

A Study of Systemic Risk in the Banking Industry

Xiangfei Feng *

School of Finance, Zhejiang University of Finance & Economics, Hangzhou, 310018, China

* Corresponding author: 3062936827@zufe.edu.cn

Abstract. This paper introduces the function and operation mechanism of banks in the market, mainly studies the interest rate risk and liquidity risk in the market risk, and briefly analyzes the intermediate role of market risk in relation to several major events in 2023 and recent years in the financial industry, such as the collapse of Silicon Valley bank; In addition, policy and regulatory risks are also an important part of the external risks faced by banks. Several major bank failures indirectly caused by the Fed's interest rate hike have attracted the attention of global economists. The systemic risks caused by the mutual contagion and chain reaction of these risks cannot be underestimated, and will even lead to systemic financial crisis. At the end of this paper, systemic risk and systemic financial crisis are discussed, which are closely related to the whole market environment or the life of every civilian. Therefore, it is necessary to study systemic financial risk, so as to better develop risk management plans and countermeasures.

Keywords: Market Risk, Liquidity Risk, Interest Risk, Financial Crisis, Risk Contagion.

1. Introduction

Banks come into existence primarily due to the inherent mismatch in timeframes between the real economy's demands. Depositors often require short-term access to their funds, whereas businesses rely on making long-term investments. This temporal misalignment, commonly known as "borrowing short and lending long," stands as the fundamental purpose of banks but also exposes them to vulnerability. Converting long-term assets into cash is challenging at any given moment, and when a significant number of depositors simultaneously withdraw their funds, banks encounter a shortage of available liquidity. The introduction of deposit insurance has significantly mitigated this issue. Nonetheless, the deposit insurance system alone does not entirely eradicate the risk of financial system runs. Firstly, wholesale financing remains outside the protective scope of the deposit insurance system. Secondly, looking at different countries' experiences, it becomes evident that not all retail deposits are covered by the deposit insurance system. In the United States, for example, deposit insurance only shields deposits up to \$250,000, and the distribution of uncovered deposits across banks is notably uneven.

Systemic risk in the banking sector emerges as a result of external disruptions, predominantly encompassing elements such as credit risk, market risk, liquidity risk, and policy and regulatory uncertainties, among others. These risks are basically external risks faced by the banking industry. Although each risk hazard may cause different problems, the ultimate and most serious consequences caused by the chain reaction and contagion of risks are not negligible. Ultimately, it may lead a financial crisis caused by systemic risks.

Owing to the interconnectivity of financial processes and the extensive reach of financial relationships, systemic financial risks exhibit a strong interdependence and self-amplifying contagion. Consequently, micro-level financial risks stemming from individual or isolated institutions may initially manifest in specific areas, gradually amassing, propagating, and expanding to develop into regional financial risks. Once these regional financial risks breach manageable boundaries and create contagion channels that cross regional borders, they have the potential to give rise to financial risks within the banking system, and in extreme cases, trigger widespread financial crises—illustrating the essence of financial systemic risk.

The 2023 banking crisis represents the most severe financial crisis experienced in the United States and Europe since the global financial crisis of 2007-2008 [1]. This banking crisis was instigated by aggressive interest rate hikes implemented by the US Federal Reserve. The elevated interest rates

resulted in substantial losses on government bond portfolios held by US banks. These losses instilled concerns of bank insolvency, setting off an unprecedented surge in deposit withdrawals, which, in turn, led to credit risks, funding issues, and liquidity challenges for select banks [2]. Ultimately, this sequence of events culminated in the collapse of four prominent banks—Silicon Valley Bank, Signature Bank, First Republic Bank, and Credit Suisse. This crisis underscores the fact that rising interest rates can expose hidden vulnerabilities within the banking system, unveiling systemic risks within the banking industry. The financial crisis triggered by the domino effect of these risks should not be underestimated.

2. Market Risk: Interest Rate Risk

Commercial banks bear the heavy responsibility of collecting funds, maintaining monetary stability, distributing funds, and serving economic development, but they also face market and policy risks [3]. The market risk discussed in the first part of this article mainly includes interest rate risk and liquidity risk.

