GLOBAL FINANCIAL STABILITY

NOTES

Bank to Sovereign Risk Transmission: New Evidence

Tobias Adrian, Mahvash Qureshi, and Tomohiro Tsuruga

Note/2025/003

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Abstract

This note examines the transmission of credit risk of banks to the sovereign using the collapse of the Silicon Valley Bank in March 2023—an event that reverberated globally across banking sectors—as an exogenous shock to identify the effect. The findings suggest a strong transmission of credit risk from the banking sector to the sovereign in the United States, as well as in other major economies, in the face of adverse shocks to the banking sector. This impact is more pronounced in economies with higher public debt (relative to GDP), greater exposure of the banking sector to domestic sovereign debt, and less well-capitalized banking systems. These results suggest that investors view banking sector stress as particularly economically costly for such countries.

Introduction

Do banks transmit credit risk to the sovereign? This is an important question from the perspective of macrofinancial stability as the financial health of banks and sovereigns remains deeply intertwined across economies (IMF 2022; World Bank 2024).[1] Early literature, mostly in the context of the 2008 global financial crisis and the 2012 euro area sovereign debt crisis, established that banks' credit risk significantly affects the sovereign, raising the risk of an adverse feedback loop in the face of a shock (Alter and Schüler 2012; Acharya, Drechsler, and Schnabl 2014; Leonello 2014; Böhm and Eichler 2020). Recent evidence has, however, been mixed with some studies suggesting that the regulatory reforms enacted after the global financial crisis have enhanced the resilience of banking systems and diminished the risk of spillover.[2] This note revisits the issue and examines whether banks' credit risk can quickly spill over to the sovereign in the post–global financial crisis reform environment, using the sudden collapse of the Silicon Valley Bank (SVB) in March 2023—an event with global repercussions for banking sectors—to determine the effect.

Credit risk of the banking sector can be transmitted to the sovereign through three key channels (Dell'Ariccia and others 2018; IMF 2022). First, through the direct exposure of banks to the sovereign owing to their holdings of government debt. For example, an adverse shock to banks' balance sheets could lead to forced selling of government bonds by banks to meet their liquidity needs, increasing sovereign yields and credit risk. Second, through the safety net provided by the government to banks in the form of implicit and explicit guarantees.[3] Stress in the banking sector may raise the actual or perceived need to activate these guarantees, straining fiscal accounts and increasing sovereign credit risk. Third, through the indirect feedback loop effect between sovereigns and banks resulting from their connectedness with the domestic corporate and household sectors. An adverse shock to the banking sector could disrupt lending to these sectors, undermining economic activity and government finances, and raising sovereign credit risk.

These three channels could also work in reverse such that an increase in credit risk of the sovereign could lead to stress in the banking sector.[4] Moreover, in the face of an adverse shock, these channels could reinforce each other, magnifying the impact of the initial shock and triggering a "doom loop" (Acharya, Drechsler, and Schnabl 2014; Brunnermeier and others 2016; Farhi and Tirole 2018).

While several studies have empirically analyzed the relevance of the doom loop, identifying the direction of risk transmission remains a challenge, given the potential endogeneity embedded in the relationship between sovereign and bank credit risk.[5] In this context, the sudden and rapid collapse of SVB, which fueled concerns about contagion risks and raised credit risk in the broader US banking sector and beyond (Figure 1), provides a rare opportunity to examine the effect of an adverse banking sector shock on

[1] The interconnectedness between banks and the sovereign is commonly referred to as the "sovereign–bank" nexus.

[2] For example, Lamers and others (2024) show that the introduction of the European Union's Bank Recovery and Resolution Directive diminished bank to sovereign risk transmission in several euro area countries. However, Pancotto, Gwilym, and Williams (2019) do not find strong support for this argument. Lamers and others (2022) find that the Bank Recovery and Resolution Directive reduced the association between sovereign and bank credit default swap (CDS) spreads but did not eliminate it. Bellia and others (2019) note that progress has been made in mitigating the possible direct transmission of risks between sovereigns and banks in the euro area through improvements in institutional and regulatory frameworks, but the indirect channel of transmission through the real economy remains largely intact.

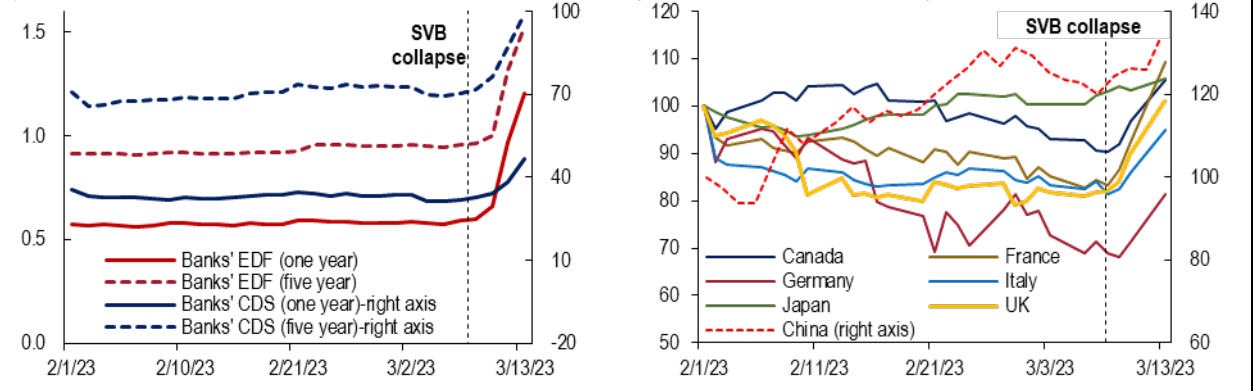
[3] Such guarantees are provided to support banks during episodes of financial stress to reduce systemic risk.

[4] For example, an increase in sovereign default risk could raise sovereign yields, reducing the market value of public debt held by banks and used as collateral to secure financing. This may imply higher funding costs and liquidity strains for banks. An increase in sovereign risk could also reduce the actual or perceived government safety net for banks, affecting their default risk. Finally, it could affect the real sector through, for example, cuts in expenditure and policy uncertainty, raising credit risk for banks.

[5] Studies have addressed the identification problem in analyzing the sovereign–bank nexus using different approaches. See, for example, Alter and Schüler (2012), Acharya, Drechsler, and Schnabl (2014), Böhm and Eichler (2020), and Lamers and others (2024) on the euro area. For the United States, Gori (2023) examines the sovereign to bank risk transmission using the 2011 political standoff over increasing the US debt ceiling to identify the effect.

sovereign credit risk in the post–global financial crisis environment. The collapse of SVB had its roots in inappropriate risk management practices at the bank that implied substantial losses on its securities and insufficient liquidity buffers to handle significant outflows as the US Federal Reserve started to raise interest rates in 2022 to combat inflationary pressures.[6] The event was thus mainly a result of internal risk factors—including credit, market, and liquidity risks—rather than of sovereign credit risk and can serve as an adverse shock to banks' credit risk in the United States, and more generally to banking sector credit risk in other major economies affected by the shock, that was unrelated to sovereign credit risk.

Figure 1. Bank Credit Risk and the SVB Collapse, 2023:M2–M3



Sources: Moody's CreditEdge and authors' calculations.
Notes: Panel 1 shows the asset-weighted average of US banks' one-year and five-year CDS spread and of their EDF computed by Moody's Credit Edge. Panel 2 shows the asset-weighted average of banks' one-year CDS spread for selected countries normalized to 100 on February 1, 2023. The dashed line corresponds to March 8, 2023, to indicate the onset of the SVB's failure. CDS = credit default swap; EDF = expected default frequency; SVB = Silicon Valley Bank.

To examine the transmission of risk from banks to the sovereign using the SVB collapse as our identification strategy, we analyze daily data on credit default swap (CDS) spreads for both sovereigns and banks to measure the change in credit risk during the period 2015–23.[7] Our sample comprises the United States and 31 other major advanced and emerging market economies that are likely to have been affected by the SVB collapse.[8] For the SVB collapse, we consider a short time window of March 9 and 10, 2023, as the event dates, when SVB experienced a severe liquidity crisis that forced it into official receivership. Using this data, we examine bank to sovereign risk transmission during the SVB collapse in the United States, the epicenter of the shock, as well as in other economies through panel estimations.

The findings indicate that changes in the (asset-weighted) average of banks' CDS spreads in the United States are, on average, not significantly associated with changes in the US sovereign CDS spreads over the sample period. However, during the SVB shock, the rise in banking sector credit risk led to a statistically significant increase in the US sovereign credit risk. Specifically, a 10 basis points increase in the (asset-weighed) average of banks' one-year CDS spread implied an increase of 4 basis points in the US sovereign one-year CDS spread. This effect was short-lived due to timely intervention by the US government and the Federal Reserve, which ensured that no direct losses were borne by US taxpayers.

[6] See Federal Reserve Board (2023), OIG (2023), and Gabbi (2023) for a detailed discussion on the factors underlying the collapse of SVB.

