

INTERNATIONAL MONETARY FUND

GLOBAL FINANCIAL STABILITY REPORT

The Last Mile:
Financial Vulnerabilities and Risks

2024
APR



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Editor's Note (5/27/24):

Figure 2.5, panel 1, has been updated to correct the charge-off rate on business loans, which was incorrectly annualized in the originally published version.



ASSUMPTIONS AND CONVENTIONS

The following conventions are used throughout the Global Financial Stability Report:

- ... to indicate that data are not available or not applicable;
- to indicate that the figure is zero or less than half the final digit shown or that the item does not exist;
- between years or months (for example, 2021–22 or January–June) to indicate the years or months covered, including the beginning and ending years or months;
- / between years or months (for example, 2021/22) to indicate a fiscal or financial year.

“Billion” means a thousand million.

“Trillion” means a thousand billion.

“Basis points” refers to hundredths of 1 percentage point (for example, 25 basis points are equivalent to $\frac{1}{4}$ of 1 percentage point).

Minor discrepancies between sums of constituent figures and totals shown reflect rounding.

As used in this report, the terms “country” and “economy” do not in all cases refer to a territorial entity that is a state as understood by international law and practice. As used here, the term also covers some territorial entities that are not states but for which statistical data are maintained on a separate and independent basis.

The boundaries, colors, denominations, and any other information shown on the maps do not imply, on the part of the International Monetary Fund, any judgment on the legal status of any territory or any endorsement or acceptance of such boundaries.

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PREFACE

The *Global Financial Stability Report* (GFSR) assesses key vulnerabilities the global financial system is exposed to. In normal times, the report seeks to play a role in preventing crises by highlighting policies that may mitigate systemic risks, thereby contributing to global financial stability and the sustained economic growth of the IMF's member countries.

The analysis in this report was coordinated by the Monetary and Capital Markets (MCM) Department under the general direction of Tobias Adrian, Director. The project was directed by Fabio Natalucci, Deputy Director; Mahvash Qureshi, Assistant Director; Jason Wu, Assistant Director; Charles Cohen, Advisor; Jay Sanat Surti, Division Chief; Nassira Abbas, Deputy Division Chief; Caio Ferreira, Deputy Division Chief and Chapter 2 co-lead; Sheheryar Malik, Deputy Division Chief; Felix Suntheim, Deputy Division Chief and Chapter 3 lead; and Nobuyasu Sugimoto, Deputy Division Chief and Chapter 2 co-lead. It benefited from comments and suggestions from senior staff in the MCM Department.

Individual contributors to the report were Rafael Barbosa, Mustafa Oğuz Çaylan, Benjamin Chen, Yingyuan Chen, Fabio Cortes, Andrea Deghi, Mohamed Diaby, Gonzalo Fernandez Dionis, Andrew Ferrante, Deepali Gautam, Sanjay Hazarika, Phakawa Jeasakul, Esti Kemp, Oksana Khadarina, Nila Khanolkar, Johannes S. Kramer, Harrison Samuel Kraus, Yiran Li, Xiang-Li Lim, Corrado Macchiarelli, Benjamin Mosk, Kleopatra Nikolaou, Natalia Novikova, Tatsushi Okuda, Sonal Patel, Silvia Loyda Ramirez, Ravikumar Rangachary, Patrick Schneider, Enyu Shao, Tomohiro Tsuruga, Jeffrey David Williams, Tao Wu, Hong Xiao, Ying Xu, Dmitry Yakovlev, and Aki Yokoyama. René M. Stulz of The Ohio State University served as an expert advisor for Chapter 3. Monica Devi, Javier Chang, Lauren Kao, and Srujana Sammeta were responsible for excellent coordination and editorial support. Rumit Pancholi from the Communications Department led the editorial team and managed the report's production, with editorial and typesetting service from Grauel Group and Absolute Service, Inc.

This issue of the GFSR draws in part on a series of discussions with banks, securities firms, asset management companies, hedge funds, standard setters, financial consultants, pension funds, trade associations, central banks, national treasuries, and academic researchers.

This GFSR reflects information available as of March 29, 2024. In Chapter 1, data used in Figures 1.1 (all panels), 1.2 (panel 1), 1.4 (panels 1, 2 and 3), and 1.5 (all panels) reflect information through April 5, 2024. The report benefited from comments and suggestions from staff in other IMF departments, as well as from Executive Directors following their discussions of the GFSR on April 3, 2024. However, the analysis and policy considerations are those of the contributing staff and should not be attributed to the IMF, its Executive Directors, or their national authorities.

FOREWORD

Financial markets have turned quite optimistic since we last published the *Global Financial Stability Report* (GFSR) in October 2023.

Expectations for a global economic soft landing and continued progress on disinflation have created an environment for households and businesses to obtain financing at lower costs, notwithstanding still-high interest rates. Investors may also be reassured by the fact that the banking turmoil from last year appears to have been contained.

A soft landing after a significant rise of global inflation is unusual by historical standards. Since the 1970s, meaningful tightening of monetary policy to reduce inflation has usually been followed by recessions and a tightening of financial conditions. This time around, markets seem to expect resilient, albeit low, growth in most countries as inflation returns to target.

A soft landing is also the IMF's baseline case, as documented by the April 2024 *World Economic Outlook*. But the job of the GFSR is to assess risks to global financial stability, which are inherently *non*-baseline possibilities. So, while near-term downside risks may have receded since our October 2023 GFSR, there are still several salient risks at the top of our minds.

First, our models reveal stretched valuations in various asset classes, predominantly through compressed risk premiums relative to historical standards. One example is the corporate bond market, where spreads continue to grind lower despite rising default rates. Another example is the sovereign debt market, where spreads, even for vulnerable issuers, have narrowed. But stretched valuations aren't limited to bonds—they're also noticeable in stock and even some commodity markets. Prices of assets have moved up together, riding the wave of lower risk premiums, increasing asset price correlations, and lowering market volatility.

This is an environment in which asset repricing can happen quickly. Sudden shifts in policies, a flare-up of geopolitical tensions, and commodity and supply chain disruptions are a few examples of

catalysts that could usurp current expectations of the trajectory of inflation and, in turn, monetary policy. Financial conditions would then tighten sharply as investor sentiment sours and asset price correlations decline.

A less favorable financing environment, in turn, would likely exacerbate existing fragilities. As detailed in this GFSR, borrowers in real estate markets, especially certain segments of commercial real estate with weak prospects, could face difficult and costly refinancings of existing loans, like the estimated 600 billion of US commercial real estate debt that is due this year. Defaults would then ensue, putting pressure on lenders with concentrated exposures in these loans. More broadly, default rates in riskier credit markets have been rising in many countries.

If global financial conditions were to tighten, capital outflow pressures on emerging markets could emerge, putting currencies and other assets under depreciation pressure. That said, major emerging markets have weathered well through interest rate hikes over the past few years, demonstrating domestic resilience built with improved policy frameworks. Weaker sovereigns, on the other hand, may once again see their international sources of funding dry up.

In the medium term, easy financial conditions are conducive to the accumulation of financial vulnerabilities, such as the overuse of debt by both governments and private-sector borrowers. For governments, concerns about debt sustainability could further intensify. In the private sector, the rapid surge in private credit over the past few years—lending by institutions that are not regulated like commercial banks or other traditional players—could expose fragilities given how opaque this market is. Another source of concern for macrofinancial stability is the growing risk of malicious cyber attacks associated with the deepening digitalization and reliance on technology.

Reassuringly, policymakers can take steps to mitigate these salient risks and reduce vulnerabilities. Such steps need to be taken decisively, starting with pushing back against overly optimistic expectations of the pace of disinflation and monetary policy easing. By

doing so, asset repricing risks could be mitigated. This has been the IMF's advice for some time, and recent communications by major central banks cautioning that disinflation has not yet been fully achieved are consistent with this recommendation.

Financial regulatory authorities should take steps to ensure banks and other institutions can withstand defaults and other risks, using stress tests, early corrective actions, and other supervisory tools. Where there are data gaps, like in private credit markets, reporting requirements should be enhanced. Regulators should prioritize full and consistent implementation of internationally agreed prudential standards, notably finalizing the phase-in of Basel III. Further progress on recovery and resolution frameworks is also of first-order importance, to limit the fallout from the demise of weaker institutions.

Authorities should strengthen efforts to contain debt vulnerabilities, including through appropriate

fiscal consolidation, as recommended by the April 2024 *Fiscal Monitor*. For emerging markets and frontier economies, such efforts should lessen the incidence and severity of capital outflows and external funding squeezes.

The overall outlook for global macrofinancial stability risks has improved in the past year, alongside declines in global inflation. However, policymakers must remain vigilant and plan for action not just in the baseline but also in adverse scenarios. Since the outbreak of the COVID-19 pandemic in 2020, financial sectors and economies have been hit by a series of adverse shocks, and further downsides could materialize. Only prudent policy and alert readiness will ensure that potential future scenarios can be tackled effectively.

Tobias Adrian
Financial Counsellor

EXECUTIVE SUMMARY

Financial Fragilities along the Last Mile of Disinflation

Financial market sentiment has been buoyant since the October 2023 *Global Financial Stability Report* on expectations that global disinflation is entering its “last mile” and monetary policy will be easing. Interest rates are down worldwide, on balance, stocks are up about 20 percent globally, and corporate and sovereign borrowing spreads have narrowed notably. As a result, global financial conditions have eased (Figure ES.1).

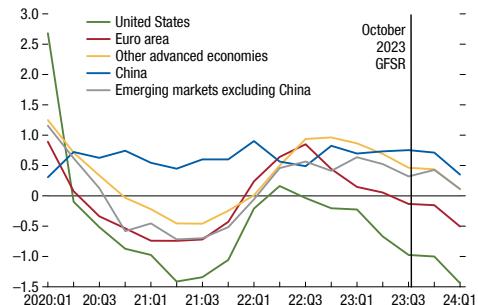
This risk-on environment has helped rekindle capital inflows for many emerging markets, on balance (Figure ES.2), and some frontier economies and low-income countries have taken advantage of strong investor risk appetite to issue sovereign bonds after a lengthy hiatus. Across all emerging markets, the estimated likelihood of capital outflows over the next year has declined.

Confidence in a soft landing for the global economy is growing against a backdrop of better-than-expected economic data in many parts of the world. Investors and central banks alike are expecting monetary policy to ease in the coming quarters, as cumulative interest rate increases over the past two years are believed to have created monetary conditions sufficiently restrictive to bring inflation back to central banks’ targets. However, global inflation remaining persistently above those targets could challenge this narrative and may trigger instability. Recent oscillation of core inflation prints in some countries serves as a good reminder that the disinflation effort is not yet complete.

So far, cracks in the financial system—unmasked by high interest rates during the monetary tightening cycle—have not ruptured further. Financial and external sectors in major emerging markets have proven resilient throughout the interest rate upswing. Bank failures in Switzerland and the United States in March 2023 have not spread to other parts of the system, and soundness indicators for most financial institutions indicate continued resilience.

Near-term financial stability risks have therefore receded, and there is less of a downside risk to global growth in the coming year, based on the IMF’s growth-at-risk framework analysis (Figure ES.3). The last mile of disinflation, however, may be complicated by several salient near-term financial fragilities.

Figure ES.1. Financial Conditions Indexes
(Standard deviations over long-term average)



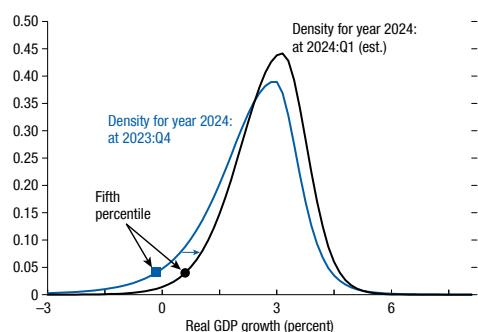
Sources: Bloomberg Finance L.P.; Dealogic; Haver Analytics; national data sources; and IMF staff calculations.
Note: GFSR = *Global Financial Stability Report*; Q = quarter.

Figure ES.2. Emerging Markets Portfolio Flow Tracking Local Currency Bonds and Equities
(Billions of US dollars)



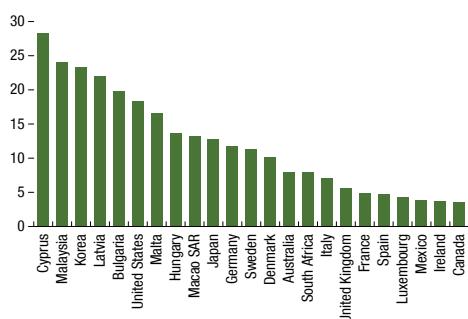
Sources: Bloomberg Finance L.P.; Haver Analytics; national authorities, and IMF staff calculations.
Note: EMs = emerging markets.

Figure ES.3. Global Growth-at-Risk
(Probability density)



Source: IMF staff calculations.
Note: est. = estimation.

Figure ES.4. Bank CRE Exposures
(Percent of total loans)



Source: IMF, Financial Soundness Indicators.

Note: Data are as of the third quarter of 2023, except Italy and Korea (2023:Q2), Australia and Germany (2023:Q1), and South Africa (2022:Q3). Ratio calculated using loans collateralized by commercial real estate, loans to construction companies, loans to companies active in the development of real estate in the numerator, and gross loans in the denominator. Some banking systems would have substantially lower ratios if non-CRE loans collateralized by commercial properties were excluded. The ratio does not fully capture the inherent risks from CRE, which also depend on other fundamental factors such as vacancy rates. CRE = commercial real estate; Q = quarter.

Salient Near-Term Risks

Commercial real estate (CRE) prices have declined by 12 percent globally over the past year in real terms amid rising interest rates and structural changes after the COVID-19 pandemic, with the US and European office sectors having seen the largest declines. Although banks appear well positioned to absorb CRE losses in aggregate, certain countries may experience more strains given that their banks hold large amounts of CRE loans (Figure ES.4), especially if these holdings are concentrated in CRE segments experiencing weak demand. Within a banking system, certain banks could suffer larger losses than others, in some cases exacerbated by issues such as less stable funding.

Residential home prices have continued to adjust downward in most countries but generally remain above prepandemic levels. Declines in real house prices have been driven by higher mortgage rates and have been more pronounced in advanced economies (−2.7 percent year over year) than in emerging markets (−1.6 percent). Still, household debt sustainability ratios are at modest levels globally, and a surge in residential mortgage defaults remains a tail risk.

Volatility has declined to multiyear lows for most asset classes, likely reflecting increased optimism that the global rate hike cycle is near its end. The average correlation across equities, bonds, credit, and commodity indices in both advanced economies and emerging markets exceeds the 90th historical percentile. Low volatility has masked the fact that financial conditions have become more responsive in this hiking cycle than in past cycles to economic data releases, especially inflation releases. Sizable inflation surprises could abruptly change investor sentiment, rapidly decompressing asset price volatility and causing simultaneous price reversals among correlated markets, thus prompting a sharp tightening in financial conditions.

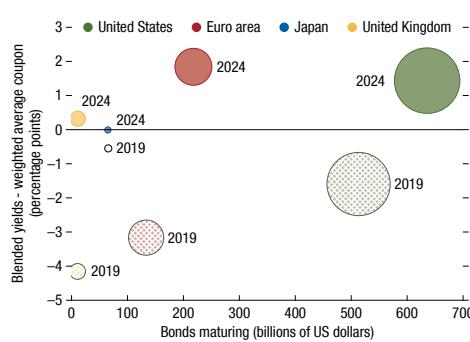
Figure ES.5. Chinese Stock Markets under Pressure
(Index = 100 in December 2020)



Sources: Bloomberg Finance L.P.; and IMF staff calculations.

Note: EMs = emerging markets; G3 = Group of Three.

Figure ES.6. Corporate Interest Rates Set to Go Up
(Percentage points, billions of US dollars)



Sources: Bloomberg Finance L.P.; S&P Capital IQ; and IMF staff calculations.

Note: The size of the bubbles corresponds to the size of the corporate bond market.

Medium-Term Vulnerabilities

Beyond these more immediate concerns, medium-term vulnerabilities are building along the last mile. Both public and private debt continues to accumulate in advanced economies and emerging markets, which could exacerbate adverse shocks and worsen downside risks to growth down the road.

Major emerging markets continue to show resilience. With central banks having tightened policy aggressively and early, inflation has eased markedly in many emerging markets, allowing some to start their cutting cycles. At this juncture, the key question is whether emerging market resilience is at a turning point. For example, there are signs that investors

are increasingly focused on medium-term fiscal sustainability. With interest rates and deficits still high, inflation declining, and growth moderating, more emerging markets are currently experiencing high real refinancing costs relative to economic growth.

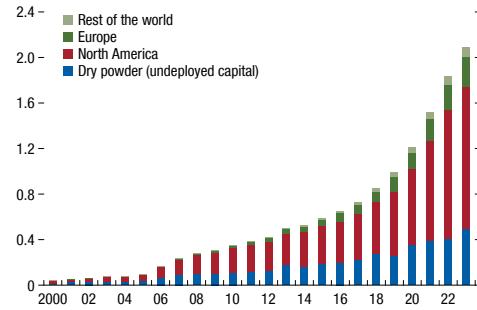
The easing of global financial conditions has benefited frontier economies and low-income countries. High-yield sovereign spreads have outperformed investment-grade spreads in recent months after reaching historically high levels in 2023. This is occurring at a critical time, with a substantial number of hard currency bonds maturing over the next two years in many countries. With external markets having been effectively closed for many low-income developing countries in prior years, local banking institutions have significantly increased their holdings of sovereign debt, increasing potential risks from a sovereign-bank nexus.

China's housing market downturn has shown few signs of bottoming out. Even though declines in new home prices have been moderate compared with housing-correction episodes in other countries, existing home prices and activity measures such as starts, sales, and real estate investments have sharply declined. Reflecting the property market ailment as well as further disinflationary pressures and the slowing growth outlook, China's stock market has come under pressure in recent months (Figure ES.5). The downturn in Chinese property and equity markets has caused heavy losses in parts of China's asset management industry, which could spill over to bond and funding markets. The steps authorities have taken to stabilize the markets since the third quarter of 2023 have yet to turn sentiments around.

Corporate credit spreads have narrowed since the October 2023 *Global Financial Stability Report*, although the recent rise in corporate earnings appears to be losing momentum in most parts of the world. Also, increasing evidence shows that cash liquidity buffers for firms in advanced economies and emerging markets eroded further over 2023, owing to still-high global interest rates. As of the third quarter of 2023, the share of small firms with a cash-to-interest-expense ratio below 1 was around one-third in advanced economies and more than half in emerging markets. Sizable amounts of corporate debt will mature in the coming year across countries at interest rates significantly higher than existing coupons, which could make refinancing challenging (Figure ES.6).

Even though defaults are on the upswing, growth in corporate borrowing globally is recovering more rapidly in this hiking cycle than in previous ones. Private credit—a rapidly growing market providing loans to midsize firms outside both the commercial bank sector and public debt markets—has helped fuel this trend (Figure ES.7). Chapter 2 identifies

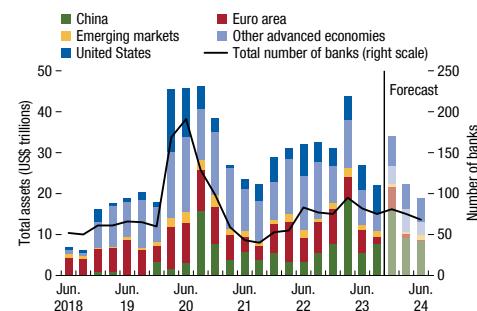
Figure ES.7. Private Credit Growth
(Trillions of US dollars)



Source: Preqin.

Note: The measure of assets under management includes those from private credit funds, business development companies, and middle-market collateralized loan obligations, with the last two being mostly US focused.

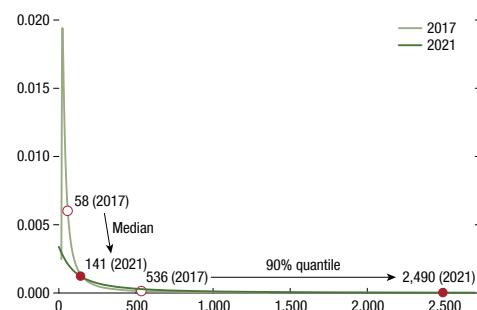
Figure ES.8. Total Assets of Banks Flagged by Three or More KRIs
(Trillions of US dollars)



Sources: Visible Alpha; and IMF staff calculations.

Note: Constructed based on historical data from the first quarter of 2018 to the third quarter of 2023 and consensus forecasts for the fourth quarter of 2023 (for banks for which actual data are not available) and for the first two quarters of 2024. KRI = key risk indicator.

Figure ES.9. Estimated Distribution of Maximum Annual Firm Loss
(Density, millions of US dollars)



Source: Advisen Cyber Loss Data; Capital IQ; and IMF staff calculations.

Note: Green lines show the estimated posterior density function of the highest loss of all firms within a year. The solid (hollow) markers indicate the median and 90th percentile in 2021 (2017).

potential vulnerabilities of private credit markets, including relatively fragile borrowers compared with high-yield and leveraged finance markets, a growing share of semiliquid investment vehicles, multiple layers of leverage, stale and potentially subjective valuations, and interconnectedness across segments and players of financial markets.

Some advanced economies will likely require heavy government bond issuances to fund fiscal deficits. With the Bank of England, European Central Bank, and US Federal Reserve conducting quantitative tightening at annual paces of £100 billion, €212 billion, and \$780 billion, respectively, along with the quantitative tightening programs being implemented by other central banks, the buyer base for government bonds has shifted. Most new marginal buyers of government bonds, such as hedge funds—which buy bonds partly for leveraged trading strategies to capture the price difference between bonds and futures—are arguably more price sensitive and more attuned to debt sustainability. This suggests more volatility in bond markets in the medium term. Some countries may find it increasingly difficult to service outstanding sovereign debt, which results in a “debt begets more debt” quandary.

The majority of banks showed resilience during the March 2023 turmoil. Strong capital and liquidity buffers and improved profitability have lifted bank stock prices across countries since then. Looking ahead, however, IMF staff’s key risk indicators suggest that a subset of banks remains vulnerable. Banks with aggregate assets of \$33 trillion, or 19 percent of global banking assets, have breached at least three of the five key risk indicators (Figure ES.8). Chinese and US banks constitute most of this subset. For some Chinese banks, the breaches are driven by thinning capital ratios and concerns about deteriorating asset quality, whereas some large regional banks in the United States face multiple pressures.

Among nonbanks, open-end bond funds, including ones focused on less liquid assets, have received large inflows in recent years. Excessive liquidity transformations that contributed to the global financial crisis and were evident at the start of the COVID-19 pandemic in March 2020 could reappear.

With growing digitalization, evolving technologies, and increasing geopolitical tensions, cyber incidents—especially those with malicious intent—are a rising concern for macrofinancial stability. Chapter 3 shows

that although most losses from cyberattacks are modest, the risk of extreme losses has been increasing (Figure ES.9). The financial sector is particularly exposed to cyber risk, and although cyber incidents have not been systemic to date, they acutely threaten the financial system because of its exposure to sensitive data, high concentration, and technological and financial interconnectedness. Better cyber legislation and cyber-related governance arrangements at firms could help mitigate risks, but cyber policy frameworks often remain inadequate—especially in emerging market and developing economies.

Policy Recommendations

Central banks should avoid premature monetary easing and appropriately push back against overly optimistic market expectations for policy rate cuts that could add to the easing of financial conditions and complicate the last mile of disinflation. Where progress on disinflation is enough to suggest that inflation is moving sustainably toward the target, central banks should gradually move to a more neutral stance of policy.

