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Risk Assessment of Banks When Interest Rate Hikes

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Abstract: Interest rates play a crucial role in the risk management of banks. When central banks raise interest rates to curb inflation or an overheated economy, the risk profile of banks can alter significantly. This paper explores the risks banks face and their assessment methods in a rising interest rate environment, focusing on SVB and Credit Suisse as case studies. It identifies key risks such as liquidity risk, credit risk, market risk, and systemic risk by examining the impact of increasing interest rates on banks' balance sheets, earnings, and capital positions. The research concludes that Asset-Liability Management (ALM) modeling, stress testing, and hedging strategies are effective tools for banks to manage these risks. A thorough literature review underscores the importance of these strategies in ensuring banks' stability and performance amidst rising interest rates. The paper highlights that proper risk management practices are essential for banks to navigate the challenges posed by changing interest rates and to maintain their financial health and operational stability in such an environment.

Keywords: Interest Rates, Bank System, Risk Assessment.

1. Introduction

The global economy has experienced tremendous volatility in recent years, especially after the COVID-19 shock to the global economy. Central banks have adopted a monetary policy of raising interest rates in response to inflationary pressures and economic overheating. While the interest rate hike is aimed at controlling inflation, it also poses significant challenges and risks to the banking sector. A rising interest rate environment can have a profound impact on banks' balance sheets, earnings, capital adequacy, and overall risk management strategies. Against this backdrop, it is of great relevance to examine the risk assessment of banks when interest rates rise. This paper intends to focus on three aspects of interest rate windfall, credit risk and liquidity risk to understand and assess the impact of interest rate hike on banks. This helps banks to develop effective risk management strategies, which in turn promotes financial stability and healthy development.

Firstly, interest rate hiking can have a negative impact on the market value of a bank's assets and liabilities and its net interest income. This is widely recognized as interest rate risk. Fabozzi and Mann's research point out that changes in interest rates affect banks in two main ways [1]. On the one hand, there are interest rate sensitivity differences in the balance sheet, and on the other hand, there is reinvestment and price risk due to interest rate changes. Specifically, a rising interest rate environment tends to lead to a decline in the market value of fixed income securities held by banks. Banks, on the other hand, often also need to pay depositors more interest in a rising interest rate

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environment, which can lead to a decline in net interest margins, which in turn may lead to an increase in banks' debt ratios and a decline in revenues.

Besides, higher interest rates may also create liquidity risks for banks. According to Drehmann and Nikolaou's study, banks may face greater deposit outflows and upward pressure on funding costs in an environment of rising interest rates [2]. In a high interest rate environment, a portion of depositors may shift to higher-yielding bond-based financial products, leading to pressure on the size of banks' deposits. At the same time, banks' financing costs in the capital market will also rise, which will further aggravate the liquidity crunch.

Then, the credit risk of banks is also affected by rising interest rates. According to Saunders and Cornett's study, borrowers' repayment costs increase when interest rates rise [3]. Particularly for highly leveraged firms and individuals that rely on short-term financing, rising interest rates could trigger a large number of defaults. Gertler and Kiyotaki's research also shows that rising interest rates lead to an increase in non-performing loans for banks, which in turn leads to an increase in loan loss provisions [4].

Lastly, this article also assesses the risks faced by banks during interest rate hikes. Market risk and systemic risk were assessed, and the recent failure of Silicon Valley Bank was discussed to illustrate the importance of risk management for banks. The importance of market risk management, especially interest rate risk, for banks was assessed in the context of the failure of Silicon Valley Bank. Systemic risk and how Basel III can be used to mitigate systemic risk in the banking system were discussed.