[7] CDS spreads reflect the cost of buying protection against the risk of default and are commonly considered in the literature as measures of credit risk of entities. These can increase (decrease) if investors perceive a higher (lower) risk of default, for example, because of economic conditions, financial crises, or adverse news about the financial health of the issuer.

[8] See Annex 1 for the list of countries in the sample and information on data sources and variables.

As stress in the US banking sector spread to other major economies, the rise in their banking sector CDS spreads similarly impacted their respective sovereign CDS spreads. However, economies with higher public debt-to-GDP ratios, greater exposure of banks to domestic sovereign debt, and less well-capitalized banking systems experienced stronger bank to sovereign risk transmission during the SVB episode. This likely reflects investor concerns about the potential implications of a shock to the banking sector on fiscal sustainability, including through possible government support and a slowdown in economic activity.

Our analysis extends the literature on sovereign–bank nexus in several dimensions. First, earlier studies have mostly focused on sovereign–bank credit risk transmission during the global financial crisis and the euro area debt crisis. However, significant changes have occurred in the macrofinancial landscape in the past decade. Notably, public debt and banks' exposure to public debt have increased in many economies, raising the potential of risk transmission between the banking and sovereign sectors. Meanwhile, financial regulatory reforms have also been enacted to various degrees across economies that could weaken the risk transmission.[9] By considering a more recent time period, our analysis provides relevant insights on the balance of risks in this new environment that can inform policymakers on the need for further reforms to mitigate risks.[10] Second, previous studies generally provide evidence on specific countries or country groups (for example, euro area, emerging markets). However, our analysis is conducted in a global setting, allowing for a richer understanding and comparison of cross-country differences in risk transmission. Third, by using the sudden collapse of SVB as an exogenous shock to the banking system, our analysis is explicitly designed to achieve causal identification from banking sector stress to sovereign risk. Finally, the US banking sector is the linchpin of the global financial system. To the best of our knowledge, this is the first study to consider the implications of the SVB collapse for cross-border banking and sovereign sector credit risk. In doing so, it highlights that even moderate shocks to the US banking sector can pose significant global contagion risks. Moreover, these risks could arise even when the direct exposure of foreign banking systems to the failing US institutions is limited.[11]

The rest of the note is structured as follows. Section II presents some stylized facts regarding the sovereign-bank nexus across economies, with a focus on the post-COVID-19 pandemic period. Section III outlines the timeline of the SVB collapse and the resulting global banking turmoil, which informs the identification strategy used in this note. Section IV presents our empirical framework and results. Section V concludes.

Sovereign–Bank Nexus: Some Stylized Facts

The interconnectedness between the banking and sovereign sectors has deepened in many economies, particularly since the COVID-19 pandemic, as banks' exposure to sovereign debt has risen amid a surge in public debt (Figure 2). In the United States, for example, banks' holdings of domestic sovereign debt constituted about 8 percent of their total assets in 2019. This share jumped to 12 percent in 2020–21 as public borrowing increased to finance the fiscal stimulus aimed at cushioning the economic impact of the pandemic. Since then, banks' exposure has declined to about 10 percent in 2023 but remains higher than in most other advanced economies.

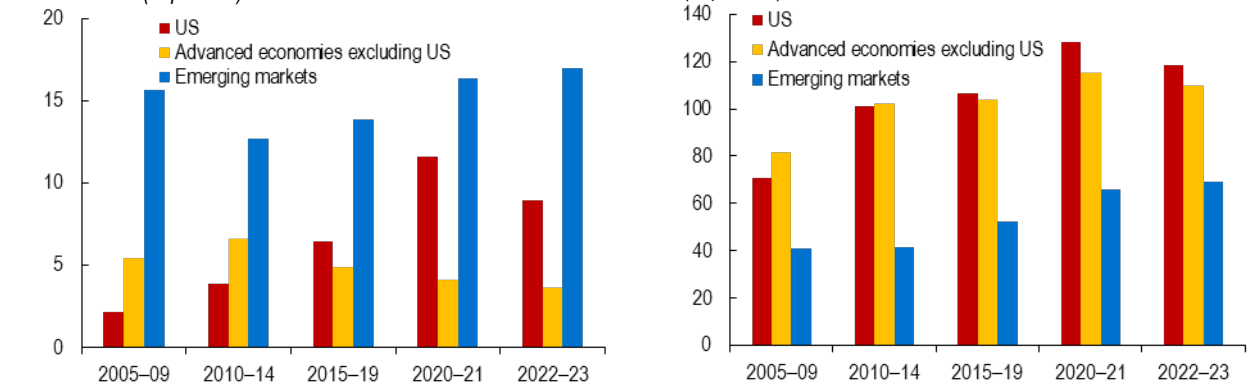
[9] While post–global financial crisis regulatory reforms, particularly those pertaining to strengthening crisis recovery and resolution, could help weaken the link between bank and sovereign risk (Lamers and others 2024), capital and liquidity rules that incentivize banks to hold larger amount of sovereign bonds could potentially strengthen the sovereign–bank nexus.

[10] Deghi and others (2022) explore the sovereign–bank nexus in emerging markets. However, their analysis does not specifically speak to the dynamics in the post-pandemic years, nor do they examine risk transmission from banks to sovereigns.

[11] Our study also complements the literature on SVB's implications for financial markets. Studies in this domain have generally analyzed the impact on domestic and global banks' equity returns (for example, Akhtaruzzaman, Boubaker, and Goodell 2023; Yousaf and Goodell 2023), while we consider the impact on US and global banking sector credit risk.

Among other advanced economies, the exposure of banks to domestic sovereign debt has, on average, fallen over the past decade. However, in some cases, it remains significant including indirectly through loans to nonfinancial corporates backed by government guarantees during the pandemic and the energy crisis after Russia's invasion of Ukraine (Schnabel 2021; European Commission 2024).[12] For emerging markets, banks' exposure to domestic sovereign debt was on an increasing trend even before the pandemic, but there has been a pronounced increase since then (Figure 2). Though the average share of domestic sovereign debt in emerging market bank assets stood at about 17 percent in 2023, it is more than 20 percent in several emerging markets (IMF 2022).[13]

Figure 2. Banks' Exposure to Domestic Sovereign Debt and Public Debt across Economies, 2005–23



Sources: IMF Monetary and Financial Statistics; IMF World Economic Outlook; and authors' calculations.
Notes: Panel 1 presents the share of banks' holdings of domestic sovereign debt in total assets across economies. Panel 2 presents the public debt-to-GDP ratio across economies. For country groups, advanced economies exclude the United States. Values are Purchasing Power Parity (PPP)-GDP weighted averages across economies. See Table 1.1 in the Annex 1 for further information on the sample and data sources.

The growing interconnectedness between the balance sheets of banks and sovereigns is also reflected in the correlation of their CDS spreads, which has more than doubled for the United States and emerging markets since the pandemic (Figure 3, panel 1). A similar trend is discernible when looking at an alternative measure of bank and sovereign credit risk, known as the CDS-implied expected default frequency (EDF) that is derived from CDS spreads to capture the actual probability of default.[14] The correlation between banks' and sovereign CDS-implied EDF has also increased significantly since the pandemic in both the United States and emerging markets (Figure 3, panel 2). Overall, the correlation between bank and sovereign credit risk tends to be stronger around episodes of elevated financial market stress, proxied by the Chicago Board Options Exchange Volatility Index (VIX), such as at the onset of the pandemic, and the Federal Reserve's switch to monetary policy tightening in the first half of 2022 (Figure 3, panel 3).

These observations suggest a strong co-movement of banking and sovereign sector credit risk across economies, especially in the post-pandemic environment. However, these statistics represent

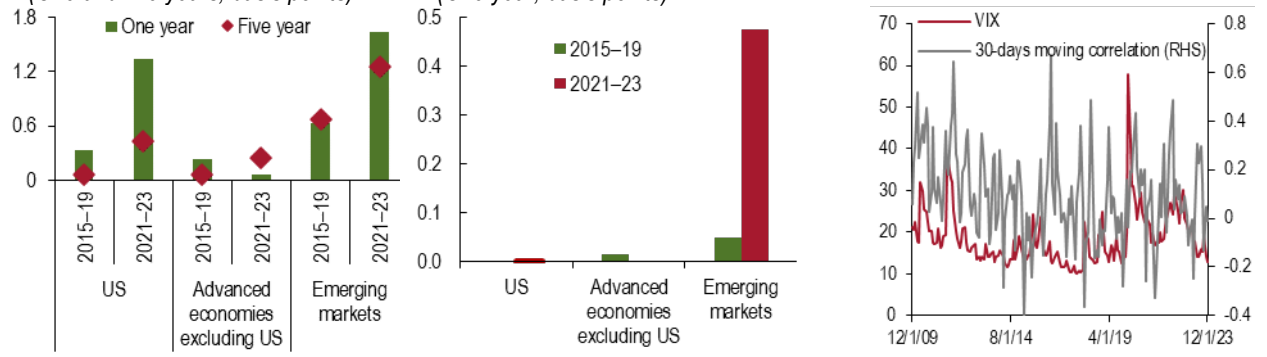
[12] For the euro area, Bechtel et al. (2021) and Charnay et al. (2023) note that quantitative easing by the European Central Bank has reduced the sovereign-bank nexus.