Authorities should strengthen efforts to contain debt vulnerabilities, including in emerging market and frontier economies. In China, robust policies to restore confidence in the real estate sector are critical.

Supervisory and regulatory authorities should use appropriate tools, including stress tests and early corrective action, to ensure that banks and nonbank financial institutions are resilient to strains in commercial and residential real estate and to the credit cycle downturn. Further progress on resolution frameworks and a readiness to apply them is critical to address the problems of weak or failing banks, without undermining financial stability or risking public funds.

Quantitative tightening and the reduction in balance sheets need to proceed with care. Central banks should carefully monitor market functioning issues and mobilize to address potential market stresses. Ensuring that banks are prepared to access central bank liquidity and intervening early to address liquidity stress in the financial sector can mitigate financial instability.

Given the potential risks of the fast-growing private credit market, authorities should consider a more proactive supervisory and regulatory approach. It is key to close data gaps and enhance reporting requirements to comprehensively assess risks. Authorities should also

strengthen cross-sectoral and cross-border regulatory cooperation and make risk assessments consistent across financial sectors.

A cybersecurity strategy can strengthen the cyber resilience of the financial sector, accompanied by effective regulation and supervisory capacity, as well as by improved reporting of cyber incidents.

Delivering critical services to address disruptions is crucial to limit potential damage to the financial system. Financial firms should develop and test response-and-recovery procedures to remain operational in the face of cyber incidents. Given the global nature and systemic implications of cyberattacks, cross-border coordination is crucial.



IMF EXECUTIVE BOARD DISCUSSION OF THE OUTLOOK, APRIL 2024

The following remarks were made by the Chair at the conclusion of the Executive Board's discussion of the Fiscal Monitor, Global Financial Stability Report, and World Economic Outlook on April 3, 2024.

Executive Directors broadly agreed with staff's assessment of the global economic outlook, risks, and policy priorities. They welcomed the continued global economic resilience and containment of financial sector risks throughout the last two years, despite significant central bank interest rate hikes aimed at restoring price stability. Directors broadly concurred that the global economy may be approaching a soft landing but recognized that future growth is expected to be low by historical standards, reflecting still-high borrowing costs, a withdrawal of fiscal support, weak productivity growth, and continued geopolitical tensions. Most Directors also agreed that increasing geoeconomic fragmentation will weigh on medium-term growth, while a few Directors highlighted that trade diversification will bring benefits. Directors regretted that, for many emerging market and developing economies, the subdued prospects for global growth imply a slower convergence toward higher living standards.

Directors broadly considered that risks to the outlook are now more balanced, while emphasizing that important downside risks remain. In particular, they noted that supply disruptions and new price spikes stemming from geopolitical tensions could raise interest rate expectations and prompt a resurgence in volatility and sharp downturns in asset prices. Directors also emphasized that more persistent-than-expected inflation could trigger capital flow movements, a sharp tightening of global financial conditions, exchange rate volatility, and may put external and financial sectors under pressure. They recognized the risk that the cooling effects of past monetary policy tightening could be yet to come. Directors noted growing stresses in the commercial real estate sector and residential housing markets in some countries. At the same time, they recognized upside risks to the outlook from several sources, including a faster-than-expected decline

in inflation as well as growth and productivity gains from enhanced structural reforms.

Directors called on central banks to ensure that inflation returns to target smoothly, by avoiding easing policy prematurely. They emphasized that the pace of monetary policy normalization should remain data dependent, be tailored to country circumstances, and clearly communicated. Where inflation and inflation expectations are approaching target, Directors agreed that central banks should gradually move to a more neutral policy stance to avoid inflation target undershoots.

Noting elevated fiscal deficits and debt levels in many countries as well as rising debt service costs, Directors called for a gradual medium-term fiscal consolidation to ensure debt sustainability and rebuild room for budgetary maneuver, priority investments, and targeted social spending to protect the most vulnerable. The fiscal adjustment would also support the disinflation process. Directors emphasized that the pace of consolidation should depend on each country's conditions and be embedded in a credible medium-term fiscal framework. They noted that historical data indicate that spending pressures could rise as a result of the record number of elections this year. In addition, Directors recognized that many economies face important medium-term spending pressures stemming from aging population, climate change, and development needs. Most Directors agreed that countries should boost long-term growth by implementing well-designed, cost-effective fiscal policies that promote innovation and facilitate technology diffusion. At the same time, Directors emphasized that these policies should avoid protectionist measures.

Directors reiterated that continued accumulation of public and private debt in many economies constitute medium-term financial vulnerabilities. They stressed

that regulatory authorities should use supervisory tools, including stress tests, to ensure that banks and nonbank financial institutions are resilient to credit risk and strains in commercial and residential real estate. Given potential new risks associated with rapid growth in private credit, Directors saw merit in considering a more proactive regulatory and supervisory approach, including enhancing reporting requirements. Noting that cyber incidents are a rising financial stability concern, they recommended better cyber-related governance arrangements and legislations. Directors emphasized the need for a full and timely implementation of Basel III.

Directors agreed that targeted and carefully sequenced structural reforms are needed to raise medium-term growth prospects. They recommended

reforms aimed at reducing the misallocation of capital and labor, increasing female labor participation, enhancing education, strengthening governance, reducing excessive business regulation and restrictions on trade, and harnessing the potential of artificial intelligence. Directors also called for reforms to facilitate the green transition and build climate resilience, while managing energy security risks. Many Directors expressed support for regular coverage of climate issues in the Fund's flagship reports.

Directors emphasized that reinvigorating multilateral cooperation is crucial to limit the costs and risks of climate change, speed the green transition, safeguard the open and rule-based international trading system, facilitate debt restructuring processes, and strengthen the resilience of the international monetary system.

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FINANCIAL FRAGILITIES ALONG THE LAST MILE OF DISINFLATION

Chapter 1 at a Glance

- Expectations that global disinflation is entering its “last mile” and monetary policy will be easing have driven up asset prices worldwide since the October 2023 *Global Financial Stability Report*.
- Many emerging markets have shown resilience, and some frontier economies have taken advantage of buoyant risk appetite to issue international debt.
- The global economy appears increasingly likely to achieve a soft landing, and cracks in the financial system exposed by high interest rates have not ruptured further. Near-term global financial stability risks have receded, according to the IMF’s growth-at-risk framework.
- However, there are several salient risks along the last mile. Growing strains in the commercial real estate sector and signs of credit deterioration among corporates and in some residential housing markets could be exacerbated by adverse shocks.
- Stalling disinflation could surprise investors, leading to a repricing of assets and a resurgence of financial market volatility, which has been low despite considerable economic and geopolitical uncertainty.
- Beyond these more immediate concerns, other medium-term vulnerabilities are building, notably the continued accumulation of debt in both public and private sectors. Some governments may find it difficult to service debt in the future, whereas the private sector’s leveraged exposures to financial assets may foretell elevated financial stability risks in the coming years.

Policy Recommendations

- Central banks should avoid easing monetary policy prematurely and push back as appropriate against overly optimistic market expectations for policy rate cuts. Where progress on disinflation is enough to suggest inflation is moving sustainably toward the target, central banks should gradually move to a more neutral stance of policy.
- Emerging and frontier economies should strengthen efforts to contain debt vulnerabilities. In China, it is critical to implement robust policies to restore confidence in the real estate sector and avoid further contagion to other sectors of the financial system.
- Supervisory and regulatory authorities should use appropriate tools, including stress tests and early corrective action, to ensure that banks and nonbank financial institutions are resilient to strains in commercial and residential real estate and to the deterioration in the credit cycle.
- Authorities need to improve the breadth and reliability of the data used to monitor and assess the risks associated with the rapid growth of lending by nonbank financial institutions to firms.
- Regulatory and crisis management tools for nonbank financial institutions need to be further developed.

Introduction

Financial market sentiment has been buoyant since the October 2023 *Global Financial Stability Report*. Interest rates are down globally, on balance; stock markets are up substantially, especially in advanced economies; and corporate and sovereign borrowing spreads have narrowed notably. Capital inflows have resumed for many emerging markets, and some frontier

and low-income countries have taken advantage of strong investor risk appetite to issue sovereign bonds after a lengthy hiatus.

The continued easing of global financial conditions has been driven by growing confidence in a soft landing for the global economy against a backdrop of better-than-expected economic data in many parts of the world. The quest for disinflation seems to be

entering the “last mile,” with investors and central banks alike expecting monetary policy to ease in the coming quarters, considering that cumulative interest rate increases over the past two years are believed to have created monetary conditions sufficiently restrictive to bring inflation back to central banks’ targets. That said, the disinflationary momentum has slowed more recently in a number of countries, raising the question of whether central banks in these countries will be able to deliver the extent of monetary easing currently expected by investors.

At the same time, cracks in the financial system—exposed during the tightening cycle by high interest rates—have not ruptured further. Major emerging markets have been resilient, and their financial and external sectors have proven strong throughout the interest rate upswing. Bank failures in Switzerland and the United States in March 2023 have not metastasized to other parts of the global financial system, and soundness indicators for most financial institutions point to continued resilience. With the global economy increasingly likely to achieve a soft landing and the financial system proving resilient, near-term financial stability risks have receded. According to the IMF’s growth-at-risk (GaR) framework, downside risks to global growth in the coming year have declined, although they remain somewhat elevated from a historical perspective.

The last mile of disinflation, however, may be complicated by several near-term, salient financial fragilities. Stress in the commercial real estate (CRE) sector has become more acute, with more borrowers likely in trouble, and with a number of banks around the world being scrutinized by investors over CRE-related loan losses. Financial market volatility appears too low compared with the elevated levels of macroeconomic and geopolitical uncertainty and valuation of many risk assets are increasingly stretched, predicated on investor expectations for a relatively brisk monetary easing that may be tested by the bumps along the last mile. Upside inflationary surprises, for example, those driven by commodity price spikes and supply-chain disruptions, could challenge the benign disinflation narrative prevalent in markets and among policymakers. A resurgence of volatility and a repricing of risk assets would lead to a sharp tightening in financial conditions and hasten the deterioration of the credit cycle, triggering adverse feedback loops.

Beyond these more immediate concerns, other medium-term fragilities are building up along the last mile. Both public and private debt continue to accumulate in advanced economies and emerging markets. For governments, the vulnerabilities lie with the servicing of historically high sovereign debt in an environment of large fiscal deficits as real economic growth may fall below market expectations for real long-term interest rates, resulting in a “debt begets more debt” quandary (see the April 2024 *World Economic Outlook* projections). While the level of debt is projected to change little in some countries, this challenge could be more acute for others with still-rising public debt. Elections to be held in a record number of countries in 2024 may also lead to fiscal “slippages” (see Chapter 1 of the April 2024 *Fiscal Monitor*). Interest rates would then become increasingly sensitive to sovereign debt issuance strategies and to central bank quantitative tightening programs, posing a challenge for monetary policy to bring down inflation in the future. In some countries, banking sector health could be jeopardized by large exposures to sovereign debt. In addition, despite the recent improvement in credit market conditions, investor sentiment in China remains weak and may continue to weigh on the already distressed property and local government sectors. Further increases in financial vulnerabilities—especially higher debt—along with loose financial conditions could exacerbate downside risks to growth in the future (according to the IMF three-year-ahead GaR framework).

With signs that reaching for yield is coming back amid expectations that interest rates will decrease in advanced economies in coming quarters, a rise in private financial and nonfinancial sector leverage could reemerge as a pressing financial stability concern. Corporations, even lower-rated ones, are finding financing easier to obtain through traditional means such as corporate bond markets, as well as through new channels like private credit markets that are opaque to policymakers (see Chapter 2). Trading strategies that use leverage to boost returns, such as bond basis trades or exotic stock options linked to Chinese stocks, have been popular among investors seeking to increase their wager by borrowing. The excessive liquidity transformations that made the global financial crisis so severe could reappear, with open-end bond funds receiving large amounts of inflows in recent months and with illiquid asset classes such as private credit

now being marketed to retail investors. In addition to increasing vulnerability in the financial system, faster credit growth stimulates aggregate demand, making disinflation more challenging.

This debt and leverage buildup is forging ahead even while the financial system is still tussling with the ongoing turning of the credit cycle, which could be hastened if the last mile turns out to be longer than expected. Many frontier and low-income countries are still experiencing financing stress, with little to no means of rolling over debt coming due. Around the world, more businesses and households are set to default as they continue to grapple with high interest rates and tighter bank lending standards. More brittle segments such as CRE and weaker banks (see Chapter 2 of the October 2023 *Global Financial Stability Report*) are front and center in the battle against defaults. In the longer term, a reversal of financial globalization could reduce cross-border banking and investment flows, making the diversification of credit risk more challenging (see Chapters 3 and 4 of the April 2023 *Global Financial Stability Report* and *World Economic Outlook*, respectively).

Monetary Policy and Financial Market Developments

The Expected Path of Monetary Policy Has Shifted Lower in Many Economies

Central banks have made notable progress in steering economies to steady disinflation, aided by positive supply-side improvements. Investors accordingly anticipate that major advanced economy central banks will pivot from monetary tightening to easing (Figure 1.1, panels 1–4). Market pricing suggests multiple policy rate cuts over the course of this year. In the United States, evidence of still-significant labor market tightness and oscillating core inflation data releases have prompted the Federal Reserve to push back against market expectations of aggressive rate cuts, joining the chorus of the European Central Bank and the Bank of England.¹ Market pricing currently indicates up to two rate cuts by the Federal Reserve, which are expected over the second half of

¹Several Federal Reserve officials have reiterated the possibility of further rate increases to counterbalance recent easing of financial conditions amid a still-uncertain inflation outlook.

the year, around three European Central Bank cuts by October, and one Bank of England cut by August. Japan remains an outlier, with markets pricing a gradual increase in the policy rate following the Bank of Japan's exit from long-standing negative interest rate policy and other unconventional measures on the back of its judgment that an achievement of price stability target came into sight.² The Bank of Japan's announcement did not elicit major market reactions as investors had reportedly anticipated these changes. In many emerging markets, policy expectations are also lower (Figure 1.1, panels 5–8; see the section "The Resilience of Major Emerging Markets May Be Tested").

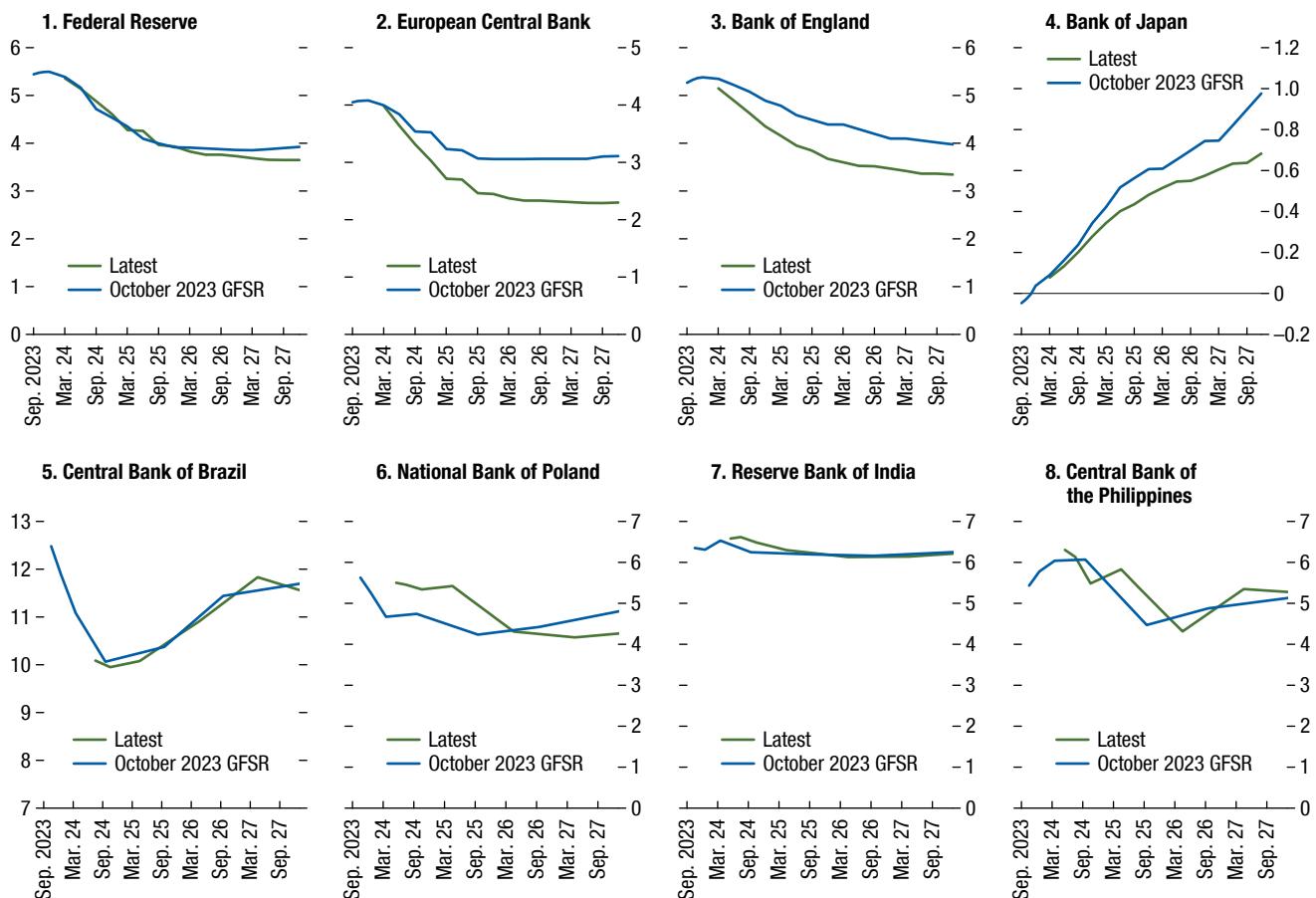
As inflation has slowed, expectations of future inflation have fallen in the euro area but have risen some for the United States since the start of the year (Figure 1.2, panel 1). Core inflation remains above central bank targets in most countries, leaving the global economy susceptible to inflationary shocks (for example, shocks arising from supply-chain disruptions). Pricing from inflation option markets reflects this uncertainty, with evidence signaling increased investor disagreement about future US inflation levels, expected over the next five years (Figure 1.2, panel 2). Predicted odds of inflation moving below or above 2 percent over the next five years are almost the same. Analysts' forecast surveys for the end of 2024 suggest that disagreement over the most likely inflation outcomes in the United States has increased since the October 2023 *Global Financial Stability Report* (Figure 1.2, panel 3). Forecasts for real GDP reflect that expected US growth is meaningfully higher than euro area growth but is coupled with higher uncertainty (Figure 1.2, panel 4).

Looking ahead, uncertainty about the path of expected policy rates remains elevated. Interest rate option prices indicate that the most likely level of the federal funds rate has declined and is now more or less consistent with the level of the median projection for 2024 in the Federal Reserve's latest Summary of

²At its March meeting, along with hiking the short-term policy rate band to above zero (between 0 to 0.1 percent) for the first time since 2016, the Bank of Japan also abolished yield curve control, halted purchases of exchange-traded funds and Japanese real estate investment trust shares, and announced that gross Japanese government bond purchases will be conducted at broadly the same amounts as in the recent past while commercial paper and corporate bond purchases will be gradually reduced before being discontinued in about one year's time.

Figure 1.1. Policy Rate Expectations: Selected Advanced and Emerging Market Economies (Percent)

Market pricing expects most major central banks to cut rates this year.



Sources: Bloomberg Finance L.P.; Federal Reserve; national authorities; and IMF staff calculations.

Note: GFSR = *Global Financial Stability Report*.

Economic Projections (Figure 1.3, panel 1). For the euro area, the distribution of policy rate outcomes has also shifted leftwards since the October 2023 *Global Financial Stability Report*, reflecting an increasingly tepid growth outlook coupled with moderating inflation (Figure 1.3, panel 2). That said, uncertainty around the most likely outcome for the policy rate has narrowed marginally relative to October 2023 for the United States, whereas it has widened some for the euro area (Figure 1.3, panels 1 and 2). From a longer-term historical perspective, uncertainty about rates—proxied by swaption-implied volatility for one-year rates, one year forward—remains elevated compared with the average before the COVID-19

pandemic, say, for both jurisdictions, albeit having compressed in recent months (Figure 1.3, panel 3).

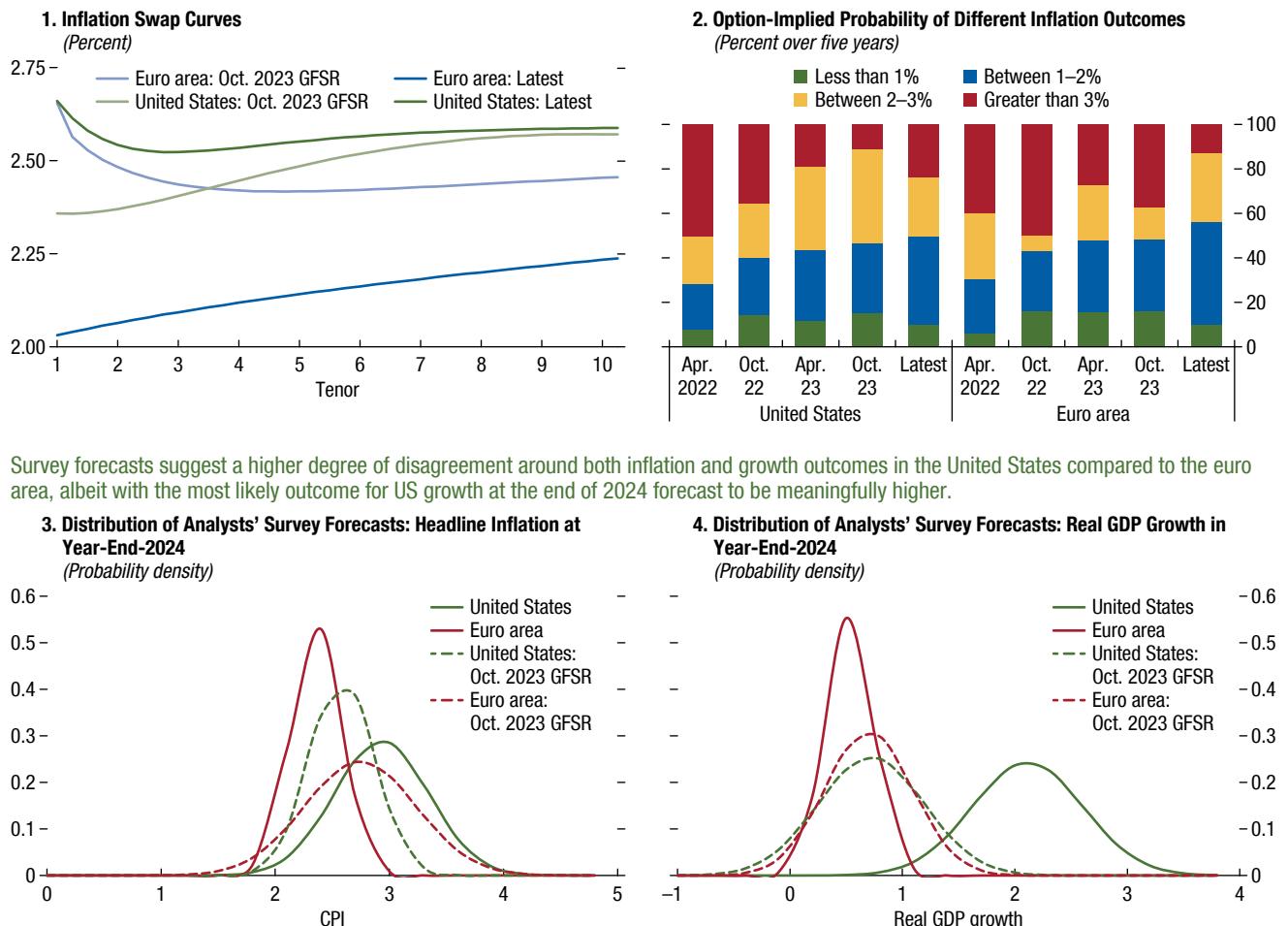
Longer-Term Interest Rates Have Declined Globally

Global long-term interest rates have declined, on net, since the October 2023 *Global Financial Stability Report* (Figure 1.4, panel 1), driven in both advanced economies and major emerging markets by both the lower expected path of policy rates (as discussed previously) and a compression of the term premium—compensation required by investors to bear interest-rate risk over long-maturity bonds (Figure 1.4, panel 2).

