & A. M. Kumar (2017). Adequacy of camels rating system in measuring the efficiency of banking industry: a retrospect. *International Journal of Research in Arts and Science*, *3*, 03-06, p.1

[34] EBA, 2025 EU-wide stress test - Methodological Note, July 5, 2024, p.3, par. 1.3.1; see also EBA, Discussion Paper on the future changes to EU-wide stress test, EBA/DP/2020/01, 22 January 2020, p. 6 s.

The exercise aims to assess the resilience of Union banks and the banking sector through the establishment of a common assessment framework based on the use of two internally consistent and relevant scenarios, running over a three-year time horizon, and the use of models to collect input data for the tests. Given the high level of detail that characterizes the methodology of EU-wide stress tests, the results that are produced by these tests offer supervisors and other market participants the opportunity to make rigorous assessments and comparisons among the European banks that are examined, especially with respect to the capital positions held by each. The EU-wide stress tests can thus be called solvency tests, which aim to assess the capitalization of individual banks by measuring, in terms of CET1 capital, the impact of macroeconomic scenarios on the capital conditions of the individual institutions under consideration. As of 2016, there are then no longer any hurdle rates or capital thresholds for passing the test: partly due to the EBA's adoption of an approach more focused on the prospective assessment of banks' capital planning, the results produced by the tests must now feed into the SREP[35] for the definition of Pillar 2 guidelines.

An interesting aspect of the EU-Wide Stress tests concerns the assumption of a static balance sheet, a choice that doesn't allow consideration of any mitigation actions taken to cope with the impact of shocks: regarding the balance sheet, the static nature requires the replacement of assets and liabilities that mature during the year with items that have a similar profile from the point of view of characteristics. This aspect is also reflected in the approach selected for the tests conducted by the EBA, which possess a constrained bottom-up nature[36]: in particular, banks must use their own models to project the impact of selected macroeconomic scenarios, but at the same time they must comply with a number of strict constraints, such as binding caps and floors, and may be subject to potential revisionary interventions by the relevant authorities.

In addition to the EU-wide tests conducted by the EBA, there are other types of stress tests, each characterised by different methodologies and objectives, which this time are directed by the ECB. In particular, the ECB is responsible for conducting annual stress tests as part of the SREP, thematic stress tests, comprehensive assessments, macroprudential tests, and ad hoc stress tests that may target individual banks or banking groups[37].

[35] EBA, 2025 EU-wide stress test - Methodological Note, July 5, 2024, p.9 par. 1.3.11, p.144 par. 6.4.6
[36] L. DE GUINDOS (2021). Macroprudential stress testing under great uncertainty. *IS MACROPRUDENTIAL POLICY RESILIENT TO THE PANDEMIC?* P.21
[37] V. BEVIVINO (2022), Gli stress test bancari. Inquadramento e regolazione, p.30

Annual stress tests are conducted in compliance with Article 100 of CRD (Capital Requirements Directive) and are reserved for significant banks that are placed under ECB supervision and don't participate in the EBA's EU-wide exercise[38]. These tests are designed to assess the ability of banking institutions to withstand specific shock scenarios, and the results obtained are used to feed into the SREP in the year in which they are conducted.

The key differentiating feature of the annual tests conducted by the ECB from the EBA stress test is the use of specific scenarios, which are not considered within the EU-wide stress tests.

Thematic stress tests are conducted by the ECB in cooperation with national central banks and focus on analysing the impact of particular risks, including exogenous risks, on the viability of particular banks or banking groups. This exercise allows for a more detailed and targeted assessment of the vulnerabilities associated with such risks, proving particularly useful for managing emerging risks, as highlighted by the 2022 thematic stress test on climate risk conducted by the ECB.

Comprehensive assessments represent an integrated process that combines an in-depth Asset Quality Review (AQR) with a stress test based on the EBA's testing methodology, albeit recognizing some flexibility in the case of the occurrence of exceptional circumstances related to the individual institution[39]. The AQR includes an assessment of banks' asset quality to ensure a greater level of transparency and clarity on the exposures held by banks. On the other hand, the stress test is conducted by the ECB in cooperation with the EBA and is concerned with testing banks' ability to cope with adverse economic conditions: in this context, the use of a standardized methodology reinforces the relevance associated with the results produced by the test because the adoption of a common approach ensures comparability across different institutions and jurisdictions.

Macroprudential stress tests aim to assess the potential systemic risks to which individual institutions, as well as the entire banking system, may be exposed.

Ad hoc stress tests are conducted by the ECB only when there are special situations or extraordinary events that could affect an individual bank or a group of banks. These tests are then designed to enable the institution to fill information gaps generated due to sudden changes

[38] C.V. GORTOS, European Central Banking Law. The Role of the European Central Bank and National Central Banks under European Law, Cham, 2020, p. 360

[39] S. Steffen (2014). Robustness, validity and significance of the ECB's asset quality review and stress test exercise, p. 8 ss.

in economic conditions, so that the institution can deal with potential scenarios that could occur based on the changes found.

In addition to regulatory stress tests, the internal procedures adopted by individual banks are also of great importance within the current supervisory frameworks. In this sense, the Basel Committee on Systemic Risk, as part of the final Basel III framework, has established more stringent requirements and expectations for banks' internal stress tests by strengthening the criteria for the three key pillars of banking regulation: specifically, in the context of Pillar 1, banks must stress test for credit risk, market risk and liquidity risk, the latter measured through the Liquidity Coverage Ratio (LCR), which from 2019 must be 100%[40], so as to ensure full coverage by High Quality Liquid Asset (HQLA) reserves of expected net cash outflows over the next 30 days in a financial stress scenario. The adoption of the Basel Regulation aims to provide a common framework for bank stress tests, although its application may vary among jurisdictions. Within the U.S. system, for example, the implementation of the EGRRCPA exempted small and medium-sized banks from the indicator calculation and provided less stringent coefficient values for Category III and IV banks. In contrast, in Europe, the 2019 revision of the Capital Requirements Regulation (CRR II) was made with the aim of aligning with the Basel III provisions on internal stress tests, confirming the 100% LCR calculation requirement for all banks and thus taking a further step toward greater regulatory uniformity. Internal and systemic stress tests are thus essential tools for risk management and banking system stability. The evolution of the financial system requires European and U.S. regulators to continuously ensure an effective supervisory system, within which stress exercises are expected to play a crucial role.

[40] K. Brůna & N. Blahová, (2016). Systemic Liquidity Shocks and Banking Sector Liquidity Characteristics on the Eve of Liquidity Coverage Ratio Application-The Case of the Czech Republic. *Journal of Central Banking Theory and Practice*, *5*(1), P. 166

CHAPTER 2

The role of stress testing during the crisis

2.1 The 2008 crisis: the risk management failures and the need of a perspective change

Certainly the 2008 crisis has been a turning point for the global economy, because, after a long period of economic stability and prosperity, the worst economic crisis since the Great Depression had a huge negative impact on governments, regulators, financial systems and individuals as a whole: in the face of the new negative scenario, they began to question the long-established beliefs about macroeconomic volatility in developed countries, which had been believed to have been neutralised by then, and about the level of structural effectiveness of financial regulation and risk management practices[41] adopted by banks and other financial institutions, which had led to the assumption that the outbreak of a new financial crisis was a risk that was almost nil and not even to be considered.

The GFC brought to light the vulnerabilities of financial institutions, which, until then, had been well concealed by a long period of economic growth: the governance, internal control programmes and corporate management of major banks began to show weaknesses with the outbreak of the crisis, underlining the need to become aware of the weaknesses in the risk management practices adopted by financial institutions, not only at the individual level, but also at the systemic level.

The difficulties experienced by banks during the 2008 financial crisis emerged mainly due to structural weaknesses in the financial system at the time, which contributed negatively to the development of the recession. First, most financial institutions demonstrated a lack of effective risk management practices, which placed excessive reliance on standardised quantitative models for assessing the risks attached to their assets: this approach led to an underestimation of the systemic nature of some risks, by focusing predominantly on the probability of risk materialisation rather than on their expected damages and the definition of potential survival plans.

Moreover, risk reporting procedures and scenario analyses had become ineffective and obsolete, and therefore they needed updates to provide a reliable analysis of the new crisis.

[41] V. Acharya, T. Philippon, M. Richardson, & N. Roubini, (2009), The financial crisis of 2007-2009: Causes and remedies. *Restoring financial stability: how to repair a failed system*, p. 1057

Against this backdrop, the gradual spread of innovative instruments within the financial world during the crisis and the awareness of their ability to trigger potentially negative and uncontrollable effects on the entire system further increased concerns for banks.

In fact, although financial innovations contributed to an improvement in the efficiency of risk management processes, they also played a decisive role in the emergence of new 'unknown' risks[42], especially at the systemic level due to the increasing complexity of traded instruments and the considerable increase in the interconnectedness of markets during the crisis: their complexity was mainly linked to the fact that the valuation of these instruments had become decidedly less reliable in market conditions characterised by less liquidity, fewer financial transactions and a dramatic increase in volatility, causing a considerable increment in disputes over the collateral to be provided to obtain funding and, inevitably, in the exposure to systemic risk. In this sense, it is important to emphasise the negative contribution of credit derivative transactions, such as CDOs (Collateralised Debt Obligations) and ABS-CDOs (Asset-Backed Securities - Collateral Debt Obligations)[43], which were used during the crisis for both hedging and speculative purposes, favouring the transmission within the system of numerous risks such as credit risk, counterparty risk, rating agency risk, and settlement risk[44]. The perception of investors and other market participants of the difficulty in assessing and identifying the risks associated with their investments has prompted them to reassess the levels of risk assumed, causing a negative knock-on effect on the assessment of risks associated with other financial instruments.

It's important to highlight that liquidity and funding problems also played a central role in the financial collapse of 2008: most of the large investment banks during the crisis period experienced an increase in maturity mismatch in their balance sheets, as long-term assets were predominantly financed with short-term debt capital. This strategy, however, over time amplified the effects of the liquidity crisis, which had meanwhile begun to spread within the banking sector.

One explanation for the materialisation of this crisis could be found in the investment strategies that large and complex financial institutions began to adopt as of 2004. By then, to boost capital inflows, these institutions increasingly relied on short-term borrowing, mainly represented by

[42] P. Jorion, (2009). Risk management lessons from the credit crisis. *European Financial Management*, *p.2, p. 6 ss.*
[43] S. M. Miller, (2023). Regulation, CDO Exposures, and Debt Guarantees through the Financial Crisis. *Mercatus Research Paper*, p.1 ss.
[44] M. S. Gibson, (2007). Credit derivatives and risk management, p.18

unsecured deposits and interbank liabilities[45], which became a major concern for investors especially following the bankruptcy of Lehman Brothers and the collapse of the Washington Mutual Holding Company. Simultaneously, they experienced an increment in the use of wholesale funding and unregulated shadow-banking vehicles. This huge influx of liquidity was then invested in assets deemed safe by the rating agencies, such as residential real estate and subprime-backed MBS (Mortgage-Backed Securities)[46], claiming that the valuations of these assets would drop sharply only in the case of a collapse of the real estate market and an extreme liquidity crisis, which would make it almost impossible to sell them. Such investment choices contributed to the dangerous accumulation of large amounts of tail risks, whose potential threat during the crisis was recognised mainly at the level of individual banks, with almost no consideration of the possible implications on the entire financial system by supervisory and regulatory standards.

The results of the adoption of these aggressive investment strategies by the major global banks were reflected in their balance sheets which, according to the 2008 Global Financial Stability Report, even doubled between 2004 and 2007[47]. Despite this, the risk related to the mutation of banks' balance sheets was apparently considered low, at least until the autumn of 2007, when the combination of the credit crisis and the bursting of the bubble in the housing market brought to light the weaknesses within the banking system: tail risks, which had been quietly accumulating in the balance sheets of the major financial institutions, began to materialise. This turmoil triggered the collapse of the indebted lending market and the drastic declines in the value of subprime mortgages and complex innovative financial products, (such as CDOs and ABSs), but above all it provoked the first bankruptcies of some large and complex financial institutions having heavily invested in the housing market, such as Bear Stearns Bank and Lehman Brothers Bank.

Large financial firms that failed during the crisis were faced with three possible scenarios: negotiating the sale of the institution to others; initiating an internal restructuring process to redevelop the bank and launch its business from scratch; a government support through extraordinary emergency measures to overcome the difficulties and continue lending. In this sense, during the crisis, the Monetary Funds intervened massively to help financial institutions

[45] M. Košak, S. Li, I. Lončarski, & M. Marinč, (2015). Quality of bank capital and bank lending behavior during the global financial crisis. *International review of financial analysis*, *37*, p. 2-3
[46] A. Sanders, (2008). The subprime crisis and its role in the financial crisis. *Journal of Housing Economics*, *17*(4), p.254
[47] Acharya, V. V., & Richardson, M. (2009). Causes of the financial crisis. *Critical review*, *21*(2-3), p.11

that were considered vulnerable from a liquidity perspective: in the US banking history, we remember above all the intervention of the Primary Fund Series of Reserve Funds after the bankruptcy of Lehman Brothers.

In the United States, the Fed's interventions to help a number of major banks that were close to bankruptcy had caused growing public concern about the possible consequences on the entire system of such a policy change in risk management within the banking sector: indeed, its traditional guiding principle of doing the minimum to preserve financial stability began to be questioned and progressively replaced by the principle of doing whatever was necessary in order to save major institutions from collapse, to prevent the potential contagion risks of such events on the whole system, and to protect the financial instruments used in the market.[48]

The collapse of the investment bank Bear Stearns and subsequently of Lehman Brothers were symbolic testimony of the difficulties, in terms of liquidity and funding management, that much of the banking sector experienced during the period of the economic crisis.

The failure of Bear Stearns, however, goes back a long way: the US bank was in fact the first institution to securitise loan packages in derivative instruments[49]. The bank's management, seeing the potential profit opportunities associated with the trades of these instruments, greatly increased the volume of transactions involving CDOs, mainly due to the set-up of Bear Stearns Asset Management, a separate Asset Management Division based in London. The decision of the Bear Stearns Bank to open its own separate division could initially have seemed a choice taken in function of better risk management, but in reality only accentuated the propagation of risks within the entire financial system: the Department, as well as not being regulated by rating agencies, was predominantly carrying out off-book transactions[50], of which Bear Stearns bank didn't provide any details to the public, except for bottom-line results, which were included in the bank's quarterly accounting records. This accounting strategy thus hampered the ability of key economic agents (investors and regulators above all) to know the potential risks taken by the institution in relation to the investment and risk management strategies adopted. Moreover, when the two hedge funds of BSAM were close because of negative valuations in March 2007, the department's managers still encouraged investors to

[48] F. Busato & C. M. Coletta, (2017). A moral hazard perspective on financial crisis. *Banks & bank systems*, p. 300 ss.
[49] J. Spina (2019). Information asymmetry and the recent financial crisis, p.8
[50] F. Betz, & T. M. Khalil (2011). Technology and financial innovation. *International Journal of Innovation and Technology Management*, *8*(01), p.4

invest in the bank, although they knew that the external public was unaware of the institution's internal difficulties. The lack of information transparency by BSAM continued even at a later stage: the Department's management, not only used the capital collected from investors for obscure internal purposes unknown to their lenders, but also it made impossible for regulators and especially their investors to access documents containing information useful for assessing the enormous risks they had decided to bet on.

The collapse of this investment bank had brought to light an important aspect of the funding crisis experienced by the banking world during the 2008 recession: the excessive dependence on short-term secured capital to finance long-term illiquid assets[51], which contributed decisively to the rapid drying up of the institution's entire liquidity. This excessive reliance made the bank unable to meet the continuous withdrawal requests during the bank runs by their depositors. The collapse of the Bear Stearns also raised the first doubts about the validity of the Too Big Too Fail (TBTF) principle and publicly exposed the difficulties and weaknesses of the credit derivatives market, which resulted directly exposed to possible external contagion: in fact, this market was found to be characterised by a high risk of concentration, as a small number of financial institutions were responsible for a large part of the transactions within it.

Despite the negative effects caused by the collapse of the Bear Stearns Bank, the systemic consequences caused by the collapse of Lehman Brothers were even worse, as the banking institution had gone bankrupt.