2. Liquidity Risk

SVB was founded in 1983 and is headquartered in Santa Clara, California, U.S.A. SVB focuses on providing financial services to technology companies, startups, and venture capitalists, and has gained a reputation for its focus on innovation and entrepreneurship. Its lines of business include lending, deposits, investment banking and asset management. Prior to bankruptcy, SVB's business was growing rapidly, attracting deposits from a large number of high-growth companies and venture capitalists. However, due to the high concentration of its customer base in the technology and entrepreneurial sectors, the funding needs of these customers were highly uncertain and volatile. SVB's balance sheet contained a large number of long-term fixed-income securities, which were relatively illiquid, leading to severe challenges in managing its liquidity risk. As interest rates rose, the market value of SVB's holdings of long-term fixed income securities declined significantly, further exacerbating its asset-liability mismatch. Fabozzi and Mann define liquidity risk as the risk that a bank will not be able to liquidate its assets quickly or obtain sufficient funding at a reasonable price, mainly in the event that outflows do not match inflows [1]. When clients began to make large-scale withdrawals, SVB was unable to liquidate these assets quickly, leading to the onset of a liquidity crisis. Although SVB attempted to alleviate the liquidity pressure through emergency financing and asset sales, these measures failed due to the loss of market confidence, which ultimately led to the bank's insolvency.

This report identifies liquidity risk as the core cause of SVB's insolvency. Firstly, SVB suffered from an asset-liability mismatch; its liability side consisted mainly of short-term deposits, while its asset side was heavily invested in long-term fixed-income securities. As a result, the market value of long-term securities declined against the backdrop of rising interest rates. Secondly, fixed-income securities are not liquid enough to cope with large-scale liquidity needs. SVB's holdings of highly liquid assets, such as cash and short-term government bonds, are insufficient and lack the ability to cope with sudden liquidity crises. In addition, SVB's client base is concentrated in high-tech and entrepreneurial companies, which are highly sensitive to changes in market interest rates. In a market environment of rising interest rates, customers of high-tech and entrepreneurial enterprises are under tremendous pressure, leading to a wave of large-scale withdrawals. As a result, SVB was unable to

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quickly convert these long-term assets into cash when customers made large-scale withdrawals, and SVB failed to effectively maintain customer confidence, which led to a concentrated outbreak of liquidity stress for SVB.

The causes of SVB liquidity risk come from several sources. Banks typically hold long-term assets, such as bonds and equity securities, but liabilities, such as deposits, tend to be short-term, which can lead to liquidity pressures in a sudden wave of withdrawals [5]. This report identifies this mismatch of asset and liability maturities as a major contributor to SVB's exposure to liquidity risk. In addition, volatility in financial markets affects the market value of bank assets, especially fixed income securities. In an environment of rising interest rates, the market value of long-term fixed income securities declines, increasing liquidity pressure on banks [6]. Finally, highly concentrated customer groups, such as SVB's tech and startup customers, may make simultaneous large-scale withdrawals during market turmoil, which, like an avalanche, exacerbates a bank's liquidity risk.

In order to deal with liquidity risk, this report argues that there are three effective measures that banks can consider. Bessis states that an adequate liquidity buffer can help banks maintain operational stability in the face of sudden withdrawal needs [7]. Therefore, this report argues that banks should maintain a certain size of highly liquid assets, such as cash and government bonds, to cope with liquidity needs. Stress testing is an important tool for banks to assess their liquidity risk under extreme market conditions. Basel Committee on Banking Supervision recommends that banks conduct regular stress tests to simulate liquidity needs and asset liquidity under different scenarios in order to formulate responses [8]. Finally, ALM is also an effective measure for liquidity risk management. Banks can better predict and manage liquidity needs by analyzing the maturity structure and interest rate sensitivity of assets and liabilities [7].

3. Credit Risk

Credit Suisse is one of the world's leading financial services companies, founded in 1856 and headquartered in Zurich, Switzerland. As a systemically important bank, Credit Suisse has significant influence in the areas of investment banking, private banking and asset management. Credit Suisse has faced serious financial difficulties in recent years. Credit Suisse suffered significant losses because of scandals with Greensill Capital and Archegos Capital Management. The Greensill Capital bankruptcy led to significant losses for investors in Credit Suisse's Supply Chain Finance Fund, while the Archegos the Greensill Capital bankruptcy resulted in significant losses for investors in Credit Suisse's supply chain finance fund, while the Archegos Capital matter resulted in billions of dollars in losses for Credit Suisse. These events significantly weakened Credit Suisse's financial position. Specifically, Credit Suisse failed to adequately assess and manage credit risk in its transactions with Greensill Capital and Archegos Capital. Defaults by highly leveraged counterparties resulted in large losses and demonstrated serious problems in the bank's credit risk assessment and monitoring. The bankruptcy of Credit Suisse not only shocked the financial markets, but also exposed major loopholes in banks' credit risk management.