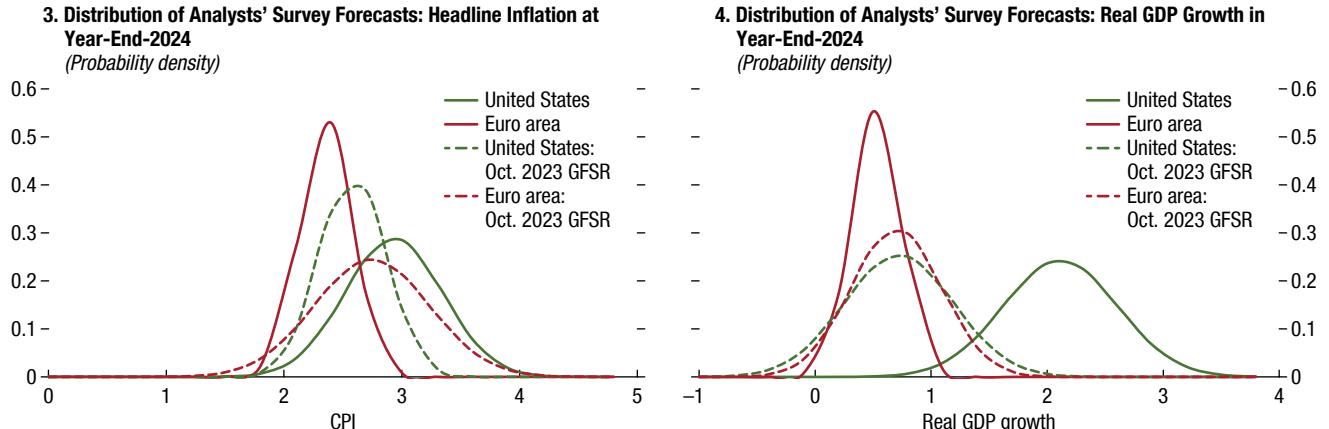
Figure 1.2. Market-Based Inflation Expectations

Market expectations of inflation have fallen in the euro area and risen some for the United States ...

... with the outlook remaining uncertain over the medium term.



Survey forecasts suggest a higher degree of disagreement around both inflation and growth outcomes in the United States compared to the euro area, albeit with the most likely outcome for US growth at the end of 2024 forecast to be meaningfully higher.



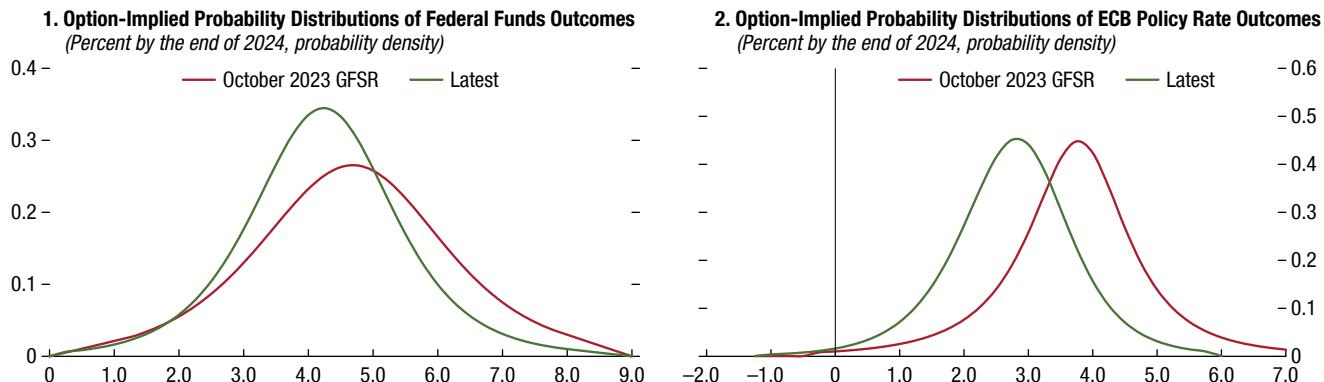
In the United States, term premiums have gyrated notably since the October 2023 *Global Financial Stability Report*. In September and October of 2023, an upward revision to the federal government's fiscal deficit and softer demand from traditional Treasury buyers such as banks and foreign reserve managers, weighed on US Treasury securities. The 10-year Treasury yield approached 5 percent at one point, driven by a term premium increase of around 70 basis points as the sell-off that started in mid-September 2023 intensified (Figure 1.4, panels 2 and 3, light and dark blue portions of the bars). More specifically, a higher real risk premium component of the term premium—capturing

fiscal and economic uncertainty—drove up the term premium.³ Subsequent announcements that Treasury securities issuances were lower than investor expectations helped ease pressure on the real risk premium. That said, the current level of real risk premiums across future horizons remains elevated compared with

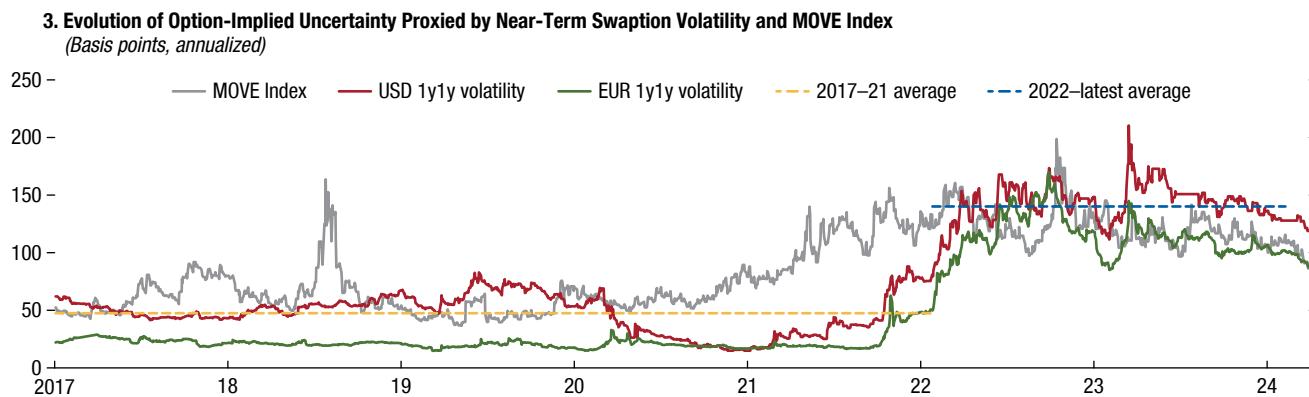
³The term premium may be decomposed further into two components: (1) the *inflation risk premium*, which reflects compensation related to future inflation uncertainty; and (2) the *real risk premium*, related to uncertainty about the future path of interest rates and the economic outlook, broadly encompassing developments in central bank balance sheets, as well as in the fiscal outlook (see the October 2023 *Global Financial Stability Report* for more details).

Figure 1.3. Option-Implied Expectations of Policy Rates

In both the United States and the euro area, market pricing reflects rate cuts on average, but uncertainty around most likely outcomes remains somewhat elevated.



Interest rates' volatility, corresponding to the near term, remains elevated for both the United States and the euro area.



Sources: Bloomberg Finance L.P.; Federal Reserve; and IMF staff calculations.

Note: In panels 1 and 2, probability densities are based on short-dated interest rate swap options, denominated in US dollars and euros, respectively. In panel 3, the horizontal dashed lines represent the averages of the USD 1y1y volatility over the periods before and after January 2022. Short-term interest rate uncertainty is captured by 1y1y at-the-money swaption-implied volatility. The ICE Bank of America MOVE index tracks the weighted average basket of at-the-money one-month options of 2-, 5-, 10-, and 30-year interest rate swaps. 1y1y = one-year, one-year forward; ECB = European Central Bank; EUR = euro; GFSR = *Global Financial Stability Report*; MOVE = Merrill Lynch Option Volatility Estimate.

the end of the previous tightening cycle in January 2019 (Blinder 2023), as well as to the average after the global financial crisis (Figure 1.4, panel 4; see also the section “Advanced Economy Government Bond Supply Will Likely Remain Large”).

Such gyrations in the term premium have had global implications, as spillovers from US term premiums to those in other advanced economies and emerging markets have steadily risen in recent years. The premiums reached a new high after US fiscal concerns in late 2023, according to the percent of variation methodology in Diebold and Yilmaz (2009) (Figure 1.4, panel 5). Co-movements among global longer-term interest rates could remain pronounced in the future.

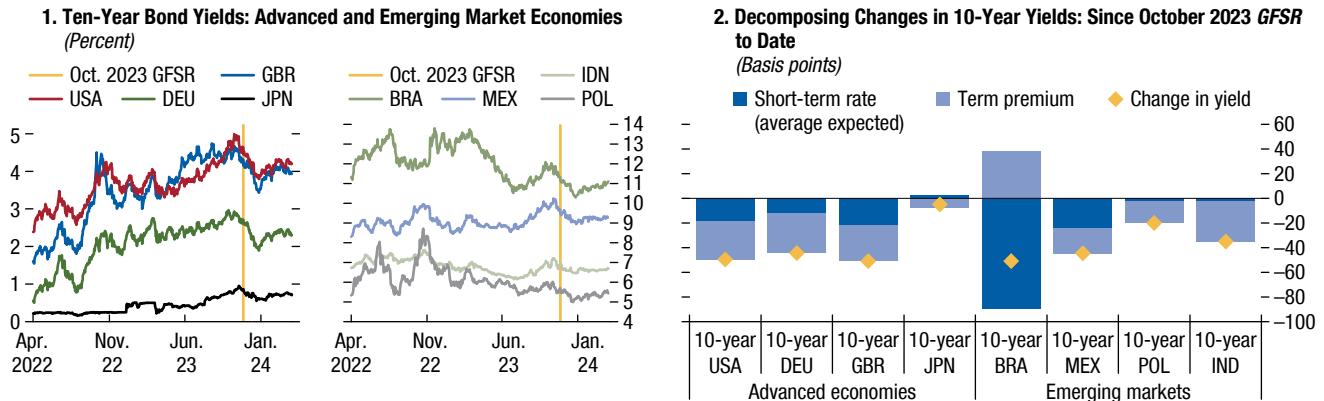
The leftward shift in rates distribution for the euro area reflects, in large part, a tepid growth outlook coupled with moderating inflation.

Asset Prices Have Rallied on the Basis of Buoyant Sentiment and Optimism about Earnings

Global equity markets have experienced broad-based rallies since the October 2023 *Global Financial Stability Report*, with the largest gains in Japan and the United States (Figure 1.5, panel 1). By contrast, Chinese stocks have significantly underperformed, reflecting tepid economic performance as property market downturns remain a drag (see the section “Chinese Asset Prices Face a Difficult Turnaround amid Weak Sentiment”). European and US corporate bond markets have moved in sympathy with the stock market rally, with borrowing spreads narrowing considerably for both investment-grade and high-yield issuers (Figure 1.5, panels 2 and 3).

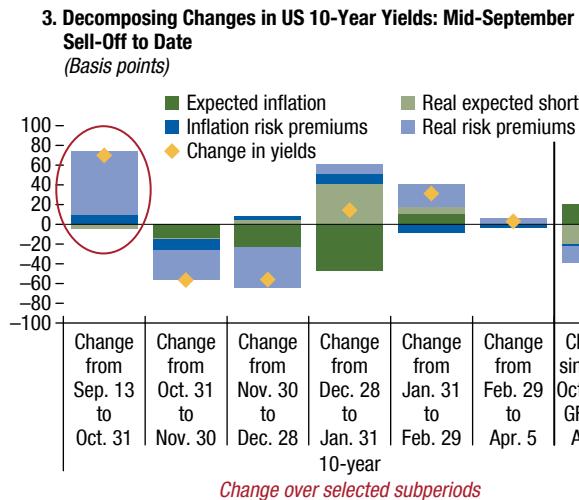
Figure 1.4. Evolution of Long-Term Rates

Long-term bond yields across major advanced and emerging market economies have declined, on net, since the October 2023 GFSR, in most cases, driven by a fall in expected path of short-term rates as well as term premiums.



However, over the period between the middle of September and the end of October 2023, term premiums exerted significant upward pressure on yields, reflecting fiscal concerns in the United States, mainly due to higher real risk premiums.

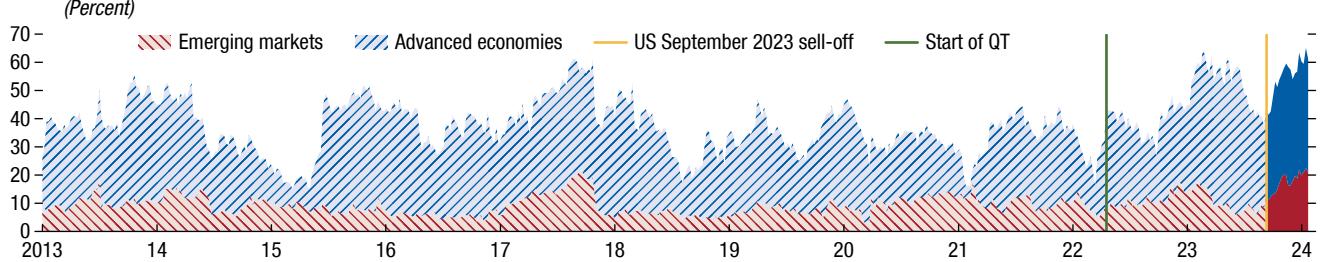
Real risk premiums across future horizons are currently elevated compared to the post-GFC average and following the end of the previous tightening cycle.



Spillovers from gyrations in US term premium to those in other advanced economies and emerging markets appear to have also risen after the September 2023 sell-off, against the backdrop of historically elevated level of interest rate volatility.



5. Spillovers from 10-Year US Term Premiums to Other Regions (Percent)

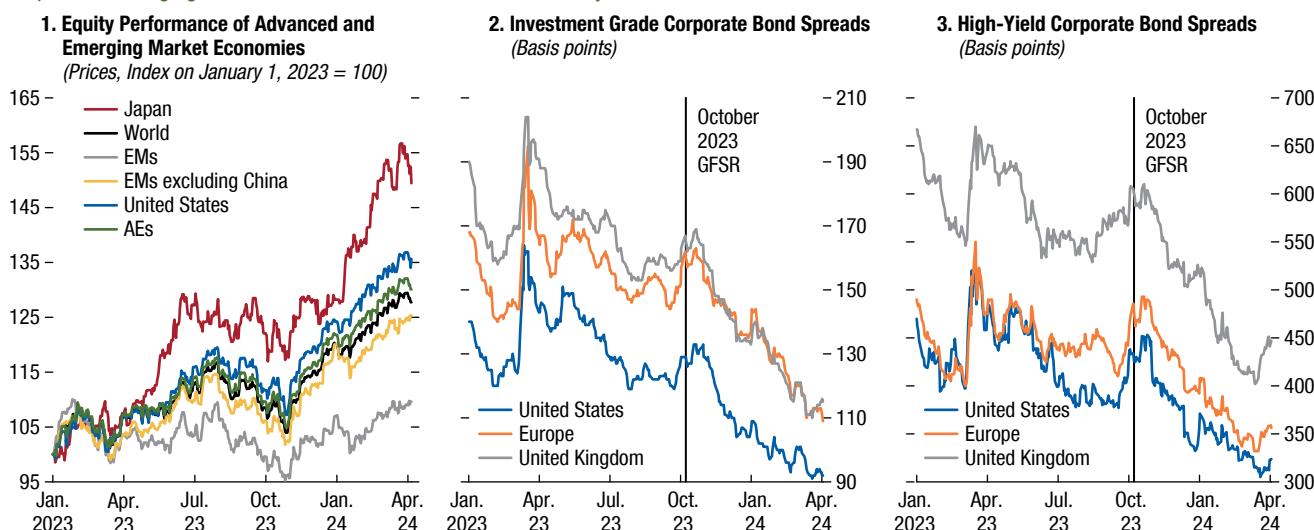


Sources: Bank of England; Bloomberg Finance L.P.; European Central Bank; Federal Reserve; ICE Bank of America; and IMF staff calculations.

Note: In panel 3, the red ellipse indicates change in yield components from the mid-September 2023 sell-off to the end of October 2023. In panel 4, time periods for Federal Reserve tightening cycles are based on Blinder (2023). Panel 5 reports spillovers from changes in US term premium to AE and EM term premium, respectively. Specifically, the measure of spillovers reported here—as per the methodology proposed by Diebold and Yilmaz (2009)—is the proportion of variation in AE and EM term premium which may be explained by shocks emanating from US term premium. AEs include 20 countries (48 percent to GDP of all AEs) and 15 EMs, amounting to around 76 percent of total EM GDP. The spillovers shown here correspond to a 50-week rolling window. On average, over a longer time period, spillovers to AEs have stood around 45 percent compared to 11 percent for EMs, albeit with significant variation over time. For instance, at the time of the taper tantrum, EM spillover was around 15 percent. AE = advanced economy; BRA = Brazil; DEU = Germany; EM = emerging market economy; GBR = Great Britain; GFC = global financial crisis; GFSR = Global Financial Stability Report; IDN = Indonesia; JPN = Japan; MEX = Mexico; POL = Poland; QT = quantitative tightening.

Figure 1.5. Asset Price Rally

Advanced economies have continued to outperform emerging market economies.



Sources: Bloomberg Finance L.P.; and IMF staff calculations.

Note: Panels 2 and 3 are using option-adjusted spreads. AE = advanced economies; GFSR = *Global Financial Stability Report*; EMs = emerging markets.

Market expectations for a soft landing have been a major tailwind for asset prices. In the United States, this has led to positive earnings prospects for the corporate sector, driven by the mega technology stocks known as the Magnificent 7. These stocks have experienced high price-to-earnings ratios accompanied by investor optimism about medium-term earnings prospects (Figure 1.6, panel 1). In recent months, earnings optimism and the stock price rally have spread more widely through the market, as reflected by price appreciation of the Russell 2000 index since October 2023 (Figure 1.6, panel 2). A standard discount cash flow model (Bank of England 2017; IMF 2019) suggests that the rise in the overall S&P 500 index appears to have been driven, almost in equal parts, by improved earnings projections and investors' stronger risk appetite (Figure 1.6, panel 3). That said, companies with strong margin power, mostly in the information technology and materials sectors, have outperformed companies with weak margin power (Figure 1.6, panel 4). Companies with weak margin power have traditionally been more sensitive to inflation, but despite inflation having fallen from its peak in June 2022, recovery by these companies has been sluggish thus far.

Even crypto markets—which have proven sensitive to risk sentiment—have rallied. Bitcoin prices have surpassed \$70,000 for the first time in history, boosted

by the recent approval of spot Bitcoin exchange-traded products (Figure 1.6, panel 5). On the back of the crypto recovery rally, market capitalization of crypto assets surpassed \$2.79 trillion in March 2024 (Figure 1.6, panel 6; see also Box 1.1). If expectations of a soft landing and continued disinflation no longer remain the baseline for investors, then overall, any optimism in earnings projections and buoyant risk sentiment could abruptly reverse, dragging stock prices down.

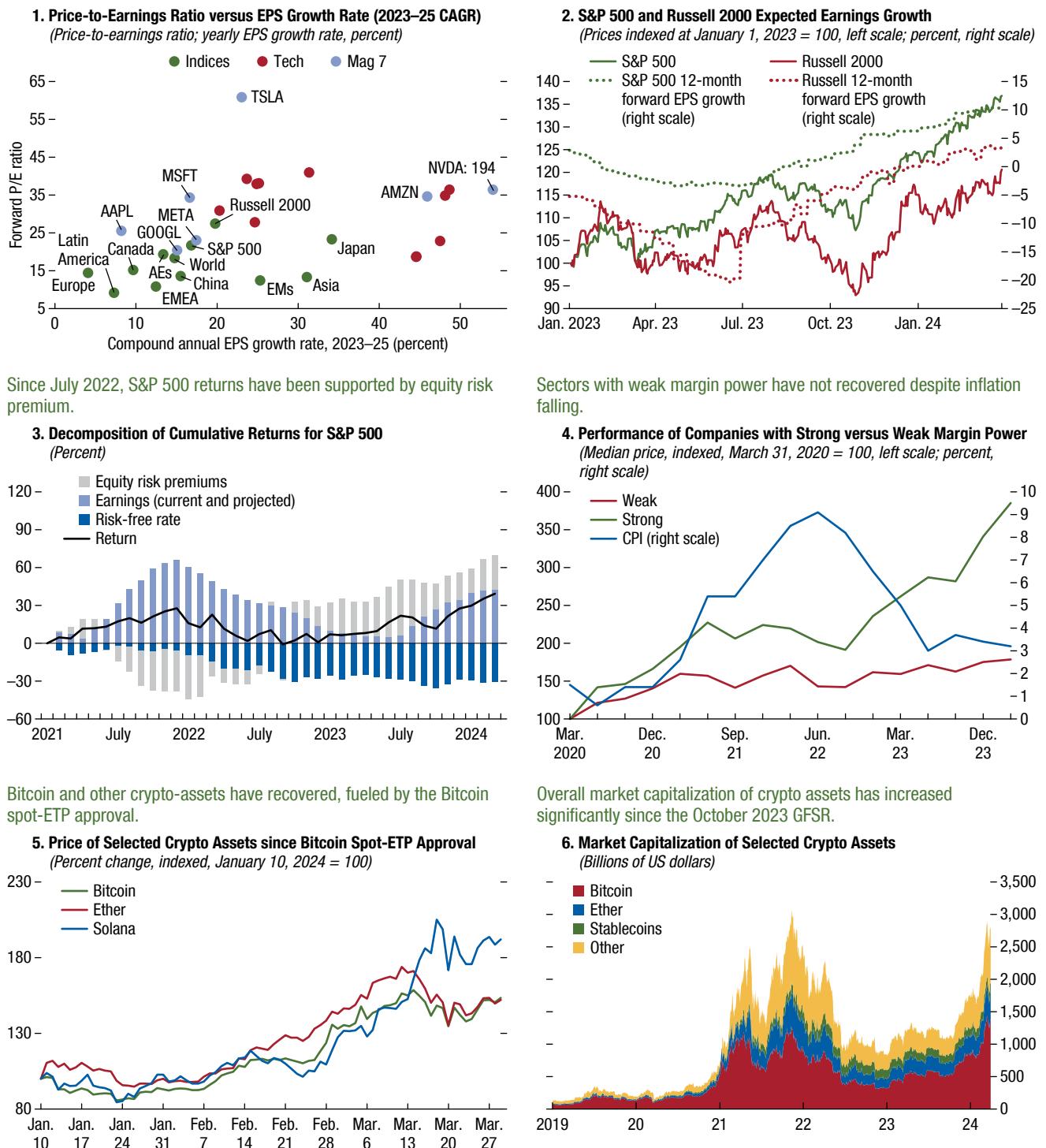
Financial Conditions Have Eased, But Bank Lending Standards Have Tightened in Some Countries

Supported by investor optimism about a soft landing, lower long-term yields, and rallies in stock and corporate bond markets, financial conditions have eased, especially in advanced economies in most regions (Figure 1.7, panel 1). In emerging markets, modest volatility in exchange rates in recent quarters has translated into a lower price of external financing risk, also modestly easing financial conditions (Figure 1.7, panel 2). In China, financial conditions have eased slightly but remain somewhat tight by historical standards, as risk sentiment is weighed down by growth and property sector issues.