The bursting of the real estate bubble in the U.S. in 2007 had triggered a deterioration process in the MBS market. Against this backdrop, Lehman Brothers, one of the largest US banks involved in MBS and CDO investments, set up its own subsidiary in London, Lehman Brothers International (Europe)[52], in order to increase the volume of repo financing transactions to finance its investments during the crisis: the choice made by the bank was justified by the fact that these transactions were illegal in the US, whereas they were accepted in the UK, where the subsidiary could actually originate and process such transactions without any particular constraints. The adoption of this strategy, however, determined a reduction in transparency in the bank's risk management practices: these refinancing transactions allowed the UK branch to record the transactions as sales, rather than as traditional lending transactions, thus avoiding

[51] M. Labonte, (2014). Systemically important or "too big to fail" financial institutions, p.45
[52] R. Fernandez, A. Wigger (2016). Lehman Brothers in the Dutch offshore financial centre: The role of shadow banking in increasing leverage and facilitating debt. *Economy and Society*, *p.10*

the application of significantly higher haircuts. Lehman Brothers' leverage ratios declined considerably following the start-up of its UK subsidiary, as the US bank was able to retire additional secured debt, by using the liquidity obtained through the repo transactions. The main problem, however, lay in the way these refinancing transactions were carried out by the London branch: in fact, the Britannic subsidiary made these trades only at the end of the quarter, at the time of the publication of the financial records[53]. The implementation of this practice by the UK branch often allowed the parent bank's manipulation of the accounting records to reduce the liabilities within the balance sheet and to show appropriate debt ratios, thus conveying a false sense of security and optimism to the market and to its lenders about the US Bank's health and above all concealing the enormous risks that were silently concentrating within its portfolio. This investment strategy implemented by the British subsidiary inevitably determined the accumulation over time of a large amount of illiquid assets: in conjunction with the adoption of continuous re-mortgaging practices, this approach put the bank's liquidity in great difficulty, with associated risks quickly spreading within the financial system.

Further worsening the situation was the failure of the British Central Bank to provide liquidity and the inability of the British institution to transfer its business clients to a third-party buyer. Faced with a dramatically irreversible situation, Lehman Brothers International (Europe) found itself forced to file for bankruptcy, despite still holding a large amount of assets: this announcement was a severe blow to the bank's lenders, who were hardly aware that they were unlikely to regain possession of their assets, which were often unmarketable and not easy to hedge.

The Federal Reserve's attempts to save the major US banks from possible failure contributed not only to the concerns of the public and major market participants, but also to the creation of large-scale moral hazard problems: the large and complex financial institutions, aware that they were deemed by the government to be 'too big to fail', were able to take advantage of a regular and continuous access to cheap sources of financing at advantageous conditions: this situation led to an escalating concentration of financial instruments with a high market risk within their portfolios.

Looking at the evolution of the crisis from a macroeconomic perspective, the FED, through its decision to implement housing policies in favour of low-income borrowers, the adoption of an

[53] Jeffers, A. (2011). How Lehman Brothers used Repo 105 to manipulate their financial statements. *Journal of Leadership, Accountability and Ethics*, p.45-46

accommodative monetary policy and its willingness to guarantee banks relatively low interest rates when accessing sources of funding, also played a significant role in the development of the financial turmoil at systemic level. Faced with the new economic scenario that had emerged as a result of the crisis, the need to revise prudential regulation, which in the meantime had undergone a process of deregulation following the development of the credit markets, was quite evident: the major international regulators had finally realised the need to update their approach to risk assessment, because the financial crisis had shown the ineffectiveness of ensuring the stability of the entire system by guaranteeing the soundness and solvency just of individual banks.

Regulators' awareness of the importance of systemic factors and the presence of a strongly interconnected financial network has thus led to the emergence of the need to adopt a macroprudential approach to risk assessment, geared towards protecting the financial stability of the entire system, with a view to reinforcing the analysis carried out at the microprudential level, based on the identification of risks present within the individual institution, but without reducing their importance. And in such a context, the development of stress test procedures had become more necessary than ever for the recovery from the crisis to restore the confidence of key economic agents within the banking system and especially to provide a valuable response to the renewed need for stability and soundness of the financial system.

2.2 The role of Supervisory Capital Assessment Program (SCAP) during the GFC

Following the financial crisis of 2007-2008, banks had suffered huge losses, and it was feared that the situation might deteriorate further.

Against this backdrop of uncertainty, the growing general mistrust of the banking system had led to a significant increase in the spread of five-year Credit Default Swaps (CDS), financial instruments that reflected the cost of insurance against the insolvency of individual banking institutions[54].

To deal with the crisis and restore confidence in the financial sector, a series of stress testing exercises were therefore carried out in the the US and European supervisory systems, with the aim of assessing the capital strength of individual banks to restore stability within the sector. One of the most significant interventions in this context was the US Supervisory Capital Assessment Program (SCAP), designed and implemented by the Federal Reserve in May 2009. This programme was one of the first large-scale tests designed to assess the capital adequacy of individual banks and at the same time provide a concrete systemic response to the difficulties that emerged during the Great Recession.

The SCAP programme made a crucial contribution, especially as it was able to address one of the most quantitatively evident critical issues that emerged during the GFC: the inability of traditional capital metrics, such as the Tier 1 capital ratio, to reflect the deterioration of the major banks and to distinguish between relatively strong and weaker institutions. The ineffectiveness of the capital ratios used had contributed to further aggravating the crisis, as it had not been possible to identify in advance the banks that would later require public support.

The stress exercise looked at a sample of 19 bank holding companies with assets over USD 100 billion[55]. These institutions represented the heart of the financial system in the US as they collectively held two-thirds of the assets and more than half of the loans of the US banking system.

The SCAP exercise was conducted, combining a top-down approach, based on the use of Fed data and models, with a bottom-up approach, using each bank's own internal data and models[56].

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[54] R. J. Herring & T. Schuermann (2022). *Objectives and challenges of stress testing* in *Handbook of Financial Stress Testing*, *9*, p.11

[55] Federal Reserve (2009), The Supervisory Capital Assessment Program: Design and Implementation, p.3 ss.

[56] V.BEVIVINO, Gli stress test bancari. Inquadramento e regolazione, p.146

The test envisaged two scenarios within its programme, developed over a two-year time horizon: a baseline scenario, which reflected the development of the main economic variables in line with the consensus view of the depth and duration of the recession; an adverse scenario, which instead assumed a deeper and more prolonged recession than the baseline scenario, including the development of worse but still plausible conditions.

Both scenarios correctly anticipated the assumption of a single recession in the first year, forecasting a recovery in the following year: the baseline scenario presented for 2009 a GDP decline of 2.0% and an unemployment rate of 8.4%, with a subsequent GDP growth of +2.1% and an unemployment rate of 8.8% for 2010; on the other hand, the adverse scenario showed for 2009 a GDP contraction and an unemployment rate of 3.3% and 8.9% respectively, followed by a positive GDP recovery and an unemployment level of +0.5% and 10.3% respectively[57].

The SCAP thus presented a looking-forward analysis, developed, however, over a limited time span (2009-2010). In spite of this, the period considered was nevertheless deemed sufficient by the Supervisory Authority to capture most of the losses arising from positions held at the end of 2008: the choice of a two-year time horizon would have allowed for a balance between, on the one hand, the need to reasonably capture the full extent of credit losses originating between 2006 and 2007, when underwriting standards were more flexible, and, on the other hand, the need to reliably project expected losses in 2011[58].

In fact, the stress scenarios were defined primarily with the objective of assessing the credit risk exposures of individual institutions[59], given the increased reporting of significant losses in credit positions held by US banks. As part of the SCAP, five banks with significant trading operations were also asked to run an immediate shock on their trading portfolios to assess the impact on market and counterparty credit risk[60].

The banks examined then had to adapt the assumptions on macroeconomic variables to their specific business activities in order to capture the impact of shocks to these variables within their balance sheets and income statements. The purpose of this process was to verify that

[57] Federal Reserve (2009), The Supervisory Capital and Assessment Program: Design and Implementation, p. 8
[58] Federal Reserve (2009), The Supervisory Capital and Assessment Program: Design and Implementation, p. 5
[59] R. J. Herring & T. Schuermann (2022). *Objectives and challenges of stress testing* in *Handbook of Financial Stress Testing*, *9*, p.6
[60] Glasserman, P., & Tangirala, G. (2015). Are the Federal Reserve's stress test results predictable? P.5

banks had an adequate level of capital to meet expected capital ratios in each period of the worst-case macroeconomic scenario.

The capital requirements for banks focused primarily on two key indicators: the Tier 1 Risk-Based Capital Ratio, which reflected the ratio of the bank's high-quality capital to its risk-weighted assets, and the Tier 1 Common Capital Ratio, which measured the ratio of Tier 1 common equity to risk-weighted assets. And banks were required to maintain at least 6% for the first indicator and 4% for the second in both stress scenarios[61].

Banks that managed to maintain a level of capital above the requirements passed the quantitative test, while institutions that demonstrated a level of capital below the minimum threshold, had to try to raise the necessary resources to make up the shortfall in the market within six months[62] or, where possible, seek government intervention to restore their financial strength.

As already mentioned, for the overall passing of the SCAP exercise, banks were not only required to meet capital ratios in all stress test scenarios, but also had to pass a qualitative assessment. This assessment by the supervisory authority covered internal aspects of the individual institution such as risk management capacity, governance effectiveness and the robustness of the implemented capital planning processes.

The results produced jointly by the qualitative and quantitative analysis identified the most vulnerable institutions, revealing that 10 of the 19 major banks subjected to the exercise needed to raise additional capital, totalling some USD 75 billion[63]: almost all of the banks that were found to be undercapitalised were able, within six months, to raise the necessary funds through the private markets to restore the strength of their capital positions. Only one of these, GMAC, saw fit to avail itself of government support and ended up being nationalised.

Despite the success of SCAP in terms of information production, the aspect for which it probably deserves more relevance concerns the effects of public disclosure of the results of the procedure.

On this occasion, the Federal Reserve decided to publish not only the results, but also the methodology of the stress test, marking a decisive break with the traditional practice of

[61] Federal Reserve (2009). The supervisory capital assessment program: Overview of results, p.2, p.4 ss.
[62] A. Lawson (2020). Supervisory Capital Assessment Program (SCAP) and Capital Assistance Program (CAP), p.9
[63] Turk, M. C. (2019). Stress Testing the Banking Agencies, p.1742, nt. 142

confidentiality that had hitherto characterised US banking supervision. Historically, in fact, the supervisory authorities had maintained strict confidentiality over much of the information concerning the financial system, particularly information that could undermine confidence in individual banking institutions.

The decision was taken in the belief that access to the SCAP's information input would provide the public with an incentive to believe the test results were plausible. This transparency-oriented approach was adopted not only with the prospect of restoring confidence in the financial system, but also with the aim of strengthening the credibility of the regulatory process as a whole: in this sense, the revelation that ten of the nineteen banks had failed the rigorous stress test had helped to further convince the public of the reliability of the stress test procedure[64].

However, it is important to emphasise that the SCAP exercise wasn't limited to disclosing information on the health of banks. Indeed, the stress exercise had also highlighted the inadequacy of the internal mechanisms adopted by banks during the early stages of the financial crisis, because they were unable to fill the information gaps within the system.

Moreover, the exercise showed how market participants were generally aware of undercapitalised banks, but lacked precise information about the extent of the shortcomings and the specific circumstances that could have led them to default, including the capital and liquidity requirements necessary to ensure solvency[65].

The results of the tests thus made it possible to close significant information gaps, thereby facilitating the restoration of confidence and stability in the financial system.

A further key element in the success of SCAP was the context in which the test results were made public, which exerted a decisive influence on the impact of the outcomes on market functioning.

At the time of the SCAP, market participants continued to doubt the risk management practices adopted by individual US banks and the resilience of the system in the face of potential further shocks; in addition, the hesitancy of banks and other market participants to cooperate with each other hindered recovery: during the year and a half between the onset of the crisis and SCAP,

[64]R. J. Herring & T. Schuermann (2022). *Objectives and challenges of stress testing* in *Handbook of Financial Stress Testing*, *9*, p.12

[65] K. JUDGE (2020), Stress testing during Times of War, p.227 ss.

regulators had underestimated the extent of the financial system's problems; on the other hand, banks, convinced that they were well-capitalised, had continued with their dividend policies and had shown some delay in recognising losses and setting aside adequate reserves for bad debts and liabilities associated with mortgage-backed securities (MBS), while continuing to claim that they were well-capitalised.

Criticism didn't spare the test programme either, especially during the initial phase. The Federal Reserve's publication of the methodology used for the SCAP exercise in a document of only 20 pages was not well received by the interested public. Most market participants considered this publication insufficient, claiming that the programme was too superficial and inaccurate to allow meaningful assessments.

The SCAP has been recognised as a turning point in the resolution of the 2007-09 financial crisis for its ability to provide credible information on the conditions of major financial institutions at a time when the scarcity of reliable data greatly complicated the functioning of the market. This exercise had the merit of addressing the uncertainties surrounding the health of the major US banks and the stability of the financial system: the simultaneous subjecting of the banking institutions under review to homogeneous stress scenarios allowed the authorities to assess the health of the major US banks and the stability of the financial system: the simultaneous subjecting of the banking institutions examined to homogenous stress scenarios allowed the authorities to assess the resilience of the entire system more accurately.

The stress exercise also made it clear that the results produced by the tests are particularly useful when they reveal information that is both unfamiliar and plausible, i.e. when they are able to reveal previously unknown aspects with great reliability[66]. The novelty and credibility of the information produced by stress tests can thus be of great relevance in assessing the health of individual banks and the banking system as a whole, as they allow economic agents to revise their assessments and expectations, thereby facilitating a more accurate management of the risks they take.

Finally, the SCAP highlighted the importance of having an adequate backstop to deal with the consequences of the test results during economic downturns. In this context, the application of the Emergency Economic Stabilisation Act[67] and the possibility of intervention by the US

[66] K. JUDGE (2020), Stress Testing during Times of War, p.229

[67] C. Lambert, F. Noth, & U. Schüwer (2017). How do insured deposits affect bank risk? Evidence from the 2008 Emergency Economic Stabilization Act in Journal of Financial Intermediation, 29, 2017, pp. 81-102

Treasury, should the need arise to recapitalise banks identified as financially vulnerable, certainly contributed to the success of the 2009 stress test, because it ensured that an effective backstop was in place even if the worst-case scenario materialised.

The contribution made by the SCAP exercise also went beyond merely restoring confidence in the financial system, as the 2009 stress test, as mentioned in the previous chapter, in fact initiated a broader and more systematic use of such procedures in the years to come, institutionalising the DFAST and CCAR: the subsequent testing programmes in fact acquired an operational dimension for assessing the resilience of banks and the US banking system, aligned with the desire to ensure greater transparency in the risk management practices adopted by banking institutions within the sector.

2.3 The stress tests during the Pandemic crisis: is the history repeating?

The SCAP exercise, conducted in 2009 to cope with the GFC, and the subsequent measures taken by financial supervisors enabled the US banking system to weather the Great Recession, laying the foundations for a long period of relative economic stability.

A new opportunity to test the resilience of banks came with the Covid-19 pandemic: the health threat from the new coronavirus had caused sudden and far-reaching changes, generating great uncertainty about future developments in every sector of the economy. Although the Covid-19 pandemic primarily affected the real economy, unlike the 2008 crisis, which originated in the financial sector, this globally significant event nevertheless had a significant impact on the financial system as well, influencing every aspect of bank management and supervision, including the stress test exercise.

Despite the uncertainty arising from the evolution of the pandemic, the Federal Reserve (FED) nevertheless decided to continue with the execution of the stress tests even in the initial phase of the crisis, preserving the rigorousness of the procedures: the spread of the virus and the unpredictability of the developments related to the pandemic crisis didn't dissuade the Federal Reserve Board from ensuring the regular conduct of the tests, supported by a sensitivity analysis, carried out between February and June 2020.

The Covid-19 crisis thus proved to be the first real test for the DFAST and CCAR, which had hitherto been conducted exclusively in contexts of relative calm and financial stability. The February 2020 tests considered a sample of thirty-four large banks with total consolidated assets in excess of $100 billion[68]. The health of these banking institutions was examined under two macroeconomic scenarios: the baseline scenario, which aligned with the average projections that emerged from surveys of economic analysts, and the severe adverse scenario, which instead set out to assess the soundness of the institutions in the face of a hypothetical set of potentially compromising events. The latter simulated a severe global recession, with an increase in the unemployment rate from 6.5% to 10%, as well as stressful conditions in the corporate debt markets and commercial real estate (CRE) [69].

[68] B. L. Johnson (2021). Stress Testing During Stressful Times: How COVID-19 Could Influence the Role of Stress Testing and Prudential Financial Regulation. *NC Bank. Inst.*, p. 305

[69]Federal Reserve, Press Release, Federal Reserve Board releases Hypothetical Scenarios for its 2020 Stress Test Exercises, Feb. 6, 2020

Each scenario considered twenty-eight volatile macroeconomic variables, reflecting a wide range of both domestic and international economic activity, including employment, interest rates, stock prices and GDP. According to the schedule set out for the tests, participating banks were required to submit their capital plans to the Federal Reserve Board by 6 April 2020, with the results due to be published on 30 June.

