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Interest Rate Risk and Liquidity Crises of Commercial Banking System -- Lessons from the Collapse of Silicon Valley Bank

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Abstract. Liquidity risk poses a significant threat to the stability of the banking sector, as highlighted by the recent bank run happened with Silicon Valley Bank (SVB). This paper examines the causes of liquidity risk through a case study and literature review of Silicon Valley Bank, focusing on its concentrated business model, reliance on uninsured deposits, asset-liability management practices, and internal risk governance. The analysis reveals that SVB's liquidity crisis was driven by its business focus and high dependence on uninsured deposits, compounded by inadequate management of interest rate risk and weaknesses in its internal risk controls. Although external supervision by the Federal Reserve was in place, its conservative approach failed to prevent the crisis. This study contributes to the literature by providing a comprehensive analysis of liquidity risk and internal governance in the context of a high-profile banking failure. It recommends that banks diversify their business models and improve the risk management for the financial investment strategies. Additionally, regulators should enhance oversight of regional and large foreign banking organizations to ensure financial stability.

Keywords: Interest rate risk, liquidity risk, bank run, risk management, asset-liability management

1. Introduction

Founded in 1983 by Bill Biggerstaff, Robert Medearis, and others, Silicon Valley Bank (SVB), headquartered in Santa Clara, California, emerged as a specialized financial institution focused on serving technology start-ups, venture capital (VC), and private equity (PE) institutions, establishing itself as a core financial service provider within the technology and innovation sector. Catering to early-stage startups, growth-stage technology companies, venture capital funds, and high-net-worth individuals, SVB distinguished itself by offering non-traditional banking services such as risk debt, start-up credit, cross-border fund management, and IPO consultation, effectively filling the service gap that traditional banks often left unaddressed for high-risk technology enterprises; this strategic

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focus involved deep cultivation of science and technology, life science, clean energy, and other innovative fields, resulting in a professional and interconnected service network.

A defining moment for SVB occurred in 2023, when a bankruptcy crisis erupted, triggered by the Federal Reserve's aggressive interest rate hikes that led to the sharp depreciation of SVB's long-term bond holdings, compounded by a concurrent cooling in technology industry financing and a surge in customer withdrawal demands; specifically, in March 2023, a staggering $42 billion one-day bank run resulted in the Federal Deposit Insurance Corporation (FDIC) taking control of SVB, marking the largest bank failure in the United States since 2008, although First Citizens Bank subsequently acquired its deposit and loan business, and retained a portion of the SVB brand.

This failure of SVB warrants a thorough analysis, as an in-depth examination of this case can assist financial institutions and regulators in gaining a deeper understanding of the critical importance of risk management, and offer valuable insights and lessons for addressing similar events that may arise in the future. Our research group will tackle this problem through a multi-faceted approach: the first part will analyze the fundamental concepts related to SVB's liquidity risk and interest rate risk, while part two will focus on duration mismatch and interest rate risk management. A third research content will focus on the causes of liquidity crises and SVB loan and portfolio risk concentration, and the final member will discuss credit risk, liquidity risk and compliance governance.

The failure of SVB offers crucial lessons for the broader banking sector, highlighting the need for banks to re-evaluate risk management practices and strategies in light of evolving economic and technological landscapes. In an era of de-globalization, regional banks must prioritize their domestic markets and mitigate cross-border risks. The integration of Environmental, Social, and Governance (ESG) factors, including the incorporation of industry-specific downturn risks (such as those in the technology sector) into risk control models, is becoming increasingly vital. Furthermore, central banks must adapt their lender-of-last-resort mechanisms to the accelerated pace of bank runs in the digital age. The SVB crisis is not an isolated incident, but rather a culmination of interest rate cycles, industry-specific economic cycles, and underlying risk management vulnerabilities. Therefore, commercial banks must re-balance the pursuit of profit with the imperative of ensuring safety and stability, and "extreme stress testing" should be normalized as a core component of risk assessment. From an investor's perspective, it is essential to look beyond the surface of financial reports and remain vigilant about the potential risk exposure concealed under accounting classifications such as "hold-to-maturity" (HTM). Ultimately, the banks that will thrive in the future will be those that have ingrained a deep-seated awareness of liquidity risk into their organizational culture and operational structure.