In contrast with financial conditions, which summarize the price of risk in capital markets, bank

Figure 1.6. Equity Valuation and Returns Decomposition

Valuations broadly respond to medium-term growth profiles.



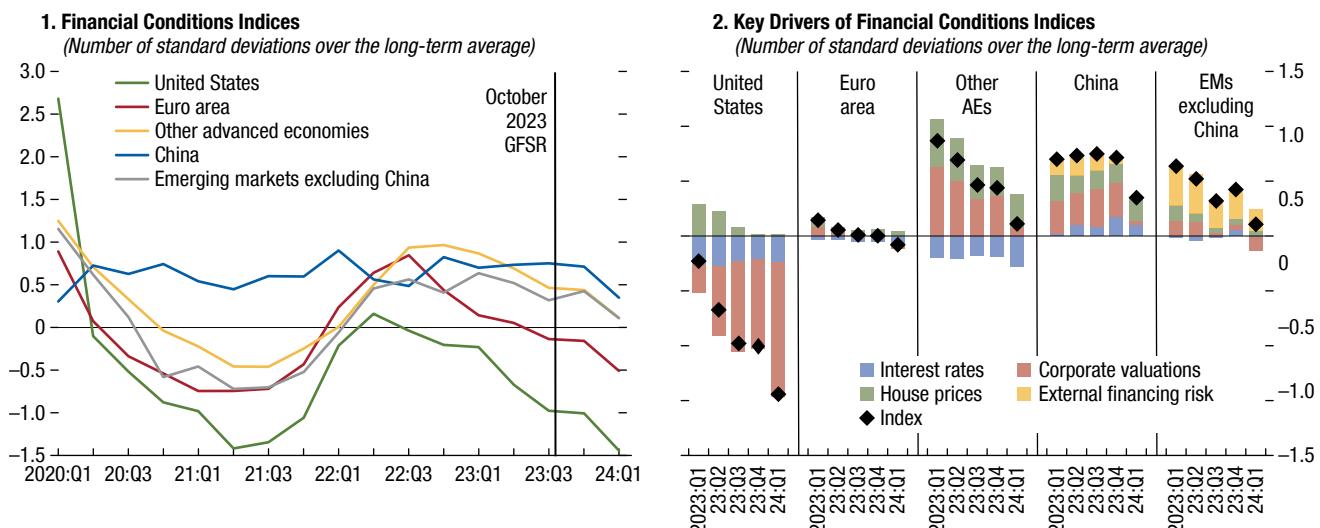
Sources: Bloomberg Finance L.P.; CoinGecko; Haver Analytics; Thomson Reuters; and IMF staff calculations.

Note: In panel 1, Mag 7 (Magnificent 7) includes Amazon, Apple, Alphabet (GOOGL, Alphabet Class C), Meta, Microsoft, Nvidia, and Tesla. In panel 3, strong (weak) margin power companies include the top (bottom) 10th percentile of earnings before interest, taxes, depreciation, and amortization margin performers from the first quarter of 2020 to the second quarter of 2022 of current S&P 500 companies. AAPL = Apple Inc.; AEs = advanced economies; AMZN = Amazon.com Inc.; CAGR = compound annual growth rate; CPI = consumer price index; EMs = emerging markets; EMEA = Europe, the Middle East and Africa; EPS = earnings per share; ETP = exchange-traded product; GOOGL = Alphabet Inc.; META = Meta Platforms, Inc.; MSFT = Microsoft Corporation; NVDA = NVIDIA Corp; P/E = price to earnings; TSLA = Tesla, Inc.

Figure 1.7. Financial Conditions Indices

Financial conditions have eased significantly since the October 2023 GFSR ...

... driven by a further improvement in corporate valuations.



Sources: Bloomberg Finance L.P.; Dealogic; Haver Analytics; national data sources; and IMF staff calculations.

Note: The IMF FCI is designed to capture the pricing of risk. It incorporates various pricing indicators including real house prices. Balance sheet or credit growth metrics are not included. For details, see Online Annex 1.1 in the October 2018 *Global Financial Stability Report*. To decompose the FCI into the four components of interest rates, corporate valuations, house prices, and external financing risk, we make outside the model adjustments to FCI such that they ensure negative signs of the FCI, and lags in data do not give a contrary-to-actual interpretation. In such instances, the value of the FCI in the line chart (panel 1) might be marginally different from the one in the drivers chart (panel 2). AEs = advanced economies; EMs = emerging markets; FCI = Financial Conditions Index; GFSR = *Global Financial Stability Report*; Q = quarter.

lending standards—measuring banks' willingness to lend—tightened sequentially in much of 2022 and 2023, especially in advanced economies (Figure 1.8, panels 1–3), amid concerns about deteriorating borrower risk profiles, expectations of economic slowdowns, and reductions in banks' risk tolerance. More recently, tentative signs indicate that the tightening in lending standards has stabilized in Brazil, the euro area, and the United States. Historically, tighter standards appear to portend an ebbing of credit growth over the next year in some countries, most notably the United States, although this connection is more tenuous in others, including Brazil, Japan, and the Philippines (Figure 1.8, panels 2, 4, and 6), as other factors such as the strength of loan demand and banking sector soundness attenuate the effect of lending standards on loan growth.

Growth-at-Risk Forecasts

Near-Term Downside Risk to Growth Has Receded Somewhat

With global financial conditions having eased and credit growth having changed little since the October

2023 *Global Financial Stability Report*, estimates based on the IMF's GaR framework suggest that downside risks to global growth for 2024 have receded somewhat, with the balance of risks to growth forecast to be broadly symmetrical. Downside risk—specifically as measured by the GaR metric⁴—suggests that with 5 percent probability, global growth over 2024 could fall below +0.7 percent, although that is an improvement compared with the level in October 2023, which stood at just below 0 percent (Figure 1.9, panel 1). From a historical perspective, the current level of forecast downside risk for the near term is still marginally elevated (Figure 1.9, panel 2).

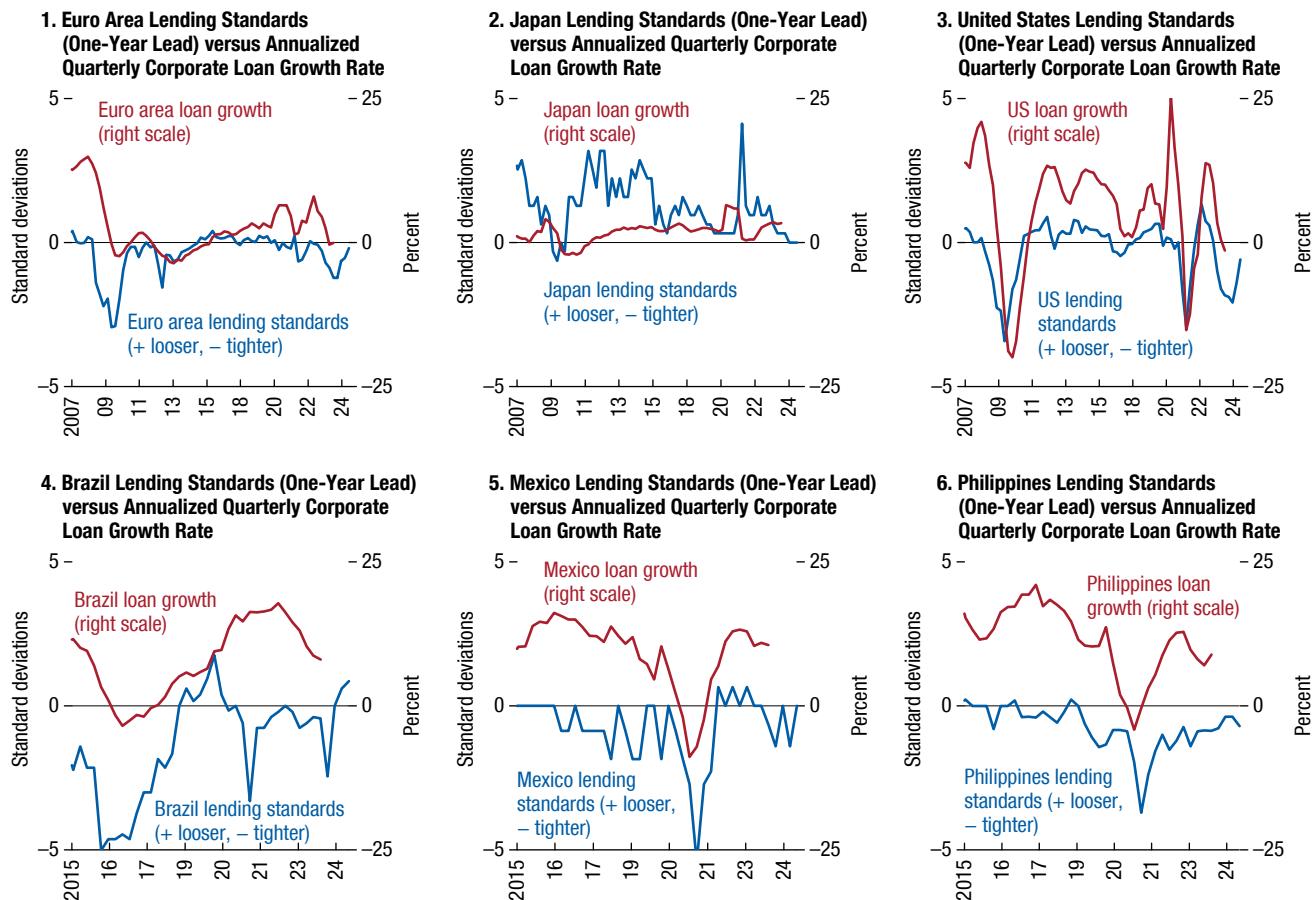
Medium-Term Downside Risk to Growth Remains Elevated

By contrast, medium-term risks to growth appear far more elevated, suggesting an intertemporal risk

⁴The GaR framework assesses downside risks by gauging the range of severely adverse growth outcomes, falling within the lower fifth percentile of the conditional growth forecast distribution. This is referred to as the GaR metric.

Figure 1.8. Lending Standards and Loan Growth
(Standard deviations and net percent of respondents)

Lending standards have tightened across most countries and tighter standards typically forecasts lower loan growth.



Sources: National central banks; and IMF staff calculations.

Note: Lending standard series for individual jurisdictions are normalized by their respective standard deviations. Positive values indicate looser standards; negative values indicate tighter standards.

trade-off. Easy financial conditions at present may prompt excessive risk taking and a buildup of financial vulnerabilities, leading to higher downside risk to growth in the coming years (Figure 1.9, panel 3, black dashed line). Possible shifts in this trade-off may be further illustrated by the following scenarios. First, if credit growth is held constant at current levels and financial conditions continue to ease to postpandemic lows, the GaR metric for the medium term would deteriorate to about its 20th historical percentile, with some marginal improvement for the near term (the yellow dotted line indicating Scenario 1 in panel 3 of Figure 1.9, panel 3). Second, if credit growth declines to its slowest pace since, say, 1991, and financial conditions are held constant, near-term downside risk

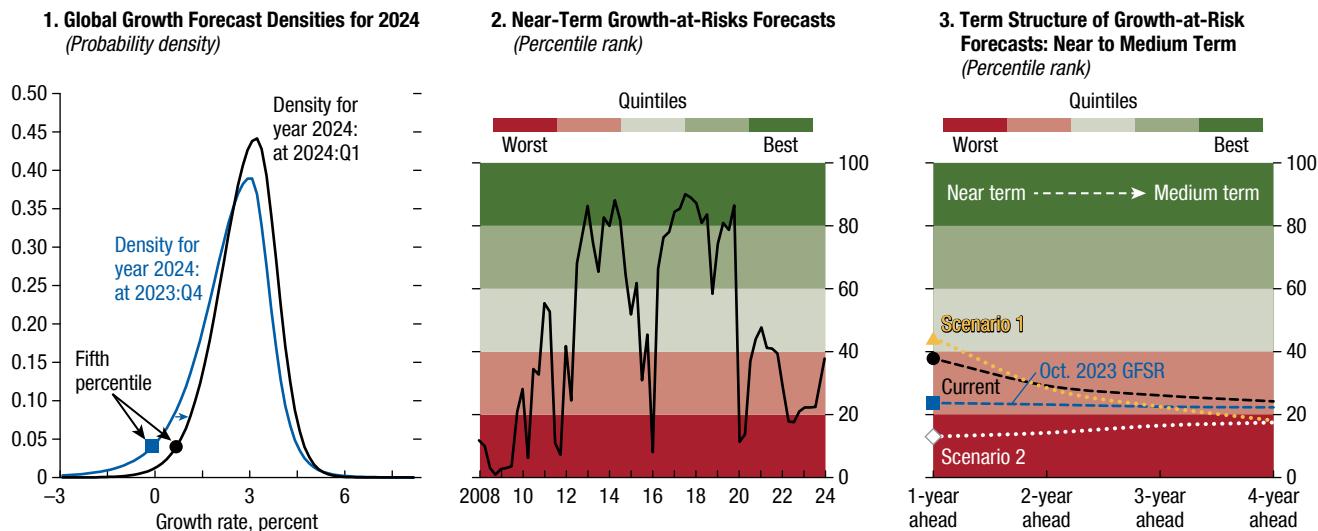
becomes elevated. Downside risk to growth is forecast to slightly lessen over the medium term, however, as ensuing deleveraging could support financial stability over time (the white dotted line depicting Scenario 2 in Figure 1.9, panel 3; see also Box 1.2, which analyzes shifts in intertemporal risk trade-off for US growth in credit scenarios calibrated on periods after previous high-inflation periods).

Salient Near-Term Risks

Even though downside risks have receded in the near term, a number of salient risks could challenge the health of the financial system, as outlined in the sections that follow.

Figure 1.9. Global Growth-at-Risk

While downside risks over the near term have receded some, these remain relatively elevated for the medium term; reflecting an intertemporal risk trade-off as financial conditions ease (and downturn in credit growth plateaus).



Sources: Bank for International Settlements; Bloomberg Finance L.P.; Haver Analytics; IMF, International Financial Statistics database; and IMF staff calculations. Note: The mode (that is, the most likely outcome) of the forecast density estimate accords with the October 2023 *World Economic Outlook* forecast for year 2024, as of the third quarter of 2023. In panel 2, the black line traces the evolution of the fifth percentile threshold (the growth-at-risk metric) of near-term growth forecast densities. The color of the shading depicts the percentile rank for the growth-at-risk metric one year ahead. Panel 3 depicts the term structure of growth-at-risk, starting from the near term and tracing out to the medium-term horizon, four years ahead. GFSR = *Global Financial Stability Report*; Q = quarter.

Commercial Real Estate Stress Has Intensified

Investors have been squarely focused on CRE, for which prices declined by 12 percent globally over the past year in real terms amid rising interest rates and slower economic growth in the United States and Europe. Notably, the US office sector declined by a significant 23 percent, while that of Europe dropped by 17 percent (Figure 1.10, panel 1). By contrast, CRE prices in the Asia-Pacific region (excluding China) remained relatively stable on aggregate, as positive net operating income partially offset high debt-servicing costs.

CRE price declines are driven by both higher global interest rates and postpandemic structural changes to CRE demand.⁵ The work-from-home

trend has weighed on CRE transactions, particularly in major global cities (Figure 1.10, panel 2), fueling concerns over future occupier demand in the office sector. Vacancy rates continued to rise in 2023, and absorption rates—a measure of how quickly CRE supply is absorbed by demand—have been negative, hinting at persisting upheaval in the sector (Figure 1.10, panel 3). Downside risks to CRE remain elevated as yields from owning CRE fall below the cost of financing CRE purchases with debt, weighing down property prices (Figure 1.10, panel 4). In a severely adverse scenario, with 5 percent probability, real CRE price declines over the next three years could reach 20 percent in the Europe, Middle East, and Africa region and 23 percent in North America. In the office sector, prices could fall more than 25 percent (Figure 1.10, panel 5).

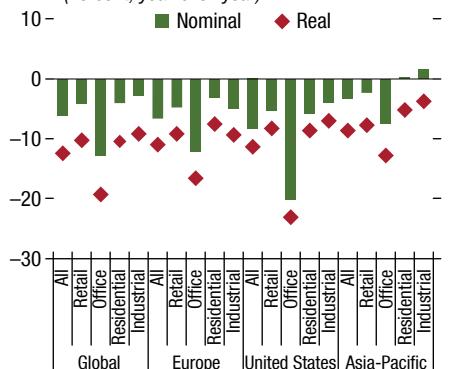
Although the banking sector appears well positioned to absorb CRE losses on aggregate, some economies could face painful losses, given the large size of the sector and its interconnectedness with the financial system and the broader economy (Figure 1.10, panel 6; see also the next section, “Concerns Are Mounting about Banks’ Exposures to Commercial Real Estate”). This is especially true in the United States, where CRE

⁵Recent empirical studies (Deghi, Natalucci, and Qureshi, 2022; Gupta, Mittal, and Van Nieuwerburgh 2022) highlighted that significant shifts in lease revenues, office occupancy, lease durations, and market rents attributed to remote work in the wake of the COVID-19 pandemic have had a significant effect on CRE valuations in addition to the effect of tighter financing conditions. Chapter 3 of the April 2021 *Global Financial Stability Report* also investigated the extent to which CRE prices reflect economic fundamentals and the implications of structural shifts in demand using a structural model for CRE valuations, finding that the median drop in fair values could reach 15 percent over five years after a permanent increase in the vacancy rate by 5 percentage points.

Figure 1.10. Developments in Global Commercial Real Estate Markets

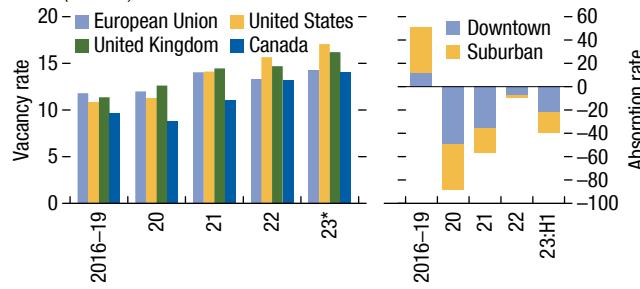
The CRE sector continued to reprice to higher interest rates in 2023 ...

1. Private and Institutional Investor-Owned CRE Price Change (Percent, year-over-year)



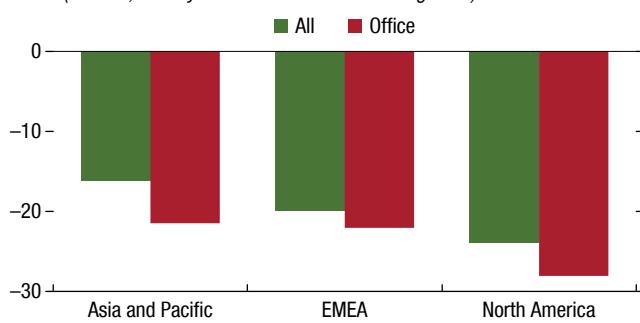
Pandemic-related structural changes continue to depress demand for office properties.

3. Office Vacancy Rates and Absorption Rates (Percent)



... increasing downside risks to CRE prices.

5. CRE-Price-at-Risk Model (Percent, three-years-ahead real cumulative growth)

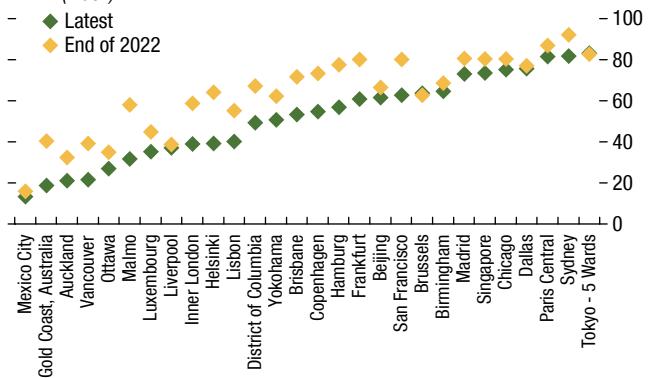


Sources: AEW Capital Management; Bloomberg Finance L.P.; European Public Real Estate Association; Haver Analytics; MSCI Real Estate; Nareit; and IMF staff computations.

Note: In panel 1, changes in private CRE properties (left scale) are computed as of the fourth quarter of 2023. Changes in valuation of high-quality properties owned by institutional investors (right scale) are computed as of January 2024. In panel 2, the liquidity score uses a combination of absolute and relative measures to calculate market liquidity, including percentage of global cross-border investment, share of institutional investment, and volume and number of unique buyers. Larger values indicate higher liquidity. In panel 3, the absorption rate is calculated by dividing the number of homes sold over a particular period by the total number of homes available for sale. The asterisk indicates data up to the third quarter of 2023 and the first half of 2023. Panel 5 shows the results from a CRE-prices-at-risk model based on Deghi, Mok, and Tsuruga (2021). Bars indicate the CRE price decline in a severely adverse scenario with a 5 percent probability (fifth percentile). Data labels in the figure use International Organization for Standardization (ISO) country codes. CRE = commercial real estate; EMEA = Europe, the Middle East, and Africa; H1 = first half.

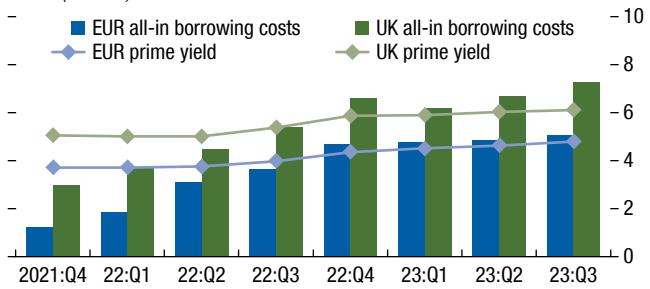
... contributing to large declines in CRE liquidity, especially major cities.

2. CRE Market Liquidity across Major Cities (Index)



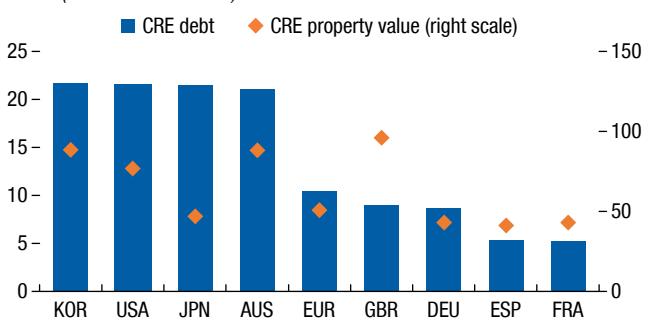
Elevated interest rates are pushing up debt costs ...

4. Real Estate Debt Cost and Prime Yields (Percent)



Given the large size of the sector, further price pressures could lead to painful economic losses.

6. Estimated CRE Debt and CRE Properties Value (Percent of 2023 GDP)



debt is estimated at almost \$6 trillion.⁶ US CRE prices saw some of the steepest price declines during this interest rate hike cycle relative to almost all past cycles (Figure 1.11, panel 1).⁷ Origination and refinancing of commercial mortgages remain challenging because of still-high interest rates, reduced property values, and risk aversion of banks (Figure 1.11, panel 2). According to analyst estimates, of the \$1 trillion of debt maturing in the US CRE market in 2024 and 2025, the refinancing gap exceeds \$300 billion.