Credit risk can be considered as the likelihood that a borrower or counterparty will fail to meet its financial obligations. Jorion defines credit risk as the risk of loss resulting from the failure of a borrower or counterparty to meet its financial obligations [9]. Credit risk management is a central issue in the banking industry. The bankruptcy of Credit Suisse exposed many problems in credit risk management. Greensill Capital bankruptcy revealed Credit Suisse's credit risk management deficiencies in supply chain finance. Credit Suisse lacked in-depth due diligence on Greensill Capital's business model and financial health and failed to identify customer concentration risks and business sustainability issues. In addition, Credit Suisse also failed to identify Archegos Capital's highly leveraged operations and strained capital chain in a timely manner, resulting in significant losses.

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The Credit Suisse incident demonstrated the need for banks to have robust internal control and governance structures in place to ensure effective management and monitoring of credit risk. This includes establishing a credit risk management unit, developing detailed credit policies and procedures, and ensuring the accuracy and timeliness of risk assessments. This report summarizes credit assessment and due diligence as the foundation of credit risk management. Credit assessment and due diligence allow banks to assess the level of credit risk of a borrower more accurately. Banks should also require borrowers to provide guarantees and collateral to mitigate credit risk and reduce the bank's exposure to credit risk [10]. The impact of an event like Archegos Capital on any bank can be devastating. It is therefore important for banks to conduct regular internal audits and risk assessments of their borrowers to avoid the recurrence of similar incidents.

4. Market Risk

In the context of bank risk management, the market risk refers to the risk of suffering from losses from the changes in the prices of financial instruments such as stocks, bonds, and currencies [11]. For a typical bank, on the asset side, the trading assets are mainly fixed-income securities, such as government bonds, and the bank investment in stocks is much smaller. Taking Silicon Valley Bank for example, on December 31, 2022, the total assets are 212 billion dollars, of which 120 billion dollars are investment securities, and among the investment securities, 117.4 billion dollars of 97.8%, are fixed income securities [12]. For Silicon Valley Bank, most of the fixed income securities are denominated in the US dollar, and a small part is denominated in other currencies. Therefore, for Silicon Valley Bank, the most important market risk is the interest rate risk, and the currency risk and the equity market risk are much less important market risk factors.

4.1. Heavy Fixed Income Exposure of the Silicon Valley Bank

The interest rate risk is the risk that the value of the bank’s fixed income securities declines significantly in value due to adverse interest rate movements. For fixed-income securities, there is an inverse relationship between price and interest rates [13]. The longer the maturity of the fixed income securities, the more the bond price falls given the same increase of the interest rates. The duration of the fixed income securities increases with the term of the securities [14]. The bankruptcy of Silicon Valley Bank is an illustration of how poor market risk management, particularly poor interest rate management, led to the bank failure. The US venture capital market experienced a boom in 2021 with huge increases in fund raising, and the boom led to tremendous increase of the deposits at SVB and SVB invested most of the new deposits in the long-term US government bonds and agency mortgage-backed securities. As of December 31, 2022, the weighted average duration of the AFS security portfolio of SVB is 3.6 years and the duration of the HTM securities is 6.2 years, indicating high interest rate sensitivity of the SVB’s portfolio.