To further explore these arguments, our analysis will unfold in the following stages. In Part 2, we will delve into the liquidity crisis analysis of the Silicon Valley Bank (SVB) case, establish the its concentrated business model and risk of concentration of uninsured deposits. Part 3 will focus on duration mismatch and interest rate risk analysis, incorporating financial data analysis. Part 4 will address the main causes of compliance, and governance, dissecting internal risk management practices. Finally, in Part 5, we will explore external regulation system, revising the supervision of Federal Bank and California Department of Financial Protection and Innovation to SVB from 2018 to 2022. This review supports our conclusion that regulators' risk assessment approach, being excessively conservative, missed the opportunity to timely capture the escalating risks at Silicon Valley Bank.

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2. Liquidity crisis analysis

2.1. Concentrated business model

As indicated by the Basel Committee on Banking Supervision, liquidity risk refers to the risk that although commercial banks have the solvency, they cannot obtain sufficient funds in time or cannot obtain sufficient funds in time at a reasonable cost to cope with asset growth or pay maturing debts [1]. Interest rate and liquidity risks are critical concerns for commercial banks. The interplay of these risks, heightened by adverse market conditions, can trigger bank runs and severely disrupt the financial stability of banking institutions. The bankruptcy of Silicon Valley Bank is a vivid case with great warning significance.

Silicon Valley Bank operated in a very particular manner. It mostly benefited tech and life science firms that received venture capital funding. SVB became highly significant and successful in this small but unique market since it concentrated so much on this region. According to industry reports, SVB had an estimated market share of around 50% in the United States venture-capital-backed startup banking market. It had established deep-seated relationships with a large number of such firms, handling their various banking needs, from basic deposit services to complex financing arrangements. This specialization provided SVB with in - depth knowledge of the sector's unique requirements. In summary, SVB's concentrated business model was centered around serving a specific, high-growth segment of the business community, which brought both opportunities and risks.

2.2. Concentration of funding sources

The funding sources of SVB were highly concentrated. A significant portion of its deposits came from private equity and venture capital firms. These deposits were characterized by high volatility and large-amount cash flows. For instance, SVB deposits surged 205% from $62 billion to $189 billion during the pandemic from 2020 to 2022, while quarterly deposit churn was as high as 25% after interest rates rose in 2022 [2,3]. when a VC-backed startup received a substantial round of funding, a large sum of money would flow into SVB as deposits. Conversely, during periods of startup cash burn or when there were delays in fundraising, these deposits could be withdrawn rapidly. This made SVB's funding base inherently unstable. Such a concentrated funding structure meant that the bank was overly reliant on the financial health and investment activities of a relatively small group of entities. If there were any disruptions in the VC and PE ecosystems, SVB would be directly affected. In conclusion, the high concentration of funding sources with their volatile nature posed a latent threat to SVB's liquidity.

2.3. Performance during the pandemic

During the COVID-19 pandemic, SVB initially demonstrated strong performance in terms of balance - sheet growth and profitability. The bank experienced a surge in deposits as venture-backed startups received significant amounts of capital infusion, given the favorable investment environment at that time. SVB's balance sheet expanded substantially, with total assets increasing by 85% also net profit up 90% from March 2020 to December 2021 [3]. Its profitability also improved, as it was able to earn interest income from the growing deposit base. However, this growth was highly dependent on its concentrated business model. The bank's success was closely tied to the flourishing VC-backed technology and life-science sectors. Had these sectors faced any setbacks,

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SVB's performance would have been severely impacted. To sum up, while SVB thrived during the pandemic, its reliance on a concentrated business model for growth left it vulnerable to sector - specific risks.

2.4. Performance during the pandemic

The increase in interest rates in 2022 placed significant pressure on SVB's balance-sheet growth. As interest rates rose, the value of SVB's fixed-income securities, which were a significant part of its asset portfolio, declined. The value of the bank began to decline as a result. Additionally, the startups SVB worked with—which were financed by private equity and venture capital—found it more difficult to cope with the rising interest rates. These businesses generated less money and grew more slowly because they had to pay more to borrow money. As a result, more consumers requested to withdraw their money from SVB and fewer deposits were made. When interest rates were low, SVB's business strategy, which catered to a single customer type, used to be effective. However, it is currently a major vulnerability. Due to its over-reliance on a single customer base, the bank was unable to adapt to the new circumstances quickly enough.