2.1. Overview of IRR

Interest rate risk pertains to the potential for market interest rate fluctuations to result in financial losses for commercial banks. According to the "Principles of Interest Rate Risk Management" issued by the Basel Committee in 1997, interest rate risk is defined as the likelihood that a commercial bank's actual income deviates from its anticipated income or that its actual costs diverge from expected costs, leading to scenarios where actual income falls short of expectations, or actual costs surpass anticipated expenses, ultimately resulting in financial losses.

When central banks enact tighter monetary policies, this action can exert significant adverse effects on the valuation of long-term assets, such as government bonds and mortgages [4]. This, in turn, can generate losses for banks that engage in maturity transformation, which involves financing long-term assets with short-term liabilities, specifically, deposits. As interest rates climb, the value of a bank's assets may diminish, potentially setting the stage for bank failure through two broad yet interconnected channels. Firstly, if a bank's liabilities outweigh the value of its assets, it may become insolvent. This risk is particularly pronounced for banks that need to raise deposit rates as interest rates increase. Secondly, uninsured depositors may grow apprehensive about potential losses and withdraw their funds, precipitating a bank run.

2.2. The Impact of Rising Interest Rates

The combination of a persistently low-interest rate environment and the fiscal stimulus during the COVID-19 pandemic has triggered increased inflation in various countries, including the United States. Consequently, there's a need for higher interest rates to counteract the surging inflation. Furthermore, the Russia-Ukraine conflict that commenced in March 2022 has introduced supply chain disruptions, resulting in shortages of fuel, energy, and food, further exacerbating inflationary pressures. By June 2022, the annual inflation rate in the United States had surged to 9.1%, marking the highest level of inflation in the country in four decades.

Early in 2023, central banks across the globe embarked on a course of raising interest rates to rein in escalating inflation rates. This uptick in interest rates amplifies the borrowing costs across various types of loans, curtails access to funds, limits the spending capacity of households, dampens the demand for goods and services, decelerates economic growth, and eases the pressure on prices. The escalation in interest rates gave rise to a banking crisis in the United States, leading to the downfall of some regional banks within the country and a systemic bank in Europe. Before the crisis unfolded, the Federal Reserve had acknowledged that higher interest rates might result in economic challenges by constraining lending, but it had not foreseen that these higher rates would culminate in a banking crisis in the United States.

2.3. The Failure of First Republic Bank

First Bank of the United States is the 14th largest bank in the United States, founded in 1985, headquartered in San Francisco, California, with 72 branches across the United States. After being bought and sold around the time of the 2008 financial crisis, the bank re-listed at the end of 2010 and in recent years has focused on "high net worth individuals" wealth management services, offering low-interest loans to the wealthy. At the end of 2022, the bank had about \$213 billion in assets.

After the collapse of Silicon Valley Bank on March 10, 2023, the first total and bank deposits were once a large loss. On March 16, 11 large U.S. banks provided \$30 billion in liquidity support to First Bank. Excluding the \$30 billion in deposits, First Bank deposits fell by more than \$99 billion, or 42.9 percent, in the 21 days following Silicon Valley Bank's collapse. On April 24th First Bank of America released financial results showing that its profit margin fell by 33% in the first quarter and that it lost more than \$100 billion in deposits and more than 40% of deposits. At the close of trading on April 28, the stock price of First Bank fell to \$3.51, with a market value of \$654 million, which has evaporated about 98% from its 2021 peak of \$39.8 billion [5]. First total and bank has actively sought to save itself by selling assets, cutting wages and laying off employees, but ultimately failed. After an emergency auction, JPMorgan Chase decided to buy all of First Harmony Bank's deposits and all of its remaining assets.

The crisis underscored the manner in which surging interest rates laid bare concealed weaknesses within the U.S. financial system. As interest rates climbed, banks incurred losses on their holdings of government bonds, which, in turn, prompted an extraordinary exodus of deposits from certain regional banks. These losses and deposit outflows triggered funding and liquidity challenges for select banks, eventually leading to bank failures, as exemplified by the case of First Republic Bank. Policymakers, particularly central banks, should take heed of how a more restrictive monetary policy can magnify vulnerabilities within the financial system, potentially undermining the central banks' endeavors to rein in inflation [6]. Consequently, central banks ought to assess the ramifications of further interest rate hikes on the stability of the financial system [7].