[13] World Bank (2024) notes that across emerging market and developing economies, banks' exposure to sovereign debt is greater in countries facing public debt distress and less well-capitalized banking systems.

[14] CDS spreads are commonly used as a measure of credit worthiness for sovereigns and corporations. While CDS spreads reflect the probability of default, the risk premium, and the expected loss given default, the CDS-implied expected default frequency (EDF) (computed by Moody's CreditEdge) is an adjusted measure to reflect the physical probability of default for an entity at a given point of time.

unconditional correlations, and in what follows, we undertake a more formal analysis to identify the impact of banking sector risk on sovereign risk.

Figure 3. Correlation between Bank and Sovereign Credit Risk, 2015–23



Sources: Chicago Board Options Exchange; Moody's CreditEdge; and IMF staff calculations.
Note: Panels 1 and 2 show the coefficients obtained from a simple linear regression of one-year (five-year) sovereign CDS spread on one-year (five-year) asset-weighted banks' CDS spread. All coefficients are statistically significant at conventional levels. Panel 3 shows the 30-day rolling correlation between banks' and sovereign one-year CDS spreads in the United States and the VIX. AEs = advanced economies; AEs ex US = advanced economies excluding the United States; CDS = credit default swap; EMs = emerging markets; VIX = Chicago Board Options Exchange Volatility Index.

The Collapse of Silicon Valley Bank and Banking Sector Turmoil: A Snapshot

The US banking sector experienced significant stress in March 2023 because of the swift unraveling of SVB, the 16th largest bank in the country. SVB's collapse marked the second-largest US bank failure by dollar amount, following Washington Mutual's demise during the global financial crisis. However, it was the fastest bank collapse in US history, occurring in less than 48 hours (Rose 2023).[15]

The Unraveling of Silicon Valley Bank

The collapse of SVB was largely unpredicted.[16] It was a major financier of the venture capital and start-up sectors in the United States and held $209 billion in assets and $173 billion in deposits at the end of 2022. More than half of SVB's assets were government- and agency-issued mortgage-backed securities. On the depositor side, venture capital and start-up firms comprised more than half of SVB's deposits. As these firms thrived during the exceptionally low-interest rate environment of the pandemic, SVB's balance sheet grew substantially.[17] However, when the US Federal Reserve started to tighten monetary policy in 2022 and raised interest rates aggressively to combat inflationary pressures, venture capital activity declined sharply amid higher rates and diminished capital availability. This led to slower deposit inflows into SVB, while outflows increased as clients withdrew cash to finance their business operations. The asset side of the balance sheet was also significantly impacted by higher interest rates, which led to a

[15] Several studies have noted the role played by digital banking and the rapid dissemination of information through social media in influencing the speed of the depositor run on SVB (Cookson and others 2023; Rose 2023; Adrian and others 2024).

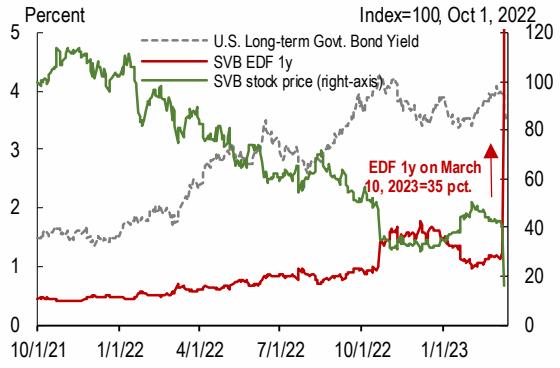
[16] See FRB (2023) and OIG (2023) for a detailed discussion on the key factors underlying the collapse of SVB and Adrian and others (2024) for a broader discussion of the March 2023 US banking sector turmoil.

[17] Since its inception in 1983, SVB grew steadily, with its assets increasing from about $18 million to $71 billion by 2019. However, between the end of 2019 and 2021, SVB's assets grew by about 200 percent, compared to 27 percent for the US banking industry (FRB 2023).

rapid increase in unrealized losses on SVB's substantial held-to-maturity and available-for-sale security portfolios.

The unrealized losses faced by SVB because of higher interest rates on its held-to-maturity portfolio, amounting to $15.2 billion by the end of 2022, were publicly known and disclosed in SVB's financial statements. While SVB's stock performance began to deteriorate in early 2022 as interest rates increased, its one-year EDF edged up only slightly until October 2022 (Figure 4).[18] On October 21, 2022, SVB's stock price sharply fell by about 24 percent following weaker-than-expected third-quarter earnings per share, causing the one-year EDF to increase by approximately 0.4 percentage points. However, its stock price and EDF stabilized soon afterward.[19]

Figure 4. US Interest Rate and SVB EDF and Stock Price, 2021:M10–2023:M3



Sources: Bloomberg LP, Moody's CreditEdge, and Refinitiv Eikon Datastream.
Note: EDF 1y=One-year Expected Default Frequency; SVB=Silicon Valley Bank.

As interest rates rose again in early 2023, SVB's balance sheet faced increasing pressure.[20] To strengthen its balance sheet, SVB sold a substantial part of its available-for-sale securities portfolio, amounting to $21 billion, on March 8, 2023. It incurred a loss of $1.8 billion on this sale and announced its intention to raise $2 billion in capital to plug the hole.[21] However, the move unnerved its depositor and investor base and led to a wave of deposit withdrawals that intensified on March 9, 2023, as SVB's stock price plunged. In response to the withdrawals, the then Chief Executive Officer of SVB, Gregory Becker, reportedly held a video conference call with some investors on March 9, 2023, during which he urged them not to panic (Miller, Tan, and McBride 2023; Moynihan 2023). The call, however, failed to assuage investors' concerns, and some venture capitalists advised their portfolio companies to withdraw their deposits from SVB. Due to large outflows, insufficient liquidity and a significant decline in its stock price, SVB's public offering scheduled for the same day was derailed and it failed to restructure its balance sheet. By the end of that day, SVB's deposit withdrawals totaled about $42 billion—almost one-fourth of its total deposit base and 300 percent of its capital—and its stock price dropped by 60 percent (Office of Inspector General 2023).[22] The deposit outflow requests continued to accumulate, and SVB's management expected $100 billion more the next day. As SVB was unable to fulfill these additional withdrawal requests, the California Department of Financial Protection and Innovation took possession of SVB and appointed the Federal Deposit Insurance Corporation (FDIC) as receiver on March 10, 2023.

[18] On August 17, 2022, SVB received a "satisfactory" CAMELS rating on liquidity, capital, and sensitivity to market risk (SVBFG and SVB 2021 Supervisory Ratings Letter, August 17, 2022).

[19] As US interest rates started to increase in 2022, SVB's stock performance started to diverge significantly from the broader stock market (Annex Figure 1.2).

[20] While SVB's stock price increased by about 16 percent and one-year EDF fell by 0.3 percentage points in the run-up to the collapse (between March 7, 2022, and the end of December 2022), the credit rating agency, Moody's, warned SVB of a potential rating downgrade in February 2023 (Kang and others 2024).

[21] SVB planned to raise $2.25 billion through $1.25 billion in public offering of common shares, $0.5 billion in offering of mandatory convertible preferred stock, and $0.5 billion in private offering to its long-standing client, General Atlantic, which was to be executed at the same price as the public offering of the common shares (Silicon Valley Bank 2023).

[22] The credit rating agencies, Moody's and S&P, downgraded SVB's credit rating on March 8 and 9, 2023, respectively.