3. Asset-liability management and interest rate risk analysis

One method used by banks and other financial institutions to manage their funds is asset liability management, or ALM. To achieve their financial objectives and lower risks, individuals must strike a balance between their assets (what they own) and liabilities (what they owe).

Making an effort to ensure that the time required to repay assets and liabilities is equal is known as matching maturities. For instance, if a bank offers long-term loans (money paid back over many years) with short-term deposits (money customers can withdraw immediately), it may have difficulties when the deposits must be reimbursed before the loans are paid back. Thus, it's critical to carefully consider when to allocate assets and liabilities.

Managing interest rate risk is the fluctuations in interest rates affect the values and returns of assets and liabilities. Financial institutions will use methods such as interest rate sensitivity analysis to adjust the asset-liability structure. For instance, when interest rates rise, the cost of fixed-rate liabilities remains unchanged, while the returns of floating-rate assets increase, and vice versa.

3.1. Concentration in the investment portfolio

Portfolio concentration refers to the degree to which an investment portfolio is concentrated in a small number of assets, sectors, industries, or individual issuers.

A high level of portfolio concentration means that a large proportion of the portfolio's value is allocated to a limited number of components. For example, if an investor's stock portfolio has a significant portion of its funds invested in just a few companies within a particular industry, it is said to have a high concentration in those stocks and that industry.

Spreading investments across a variety of asset classes, such as stocks from different industries, bonds, real estate, and other financial instruments, is known as a diversified portfolio. Because a diversified portfolio isn't concentrated on a single asset, it is less risky. A concentrated portfolio, on the other hand, when the majority of your money is invested in one or a small number of assets, might be hazardous. You may earn a lot of money if those investments perform well. However, your entire investment could lose a lot of value if they perform poorly, perhaps as a result of issues in a particular firm or industry.

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In short, portfolio concentration is an important way for investors to understand the risks and potential rewards of their investments. It helps them decide whether to spread their money out or focus it in one area.

3.2. Interest rate risk

The possibility of suffering a financial loss due to unforeseen fluctuations in interest rates is known as interest rate risk. A bank's financial stability may suffer as a result of these shifts in the value of assets like deposits, bonds, and loans. An increase in interest rates, for instance, may result in a decrease in the value of a bank's fixed-rate loans (assets) and an increase in the cost of paying greater interest on deposits (liabilities). The bank's fixed-rate loans continue to yield the same amount if interest rates decline, but variable-rate obligations may become less expensive.

To put it briefly, banks, investors, and others are quite concerned about interest rate risk. Maintaining stability and achieving financial objectives need effective risk management.

Rising interest rates have the potential to reduce the value of banks' assets, such as bonds and loans. For this reason, Silicon Valley Bank's (SVB) long-term investments came with significant risks. The market value of these long-term securities declines when interest rates rise, resulting in significant losses. About 65% of SVB's funds were invested in long-term bonds, which had maturities longer than five years. This increased the bank's risk and liquidity issues by making it difficult for it to react swiftly when interest rates rose.

SVB's strategy produced strong returns in an era with low interest rates. However, the bank was unable to manage the concealed risks when interest rates began to rise, which resulted in a serious liquidity crisis. When interest rates increased, SVB's investments erupted like a "landmine," resulting in catastrophic losses.

4. Corporate governance and risk management

Systemic flaws in corporate governance are highlighted by SVB failure in March 2023. The board's failure to provide strong oversight was a major governance failing at SVB.

First, the core responsibilities of the board of directors in bank risk management include supervising risk management and strategic decision-making. In terms of market risk, operational risk, credit risk, or even strategic and business risk, SVB’s board of directors lacks strict risk management measures [4].