Market-based CRE financing has also slowed dramatically, with the issuance of commercial mortgage-backed securities (CMBS) down 45 percent from the previous year and delinquencies of CMBS specializing in offices reaching 6.1 percent, up from 1.5 percentage points a year ago (Figure 1.11, panel 3 and panel 4, left). Banks' net charge-off rates for CRE loans also rose briskly (Figure 1.11, panel 4, right). Large near-term refinancing needs and further price declines could jeopardize the health of financial institutions with concentrated holdings in CRE. The share of real estate investment funds (REITs)—major holders of US CRE properties—with an interest coverage ratio (ICR) below 1—that is, REITs with cash flows not covering debt payments—increased in 2023 relative to previous years (Figure 1.11, panels 5 and 6).⁸ A concern is that 15 percent of REITs that specialize in the troubled office sector are potentially in debt distress, a 10 percentage point increase from the previous year.

An easing in financial conditions could aid the recovery in CRE markets, as capital growth and financial conditions are closely related (Deghi, Natalucci, and Qureshi 2022). Reduced interest rates should lower the financial burden on investors seeking to either fund fresh transactions or restructure existing

⁶In the United States, for example, current CRE net charge-offs represent a small fraction of the total loan portfolio (on aggregate, less than 1 percent). However, for some banks (including large banks), delinquency of nonowner-occupied loans over total CRE loans is above 5 percent, reaching up to 17 percent.

⁷Part of the divergence in price behavior between recent and past cycles may be attributed to the steep pace of monetary policy tightening, a factor that has contributed to the sharp increase in mortgage rates and CMBS spreads. Tightening has also notably slowed private equity fundraising (Deghi, Natalucci, and Qureshi 2024).

⁸The ICR is a metric widely used by practitioners to assess how easily firms can meet interest payments out of earnings. In this analysis, ICR is calculated as the ratio of EBITDA (that is, earnings before interest, taxes, depreciation, and amortization) to interest expenses on outstanding debt. Any ICR below 1 is a signal of severe distress. Debt at risk is therefore defined as the amount of debt attributable to firms with an ICR of less than one.

loans, fostering increased investment in the sector. That said, the scale of past rate hikes, higher labor and material costs, and structurally lower occupancy rates in some sectors suggest that challenges within the CRE sector may endure.

Concerns Are Mounting about Banks' Exposures to Commercial Real Estate

CRE loans make up a sizable portion of total bank loans in a number of banking systems around the world (Figure 1.12, panel 1). Most banks appear to have adequate loan-loss reserves and capital buffers to absorb potential CRE losses, but some have come under investor pressure recently. For example, the stock prices of a number of banks around the world declined precipitously after they announced losses or provisions on their US CRE portfolios. As the CRE sector grapples with declining property prices, rising vacancy rates, higher financing costs, and structural changes after the pandemic, banks have tightened lending standards in both the euro area and the United States (Figure 1.12, panel 2).

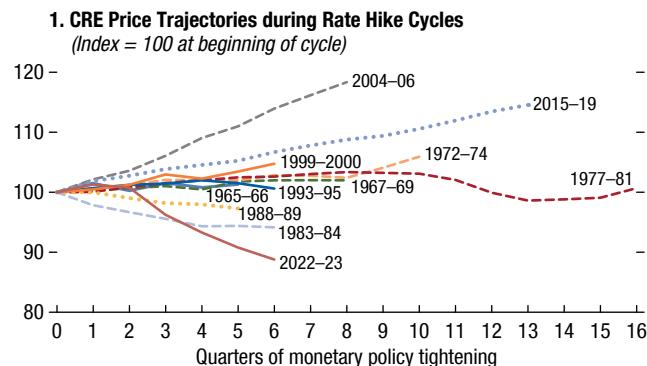
In the United States, where CRE loans make up about 18 percent of total bank loans, an estimated \$277 billion in CRE loans will mature in 2024, \$82 billion of which are backed by office properties (Mandtz, 2023). The nonperforming CRE loan rate for US banks by the end of 2023 had doubled from a year earlier, reaching 0.81 percent from just 0.40 percent at the end of 2022. Over the past year, banks have continued to increase provisions for CRE nonperforming loans, albeit at a slower pace than the rise in such loans. As a result, the CRE coverage ratio—that is, the ratio of loan-loss reserves to cover future losses to nonperforming loans—fell to 154 percent from 200 percent for the banking sector, with a more pronounced decrease for US global systematically important banks than for other banks (Figure 1.12, panel 3). Despite this decline, the coverage ratio remains relatively high, suggesting that banks are anticipating higher delinquencies, defaults, and charge-offs within their CRE portfolios.

Credit losses are expected to vary across CRE categories, geographic regions, and bank sizes. The proportion of office loans with a high probability of default in major metropolitan areas, for example, indicates substantial regional differences.⁹ San Francisco, Seattle,

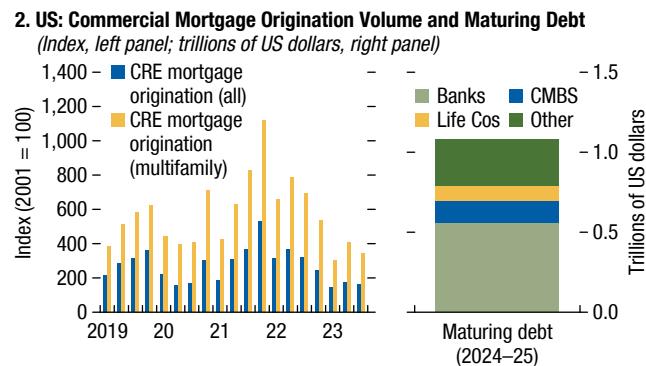
⁹“The proportion of office loans with a high probability of default” refers to criticized rate, which is defined as the share of criticized office loans to total loans calculated by Mandzy (2023).

Figure 1.11. Vulnerabilities in the US Commercial Real Estate Market

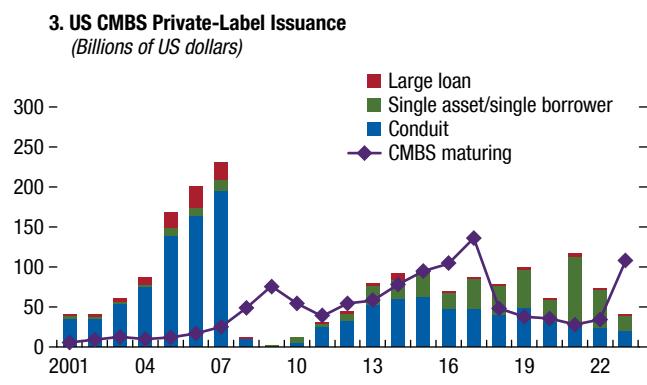
CRE valuations have plummeted more in the present monetary policy tightening cycle than in previous episodes.



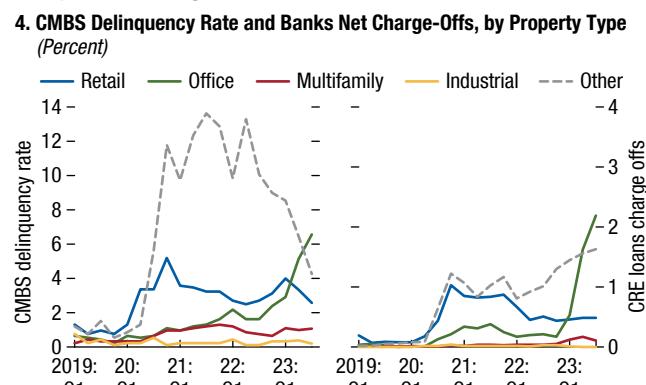
Commercial mortgage originations have declined ...



... and maturing CMBS have exceeded new issuance ...

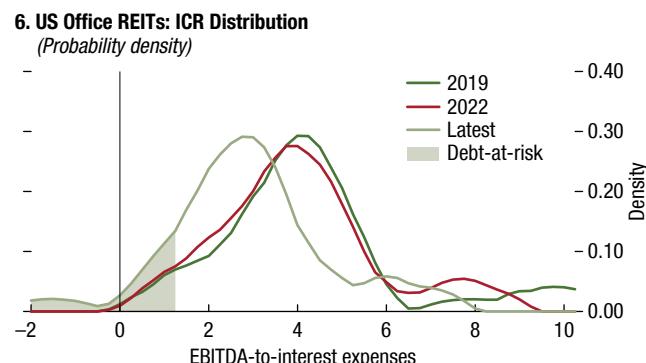
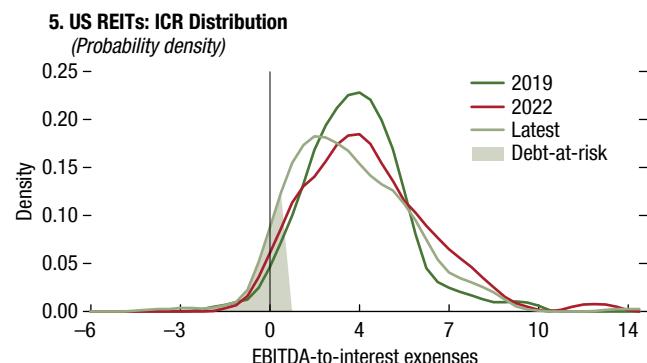


... while delinquencies in the office sector and bank net charge offs in multiple sectors surged.



A decline in CRE valuation could put further pressure on financial institutions with concentrated holdings in the sector, like REITs ...

... especially REITs owning and managing office space.

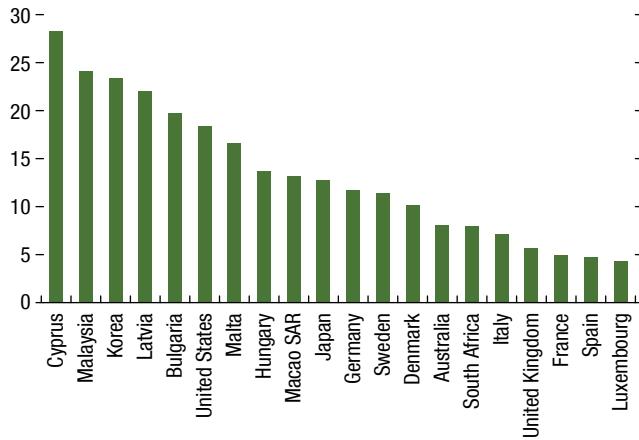


Sources: Bloomberg Finance L.P.; Haver Analytics; Mortgage Bankers Association; MSCI Real Estate; S&P Capital IQ; Trepp T-ALLR; and IMF staff computations.

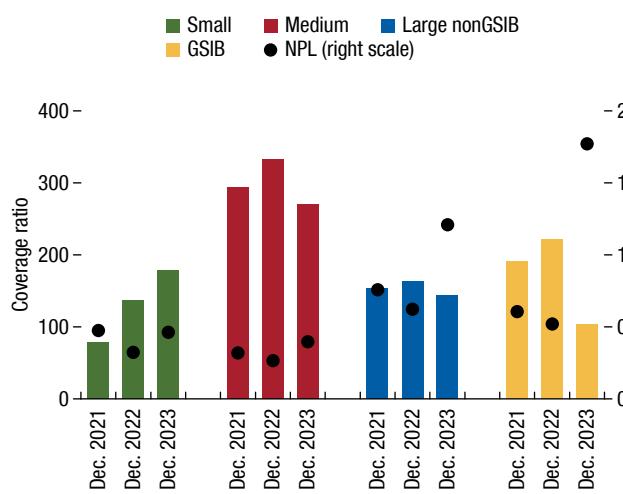
Note: Panel 2 shows a CRE loan origination volume index by property type. The indexes are reported relative to the year 2001, with the average quarterly volume in that year defined as a value of 100. Panels 5 and 6 show the distribution of the ratio of EBITDA-to-interest rate expense (that is, ICR) across REITs and REITs specialized in office space, respectively. Distribution is based on yearly average of ICR across US REITs. "Latest" refers to 2023 up to the third quarter. Debt-at-risk corresponds to the debt of firms' with ICR below 1 debt at risk for (shaded area). CMBS = commercial mortgage-backed securities; CRE = commercial real estate; EBITDA = earnings before interest, taxes, depreciation, and amortization; ICR = interest coverage ratio; Life Cos = life insurance companies; REITs = real estate investment trusts.

Figure 1.12. Banking Exposures to Commercial Real Estate

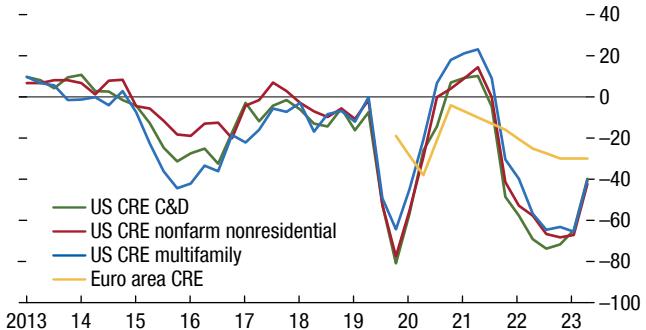
Some banking systems have significant CRE exposures.

**1. Commercial Real Estate Exposure to Total Loans
(Percent)**

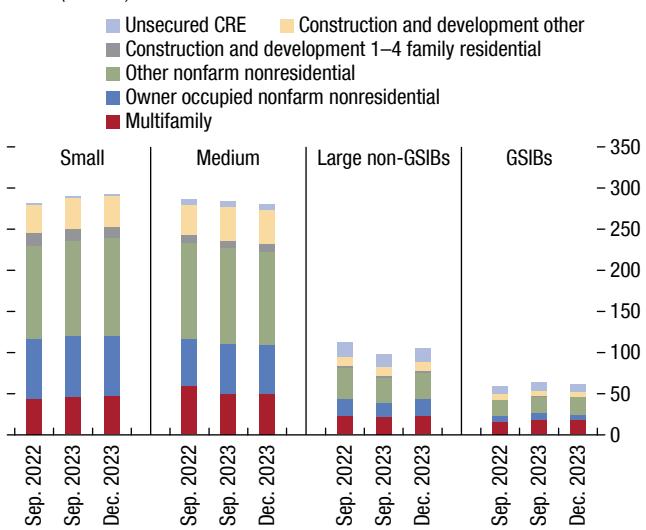
CRE NPLs are rising while coverage ratios are falling across most banks in the United States subcomponent of CRE across banks in the United States.

**3. CRE Coverage and NPL Ratios
(Percent)**

CRE lending standards tightened both in the euro area and the United States.

**2. CRE Lending Standards
(Percent of net respondents)**

Nonfarm nonresidential loans, which includes office, represent the largest subcomponent of CRE across banks in the United States.

**4. CRE Segment Exposure to Tier 1 Capital
(Percent)**

Sources: European Central Bank; Federal Financial Institutions Examination Council; Federal Reserve; Haver Analytics; IMF, Financial Soundness Indicators; and IMF staff calculations.

Note: In panel 1, the ratio is calculated using in the numerator loans collateralized by commercial real estate, loans to construction companies, and loans to companies active in the development of real estate; and gross loans as the denominator. Data are as of the third quarter of 2023, except Italy and Korea (2023:Q2), Australia and Germany (2023:Q1), and South Africa (2022:Q3). Some banking systems would have substantially lower ratios if non-CRE loans collateralized by commercial properties are excluded. The ratio does not fully capture the inherent risks from CRE, which also depend on other fundamental factors such as vacancy rates. In panel 2, positive values indicate looser standards; negative values indicate tighter standards. Panels 3 and 4 were calculated based on a data set including 4,528 banks accounting for 99.8 percent of total bank assets in third quarter of 2023 and followed the Federal Reserve's supervisory definition, small banks correspond to banks with less than \$10 billion in total assets, medium banks correspond to banks with assets between \$10 billion and \$100 billion, Large non-GSIB corresponds to large banks with assets above \$100 billion not classified as a GSIB, and GSIB corresponds to large banks classified as GSIBs. In panel 3, coverage ratio = loan loss reserves to NPLs; NPLs = nonperforming loans defined as noncurrent loans to total loans; the CRE breakdown corresponds to the Federal Financial Institutions Examination Council definitions. C&D = construction and development loans; CRE = commercial real estate; GSIB = global systemically important bank.

and Washington, DC, reported rates above 50 percent, whereas areas like Miami and San Diego reported values below 20 percent. Global systemically important banks (GSIBs) from the United States are more exposed to problematic office CRE areas in central business districts than are small banks (Glancy and Wang 2023). However, GSIBs have significantly smaller CRE exposures to Tier 1 capital (Figure 1.12, panel 4).

Nonperforming loans are expected to climb further in the coming quarters for several reasons—for example, in the United States, quarterly CRE non-performing loans and losses did not peak until nine quarters after the start of the global financial crisis in mid-2007.¹⁰ In addition, there remains a subset of banks that have exceptionally high CRE concentration for which losses could compromise their safety and soundness. One-third of US banks, mainly small and medium banks, with \$3.7 trillion in total assets, reported CRE exposures exceeding 300 percent of their Tier 1 capital plus the allowance for credit losses, including a large non-GSIB bank, which shocked its shareholders by reporting sizable provisions for CRE-related loan losses in its fourth quarter 2023 earnings release (Box 1.3).

Notable Pressures on Residential Real Estate in Some Countries

Since the October 2023 *Global Financial Stability Report*, residential home prices have continued to move modestly downward in most countries, although they are generally still above the pre-pandemic average (Figure 1.13, panel 1). The cooling of home prices likely reflects lower affordability and, by extension, demand, amid higher interest payments. Overall, declines in quarterly real house prices were more marked among advanced economies (-2.7 percent year over year, based on latest available data) than in emerging markets (-1.6 percent), likely because mortgage rates have climbed substantially in some of these economies since the pandemic, restraining home purchase activities (Figure 1.13, panel 2). The Chinese property market has fared worse than other countries, although for reasons

¹⁰The conclusion on nonperforming loans is based on the Federal Deposit Insurance Corporation's "Federal Quarterly Banking Profile" <https://www.fdic.gov/analysis/quarterly-banking-profile/>. Accessed February 26, 2024.

other than interest rate pressures (see the section "Chinese Asset Prices Face a Difficult Turnaround amid Weak Sentiment").

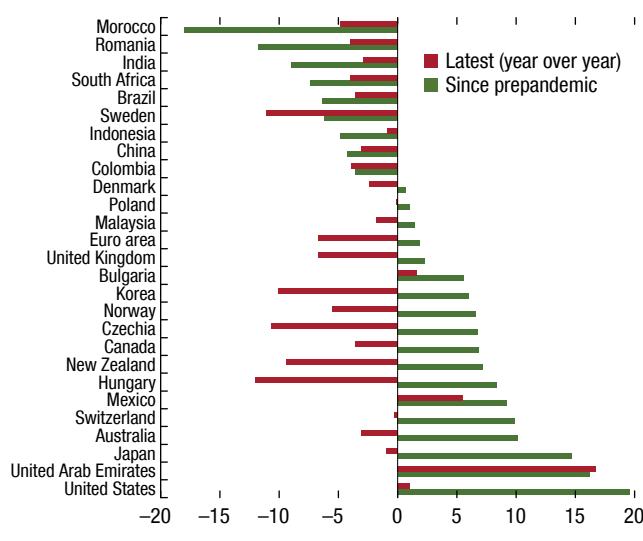
The cooling of home prices does not by itself suggest more elevated financial stability risks, which instead depend on whether the household debt burden is unsustainable. Debt sustainability ratios across advanced economy households are still at modest levels based on the latest data (the third quarter of 2023; Figure 1.13, panel 3, green bars). Assuming the average interest on households' outstanding debt increase further in the fourth quarter of 2023, in line with the average quarterly pace observed in 2023, debt service ratios could increase by up to almost 2 percentage points (Figure 1.13, panel 3, red dots). The effect would be larger in more leveraged consumer markets such as Denmark, The Netherlands, and Sweden.¹¹ In all, with a modest debt burden across countries, the risk of a surge in residential mortgage defaults remains contained. Underwriting standards have been more stringent since the global financial crisis, and the household sector's leverage never rebounded, which has helped to safeguard stability in the household sector.

In the United States, monthly home prices have risen by 6.1 percent since the beginning of last year (Figure 1.13, panel 4). This appreciation has been fueled by a dearth in the supply of homes, with the lock-in effect—homeowners with mortgages fixed at low rates being discouraged from changing homes given high prices and high new mortgage rates—playing a part (see the October 2023 *Global Financial Stability Report*). Although the demand for home purchases has been supported recently by mortgage rates declining from a peak of 7.8 percent to 6.8 percent, 30-year mortgage rates are still around 3 percentage points above pandemic lows. A smaller stock of consumer savings available for down payments also attenuates demand, and mortgage originations are 21 percent lower than one year ago (Figure 1.13, panel 4).

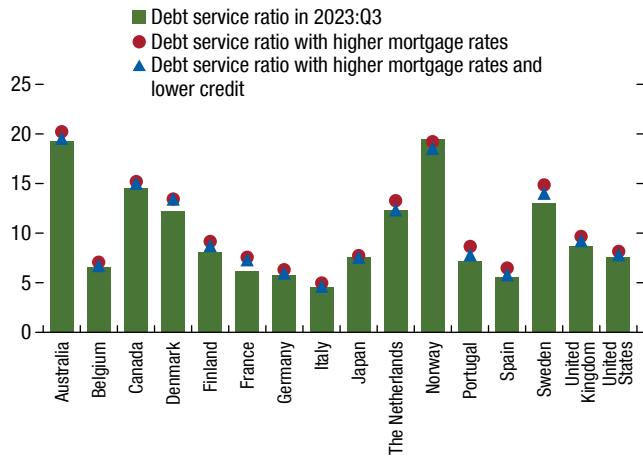
¹¹The risks related to higher interest rates under two alternative scenarios for the fourth quarter of 2023 are mitigated by a large share of fixed-rate mortgages in some countries. The mortgage debt service interest rates use the reference mortgage rates from the G10 Accounts, a weighted average of the prevailing mortgage rates in each country, excepting Australia and Japan, for which a variable or floating rate is used, and Canada and the United States, for which a fixed 5-year and 30-year mortgage rate, respectively, are used.

Figure 1.13. Developments in Residential Real Estate Markets

Housing markets continue to feel the effect of the high interest rate environment.

1. Real House Price Growth, by Country or Region
(Percent, year-over-year)

Higher mortgage rates could result in higher debt to income ratios and a progressive deterioration in housing affordability which could spur a further home price correction.

3. Debt Service Ratio in Selected OECD Countries
(Percent)

Sources: Bank for International Settlements; Federal Housing Finance Agency; Federal Reserve Bank of St. Louis; Haver Analytics (G10 Accounts); National Association of Realtors; New York Fed Consumer Credit Panel/Equifax; and IMF staff calculations.

Note: In panel 2, the reference mortgage rate in each country is obtained from Haver Analytics, G10 Accounts. For Belgium, Denmark, Finland, France, Germany, Italy, The Netherlands, Spain, Sweden, and the United Kingdom, this is represented by a weighted average of the prevailing mortgage interest rates. For Canada, the reference rate is the five-year average residential mortgage lending rate, whereas for the United States, it is the 30-year fixed mortgage rate. The size of the bubble refers to the latest level of the reference mortgage rate in each country. Since pre pandemic refers to the average of the available quarters in 2023 versus the fourth quarter of 2019. Mortgage interest rates data for Australia, Norway, and the United States include information until the fourth quarter of 2023. In panel 3, the debt service ratio is defined as the ratio of interest payments plus amortizations to income, assuming debt is repaid in equal portions over the maturity of the loan (that is, no prepayments). The panel shows changes of debt-service to income ratios in the third quarter of 2023 (latest available), year over year, under two alternative scenarios for the fourth quarter of 2023. The first alternative scenario corresponds to an increase of the average interest rate paid on the outstanding stock of debt, ceteris paribus, based on the average change in mortgage rates across jurisdictions since 2023. The second alternative scenario shows instead the same increase in mortgage rates against a continuation of a credit slowdown, obtained projecting the latest year-over-year credit growth into the fourth quarter 2023. In the case of Norway, the reference credit growth is the second quarter of 2023. The average remaining maturity of household debt across countries is assumed equal to 18 years. Income is proxied by households' gross disposable income that proxies for the amount of money available to households to pay debt service costs, consistent with the definition by the Bank for International Settlements. In panel 4, monthly US house prices are interpolated at quarterly frequency. OECD = Organisation for Economic Co-operation and Development.