3. Liquidity Risk

Liquidity risk pertains to the hazard that commercial banks, even when possessing the means to repay, may find themselves unable to secure adequate funds promptly or at a reasonable expense to manage expanding assets or meet impending obligations.

3.1. Classification

Typically, it's categorized into two facets: asset liquidity risk and liability liquidity risk. Asset liquidity risk pertains to the peril of being unable to realize the full value of assets when they mature, leading to an incapacity to settle maturing obligations and necessitating additional financing, such as securing new loans at favorable terms, which can result in financial losses for commercial banks. On the other hand, liability liquidity risk revolves around the irregular oscillations in funds sourced by commercial banks, notably deposit funds, due to shifts in both internal and external variables. Such fluctuations can disrupt the banks' operations and lead to associated financial losses.

3.2. SVB Case Analysis

Silicon Valley Bank, headquartered in Santa Clara and operating under a California state charter, maintained offices both in California and Massachusetts. The financial institution was a subsidiary of Silicon Valley Bank Group, an investment conglomerate with a robust market capitalization and a presence spanning 15 U.S. states and numerous foreign nations. Catering specifically to the technology industry in the Bay Area, Silicon Valley Bank was known for tailoring its financial services to meet the unique needs of this sector. Over time, it ascended to become the largest financial institution in Silicon Valley by asset holdings, becoming the bank of choice for 50 percent of private equity startup companies. Notably, Silicon Valley Bank carried a substantial portion of uninsured

deposits. The collapse of Silicon Valley Bank (SVB) stemmed primarily from two principal factors: (i) SVB's ill-fated investment strategy during the technology boom of 2020 to 2021, and (ii) the decision by the U.S. Federal Reserve to raise interest rates.

Amid the technological upswing of 2020 to 2021, SVB directed the funds it had garnered through deposits into long-term treasury bonds when interest rates were at their nadir during this period. This choice echoed a common pitfall in the banking industry—matching short-term borrowing with long-term bond investments. When interest rates remained at a low ebb, SVB's investment strategy appeared sound, promising profitability. However, the advent of rising interest rates initiated by the Federal Reserve to curb inflation introduced substantial perils to the bank's stability. As the Federal Reserve embarked on its path of interest rate hikes, the market value of the U.S. treasury bonds within SVB's portfolio plummeted below the acquisition cost. Consequently, SVB was compelled to divest these bonds at a considerable loss. Virtually all of SVB's available-for-sale securities experienced setbacks, with the majority consisting of U.S. treasury bonds. These incurred losses set off alarms about the bank's financial well-being. Within a mere 48 hours, depositors who were privy to the bank's predicament-initiated withdrawal requests, hastily extracting significant sums from the bank. Subsequently, the escalating demand for withdrawals ushered in a severe liquidity crunch at Silicon Valley Bank, triggering a liquidity crisis.

The bank's stock price nosedived dramatically (refer to Figure 1), impinging on its capacity to procure additional equity capital. As a culmination of these adverse developments, Silicon Valley Bank met its demise on March 10, 2023.

