Interest Rate Risk, Uninsured Deposits, and Run Dynamics: A Case Study of Silicon Valley Bank

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Abstract

The Silicon Valley Bank (SVB)'s failure to withstand a run by depositors in March 2023 is explored in this case study, which reveals how interest rate risk, concentrated uninsured funding and the lack of visibility into securities losses contributed to the rapid deposit withdrawal. The study traces the bank's market-value recovery position and constructs a stylized sequential-service recovery model for uninsured depositors as they withdrawal from the bank according to various withdrawal shares and asset-liquidation discounts, based on SVB's Form 10-K and supervisory reviews during fiscal 2022, along with the bank-run literature. Unrecognized losses on held-to-maturity securities of $15.1 billion nearly completely negated SVB's reported equity of $16.0 billion, which resulted in an estimated market-value equity balance of approximately 0.55% of uninsured deposits. In the stylized model, the buffer is depleted when depositors withdraw around 27% of their uninsured deposits, just before the 26% that they actually withdrew on March 9, 2023, leaving a first-mover advantage that is typical of a self-fulfilling run. The analysis looks at how the findings can be applied to bank managers, supervisors, corporate depositors and analysts and that large numbers of unrecognized securities losses remained within the banking system at the end of 2024. The study provides a clear-cut guidance for public information screening of run vulnerability, with the caveats of a case study and simplifying assumptions.

Keywords: bank runs, uninsured deposits, interest rate risk, held-to-maturity securities, Silicon Valley Bank

I. INTRODUCTION

On March 10, 2023, California regulators shuttered Silicon Valley Bank (SVB) and took it over as a receiver of the Federal Deposit Insurance Corporation (FDIC). The closure was part of an effort to withdraw approximately $42 billion on 9 March, with requests for an additional $100 billion made on the morning of the closure (Board of Governors of the Federal Reserve System [Board], 2023). SVB was one of the largest bank failures in U.S. history, with assets of some $209 billion, and together with the failures of Signature Bank and First Republic Bank, it was

part of three of the four largest bank failures in U.S. history to have happened in two months' time (Metrick, 2024).

The episode is analytical in importance because it was not credit losses driven. Most of the securities in SVB's portfolio consisted of U.S. Treasury and agency-guaranteed mortgage-backed securities, which have little default risk (Board, 2023). The issue was time. The Federal Reserve increased its policy rate by almost 4.5 percentage points between March 2022 and March 2023, and the market value of long-term fixed-income assets decreased as a result (Jiang et al., 2024). The resulting decline in the market value of U.S. bank assets was estimated to have been some $2 trillion, or an average of around 10%. In the absence of the purchases, on the other hand, the FDIC (2023) reported $620.4 billion of unrealized losses on available-for-sale (AFS) and held-to-maturity (HTM) securities at year-end 2022, of which $340.9 billion was reported as held-to-maturity securities, which are not included in reported equity.

Losses are not the sole reason for a bank to fail. In theory, a bank that can keep its assets until they mature and can keep its funding in the bank can withstand a rate cycle. Vulnerability occurs when monies can be withdrawn before they have the time to replace themselves. SVB's deposit base was extremely skewed toward uninsured deposits, with around 94% of deposits being above the $250,000 insurance limit (Board, 2023). If the bank fails, such depositors lose money, and they will thus have an incentive to withdraw whenever they suspect that assets are not sufficient to cover liabilities (Diamond & Dybvig, 1983; Jiang et al., 2024).

The question of this study is divided into three parts. First, how much “mark to market” capital shortfall did SVB have compared to the reported equity? Second, what was the thickness of the resulting buffer of uninsured deposits and how were withdrawal dynamics encouraging to runs? Third, what do bank managers, supervisors, depositors, and analysts learn from this practical viewpoint? The study uses a single-case design, relying on the disclosure to respondents and a clear, stylized model of depositor recovery, in order to address them.