The publication of the results of the proceedings in June by the Federal Reserve Board revealed that all banks involved in the February 2020 trials had been strongly capitalised in both scenarios analysed. However, the Authority recognised that the scenarios used in the tests were inadequate, as they were based on conditions prior to the virus outbreak, and thus were not aligned with the emerging reality. In particular, in the severely adverse scenario, the February 2020 stress test had predicted results consistent with a rapid economic recovery, an assumption that turned out to be wrong: in the months following the first round of tests, the US unemployment rate jumped from 4.5% in March to 14.7% in April[70], far exceeding the 10% predicted by the stress test. The sudden rise in unemployment, coupled with the significant drop in gross domestic product, thus led to a loss of grip on reality by the tests, making the results produced obsolete[71].

To capture the most relevant economic data of the emergency and thereby align with the crisis environment generated by Covid-19, the Federal Reserve Board, along with the release of the February 2020 test results, published an innovative sensitivity analysis (Additional Sensitivity Analysis) [72], compared to the one conducted from February to June 2020.

This analysis focused on low-probability but highly dangerous risks, without assigning them a probability of occurrence, reflecting the fact that the primary objective of this assessment method was not to influence market and supervisory decisions, but rather to quantify the pandemic effects for the thirty-four banks under review, allowing supervisors and institutions to understand the direction and magnitude of possible outcomes.

The new test included three downward recession scenarios, which could be interpreted as baseline situations for an economic environment severely affected by the pandemic: the V-

[70] U.S. Bureau of Labor Statistics, Unemployment rate rises to record high 14.7 percent in April 2020, May 13, 2020
[71] B. L. Johnson (2021). Stress Testing During Stressful Times: How COVID-19 Could Influence the Role of Stress Testing and Prudential Financial Regulation. *NC Bank. Inst.*, p, 305 ss.
[72] Federal Reserve, Press Release, Federal Reserve Board Releases Results of Stress Tests for 2020 and Additional Sensitivity Analyses Conducted in Light of the Coronavirus Event, June 25, 2020 (inde, Fed, 6/2020),

shaped recession predicted a significant initial decline followed by a rapid recovery in GDP and employment; the U-shaped recession suggested a slower recovery; and finally, the W-shaped recession represented the most adverse scenario, characterized by a double-wave downturn. In these scenarios, the unemployment rate ranged between 15.6% and 19.5%, marking a significant increase from the 10% set for the severe adverse scenario in the February test.

Compared with the stress test conducted earlier, the scenarios used in the sensitivity analysis showed significantly more pronounced effects on capital, reflecting the impact of the prolonged decline in GDP. In particular, the analysis highlighted how the capital shortfalls, found in many of the assessed banks, occurred significantly especially in the last two scenarios, an outcome justified by a significant increase in loan write-downs, which affected the gradual deterioration of the loan portfolio: loan losses, reported in the stress test at an average of around 6%, were significantly lower than those projected in the sensitivity analysis scenarios, especially for the U-shaped and W-shaped downturns, where losses were between 8% and 10%.

Another important aspect of this analysis relates to the results, which were published at a very high level of aggregation[73]: in fact, the disseminated information referred to an overall assessment of the impact of the pandemic crisis within the banking system, without revealing individual results for banks, and only emphasizing how the effects of the crisis became increasingly variable as the severity of the scenario considered increased. The aggregate results revealed loan losses of between $560 billion and $700 billion[74], with capital ratios in the most adverse scenarios falling from 12% in the fourth quarter of 2019 to a range of 7.7% to 9.5%. Despite evidence of deteriorating capital conditions in both the U- and W-shaped scenarios, the results showed that most of the banks still remained well capitalized even in the face of significant shocks, even as many of them approached minimum capital levels.

Based on these outcomes, the Federal Reserve Board then took a number of measures to ensure that banks maintained adequate levels of capital, such as the introduction in August 2020 of new specific capital requirements for large banks, which became effective October 1, 2020[75]. The regulatory change didn't affect the CET1 capital ratio, which was set at 4.5% for all banks,

[73] J. Henry (2020). Banking system stress testing and COVID-19: A first summary appraisal in *Journal of Risk Management in Financial Institutions*, *p. 12*

[74] Federal Reserve, Press Release, Federal Reserve Board Releases Results of Stress Tests for 2020 and Additional Sensitivity Analyses Conducted in Light of the Coronavirus Event, June 25, 2020 (inde, Fed, 6/2020),

[75] Federal Reserve, Press Release, Federal Reserve Board Announces Individual Large Bank Capital Requirements, August 10, 2020 (inde, Fed, 8/2020).

but by the introduction of a Stress Capital Buffer (SCB), defined on the basis of test results. This buffer was conceived as an additional capital margin available to banks to cope with possible future losses: set at a minimum value of 2.5%, it could reach as high as a mandatory threshold of 7 to 8 % for some institutions. Global systemically important banks (G-SIBs), eight of the thirty-four institutions involved, were also required to maintain an additional capital surcharge of at least 1%.

In addition to the February 2020 stress tests and sensitivity analysis conducted through June of that year, the FED introduced a mid-cycle test in September to assess the impact of the pandemic on the capital strength and resilience of large banks.

This test, similar to the one in February, considered two hypothetical scenarios, which developed a time horizon between the beginning of the third quarter of 2020 and the end of 2021[76]: a severe adverse scenario and an alternative severe scenario.

In the first scenario, the model assumed a peak in the unemployment rate at 12.5%, followed by a gradual reduction to 7.5 % by the end of 2021. The rise in unemployment was also accompanied by a 3% contraction in gross domestic product (GDP). By its characteristics, this scenario was extremely negative, reflecting severe recessionary conditions that could seriously affect the viability of banks.

On the other hand, the alternative severe scenario, while less extreme, still projected a prolonged recessionary situation: under this scenario, the unemployment rate would fall more slowly, from 11% to 9% by the end of 2021; GDP contraction was lower than that defined in the severe adverse scenario, registering a 2.5% decline between the third and fourth quarters of 2020.

The second round of DFAST was a more calibrated response to the difficulties that emerged during the pandemic from Covid-19. Unlike the tests conducted earlier in the year, which were based on predictive scenarios that were less aligned with the actual severity and evolution of the health crisis, the second round of DFAST introduced more realistic hypothetical scenarios

[76] B. L. Johnson (2021). Stress Testing During Stressful Times: How COVID-19 Could Influence the Role of Stress Testing and Prudential Financial Regulation. *NC Bank. Inst*, p.309 ss.; also see Federal Reserve, Press Release, Federal Reserve Board Releases Hypothetical Scenarios for Second Round of Bank Stress Tests, September 17, 2020 (inde, Fed, 9/2020), ; BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM, Supervisory Scenarios for the Resubmission of Capital Plans in the Fourth Quarter of 2020, September 2020.

that allowed for a credible analysis about the impact of the pandemic on the conditions of individual banks and the banking system as a whole.

The publication of the results had the effect of stabilizing the expectations of economic agents and bolstering confidence in the resilience of the U.S. financial system[77], dispelling uncertainties caused by the non-disclosure of the bank-level outcomes of the Additional Sensitivity Analysis (ASA) launched in June 2020, which had raised significant doubts among investors about the soundness of banks and the overall stability of the system.

The pandemic crisis thus highlighted the great flexibility enjoyed by the stress tests: the rapid updating and adaptation to which the stress tests were subjected in a matter of months made it possible to capture the information gaps that had inevitably arisen within the financial system due to the effects of the Covid-19 crisis. In an environment as dynamic and unpredictable as the one at the time, the ability to recalibrate the stress scenarios based on the most recent data proved crucial for regulators to have an up-to-date and realistic information picture of financial system conditions at their disposal, giving them the ability to prepare corrective measures so as to prevent further deterioration of macroeconomic conditions.

Although the first round of tests executed in February 2020 didn't effectively capture the new economic conditions within the system due to the Covid-19 pandemic, it is undeniable that these assessments provided significant input to regulators, economic policymakers, and financial market participants for a preliminary framing of the pandemic crisis: indeed, the analysis provided by the first round of tests enabled key stakeholders to gain a deeper understanding of the inherently complex nature of the crisis and to assess its dimensions, which led to just-in-time interventions by the Federal Reserve Board, with the publication of the ASA, the introduction of the stress capital buffer, and the launch of the second DFAST exercise in September 2020.

The FED's decision to conduct both the stress tests and the sensitivity analysis within the pandemic period was justified by the fact that the two procedures pursued distinct objectives: while the sensitivity analysis to Covid-19 was intended to measure the magnitude of the current recession at the aggregate level, the stress tests, on the other hand, were intended to determine the size of the capital buffers needed for individual institutions. This aspect testifies to the

[77] Federal Reserve, Press Release, Federal Reserve Board Releases Second Round of Bank Stress Test Results, December 18, 2020.

complementary function that the stress exercise can provide to the other tools of banking regulation[78], in this case the sensitivity analysis, so that the authorities can make a more in-depth assessment of financial system conditions and make more informed decisions regarding individual banks' capital adequacy assessments.

SCAP and the pandemic crisis have highlighted an important consideration with a view to the future: history is unlikely to repeat itself, and crises that occur over time possess their own characteristics, quite different from those of the past. Thus, to meet the new challenges ahead, the adoption of innovative solutions becomes critical. And in an ever-changing environment such as today's financial system, the adaptability and flexibility of stress testing can provide a key contribution to the definition of unconventional approaches capable of generating new and valuable information over and above what already exists, thereby enabling information gaps to be closed, and stability and confidence within the banking sector to be restored.

[78] T.P CLARK, L.H. RYU (2013), CCAR and Stress Testing as Complementary Supervisory Tools, p.4

CHAPTER 3

The analysis of SVB episode

3.1. 40 years of Silicon Valley Bank:1983-2023

The bankruptcy of SVB in March 2023 came as a surprise to everyone, given the long period of economic prosperity and the positive status the bank had enjoyed for several years, so much so that it was recognised as one of the best national and regional banks in the US until shortly before its collapse.

The SVB was founded in 1983 in Santa Clara (California) and during its 40 years of operation it provided an exceptional boost to the development of innovation, becoming the leading bank for many successful start-ups in the USA. In fact, the Californian Bank is credited with the great support it provided from a financial and strategic point of view in the development of numerous entrepreneurial initiatives in the technology, health and private equity sectors, which were often financed by the Bank through mortgages with real estate guarantees and with long-term public securities[79]. Its main lenders, who operated mainly in the wholesale and short-term markets, were venture capital firms that deposited at the financial institution millions of dollars, which in most cases were not protected by any collateral.

During its life, the Californian Bank has experienced exceptional growth in several respects: from a structural point of view, Silicon Valley Bank has in fact evolved into a bank holding company, the Silicon Valley Bank Financial Group (SVBFG), whose main branch continued to be the one based in California. The transformation determined the opening of several branches around the world, especially in India and China, to be able to carry out and provide substantial financial intermediation to the growing number of customers located outside of Silicon Valley and the US territory. This structural evolution also translated into rapid asset growth: the value of the assets held by the bank increased exponentially in just 17 years, from about $956 million in 1992 to almost $70 billion in 2019. As we shall see, the SVB's expansion then underwent a further boost during the Covid-19 pandemic, peaking in the first quarter of 2022, when it held a volume of assets worth $218 billion: a possible explanation can be found in the fact that during 2021, venture capital funding, which often supported the development of technology

[79] E. MONTANARO, *Brevi riflessioni sul fallimento della Silicon Valley Bank*, p.106

companies, grew dramatically, leading to a sudden influx of large amounts into the SVB's deposits.

At the time of crisis, Silicon Valley Bank was the 16th largest bank in the US at the time and had a high volume of cross-border exposures, which were mainly managed through a subsidiary in the UK[80]. Despite this radical structural change, the financial group took the decision to concentrate the provision of cross-border financial intermediation services mainly in China and India and thus to limit its territorial network, not allowing it to adequately fractionate its funding in the retail market.

The Silicon Valley Bank experience assumes great importance because it represents the second largest bank failure in US history, and it is considered the largest banking collapse since the 2008 financial crisis.

Its collapse officially took place in the morning of 10 March 2023, when the Californian Department of Financial Protection and Innovation decreed the closure of the Bank: the decision taken by the Department become inevitable in the face of the enormous losses that SVB suffered over the previous two days.

In fact, on 8 March 2023, the Bank announced a loss of $1.8 billion during the sale of securities: to address this issue, the Bank made plans to raise more than USD 2 billion to make up the shortfall in its balance sheet[81].

This announcement, however, did not only have internal consequences within the financial group, but also had major implications on the balance within the technology sector, generating a veritable earthquake: the major venture capital companies, aware of the downward spiral the bank had entered, had in fact advised tech start-ups to withdraw their money from the SVB. The publication of the press release, which took place at the close of the market on Wednesday 8 March by the Californian Bank, further threw most of the venture and start-up companies, which deposited millions of dollars with the Silicon Valley Bank and looked at the Bank as a highly reliable financial partner until that moment.

On 9 March, Silicon Valley Bank's shares fell by 60% compared to the previous day, and the risk of a bank run situation was bound to materialise: Silicon Valley Bank's depositors, panic-

[80] Van Vo, L. & H. T. T. Le (2023). *From hero to zero: The case of Silicon Valley Bank* in *Journal of Economics and Business*, p.144 ss., p.144

[81] A. Metrick (2024). *The failure of Silicon Valley bank and the panic of 2023* in *Journal of Economic Perspectives*, *38*(1), p.1 ss., p.10 ss.

stricken by the deficit situation the bank was going through, withdrew their deposits, rapidly draining the available bank liquidity.

On the day of the definitive closure of the Californian Bank, the Federal Deposit Insurance Corporation, in a desperate and unsuccessful attempt to contain the consequences of the banking recession, acquired the Silicon Valley Bank, which meanwhile reached a condition where it was no longer able to generate sufficient liquidity to meet the demands of depositors.

Behind the SVB case, there are several reasons that contributed to its failure, which must be interpreted as the result of the combination of a series of factors that, in aggregate, favoured the accumulation of large risks within the bank's balance sheet over time, and which, at the time of the crisis, highlighted all the fragilities that had hitherto remained hidden.

However, among all the aspects that may have contributed to the banking collapse, a factor that has perhaps passed into the background and that might instead be interesting to explore in relation to this topic concerns the policy choices adopted by the US government in recent years in the area of banking supervision, which, as we shall see, have changed the rules on stress tests within the banking sector. In this context, the regulatory contribution of the Trump Administration's reforms assumes a relevant role and deserves to be analysed, to understand how much the political influence has been decisive in generating a profound change of perspective in the stress test procedures, and, consequently, in compromising the financial soundness of the SVB.

3.2 The SVB case: observations from CAMELS analysis' results

To understand how Silicon Valley Bank's vulnerabilities haven't been fully recognized by regulators, it seems useful to consider the ratings made by the CAMELS rating system on the bank's major areas. These ratings were made by the Federal Reserve Bank of San Francisco even at the time when the Californian Bank was at its peak. The scores given to the different areas are shown in the table below and refer to the period 2019-2021, since Silicon Valley Bank failed before the ratings for the year 2022 were carried out, which would likely have resulted in a downgrade of the overall rating given to the bank in light of the difficulties experienced by the institution. However, their analysis can provide an important key to understanding some key issues in stress testing and revealing deficiencies in supervision.

	Year of examination		
	2019	**2020**	**2021**
Uniform composite rating	**2**	**2**	**2**
Component ratings:			
Capital	2	2	2
Asset Quality	2	2	2
Management	2	2	3
Earnings	2	2	2
Liquidity	**1**	**1**	**2**
Sensitivity to Market Risk	2	2	2

Source: SVB 2019 CAMELS Examination Report; SVB 2020 CAMELS Examination Report; Supervisory Lessons from SVB Failure

In 2019, the SVB's CAMELS ratings had indicated an overall satisfactory financial situation, in line with the great growth that affected the Californian Bank during the year, so much so that it received an overall CAMELS rating of 2[82]: in fact, among the different areas, the Federal Reserve had given the bank a rating of 2 for both asset quality and management and even a rating of 1 to the liquidity area, which is the highest score provided by the CAMELS system, reflecting how stable the bank was considered to be, thanks in part to the adoption of appropriate risk management practices.

In 2020, the results of the CAMELS rating system for Silicon Valley Bank continued along the same lines as in the previous year, with the Californian bank receiving an overall rating of 2 as was the case in 2019[83]. Liquidity, which had again been given a score of 1, continued to be rated extremely positively by the supervisory authority, which considered the bank to have sufficient sources of liquid assets to absorb fluctuations in financial needs: a possible motivation behind this outcome could be found in the influx of large amounts of capital coming mainly from

[82] Federal Reserve Bank of San Francisco, SVB 2019 CAMELS Examination Report, April 13, 2020, p.5
[83] Federal Reserve Board, SVB 2020 CAMELS Examination Report, May 3, 2021, p. 5-8

venture capital financing, which guaranteed the bank a large cash supply, ready to be invested for the purchase of long-term securities.