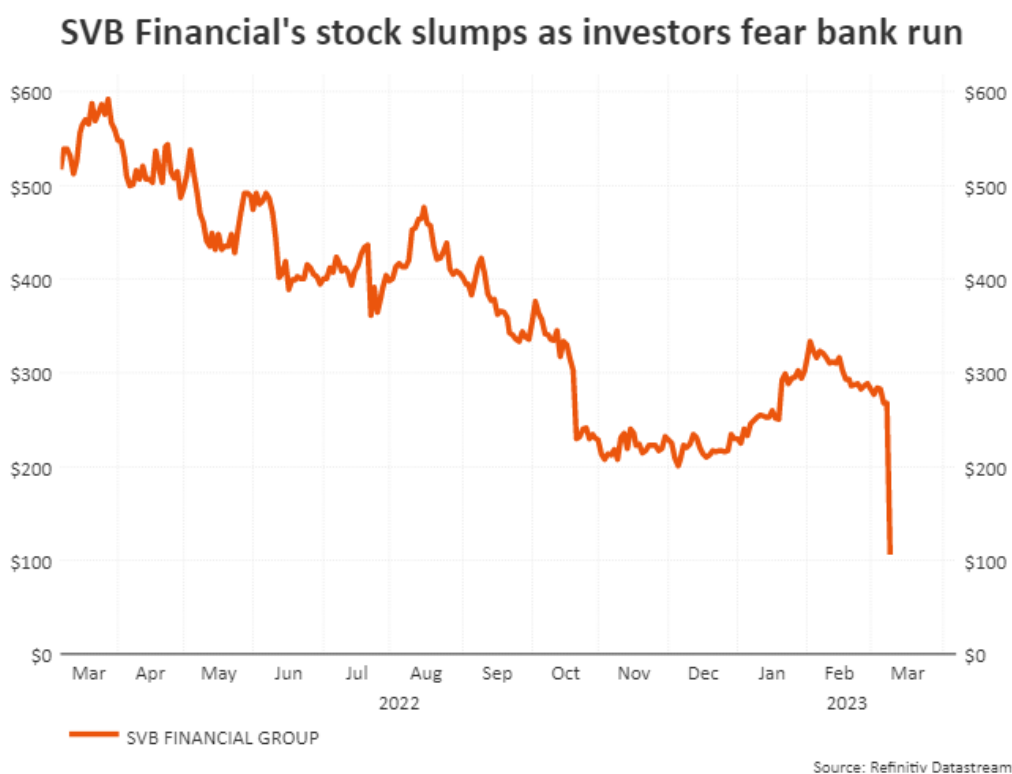


Figure 1. Stock price crash of SVB

3.3. Liquidity Risk Management

Liquidity risk management stands out as one of the most intricate challenges faced by commercial banks, encompassing both primary and secondary risks. This multifaceted risk can stem from various sources, including inadequacies in a bank's own liquidity risk management, political instability, economic downturns, credit vulnerabilities, operational hazards, reputational threats, and more. All of these factors directly imperil a bank's ongoing operations and its very existence. Furthermore, the repercussions of liquidity risk extend to the entire financial system, underscoring the immense significance of effective liquidity risk management. Key strategies for managing this risk involve the

establishment of a robust governance structure for liquidity risk management and the formulation of comprehensive policies and procedures. In September 2008, the Basel Committee on Banking Supervision issued the "Principles for Sound Liquidity Risk Management and Supervision," articulating 17 core principles for handling liquidity risk. Subsequent consultation drafts and official versions were released in December 2009 and April 2010, with Basel III introduced in December 2010 and subsequently refined in January 2013 and October 2014.

4. Policy and Regulatory Risks

4.1. Brief Concept

Policy risk refers to the loss risk caused by the new policies, new regulations issued by the government financial regulators and other relevant departments and the changes of national fiscal policies in the operation activities of commercial banks. These risks include national fiscal policy changes, regulatory policy changes, administrative policy changes, etc., all of which may bring potential losses to commercial banks. The second part of this paper mainly discusses the impact of lax supervision and policy changes on the banking industry.

4.2. Relevant Analysis

Numerous banking crises in history can be traced back to governmental policies, as exemplified by the global financial crisis of 2007/2008. During the period from 2002 to 2004, the United States pursued an overly accommodating monetary policy, marked by persistently low interest rates. These low rates fostered a quest for higher returns, coupled with a host of other factors like lenient lending criteria, excessive leverage, and the inadequate assessment of risk. This collective set of circumstances culminated in a mortgage crisis, which promptly rippled through worldwide financial markets, ultimately precipitating the 2008 financial crisis.

The financial turmoil in 2008 can be attributed to government policies that facilitated the deregulation of the financial industry and ushered in a transition towards self-regulation. This change empowered investment banks in the United States to escalate their leverage levels. This creates holes in the financial system. Because of the deregulation of the financial sector at the time, the speed and complexity of financial innovation was not monitored. The banking crisis of 2023, brought about by lapses in corporate governance and risk management within major financial institutions, stands in stark contrast to the global financial crisis of 2008 [8]. In this year, banks in the United States and Europe boast higher capitalization levels compared to the 2008 global financial crisis, and the regulatory oversight is more stringent in 2023 than it was in 2008. Nevertheless, the collapses of Silicon Valley Bank, Signature Bank, Credit Suisse, and First Republic Bank triggered a ripple effect of financial instability, raising apprehensions about the potential for the crisis to proliferate across borders.

