

Tailoring Liquidity Rules Did Not Cause the Failure of Silicon Valley Bank

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When Silicon Valley Bank (SVB) collapsed in March 2023, some policymakers pointed to S. 2155 (passed in 2018) as a cause for the bank’s failure. The Biden White House subsequently released a statement calling for the reversal of the previous Administration’s banking reforms.¹ This report explains how the tailored liquidity rules implemented under S. 2155 did not cause the failure of SVB. The pre-S. 2155 liquidity rules would not have positioned SVB to withstand the significant deposit outflows it faced in March 2023 (\$142 billion in two days). Withstanding those outflows would have required a 200% liquidity coverage ratio (LCR), double the pre-S. 2155 requirement. A 100% LCR would have reduced SVB’s illiquidity risk by less than 1%.

S. 2155 tailored regulations for the U.S. banking system.

S. 2155 is the Economic Growth, Regulatory Relief, and Consumer Protection Act of 2018. It aimed to improve consumer credit access, encourage business investment, and protect student loan borrowers. S. 2155 received bipartisan support, including a two-thirds Senate majority.²

Provisions of S. 2155 tailored the supervision and regulation of midsized banks, which tend to have different patterns of risk than the largest banks. One analysis from the International Monetary Fund found that (among banks exceeding \$10 billion of assets) larger banks tended to have more leverage, more organizational complexity, and less risk-weighted capital.³

The Dodd-Frank Act of 2010 had set the threshold for mandatory application of “enhanced prudential standards” (EPS) at \$50 billion of consolidated assets.⁴ All banks above the threshold were automatically subjected to the most stringent capital, liquidity, and stress testing requirements. By year-end 2017, the four largest U.S. banks far exceeded \$1,000 billion in consolidated assets, and the largest U.S. bank had \$2,141 billion in consolidated assets.⁵ Title IV of S. 2155 raised the statutory threshold for the mandatory application of EPS to \$250 billion.⁶

¹ The White House, “FACT SHEET: President Biden urges Regulators to Reverse Trump Administration Weakening of Common-Sense Safeguards and Supervision for Large Regional Banks,” March 30, 2023, <https://archive.is/SD6ne>.

² Roll call vote number 45, “Economic Growth, Regulatory Relief, and Consumer Protection Bill,” Congressional Record, daily edition, vol. 164 (March 14, 2018), p. 21730.

³ Luc Laeven, Lev Ratnovski, and Hui Tong, “Bank Size and Systemic Risk,” IMF Staff Discussion Note 14/04 (Washington, DC: International Monetary Fund, 2014): 9, <https://www.imf.org/external/pubs/ft/sdn/2014/sdn1404.pdf>.

⁴ Dodd-Frank Act § 165, 12 U.S.C. § 5365.

⁵ Federal Reserve Board of Governors, “Large Commercial Banks,” December 31, 2017, <https://www.federalreserve.gov/releases/lbr/20171231/default.htm>.

⁶ 12 U.S.C. § 5365(a)(1).

Although the mandatory threshold was raised, the Federal Reserve Board of Governors (Fed) still had the discretion to apply EPS as appropriate. Under S. 2155, the Fed had the broad power to “apply any prudential standard” to banks above \$100 billion in consolidated assets if it “determines that application of the prudential standard is appropriate” for “financial stability” or “safety and soundness.”⁷ When making those determinations, S. 2155 specifically directed the Fed to consider “capital structure, riskiness, complexity, financial activities [...], size, and any other risk factors that the [Fed] deems appropriate.”⁸

Under S. 2155, the Fed supervised and regulated SVB as a Category IV bank.

Following the passage of S. 2155, the Fed established and enacted a “four-tiered” framework for the supervision and regulation of banks under its purview.^{9, 10}

- (I) Global Systemically Important Banks (GSIBs), as defined under U.S. law.
- (II) Non-GSIBs with over \$700 billion in assets or over \$75 billion in cross-jurisdictional activity.
- (III) Non-GSIBs with over \$250 billion in assets or over \$75 billion in (a) nonbank assets, (b) weighted short-term wholesale funding (wSTWF), or (c) off-balance sheet exposure.
- (IV) Non-GSIBs with over \$100 billion in assets.

Category IV is the lowest tier, with higher tiers facing increasingly stringent requirements.