The first signs of a change in the SVB's condition began to be appreciated by the ratings for the following year, partly because of the new evolutionary scenario that was developing due to the outbreak of the Covid-19 pandemic: liquidity had in fact been downgraded from 2020, receiving a rating of 2[84], and the Management area had gone from being rated as satisfactory to being deemed unsatisfactory, signalling weaknesses in risk management controls and procedures. Despite this, the Bank still received an overall CAMELS rating of 2, in line with that received in previous years. In fact, the albeit limited identification of early signs of weakness was not enough to prompt supervisors to revise the supervisory strategy envisaged the SVB. This result signals how the severity of the liquidity risk to which the Californian Bank was exposing itself, as a result of the aggressive investment strategy undertaken, had not been appreciated by the supervisors: in the face of an overall still positive assessment of the SVB's financial health by the CAMELS system, the supervisors in fact preferred not to intervene, considering the identified weaknesses not yet sufficiently serious to warrant their corrective action.

Although such an analysis can be a useful tool for offering an overall analysis of the health of a banking institution, it is important to stress that the assessments that are produced offer a rather circumscribed view of the potential vulnerabilities and challenges may affect individual banks: the simplicity of the underlying methodology, based on the consideration of financial and operational indicators for the bank's internal level assessment of risks, highlights the static profile of this tool, providing only a partial view of the potential threats that may affect the individual bank. This lack of elasticity in the mode of measurement makes it difficult to capture those dynamic aspects that may affect the bank's different areas of activity. Moreover, the level of reference adopted by the CAMELS system, in focusing on the internal characteristics of the individual institution, allows neither the supervisors nor the institution to assess the impact of systemic risks on the institution's business areas. In light of the latter consideration, it seems clear that the assessments made for SVB appear to be decidedly unreliable: some exogenous variables such as rapid advances in technology and rising interest rates had major implications for the quality of assets and liquidity available to SVB, an aspect that makes the judgment produced by the CAMELS rating system difficult to believe.

[84] P.H. KUPIEC, Supervisory lessons from the SVB Failure, May 17, 2023, p.5

Certainly, the experience of the Californian Bank is further testimony to the importance of conducting bank assessments that are also capable of reflecting changes in economic conditions and capturing the complex interrelationship between various risk factors, as well as their combined impact on bank health.

Therefore, within today's dynamic financial environment, having tools that can easily adapt to different situations becomes crucial to capture in advance the difficulties that could threaten the stability of the individual institution.

However, the considerations just made don’t imply that the CAMELS methodology should be considered ineffective or outdated: its limitations don’t diminish the importance of its role within the U.S. supervisory system. And in this context, the support of stress tests to the assessments provided by the CAMELS rating system could prove to be of great help in ensuring less myopic and more reliable outcomes of the financial and operational conditions of banking institutions.

3.3. The Economic Growth, Regulatory Relief, Consumer and Protection Act (The EGRRCPA)

The Dodd Frank Consumer and Protection Act of 2010, in part due to the introduction of the stress test of the same name, made an important contribution to the positive recovery of many US banks after the Financial Crisis of 2008, laying the foundation for a long period of economic prosperity within the industry. Despite this, the legislation came under heavy criticism from Republican politicians, many Wall Street executives, and representatives of community banks, credit unions, and industry associations, who blamed the legislation for the excessive regulatory burdens with which US banking institutions were required to comply[85]: regarding the regulation, opponents particularly objected to the one-size-fits-all approach, which tended to support the activities of large Banks, at the expense of those carried out by Community and Regional Banks. This group of banks represented the main financiers of entrepreneurs and small businesses, but, due to onerous regulation, their lending capacity was limited, with consequent negative implications on the businesses of their customers, who found difficulties to achieve economic independence. And the criticism also extended to the stress tests, with reference to compliance costs: in this sense, the procedures that smaller banks were obliged to undergo were in fact considered so elaborate that the financial burden associated with their execution outweighed the potential benefits that could be derived[86].

Concerns were therefore centred on the possible negative 'ripple effects'[87] of the regulation imposed by the DFA on the survival of the smaller part of the market.

Going into more detail about the regulation, the Dodd Frank Wall Street Consumer and Protection Act provided for a division of US banks into three categories, depending on their asset size: in ascending order, a first tier comprised banks with more than $10 billion assets, which were required to conduct only internal capital stress tests; the second tier included banks with more than $50 billion in assets, which were subject to reinforced prudential requirements in terms of capital, leverage and liquidity, the submission of resolution plans and to the supervisory stress tests, the DFAST and CCAR, the exercise of which also affected the third tier identified by the regulations, which grouped together banks with more than $250 billion in total consolidated assets or with more than $10 billion in off-balance sheet foreign exposure[88]. In

[85] H. E. S. T. E. R. Peirce (2013). *Regulatory burdens: The impact of Dodd-Frank on community banking* in *Mercatus Center-George Mason University, Arlington, VA*., p.1 ss., p.5 ss.
[86] M. TURK, Stress testing the Banking Agencies, p.1725
[87] D. Skeel (2010). *The new financial deal: understanding the Dodd-Frank Act and its (unintended) consequences*. John Wiley & Sons., p.32 ss.
[88] *Dodd-Frank Act § 165(a)(1)(A)*

this context, the Dodd Frank Act instructed banking authorities to impose enhanced prudential standards (EPS) on bank holding companies with total assets of at least $50 billion, which were categorised as SIFIs (Systemically Important Financial Institutions), deeming the exceeding of the threshold indicated as a justifiable factor[89]for the application of stricter requirements and regulations than those applicable to banks that did not pose such risks to the stability of the US financial system.

Regarding the liquidity positions in banks' balance sheets, the regulations required that financial institutions, falling into the last category, had to maintain a Liquidity Coverage Ratio above 100%, while for financial entities with more than $50 billion in assets, the liquidity ratio had to at least exceed 70%.

Concerns expressed by many economic actors began to manifest themselves well before the outbreak of the pandemic crisis and helped trigger a policy-driven overhaul movement in the United States, which began with a 2017 executive order by the Trump administration to compel federal banking agencies to conduct a comprehensive review of post-crisis financial regulations and culminated with the implementation of the Economic Growth Regulatory Relief Consumer and Protection Act (EGRRCPA) on 24 May 2018: this is arguably one of the most impactful reforms to the Dodd-Frank Act rules, as it proposed a change in the pool of Banks to be subject to supervisory stress tests, promoting the adoption of more tailored tests for banks with less than $250 billion in assets. It is important to emphasise, however, that this amendment Act, which was primarily intended to fulfil a complementary objective to the original DFA, namely the establishment of regulatory relief for small and medium-sized enterprises, was introduced without any proper prior investigation into the effectiveness of the regulation[90].

The Trump administration thus started a real process of dismantling the Dodd-Frank Act of 2010, because the EGRRCPA, although it kept the original legislation in place, nevertheless limited its scope. The changes proposed by the amendment act were officially integrated within the FED's practices on 10 October 2019, with the adoption of the Domestic Tailoring Rule, which can thus be defined as the combination of the Economic Growth, Regulatory Relief, Consumer and Protection Act of 2018 and the implementation of its regulations. This regulatory intervention has in fact resulted in a revision of the physiognomy and application requirements

[89] *Dodd-Frank Act § 165(a)(1), 12 U.S.C. § 5365(a)(1) (2012)*

[90] T. W. Joo (2018). *Lehman 10 years later: the Dodd-Frank rollback*. *Loy. U. Chi. LJ*, *50*, p.561 ss., passim., p.568 ss.

of the proportionality principle about supervisory stress tests, which, as we shall see, has also affected the fate of the SVB.

To understand the role of the new regulatory package in the of Silicon Valley Bank collapse, it is useful to take an in-depth look at the changes brought about by the Economic Growth, Regulatory Relief, Consumer and Protection Act regarding supervisory stress testing within the US financial system.

This rule brought about three significant changes in stress tests: the revision of the minimum threshold for the applicability of the tests; the revision of the frequency with which financial institutions, falling within the new parameters, are required to conduct stress tests; and the reduction of stress test scenarios from three to two[91].

As mentioned earlier, Section 165 of the Dodd-Frank Wall Street Reform and Consumer and Protection Act of 2010 required National Banks and Federal Savings Associations with total consolidated assets greater than $10 billion to conduct stress tests annually[92]. Section 402 of the EGRRCPA fundamentally changed certain aspects of the testing discipline under the Section 165 of the Dodd-Frank Act: in particular, the new reform increased the minimum threshold for the applicability of the tests, providing for an immediate increase from $50 billion to $100 billion and a further increase to $250 billion of total assets six months after the regulations came into force; as we mentioned before, the changes also affected the frequency of the supervisory stress tests were required to be conducted, such that they were no longer required to be conducted on an annual basis, but rather on a periodic basis; finally, the regulations updated the DFAST structure, reducing the number of stress scenarios from three to two.

Regarding the first point, the adoption of the EGGRCPA Final Rule has resulted in the revision of the concept of "covered institution"[93]: whereas, with the DFA, the term took into account US financial institutions with more than $50 billion in assets, with the implementation of the regulations it is limited to include only national banks and (Federal Savings Associations) FSAs with assets in excess of $250 billion. This revision inevitably resulted in two existing categories of covered institutions: covered institutions from $10 billion to $50 billion and covered institutions with more than $50 billion. As for the second aspect, i.e. the frequency with which

[91] 86, *Fed.Reg.197*, (October 10, 2019), p.1, p.3 ss.

[92] Federal Register, Vol. 77, No. 195 - Final Rule: Annual Stress Test, October 9, 2012, p. 3-6, p.10
[93] 86, *Fed.Reg.197*, (October 10, 2019), p.2

stress testing procedures were to be supported, the concept of periodicity was not initially defined within the document, leaving a wide discretion to supervisory authorities in assessing this aspect.

In the same context of rethinking banking regulation, the Federal Reserve Board then proposed a subdivision of large holding companies into four standard risk-based categories in the 2019 Tailoring Rule[94], with the aim of specifying a proportionality criterion in the application of stress test procedures. In this regard, four different banking categories have been specified, in an attempt to limit the financial burden that the implementation of the tests entails for non-systemic banks: Category I, comprising the U.S. GSIBs; Category II, which grouped all financial institutions with more than USD 700 billion in total assets and large bank holding companies with more than $75 billion in off-balance sheet foreign exposures; Banks that fell within Category III had more than $250 billion in total consolidated assets or more than $75 billion in non-banking assets, weighted short-term wholesale funding or off-balance sheet exposures; finally, Category IV comprised other firms with total consolidated assets between $100 billion and $250 billion. A residual category included all financial institutions with total assets in the range of $50 billion to $100 billion and to which Silicon Valley Bank belonged, at least initially.

Analysing the impact of this legislation in the stress testing context, for firms falling in the first three Categories (I, II, III), the 2019 Domestic Tailoring Rule made no change in the supervisory stress testing frequency compared to what was originally envisaged for the stress testing process by the Dodd-Frank Act of 2010, as the affected financial institutions continued to be subject to supervisory DFAST and quantitative CCAR on an annual basis. On the other hand, the revision Rule significantly affected Category IV Banks and especially the residual category. According to the new regulatory package, Category IV banks continued to be tested, albeit with a simplified structure, maintaining an annual frequency for the Quantitative CCAR, but being subject to the Supervisory DFAST every two years instead of annually: the rationale behind this choice was linked to the consideration that these financial institutions were unlikely to have a major impact on the equilibrium of the financial system due to the 'modest' size of their assets, which is why the DFAST conducted by the supervisory authority every two years would still provide sufficient information to fulfil the main purposes of the tests, such as an overall assessment of risks and the potential impact of adverse economic conditions on the adequacy

[94] *Prudential Standards for Large Bank Holding Companies and Savings and Loan Holding Companies*," 83 FR 61408 (Nov. 29, 2018)

of the capital available to the covered institution. However, the Tailoring Rule specifies that for a covered institution, falling within Category IV and consolidated under a holding company, an annual supervisory DFAST exercise is required[95]. When considering the residual category, the magnitude change brought by the revision Rule is even more apparent. In fact, the new regulatory framework has eliminated all system-wide and individual stress testing requirements for banks in this group, which is significantly broader than the group previously defined by Dodd-Frank, confirming the regulators' desire to focus more attention on those banking firms deemed most dangerous to systemic stability and to reduce the financial burden on other non-systemic firms.

However, the 2019 Tailoring Rule also provided that should a significant change in market conditions materialised for a bank holding between $100 billion and $250 billion in total assets (Category IV banks), the Fed would have retained the power to subject that institution to Enhanced Prudential Standards (EPS) should it deem such action appropriate to protect financial stability.

With respect to the differentiation in the frequency of exercise of the supervisory DFAST for Category IV banks, the concept of a reporting year was introduced, defined as the year in which the covered institution must report and publish the results of its stress test: because of this change, a covered institution may therefore be subject to either an annual or biennial reporting year. However, the changes brought by EGRRCPA to the 2010 Dodd-Frank Act did not only affect the tests for assessing bank capitalisation, but also those related to liquidity risk management: for the first two Categories, the Liquidity Coverage Ratio did not change, as firms in these categories must maintain a ratio value above 100%, i.e., High Quality Liquid Assets (HQLA) must continue to exceed Total Net Cash Outflows, while for Categories III and IV, a daily LCR of 85% and a monthly LCR of 70% of the relevant full requirement was proposed, respectively[96]. For the residual category, the regulatory reform even exempted the companies concerned from the LCR, a decision which, as we shall see, may nevertheless have affected the dynamics that led to the failure of the SVB.

[95] D.POLK, *The Final Tailoring Rules for U.S. Banking Organizations*, p.10
[96] D.POLK, *The Final Tailoring Rules for U.S. Banking Organizations*, p.5 ss., p.10 ss.

Category	Stress test			
	Supervisory DFAST	Company-run DFAST	Quantitative CCAR	LCR
Category I – U.S. GSIBs	Annual	Annual	Annual	100%
Category II	Annual	Annual	Annual	100%
Category III	Annual	Biennial (even years)	Annual	Reduced daily (85%)
Category IV	Biennial	Exempted	Annual	Reduced Monthly (70%)
Residual (<$50 billion in total assets)	Exempted	Exempted	Exempted	Exempted

Source: D. Polk, *Final Tailoring Rules for U.S. Banking Organizations,* p.21

Instead, as regards the third point, i.e. the removal of the adverse scenario from the supervisory DFAST exercise, the decision to modify the structure of the stress test, providing for the application of only two scenarios within the tests, the baseline scenario and the severely adverse scenario, stemmed from a consideration borne out of experience: based on the occasions in which the Dodd-Frank Act Stress Test has been performed up to that moment, the information contribution provided by the adverse scenario did not in fact seem to add anything new to what was already contained within the other two scenarios according the opinion of the FED and the Office Comptroller of the Currency,.

Another aspect on which the Economic Growth, Regulatory Relief, Consumer and Protection Act has intervened concerns the transition period between when a Bank becomes a covered institution and when it must report the results of its first stress test[97]. Indeed, the EGRRCPA amended Section 46.3 of the Dodd-Frank Act, specifying that, for a Bank that transitioned from the residual category to meet the requirements to become a covered institution, the first supervisory DFAST, to which the institution would be subject under the stress testing rule, should be conducted in the first available reporting year, which should have begun the third quarter following the time the Bank would have met all of the conditions to become a covered institution. Although this was the procedure introduced by the EGGRCPA, supervisors have

[97] 86, *Fed.Reg.197*, (October 10, 2019), p.3

retained the ability to intervene, changing the transition period for covered institutions, depending on the nature and level of activity of the institution.

The changes that the EGRRCPA made to the DFA in 2010 were therefore notable, and if, on the one hand, they contributed to making the supervision process more streamlined and 'less burdensome', on the other hand they resulted in a substantial deregulation of Banks with asset volumes of up to $100 billion[98]. These deregulated banks, although they may represent a small portion of the US banking system, nevertheless operate within a highly interconnected financial network, in which the difficulties of one node could have a considerable impact on the stability within the system; In this context, the absence of a preventive instrument such as the stress test to test the resilience of these firms, coupled with accommodating oversight by the supervisory authority, may therefore represent a danger to the financial network because of the accumulation of a series of risks within the sector which could generate significant shocks should they materialise and which could ultimately lead to bank failures, not least the case of the SVB, and which we will explore in more detail later in this chapter.

[98] J.C. KRESS, M.C. TURK, *Too many to fail: Against Community Bank Deregulation, in Northwestern University Law review, 115, 2020*, p.467 ss.