A rebound of home prices could prove a headwind to central bank efforts to control inflation, as prices remain higher than pre-pandemic levels.

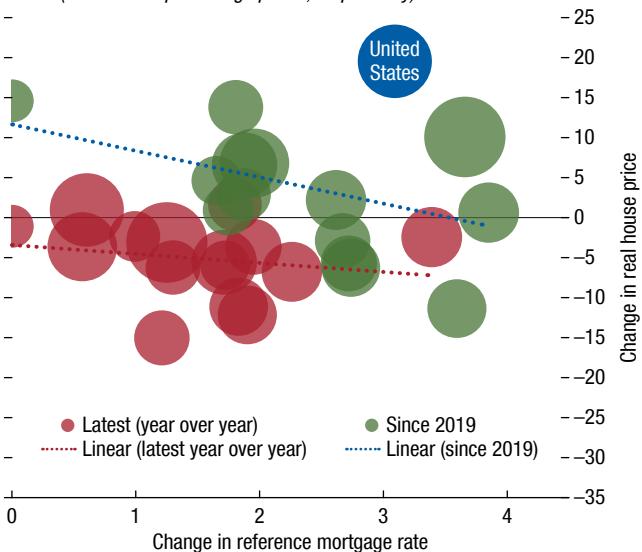
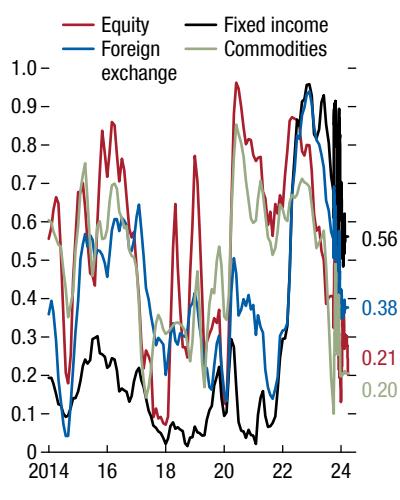
2. Change in Real House Price and Reference Mortgage Rates in Selected OECD Countries
(Percent and percentage points, respectively)

Figure 1.14. Cross Asset Volatility

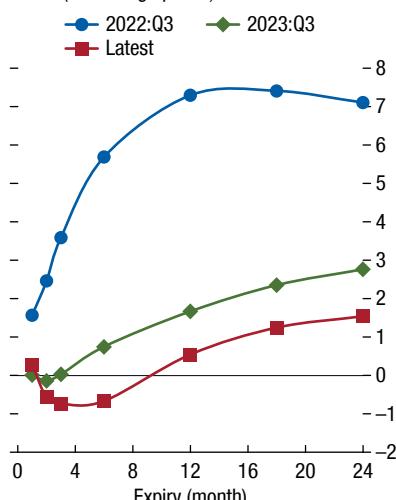
An optimistic policy and economic outlook has compressed volatility across asset classes.

1. Cross-Asset Implied Volatilities (Percentile since 2001)



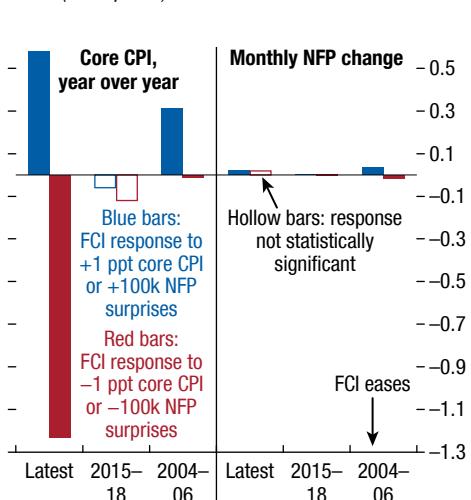
Volatility risk premiums are now deeply in negative territory, suggesting some risks of complacency.

2. Spread between S&P 500 Option-Implied and Model-Based Volatility (Percentage points)



However, financial conditions appear responsive to data surprises, especially inflation surprises.

3. Sensitivity of US Financial Conditions Index to Core Inflation and Nonfarm Payroll Releases (Index points)



Sources: Bloomberg Finance L.P.; and IMF staff calculations.

Note: Panel 1 shows the average percentile of implied volatility against own history across asset classes in Europe, Japan, the United States, and emerging markets. Commodities include implied volatility of oil and gold as well as 180-day realized volatility of weekly returns for bitcoin. Panel 2 shows the difference between S&P option-implied volatility and a forward-model-based volatility estimated using the Glosten-Jagannathan-Runkle generalized autoregressive conditional heteroskedasticity model. Panel 3 displays the coefficients of regressions of the change in the Goldman Sachs US FCI on core CPI and NFP surprises. CPI = consumer price index; FCI = Financial Conditions Index; NFP = nonfarm payroll; ppt = percentage point.

Compressed Volatility and High Cross-Asset Correlations Could Amplify Repricing Risks

Volatility has declined to multiyear lows for most asset classes (Figure 1.14, panel 1), likely reflecting increased optimism that the global hiking cycle is near its end while the global economy has remained largely resilient. Volatility risk premium, measured as the spread between market-implied volatility and model-based fair value, have fallen across maturities since the October 2023 *Global Financial Stability Report*. Shorter-dated volatility risk premiums are now deeply in negative territory, similar to levels just before the start of the tightening cycle in 2022 (Figure 1.14, panel 2). These low levels of premiums may reflect investor complacency, thereby exacerbating any sudden reassessment of the policy or economic outlook.

Low volatility has masked financial conditions becoming more responsive to economic data releases in this hiking cycle than in past ones. Intraday financial conditions, in particular, move appreciably in response to core consumer price index surprises, defined as the

actual core inflation number minus the Bloomberg survey median, likely reflecting investor attention to the Federal Reserve's data dependence (Figure 1.14, panel 3). Sizable inflation surprises may therefore abruptly change financial conditions and rapidly decompress the low asset price volatility.

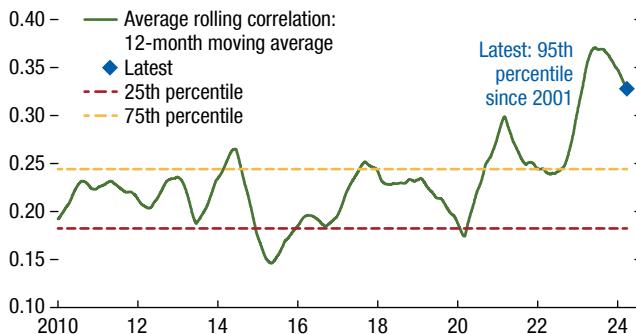
In contrast to the low asset price volatility, the average correlation across advanced economy and emerging market equities, bonds, credit, and commodity indices is high, exceeding the 90th historical percentile (Figure 1.15, panel 1). Shocks hitting correlated markets could cause simultaneous price reversals and contagion, as movements in one asset class can quickly spill over into others.

A key reason for the concerted rise of asset correlation is the increase in passive investing and hedge fund activities focused on index-level products. The use of passive investing vehicles, such as exchange-traded funds (ETFs), has increased significantly (Figure 1.15, panel 2), with ETFs focused on high-yield and emerging market bonds more sensitive to market-wide proxies, such as S&P 500 returns, than their respective underlying

Figure 1.15. Cross-Asset Correlations and Some Structural Factors

Average cross-asset correlations are elevated, heightening the risk of contagion.

1. Average Rolling Cross-Asset Correlation (12-month moving average)



... and its greater sensitivity to broader market indices may help boost cross-asset correlations.

3. Average Correlation to the S&P 500 Index

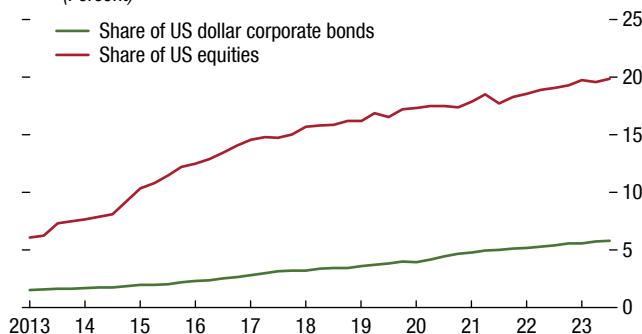


Sources: Bloomberg Finance L.P.; Federal Reserve; Securities Exchange Commission; and IMF staff calculations.

Note: The average cross-asset correlation in panel 1 is calculated using daily returns over a six-month period on the following proxies: the S&P US Treasury Bond Current 10-Year Total Return Index, the S&P 500 Index, the MSCI EAFE Index, the MSCI Emerging Markets Index, the iBoxx USD Liquid Investment-Grade Index, the iBoxx USD Liquid High-Yield Index, the J.P. Morgan EMBI Global Core Index, the United States Oil Fund LP, and gold and silver US dollar spot prices. Panel 2 uses ETFs as the proxy for passive investing. This may potentially underestimate the overall share of passive investing as it does not include other vehicles such as index trackers that are also associated with passive investing. Panel 3 uses the iShares iBoxx \$ High Yield Corporate Bond and the iShares J.P. Morgan USD Emerging Markets Bond ETFs as the proxies for high-yield and emerging market bond ETFs. The iBoxx USD Liquid High Yield and J.P. Morgan EMBI Global Core indices are used as the proxies for the underlying high-yield and emerging market bond indices. This panel calculates a simple average of the correlation of both to the S&P 500 index. Panel 4 uses futures as a proxy for the trading of index level securities. ETF = exchange-traded fund.

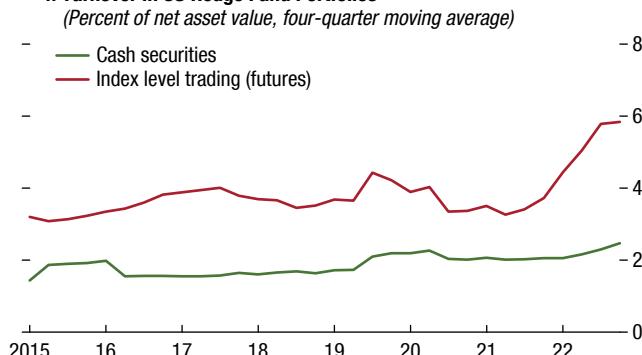
The rise of passive investing may reduce the relative importance of asset-specific fundamentals ...

2. Market Share of Passive Investing of US Equities and US Dollar Corporate Bonds (Percent)



Greater focus of hedge funds on trading index level securities may be another factor.

4. Turnover in US Hedge Fund Portfolios



indices (Figure 1.15, panel 3; see also Chapter 1 of the April 2018 *Global Financial Stability Report*). Similarly, hedge funds appear to have shifted from picking individual securities—sometimes as contrarians to the broader market, thereby supporting asset price differentiation—to increasing their trading of index-level securities, such as futures, options, and ETFs (Figure 1.15, panel 4). This shift has exposed hedge funds to common shocks across financial markets rather than to asset-specific fundamentals. The assets of multi-strategy hedge funds that are more likely to trade index-level securities have grown significantly in recent years, increasing to almost

\$700 billion from \$356 billion in 2020.¹² These hedge funds are also active participants in leveraged basis trade (see the section “Leveraged Positions in Treasury Markets Have Remained Large”), having increased their financial leverage significantly during the past decade.¹³

¹²Multi-strategy hedge funds’ share of total hedge fund assets has risen to 14 percent from 9 percent in 2020, according to data from BarclayHedge.

¹³The ratio of gross notional exposure of derivatives to net asset value for multi-strategy hedge funds rose to 14.8 in the second quarter of 2023 from 5.5 in the fourth quarter of 2014.

Medium-Term Vulnerabilities

Beyond these more immediate concerns, other medium-term fragilities are accumulating along the last mile.

The Resilience of Major Emerging Markets May Be Tested

Most major emerging markets have shown resilience to the external environment. Inflation has eased markedly in many emerging markets, having responded to early and proactive monetary tightening (Figure 1.16, panel 1), most notably in Latin America. There, measures of core inflation peaked in early 2023 and have continued to decline for most economies. On average, emerging market central banks have raised policy rates by 780 basis points from trough to peak after the pandemic, compared with an average increase of just 400 basis points by advanced economy central banks. Many emerging markets have already started their cutting cycles, given the improving inflation outlook. Early tightening widened the average nominal interest rate differential between emerging markets and the United States to over 6 percentage points. Real rates also rose on an ex ante basis (Figure 1.16, panel 2). As a result, emerging market currencies experienced modest volatility against the dollar, even as advanced economies hiked rates. Volatility did rise substantially for currencies in Latin America and in Central and Eastern Europe, Middle East, and Africa (CEEMEA) when advanced economies began rate hikes, but declined soon after (Figure 1.16, panel 3). For Asian currencies, volatility has been low throughout the cycle.

Portfolio flows to emerging markets have recovered since the October 2023 *Global Financial Stability Report*. The IMF's measure of capital flows-at-risk improved on the back of constructive investor sentiment. Flows to local currency bond and equity markets in emerging markets (excluding China) were robust in the final quarter of 2023, before softening in early 2024. Chinese portfolio inflows have rebounded somewhat in recent months (Figure 1.16, panel 4). Across all emerging markets, the estimated likelihood of outflows over the next year declined from 32 percent to 27 percent, and the 5th percentile of one-year-ahead capital outflows fell to 2.3 percent of GDP (Figure 1.16, panel 5).

With inflation abating in major emerging markets, many central banks have started to cut interest rates.

Since the start of 2023, Latin American interest rate differentials compared with the United States—which has yet to cut rates—have declined by nearly 200 basis points on average, led by Brazil and Chile, while in CEEMEA, the average differential has declined by about 120 basis points (Figure 1.16, panel 6, solid blue line).

At this juncture, the key question is whether emerging market resilience is at a turning point—that is, will diminishing interest rate differentials lead to exchange rate depreciation and capital outflows anew? In fact, there are reasons to believe that narrowing rate differentials will not abruptly sour investor sentiment toward major emerging markets, as they appear to have already priced this in (Figure 1.16, panel 6, dashed lines). For Asia excluding China and CEEMEA, expectations for one-year-ahead interest differentials peaked in the first and third quarters of 2022, respectively, and have been on the decline since, indicating that investors anticipated emerging market central banks to be ahead of the United States in cutting rates. Latin American markets correctly predicted a year before that policy differentials would peak in late 2022. The market has therefore acknowledged the progress that countries have made in their fight against inflation, which has kept currency volatility, capital outflows, and other external pressures at bay. This has allowed major emerging markets to focus monetary policy on inflation.

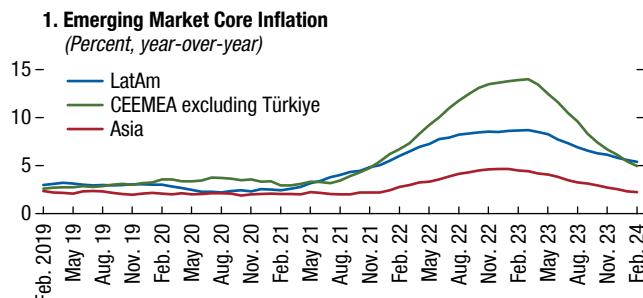
That said, investors could also be too sanguine about the gradual pace at which policy rate differentials close. External pressures on emerging markets could emerge if policy rate differentials turn out narrower from what is currently priced in, especially if advanced economies keep rates higher than anticipated to fight stubbornly high inflation. Historically, emerging markets have also faced spillovers of term premium shocks in the United States (see the section “Longer-Term Interest Rates Have Declined Globally”). Should this scenario play out, countries with strong current accounts, fiscal credibility, and relatively lower short-term debt will tend to face more moderate capital flow (Fratzscher 2012). The strength of institutional frameworks and the depth of domestic capital markets can also plausibly impact emerging market resilience to external financial stress.

Another area of concern is geopolitical developments in the Middle East and North Africa (MENA). An escalation of current conflicts could trigger a repricing of emerging market sovereign risk, resulting

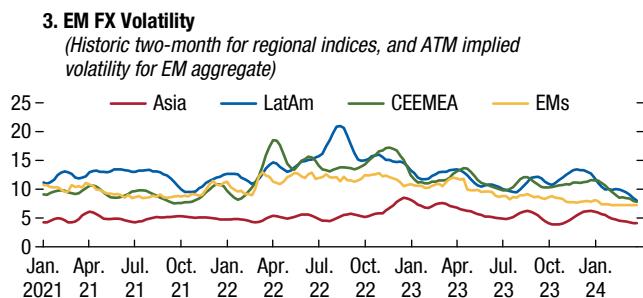
Figure 1.16. Emerging Market Inflation, Interest Rates, and Portfolio Flows

Inflation decelerated quickly in many emerging market economies in response to earlier and more proactive monetary policy tightening ...

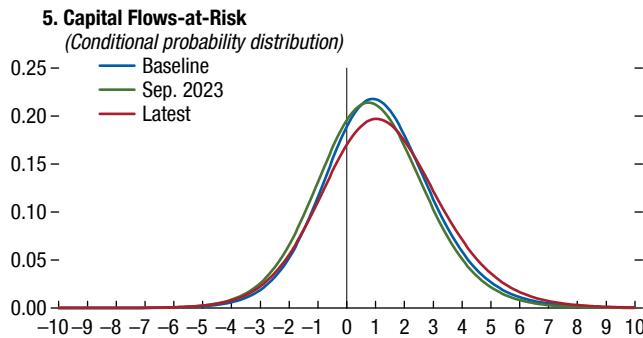
... resulting in large, positive ex ante real rates, particularly in Latin America and CEEMEA.



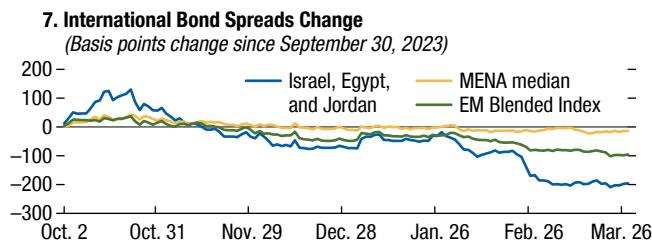
EM FX volatility has declined and remained relatively contained even as advanced economy interest rates rose sharply.



Capital flow-at-risk has improved on the back of improved risk sentiment, with the conditional probability distribution shifting toward inflows.



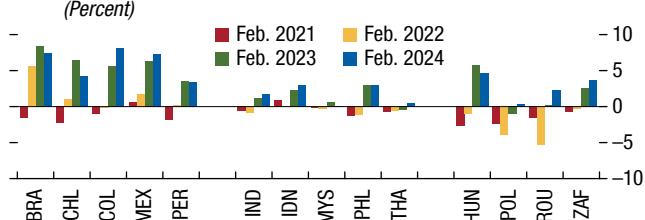
Funding conditions in MENA have improved, alongside broader EMs, indicating that contagion risk is contained.



Sources: Bloomberg Finance L.P.; J.P. Morgan; and IMF staff calculations.

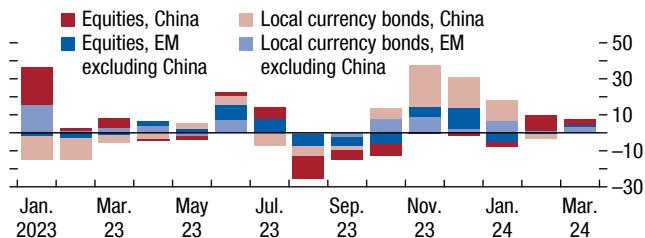
Note: In panel 1, the figures are an average of regional core consumer price inflation. In panel 2, ex ante real rates are computed using market expectations of year-ahead inflation, and the percent is the difference between policy rate and consensus inflation forecasts. In panel 3, the regional indices are a simple average of historic two-month volatility for five countries in each region. The EM aggregate line is calculated by J.P. Morgan using three-month at-the-money implied volatility. In panel 7, EM Blended Index is 67% B rated and 33% A rated, reflecting the average rating of directly impacted economies. Data labels in the figure use International Organization for Standardization (ISO) country codes. Asia = India, Indonesia, Korea, Malaysia, Philippines, and Thailand; ATM = at-the-market; CEEMEA = Czechia, Hungary, Poland, and South Africa; CPI = consumer price index; EM = emerging market economy; FX = foreign exchange; LatAm = Brazil, Chile, Colombia, Mexico, and Peru; MENA = Middle East and North Africa.

2. Ex Ante Real Rates Difference between Policy Rate and Consensus Inflation Forecasts
(Percent)



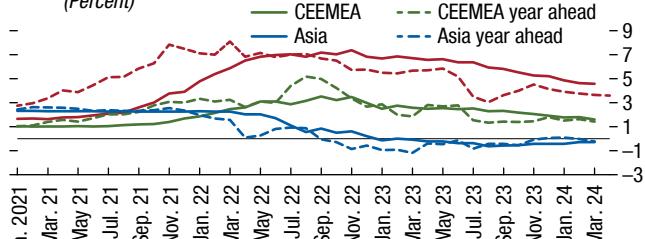
EM portfolio inflows accelerated in the fourth quarter of 2023 before moderating in the first quarter of 2024.

4. Portfolio Flow Tracking: Local Currency Bonds and Equities
(Billions of US dollars)



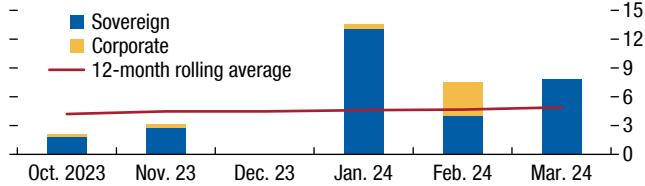
Markets have been pricing a declining interest rate differential in relation to the United States since early in 2022.

6. Average Difference in Policy Rate between EM and US (Solid Lines) and One-Year Ahead Average Differential Implied by Forward Rates (Dashed Lines)
(Percent)



Major MENA sovereigns and firms continue to tap international markets to raise funding.

8. MENA Hard Currency Sovereign and Corporate Issuances
(Billions of US dollars)



in tighter financing conditions, as markets reassess potential default risk amid heightened uncertainties. Nonetheless, market indicators suggest that contagion from the conflict remains contained for now. Despite initial heightening of risk aversion in October, energy prices and implied volatility have moderated. Hard currency bond spreads also tightened for most MENA sovereigns, some to levels even tighter than before the current conflict (Figure 1.16, panel 7). MENA issuers continue to access international markets despite the ongoing conflict (Figure 1.16, panel 8).

Investors Are More Attuned to Fiscal Sustainability Risks in Major Emerging Markets

Beyond near-term risks in emerging markets, signs indicate that investors are increasingly focused on medium-term fiscal sustainability. Emerging market local currency bond yields are still broadly trading near the upper end of their historical range on a nominal basis and, to a lesser degree, on an inflation-adjusted basis (Figure 1.17, panel 1). These yields could remain elevated in the years ahead, as investors demand additional compensation (that is, term premiums) for holding emerging market bonds instead of receiving US long-term real interest rates (Figure 1.17, panel 2).¹⁴ In several emerging markets, term premiums are now substantially higher than their prepandemic levels, together with higher expected short-term rates (Figure 1.17, panel 3).¹⁵ In the hard currency bond market, emerging markets across the ratings spectrum will also need to refinance or issue new debt close to current secondary market yields, which are significantly above the coupons paid on existing debt stock (Figure 1.17, panel 4).