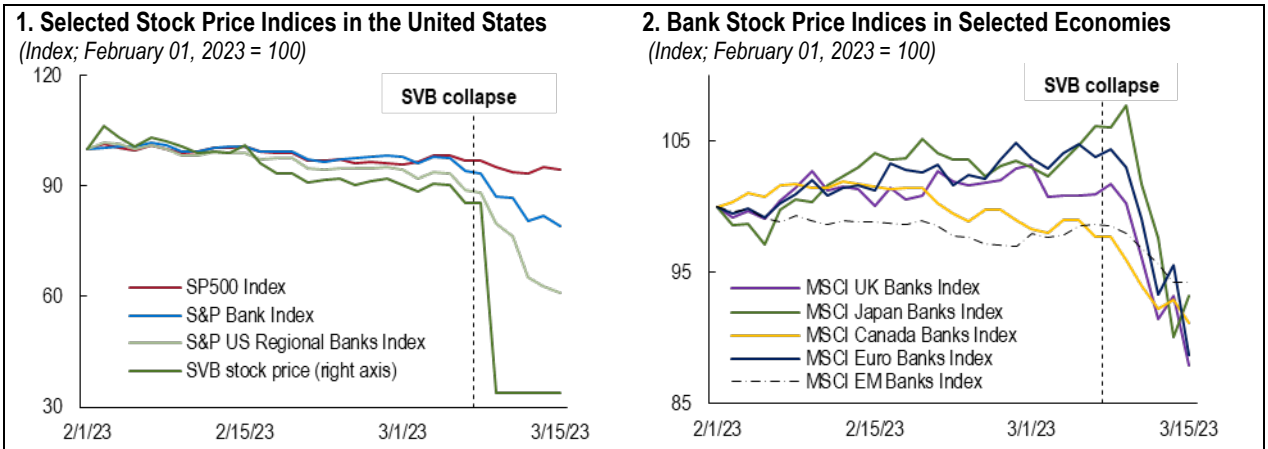
The Aftermath

The sudden and rapid collapse of SVB shook the confidence of investors and depositors across the banking system in the United States, increasing risk aversion and triggering financial market volatility. Deposit outflows picked up pace from other regional and mid-sized banks in the United States, particularly from those that were similar in structure and customer base to SVB (such as those with a greater asset-liability duration mismatch, higher exposure to tech and start-up sectors, and higher share of uninsured deposits; Adrian and others 2024). This led to acute liquidity stress at another regional, mid-sized bank, called Signature Bank, which collapsed on March 12, 2023.

During the banking turmoil on March 9 and 10, 2023, US banking sector credit risk, measured by the asset-weighted average of banks' short-term (one-year) and long-term (five-year) CDS spreads, increased by 5.4 basis points and 15 basis points, respectively. In addition, banks' EDF increased by 0.4 percentage points (Figure 1, panel 1).[23] The Standard and Poors (S&P) 500 index dropped by a cumulative 3 percent, while the US banks and regional banks stock indices fell by 7 and 13 percent, respectively (Figure 5, panel 1).[24]

The impact of SVB's downfall reverberated globally. Stock prices, particularly, of banks, fell sharply in major economies (Figure 5, panel 2), while banking sector credit risk increased (Figure 1, panel 2). This occurred even though the direct exposure of many international banks to SVB was limited, highlighting that in an interconnected financial system, stress can spread quickly through multiple channels.[25]

Figure 5. Banks' Stock Prices and the SVB Collapse, 2023:M2–M3



Sources: Morgan Stanley Capital International; Refinitiv Eikon DataStream; S&P; and authors' calculations.
Note: The dashed line crosses *x*-axis on March 8, 2023, at the onset of the SVB collapse. MSCI = Morgan Stanley Capital International; S&P = Standard and Poors; SVB = Silicon Valley Bank.

Notably, while the banking turmoil evolved and banks' credit risk jumped, the cost of purchasing protection against the credit risk of the US government and some other sovereigns also increased (Figure 6). For example, the spread on US sovereign one-year CDS increased by about 10 basis points during

[23] While the US banking sector in aggregate faced ballooning unrealized and realized losses on its securities holdings as interest rates increased in 2022, which was flagged by the Federal Deposit Insurance Corporation in its quarterly reports (for example, Gruenberg 2022, 2023), banks' CDS spreads remained fairly stable up until the collapse of SVB (Figure 1, panel 1; Annex Figure 1.3).

[24] The four largest US banks—JPMorgan Chase, Bank of America, Wells Fargo, and Citigroup—together lost about $44.5 billion in market value between March 8 and 10, 2023.

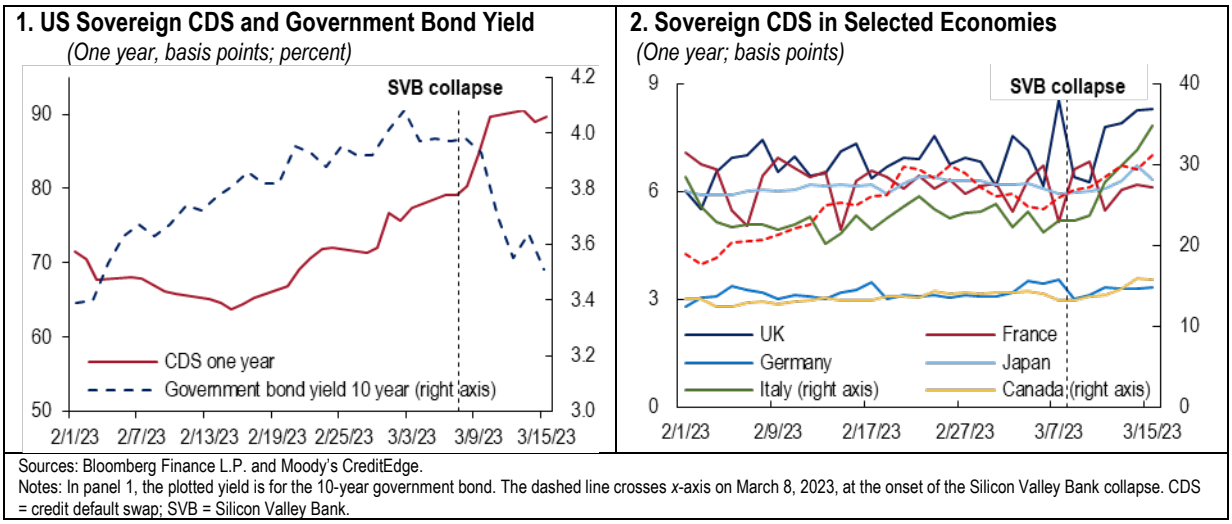
[25] See, for example, Gunning (2023) and Akhtaruzzaman, Boubaker, and Goodell (2023), for the cross-border spillover effects of the SVB collapse on financial markets.

March 9 and 10, 2023. This occurred in the context of falling yields on US Treasuries, as increased investor risk aversion implied a flight to quality, raising the demand for US Treasuries.[26]

As sentiment in financial markets deteriorated and risk of contagion increased, the US authorities stepped in with a forceful response to preserve financial stability. On March 12, 2023, the Federal Deposit Insurance Corporation announced that all deposits of SVB (as well as of Signature Bank) were to be fully protected, while the Federal Reserve initiated an emergency funding program, allowing banks to borrow funds using high-quality securities as collateral at their full-face value.[27] Concurrently, the government also announced that any losses to the Deposit Insurance Fund to support uninsured depositors were to be recovered by a special assessment on banks, and no losses in the resolution of the banks were to be borne by taxpayers. These actions helped to alleviate investors' concerns about systemic risk and possibly also about a government bailout. Although some parts of the banking sector remained under significant pressure in the following days,[28] the broader US stock market recovered soon after (Figure 5, panel 1), while the US sovereign CDS spread and the CDS-implied EDF declined (Annex Figure 1.1).

In sum, the unraveling of SVB—a remarkable event because of its unprecedented speed and magnitude—was largely unforeseen, despite mounting unrealized losses on its securities portfolio and weak profitability during 2022. It was a direct consequence of the bank's imprudent risk management practices and lapses in supervision, resulting in inadequate risk management oversight. The event was unrelated to a change in US sovereign credit risk; instead, it was triggered by bank-specific developments.[29] However, the event provides a source of variation in the default risk of the banking sector in the United States, as well as in other major economies, which can be used to determine the causal effect of bank credit risk on sovereign credit risk.

Figure 6. Sovereign Credit Risk in the United States and Selected Economies, 2023:M2–M3



Sources: Bloomberg Finance L.P. and Moody's CreditEdge.
Notes: In panel 1, the plotted yield is for the 10-year government bond. The dashed line crosses *x*-axis on March 8, 2023, at the onset of the Silicon Valley Bank collapse. CDS = credit default swap; SVB = Silicon Valley Bank.

[26] The decline in long-term US government bond yields may be partly attributed to a reassessment of the monetary policy path, because of lower expectations of future policy rates in the US after the SVB collapse. The increase in the US sovereign CDS spread prior to the SVB collapse took place against a backdrop of the US debt ceiling crisis and rising US government bond yields.

[27] Source: Joint Statement by Treasury, Federal Reserve, and FDIC, March 12, 2023.

[28] Concerns regarding the banking sector persisted for several weeks. Besides SVB and the Signature Bank, First Republic Bank's assets in the United States were also seized and sold to a major bank in May 2023. In Europe, Credit Suisse faced severe financial difficulties and was acquired by UBS Group AG on March 19, 2023.

[29] This assertion is further supported by the correlation between the short-term EDF of the US banking sector (asset-weighted average) and the short-term CDS-implied EDF of the US sovereign, which is small and statistically not significant for the period preceding the SVB's collapse when interest rates increased (that is, from early 2022 to March 07, 2023, or from early 2023 to March 07, 2023).