II. LITERATURE REVIEW

A. Theories of Bank Runs

The Diamond-Dybvig (1983) model is the standard model of bank runs. Banks convert liquid, demandable deposits into illiquid assets, that makes depositors' consumption needs less demandable, but also introduces multiple equilibria. Other people will withdraw if other people expect others to withdraw, they have individually rational reason to withdraw, because the banks will be sequentially accepting withdrawals at par, and they can't accept all withdrawals without losing money on the sale of the assets. Diamond and Dybvig claimed that by eliminating the incentive to be first in line, deposit insurance can break the run equilibrium.

Subsequent studies have extended the notion of self-fulfilling panics. Goldstein and Pauzner (2005) demonstrated that it is possible to establish, on the basis of a global-games framework, that the likelihood of a run is related to a bank's fundamentals, thus making a run more likely even when beliefs coordinate. Gorton and Metrick (2012) noted that runs are not limited to retail deposits: A run on repurchase agreements in the shadow banking system occurred during the 2007–2009 crisis, as lenders pulled out their short-term funding secured by securities with unknown values. Egan et al. (2017) estimated a structural model of deposit demand in which depositors respond to bank default risk, and in which insured and uninsured deposits react differently, suggesting that the composition of a bank's deposits is important for its exposure to a loss of confidence.

Collectively, this literature suggests a dichotomy for the current investigation. Run on insured depositors have little motivation to run because their claims are protected, while the losses of uninsured depositors might be felt if assets are less than liabilities. The size of the uninsulated deposit base is thus a first order risk factor for runs, as are the capital buffer.

B. Interest Rate Risk and the Deposit Franchise

Interest rate risk arises on the basis that the duration of the banks' assets is longer than the duration of their liabilities. Hanson et al. (2015) hypothesized that banks are natural carriers for long-term fixed-income assets because the nature of their funding is relatively stable, so that they can withstand price fluctuations without having to sell. Drechsler et al. (2017) demonstrated that banks with market power in the deposit market increase their deposit spreads when policy rates increase, causing banks to withdraw deposits from the banking system and thus contracting their lending activities, which they termed the "deposits channel of monetary policy. Drechsler et al. (2021) further argued that the deposit franchise, in the form of low and sticky deposit rates, can mitigate the interest rate risk embedded in long-duration assets, thus eliminating the need for maturity transformation to expose bank value to interest rate changes. This hedge relies on

deposits being left at the bank, and thus is susceptible to the same uninsured-deposit flight as described above.

The most directly relevant contribution is Jiang et al. (2024) who mark bank assets to market based on rising interest rates from early 2022 to early 2023. They have seen an average drop in asset values of 10%, or approximately $2 trillion in total, and they have found that this drop in asset values can generate self-fulfilling solvency runs even if assets are completely liquid. Large asset losses, low capital, and high uninsured leverage are the most fragile characteristics of banks, and a case study of SVB verifies the model's conclusions. The present study extends this framework in two ways, however. First, it tests the framework at the institutional level, and second, it incorporates an explicit sequential-service calculation that tracks how the first-mover incentive changes as withdrawals accumulate.

C. Accounting, Regulation, and Supervision

The extent to which interest rate risk is visible is related to accounting classification. Securities held for trading are reported at fair value, with gains and losses reported in accumulated other comprehensive income (AOCI) and securities held to maturity are reported at amortized cost and the fair values of these securities are disclosed in the financial statement notes (SVB Financial Group, 2023). Reported equity will thus overstate the loss absorbing capacity of HTM portfolios if they have declined in value. However, regulatory capital rules can also help protect capital ratios, as the advanced-approaches framework allows banks not subject to it to exclude AOCI from regulatory capital, as was the case with SVB (Board, 2023).

Official reviews cite supervisory issues, but also point to weak interest rate and liquidity risk management at SVB. The Board (2023) concluded that SVB's board and management failed to manage their risks, that supervisors did not fully appreciate the bank's vulnerabilities as it grew, that supervisors did not ensure that identified problems were fixed quickly, and that changes in the regulatory framework following the Economic Growth, Regulatory Relief, and Consumer Protection Act (2018) reduced standards and contributed to a less assertive supervisory approach. The Basel Committee on Banking Supervision (2023) described the turmoil as the most serious system-wide banking stress since the Global Financial Crisis, emphasized the need for proper supervision, and recommended that the banking book liquidity risk and interest rate risk be analysed.