2022 Executive Compensation Elements At-A-Glance

	CASH		EQUITY		
	Salary	ICP	PRSUs (50%)	Stock Options (25%)	RSUs (25%)
Purpose	Designed to attract and retain experienced executives. Reflects scope of leadership, years of experience, skills, market competitiveness and on-going individual performance.	Short-term incentive designed to reward based on financial performance and achievement of individual goals and objectives.	Long-term incentive designed to align executives with stockholder interests by aligning payouts to financial performance relative to peers.	Long-term incentive designed to align executives with stockholder interests by aligning payouts to share price performance over time.	Long-term incentive designed to align executives with stockholder interests and retain executives.
Performance Period	Ongoing	1-Year	3-Year	4-Year Vesting Period	
Performance Measures	-	ROE*	TSR* ROE*	Stock Price Appreciation^	

^ RSU and stock option awards are based on a fixed number of shares at the time of grant; any incremental value realized above the grant value of RSUs and stock options, as well as earned PRSUs, is based on stock price appreciation.

* Includes measurement of performance relative to peers.

Figure 1. 2022 executive compensation elements At-A-glance [5]

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According to the Figure 1, the management incentive compensation established by the board of directors is disconnected from risk supervision. The incentive compensation program didn't consider risk management but only the financial performance, such as return on equity (ROE), total shareholder return (TSR), and stock price appreciation [5,6].

Second, a major problem that is prevalent in the banking industry is the lack of risk management expertise on the boards of directors of banks. Today, the boards of directors of the vast majority of banks are not equipped to challenge management about the risks that affect the business. For example, of the seven board members assigned to the SVB Risk Committee, only one has a background related to risk management. In addition, according to the information provided in SVB's 2023 proxy statement, none of the committee members has held a senior risk management role.

Due to the lack of professionals in supervising risk management, SVB failed to identify and respond to the risks of insurance deposit concentration and interest rate.

Third, management's risk mitigation strategies lagged behind the bank's rapid growth, a misalignment exacerbated by insufficient accountability mechanisms. SVB failed to challenge management's aggressive investment strategies, such as overexposure to long-term held-to-maturity (HTM investment is usually held until maturity and difficult to sell in advance, resulting in limited liquidity.) securities. While aggressively allocating long-term bond assets, SVB have not reserved an equal proportion of cash to cope with a large outflow of deposits, triggering a liquidity crisis in the face of a large-scale currency squeeze.

4.1. Weakness in SVB's line-of-defense framework

An independent and effective line-of-defense framework consists three parts, including a frontline function that assesses and manages risk, an independent risk management function and an independent internal audit function.

However, examiners noted that SVB's risk management framework was not effective. It did not incorporate coverage of all risk categories and address foundational, enterprise-level risk management matters.

The risk management department failed to effectively identify and report the risk of insurance deposit concentration. The audit department failed to find or correct the weak links in internal control, such as imperfect risk management processes or poor implementation. The audit report was not transparent and failed to clearly reflect the real financial situation and risk level of the bank. The business department relied too much on technology start-ups and venture capital, and had failed to diversify customers and industries.

The weak line-of-defense framework resulted the comprehensive failure of risk management. It is manifested in insufficient risk identification, poor implementation of control measures, insufficient supervision and reporting. The lack of coordination between the defense lines and the poor supervision of the management have further exacerbated the failure of risk management.

4.2. Ineffective risk management practices

Effective risk management ensures, that banks maintain stable operations in a complex and changing market environment by identifying, assessing and controlling various risks. Specifically, credit risk management reduces the possibility of default on borrowers and ensures the stability of credit business through strict loan approval and post-loan monitoring; Market risk management is a hedge tool and asset-liability management to reduce the impact of interest rate, exchange rate and market price fluctuations on investment and trading business; Liquidity risk management uses reasonable

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capital allocation and emergency plans to ensure that banks can meet the withdrawal and payment needs of customers and maintain smooth daily operations; Operational risk management reduces the interference of human error, fraud and technical failure to business by improving internal control and technical systems; Compliance risk management ensures that banking business complies with laws and regulations through continuous monitoring and training, avoiding fines or loss of reputation caused by violations. By comprehensively covering the risk management framework of banking business, banks can maintain financial health, customer trust and market competitiveness while dealing with uncertainty, there by achieving long-term stable operation.