Empirical Framework and Results

To examine the impact of bank credit risk on the sovereign using the SVB collapse to identify the effect, we estimate the following regression model:

$$\Delta \text{CDS}_{i,t}^{\text{SOV}} = \vartheta \Delta \text{CDS}_{i,t-1}^{\text{SOV}} + \beta \Delta \text{CDS}_{i,t}^{\text{BANK}} + \gamma \text{SVB}_t + \eta \Delta \text{CDS}_{i,t}^{\text{BANK}} \times \text{SVB}_t + \sum_k \rho_k Z_{ik,t} + \sum_l \mu_l G_{l,t} + \alpha_i + e_{it} \quad (1)$$

where $\Delta \text{CDS}_{i,t}^{\text{SOV}}$ is the first difference of the daily sovereign CDS spread for country *i* at time *t*, and $\Delta \text{CDS}_{i,t}^{\text{BANK}}$ is the first difference of the (asset-weighted) average of banks' daily CDS spreads in country *i* at time *t*.[30] SVB is a dummy variable, which takes the value of one for the dates of March 9 and 10, 2023, when the collapse of SVB unfolded, and zero otherwise.

To identify the shock to banks' CDS spreads that is unrelated to sovereign risk, we consider the change in banks' CDS spreads during the SVB collapse by including an interaction term between the change in banks' CDS spreads and the SVB dummy variable.[31] A positive and statistically significant coefficient on this term would indicate increased risk transmission from banks to the sovereign during the SVB banking turmoil. Z_k indicates other country-specific variables that could influence the sovereign CDS spread such as daily changes in government bond yields, stock returns, and public debt-to-GDP ratio. To control for macroeconomic factors that may affect sovereign CDS spreads at a lower frequency (such as economic growth, inflation), Z_k includes country–month–year interaction effects.[32] *G* reflects global variables to capture the effect of common shocks (such as daily changes in financial uncertainty proxied by the VIX index).[33] α_i denotes country fixed effects to control for possible time-invariant country-specific (structural) characteristics that may influence sovereign default risk, and *e* is the error term.

We estimate equation 1 separately for the United States ($i \in$ United States), the epicenter of the shock, and for a panel of major advanced and emerging market economies (excluding the United States, $i \notin$ United States), whose banking sector likely experienced adverse spillovers from the SVB collapse. The estimations use daily data on CDS spreads for the period January 2015 to December 2023.[34] The standard errors are heteroscedasticity adjusted when equation 1 is estimated for the United States and are clustered at the country and date levels in the panel estimations.

Bank and Sovereign Credit Risk: United States

The estimation results for equation 1 when considering US data show that, on average, there is no strong relationship between banks' and sovereign short-term (one-year) CDS spreads over our sample period (Annex Table 2.1). However, the change in banking sector CDS spread has a statistically significant

[30] See Annex 1 for detailed information on the sample and data sources.

[31] Other approaches that have been implemented to identify spillover of credit risk from banks to sovereigns include considering bank stock prices as instruments (Böhm and Eichler 2020), using bank and sovereign credit ratings (Hu and others 2020), and banks earnings announcements (Lamers and others 2024). Considering a short-time window (of two days) for the SVB collapse helps to address potential simultaneity concerns between bank and sovereign credit risk transmission by isolating the effect of the former on the latter.

[32] When estimated only with the US data, month–year interaction effects are included to control for domestic and global macroeconomic developments at a lower frequency.

[33] For robustness, we also consider a panel specification with date-specific effects to capture common factors across countries more generally. The presence of daily fixed effects can, however, absorb all day-specific variations, making it complicated to interpret the impact of other explanatory variables. It can also reduce the degrees of freedom, potentially leading to overfitting.

[34] To confirm that banks' CDS spreads in these economies respond to credit risk in the US banking sector, we estimate a model of daily change in (asset-weighted) banks' CDS spreads in these economies on the lagged dependent variable, change in the US (asset-weighted) banks' CDS spread, the VIX Index, long-term government bond yields, country fixed effects, and month-year effects to capture time-variant common factors. The results show a strong association between bank credit risk in the United States and other major economies.

effect on the sovereign CDS spread in times of banking sector distress (proxied by the SVB collapse).[35] Specifically, a 10 basis point increase in the (asset-weighted) average of banks' one-year CDS spreads implies an increase of about 4.5 basis points in the US sovereign one-year CDS spread (Annex Table 2.1, columns 1–3). The dummy variable for the SVB collapse is also positive and statistically significant, suggesting that the short-term sovereign default risk was about 3 basis points higher during March 9 and 10, 2023, than otherwise, possibly because of factors other than the rise in banking sector credit risk.[36]

These results are robust to including other variables such as the daily change in government bond yields, stock market (S&P 500) return, and change in implied financial market volatility (proxied by the VIX), while controlling for time effects (month–year interaction) to capture the impact of other macroeconomic variables (such as economic growth and inflation).[37] They are also robust to restricting the sample to a shorter time period of post-pandemic years (column 4), as well as to covering a longer sample period from 2010 to 2023 (column 5).[38]

Furthermore, looking at the change in the long-term (five-year) CDS spreads instead of the short-term (one-year) spreads, the results show, on average, a strong positive association between changes in the banking sector and sovereign CDS spreads, which was more pronounced during the SVB collapse (Annex Table 2.1, column 6). The impact of an increase in long-term bank credit risk on sovereign credit risk during the SVB collapse is, however, quantitatively smaller than for short-term credit risk. That is, a 10 basis points increase in banks' five-year CDS spread raises the sovereign five-year CDS spread by about 1 basis point. This result is intuitive as short-term sovereign CDS spreads are likely to be more sensitive to immediate financial conditions and market perceptions of risk. Increased credit risk for banks can swiftly affect the sovereign's short-term borrowing costs and creditworthiness, raising short-term CDS spreads (Augustin 2018).[39]

The strong transmission from banks' credit risk to the sovereign holds when considering the one-year CDS-implied EDF (Annex Table 2.1, column 7). The results show that a 5 percentage points increase in US banks' probability of default in the face of an adverse shock raises the sovereign default probability by 0.1 percentage point. The results are also robust to restricting the sample period to the post-pandemic years (January 2021 to December 2023), as well as to alternative dates of the SVB collapse (for example, considering March 9 or 10, 2023, as dates for the SVB collapse, rather than taking both as in the baseline specification).

These findings suggest that an adverse shock to the US banking sector could quickly spill over to the sovereign, raising the risk of a doom loop. In terms of the channels through which the US banking sector credit risk possibly affected the sovereign during the SVB collapse, the main mechanism appears to be investors' perceived government support for banks (that is, the "safety net" channel). This is supported by two key observations. First, as mentioned earlier, the SVB collapse implied a lowering of yields on US long-term Treasuries (Figure 6, panel 1). Thus, there is no strong evidence of fire sales of government bonds by banks (through the exposure channel) raising sovereign credit risk. Second, and importantly, soon after the US government announced on March 12, 2023, that there would be no public bailout for

[35] The US CDS spread during the SVB collapse may have been impacted by a change in market liquidity. However, the risk-adjusted bid-ask spread of US CDS spread (that is, bid-ask price to 30-day standard deviation of the premium) during the SVB episode was at most 2.6 basis points, well below the average of 10.6 basis points during 2020–2023.

[36] The other factors could include an increase in macroeconomic uncertainty and increased risk aversion resulting from the SVB collapse, leading to a higher sovereign default risk.

[37] The effect of any fiscal news, including that related to the 2023 US debt ceiling debate, on the US sovereign CDS spread is likely to be captured by the inclusion of the long-term government bond yield. .

[38] In addition, the results are robust including measures of stock market volatility and geopolitical risk (Caldara and Iacoviello 2022).

[39] By contrast, long-term CDS spreads tend to be influenced by broader economic fundamentals and long-term expectations, which may not react as sharply to short-term fluctuations in bank risk.

the collapsed SVB and Signature Bank, the short-term US sovereign CDS spread declined and the strong link between the change in banks' and the sovereign CDS spread weakened (Annex Figure 1.1; Annex Table 2.2).[40] This observation suggests that the no bailout announcement muted investors' expectations regarding the direct impact of the banking turmoil on the sovereign balance sheet, disconnecting the transmission of risk from banks to the sovereign and lowering the latter's credit risk in the immediate aftermath of the announcement.[41]

These findings support earlier literature on the transmission of bank risk to the sovereign through the safety net channel (for example, Acharya, Drechsler, and Schnabl 2014). In addition, they show that such transmission may occur even when bailouts or support have not been formally announced or conferred by the government.

Bank and Sovereign Credit Risk: Panel Estimation

Next, we assess bank to sovereign risk transmission in other major advanced and emerging market economies. Similar to the US, banking systems in many countries have significant sovereign exposure. This likely heightened investor awareness of risks during the SVB collapse, potentially causing a widening of their sovereign CDS spreads as banking sector CDS spreads rose (Figures 1 and 6).[42] Taking advantage of the exogeneity of the SVB collapse for banking systems across countries, we use the event to formally analyze the effect of the rise in baking sector credit risk to the sovereign for our sample of major economies, excluding the United States.