Category IV banks are subjected to both risk-based and leverage-based capital requirements, as well as biannual supervisory stress tests of their capital buffers. Category IV banks must submit an annual capital plan. Additionally, Category IV banks with over \$50 billion in wSTWF are subjected to a liquidity coverage ratio (LCR) requirement, a net stable funding ratio (NSFR) requirement, and liquidity stress tests. An LCR measures the ratio of a bank’s “high quality liquid assets” (HQLA) against its expected net cash outflows over a 30-day stress scenario. Category IV banks without \$50 billion in wSTWF are still required by the Fed to establish and maintain a liquidity buffer of “highly liquid assets” (i.e., cash, HQLA, or other low-risk assets approved by the Fed) sufficient to meet its estimated 30-day net liquid cashflows during a period of stress, i.e., a one-to-one ratio of highly liquid assets to expected liquidity withdrawals.¹¹

⁷ 12 U.S.C. § 5365(a)(2)(C).

⁸ *Id.*

⁹ Federal Reserve Board of Governors, “Prudential Standards for Large Bank Holding Companies, Savings and Loan Holding Companies, and Foreign Banking Organization,” *Federal Register* 84, no. 212 (November 1, 2019): 59032-59123, <https://www.federalregister.gov/documents/2019/11/01/2019-23662/prudential-standards-for-large-bank-holding-companies-savings-and-loan-holding-companies-and-foreign>.

¹⁰ Federal Reserve Board of Governors, “Requirements for Domestic and Foreign Banking Organizations,” October 10, 2019, <https://www.federalreserve.gov/aboutthefed/boardmeetings/files/tailoring-rule-visual-20191010.pdf>.

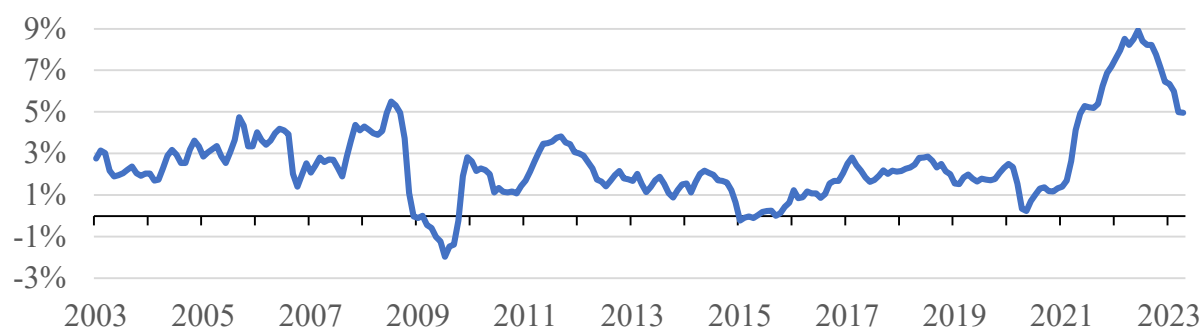
¹¹ 12 C.F.R. § 252.35(b).

SVB’s annual regulatory filings indicate that its total assets grew from \$69.9 billion to \$113.8 billion in 2020.^{12, 13} Its total assets reached \$208.6 billion in 2021 and \$209.0 billion in 2022.¹⁴ SVB did not have more than \$75 billion in nonbank assets, wSTWF, off-balance sheet exposure, or cross-jurisdictional activity.¹⁶ SVB was not a GSIB.¹⁷ Therefore, under the Fed’s four-tiered framework, the Fed regulated SVB as a Category IV bank.

SVB failed after its depositors attempted to withdraw \$142 billion over two days.

SVB suffered large losses on its portfolio of long-term bonds as inflation reached a four-decade high (Figure 1) and the Federal Open Market Committee (FOMC) raised overnight interest rates by 5% (Figure 2). In 2022, the fair value of its securities fell by \$22.2 billion (17.8%).¹⁸ SVB’s total deposits peaked at the end of Q1 2022 and fell by \$8.8 billion (14.2%) by Q4 2022.¹⁹

Figure 1: Consumer Price Index (year-over-year growth)



Source: Bureau of Labor Statistics

On March 8, SVB announced that it was forced to sell a bond portfolio at a \$1.8 billion loss and needed to raise \$2.25 billion in capital.²⁰ Moody’s downgraded the bank’s bond rating and

¹² Federal Financial Institution Examination Council, Call Report: Silicon Valley Bank (December 31, 2019): 19.

¹³ FFIEC, Call Report: Silicon Valley Bank (December 31, 2020): 19.

¹⁴ FFIEC, Call Report: Silicon Valley Bank (December 31, 2021): 19.

¹⁵ FFIEC, Call Report: Silicon Valley Bank (December 31, 2022): 19.

¹⁶ *Id.* at 34, 37–39, 53.