D. Research Gap

There is theoretical logic and a large sample measurement of run vulnerability in existing studies and supervisory detail in official reviews. Less common, however, is a compact, replicable calculation that can be used by practitioners with just public disclosures at a single institution, and which explains the development of vulnerability as withdrawals are made. This study is an attempt to fill the gap.

III. METHODOLOGY

A. Research Design

The study is of an explanatory single case design (Yin 2018). One case is sufficient if it is a critical or revealing case, where a theoretical proposition can be analyzed in an unusually clear way. SVB is in this category for three reasons. The bank amassed three vulnerabilities identified in the literature as being particularly harmful: large unrecognized securities losses, thin capital, and a very high proportion of uninsured deposits. Secondly, the failure was swift and has been well documented in official reviews and therefore there is no contestation about the sequence of events. Thirdly, the bank's disclosures allow for a reconstruction of its market-value position from publicly reported information. The propositions are that (a) the reported equity grossly overstated SVB's loss-absorbing ability, and (b) the resulting equity cushion was too small to shield the uninsured depositors from a first-mover advantage when the bank was liquidated, and that such advantage would accrue to those depositors who were not insured.

B. Data Sources

The balance-sheet information is from the SVB Financial Group's Form 10-K for the fiscal year ended Dec. 31, 2022 (SVB Financial Group, 2023), which includes consolidated figures for the holding company. The narrative provided by the Board (2023) addresses the share of uninsured deposits, the timing of the run, and the supervisory narrative. Other data on a system-wide basis comes from FDIC (2023) and the Office of Financial

Research (OFR, 2025). The inputs are summarized in Table I.

TABLE I. SVB FINANCIAL GROUP INPUTS AT DECEMBER 31, 2022 ($ BILLIONS)

Item	Value
Total assets (A_b)	211.8
Investment securities	120.1
Loans (amortized cost)	74.3
Total deposits	173.1
Stockholders' equity (E_b)	16.0
HTM securities, carrying value	91.3
HTM securities, fair value	76.2
HTM unrealized loss (UL)	15.1
AFS securities, amortized cost	28.6
AFS securities, fair value	26.1
Uninsured deposits (D_U), derived	162.7
Insured deposits (D_I), derived	10.4
Other liabilities (O), derived	22.7

Sources: SVB Financial Group (2023); Board (2023). Derived items apply the 94% uninsured share to total deposits; other liabilities are the residual.

Uninsured deposits are not reported directly in the consolidated data used here, so they are approximated by applying the 94% uninsured share reported by the Board (2023) to consolidated deposits of $173.1 billion, which gives about $162.7 billion. The remaining $10.4 billion is treated as insured. Other liabilities, including borrowings, are computed as the residual of total assets less equity less deposits, about $22.7 billion. Because bank-level and holding-company figures differ slightly across sources, small discrepancies are expected; they do not affect the qualitative conclusions.

C. Analytical Framework

1) Market-Value Equity

The unrecognized loss to be deducted from the reported equity is the unrecognized loss (UL). Equity in terms of market value is represented by Eq. (1), which represents the reported stockholders' equity. Am is market-value assets, and is equal to reported assets Ab minus UL. Loans are carried at the value of its face amount, while losses on securities are disclosed in the securities portfolio analysis. All prices are before tax.

$$E_m = E_b - UL \qquad (1)$$

The buffer relative to uninsured deposits (DU) is provided by Eq. (2). It reflects the number of dollars of loss-absorbing capital (valued at market) behind every dollar of uninsured deposits.

$$\beta = E_m/D_U \qquad (2)$$

2) Sequential-Service Recovery

Similar to Diamond and Dybvig (1983), a withdrawal is paid at par, according to the arrival date. Let ϕ be the percentage of uninsured deposits that are withdrawn prior to the bank collapse and h be the reduction in the value of the assets that must be sold to cover the withdrawals. If assets have to be sold, their fair value is S as defined by Eq. (3).