The results are similar to those obtained for the United States and show that, on average, a change in banking sector credit risk is not significantly associated with changes in sovereign credit risk during the sample period (Annex Table 2.3, columns 1 and 2). Nevertheless, in the face of an adverse shock to banking sector risk such as during the SVB collapse, the transmission of default risk from banks to the sovereign is strong and statistically significant. For example, a 10 basis points increase in banks' CDS spread implied, on average, an increase in sovereign CDS spread by about 3.5 basis points in our sample of countries during the SVB collapse

Notably, the effect of banking sector risk on the sovereign appears to increase with the level of public debt-to-GDP ratio. Specifically, it is about three times larger for countries with public debt-to-GDP ratios above the sample median than the baseline effect (Annex Table 2.3, column 3).[43] These results are largely robust to alternate specifications such as when date-specific time effects are included in the model (Annex Table 2.3, columns 4 and 5), as well as when the model is estimated over a longer period of 2010–23 (Annex Table 2.3, columns 6 and 7).

Looking across subsamples of advanced and emerging market economies, the transmission of banks' credit risk to sovereigns appears to be stronger, on average, in emerging markets compared to advanced economies (Annex Table 2.4, columns 1 and 3). This may be due to a relatively lower degree of crisis preparedness including the scope and speed of deposit insurance coverage, and effective recovery and

[40] No public bailout does not necessarily imply that there are no fiscal implications. The sovereign may still be exposed to banking sector risk through the public liquidity backstop provided to the central bank for emergency liquidity assistance (or the Fed's discount window in the US).

[41] The no public bailout announcement was made jointly with the Federal Reserve's announcement of an emergency funding program to provide liquidity to banks. While the latter announcement may have alleviated concerns about the indirect effect of banks credit risk on the sovereign through the real economy by ensuring banking sector stability, it is worth noting that the (asset-weighted) banking sector one-year CDS spreads and banking sector stock prices continued to face pressure for several days even after the announcement, suggesting that the effects of this channel in reducing sovereign credit risk may be small at best.

[42] Banks' CDS spreads in other countries may also have, at least, partly risen during the SVB collapse because of their direct exposure to the US banking, concerns about potential tightening of global financial conditions, and a generally weaker investor risk appetite amidst higher uncertainty.

[43] The median public debt-to-GDP ratio in the sample is 67 percent. Considering the 75th percentile as a threshold for high level of public debt-to-GDP, the transmission of banks' credit risk to the sovereign is four times as large as the baseline effect.

resolution frameworks in these economies. However, the transmission is statistically and quantitatively significant in advanced economies with high public debt-to-GDP ratios—those with public debt levels above the sample median—suggesting that such economies may be perceived as having less fiscal room to absorb stress in the banking sector (Annex Table 2.4, column 2).[44]

The impact of banks' credit risk on the sovereign also appears to be conditional on the level of banking sector vulnerabilities. On average, countries where banks hold a higher share of domestic sovereign debt in total assets (above the sample median) experience significantly stronger risk transmission compared to those with a lower share (Annex Table 2.5, columns 1 and 2). Conversely, countries with less well-capitalized banking systems (Tier 1 capital to assets ratio that is below median) experience a much stronger transmission of credit risk from banks to the sovereign (Annex Table 2.5, columns 3 and 4). These findings suggest that investors view greater exposure of banks to domestic sovereign debt and weaker bank capital adequacy ratios as vulnerabilities that can increase the fiscal burden during adverse shocks to the banking sector.

Conclusion

This note examines the transmission of credit risk from banks to the sovereign using the global banking sector turmoil triggered by the failure of the SVB in March 2023 as an exogenous shock to identify the impact. The findings show that an adverse shock to the banking sector could have a statistically and quantitatively significant effect on sovereign credit risk in the United States and in other major economies. In addition, the impact is likely to be more pronounced in economies with high public debt (relative to GDP) and banks' domestic sovereign debt exposure, and less well-capitalized banking systems. These findings have important policy implications and suggest that while banking systems may have generally become more resilient over the past decade, and crisis management frameworks have improved, the threat of risk transmission from banks to the sovereign triggering a doom loop remains material across many economies.

To strengthen resilience, policymakers need to act on three fronts. First, supervisory and crisis management frameworks need to be further strengthened. The failure of SVB was a direct result of inadequate risk management practices at the institution, reinforcing the importance of proactive supervision and early intervention to maintain banking sector stability.[45] Supervisory and resolution authorities should ensure sufficient recovery and resolution planning to swiftly tackle failing banks and avoid a systemic financial crisis without putting undue strain on government finances. Deposit insurance regimes also need to be strengthened to maintain depositor confidence, particularly considering the much faster speed with which deposit withdrawals can occur owing to new technology. Second, policymakers should aim to contain fiscal vulnerabilities and build buffers. In the face of an adverse shock, countries with stronger fiscal positions may be perceived as being better placed to absorb the shock, which can prevent a doom loop. Third, efforts should be undertaken to reduce the interdependency between banks and sovereigns in cases where banks' asset portfolios are heavily tilted toward domestic sovereign debt. While government securities serve as quintessential high quality liquid assets that banks utilize for refinancing in many countries, concentration risks should be adequately monitored, and consideration could be given to introducing capital surcharges on bank holdings of domestic sovereign bonds above certain thresholds (IMF 2022).

[44] For emerging markets, the number of countries with public debt-to-GDP ratio exceeding 67 percent is rather limited in the sample. Deghi et al. (2022) find that the transmission of sovereign risk to banks tends to be stronger at high public debt-to-GDP ratios. Thus, high levels of public debt are a key financial fragility, which significantly raise the risk of a doom loop in the face of an adverse shock to the banking or sovereign sector.

[45] See Adrian and others (2023, 2024) and Adrian and Dobler (2024) for a detailed discussion of the vulnerabilities in the US banking sector highlighted by the March 2023 turmoil and the warranted policy actions to further strengthen the resilience of banking systems globally.

Annex 1. Data and Additional Stylized Facts

Annex Table 1.1. List of Countries in the Sample

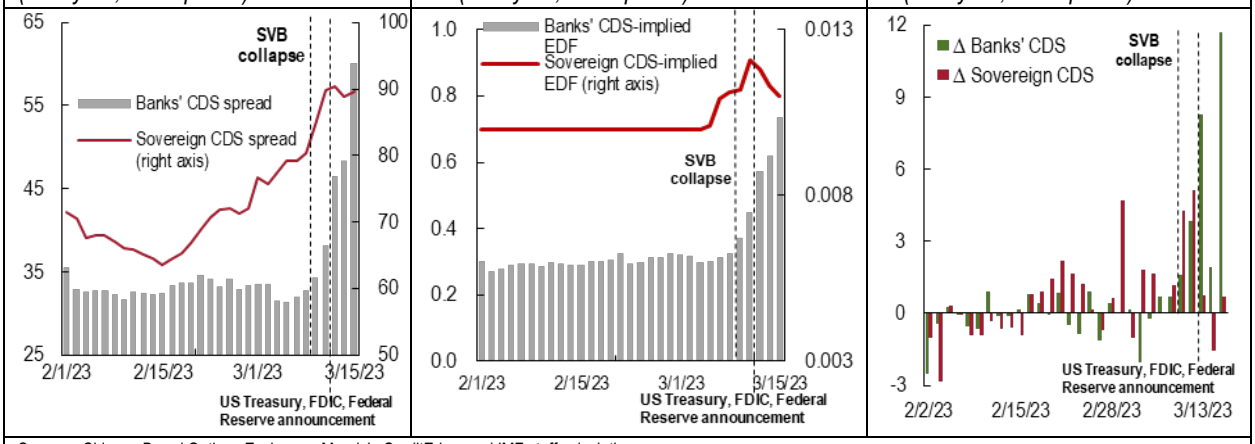
Australia	Denmark	Italy	Singapore
Austria	Finland	Japan	Spain
Belgium	France	Korea, Rep. of	Sweden
Brazil	Germany	Malaysia	Switzerland
Canada	Greece	Netherlands	Thailand
Chile	India	Norway	Türkiye
China	Indonesia	Philippines	United Kingdom
Colombia	Ireland	Portugal	United States