3.4. The SVB growth: regulatory reflections from an accounting perspective

The introduction of the Economic Growth, Regulatory Relief, Consumer and Protection Act at the DFA certainly helped to reshape the US banking framework: while on the one hand, systemically important banks (G-SIBs) have remained subject to supervisory stress tests conducted by the Fed, on the other hand, the regulatory reform excluded firms such as the SVB from the group of banks deemed systemically important, relieving them of the obligation to perform stress test procedures.

After having presented the changes that have been made to the stress test framework following the implementation of the EGRRCPA, it would be interesting to understand whether or not, given the growth Silicon Valley Bank has experienced over the 2019-2022 period, the institution would have been subjected to the exercise of the tests and, if so, into which of the four standard risk-based categories identified by the regulations it should have fallen. From this perspective, it is useful to focus our field of observation on the financial statements data regarding the Californian bank situation over the last four years, the analysis of which is nevertheless an excellent starting point to provide useful considerations that can help answer our question.

An initial general consideration can be derived from observing the evolution of the Californian Bank's balance sheet from the last year the Silicon Valley Bank was subject to supervisory stress tests, 2019, until the end of 2022: during the period considered, it can be seen, by examining the main balance sheet items shown in the table below, that the bank has in fact experienced an enormous growth in the size of its assets held.

Balance sheet items	**2022**	**2021**	**2020**	**2019**	**2022-2019**
Cash and Cash equivalents	$12.511	$13.125	$16.970	$6.179	202%
Securites	$117.297	$ 125.288	$ 47.435	$ 27.752	423%
HTM Securities	$91.321	$98.196	$30.912	$13.843	660%
AFS securities	$26.069	$27.221	$16.592	$14.014	186%
Net Loans and Leases	$73.613	$65.852	$44.733	$32.844	224%
Total Assets	$209.026	$208.581	$113.839	$69.943	299%
Total Deposits	$175.378	$ 191.431	$103.194	$62.943	279%
Total Liabilities	$193.570	$193.786	$106.770	$64.909	298%
Total Equity Capital	$15.456	$14.795	$7.069	$5.034	307%

Source: *2019,2020,2023 SVB annual reports*

Starting first of all with the increase in total assets, we can observe how these have even tripled with respect to 2019: while at the beginning of the observation period, the Bank held a volume

of assets of 'only' $64 billion, already in 2020 their size has almost doubled, reaching $113 billion; a further increase was experienced in the following year, 2021, in which the Bank's total assets rise to $208 billion, before almost stabilising the following year. A further relevant aspect, which cannot be grasped by the balance sheet data, concerns the gradual increase in off-balance sheet foreign exposures, which exceeded $10 billion in the second quarter of 2020: their growth is not only relevant from an accounting point of view, but also from a regulatory point of view regarding stress test procedures.

In fact, taking into consideration the size requirements of the Federal Reserve Board's implementation of the EGRRCPA, we can see that SVB already met the requirements to be categorised as a Category IV bank as of 2020, as the assets held by the bank were well in excess of $100 billion and off-balance sheet foreign exposures had also exceeded the required threshold: the financial institution should therefore have been subject to the enhanced prudential standards (EPS) that the EGRRCPA had envisaged for banks falling within this group, and above all should have been among the banks subject to the supervisory DFAST. According to the regulatory reform on the transition period between when a bank becomes a covered institution and the period in which to perform its first regulatory stress test, Silicon Valley Bank was to report the results of its procedures at the next DFAST exercise conducted by the Federal Reserve in 2022. However, the Federal Reserve didn't carry out this review of stress test competence over the Silicon Valley Bank, probably because of extra-prudential reasons, inexplicably preferring not to have the standards of larger systemic banks applied to smaller financial institutions as well.

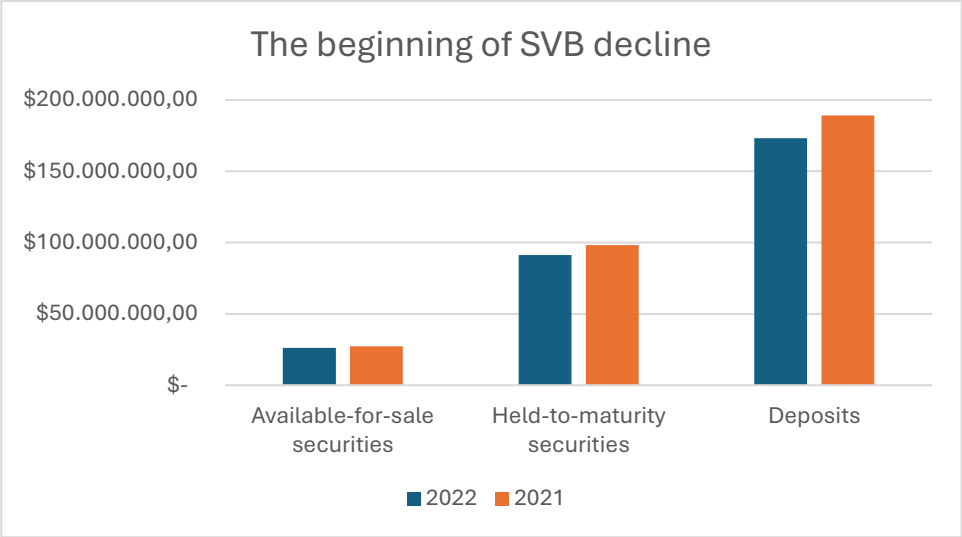
Looking at the evolution of the Californian Bank's liabilities, it is evident that the liabilities also experienced a growth trend rather like that experienced by the bank's assets. And the exponential growth in the volume of deposits experienced by the bank over the period considered becomes evident: between 2019 and 2020, they increased by 66%, while between 2020 and 2021, the increase was even 86%. In just three years, deposits tripled in size: the SVB's main customers were start-up companies and venture capitalists who, taking advantage of the Fed's monetary policy based on quantitative easing (QE) and the resulting near-zero interest rates, deposited unprecedented amounts of money with the SVB[99]. The Bank's management then opted to invest this huge influx of deposits in securities, specifically in Held-To-Maturity

[99] V. V. Acharya, M. P. Richardson, K. L. Schoenholtz, B. Tuckman, R. Berner, S. G. Cecchetti,..& L. J. White, (2023). *SVB and beyond: The banking stress of 2023*, p.15 ss.

(HTM) securities, which in fact represent the main reason, in quantitative terms, behind this increase in the SVB's total consolidated assets: the Bank's investments in this type of securities rose from $13 billion in 2019 to reach $98 billion in 2021, an increase of almost 500% over the previous year. The Bank's decision to invest in HTM securities, which were reported in the Balance Sheet at amortised cost, can be justified for a number of reasons: firstly, for the absence of alternatives in which to invest, given the Bank's special client base; second, the low risk from a credit perspective that characterises these financial instruments, coupled with the guaranteed return over the long term and the fact that unrealised gains and losses don't have to be accounted for until they are sold.

In 2022, however, the situation underwent a major change, due to the rise in interest rates: this economic policy intervention had a negative impact on the technology sector, which first suffered a sharp slowdown in growth and then a drastic drop in the activity of venture capital firms, with consequences also on the value of HTM securities, which, performing inversely to the interest rate, began to decline progressively. Depositors, faced with the bank's difficulties in dealing effectively with interest rate changes, began to demand repayment of their deposits.

Looking at 2022 balance sheet values, we can notice this trend change and the first bank fragility signs because the values of securities and deposits have decreased compared to the previous year: within the securities category, while AFS securities don't seem to have been affected by this surge, being readily liquid financial instruments and not exposed to interest rate risk, the same cannot be said for HTM securities and deposits, which have begun to show a decrease compared to what was observed in 2021. The chart below shows that the decline that affected HTM portfolio and deposits was rather small in percentage terms, given the size of these items, as the 2022 values fell by 7% and 8.51% respectively; in absolute terms, however, the reduction recorded was considerable: $7 billion for HTM securities and as much as $16 billion for deposits.



Source: *2019,2020,2023 SVB annual reports*

This turnaround, which took place from 2022 onwards, reflected the first concern signs that depositors and key economic agents had begun to show about the bank's health: the fear of losing the money deposited at the bank prompted them to demand its repayment. Thus began a downward spiral that led the Silicon Valley Bank to experience a dramatic liquidity crisis. To meet the progressively increasing demands for reimbursement from their depositors the Californian Bank found itself forced to sell the securities it held in its Held-to-Maturity portfolio: the Bank entered in a liquidity mismatch position, given the large concentration of long-term financial instruments held and the insufficient cash on hand to meet the liquidity needs of depositors. In addition to recording a considerable loss in their value due to the sharp rise in interest rates, the sale of the HTM securities further aggravated the situation because the unrealised losses, which until then didn't have to be considered, now had to be accounted for, thus causing huge losses for SVB, as evidenced by the exceptional increase in interest expenses compared to the previous year[100].

Income statement items	**2022**	**2021**	**2020**
Gains (losses) on investment	$-285.000	$761.000	$421.000
Interest expenses	$-862.000	$ -62.000	$ -60.000

Source: *2022,2020 SVB annual reports*

The accounting analysis of SVB's evolution thus provides an initial explanation of the main aspects that characterised the failure of the Californian Bank. However, balance sheet-oriented assessments cannot provide a full understanding of the dramatic changes and risks that affected

[100] FDIC, *Quarterly Banking Profile, First Quarter (2022)*, p.4

the bank over the time horizon considered: this consideration becomes even more relevant in contexts where macroeconomic conditions deteriorate, as accounting data often tend to overstate the value of assets shown in the balance sheet[101]. However, their observation constitutes a good starting point for reflecting on the role of the stress test procedures in relation to SVB's bankruptcy, which we will discuss in the next section, and for understanding whether their exercise could have had any influence on the evolutionary framework of the Californian Bank.

[101]R. J. Herring & T. Schuermann (2022). *Objectives and challenges of stress testing* in *Handbook of Financial Stress Testing*, *9*, p.18

3.5. Would have the DFAST saved the Silicon Valley Bank?

The SVB collapse in March 2023 was a dramatic event that occurred after a long period of financial stability and raised doubts about the effectiveness of the current US supervisory apparatus, with reference to small and medium-sized banking enterprises.

It is important to emphasise that the analysis of the main accounting entries, in relation to the bank's capital and liquidity conditions, offers a circumscribed view of the complex web of factors that led to the failure of the Californian Bank; however, in light of the considerations we made in the previous chapter, we can say that even if SVB had been subjected to the DFAST exercise, the bank run and the subsequent failure of the institution could hardly have been avoided. One of the main reasons has to do with the structural aspect of the stress test procedure, which would hardly have accurately captured the severity of the liquidity mismatch that had been created within the bank's balance sheet. In addition, the 2022 DFAST, which was carried out during the first half of that year, thus the period when the liquidity crisis had reached the point of no return, incorrectly considered a severely adverse scenario characterised by a decline in interest rates[102], which would therefore not have allowed the actual impact of their surge on the Bank's balance sheet conditions to be captured.

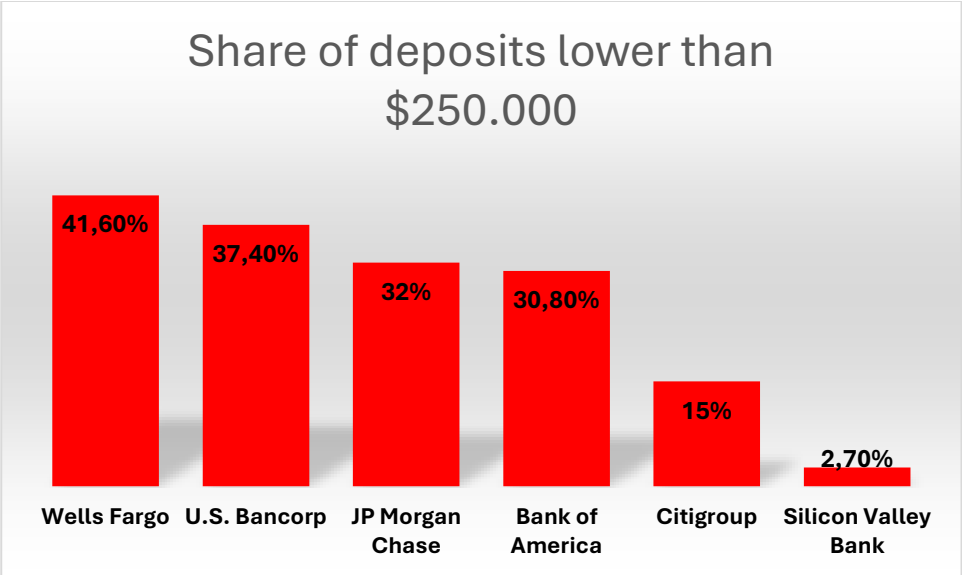
Regarding to liquidity, some studies[103] estimated a 75% LCR for the Silicon Valley Bank at the end of 2022: in the absence of the 2019 Tailoring Rule, the bank would have been subject to the calculation of the LCR, which for 2022 was well below the minimum threshold required in the case of full implementation, i.e. 100%. It is therefore highly probable that the supervisory authorities could have appreciated in advance the difficulties that the Californian bank was facing in terms of solvency[104], and in light of this, they could have pushed for a much earlier liquidity injection by the government and at the same time to incentivise SVB to reshape the business model adopted at the time, with a consequent re-evaluation of the asset portfolio held and the management practices adopted. However, it is rather difficult to assert that, had the Californian Bank succeeded in meeting an LCR of 100%, it would have been able to avoid collapse, not least because of the constitutive limitations of this liquidity ratio, like the stress

[102] F. COVAS, *How did Regulatory Tailoring affect SVB's Capital Requirements*? – May 3, 2023 – *Bank Policy Institute*, p.1, p.3

[103] In topic: G. Feldberg (2023). *Lessons from applying the liquidity coverage ratio to Silicon Valley bank*. *Yale School of Management, March 27*; B. NELSON, (2023). *Update on SVB's LCR*, *Bank Policy Institute*, March 28

[104] B. Tuckman, (2023). 4 SILICON VALLEY BANK: FAILURES IN "DETECTIVE" AND "PUNITIVE" SUPERVISION FAR OUTWEIGHED THE 2019 TAILORING OF PREVENTIVE SUPERVISION. *SVB and Beyond: The Banking Stress of 2023*, 60, p.89

scenarios equal for all banks, making the regulatory measure difficult to be set up as a tool for the management of liquidity risks at an individual level[105]. In this context, a further aspect to be considered concerns the characteristics of the Californian Bank's customer base, which, being made up of depositors with multimillion-dollar accounts, would in any case have made any public aid intervention too complicated: comparing it with the other institutions that were part of Category IV, the banking group to which Silicon Valley Bank should also have belonged, we can see that 97% of the deposits held by the bank exceeded $250.000, while for the other institutions this situation concerned a small percentage of their customer bases[106], as shown in the following graph.



Source: F. Richter, *SVB and Signature Were Highly Exposed to Risk of a Bank Run*, Mar 13, 2023

Although the consequences on a technical level are nonetheless to be regarded as significant, this is perhaps not the main aspect to be considered. What is most relevant in this context is the underlying logic of the LCR reduction established for Category III and Category IV banks: liquidity provision is in fact a variable cost that can vary across institutions and can only be described as proportional 'in nature'[107]. Based on this rationale, simplifying the requirements based on the assets held by individual banks, rather than based on the current risks undertaken by each institution, means adopting an analytical perspective for medium-sized banks that fails

[105] Tuckman59, B. (2023). 4 SILICON VALLEY BANK: FAILURES IN "DETECTIVE" AND "PUNITIVE" SUPERVISION FAR OUTWEIGHED THE 2019 TAILORING OF PREVENTIVE SUPERVISION. *SVB and Beyond: The Banking Stress of 2023*, 60,p.90

[106] F.Richter, SVB and Signature were highly exposed to a risk of a bank run, May 13, 2023

[107] M. Arrigoni, & E.R. Restelli (2024). Proportionality in the European Banking Law. Lessons from Silicon Valley Bank. *European Company and Financial Law Review*, *20*(5-6), p.7

to fully capture their state of health and that contributes to weakening, at least partially, the effectiveness of prudential requirements in discouraging financial institutions from taking excessive risks. For this reason, the coverage level against such risks should be outside the scope of proportionality[108].

Assessing the scope of the stress tests by considering only the characteristics of the procedures means limiting the perspective of analysis, ignoring the relevance of the tests in terms of their effects within the financial system.

Under this POV, while the regulatory stress tests would probably not have averted the SVB's collapse, the pre-announcement, exercise and publication of the results of the tests could nevertheless have influenced the behaviour of the Californian bank, prompting it to re-evaluate its financial positions: indeed, many studies emphasise how the exercise of the tests often leads to safer and more resilient banks in terms of both risk-weighted assets and capital ratios[109].