$$S = (\varphi D_U)/(1 - h) \qquad (3)$$

The other uninsured depositors, O, are assumed to be senior to insured deposits and DI. The value of the recovery rate for the uninsured depositors who stay, R, is determined by Eq. (4).

$$R = (A_m - S - D_I - O)/((1 - \varphi) D_U) \qquad (4)$$

If R is equal or greater than 1, then no other depositor would have any reason to remove their money before others since they would be getting their money back. If the value is less than 1, it means that you would be better off withdrawing sooner rather than later. Because the threshold share φc at which R first drops below 1 is a measure of the amount of outflow that the bank can absorb before a first-mover incentive emerges, this threshold is also apparent in the graph. The model assumes that the central bank does not have borrowing facilities, the assets are sold pro rata, and that taxes, resolution costs and the value of the franchise are zero.

D. Validity

The validity is based on the transparency of the inputs and not on statistical inference. The model is not a forecast. It separates the expected arithmetics of the run incentive under specified assumptions and Section V-D examines its bounds.

IV. RESULTS

A. Balance-Sheet Profile

At the end of 2022, SVB's consolidated balance sheet was extremely concentrated in securities, as can be seen in Table I. Investment securities held totaled $120.1 billion, or 56.7% of total assets of $211.8 billion, and loans totaled $74.3 billion or 35.1% of total assets. The assets held in HTM securities were valued at $91.3 billion and made up 43.1% of assets. Of the $173.1 billion in funding, deposits

accounted for 94% or around $162.7 billion, with a majority (around 94%) of these funds being uninsured (Board, 2023). However, the reported stockholders' equity of $16.0 billion was a comfortable 7.6% of assets on the surface.

B. Market-Value Solvency

The unrecognized loss on the HTM portfolio was $15.1 billion, or 16.5% of the carrying value, which stood at $91.3 billion. AFS securities, by comparison, had a fair value of $26.1 billion, and an amortized cost of $28.6 billion, with a $2.5 billion loss (8.7%) already accounted for in the reported equity account under AOCI. Using Eq. (1), the market-value equity was found to be $16.0 billion minus $15.1 billion, which is about $0.9 billion. About 94% of reported equity was thus wiped out by the HTM loss. The market-value assets were $196.7 billion, thus the market-value equity equated to approximately 0.46% of these assets. The buffer in Eq. (2) was 0.55% of estimated uninsured deposits.

In their analysis of the U.S. banking system, the FDIC (2023) found that the value of unrealized securities losses at year-end 2022 came to $620.4 billion; and Jiang et al. (2024) estimate that, if left unchecked, many U.S. banks would be in danger from self-fulfilling solvency runs. But the situation faced by the banks, such as SVB, was harsh but not unprecedented.

C. Run Dynamics

The recoveries from Eq. (4) for a number of combinations of withdrawal share and liquidation discount are given in Table II, and plotted in Fig. 1 as a continuous function. If they do not receive the discount, the other depositors would be paid back entirely at each level of withdrawal, since the market-value buffer is positive and they would be paid by the assets at fair value upon withdrawal. After a certain point, however, the buffer is depleted as withdrawals continue to be made, even at a small discount.

TABLE II. RECOVERY RATE FOR REMAINING UNINSURED DEPOSITORS (%)

$\varphi \setminus h$	0%	1%	2%	5%
0%	100.6	100.6	100.6	100.6
26%	100.7	100.4	100.0	98.9
50%	101.1	100.1	99.1	95.8
75%	102.2	99.2	96.1	86.4

Computed from Eq. (4) using the inputs in Table I. φ = share of uninsured deposits withdrawn; h = liquidation discount.

With a 1% discount, R falls below 100% when about 55% of uninsured deposits have been withdrawn, which requires approximately $90 billion of asset sales at fair value. With a 2% discount the threshold falls to about 27% of uninsured deposits (approximately $45 billion of sales), and with a 5% discount it falls to about 10% (approximately $18 billion).