Annex Table 1.2. Data Description and Sources

Variable	Description	Source
Financial Variables (Bank Level)		
Banks' exposure to domestic sovereign bond	Banks' domestic sovereign bond holdings	IMF, Monetary and Financial Statistics
Banks' total assets	Banks' total assets.	IMF, Monetary and Financial Statistics
Banks' CDS spread	CDS spread (basis points) for banks is the cost of protection against the default of a bank's debt over a period (one and five years)	Moody's CreditEdge
Banks' CDS-implied EDF	CDS-implied EDF measures are physical default probabilities derived from CDS spreads for banks over a time period (one and five years)	Moody's CreditEdge
Banks' EDF	EDF is defined as the probability that a firm will default within a specified time horizon (one and five years)	Moody's CreditEdge
MSCI Bank Index	The MSCI Bank Index is a stock market index that tracks the performance of large and mid-cap stocks in the banking sector across various developed markets	Morgan Stanley Capital International, Refinitiv Eikon DataStream
S&P 500 Banks Index	The S&P 500 Banks Index measures the performance of banks in S&P 500	Standard and Poors (S&P), Refinitiv Eikon DataStream
S&P Regional Banks Index	The S&P Regional Banks Select Industry Index represents the regional banks segment of the S&P Total Market Index	Standard and Poors (S&P), Refinitiv Eikon DataStream
Macroeconomic and Financial Variables [Country-Level]		
Banks' capital adequacy ratio	Tier 1 capital to total assets	IMF, Financial Soundness Indicators
Credit-to-GDP ratio	Total credit to nonfinancial private sector divided by GDP	Bank for International Settlement
Current account to GDP	Annualized quarterly current account divided by GDP	IMF, World Economic Outlook
Federal Fund Futures Rate for 30 days (3-month)	Futures of 30 days average Federal Fund starting with a 3-month contract period	Haver Analytics
Government bond yield	Benchmark 10-year government bond yield	Bloomberg Finance L.P.
Headline inflation rate	Monthly growth of CPI compared to 12 months ago	Bank for International Settlement
Policy rate	A policy rate is a short-term interest rate set by a central bank.	Bank for International Settlement and Haver Analytics
Public debt-to-GDP ratio	General government debt-to-GDP ratio	IMF, World Economic Outlook
Real GDP Growth	Annualized growth of quarterly GDP	IMF
Sovereign CDS spread	Sovereign CDS spread is a financial derivative that provides protection against the default of a sovereign government or authority over a period (one and five years)	Moody's CreditEdge
Sovereign CDS-implied EDF	CDS-implied EDF measures are physical default probabilities derived from CDS spreads for sovereigns over a period (one and five years)	Moody's CreditEdge
Stock market return	Stock market index is the composite of a selected group of stocks in various economies; return is computed as percent daily change	Refinitiv Eikon DataStream and authors' calculations.
S&P 500	The S&P 500 Index is a market-capitalization-weighted index that tracks the stock performance of 500 of the largest publicly traded companies in the United States	Standard and Poors (S&P), Refinitiv Eikon DataStream
VIX	The VIX is a measure of the stock market's expectation of volatility based on S&P 500 index options	Chicago Board Options Exchange

Note: CDS = credit default swap; CPI = consumption Price Index; EDF = expected default frequency; VIX = Chicago Board Options Exchange Volatility Index.

Annex Figure 1.1. Bank and Sovereign Credit Risk in the United States around SVB Collapse, 2023:M2–M3

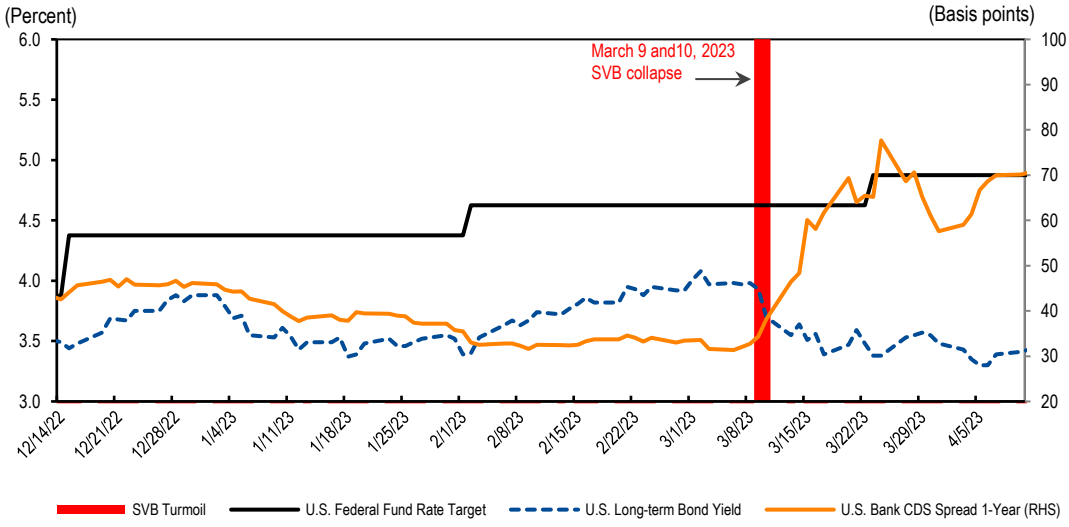


Sources: Chicago Board Options Exchange; Moody's CreditEdge; and IMF staff calculations.
Note: Panels 1 and 2 show the US one-year sovereign and asset-weighted average of banks' CDS (CDS-implied EDF). Panel 3 shows the daily change in one-year sovereign and banks' CDS spread. The dashed lines are drawn between March 8 and 9, 2023, to indicate the onset of the SVB collapse, and between March 10 and 13, 2023, to indicate the announcement by the US Treasury, Federal Deposit Insurance Corporation, and Federal Reserve on March 12, 2023, to support the banking system but of no bailing out of SVB and Signature Bank. CDS = credit default swap; EDF = expected default frequency; FDIC = Federal Deposit Insurance Corporation; SVB = Silicon Valley Bank.

Annex Figure 1.2. SVB Stock Price and S&P 500 Index, 2021:M10–2023:M3

Note: S&P = Standard and Poor's; SVB = Silicon Valley Bank.
Sources: Bloomberg LP, and Refinitiv Eikon DataStream

Annex Figure 1.3. US Interest Rate and Banks' CDS Spread, 2022:M12–2023:M4



Sources: Haver Analytics; BLS; and IMF staff calculations.
Notes: Banks' CDS spreads are asset-weighted average. US long-term bond yield refers to market yield on US Treasury securities at 10-year constant maturity. CDS = credit default swap; SVB = Silicon Valley Bank.

Annex 2. Estimation Results

Annex Table 2.1. Estimation Results for US Bank to Sovereign Risk Transmission

	Δ Sovereign CDS (1-year)					Δ Sovereign (5-year) CDS	Δ Sovereign (1-year) CDS-implied EDF
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ Sovereign CDS (lagged)	-0.019	-0.012	-0.014	0.005	-0.116*	-0.194***	
	(0.082)	(0.078)	(0.079)	(0.089)	(0.067)	(0.046)	
Δ Banks' CDS	0.018	-0.016	-0.022	-0.154	0.023***	0.037***	
	(0.046)	(0.037)	(0.043)	(0.167)	(0.008)	(0.011)	
SVB collapse	3.026**	2.914**	2.902*	2.242	2.491*	-0.636***	-0.001***
	(1.458)	(1.477)	(1.481)	(1.490)	(1.436)	(0.207)	(0.000)
Δ Banks' CDS × SVB collapse	**0.379*** **	**0.431*** **	**0.433** **	**0.654** **	**0.548*** **	**0.076*** **	
	(0.112)	(0.161)	(0.170)	(0.312)	(0.124)	(0.018)	
Δ VIX (log)		0.315	0.016	2.596	1.667***	-0.072	0.000
		(0.570)	(0.679)	(2.102)	(0.565)	(0.274)	(0.000)
Δ Government bond yield (10 year)		0.201	0.179	0.618	-0.176	-0.063	-0.000
		(1.026)	(1.152)	(1.834)	(0.830)	(0.446)	(0.000)
Δ Policy rate			0.108				
			(0.556)				
Stock market returns			-0.032				
			(0.055)				
Public debt to GDP			-0.006				
			(0.012)				
Δ Sovereign CDS-implied EDF (lagged)							0.285
							(0.217)
Δ Banks' CDS-implied EDF							-0.000
							(0.000)
Δ Banks' CDS-implied EDF × SVB collapse							**0.022*** **
							(0.001)
Sample period	2015-23	2015-23	2015-23	2021-23	2010-23	2015-23	2015-23
Month x year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,317	2,128	2,010	713	3,266	2,128	2,128
R^2	0.089	0.078	0.076	0.088	0.071	0.092	0.194

Source: Authors' estimates.
Notes: Columns 1–3 present the estimation results for change in the US sovereign one-year credit default swap (CDS) spread (in basis points) on change in the (asset-weighted) average of US banks' one-year CDS spread (basis points) and other variables for the time period January 2015 to December 2023. In columns 4 and 5, the sample period covers January 2021 to December 2023, and January 2010 to December 2023, respectively. Column 6 presents the results for change in US sovereign five-year CDS spread on change in the (asset-weighted) average of US banks' five-year CDS spread and other variables. SVB collapse is a dummy variable equal to one for March 9 and 10, 2023. Column 7 presents the results for change in US sovereign one-year CDS-implied expected default frequency (EDF) in percent on change in the (asset-weighted) average of US banks' one-year CDS-implied EDF and other variables. The bold statistics in all columns indicate the impact of a change in banks' CDS on change in sovereign CDS (or CDS-implied EDF) during the SVB collapse. All equations include a constant (not shown). Robust estandard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10, 5 and 1 percent levels, respectively. CDS = credit default swap; EDF = expected default frequency; SVB = Silicon Valley Bank; VIX = Chicago Board Options Exchange Volatility Index.