¹⁷ See (e.g.) Financial Stability Board, “2022 List of Global Systemically Important Banks (G-SIBs)”, November 21, 2022, <https://www.fsb.org/wp-content/uploads/P211122.pdf>.

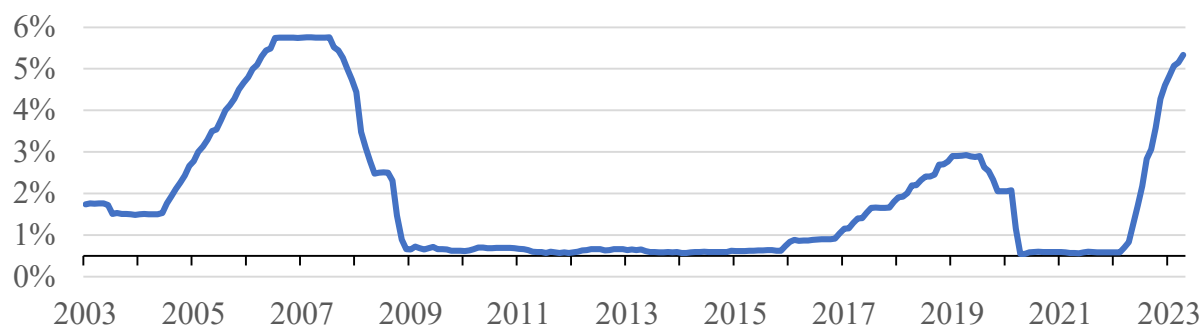
¹⁸ Author calculations using FFIEC, Call Report: Silicon Valley Bank (December 31, 2021): 21 and FFIEC, Call Report: Silicon Valley Bank (December 31, 2022): 21.

¹⁹ Author calculations using FFIEC, Call Report: Silicon Valley Bank (March 31, 2022): 19 and FFIEC, Call Report: Silicon Valley Bank (December 31, 2022): 19.

²⁰ Jonathan Weil and Ben Eisen, “Banks Lose Billions in Value After Tech Lender SVB Stumbles,” *Wall Street Journal*, March 9, 2023, <https://archive.is/IlyMN>.

slashed its outlook to negative.²¹ On March 9, SVB’s stock fell by 60% and customers withdrew \$42 billion of deposits.²² On March 10, SVB management expected \$100 billion of additional withdrawals.²³ In total, SVB would have lost \$142 billion (or 81%) of its total deposits over two days. Unable to meet its deposit obligations, SVB was shut down by regulators on March 10.

Figure 2: Effective Federal Funds Rate



Source: Federal Reserve Board of Governors

Pre-S. 2155 liquidity requirements would not have prevented the failure of SVB.

Under the pre-S. 2155 framework, SVB would have been subject to a 100% LCR requirement because it had more than \$50 billion in consolidated assets.²⁴ Under the S. 2155 framework, although SVB was supervised and regulated as a Category IV bank, it was not subject to an LCR or NSFR because it did not have over \$50 billion in wSTWF.

While SVB did not report an official LCR, academics have estimated what its LCR would have been under the pre-S. 2155 framework. While estimates vary because of differences in assumptions and methods, SVB’s LCR was generally high. Bill Nelson (Bank Policy Institute) estimates that SVB’s LCR would have been either 101% or 75%, depending on whether expected deposit outflows were \$52 billion or \$70 billion, respectively.²⁵ Greg Feldberg (Yale School of Management) similarly estimates that SVB’s LCR would have been 75%.²⁶

²¹ “Moody’s downgrades credit ratings on Silicon Valley Bank, SVB Financial,” *Reuters*, March 10, 2023, <https://archive.is/AZsu1>.

²² Jonathan Weil and Ben Eisen, “Banks Lose Billions in Value After Tech Lender SVB Stumbles,” *Wall Street Journal*, March 9, 2023.

²³ Michael S. Barr, “Review of the Federal Reserve’s Supervision and Regulation of Silicon Valley Bank,” Federal Reserve Board of Governors (April 28, 2023): i, <https://www.federalreserve.gov/publications/files/svb-review-20230428.pdf>.

²⁴ FFIEC, Call Report: Silicon Valley Bank (December 31, 2019): 19 and subsequent call reports at same page.

²⁵ Bill Nelson, “Update on SVB’s LCR,” Bank Policy Institute, March 27, 2023, <https://archive.is/fG1pa>.

²⁶ Greg Feldberg, “Lessons from Applying the Liquidity Coverage Ratio to Silicon Valley Bank,” Yale Program on Financial Stability, March 27, 2023, <https://archive.is/n2juI>.