The decision to exclude from the tests medium-sized banks, such as Silicon Valley Bank, which are to be considered of great importance for the activities they carry out, but not of such significance in terms of consolidated assets, means leaving these companies essentially uncontrolled, eliminating the possibility, both for these financial institutions and for the supervisory authorities, of gaining that informational benefit that can in no way be considered secondary, due to the increasing complexity of the relationships existing within the financial network. In this context, it is important to note that the stress tests could have provided complementary support to such tools, as the CAMELS rating system, which was not able to identify early on the liquidity and asset quality difficulties that damaged SVB's soundness. However, the use of the tests could have influenced the scores produced by that assessment tool: had the Californian Bank been subjected to the 2022 DFAST, the results that would have been obtained from the tests could likely have resulted in an early revision of the scores given by the CAMELS system in the areas of liquidity and asset quality of the bank, reflecting the fact that the influence of information generated by the tests can extend to adjacent supervisory tools, as in this case by the rating system. And being able to rely on stress test analysis support,

[108] M. Arrigoni & E. R. Restelli, (2024). Proportionality in the European Banking Law. Lessons from Silicon Valley Bank. *European Company and Financial Law Review*, p. 944

[109] V. V. Acharya, A. N. Berger, & R. A. Roman (2018). *Lending implications of US bank stress tests: Costs or benefits?* in *Journal of Financial Intermediation*, *34*, p.58 ss.

based on adopting a hypothetical perspective, the reliability of the scores given to banks by the CAMELS system would also have inevitably increased.

Considering the magnitude of the problems that stress tests conducted by supervisory authorities face and the solutions they propose, the choice of limiting the tests to large banks alone therefore seems difficult to justify. In fact, the presence of a disproportionate concentration of assets in the hands of the large banks within the US banking sector[110] cannot preclude the possibility that a crisis could be generated by the group of small and medium-sized firms: judging the dangerousness of a bank on the basis of the market share it holds means ignoring potential risks linked to the bank's business, potentially correlated with the maintenance of financial stability within the system.

The Trump administration's decision to intervene in banking supervision with the implementation of the Economic Growth, Regulatory Relief, Consumer and Protection Act, to provide a simplified capital regime for small institutions, rather than being a justifiable choice based on a legal problem, probably represents a political choice to promote specific economic and industrial objectives[111]: the adoption of the legislation, rather than with the aim of reducing the expected expenses of conducting stress tests for non-big banks without compromising the post-crisis resilience of the financial system, seems instead to find more justification in the intention to achieve greater consensus by pandering to criticism of the original structural conformation envisaged for DFAST.

In this context, however, it is important to emphasise the fact that while the Dodd Frank Act produced a two-tier division of the banking system, providing more restrictions for TBTF financial institutions while at the same time providing less regulatory burden for smaller banks, the EGRRCPA contributed to further exacerbating this disparity[112], rather than implementing proportionality and creating the level playing field, through a further relaxation of rules for small and medium-sized institutions. The adoption of the legislation thus led to a downturn in the prudential supervisory process, considerably weakening its preventive function and accentuating the phenomena of regulatory arbitrage, because it increased the risk-sensitivity of small and medium-sized banks if vulnerabilities materialised, as was the case with the SVB.

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[110] Federal Reserve Bank of Chicago, *Top Banks and Holding Companies*, June 30, 2020, https://www.chicagofed.org/banking/financial-institution-reports/top-banks-bhcs

[111] M. Arrigoni, & E. R. Restelli (2024). *Proportionality in the European Banking Law. Lessons from Silicon Valley Bank* in *European Company and Financial Law Review*, *20*(5-6), p.7

[112] J. C. Kress & M. C. Turk (2020). *Too many to fail: Against community bank deregulation*. *Nw. UL Rev.*, *115*, 647, p. 708

Removing much of the larger banks from the burden of stress tests incentivised the shift of assets held by the larger institutions to the under-regulated sector composed of smaller firms, given the possibility of higher returns[113]. Considering the recent banking crisis, this shift in the balance within the financial system has favoured the expansion of the market share held by small and medium-sized banks, which has also contributed to making them less stable[114].

The decision to exclude the Californian Bank from the execution of the tests entailed foregoing the qualitative information that other regulatory instruments, focusing instead on specific aspects, would not have been able to capture[115].

The onerousness associated with the implementation of stress test procedures is therefore not a valid justification for reducing its applicability only to a restricted group of financial institutions chosen on the basis of a quantitative criterion, since the costs associated with ex-post regulation, such as resolution procedures and governmental public funding, turn out to be decidedly higher than those that would instead result from the adoption of an ex-ante regulatory approach[116]: regardless of the burden that banks have to bear in order to comply with stress test procedures or other requirements that seek to internalise such risks, at least potentially, the cost to banks of implementing the tests is incomparably lower than the social cost of a financial crisis especially in terms of the spillover effects on the system, even if the crisis are isolated phenomena. The banking sector had the opportunity to learn this lesson already during the financial crisis of 2007-2009, when we witnessed the simultaneous failure of many small institutions. The GFC experience taught us that companies that behave like banks should be regulated as such, irrespective of their size[117]: a critique by Crawford, presented well before the collapse of Silicon Valley Bank, becomes valid again in this context, given that the regulatory reforms desired by the Trump Administration, which have accentuated the unequal treatment under banking supervision and eased the regulatory burden originally envisaged by the Dodd-Frank Act with the exclusion of a swathe of banks from the application of stress tests,

[113] K. R. Cortés, Y. Demyanyk, L. Li, E. Loutskina & P. E. Strahan (2020). *Stress tests and small business lending* in *Journal of Financial Economics*, *136*(1), p.12

[114] J. C. Kress & M. C. Turk (2020). *Too many to fail: Against community bank deregulation*. *Nw. UL Rev.*, *115*, 647, p. 708

[115] J. ARMOUR, D. AWREY, PL DAVIES, L. ENRIQUES, JN GORDON, CP MAYER, J. PAYNE, *Principles of Financial Regulation*, Oxford, 2016, p.428

[116] V. Bevivino (2022). *Gli stress test bancari. Inquadramento e regolazione*, p.275

[117] J. Crawford (2017). *Lesson unlearned? Regulatory reform and financial stability in the Trump Administration*. *Colum. L. Rev. Online*, *117*, 127, p.1 ss.

have however not been supported by adequate legislation and above all don't seem to have learned the lesson from the previous financial crisis.

While the stress procedures could not have prevented the collapse of the SVB, on the other hand, the Californian Bank, by exploiting the information produced by the stress test results, would have acquired earlier at least a partial awareness of the vulnerabilities to which the institution was exposed, both to the bank itself, especially to Board of Directors and management, who could have identified potential early warning signals regarding the risk management strategies implemented, and to the supervisory authorities, which could have adopted different behaviours, resorting to corrective actions and prudential tailoring measures aimed at containing, or at least managing in a different manner, the acute liquidity stress experienced by the bank. However, the bank's problems had been flagged in reports well before its collapse and, despite this, supervisors preferred to adopt an overly deliberative approach, moving in the direction of a 'consensus-driven environment'[118]. In this context, a further critical advantage emerges that could be derived from the use of evidence: the information produced could be useful, not only to identify specific problems, but also to force market participants and regulators to recognise in time the nature and extent of the crisis that might have developed earlier[119].

The SVB bankruptcy is further evidence of a financial system that is constantly evolving and the speed with which bank collapses can materialise compared to the past: unlike the 2008 Lehman Brothers failure, in which the bank went through months of recession before being resolved, in the Silicon Valley Bank case the actual collapse occurred within a few days, as the runs to the teller windows by depositors on 8 and 9 May 2023 soon exhausted all the liquid resources of the Californian banking institution. The characteristics of banking crises are bound to change constantly, increasing the unpredictability of how they will manifest themselves.

And the finance world is also being affected by the massive use of social media and the exponential development of technology, factors that exponentially amplified the difficulties the bank was experiencing SVB, leading to a rapid explosion of concern among bank's depositors who immediately took action to withdraw their deposits. And for an ever-changing dynamic environment, such as the financial one, characterised by the presence of continuous

[118] Board of Governors of the Federal Reserve, *Review of the Federal Reserve's Supervision and Regulation of Silicon Valley Bank*, Washington, D. C. 20551, p.23

[119]Bevivino, V. (2022). *Gli stress test bancari. Inquadramento e regolazione*, p.274

uncertainty, the availability of periodically updated information on the health state of banking institutions at all levels becomes crucial in order to be able to better cope with the continuous changes and related difficulties that might arise, as new risks not taken into account could suddenly materialise, while risks initially deemed negligible may easily turn into a significant problem for a sound and prudent bank management: the speed at which modern finance evolves will inevitably continue to outpace the speed at which regulators adapt to the constant changes, generating an information gap, which supervisory tools such as system-wide stress testing procedures can nevertheless help to bridge to a large extent.

And its failure could provide an opportunity for regulators to consider sector-wide stress tests[120], i.e. ad hoc procedures that would target only medium-sized banks not subject to traditional regulatory stress tests, and which would become part of a macroprudential effort coordinated through Dodd-Frank's Financial Stability Oversight Council (FSOC). The publication of the results of these ad hoc stress tests would reduce the information asymmetry that exists between institutions and supervisors by allowing the authorities to have a better understanding of the business models adopted by these credit institutions. Such exercises should be conducted by the Fed with the objective of assessing the resilience of medium-sized banks in the face of potential shocks or adverse macroeconomic conditions and probably they would allow the authority to keep track of the aggregate risks that exist within these banking groups and that could translate into potential dangers to the stability of the financial system. In addition to ensuring a more macroprudential approach to the assessment of non-stress test banks, as in the case of the SVB, by containing to some extent the dispersion of financial risk within the under-regulated banking sector, the implementation of this tool could then produce useful results in informing the supervisory priorities of supervisors at microprudential level. Although this recommendation may result in an increased regulatory burden for medium-sized banks, it could play a crucial role in preserving the long-term viability of these institutions.

We can therefore say that the SVB's experience has taught us the importance of having a sound financial system, which inevitably passes through preventive supervision of even medium-sized companies, including stress test procedures among its instruments: in the face of an interconnected, uncertain and dynamic economic and financial environment such as the current one, eliminating the informational benefit that stress tests can produce for these institutions,

[120] J.C. KRESS, M.C. TURK, *Too many to fail: Against Community Bank Deregulation, in Northwestern University Law review, 115, 2020*, p.714-716

just because they are deemed too ‘onerous’, means accepting that potential threats, which may consolidate over time within these institutions, are ready to materialise at any moment in combination with other factors, generating a disproportionately higher burden, and are capable of destabilising the stability of the entire system and, ultimately, generating new global crises.

CHAPTER 4

The stress tests in the EU framework

4.1. The regulatory stress tests in the EU Banking Framework

After presenting the SVB collapse, analysing the regulatory changes in stress tests and their contribution to the Californian Bank's recession, it is interesting to see whether similar profiles to those of the Silicon Valley Bank can also be found within the Banking Union.

Within the European regulatory oversight framework, there are two supervisory authorities that are responsible for conducting system-wide stress tests: the European Banking Authority (EBA) and the European Central Bank (ECB).

The decision to define two supervisory stress tests is part of a supervisory context that, since the 2008 crisis, has focused on strengthening the macroprudential approach in making assessments of the resilience of financial institutions, with the aim of promoting transparency, cooperation and preventing the spread of potential systemic risks within the system[121].

Before going into the details of the European banking supervision aspects of stress tests, it seems appropriate to give a brief account of the main regulatory interventions, which have contributed to the process of harmonisation within the EU financial system.

The starting point can be found in the Regulation (EU) No 1093/2010 which established the birth of the EBA and vested it with the powers to initiate and coordinate the initiative for Union-wide stress tests[122] with the purpose of identifying the systemic risk[123] : by assigning the EBA the responsibility for the exercise of supervisory stress tests, the regulator wanted to ensure the uniform and consistent application of the Single Rulebook, so that the comparability of test results and the accompanying information assets would emerge[124]. In its system-wide assessment of the resilience of banks within the Union, the EBA may directly request information from these financial institutions and may also request competent authorities to

[121] L. DE GUINDOS (2021). Macroprudential stress testing under great uncertainty. *IS MACROPRUDENTIAL POLICY RESILIENT TO THE PANDEMIC?* ,p.13

[122] *EBA Regulation*, art.32 par.2

[123] In topic*: EBA Regulation*, art.21,22,23,32

[124] S. CAPPIELLO (2015), *The EBA and the Banking Union*, in *European Business Organization Law Review*, 16, p.421 ss., p.431

conduct specific reviews and on-site inspections (as well as to participate in such inspections to ensure the comparability and reliability of methods, practices and results)[125].

Subsequently, the entry into force of Regulation No. 1024/2013 decreed the introduction of the SSM (Single Supervisory Mechanism), which brought about a significant change in the banking supervisory framework envisaged within the EU, altering the EBA's position in this regard and giving the ECB responsibility for direct or indirect supervision of credit institutions, depending on their features.

The Capital Requirement Directive IV (CRD IV), a package consisting of Directive 2013/36/EU and Regulation 575/2013, then provided a regulatory framework for banking supervision within the EU, also intervening in the definition of the frequency with which EU-wide stress tests should be conducted by the supervisor: Article 100 of Directive 2013/36/EU in fact established the obligation for the competent authorities to conduct supervisory stress tests on the institutions they supervise as appropriate, but at least annually.

The EBA also attributes supervisory relevance to the results of the EU-wide stress test by virtue of the fact that the results of the tests feed into the SREP (Supervisory Review and Evaluation Process), a periodic supervisory process that allows supervisors to engage with individual banks to identify appropriate management actions (such as capital planning) and to ensure that they remain above the applicable limits of the of capital requirements and continue to finance the economy: in particular, the qualitative results feed into the risk governance part of the SREP, with the aim of determining the Pillar 2 Requirements (P2R)[126], while the quantitative results are considered by supervisors, together with the management decisions and capital actions proposed by the Banks themselves to mitigate the impact of the stress, in order to assess the potential need to establish a Pillar 2 Capital Guidance and to set the P2G leverage ratio capital requirement[127].

The EU-wide stress test of 2014 was conducted by the EBA in parallel with a Comprehensive Asset Quality Review of EU credit institutions, which was conducted by the ECB in the run-up to the introduction of the Single Supervisory Mechanism to gain insight into the situation of

[125] EBA Regulation, art.21,par.1, par.1b
[126] See EBA,*2021 EU-Wide Stress Test Results*
[127] *EBA, Guidelines for common procedures and methodologies for the supervisory review and evaluation process (SREP) and supervisory stress testing, EBA/GL/2022/03, p.11 ss.*

banks, for which it would then have responsibility for prudential supervision and system-wide testing.

An important regulatory contribution around stress tests was then made by the Capital Requirements Regulation (CRR), which introduced the principle of proportionality, with which it substantially changed the shape of the banking system within the EU. The main change introduced by the Regulation concerns the distinction between large institutions [128] and small and non-complex institutions[129]: the first category includes banks with total consolidated assets in excess of €30 billion whereas the second group collects banks with consolidated assets not exceeding €5 billion, because their activities are not reasonably likely to threaten the stability of the system, given their characteristics, nature, riskiness, interconnectedness and cross-border operations.

In line with this regulatory trend, Article 97 of CRD IV then proposed a 'lighter' supervisory regime, which was to be translated into simplified standardised methodologies for small institutions regarding supervisory stress tests and the disclosure of their results for SREP purposes[130].

With the implementation of the CRD-V package, the regulators wanted to give further strength to this differential line by proposing the implementation of a special discipline for small and non-complex institutions, different from that for large institutions.

In order to implement the changes in banking supervision brought about by the Capital Requirements Directive (CRD IV and CRD V) and the Capital Requirements Regulation (CRR), the EBA issued guidelines on SREP procedures and the stress testing of institutions, which were published on 18 March 2022 and came into force on 1 January 2023, effectively repealing the previous ones of 2018 and 2014. Regarding the SREP procedures, the guidelines were addressed to the competent authorities with a twofold purpose: on the one hand, to promote the implementation of common procedures and methodologies for the SREP[131]; on the other hand, to achieve convergence of the practices that competent authorities should adopt when conducting supervisory stress tests within the Union.