Annex Table 2.2. Estimation Results for US Bank to Sovereign Risk Transmission: Post–SVB Collapse, 2015–23

	Δ Sovereign CDS (one year)	
	(1)	(2)
Δ Sovereign CDS	-0.012	-0.012
	(0.078)	(0.078)
Δ Banks' CDS	-0.015	-0.015
	(0.038)	(0.038)
SVB collapse (March 9)	3.499**	
	(1.543)	
SVB collapse (March 10)	4.481***	
	(1.515)	
Post-SVB collapse (March 13)	**0.167**	
	(1.606)	
Post-SVB collapse (March 14)	**-2.267**	
	(1.636)	
SVB collapse (March 9-10)		2.815*
		(1.612)
Δ Banks' CDS × SVB collapse (March 9-10)		0.433***
		(0.161)
Δ **Banks' CDS × Post-collapse (March 13)**		**0.020**
		(0.194)
Δ **Banks' CDS × Post-collapse (March 14)**		**-1.180**
		(0.852)
Δ VIX (log)	0.300	0.300
	(0.573)	(0.573)
Δ Govternment bond yield (10 year)	0.241	0.241
	(1.029)	(1.029)
Month × year effects	Yes	Yes
Observations	2,128	2,128
R^2	0.079	0.079

Source: Authors' estimates.

Notes: Columns 1 and 2 present the estimation results for change in the U.S. sovereign one-year credit default swap (CDS) spread (in basis points) on change in the (asset-weighted) average of U.S. banks' one-year CDS spread (basis points) and other variables for the time period January 2015 to December 2023. SVB collapse is a dummy variable equal to one for the dates indicated in parentheses (March 9, 2023; March 10, 2023; or both March 9 and 10, 2023), and zero otherwise. Post-SVB collapse is a dummy variable equal to one for March 13-14, 2023, and zero otherwise. All equations include a constant (not shown). Robust estandard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10, 5 and 1 percent levels, respectively. CDS = credit default swap; SVB = Silicon Valley Bank.

Annex Table 2.3. Panel Estimation Results for Bank to Sovereign Risk Transmission

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ Sovereign CDS (lagged)	-0.197***	-0.197***	-0.220***	-0.189***	-0.227***	-0.190***	-0.208***
	(0.013)	(0.013)	(0.019)	(0.033)	(0.049)	(0.019)	(0.019)
Δ Banks' CDS	0.005	0.001	-0.009	-0.003	-0.016	0.022	0.006
	(0.015)	(0.016)	(0.007)	(0.023)	(0.028)	(0.026)	(0.024)
SVB collapse	1.067	0.683	2.974			1.164	2.084
	(1.715)	(1.162)	(4.144)			(1.799)	(3.379)
Δ Banks' CDS × SVB collapse	**0.348***	**0.331***	**1.168*****	**0.381***	**0.547***	**0.331***	**1.058*****
	(0.171)	(0.194)	(0.232)	(0.219)	(0.293)	(0.199)	(0.109)
Δ VIX (log)	6.622*	-0.101	9.099			8.347**	11.602**
	(3.416)	(1.732)	(6.061)			(3.083)	(5.256)
Δ Govternment bond yield (10 year)	33.693	31.681	100.173	35.464	115.509	39.577	88.727**
	(27.924)	(26.638)	(66.856)	(30.228)	(69.029)	(23.519)	(37.892)
Stock market returns		-1.327					
		(0.924)					
Δ Policy rate		-2.120					
		(1.864)					
Sample	All (excluding US) 2015-23	All (excluding US) 2015-23	Public debt > median 2015-23	All (excluding US) 2015-23	Public debt > median 2015-23	All (excluding US) 2010-23	Public debt > median 2010-23
Country × month × year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Date-specific effects	No	No	No	Yes	Yes	No	No
Observations	52,756	51,938	26,159	55,532	26,157	73,513	36,425
R^2	0.078	0.081	0.095	0.118	0.184	0.086	0.104

Source: Authors' estimates

Notes: Columns 1–7 present the estimation results for change in sovereign one-year credit default swap (CDS) spread (in basis points) on change in (asset-weighted) average of banks' one-year CDS spread (basis points) and other variables for major advanced and emerging market economies (excluding the U.S.). SVB collapse is a dummy variable equal to one for March 9 and 10, 2023. High public debt in columns 3, 5, and 7 refer to public debt to GDP ratio above the sample median. Country-month-year interactions are included in all specifications to control for country-level time-variant factors such as economic growth and inflation. Month-year interaction effects are included in columns 1–3 and columns 6–7, and date-specific effects are included in columns 4–5 to control for factors common across countries. In columns 1–5 and columns 6–7, the sample period is 2015–2023 and 2010–2023, respectively. All equations include a constant (not shown). Standard errors are clustered at the country and date levels. *, **, and *** indicate statistical significance at the 10, 5 and 1 percent levels, respectively.

Annex Table 2.4. Panel Estimation Results by Country Group, 2015–23

	Advanced economies (AEs)		**Emerging markets (EMs)**	
	(1)	(2)	(3)	(4)
Δ Sovereign CDS (lagged)	-0.216***	-0.223***	-0.041	-0.139***
	(0.018)	(0.021)	(0.032)	(0.004)
Δ Banks' CDS	-0.009	-0.010	0.504***	0.575***
	(0.006)	(0.007)	(0.100)	(0.052)
SVB collapse	3.922	4.413	0.671	-0.284
	(5.174)	(5.951)	(0.733)	(0.768)
Δ Banks' CDS × SVB collapse	**0.405**	**1.111*** **	**0.952*** **	**-0.045**
	(0.355)	(0.289)	(0.151)	(0.279)
Δ VIX (log)	6.926	9.873	7.611**	6.529
	(5.186)	(7.575)	(3.145)	(5.561)
Δ Government bond yield (10 year)	87.320	112.121	5.737***	13.009*
	(62.595)	(73.069)	(1.038)	(4.564)
Sample	AEs (excluding US)	AEs with public debt > median	EMs	EMs with public debt > median
Country × month × year effects	Yes	Yes	Yes	Yes
Observations	37,921	22,013	14,835	4,146
R^2	0.091	0.098	0.274	0.250

Source: Authors' estimates.

Notes: Columns 1–4 present the estimation results for change in sovereign one-year credit default swap (CDS) spread (in basis points) on change in (asset-weighted) average of banks' one-year CDS spread (basis points) and other variables for a sample of advanced economies (excluding the US) and emerging markets, respectively. SVB collapse is a dummy variable equal to one for March 9 and 10, 2023. Public debt above median in columns 2 and 4 refers to public debt to GDP ratio above the full sample (excluding the US) median. All equations include a constant (not shown). Standard errors are clustered at the country and date levels. *, **, and *** indicate statistical significance at the 10, 5 and 1 percent levels, respectively. AEs = advanced economies; CDS = credit default swap; EMs = emerging markets; SVB = Silicon Valley Bank.

Annex Table 2.5. Panel Estimation Results by the Level of Banking Sector Vulnerabilities, 2015–23

	Domestic sovereign debt exposure		Capital adequacy ratio	
	Above sample median	Below sample median	Above sample median	Below sample median
	(1)	(2)	(3)	(4)
Δ Sovereign CDS (lagged)	-0.198***	-0.181***	-0.358***	-0.047**
	(0.014)	(0.050)	(0.020)	(0.019)
Δ Banks' CDS	0.004	0.025	-0.001	0.118
	(0.016)	(0.016)	(0.019)	(0.118)
SVB collapse	1.027	-0.249*	1.458	1.331
	(1.463)	(0.130)	(0.910)	(2.692)
Δ Banks' CDS × SVB collapse	**0.305***	**-0.018**	**0.252**	**0.854****
	(0.170)	(0.060)	(0.179)	(0.350)
Δ VIX (log)	10.242*	0.530**	7.622**	4.152
	(5.227)	(0.228)	(3.601)	(2.637)
Δ Government bond yield (10 year)	37.581	0.194	27.480	46.051
	(32.054)	(0.280)	(22.322)	(41.546)
Sample	All countries (excluding US)	All countries (excluding US)	All countries (excluding US)	All countries (excluding US)
Country × month × year effects	Yes	Yes	Yes	Yes
Observations	31,064	21,692	29,732	23,024
R^2	0.080	0.070	0.136	0.068

Source: Authors' estimates.
Notes: Columns 1–4 present the estimation results for change in sovereign one-year credit default swap (CDS) spread (in basis points) on change in (asset-weighted) average of banks' one-year CDS spread (basis points) and other variables for a sample of advanced economies (excluding the US) and emerging markets, respectively. In columns 1 and 2, domestic sovereign debt exposure of banks is defined as banks' aggregate holdings of domestic sovereign debt to banks' total assets. SVB collapse is a dummy variable equal to one for March 9 and 10, 2023. All equations include a constant (not shown). Standard errors are clustered at the country and date levels. *, **, and *** indicate statistical significance at the 10, 5 and 1 percent levels, respectively. CDS = credit default swap; SVB = Silicon Valley Bank.

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