SVB faced \$142 billion in outflows over only two days. No reasonable bank liquidity requirement can defend against outflows of this speed and size. Realistically, meeting deposit outflows of this speed would have required holding the same amount of assets in money market securities. Using Feldberg’s estimate of a \$71 billion expected 30-day outflow, meeting deposit outflows of this size (\$142 billion) would have required SVB to have a 200% LCR, which is double the requirement for GSIBs and double the requirement under the pre-S. 2155 rules.²⁷

Moreover, under the pre-S. 2155 framework, SVB could have reduced its foreign exposures and have been subject to a modified LCR requirement. Under the modified requirement, SVB’s LCR would have been higher. For example, Nelson estimates either 144% or 107% (again depending on the assumption for expected 30-day outflows). These high LCR estimates reflect that the bulk of SVB’s assets, including Treasuries and agency mortgage-backed securities (MBS) are among the most liquid in the global financial system. Treasuries are Level 1 HQLA, and agency MBS are Level 2A HQLA.²⁸

However, SVB’s large losses came from its large holdings of Treasuries and agency MBS. As inflation spiked to a four-decade high and the Fed raised interest rates rapidly in response, the value of those bonds dramatically fell in the environment of higher rates. No reasonable bank capital buffer can absorb double-digit percentage losses when 10-year Treasury yield quadruples. For a 10-year Treasury note priced at par, this rise corresponds to nearly a 25% price decline.²⁹

Figure 3: 10-Year Treasury Yield



Source: Federal Reserve Board of Governors

Some have argued that subjecting SVB to an LCR requirement would have raised warning signs for supervisors. However, even without an LCR requirement, supervisors were already aware of the significant funding and liquidity risks at SVB. As Vice Chair for Supervision Michael Barr explained in his March 2023 testimony before the U.S. Senate Banking Committee:

²⁷ *Ex post* LCR = (Actual Withdrawals) / (Expected 30-Day Withdrawals) = (\$142 billion) / (\$71 billion) = 200%.

²⁸ 12 C.F.R § 249.20(a–b).

²⁹ For a newly issued 10-year Treasury with a 1% coupon rate, a 1% 10-year yield corresponds to a price of 100 cents on the dollar (i.e., priced at par). A 4% 10-year yield corresponds to a price of 75.5 cents on the dollar. An analogous calculation for agency MBS would require an assumption about the degree that rising interest rates slow mortgage prepayment speeds, which depends on pool-specific characteristics like weighted-average coupon rate.

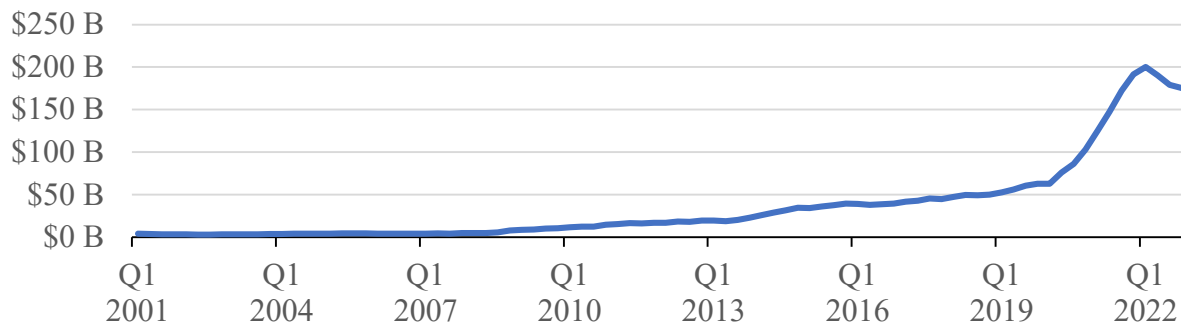
Near the end of 2021, supervisors found deficiencies in the bank’s liquidity risk management, resulting in six supervisory findings related to the bank’s liquidity stress testing, contingency funding, and liquidity risk management. In May 2022, supervisors issued three findings related to ineffective board oversight, risk management weaknesses, and the bank’s internal audit functions.³⁰

Supervisors lowered SVB’s management rating and rated the bank’s governance and controls as “deficient-1,” meaning that the bank was not “well managed.” Supervisors also raised concerns about SVB’s solvency risks.³¹ Nevertheless, the Fed did not take public enforcement action.

Meeting a 100% LCR would have only slightly decreased SVB’s illiquidity risk.