The risk management practices at SVB were in stark contrast to effective methodologies. The proportion of capital and reserves to total liabilities ranges between 7.3%-7.9%, which is a weak percentage compared to that bank size. The proportion of total finance to total liabilities varies between 31.4% and 39.1%, a relatively low percentage considering the bank's primary activity of financing emerging technology companies. The reliance on deposit-based financing, which ranges from 35% to 44.3%, highlights an operational risk in effectively utilizing deposits. This situation elucidates SVB's inclination towards investing in long-term bonds, which constituted between 42.7% and 60.6% of its total assets. The bank's inability to manage bond risks became evident when rising interest rates led to significant market losses in the bond portfolio, exposing market and interest rate risks. SVB demonstrates a commendable capability in collecting bad debts, with the percentage remaining below the 6% threshold recommended by Bank for international settlements (BCBS) relative to total finance. A notable risk for the bank is the high proportion of demand deposits among its liabilities, ranging from 88.5% to 95.3%. Consequently, during the bank run, SVB faced cash withdrawal requests totaling $42 billion within two days. Bank for international settlements stipulates that liquid assets should constitute 30-40% of total assets [7]. SVB did not adhere to this standard, as its liquid assets ranged from 6.5% to 15.3% of total assets, indicating a failure in managing liquidity risks. Therefore, it could not meet the customers' withdrawals timely [8].

It is worth mentioning that in 2022 SVB's Chief Risk Officer was absent for about eight months, and it wasn't until January,2023 that a new Chief Risk Officer was hired. This lack of leadership can leave the board and risk management team in the dark about new risks emerging in the portfolio, and may ultimately lead to poor strategies and approaches for managing SVB's market and liquidity risks.

The bankruptcy of Silicon Valley Bank demonstrates that banks can avoid such situations by enhancing management practices in three key areas: improving corporate stability, strengthening liquidity management, and reducing the substantial allocations on the asset side. Firstly, SVB have long been deeply engaged in the field of technology venture capital, amassing a substantial quantity of customer resources and liability base.

However, this also resulted in an overly concentrated client base, making them more susceptible to large-scale bank runs. Therefore, banks should diversify their expansion across various sectors and mitigate risks by cultivating differentiated competitive advantages.

Secondly, the liquidity management in commercial banks is of paramount importance. Banks must prioritize long-term strategic planning for their assets and liabilities. It is essential to integrate asset management methodologies with the unique characteristics of their operations. This approach ensures the maintenance of sufficient liquidity stability, even in the face of unforeseen adverse events. It also assists enterprises in mitigating losses and significantly reduces the likelihood of bankruptcy in adverse conditions.

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Finally, commercial banks can reduce their large asset allocation to long-term Treasuries and mortgage-backed securities. In the case of banks with commendable liabilities, enhancing their resilience to unforeseen circumstances can be achieved by diminishing dependence on asset-side arbitrage techniques and adopting more cautious measures. This effectively enhances the adaptability of the institution [9].

4.3. Communication failures and misjudged stakeholder trust

Silicon Valley Bank's collapse was accelerated by poor communication strategies. On March 8, 2023, SVB issued a statement indicating a loss of approximately $1.8 billion due to the sale of bonds, including U.S. Treasury bonds and mortgaged-backed security (MBS). On the same day, SVB announced a financing plan, intending to raise $2.25 billion to improve its balance sheet. The aforementioned two pieces of news have triggered panic among investors and depositors, leading to a large-scale run on the banks.

Moreover, management misjudged customer loyalty, assuming tech-sector clients would maintain deposits despite rising rates.

Additionally, Baal, Vice Chairman of the Federal Reserve for Supervision, pointed out that social media played a role in stimulating the process of bank runs. He explained that uninsured depositors, already concerned by SVB's financial disclosures, used social media to share information and concerns. This created a feedback loop of anxiety and ultimately triggered a mass exodus of deposits as depositors acted on fears amplified by online discussions [10].

In conclusion, SVB's governance and risk management failures exemplify the consequences of weak oversight, flawed incentive structures, and inadequate communication. Boards must prioritize expertise, impose strict risk standards, and promote openness in order to address these concerns.