4.3. The Importance of Regulation

In the aftermath of the 2008 financial crisis, a substantial wave of regulatory reforms swept through the banking sector, with the primary objective of fortifying the resilience of the financial system. These post-crisis regulatory changes were designed to address three principal aims: (i) Enhance the robustness of individual banks, thereby diminishing the likelihood of financial institutions facing insolvency. (ii) Bolster the overall resilience of the financial system, thereby curbing the potential spillover effects that could affect the broader economy in the event of large financial institutions failing. (iii) Minimize the risk to taxpayers by reducing the burden of shouldering the costs incurred during future banking crises.

Banking supervision and regulation are deeply concerned with upholding the safety and soundness of banks and the banking system. Their collective responsibility lies in ensuring that banks operate in a secure and prudent manner. They aim to mitigate risks posed to taxpayers and the financial system in cases of systemic bank failures, chiefly by lessening the likelihood of such failures. Bank regulation

prescribes the rules and guidelines governing banks, operating under the established legal framework. This includes legislation like the Glass-Steagall Act of 1933 or the Dodd-Frank Act of 2010 (DFA) [9]. In contrast, bank supervision involves a comprehensive examination and assessment of a bank's risk management systems, financial health, and adherence to laws and regulations, with the power to enforce these rules. Bank regulation and supervision complement one another; regulation establishes the legal structure aligning with financial stability objectives, while supervision scrutinizes individual bank activities by employing tools bestowed upon supervisory authorities by law and regulation, and also carries out enforcement measures. It's crucial to emphasize that neither regulation nor supervision, in isolation, is sufficient; both are indispensable components.

5. Systemic Risk

5.1. Bank Systemic Risk

Systemic risk in the banking sector emerges as a consequence of external shocks affecting the industry. It signifies that the entire market experiences fluctuations due to the impact of various factors, including economic, political, social, and technological influences, which introduce uncertainty into investors' returns. The fundamental drivers of systemic risk lie in transformations within the political, economic, and social landscape. Notably, systemic risks encompass policy risk, interest rate risk, exchange rate risk, and purchasing power risk [10]. Systemic risk has a systematic connection with all securities. It is a risk that all investors will face and it is an unavoidable risk. The degree of risk can be measured by Beta coefficient [11].

In the broader perspective, the emergence of systemic risk hinges not only on the interplay of internal and external economic and financial conditions, the operational health of financial institutions, the indebtedness of both government and private entities, interest rate dynamics, and other common variables. It also, to a certain degree, can be influenced by unforeseeable and extraordinary events, often referred to as "black swans." A quintessential example of this is the "Black Monday" stock market crash that transpired in the United States on October 19, 1987.

5.2. Financial Risk Contagion

Viewed through the lens of risk contagion, systemic financial risk encompasses the potential scenario where a singular institution incurs losses on its assets, thereby triggering the transmission of individual financial risks throughout the entire market, setting off a chain reaction. Given the intricate network of financial processes and the widespread interconnectedness of financial relationships, financial risks exhibit robust interconnections and possess self-reinforcing communication traits. This dynamic allows micro-financial risks originating from specific institutions or locales to gradually accumulate, propagate, and spread, culminating in the emergence of regional financial risks [12]. Should these regional financial risks breach controllable boundaries and establish contagion pathways transcending regional confines, they can lead to comprehensive financial turmoil and even give rise to a full-blown financial crisis, constituting macro financial risk.

Historically, panic has served as a significant catalyst for the contagion of financial risks. Recognizing this, U.S. regulators took proactive measures to mitigate the spread of these risks before they gained momentum. Firstly, the FDIC provided insurance for all deposits held in Silicon Valley Bank and Signature Bank, effectively mitigating the most immediate risk of a bank run. Secondly, the Federal Reserve instituted the Bank Term Funding Program (BTFP), allowing banks to meet short-term payment obligations without the necessity to liquidate assets, thereby preventing the transformation of potential "paper" losses into realized losses that could erode capital. This, in essence, substantially curbed the risk associated with asset sales. Yet, despite these measures, the prevailing sense of panic in financial markets persisted [13].