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[128] *Regulation (EU) No 575/2013 (CRR),* Art. 4(1) (145)

[129] *Regulation (EU) No 575/2013 (CRR), Art. 146*

[130] EBA, *Guidelines for common procedures and methodologies for the supervisory review and evaluation process (SREP) and supervisory stress testing,* EBA/GL/2022/03, para. 2.1.1 and 2.4

[131] EBA, *Guidelines for common procedures and methodologies for the supervisory review and evaluation process (SREP) and supervisory stress testing,* EBA/GL/2022/03, p.6

With regard to supervisory stress testing procedures, the EBA wanted to give continuity to the CRD IV rules on the importance of applying the principle of proportionality in describing the qualitative and quantitative aspects of stress testing, with the aim of creating a relationship between the level of complexity of the methodologies, practices and infrastructure of stress testing procedures and the size, structure and internal organisation of the institution: competent authorities, responsible for conducting stress tests, would have a comprehensive and detailed picture of financial institutions within the EU financial system, with the possibility of adopting a lighter-touch approach for small and medium-sized firms with a low exposure to systemic risk.

Moreover, article 17 of the EBA guidelines proposes a categorisation of the institutions, for which prudential supervision is required, into four categories, based on their contribution to systemic risk: Category 1, which includes all large institutions, those financial institutions, which are classified as such by the competent authorities, following a careful assessment of the main characteristics of that institution, such as its size, internal organisation, nature, purpose and complexity of its activities, or following an assessment of its risk profile, in the event that these institutions do not fall within the G-SIIs (Globally Systemically Important Institutions) or O-SIIs (Other Systemically as category 2 institutions); Category 2, which includes medium to large banks that have been excluded from Category 1; Category 3, which instead includes small and medium-sized firms, which do not fall within Categories 1 and 2; and finally, Category 4, which includes all small and non-complex financial institutions. The guidelines then add some important details on the characteristics of the financial institutions belonging to the different categories: banks, which fall under Category 2, in addition to having significant domestic operations, often have business models with numerous cross-border activities in different business lines; Category 3 banks, on the other hand, operate almost exclusively domestically or in any case with cross-border activities; Category 4, on the other hand, includes all those small, non-complex institutions with a limited scope of activities.

In this context, the decision to consider the proportionality principle is justified by the desire to promote some flexibility with respect to the conduct of supervisory stress tests by allowing competent authorities to be able to conduct simplified versions of stress tests for institutions not falling within Category 1. With respect to Category 2 banks, their compliance with the guidelines is subject to some variability, depending on their nature, scale and size, which is also reflected in the complexity and characteristics of the stress tests, which must still consider aspects such as the nature of domestic and cross-border activities and related business lines.

The same argument can be made for Category 3 and 4 institutions, which are required to comply with the EBA guidelines, depending on their activities, resources deployed and risk profile, and whose scope of stress tests must in any case adapt to the limited scope of activities of these institutions and their limited impact on systemic risk. Currently the sample for EU-wide stress tests conducted by the EBA includes EU banks with at least €30 billion of assets, with the purpose of ensuring the coverage of approximately 75% of banking assets in the euro area.

Regarding the supervisory stress tests performed by the ECB, the SSM Regulation stipulated that European credit institutions, which are classified as significant institutions, must be directly supervised by the ECB in its stress test procedures. To meet the criterion of significance, banks must meet one of the requirements of the Regulation: size, economic importance, cross-border activities and direct public financial assistance[132].

In terms of size, a bank must exceed €30 billion in total assets to be classified as significant; the second requirement is that a bank may be subject to direct supervision by the European Central Bank if it is significant to its country's economy or to the EU economy. Regarding cross-border activities, in order for a bank to be considered a significant institution, its total asset value must exceed €5 billion and, above all, the ratio, determined as the quotient between the bank's cross-border assets and its liabilities in more than one other participating Member State, must be around 20%. Finally, institutions that have received or are receiving funding from the EU Stability Mechanism or the European Financial Stability Facility are also eligible to come under the direct supervision of the ECB and thus be subject to the stress test procedures.

In addition, the ECB conducts regular reviews of all authorised banks within authorised countries and may assign the significance criterion to the three most significant banks established in a particular state, making them part of the sample of institutions for which stress tests will be prepared.

Although these requirements refer to the tests conducted by the ECB, we can nevertheless note a certain regulatory alignment with the discipline required for the EBA-led EU-wide stress tests, which translates into a convergence from the point of view of the selection of the sample of banks included in the tests, since the EU-wide stress test performed by the EBA covers the largest significant banks supervised directly by the ECB: indeed, the last EU-wide stress test

[132] ECB, *what makes a bank significant?*

conducted by the EBA in 2023 included as many as 57 euro area banks under the direct supervision of the ECB[133].

As far as liquidity requirements are concerned, the LCR was fully implemented within the EU Banking Framework as of January 2018, with regulators stipulating that this liquidity measure should be expressed as a percentage and set at a minimum level of 100%, guaranteeing that a credit institution has sufficient liquid assets to meet its net liquidity outflows during a 30-day period[134]. Unlike in the U.S., however, the EU Prudential Regulation refrained from introducing any waiver of the LCR, even for small and complex institutions, a trend confirmed by the latest EU-wide stress test conducted by the EBA, where the 100% minimum threshold for the liquidity ratio was confirmed across the board[135].

The EU prudential regulation regarding stress tests therefore appears to be heavier and more stringent than that provided for within the US legal system, which is justified by the intensive use of the proportionality principle: despite remarkable compliance costs at all levels for the execution of procedures, the European financial system appears to be solid and projected towards a further strengthening of supervisory practices, also in the light of the recent SVB collpase, which highlighted the dangers associated with the weakening of prudential regulation and supervision and the importance of a more effective and efficient supervision of the financial sector.

[133] ECB, *Stress tests*

[134] Commission Delegated Regulation (EU) 2015/61 of 10 October 2014 to supplement Regulation (EU) 575/2013 with regard to liquidity coverage requirement for Credit Institutions, p.1

[135] M. Arrigoni & E. R. Restelli (2024). *Proportionality in the European Banking Law. Lessons from Silicon Valley Bank* in *European Company and Financial Law Review*, *20*(5-6), p.5

4.2. There exist a European SVB?

After analysing the European regulatory framework on banking supervision regarding stress tests, it is interesting to assess the level of stability of the Banking Union, following the failure of Silicon Valley Bank, and to see whether there might be conditions within it to experience a case like the recent Californian Bank collapse.

Starting from a general consideration, a critical difference between the EU and US systems concerns the structural characteristics of the balance sheets of the banks operating within their respective systems: unlike the US banking system, where some institutions such as the SVB have experienced an exponentially uncontrolled growth in the size of their balance sheets, due to the boom in deposits and the consequent portfolio choices made, European banks have instead shown less long-term bonds in their portfolios and greater stability of deposits. And in this context, the different regulatory frameworks for banking supervision, which supervisory authorities decided to implement within their respective financial systems, probably might have played a remarkable role.

First, it is important to emphasise the different interpretation of the proportionality principle within the European and the US system, with implications even in the implementation of supervisory tests: while in the US, the adoption of the EGGRCPA in the Tailoring Rule exempted firms with consolidated assets of less than $100 billion from performing system-wide stress tests, the EU Legislation has nevertheless sought to maintain a uniform application of the rules approximately across all banks, keeping the attention even on the small and non-complex institutions, albeit with the possibility of adopting simplified stress test methodologies due to the size of these Banks[136]. Maintaining the requirement for the applicability of stress tests also for firms that should be placed in Category 4, according to the EBA guidelines, allows these institutions to have information that, given their nature, can provide significant insights into the health of the Bank and the sustainability of the business model employed: the information produced by stress tests provides an opportunity for individual banks to assess whether the operations and strategies implemented internally are in line with its risk appetite, through the identification of the risk threshold within the firm's risk capacity and the definition of those events that could compromise its soundness. And given the difficulty in correctly estimating the risks assumed by a bank, the qualitative assessment, which can be carried out by exploiting the

[136] M. Arrigoni & E. R. Restelli (2024). *Proportionality in the European Banking Law. Lessons from Silicon Valley Bank* in *European Company and Financial Law Review*, *20*(5-6), p.7 ss.

information produced by the procedures, becomes fundamental and much more important than the quantitative results in examining the corporate governance structure adopted by the individual institution. In the light of what happened with the Silicon Valley Bank, therefore we can argue that the information contribution provided by stress tests becomes fundamental also for small and medium-sized banks for the adoption of effective business models and to allow the supervisory authorities to be able to intervene promptly to make corrections, should the conditions for their intervention exist.

As a result, almost all the EU banks exhibit business models with greater diversification in both trading and banking portfolios than banking institutions in the US system. And in this sense, the constant monitoring and scrutiny to which European banks, including small and non-complex banks, are subjected through the stress tests discourages the adoption by individual banks of business models that provide for concentration policies, which cause the creation of larger banks and then expose the institution to potentially large outflows of deposits should it be faced with the need to raise liquidity to meet massive withdrawal requests from depositors[137].

Furthermore, if in a hypothetical context the SVB had been a European Bank, the Californian institution, by the value of total consolidated assets during the 2019-2022 period, would have qualified as a large institution, inevitably falling within either Category 1 or Category 2[138]: the financial institution's categorisation in one of these two groups would have been a valid requirement for the applicability of the EBA's full supervisory stress testing procedures. Silicon Valley Bank, due to the size of its assets, would then have been classified as a significant institution, which is why it would have been placed under the direct supervision of the ECB, and consequently also under its stress tests.

A further aspect of divergence between the EU system and the US system, which could help to understand the better conditions of European banks, concerns the extension of the applicability of capital and liquidity requirements also to small and non-complex institutions: in the United States, the introduction of the EGGRCPA established the exclusion of banks with assets of less than $100 billion from the system-wide stress test procedures and the calculation of capital and solvency ratios, such as the LCR, while the European Prudential Regulation instead preferred to

[137] M. Arrigoni & E. R. Restelli (2024). *Proportionality in the European Banking Law. Lessons from Silicon Valley Bank* in *European Company and Financial Law Review*, *20*(5-6), para. 5.1, p.18

[138] M. Arrigoni & E. R. Restelli (2024). *Proportionality in the European Banking Law. Lessons from Silicon Valley Bank* in *European Company and Financial Law Review*, *20*(5-6), para. 4.3, p.17

retain capital and liquidity requirements[139] almost in their entirety, even for small and non-complex institutions, thereby promoting the creation of a level playing field within the system. This choice has allowed both the supervisory authorities, the EBA and the ECB, and the individual institution, not to lose the valuable information content that these regulatory measures are able to provide: the European regulators have not only recognised the importance of these measures for static analysis, which must in any case be calibrated according to the current risk undertaken by each institution, but also the possible consequences of their removal or weakening in terms of transparency and potential distortions in the investment strategies implemented by individual entities.

From a capital perspective, European Banks show overall better capitalisation than US Banks, especially in the smaller institutions[140]: while European and US G-SIBs present rather aligned capital ratios, mainly due to the similar regulatory disciplines to which these banks are subject in this context, the difference is rather significant when comparing smaller firms, with ratios showing decidedly higher values for European Banks.

In this context, it is important to emphasise that the risk of unrealised losses, which is a major concern for many US banks, appears to be much lower in European banks, which, although they have experienced a similar increase in deposits as US financial institutions, have opted to invest in cash positions rather than in long-dated securities.

And this trend line in favour of European banks was also confirmed for liquidity, with particular reference to the LCRs calculated within the two financial systems: European banks, both G-SIBs and small ones, were shown to possess HQLAs of 160%, while US banks, especially those falling within Categories I and II, recorded average HQLAs amounting to 125% of the net cash flows needed to face adverse market conditions over a 30-day time horizon[141].

The financial institutions within the Banking Union, especially the small and medium-sized ones seem to be in a much better solvency condition also because of the large availability of cash and central bank reserves within their existing reserves[142], allowing them to effectively manage

[139] Enria, *A new stage for European banking supervision* (fn. 35), March 23, 2023
[140]LOOMIS SAYLES, *Shifting Trends Favor European Banks vs. US Banks for the First Time in Years*, September 18, 2023, para. 2
[141] M. Arrigoni & E. R. Restelli, (2024). Proportionality in the European Banking Law. Lessons from Silicon Valley Bank. *European Company and Financial Law Review*, *p. 942*
[142]LOOMIS SAYLES, *Shifting Trends Favor European Banks vs. US Banks for the First Time in Years*, September 18, 2023, para. 3

a risk of mark-to-market losses and the resulting possible liquidity demands. The limited insurance cover provided by the FDIC for the Californian Bank's deposits, however, reminded regulators and authorities of the importance of the definition of the third pillar of the Banking Union, the European Deposit Insurance Scheme (EDIS), which is still missing for the time being: within the EU regulation, there is still no operational guarantor of the negative effects of stress test results divulgation, a situation which, in times of crisis, could make it more complicated to restore confidence within the system, or alternatively, in order to contain the overall impact on financial stability, could lead to a restriction of the publication of test results with all the appropriate consequences[143].

Overall, however, given the different interpretation of the proportionality principle in stress tests and the better situation of European banks in terms of capital and liquidity, we can consider a European SVB unlikely at present, although this situation should not distract regulators and authorities from the continuous and necessary process of improving banking supervision practices in order to ensure a resilient EU financial system.

[143]V. Bevivino (2022). *Gli stress test bancari. Inquadramento e regolazione*. p. 273

4.3 ECB ad-hoc stress tests: lessons from the SVB collapse

In the first chapter, we mentioned the possibility of the ECB conducting ad-hoc stress tests that target individual banks. Such procedures don't have the same relevance that is generally attributed to traditional stress tests, partly because of the lower frequency with which they are conducted. However, considering the recent banking crisis, it might be interesting to understand how their exercise might have helped to address a case similar to that of the SVB, should it occur in Europe.

The direction of the exercise by an authority with macroprudential powers such as the ECB offers the possibility of conducting specific assessments of individual banks, including small and medium-sized ones, by adopting an analytical approach that simultaneously considers potential internal vulnerabilities related to the business model adopted by the individual institution and systemic risks that could impact the institution's business: the results produced thus provide a comprehensive view of the bank's health.

Since these are not stress tests that are conducted by the ECB on a regular basis, their structure may also favour greater versatility and adaptability, depending on the relevant banking context that is to be examined.

And this greater flexibility could be reflected, for example, in the selection of scenarios, which could be defined on the basis of the specifics presented by the individual bank: in the event that a case similar to SVB had occurred within the European system, the ability to select forecast scenarios capable of reflecting macroeconomic conditions experienced by the institution, such as rising interest rates, or situations particularly relevant to the bank, such as low diversification of investment portfolios and rapid technological progress, would likely have allowed for a timely identification of what the fate of the Californian bank would be. A reliable projection of SVB's future would also have aided the identification of its weaknesses: while a quantitative assessment of outcomes would have revealed inefficiencies in liquidity management, qualitative assessments would have highlighted the difficulties experienced by bank governance in managing the risks it assumed.

In this context, what is important to emphasize concerns the plausibility of the results produced by this type of testing: the precision of the reference and the definition of scenarios tailored based on the specific risks to which the bank was exposed would have further strengthened the reliability of the hypothetical information generated by the exercise. The selection of sufficiently adverse and credible stress scenarios would certainly have discouraged the sense of

complacency that occurred at the time of SVB's collapse and that prompted supervisors to adopt a disaster myopia[144] attitude toward the Californian Bank, underestimating or ignoring the risks of the banking institution: it is worth noting, however, that this smug attitude affected not only the supervisory authorities but also the bank itself, which, as we have seen, in the long run experienced a significant weakening in its ability to manage the risks.

Thus, the establishment of realistic and sufficiently rigorous stress scenarios would have fostered the formation of greater awareness on the part of both the supervisory authority and Silicon Valley Bank of the vulnerabilities to which the bank itself appeared to be exposed. And the increased precision in the implementation of the procedures could then have been translated into proactive responses by the bank and the supervisor to address the vulnerabilities that would emerge: on the basis of the results of the stress test, the bank would have immediately initiated a review of its governance and risk management practices, considering not only alternatives to investment strategies geared exclusively to HTM securities, but also other solutions that would provide greater liquidity to address the maturity mismatch that had arisen within the institution's balance sheet; on the other hand, supervisors, particularly the ECB, would have been able to take advantage of the information generated by the ad-hoc exercise to promptly review the supervisory approach taken toward the institution and to design specific corrective measures aimed at addressing its problems. The possibility of outlining intervention actions that are tailored to the specific needs of the institution under consideration is another strength of these tests, because the definition of customized adjustment measures allows for the possibility of acting directly on the bank's issues: among possible solutions, the ECB could have considered the option of increasing monitoring during the critical phase of the banking institution, through the periodic administration of ad-hoc stress tests to have a constant update on its condition, or it could have considered coordinated intervention with other supervisory authorities, such as the EBA and ESRB, in order to make supervision of the institution more effective.

And the effects of this exercise would probably have extended to other areas of banking regulation, such as resolution mechanisms. Again, taking the case of the European SVB as a reference, based on the results obtained from the test, the ECB could have devised customized resolution plans for the bank, including specific strategies to contain liquidity shortfalls, such

[144] J. S. Tomas (2024). THE RISE AND FALL OF SILICON VALLEY BANK, p. 19

as access to emergency funds, in the form of loans made available by the ECB itself or other public institutions.