5. Analysis of supervision system

5.1. Federal reserve system supervision structure

The US central bank is known as the Federal Reserve System, or Fed. It manages the nation's financial system and contributes to economic stability. Its framework is intended to efficiently regulate banks and handle monetary policy.

The Federal Reserve Board, with its headquarters in Washington, D.C., is at the top. It has seven governors with 14-year tenure who are selected by the president and confirmed by the Senate. The Board oversees the operations and budgets of the Federal Reserve Banks, determines monetary policy to stimulate employment growth and manage inflation, and monitors banks to maintain their financial stability. Twelve Federal Reserve Banks, including the Federal Reserve Bank of San Francisco (FRB San Francisco), are located beneath the Board. The Board receives information on regional economic situations from these regional banks, which also manage daily operations, oversee local banks, and offer payment services.

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The 2018 Economic Growth, Regulatory Relief, and Consumer Protection Act amended the Dodd-Frank Act, which was enacted to keep banks from being "too big to fail" following the 2008 financial crisis. Silicon Valley Bank (SVB), with assets of roughly $210 billion, was impacted by this development. SVB was subject to less regulations and had lower capital requirements, but it still had to pass stress testing [11]. SVB had more freedom to operate because of this laxer regulation, but there was less protection as a result. The lowered requirements contributed to SVB's failure in 2023 when it encountered difficulties.

5.2. Supervision of SVB

The Federal Reserve's supervision of Silicon Valley Bank (SVB) exposed a number of issues that ultimately caused the bank to fail. These included inadequate enforcement, sluggish risk identification, and lax rules.

(1) The Fed's slow response and delayed risk identification

The Fed's slow response and delayed risk identification was one of the main problems. The Fed identified flaws in SVB's risk management system as early as 2019 and sent out "Matters Requiring Attention" (MRAs) warnings. It did not, however, compel SVB to address these issues in their entirety. Because of this inaction, the dangers increased and ultimately resulted in the bank's demise. Despite acknowledging in 2020 that SVB did not meet regulatory standards for large banks, the Federal Reserve permitted the bank to double its assets to $209 billion between 2020 and 2021, indicating a lack of decisive intervention.

Critical risks inherent to SVB’s business model were inadequately monitored, including its rapid asset growth, high reliance on uninsured deposits (approximately 90%), and significant exposure to interest rate risk. While these factors were documented by Federal Reserve regulators, sufficient measures were not implemented to curb their expansion or enforce risk hedging strategies. For instance, after SVB was categorized as a “Large and Foreign Banking Organization” (LFBO) in 2021, supervisory teams identified deficiencies in the bank’s liquidity management. However, the subsequent actions taken proved insufficient to prevent the liquidity crisis that ultimately led to SVB’s collapse, illustrating a breakdown in the regulatory oversight process [12].

(2) Gaps in the regulatory framework

Loosening of Regulatory standards: Following the passage of the Economic Growth, Regulatory Deregulation, and Consumer Protection Act of 2019, the Federal Reserve adjusted its prudential standards for non-globally systemically important banks. As a "Category IV" bank, SVBS are exempt from requirements such as liquidity coverage ratio and net stable funding ratio, and the frequency of stress tests is reduced, resulting in inadequate capital and liquidity management.

The Fed's regulatory framework classifies banks by asset size, but SVBS 'unconventional business models, which focus on technology and venture capital, have not been adequately evaluated. Its unique exposures, such as long-term portfolio investments and volatile deposits, did not trigger targeted regulatory action.

(3) Post-event review and improvement measures

Internal Investigations and transparency: The review led by Fed Vice Chair Barr (released in May 2023) acknowledged regulatory failures and plans to make public portions of the regulatory review to enhance transparency. The report recommends strengthening capital and liquidity requirements, especially for banks with more than $100 billion in assets.

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Changes in regulatory tools, with the Fed proposing the creation of a "new type of activity oversight group" to address risks from non-traditional banking activities; Also consider restoring stricter stress tests and liquidity rules to reduce reliance on size classifications.