4.2. Heavy Fixed Income Exposure of the Silicon Valley Bank

In 2022, the US inflation rate began to increase to very high level, for multiple reasons, including the global supply chain disruptions caused by the coronavirus pandemic starting at the end of 2019, the tightening labor market conditions in the US, the high wage pressures, and the high energy prices [15]. Starting in 2021, the US inflation rate began to increase, all the way from 1.40% in January 2021 to 89.06% in June 2022, much above the target inflation of 2-3% per year. To bring the inflation under control, the Federal Reserve had begun to raise the federal funds rate target range, from 0.0% - 0.25% to 4.25%-4.50% in December 2022 and then to 5.25% - 5.50% in 2024, and the large increase of the interest rate had led to large market value loss to Silicon Valley Bank that holds tremendous long-term bonds. The loss is particularly severe for SVB because SVB’s fixed-income security

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holdings are concentrated in medium- to long-term bonds and agency mortgage-backed securities and high-duration bonds are more affected by the interest rate hikes. The news of the large capital losses of the government bonds went viral on social media, leading to widespread panics and bank runs at SVB, and because most of its deposits are uninsured, the bank run is even more rapid, and this eventually led to the failure of the Silicon Valley Bank.

5. Systemic Risk

In the context of bank risk management, the systemic risk is the risk that an event could lead to severe instability of the entire banking system, and this might lead to disruptions to the entire economy. The high Federal funds rates in the United States are not only impacting Silicon Valley Bank, but also impacting all banks. Higher interest rates mean that US banks need to pay much higher interest expenses to depositors, and the very high interest rates mean that corporations are much less likely to borrow money because they might postpone their discretionary capital spending until the interest rates are lowered. However, the interest rate cut is being postponed and until the date of writing, the US federal funds rate remains very high, above 5%. The signal of the Federal Reserve is that the interest rate might be cut twice in 2024 starting in September [16]. The high interest rate would decrease the market value of all long-term government bonds and most US banks hold US government bonds, and the capital loss is not unique to the Silicon Valley Bank, but to most US banks. Thus, the interest rate hike is a systemic risk factor, threatening the stability of the entire US banking system.

To mitigate the systemic risk and prevent a banking crisis during the interest rate hikes, capital adequacy is important, and Basel III has addressed this issue. Basel III has strict capital adequacy requirement, aimed at ensuring that banks hold enough capital to absorb potential losses even in stress scenarios. Basel III also requires that banks maintain adequate liquidity and stable funding sources to be able to remain liquid during stress scenarios [17]. Strictly following Basel III could prevent some bank failures, for example, if SVB had maintained sufficient capital and liquidity, there would not be such panic over its survival and the subsequent bank runs and bankruptcy. In addition, as of December 31, 2022, the CET1 capital ratio of Silicon Valley Bank is 15.26%; the Tier 1 capital ratio is 15.26%; and the total capital ratio is 16.05% [12]. These capital adequacy ratios are all above the regulatory minimum. Therefore, the risk of insolvency is not the reason for the bankruptcy of the Silicon Valley Bank. The more important reason is that most of its deposits are uninsured deposits, so the depositors have stronger incentive to withdraw the money, and the illiquidity is the key reason for its collapse.

6. Conclusion

When central banks raise interest rates, banks are exposed to tougher risk profiles, including liquidity risk and credit risk. The bankruptcy of Silicon Valley Bank illustrates the criticality of liquidity risk management. By analyzing SVB's liquidity risk management failures, it can be seen that asset-liability mismatch, insufficient liquidity buffer, and the lack of risk early warning mechanism are the main reasons for its bankruptcy. The Credit Suisse incident, on the other hand, illustrates the significant losses that can result from credit risk management failures. By analyzing the Greensill Capital and Archegos Capital incidents, Credit Suisse has serious deficiencies in risk assessment, risk concentration management, internal control, and risk warning mechanisms. Learning from these lessons, banks must strengthen liquidity risk management and credit risk management, especially in the financial environment of rising interest rates, to better maintain sound bank operations. The environment of interest rate hikes is challenging for banks because higher interest rate raises the interest costs of banks' deposits and discourages corporate borrowing from banks and depress the fixed-income asset holdings of most banks. The key reason for the failure of the Silicon Valley Bank is that it is heavily exposed to the fixed income sector and the rising rates caused large capital losses

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to the Silicon Valley Bank, which led to the bank runs and bankruptcy. High interest rate is a systemic risk for the banking system, and capital adequacy and liquidity maintenance are important in controlling the systemic risk, and Basel III can be effective in ensuring that banks hold adequate capital and liquidity and mitigating the systemic risk of the banking industry.

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