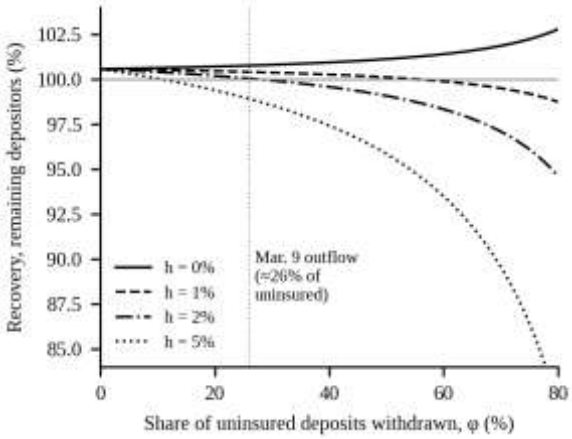


Fig. 1. Recovery rate for remaining uninsured depositors by withdrawal share and liquidation discount (h).

The 1% discount, applied to the total amount of uninsured deposits, means that R is below 100% after about 55% of uninsured deposits have been cashed in, which would need about $90 billion of asset sales at fair value. A 2% discount brings the threshold down to about 27% of uninsured deposits (or approximately $45 billion in sales) while a 5% discount brings it down to about 10% (or approximately $18 billion in sales).

These thresholds can be used to compare with the actual events. On March 9, about 26% of estimated uninsured deposits and 24% of consolidated deposits were attempted withdrawals (Board, 2023). At that discount, recovery rate is 100.0% (almost at the edge of recovery) and at 5% discount, the recovery rate is 98.9%. The additional $100 billion on March 10 would have totalled approximately $142 billion or approximately 82% of consolidated deposits. A 50% and 75% withdrawal rates will have recovery rates at 99.1% and 96.1% respectively with 2% discount and 95.8% and 86.4% respectively with 5% discount.

As withdrawals increase, the first-mover advantage increases as can be clearly seen in Figure 1. The more dollars withdrawn, the more dollars have to be sold off at a loss, and those that don't sell off at a loss are the ones that suffer the loss. This is the sequential-service mechanism of Diamond and Dybvig (1983) with an insufficient buffer to cover the discount.

D. Summary of Findings

There are three findings that stand out. Firstly, HTM losses caused the market value equity to become a small portion of the reported value. Secondly, the buffer was only one

half percent of the estimated uninsured deposits. Third, in the stylized model, a 2% liquidation discount was enough to deplete the buffer when withdrawals were approximately 27% of the uninsured deposits, which is a level around the 26% that was made in March 9, while a 5% discount depletes the buffer at about 10%.

V. DISCUSSION

A. Interpretation

The findings support the notion that the failure of SVB was not a single failing, but rather multiple vulnerabilities. But if the funding had been more stable and the losses had been unrecognized only, there would not have been a run, and if the assets had been valued well above the liabilities, then a concentrated uninsured deposit base would not have been a problem. The mix resulted in a situation where a relatively small, public event could alter depositors' perceptions of the coverage of assets by liabilities. According to the Board (2023), the securities sales loss and the plan to raise capital for SVB were announced on March 8, 2023, before the run. But even if a few people thought the market value of the assets was a bit lower than it was, or that the capital raise was a bit less successful, each individual depositor would have been better off withdrawing since the market-value buffer was less than 1% of the uninsured deposits.

The results are in line with either of the two dominant interpretations found in the literature. From a fundamentals-based reading, as per Goldstein and Pauzner (2005) and Jiang et al. (2024), the weak market-value position of SVB made for a likely run, which was in this regard a solvency run as opposed to a panic run. Metrick (2024) interprets the collapse as a good start to a broader panic, and a lesson in the economics of banking. Both perspectives were complementary: Weak fundamentals set the stage for the vulnerability, and coordination between a focused base of depositors hastened the realization.

B. Practical Implications

1) Bank Management

Economic value of equity should be measured and reported alongside regulatory capital (HTM and loan portfolios), managers should test sensitivity of uninsured deposits to rate shocks, not assume deposits are sticky. The market-value equity is not affected that much by hedging or by shortening duration, and the less synchronized the outflows, the less risky the equity. Because the time available for response may be measured in hours, contingency funding plans should be put into operation, including the ability to pledge collateral and access central bank facilities quickly.