6. Conclusion

The above briefly analyzes market risks and policy regulatory risks. However, the risks encountered by the banking industry in practice are often more complex and diverse. Whether it is a liquidity crisis of small banks or a financial crisis that affects the whole market seriously, they are all caused by non-single risks. The chain reaction and infectivity among risks have been proven, and the relationship between them is worth studying, so as to better develop risk management programs and countermeasures.

Market anxiety is rooted in skepticism concerning the stability of small and medium-sized banks, essentially reflecting a lack of trust in the effectiveness of bank supervision. On one hand, the market perceives that systemically vital banks are subject to more stringent regulations, thus rendering them more resilient. Simultaneously, there's an anticipation that financial institutions fall under the "too big to fail" umbrella. Confidence emerges as a pivotal element within financial markets. When investors start to lose faith in the market, capital begins to flow out, setting off a chain of issues such as plummeting stock values, exchange rate fluctuations, and declining bond prices. In a broader sense, it's foreseeable that this current sequence of banking crisis events will steer U.S. financial regulation towards a renewed phase of tightening, with medium-sized banks likely to encounter heightened regulatory requirements.

References

- [1] Ozili, P. K. (2023). Causes and consequences of the 2023 banking crisis. Social Science Research Network.
- [2] Dutta, A., Voumik, L. C., Kumarasankaralingam, L., Rahaman, A., & Zimon, G. (2023). The Silicon Valley Bank failure: Application of Benford's law to spot abnormalities and risks. *Risks*, 11 (7), 120.
- [3] Jiang, E. X., Matvos, G., Piskorski, T., & Seru, A. (2023). Monetary tightening and U.S. bank fragility in 2023: Mark-to-Market losses and uninsured depositor runs?
- [4] Hauf, P. and Posth, A. (2023). Silicon Valley Bank - (Why) Did Regulation and Risk Management Fail to Uncover Substantial Risks? Social Science Research Network.
- [5] Amberg, N., Jansson, T., Klein, M., & Picco, A. R. (2022). Five Facts about the Distributional Income Effects of Monetary Policy Shocks. *The American Economic Review*, 4 (3), 289 – 304.
- [6] Mercadier, M., Tarazi, A., Armand, P. and Lardy, P. (2021). Banks' Risk Clustering Using K-Means: A Method Based on Size and Individual & Systemic Risks. Social Science Research Network.
- [7] Elnahass, M., Trinh, V. Q., & Li, T. (2021). Global banking stability in the shadow of Covid-19 outbreak. *Journal of International Financial Markets, Institutions and Money*, 72, 101322.
- [8] Lin, J. Y., & Treichel, V. (2012). The unexpected global financial Crisis: Researching its root cause. In World Bank policy research working paper.
- [9] King, M. (2023). We need a new approach to bank regulation. *Financial Times*. <https://www.ft.com/content/43b926a6-b1ba-47a6-91f7-9ad5f776f8f8>,
- [10] Financial company bankruptcies: Congress and regulators have updated resolution planning requirements. (2020). U.S. GAO. <https://www.gao.gov/products/gao-20-608r>.
- [11] Supervision and regulation. (2022). <https://www.federalreserve.gov/publications/2021-ar-supervision-and-regulation.htm>.
- [12] Fdic Announces Retention of Financial Advisor to Assist with the Liquidation of Securities of the Former Signature Bank, Gale Academic Onefile Select. (2022). <https://go.gale.com/ps/i.do?id=GALE%7CA744393103&sid=sitemap&v=2.1&it=r&p=EAIM&sw=w&userGroup=anon%7Eb5fb65d0&aty=open-web-entry>.
- [13] Special assessments pursuant to systemic risk determination. (2023). Federal Register. <https://www.federalregister.gov/documents/2023/05/22/2023-10447/special-assessments-pursuant-to-systemic-risk-determination>.