Although it is crucial not to underestimate the complexities involved in modelling these procedures, which may require unconventional technical solutions compared to stress tests conducted regularly by the Authority, the flexibility and adaptability that characterize the different phases of a customized stress test can offer both individual institutions and supervisors a major strategic advantage in assessing bank vulnerabilities: even in light of the recent banking crisis, the benefit from their exercise would still outweigh the costs required to implement them. Given the high level of interconnectedness among the various banking institutions within today's financial network, the vulnerabilities found in an individual bank, regardless of its size, can also be a valid cause for concern for the stability of the entire sector: the difficulties of one institution could in fact generate systemic consequences of considerable magnitude and could ultimately lead to the materialization of a crisis, the cost of which would be far greater than that required for the exercise of the tests. In the light of the considerations just made, it is evident how such an exercise can also assume relevance for systemic purposes, since ensuring financial stability within the banking system also passes through adequate monitoring of individual institutions: the implementation of these stress tests would thus enable banks to respond promptly to emerging risks that might arise from the continuous changes in the financial world, thereby promoting the preservation of stability not only for the individual institution, but also for the entire system.

While the possibility exists within the EU to use customized procedures for the assessment of individual banks, the same consideration cannot be made for the United States: the presence of a highly centralized stress test system with a focus mainly on large banks and the use of generally standardized scenarios underscore the regulatory rigidity that currently characterizes the U.S. supervisory system regarding stress tests. Customizing exercises for individual banks would require greater discretion on the part of supervisors, which would mean going against the grain with the analysis profile chosen for the traditional regulatory test exercise, with the risk of creating consistency problems in the supervisory process. A further argument for not adopting ad-hoc stress tests in the U.S. system lies in the well-established belief that banks are already able to identify and manage their vulnerabilities through their internal risk management models. The danger of this consideration may be particularly relevant for small and medium-sized banks because, as discussed on several occasions, such internal

assessments provide only a limited analysis of the risks faced by the individual institution, lacking the systemic analysis perspective that only supervisors can provide.

Although we don’t wish to question here the validity of the U.S. supervisory apparatus with regard to stress tests, it seems clear that there is a need to have tools available that can be adapted to different needs, especially in today's constantly changing environment.

We can certainly say that in an increasingly complex and interconnected environment, ad hoc stress tests represent an important solution at the ECB's disposal to continue preserving the stability of the financial system: the specificity and at the same time the dynamism that these procedures can offer in the analysis of individual vulnerabilities could make them a key tool for dealing with future challenges that will arise at the level of individual banks, thereby also ensuring the resilience of the system as a whole.

4.4. Stress testing after SVB collapse: some reflections and a look to the future

The recent collapse of the SVB presents an opportunity to rediscover the application and information potential associated with stress tests. However, the uncertainty that characterising the modern finance inevitably forces regulators to ask questions about current and potential future challenges, and possible improvement areas where they can intervene to try to keep up with the evolution speed of the financial system**.**

Starting from a general perspective, we can observe that the SVB failure, although it occurred with different dynamics than those that occurred during the GFC, nevertheless showed some constants compared to what happened in the past. First of all, the Californian Bank represents a further testimony to the fact that fragilities often arise where liquidity and maturity transformation occur: within the banking sector, activities and institutions are often structured to discourage the generation of information, a situation which can often also have implications for banking supervision, both in terms of macro-surveillance and regulatory learning[145], given the high degree of interconnectedness that characterises today's financial network,

If we add to this the inertia that regulators often show in taking corrective decisions, we can also understand how within the system there remain, for various reasons, large swathes of knowable and specific information, which are currently not known to any actor, whether private or public[146]. These two aspects provide an opportunity to emphasise the advantages of using the stress tests, which refer not only to the information capital that they can make directly available to the various recipients, but also to their ability to indirectly hinder possible tolerance behaviour adopted by supervisors[147]. Given the complexity of the current financial system, the application of such exercises, both at the individual and systemic level, can no longer be questioned. And the complexity of modern finance must be an incentive to stimulate research and regulators' attention to weak signals, the evaluation of which is likely to become progressively more important in understanding the health of the financial system.

[145] V. Bevivino (2022). *Gli stress test bancari. Inquadramento e regolazione*, p. 209-216

[146] M.D. FLOOD, DROR Y. KENNETT*, The complexity of bank holding companies: A new measurement approach*, Office of Financial Research working Paper No. 17-03, 2017, p.7

[147] In topic: H. ROCKOFF, *It is Always the Shadow Banks: the Regulatory Status of the Banks that Failed and Ignited Americas's Greatest Financial Panics,* in H. ROCKOFF, I. SUTO (eds), *Coping with Financial Crises. Some lessons from Economic History*, Singapore, 2018, p. 77 ss., passim, p.84 ss.; K. JUDGE, *Information gaps and shadow banking*, p.235

The SVB collapse confirms a further aspect of the economic history of crises within the US financial system, namely that most banking crises begin in the shadow banking system[148]. Even in the case of the recent banking crisis, the progressive penetration of the credit market by non-bank financial institutions played an important role, contributing to a significant reduction in the credit business offered by medium-sized banks: market participants have in fact decided to take advantage of the favourable lending conditions provided by the shadow banking system, relying in this way on the incomplete information made available by these non-bank financial institutions on asset values and risk allocation.

Looking ahead, it therefore becomes crucial to have a greater understanding of the credit activities carried out by non-banks to understand their potential impact on the stability of the banking system and the viability of individual banks, with a particular focus on smaller banks. In light of this consideration, regulators should therefore provide for a discipline for this phenomenon that should increasingly aligned with that of banking, given the ability of these institutions to perform the same lending activities offered by banks, considering the possibility of greater supervision of these institutions through a progressively increasing use of stress testing procedures.

And the EU system seems to be moving in this direction, given the recent proposal to implement stress test procedures focused on the non-banking financial sector in order to sharpen supervisors' skills in monitoring risks and vulnerabilities within the banking sector[149]: these exercises, although still in an embryonic stage of preparation, should maintain a system-wide analysis profile in order to be able to capture those aspects relevant to the stability of the financial system.

Although the shadow banking system played a decisive role, the SVB collapse show that within an ever-changing financial system, the information gaps that need to be filled are primarily endogenous to the system[150]. And in this context, the application of the proportionality principle to supervisory stress-testing procedures, despite being introduced with the idea of facilitating the supervisory practices of the authorities, could nevertheless facilitate the silent accumulation of risks within the under-regulated sector, which could materialise in a substantial way at times of crisis: in a financial system such as the current one, characterised by

[148] G. FELDBERG, A. METRICK, *Stress tests and policy, in The Journal of Financial Crises*, 3, 2021, p.1 ss., p.1, p.7
[149] E.DUARTE, L.PRONINA,N.COMFORT, *EU Proposes Stress-Testing Links Between Lenders, Shadow Banks,* Bloomberg, May 22, 2024
[150] J. Pasztor (2013). *Endogenous risk and dangers to market stability* in *Journal of Investment Consulting*, *p. 4 ss.*

the presence of a few large banks and many small-to-medium sized banks, envisaging a certain gradualism in the applicability of the procedures means losing part of the information capital that could be obtained from the evaluation of this banking group and that could also have consequences on the activities of the other credit institutions within it, given the high degree of interconnectedness dominating the financial network. This consideration is also valid for the European system, albeit to a lesser extent, whereas it is more significant for US regulation, where there are many medium-sized banks that have experienced difficulties similar to those encountered by the SVB. This doesn't mean that regulators should question the validity of the application requirements of the proportionality principle, but simply that for those banks for which full application of the tests is not required, alternative regulatory measures should be provided that are consistent and easily adaptable to the changing conditions of modern finance and that, although they do not have the same scope of information, can help to compensate the degree of uncertainty associated with the lesser information available about them.

The current regulatory framework should be taken as a suggestion for individual banks to improve the internal procedures they are required to conduct. Although such exercises have less applicative potential than supervisory stress tests, they could nevertheless prove particularly useful for small and medium-sized banks, for which internal tests are expected to assume a progressively increasing cross-sectoral role within bank governance: in this sense, a greater integration of tests, not only in internal management practices, but also in strategic planning processes and in the definition of the financial institution's business plans[151], could play an important role in increasing the degree of resilience of the institution itself. To become an effective tool for analysing the health of the individual bank within a fast-changing financial system, the framework of internal stress tests needs to be continuously updated and strengthened, in an effort to give these procedures the level of dynamism and flexibility that is currently lacking. For this type of testing, an excellent starting point could be to define a set of multiple assumptions within the scenarios selected for the procedures, as it could provide the Board and Bank Management with useful information for a greater understanding of idiosyncratic risks, thereby stimulating a continuous process of improvement process in the business model adopted by the institution. However, the development of internal testing must be accompanied by constant communication and coordination between the authorities and the institution, to enable the supervisor to maintain a certain standard of monitoring of the

[151] TRELIANT, *Stressful Times Call for Renewed Stress Testing*, March 23, 2023

institution's situation, using the information received through collaboration also to make effective assessments of the stability of the system and, if necessary, to set capital surcharges based on the results of the tests.

Given the rapidity with which the financial environment continues to change, the information derived from the use of stress tests thus becomes crucial at all stages of banking supervision, both during the crisis identification and containment phase and as a crisis management and resolution tool. However, none of the benefits of using stress tests in times of crisis can materialise in the absence of an adequate backstop capable of managing the fallout if the tests produce bad news. In this context, the recent collapse SVB collapse proved the importance of having an effective safeguard system within the banking sector, where a system-wide extension of insurance coverage cannot be considered a sufficient measure: although such a regulatory intervention may solve bank run problems, on the other hand, it shouldn't underestimate the potential moral hazard and distortions that such a measure could generate and the consequent dangerous exposure of taxpayers to losses. In this context, the information support offered by evidence can become invaluable in balancing protective measures in the right direction from a regulatory perspective and in allowing regulators to have a complete and clearer picture of the next steps to be taken.

Improvements in testing techniques may also allow for an increase in the ways in which these procedures can be used to provide information on ongoing threats to individual banks and, more importantly, to supervisors[152]. Considering the complexity and speed change of the modern finance, the opportunity to harness the application potential of stress tests outside the banking boundary may prove crucial in assessing the impact of certain phenomena that are set to play an increasingly important role in the stability of the financial system, such as climate, technology, information technology and pandemics. In fact, system-wide tests can be a useful tool for measuring the possible connections between the risks associated with these phenomena and the stability of the system, because these phenomena, although different in meaning and level of relationship, are united by the uncertainty of the potential risks that could arise and their relative probability of occurrence: in this context, the predictive capacity of stress tests, based on the generation of scenarios on a hypothetical basis, although one cannot deny their partial reference to historical data at least at the outset, could prove important in understanding how these emerging risks could pose a threat to the entire system. This type of

[152] V. Bevivino (2022). *Gli stress test bancari. Inquadramento e regolazione*, p. 273

test application, however, will require more coordination than currently exists among regulators and, above all, a broader conception of the supervisory aspects of stress testing that can capture the interconnections between the financial system, the real economy, and the society in which it operates. In this context, European stress testing activity seems to show a greater degree of development than US stress testing in constructing system-wide tests with this analysis profile, not least because of the legal limits to the lines along which the Fed can assess banks during stress testing: in the years when the EBA didn't hold its EU-wide stress test, the ECB in fact conducted tests on liquidity risk in 2017, on interest rate in 2019, in 2022 on climate risk, and in May 2024 on cyber risks to test the resilience of the EU banking sector.

Since the financial system is continuing to evolve very rapidly, it becomes crucial for regulators to have an up-to-date information capital at their disposal, fed mainly by the results of systemic stress tests, to be able to adapt to the continuous changes and fill the information gaps that inevitably form. These procedures, which may concern both banks and related phenomena, are thus destined to make an increasingly important contribution to system stability, both within the EU and in the US.

Looking to the future, the SVB experience is just one more confirmation of the importance of having a heavily regulated banking sector: with regard to prospective tests, one must enter into the perspective that the onerousness associated with their implementation can never justify their exemption, because the costs associated with their implementation will always turn out to be lower than the potential costs that may arise from a crisis.

CONCLUSION

The enactment of the EGRRCPA in 2018 had resulted in the exclusion of Silicon Valley Bank from the selection sample of subsequent supervisory stress tests, leaving the Californian bank essentially unchecked: the less regulatory weight and scrutiny to which it was subjected likely played a key role in the exponential growth experienced in 2019-2022. Deprived of the ability to have a forward-looking or hypothetical view of its actions, the SVB then embarked on highly aggressive investment strategies, which resulted in the formation of a liquidity mismatch in the institution's balance sheet, due to the excessive concentration of capital in HTM securities, which proved difficult to convert into cash to meet the sudden and large demands of Californian Bank depositors.

According to the new regulatory architecture, it is important to note that Silicon Valley Bank should have been subject to the 2022 DFAST: in 2020, total assets of the Californian Bank exceeded $100 billion and off-balance sheet foreign exposures had also crossed the $10 billion threshold. Despite this, the Federal Reserve didn't take a proactive stance in reviewing the Californian Bank's position, overconfident in the moment of prosperity the SVB was experiencing.

However, in the event that the Bank had been subjected to the 2022 stress exercise, its failure couldn't have been avoided anyway: in addition to the situation being nearly compromised, the structure of the 2022 stress exercise erroneously predicted a lowering of interest rates and wouldn't have allowed for the liquidity shortfalls that the Bank was experiencing to be captured. In terms of effects, on the other hand, the analysis offered by the DFAST instead proposes interesting opportunities for reflection: the information produced by the procedure could have influenced the Bank's behaviour, prompting Bank's Management and Board to revise the investment strategies implemented, recalibrating them toward more liquid assets; the results produced would have prompted supervisors to move out of that tolerance and take corrective measures, such as anticipated liquidity injections that, if they wouldn't have brought SVB out of bankruptcy, could still have reduced its magnitude. The stress tests would also likely have stimulated a reassessment of the scores given by the CAMELS rating system: the overall satisfactory ratings given to the institution could have been downgraded in advance, sending an early warning signal to supervisors and economic agents of interest and signalling the increased scrutiny to be placed on its condition.

SVB's collapse is further evidence that crises can originate in medium-sized banks as well: assessments based on the size of assets within its balance sheet rather than the range of risks to which the bank may be exposed can greatly limit supervisors' perspective of analysis of system-wide vulnerabilities. Given the strong interconnectedness that characterizes the current financial system, the difficulties that small and medium-sized banks may experience can generate dangerous systemic effects, ultimately leading to a full-blown crisis.

Given the magnitude of the problems that regulatory stress tests are intended to address, the change introduced by the EGRRCPA seems difficult to justify, because the financial burden required of banks to carry out such procedures will undoubtedly be less than the costs resulting from the materialisation of a crisis. Reducing the scope of an instrument that proved instrumental in solving the 2008 crisis seems paradoxical and could signal political motivations behind this choice.

Within the EU, on the other hand, the definition of a proportionality principle of stress tests adapted to the characteristics of the European banking sector and the stricter regulation foreseen for these procedures, especially with reference to internal assessments carried out by individual banks that didn't provide for exceptions from the 100% LCR requirement, have certainly contributed to the better solvency conditions in which European banking institutions are in compared to those in the U.S., a situation that makes it difficult to think of a potentially SVB-like case within the EU system.

Certainly, the collapse of the SVB has underscored the importance of having an adequate backstop available within the financial system, an aspect on which both the United States and European Union must act to prepare for future challenges: a contribution to their definition can come from stress tests, which can ensure a calibration of the insurance backstop measures to be implemented within their respective systems, thus preventing the possible correlated manifestation of moral hazard situations.

Looking to the future, the characteristics of modern finance therefore call for increased monitoring by supervisory authorities with respect to smaller financial institutions: in this sense, the development of sector-wide stress tests, which have these types of institutions as a reference, or the use of ad hoc procedures, which the ECB can count on, could certainly provide a tangible contribution to the assessment of vulnerabilities that may affect institutions belonging to this banking group.

In today's ever-changing environment, stress tests represent an indispensable tool for dealing with potential difficulties that may affect the financial system: indeed, their adaptability and flexibility could also prove crucial for analysing hitherto less regulated aspects such as the shadow banking system or new ones such as technological finance (Fintech), or contexts adjacent to the world of finance, such as climate risk or cyber risks, which given the high interconnectedness that characterizes all aspects of today's reality, cannot be underestimated.

Although uncertainty will continue to dominate the finance world for the foreseeable future, the SVB case has highlighted an important element of certainty for supervision: the relevance of stress tests in the banking system.

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