(4) External criticism and systematic reflection

Regulatory culture issues: The fact that the Fed's regional banks (e.g., the San Francisco Fed) have an interest in the SVB (e.g., the CEO of the SVB is a former member of the San Francisco Fed Board) may undermine regulatory independence.

Policy was out of step with markets: Dodd-Frank did not subject midsize banks such as SVBS to strict regulation, and the Fed's failure to anticipate the fragility of the banking system during a cycle of rapidly rising interest rates exacerbated the crisis.

The failure of SVBS was as much a result of failures by bank management as it was a reflection of the Fed's lagging and poorly enforced regulatory framework. The incident prompted the Fed to reassess its risk classification criteria, strengthen supervision of mid-sized banks and push for more transparent regulatory reporting. However, how to balance financial innovation and risk control remains a long-term challenge.

5.2.1. RBO supervision of SVB

The DFPI's analysis of its regulatory activities concerning Silicon Valley Bank (SVB) reveals several key trends: (1) in terms of type and frequency, SVB was subject to routine CAMLS examinations approximately once a year (e.g., seven times between 2016 and 2023), while the parent holding company, SVBFG, underwent regular checks with a similar frequency (six times in total), supplemented by increased special reviews from 2021 onward, covering areas like asset quality, liquidity planning, capital planning, governance, and risk management to address specific risk points; (2) regarding time distribution and trends, the early years (2016-2020) prioritized routine CAMLS exams and holding company checks, whereas post-2021 witnessed a significant surge in special reviews (e.g., liquidity, capital planning), potentially driven by SVB's business expansion or escalating market risks, alongside the introduction of new horizontal capital review (HCR) and liquidity review (HLR) in 2022-2023 to facilitate multidimensional monitoring of systemic risk; (3) ultimately, there was a shift in regulatory focus from routine inspections towards specific, risk-oriented reviews, particularly concerning capital adequacy, liquidity management, and governance structure, indicative of a more prudent assessment of SVB's risk exposure, demonstrating a deepening supervisory approach that evolved from routine oversight to specialized assessments, reflecting a dynamic response to emerging risks like liquidity pressure and capital planning deficiencies, emphasizing that a future analysis of inspection results and corrective measures, in conjunction with regulatory reports, is critical for a complete picture [12].

5.2.2. LFBO supervision of SVB

The regulatory strategies for large foreign banking institutions (LFBOs) concerning Silicon Valley Bank (SVB) were characterized by a relatively relaxed environment from 2021 to 2022, stemming from a historical backdrop of deregulation that included the passage of the Economic Growth, Regulatory Relief, and Consumer Protection Act in 2018. The raised the asset threshold for "systemically important banks" from $50 billion to $250 billion, resulting in SVBS (with approximately $209 billion in assets at the end of 2022) being classified as "mid-sized banks," exempt from some of the stringent regulations (such as annual stress tests, liquidity coverage ratio requirements). In 2020, the Federal Reserve revised the Volcker Rule to further loosen restrictions

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on proprietary trading by mid-sized banks. These policies led to the rapid expansion of SVBS but also to the emergence of regulatory blind spots in FLBO. SVB assets surged from $71 billion in 2020 to $209 billion in 2022 without triggering greater regulatory scrutiny. Its business is highly concentrated in the technology sector and start-ups, and customer deposits are highly concentrated and volatile, but it is not mandated by regulators to diversify its risk. Heavily invested in long-term Treasury bonds and mortgage-backed securities (MBS), unhedged interest rate risk, and regulators did not adequately assess their interest rate exposure.

The Silicon Valley Bank (SVB) crisis in 2023 exposed critical regulatory loopholes, notably the neglect of unrealized losses, as the Federal Reserve's aggressive interest rate hikes in 2022 caused the market value of SVB's long-term bond holdings to plummet, yet the bank's accounting treatment (HTM classification) concealed approximately $15 billion in unrealized losses, and regulators failed to mandate adequate disclosure or capital buffers [13]. Furthermore, SVB's heavy reliance on uninsured deposits, coupled with a high concentration of customers and a significant risk of bank runs, was not addressed by regulations imposing higher liquidity coverage ratio (LCR) requirements, and the Federal Reserve's traditional liquidity stress test model failed to account for the potential impact of social media-induced panic withdrawals.