Higher emerging market term premiums may also reflect the increase in bond supply in those countries. Averaged across emerging markets, net domestic local currency bond issuance is nearly 1 percentage point of GDP higher than in prepandemic years. Banks, and in some cases central banks, stepped in to absorb significant amounts during 2020–21 but have since

slowed their purchases, while foreign inflows have not been consistent in recent years (Figure 1.17, panel 5). Nonbank financial institutions have become influential buyers in several countries, although the depth of that investor base, allocation strategies, and regulatory frameworks vary considerably across countries (Figure 1.17, panel 6), offering no guarantee that those institutions will remain the marginal buyers of emerging market government bonds if policy or investor preferences change. Emerging markets facing the combination of sizeable expected debt issuance and uncertainty about who will absorb additional debt are more likely to experience market instability, even absent external shocks.

Even though emerging market hard-currency sovereign spreads narrowed recently—likely a result of the easing in global financial conditions (Figure 1.18, panel 1; see also the section “Financial Conditions Have Eased, but Bank Lending Standards Have Tightened in Some Countries”—market-implied default rates over the next five years remain higher than in 2019 for some sovereigns, even after adjusting for recent credit rating changes (Figure 1.18, panel 2). This suggests that investors have become more attuned to debt sustainability risks in the medium term, likely a result of pandemic-era fiscal expansions, higher debt burdens, and a disproportionate increase in the share of external borrowings by some emerging markets (Figure 1.18, panel 3). The persistent balance sheet erosion of some emerging market sovereigns over recent years, coupled with a lack of evident fiscal consolidation despite periods of robust economic growth, has ignited concerns about the adequacy of fiscal buffers to face future shocks.

Crucially, with interest rates settling at higher levels than before the pandemic, inflation coming down, and growth moderating (Figure 1.18, panel 4; see also the April 2024 *World Economic Outlook*), an increasing number of emerging market sovereigns have high real refinancing costs relative to economic growth (Figure 1.18, panel 5) and face large interest payments as a share of government revenues.¹⁶ Looking ahead, the gap between five-year-ahead real local currency interest rates—implied by long-term government bond yields—and consensus forecasts of real growth is expected to increase (as seen by the shift of the cross-country distribution of this gap in

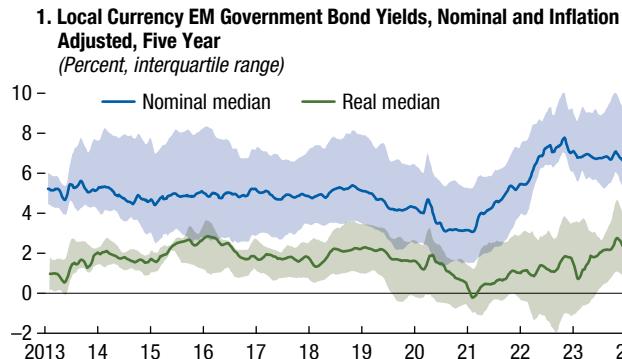
¹⁴Real financing rates are proxied by the real 5y10y-forward Treasury yield.

¹⁵Emerging bond yields are decomposed into term-premium and risk-neutral expected short-term rates, estimated by IMF staff using the Adrian, Crump, and Moench (2013) methodology. See also Chapter 1 of the April 2024 *Fiscal Monitor* for a more comprehensive spillover analysis of US longer-term yields to those in other countries.

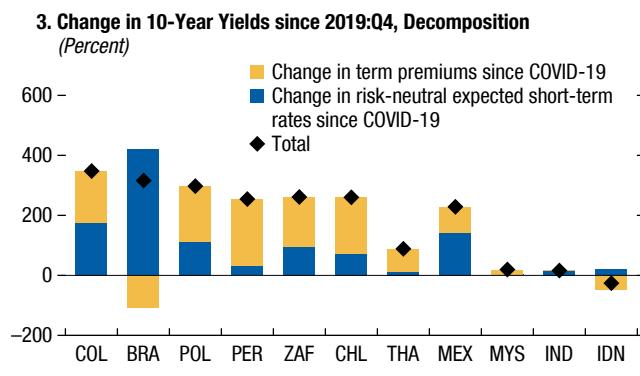
¹⁶Refinancing costs are proxied by consensus analysts' estimates of long-term real economic growth.

Figure 1.17. Emerging Market Bonds and Investor Base

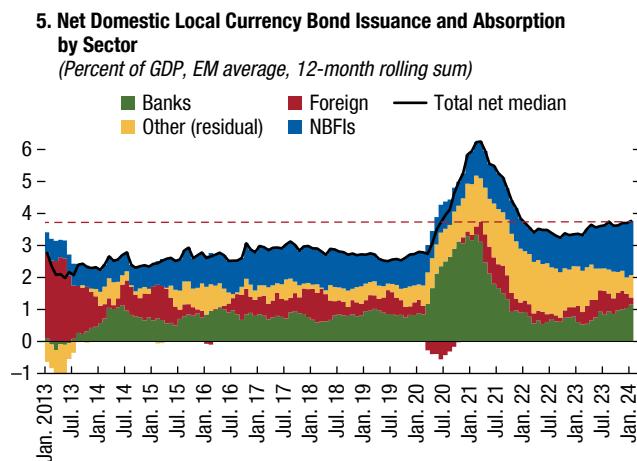
Local currency government bond yields remain high ...



Expected short-term rates and term premiums have risen on net since 2019 in many emerging markets.



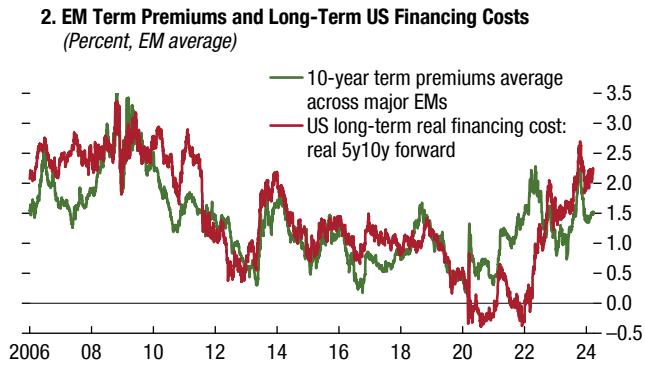
Net domestic bond issuance has remained fairly high, with nonbank financial institutions taking on a longer financing role in recent months.



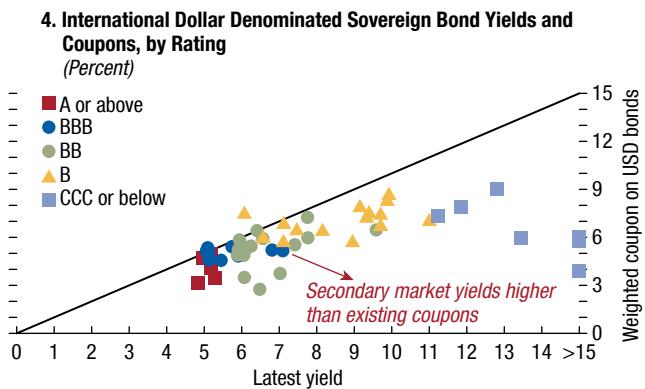
Sources: Bloomberg Finance L.P.; Consensus Economics; Haver Analytics; J.P. Morgan; national pension authorities; sovereign rating agencies; and IMF staff calculations.

Note: In panel 1, real yields are calculated using blended 1-year-forward inflation expectations based on Consensus Forecasts. In panel 2, yield decomposition is calculated by IMF staff using ACM methodology. Panel 4 calculates the weighted coupon for sovereign bonds (excluding quasi sovereigns) included in the JPM EMBIG or calculated individually as of January 2024. Panel 5 represents the change in monthly holdings of domestic local currency bonds by each sector, scaled by GDP, and averaged across 12 major EMs. The NBFI category generally includes insurance, pension, and investment funds where available, although definition differs somewhat across countries. BRA = Brazil; CHL = Chile; COL = Colombia; EM = emerging market; HUN = Hungary; IDN = Indonesia; IND = India; MEX = Mexico; MYS = Malaysia; NBFI = nonbank financial institution; POL = Poland; ROU = Romania; THA = Thailand; TUR = Turkey; ZAF = South Africa.

... and term premiums have tracked long-term real forward rates in advanced economies.



Secondary market yields on international dollar bonds are well above coupons on existing debt stock, implying higher debt servicing costs going forward.



The size of the domestic investor base and each sector's bond allocation varies considerably across countries.

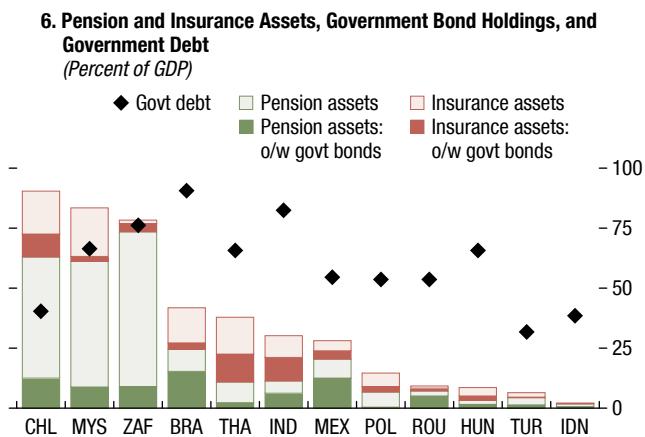
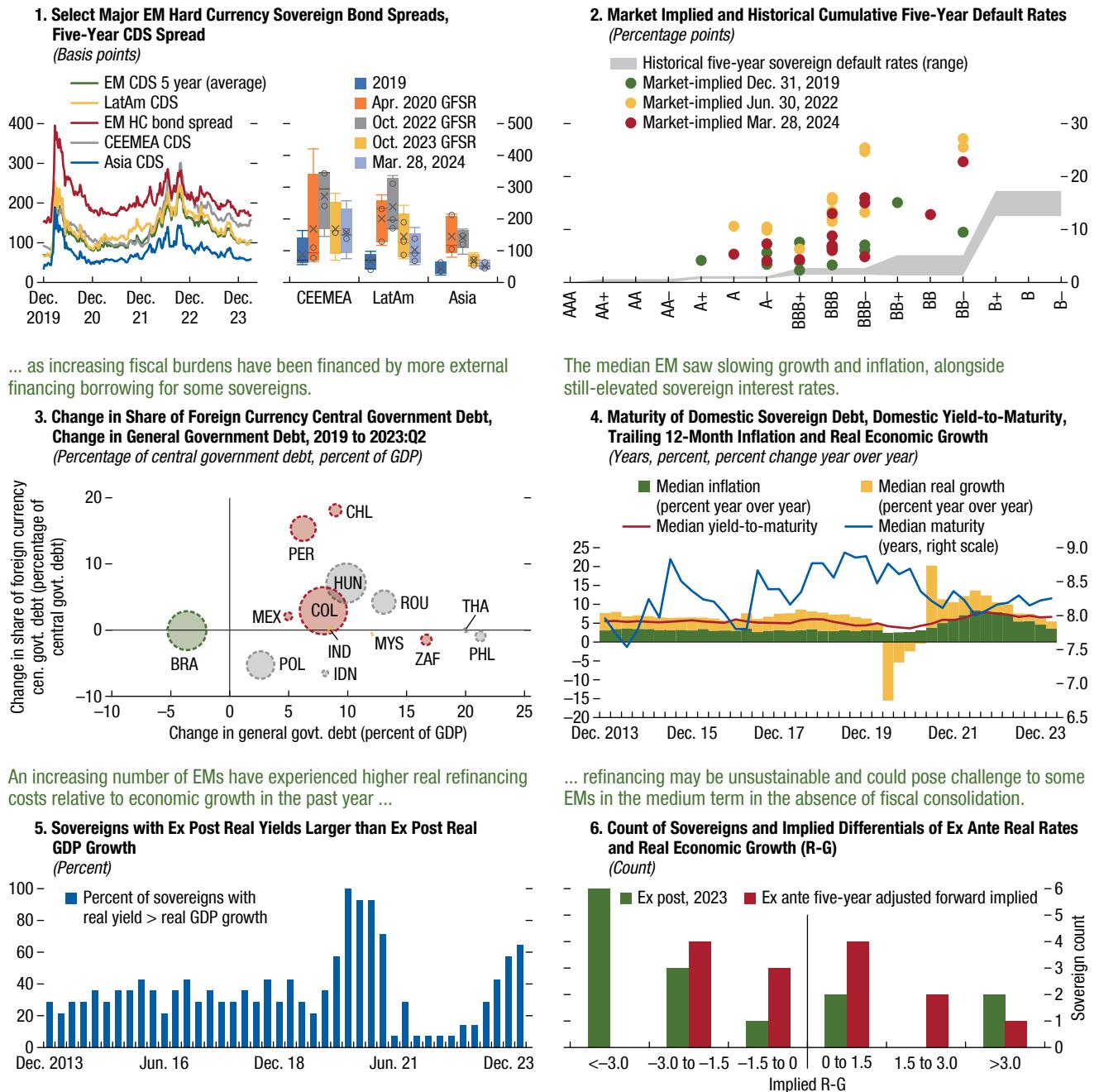


Figure 1.18. Investors Expect Debt Sustainability to Be Challenged in Coming Years

EM sovereign bond spreads have narrowed as global financial conditions eased ...



An increasing number of EMs have experienced higher real refinancing costs relative to economic growth in the past year ...

Sources: Arslanalp and Tsuda 2014; Bloomberg Finance L.P.; Consensus Economics, Inc.; Fitch Ratings; Moody's; S&P Global Ratings; and IMF staff calculations.

Note: Data for EM sovereign includes 14 major sovereigns and excludes China and the Russian Federation. Government debt securities refers to central government debt unless otherwise specified. Spreads in panel 1 are simple averages across 14 major sovereigns. In panel 2, implied market default rates are derived from pricing of five-year CDS spreads, with assumption of 50 percent recovery rate. Five-year historical default range is from Moody's, Fitch, and S&P sovereign default studies. The size of bubbles reflects the relative change in local currency five-year government yields. Sovereigns in red are those downgraded by at least one notch, yellow are those downgraded by at least one rating agency without changes to the average rating, and green are sovereign upgraded by at least one notch. For Hungary, credit ratings were upgraded by one agency and downgraded by another agency during the period. Average rating changes are from the past three years. Average maturity of local currency government debt in panel 4 is a simple average of 14 major sovereigns with all data as of March 28, 2024. Ex post real yields in panel 5 are local currency government financing rates and trailing 12-month inflation rate. Implied government financing rates in panel 6 are proxied by five year local currency government yields. Ex ante estimates consider consensus 5-year estimates of real economic growth and inflation, while projected refinancing rates are reflected by the local 5y5y forward, adjusted for differences in term premiums as of December 31, 2023. Data labels in the figure use International Organization for Standardization (ISO) country codes. CDS = credit default swap; CEEMEA = Central and Eastern Europe, Middle East, and Africa; EM = emerging market; GFSR = Global Financial Stability Report; HC = hard currency; LatAm = Latin America.

Figure 1.18, panel 6).¹⁷ Without fiscal consolidation, more sovereigns will find it difficult to service debt, see their fiscal buffers dwindle, and face even higher sovereign interest rates. A “debt begets more debt” vulnerability may therefore be building, particularly in a high-for-longer interest rate environment.

Frontier Economies and Low-Income Countries Still Face Debt Challenges

Financing conditions for frontier and low-income countries have improved as lower secondary market yields—a combination of reduced spreads and the decline in Treasury yields—have made issuance more affordable. High risk-free interest rates combined with investors’ cautiousness about riskier sovereign bonds had depressed demand for debt from these countries. In contrast with the significant issuance from frontier economies in the years immediately preceding rate hike cycles of major central banks, issuance was minimal throughout 2022 and 2023. Net issuance—gross issuance minus maturing bonds—has essentially been zero over the past year (Figure 1.19, panel 1). Yields on bonds from these countries remain much higher than those that prevailed before the current advanced economy hiking cycle, but they have fallen markedly in recent months. In the first quarter of 2024, several frontier economies have taken advantage of the improved market conditions to issue new debt or roll over upcoming maturities.

Even though the backdrop for frontier economies and low-income countries is not favorable, the spread these issuers need to pay has narrowed in recent months. High-yield sovereigns—consisting of frontier economies and low-income countries—have outperformed investment-grade sovereigns in recent months after reaching historically high levels in 2023, largely driven by easier global financial conditions. Progress in certain restructuring cases has also served as a tailwind. In late 2023, Zambia negotiated a deal with its international bondholders but was set back by the lack of agreement with other creditors. Earlier in 2024, Ghana reached a deal with its official creditors, paving the way for the sovereign to come to terms with bondholders.

¹⁷Refinancing rates are reflected by the local currency 5y5y forward, adjusted for differences in term premiums as of December 31, 2023. Consensus analysts’ growth and inflation expectations over the next 5 to 10 years are used, except for South Africa, where the short-term (2025) estimates are used because of a lack of data.

This improvement in financing, if sustained, is occurring at a critical time, with a substantial amount of hard currency bonds maturing in coming quarters. Frontier issuers were able to sell significant amounts of bonds from 2017–21, but most of that debt was relatively short-dated, with about half of the debt issued during that time having 10 or fewer years’ initial maturity. Frontier issuers have a combined \$30 billion in foreign currency bonds coming due in 2024 and 2025 (Figure 1.19, panel 2), about the same amount as aggregate debt that matured in the entire five-year period from 2019 to 2023. This is partly a result of fiscal responses to the pandemic, which ballooned total debt for frontier economies and low-income countries (Figure 1.19, panel 3). Even if markets will be receptive to rolling over these maturities, it is likely to be at much higher coupons than the debt they are replacing, placing a further fiscal burden on these countries in the coming years. The interest rate burden for these countries is already high by historical standards, as they have increasingly borrowed on commercial rather than concessional terms in recent years (see Chapter 1 of April 2024 *Fiscal Monitor*).

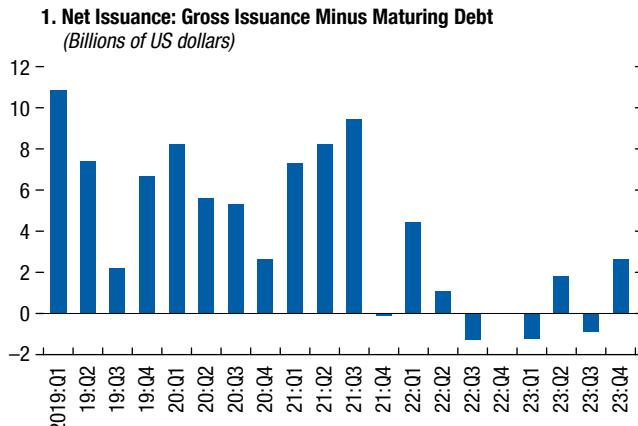
With external markets effectively closed during prior years, fiscal authorities have increasingly turned to domestic markets to obtain funding. For many low-income countries, this has meant that local banking institutions have significantly increased their holdings of sovereign debt, increasing potential risks from a sovereign bank nexus. This has been particularly true for low-income countries in Africa (Figure 1.19, panel 4). Should financing conditions tighten again, local markets in these countries could be pressured further.

Chinese Asset Prices Face a Difficult Turnaround amid Weak Sentiment

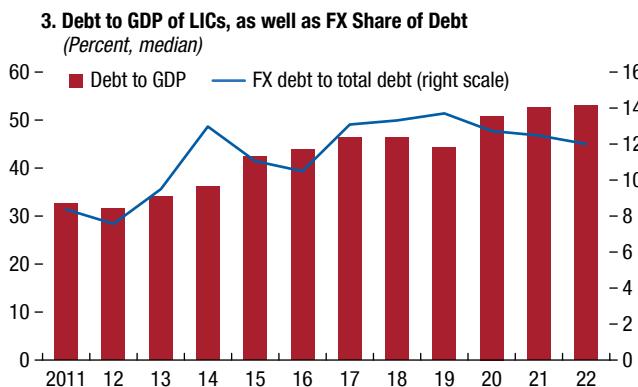
China’s housing market downturn has shown few signs of bottoming out. Declines in new home prices have been moderate to date compared with major correction episodes of the past (for example, Japan in the early 1990s) (Figure 1.20, panel 1). Yet existing home prices and activity measures such as starts, sales, and investments, have dropped off sharply. The limited new home price adjustment and the extended use of forbearance measures for struggling developers have restrained negative spillovers to banks’ balance sheets but have disincentivized debt restructuring crucial to a sustained recovery of the housing market.

Figure 1.19. Financing Still Challenging for Frontier and Low-Income Countries

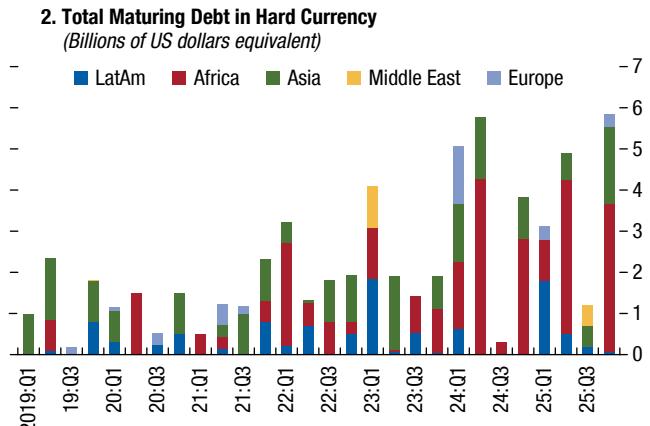
Total foreign currency issuance from frontier economies has barely kept pace with maturing bonds in recent years.



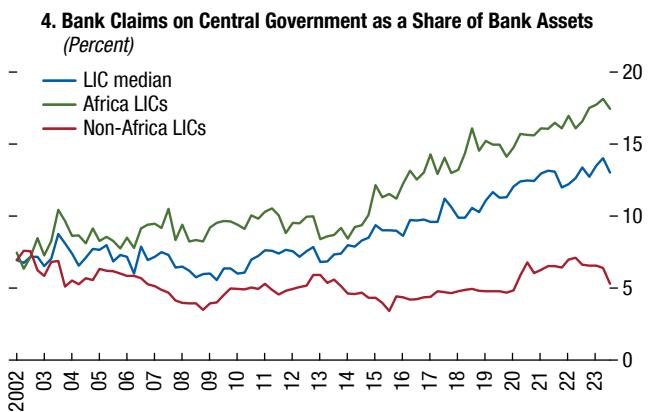
Total debt from LICs rose sharply, with foreign currency debt comprising a smaller share of the total.



Frontier countries will have large maturities of hard currency bonds in the coming quarters.



Domestic banks have been absorbing more of this sovereign debt, especially for African LICs.



Sources: Bloomberg Finance L.P.; Haver Analytics; IMF, International Financial Statistics; and IMF staff calculations.

Note: Panels 1 and 2 refer to frontier markets, which are defined here as countries with hard currency debt included in the J.P. Morgan NEXGEM (Next Generation Emerging Markets) index. The sample of countries for panels 3 and 4 are those classified as LICs by the IMF. Many LICs have never issued hard currency bonds. A list of LICs can be found at <http://www.imf.org/external/pubs/ft/dsa/dsalist.pdf>. FX = foreign exchange; LIC = low income country.