2) Supervisors

The Board (2023) determined that there was an identification of vulnerabilities, but it was not ensured that they were addressed promptly. A practical answer is to continue to track the equity in the market value of the deposits with respect to the uninsured deposits as a regular measure and to correlate supervisory actions with the equity of the market value of deposits, regardless of the accounting classification. The size thresholds may not be as meaningful as funding structure and duration, as demonstrated by the SVB case.

3)Corporate Treasurers and Depositors

For organizations with balances in excess of insurance, the insurance is treated as a payment of a “secured” lender, and counterparties should be assessed accordingly. Practical measures involve diversifying across institutions, operating cash in Treasury money-market funds, and watching the condition of banks through public filings, based on their market value.

4) Analysts and Investors

Reported equity can be adjusted for unrecognized losses on uninsured deposits (as here) per the note disclosures, and the value compared with uninsured deposits. Only public information has to be used in the calculation, so this suggests that this kind of screen may be applied routinely in other institutions.

C. System-Wide Context

Loss of life due to rate is still a reality. At the end of 2024, bank depositories' unrealized securities losses were $481 billion or approximately 19.9% of the aggregate equity held by the banking subsidiaries, but decreased from their peak level. (2025) These data, combined with the FDIC (2023) data for $620.4 billion at the end of 2022, indicate that the underlying exposure is in moderate but still evident. The two dimensions measured by the framework explored here are whether it means fragility and the extent of uninsured funding of the relevant bank.

D. Limitations

There are a number of caveats to the findings. First, the study does not establish generality because the evidence for the system is from other studies. Second, inputs are combined and pre-tax. Market-value equity would be slightly higher, but deferred tax assets would be based on future profitability and 94% of uninsured deposits are consolidated. Third, loans are carried at the face value and insured deposits and other liabilities are deemed to be

fixed. Fourthly, the model does not include central bank facilities that could provide liquidity against security and thus diminish the requirement for discounted sales, so it is an incentive structure and not the actual result that would have occurred if central bank facilities had been used to the full. Fifth, there is only one withdrawal share rather than actual decisions made by depositors and a lack of measurement of role of information, social networks, and digital channels. Lastly, thresholds are calculated after the fact, therefore there is the risk of hindsight bias. Finally, future research could use the framework to the cross-section of banks, include the ability to borrow using collateral, and test the thresholds against data at the deposit level.

VI. CONCLUSION

This paper explored Silicon Valley Bank's failure as a system in which the interactions between interest rate risk, concentrated uninsured funding, and limited visibility of securities losses were all observed. It used public disclosures to build up the bank's market-value position and a stylized sequential-service model of depositor recovery.

The $16.0 billion in reported equity is nearly completely offset by unrecognized losses of $15.1 billion, resulting in an estimated market-value equity of $0.9 billion, or approximately 0.55% of the uninsured deposits. The stylized model would have depleted this buffer at withdrawals of approximately 27% of uninsured deposits, which is near the percentage of withdrawals during March 9, 2023. The case hence shows in numerical terms the first-mover advantage as outlined by Diamond and Dybvig (1983) and solvency-run as outlined by Jiang et al. (2024).

The implications for each of the stakeholder groups are then provided. Managers need to control and report on the value of equity and assess the sustainability of uninsured funding. Supervisors shall escalate on the basis of market-value capital, when compared to uninsured deposits. The amount deposited at a corporate level should be considered a credit exposure and analysts should use the simple screen below to public filings. The lessons continue to be pertinent, as evidenced by the continued large, unrealized securities losses as of 2024 (OFR, 2025).

Limitations include the single case study design, assumptions about style and the use of consolidated, pre-tax data. Despite this, the overall trend studied is clear over all the discount rates considered: If capital measured at market value is very small in relation to uninsured funding, then confidence, not credit quality, may be the reason a bank lives or dies.

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