For this report, define “illiquidity risk” as the probability that a solvent bank has insufficient HQLA to meet its deposit withdrawals. I estimate the effect a meeting a 100% LCR on SVB’s illiquidity risk by modeling the growth of SVB’s total deposits using data since Q1 2001.

Figure 4: SVB Total Deposits



Source: Federal Financial Institution Examination Council

The time series plot suggests modeling the natural logarithm of SVB’s total deposits as driven by a Wiener process. By definition, a *Wiener process with respect to filtration* (F_t) is a real-valued continuous-time stochastic process X such that its sample paths are continuous and centered ($X_0 = 0$); it is adapted to filtration (F_t); and for all times $s, t \geq 0$, the increment $X_{s+t} - X_t$ is independent of sigma-field F_t and is normally distributed with $E(X_s X_t) = \min(t, s)$. By standard result, X is completely characterized by two independent components: a linear drift μ and a σ -scaled Brownian motion B . X obeys the stochastic differential equation (SDE):

$$dX_t = \mu dt + \sigma dB_t$$

³⁰ Michael S. Barr, “Bank Oversight,” Testimony before the U.S. Senate Committee on Banking, Housing, and Urban Affairs, March 28, 2023, <https://federalreserve.gov/newsevents/testimony/barr20230328a.htm>.

³¹ *Id.*

Because data on SVB's total deposits are only published for quarter-end dates, I integrate the SDE with respect to time and discretize the process into an autoregressive model of order 1:

$$(1 - L)X_t = \mu + \epsilon_t$$

where X_t is SVB's log deposits at quarter t, L is the lag operator, and ϵ_t are i.i.d. normally distributed innovation terms with mean zero and variance σ^2 .³² Define $Y_t = (1 - L)X_t$ as the quarterly log growth in SVB's total deposits. Y_t satisfies the following regression equation:

$$Y_t = \mu + \epsilon_t$$

The maximum likelihood estimates are $\hat{\mu} = 4.33\%$ and $\hat{\sigma} = 7.28\%$. These estimates imply that (under typical economic conditions in which SVB had remained solvent) it would have been nearly impossible for SVB's total deposits to fall from over \$175 billion to less than \$33 billion in a single quarter, never mind in two days. Where Φ is the cumulative distribution function for the standard normal distribution, the probability of an outflow at least this large is calculated as:

$$P(Y_t \leq \ln(33/175)) = P(Y_t \leq -1.668) = \Phi\left(\frac{-1.668 - 0.0433}{0.0728}\right) \approx 0.0\%$$

These estimates also imply that (under typical economic conditions in which SVB had remained solvent) it would have been nearly impossible for SVB's total deposits to fall by more than \$52.9 billion, which was its total HQLA as of Q4 2022. Its illiquidity risk is calculated as:

$$P(Y_t \leq \ln(121.1/175)) = P(Y_t \leq -0.360) = \Phi\left(\frac{-0.360 - 0.0433}{0.0728}\right) \approx 0.0\%$$

However, the LCR instead contemplates atypical economic conditions. It aims to ensure that solvent banks have sufficient liquidity to meet a higher-than-usual volume of deposit withdraws. To illustrate such a stress scenario, I consider a quarter with (1) zero trend growth of deposits, and (2) quadruple the historical variance of deposit growth. (These choices are judgmental, but I think are intuitively reasonable.) In this scenario, SVB's illiquidity risk is still less than 1%.

$$P(Y_t \leq \ln(121.1/175)) = P(Y_t \leq -0.360) = \Phi\left(\frac{-0.360}{0.145}\right) \approx 0.7\%$$

Suppose SVB held \$71 billion of HQLA instead of \$52.9 billion, which Feldberg estimates would have given SVB a 100% LCR instead of a 75% LCR. The illiquidity risk falls by 0.6%.

$$P(Y_t \leq \ln(104/175)) - P(Y_t \leq \ln(121.1/175)) \approx -0.6\%$$

The probabilities reflect deposit outflows over an entire quarter. Keep in mind, the LCR was designed to consider withdrawals of these magnitudes over 30 days. The model-implied probabilities over a 30-day periods would be even smaller than the quarterly probabilities.

³² The generalized central limit theorem of Gnedenko and Kolmogorov motivates the normality assumption. Even if the distribution of daily withdrawals has a power tail, the distribution of the sum of daily withdrawals will converge in probability to a stable distribution if daily withdrawals have finite variance. Moreover, if the distribution of daily withdrawals has stability parameter greater than two, then the distribution of converges to a normal distribution.

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