5.3. Reflections as the post-crisis regulatory response strategy

Following the failure of Silicon Valley Bank in March 2023, regulators implemented a multi-pronged strategy to stabilize the financial system and prevent future crises. This response encompassed emergency interventions, strengthened regulatory reforms, and a reevaluation of long-term regulatory trends.

a. Emergency interventions. The FDIC takes over the SVB and fully protects deposits (including those above the $250,000 insurance limit) to prevent the spread of systemic risk. The Fed eased the selling pressure by launching the Bank Term Funding Program (BTFP), which allows banks to borrow against the face value of their bonds rather than the market price for liquidity.

b. Strengthen regulatory reforms. Increased capital and liquidity requirements: The Fed proposed stricter capital and liquidity rules (such as reinstating LCR and NSFR requirements) for banks with more than $100 billion in assets, and enhanced interest rate risk management.

c. Extend the scope of the stress test. Include mid-sized banks in the multi-scenario stress test, including emerging risks such as interest rate spikes, economic recessions, and digital runs.

d. Focus on unrealized losses. Require banks to more transparently disclose potential losses on held-to-maturity (HTM) assets and assess their impact on capital adequacy ratios.

e. Concentration risk management. Risk diversification requirements for banks with high customer industry concentration or single deposit source.

f. International coordination and foreign banking supervision. Strengthen cross-border regulatory cooperation, especially on the monitoring of cross-border banks' liquidity management and risk exposure. Us subsidiaries of foreign banks are subject to stricter liquidity coverage ratio (LCR) and capital planning requirements.

Looking ahead, long-term regulatory trends point towards a redefinition of "systemic risk," potentially involving a lower threshold for asset size (e.g., from 100 billion) for strict supervisory oversight. The integration of technology-driven regulatory upgrades, utilizing AI and big data analytics, aims to monitor bank liquidity risk and social media sentiment in real-time, providing early warnings of potential bank runs. Lastly, greater emphasis is being placed on executive accountability, with the Federal Reserve considering measures to hold bank executives directly responsible for risk management failures, including clawing back pay or imposing penalties.

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In summary, the investigation demonstrates that while Federal Reserve supervisors were aware of certain liquidity vulnerabilities at SVBFG, they failed to recognize the more significant issues that led to the bank's demise. They moved too slowly, especially in light of SVBFG's significant shortcomings, the challenging financial climate, and its particular difficulties. Supervisors used asset liquidity as the primary metric for assessing risk when SVBFG was a member of the Regional Bank Group (RBO). The risks associated with SVBFG's deposits and expanding long-term securities investments were not adequately captured by this method. SVBFG was not a good fit for the typical risk tools and criteria used for RBO banks. Despite SVBFG's rapid growth, authorities did not conduct thorough risk assessments or enforce stringent control because they believed the bank had significant liquidity. supervisors were not entirely aware of how changes in SVBFG's balance sheet raised risks or how new stress indicators impacted liquidity. Additionally, they failed to appropriately account for liquidity shortages in their evaluations from the large bank (LFBO) perspective. These left SVBFG vulnerable to the shocks that caused its collapse [11].

6. Conclusion

This paper explores the causes of liquidity risk in the banking sector, using Silicon Valley Bank (SVB) as a case study. The analysis emphasizes how concentrated business models and heavy reliance on uninsured deposits contribute to liquidity risk, alongside challenges in managing asset-liability mismatches and interest rate fluctuations. It also reveals weaknesses in internal risk management, especially at the board level and within the three lines of defense. Although the Federal Reserve provides external oversight, its conservative approach has proven inadequate in preventing banking crises.

The findings indicate that banks should diversify their operations and reduce dependence on uninsured deposits to lower liquidity risk. Improving asset-liability management and strengthening internal risk controls are equally important. Policymakers should enhance regulatory measures, particularly for regional and large foreign banks, to ensure financial stability.

This study adds to existing research by offering a detailed analysis of liquidity risk and internal risk management through the lens of a prominent banking collapse. However, limitations such as data constraints and the focus on a single case highlight the need for further investigation. Future research could test these findings in other markets and explore how technology can improve risk management practices.

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