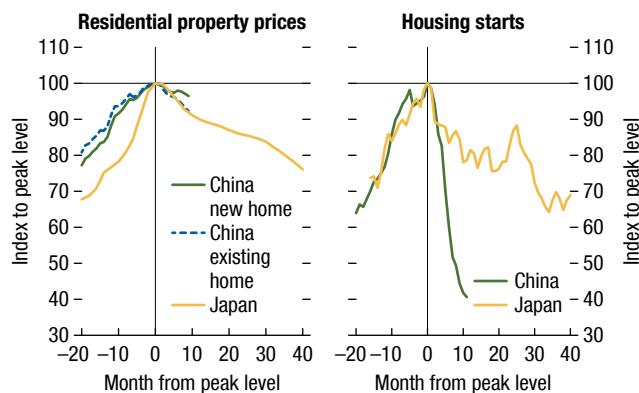
Other support policies over the past few months—including mortgage rate cuts, easing of home purchase restrictions, and promises for affordable housing and urban redevelopment—have had limited success in restoring homebuyer confidence.

As negative factors continue to dominate, financing conditions for the property sector remain tight in terms of both banks and market-based financing (Figure 1.20, panel 2), despite repeated official policy guidance for the financial sector to support the housing market. A large decline in presale revenues

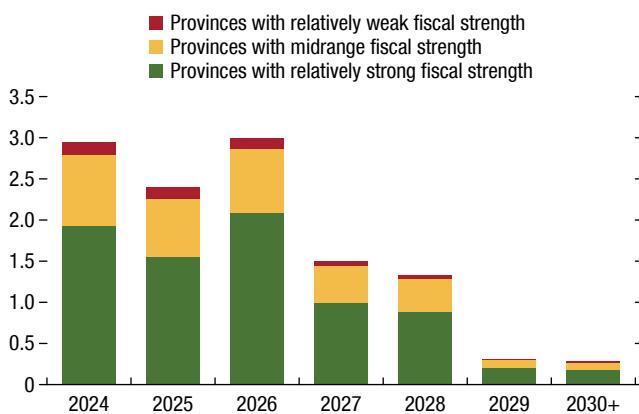
adds further challenges and may have prevented some construction projects from being completed. This has in turn depressed land-sale proceeds to local governments at a time when their off-balance sheet borrowing entities, local government financing vehicles (LGFVs), are due for large debt repayments over the next two years (Figure 1.20, panel 3). High debt-to-earnings ratios put most LGFVs' commercial viability in question, with those in financially weaker provinces also facing high financing costs (Figure 1.20, panel 4).

Figure 1.20. Property Market and LGFV Problems Have Not Improved

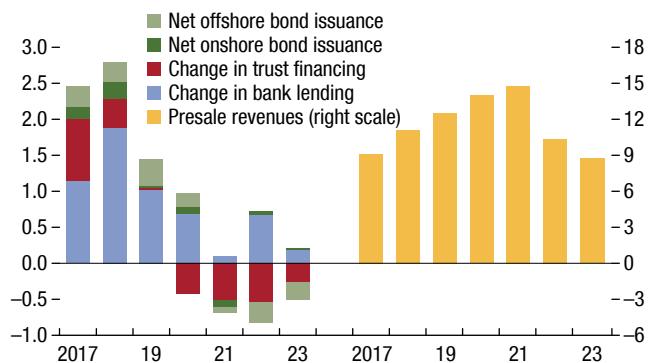
China's housing market correction continues.

1. China versus Japan's 1990s Housing Market Corrections

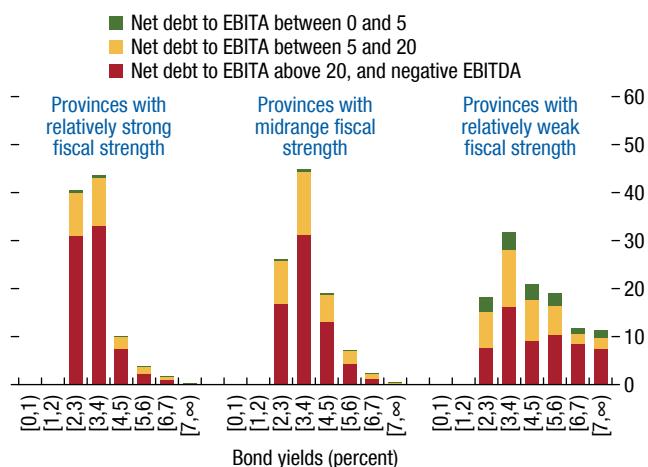
Despite policy support to ease short-term refinancing risks, debt-repayment pressure remains high for LGFVs.

3. Local Government Financing Vehicles: Bond Maturity Schedule (Trillions of renminbi)

Property developers' financing conditions remain tight, with their funding from the financial system unable to offset the decline in presale revenues.

2. Property Developers: Sources of Financing (Billions of renminbi)

LGFV from fiscally weak regions continue to face higher funding costs due to market perception of weaker government support.

4. Local Government Financing Vehicles: Bond Yields, by Provincial Fiscal Strength (Percent of outstanding bonds in each group of provinces)

Sources: Bloomberg Finance L.P.; CEIC; WIND; and IMF staff estimates.

Note: In panel 1, China residential price is based on the average of primary and secondary market price index from National Bureau of Statistics. Japan housing start is based on building construction started in square meters. In panels 3 and 4, the ranking of public finance conditions is based on local governments' general budget deficit and official debt. EBITA = earnings before interest, taxes, and amortization; LGFV = local government financing vehicle.

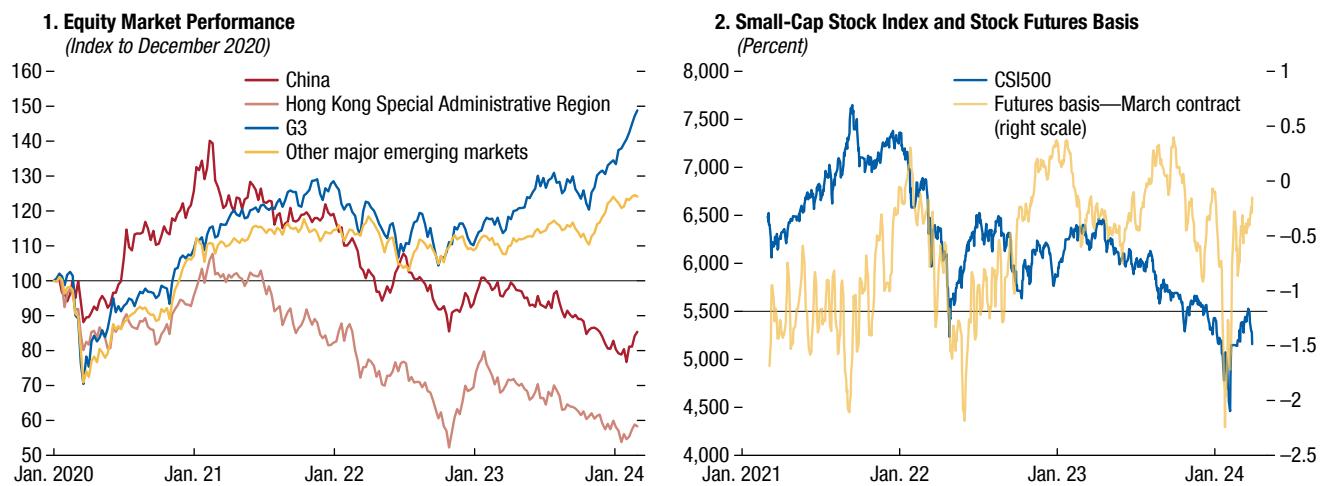
Reflecting property market ailment as well as disinflationary pressures, China's stock market has come under pressure in recent months. Despite the recent rebound, Chinese and Hong Kong SAR stock prices declined as much as 11 and 14 percent, respectively, since the October 2023 *Global Financial Stability Report*, in sharp contrast with the strong rally in global markets (Figure 1.21, panel 1). Concerningly, investors are not yet ready to "buy the bottom" despite a 45 percent decline since the peak in 2021

and a multiyear low valuation as measured by the forward-price-to-earnings ratio. This reflects investor disappointment about macro policy support, uncertainty in the property market outlook, and rising geopolitical risks. Sentiment remains fragile despite the authorities' measures to stabilize the markets since the third quarter of 2023.

The stock sell-off may have also been exacerbated by derivative products. The "snowball product" is a structured deposit product with embedded derivatives

Figure 1.21. Chinese Stock Markets under Pressure

Intensified pressure continues on concerns of slowing growth outlook and deflation risks.



Sources: Bloomberg Finance L.P.; and IMF staff calculations.

Note: CSI = Chinese Securities Index; G3 = Group of Three.

that offers high-net-worth investors bond-like coupons if the small cap China Securities Index (CSI) indices stay within a predetermined range, with options to use leverage to boost returns. If stock prices fall below that range, investors lose the coupon payment, and leveraged investors could face margin calls. Banks and security firms that sell these products—estimated at US\$45 billion outstanding—effectively have short positions on stocks, which they hedge by buying stock futures. As small cap CSI indices fell precipitously, partly because of lower liquidity, many leveraged investors failed to meet the margin calls, forcing the sellers to liquidate the products while unwinding their futures hedges, which in turn widens the stock-futures basis and further feeds into selling pressures (Figure 1.21, panel 2). Related products have also been marketed to offshore investors, such as the equity-linked investments popular in Korea and are, like options on the Hang Seng China Enterprise Index, leading to spillovers from Chinese to regional markets.¹⁸

Asset Managers at Chinese Nonbanks Are Hit by Property Sector and Stock Market Woes

The property market and equity fallout have created heavy losses in parts of China's large asset management industry. As of 2023, total assets under

A collapse in the futures basis may reflect the unwind of snowball options.

management across various products was ¥110 trillion or nearly 90 percent of GDP (Figure 1.22, panel 1). The 45 percent decline in the equity market since 2021 has reduced the net asset value of equity and hybrid mutual funds by over 20 percent, reflecting both valuation losses and redemptions. In addition, many trust products have experienced large losses over the past three years, resulting in widespread defaults of real-estate-focused trust products. That said, trust products are not allowed to use leverage, therefore, their financial spillovers have been limited, and their investor base consists mostly of institutions and high-net-worth individuals.

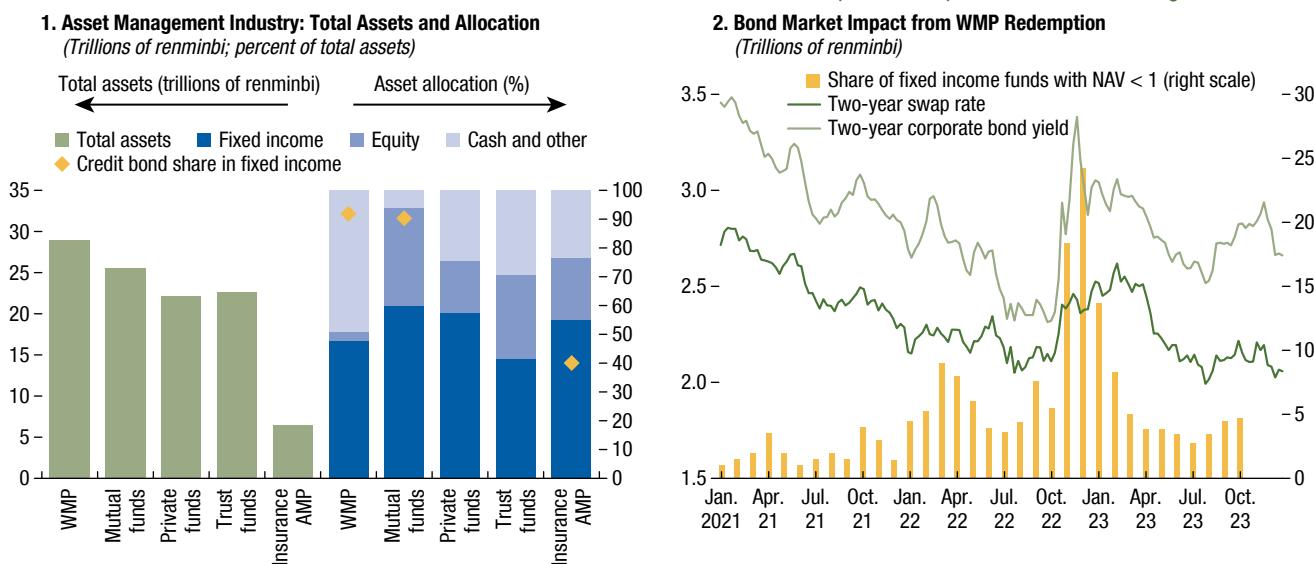
Unlike trust funds, wealth management products and investment funds focused on public sector debt could pose greater financial stability risks. Their combined size is three times as large as trust funds. Their large fixed-income exposures consist almost entirely of credit bonds,¹⁹ making them more vulnerable to credit risks and rollover risks in a corporate bond market for which the average maturity is only three years. Previous IMF staff analysis showed that LGFV and property bonds may account for a sizable share

¹⁸There is an estimated \$20 billion of equity-linked investments in Korean markets.

¹⁹Most Chinese corporate bonds are rated AA and above, as state-owned enterprises are the primary issuers. The domestic rating is not comparable to international standards, as domestic rating agencies place considerable weight on the perceived strength of implicit guarantees and the domestic ratings tend to be static. There is also limited risk differentiation except for those bonds rated below AA, even though those issuers are mainly not state owned.

Figure 1.22. The Chinese Asset Management Industry Is Large and Exposed to Risks

Asset management industry have high exposures to credit risks.



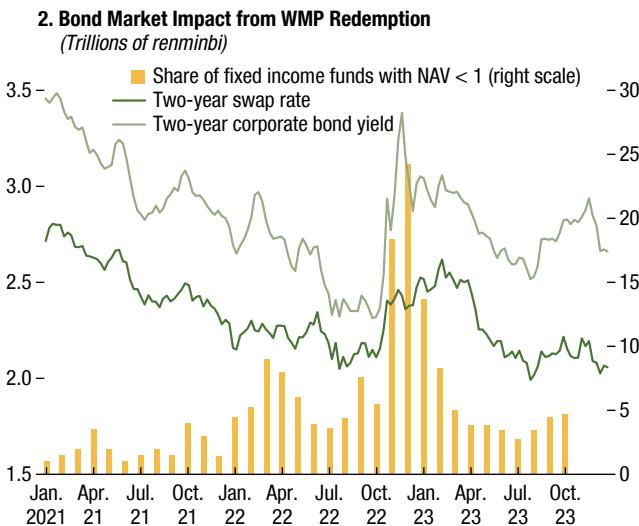
Sources: AMAC; Bloomberg Finance L.P.; China Trustee Association; China Wealth; and Insurance Asset Management Association of China.

Note: NAV = net asset value; WMP = wealth management product.

of the credit bond holdings of wealth management products, as they constitute about 25 percent of total assets under management for wealth management products and credit mutual funds (see the April 2023 *Global Financial Stability Report*). Moreover, the investor base is more retail focused and thus prone to run risks. For example, wealth management products are held almost exclusively by retail investors who are also bank depositors and lack experience handling investment volatility. The perils of these features were on full display in late 2022, when a spike in bond yields led to large-scale redemptions by retail investors who feared wealth management product losses, inducing further spikes in bond yields that spilled over to broader funding markets (Figure 1.22, panel 2). Large liquidity injections into the interbank market by the People's Bank of China stabilized redemptions and funding rates.

It is of concern that spillovers from asset management products may be higher now, given rising interconnectedness and higher financial leverage in the bond markets. Both interbank lending and lending between banks and nonbank financial institutions have increased notably in recent years. Financial leverage in

A credit shock could generate a negative feedback loop between losses and redemptions and spillover to broader funding market.



the interbank market, as proxied by repo transaction volume, has also risen sharply recently.²⁰ Shocks emanating from wealth management products and mutual funds could quickly spread to banks through tightening financial conditions in the credit and funding markets, with those that have higher wholesale funding exposures, such as the small and medium-sized banks, being more vulnerable.

Global Corporate Default Risk Might Be Underpriced by Markets

Since the October 2023 *Global Financial Stability Report*, global corporate earnings projections have been bolstered by prospects of a likely soft landing and expectations of monetary easing, reversing the downward trend in earlier quarters (Figure 1.23, panel 1). At a sectoral level, interest rate sensitive sectors such as the consumer discretionary showed the

²⁰Financial institutions have increased investment in the repo market, particularly the overnight repo. The repo rate remains below the policy rate, likely reflecting that the liquidity injected by the People's Bank of China through structural credit facilities has not been met by loan demand (the M1–M2 gap).

largest narrowing in credit spreads in accordance with gains in stock prices. Although equity prices in the energy sector underperformed due to lower oil prices, credit spreads still contracted as investors' assessment of the sector's creditworthiness was boosted by lower global interest rates (Figure 1.23, panel 2).

Spreads have narrowed even in riskier segments, owing partly to credit substitution. The proportion of CCC- or lower-rated firms in the speculative-grade corporate bond index was halved over the past decade (Figure 1.23, panel 3), as some firms that faced constraints in accessing bond markets issued other forms of debt, including private credit (Bank of England 2023a; April 2024 *Global Financial Stability Report*, Chapter 2). The departure of riskier firms has meaningfully improved the credit quality of the index.

But market pricing may not reflect true corporate credit risk, considering that credit substitution, reduced issuance, and strong inflows (for example, via open-end funds; see the section "Liquidity Mismatch at Open-End Investment Funds Is Rising") may have suppressed bond spreads. In actuality, the rise in corporate earnings since 2020 is losing momentum in most parts of the world (Figure 1.23, panel 4), and remains sensitive to economic growth and inflation developments as well as the transmission of monetary policy tightening. Reflecting these headwinds, corporate spread models such as the excess bond premium (Figure 1.23, panel 5) and IMF staff's cross-country corporate bond misalignment model (Figure 1.23, panel 6) suggest that corporate spread valuations are stretched and could face sharp upward adjustment should a soft landing not materialize. In the case of high-yield bonds, misalignments relative to the levels implied by fundamentals are severe for both US and euro area issuers by historical standards.

More Firms May Become Vulnerable in the Medium Term

Increasing evidence has shown that cash liquidity buffers for firms in both advanced economies and emerging markets eroded further over the course of 2023 (Figure 1.24, panel 1; see also the October 2023 *Global Financial Stability Report*), owing to still-high global interest rates. As of the third quarter of 2023, the share of small firms with a cash-to-interest expense ratio below 1 was around 33 percent in advanced

economies and 55 percent in emerging markets. If interest expense rises in line with current market yields, these shares would rise to 38 percent and 59 percent, respectively, pushing more firms into liquidity problems. Corporate bankruptcies have therefore steadily increased in the euro area, Japan,²¹ and the United States, led by smaller firms, amid policy support measures being scaled back (Figure 1.24, panel 2). Over the medium term, slowing economic growth in many parts of the world would also likely heighten corporate debt vulnerability.

Before global rate hikes, corporate issuers were able to reduce interest expenses by refinancing. However, a considerable amount of corporate debt will mature in the coming year across countries at interest rates significantly higher than existing coupon rates (Figure 1.24, panel 3), making refinancing challenging. Recent trends in credit ratings have reflected these concerns: net rating upgrades among investment-grade firms have fallen sharply on a market-cap-weighted basis, suggesting that credit quality is deteriorating even for large issuers (Figure 1.24, panel 4). Borderline corporates, or firms just above speculative grade, are at risk of becoming "fallen angels." Scenario analysis of US BBB-rated firms shows that even under a soft-landing scenario, by 2025, the probability of default will be higher for some firms, posing higher downgrade risks (Figure 1.24, panel 5).²² Many institutional investors with investment mandates focused on capital preservation may then be tempted to dump potential fallen angels, creating holes in these companies' funding profiles. It is concerning that even though the credit downturn has deepened, global private nonfinancial corporate credit growth is recovering rather quickly in this hiking cycle compared with previous ones, including the cycle before the global financial crisis (Figure 1.24, panel 6).²³

²¹In Japan, the recent rise in bankruptcies is not broad based but largely confined to specific sectors (for example, food services and retail, for which bankruptcies were subdued during the pandemic, possibly because of policy support measures).

²²US BBB-rated firms include BBB+, BBB, and BBB– issuers rated by S&P.

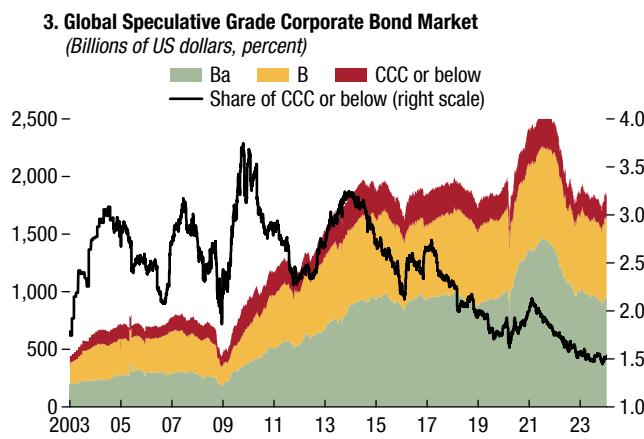
²³Negative credit growth during hiking cycles is a result of both a slowdown in originating new debt and a decline in the market value of existing debt (especially debt securities such as bonds) because of higher interest rates. The latter driver may lead to the large negative credit growth at the onset of this rate hike cycle, given how quickly global interest rates have moved up.

Figure 1.23. Corporate Earnings

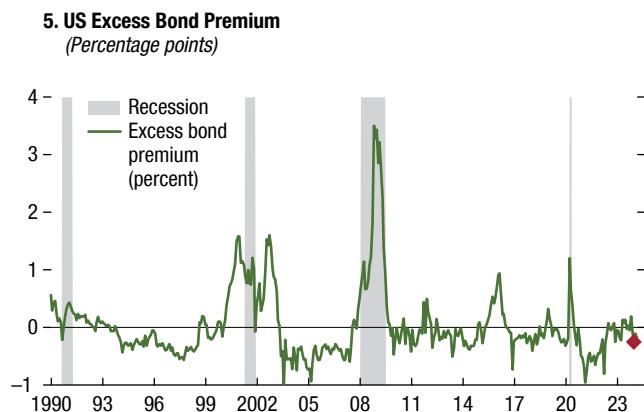
The growing expectations for the Federal Reserve's dovish pivot and soft landing of the economy boosted expected earnings.



The share of CCC or lower-rated corporate bonds halved over the last decade, improving the average credit quality of the universe, as private debts substitute a part of them.



Excess bond premium historically widens significantly in recessions.



Sources: Bloomberg Finance L.P.; Federal Reserve Board; Haver Analytics; Refinitiv DataStream; and IMF staff calculations.

Note: In panel 2, corporate sector spreads are based on Bloomberg Global Aggregate Corporate Bond Index. Real estate sector spread is proxied by Global Aggregate Securitization REIT Index spread. EPS = earnings per share; GFSR = Global Financial Stability Report; HY = high yield; IG = investment grade.

Rate-sensitive and war-related industries outperformed since the Federal Reserve's dovish pivot amid heightened geopolitical tensions.

2. Global Equities and Corporate Bonds Performance since the October 2023 GFSR

This bubble chart plots Global equity sectors change (percent) on the X-axis against Global corporate sector spread change (basis points) on the Y-axis. Industries shown include Energy, Consumer staples, Utilities, Communication services, Aerospace and defense, Information technology, Financial institutions, Consumer discretionary, Real estate, Health care, Material, and others. A red arrow labeled "Positive returns" points towards the upper-left quadrant.

The upward trend in corporate profitability since the 2020 is now losing momentum.

4. Global 12-Month-Trail Earnings per Share Ratios
(Indices, January 2023 = 100)

The chart tracks the 12-month-trail earnings per share ratio for various countries from January 2020 to January 2024. Most countries show an upward trend, with India reaching the highest value of approximately 120 by January 2024.

Country	Index (January 2023 = 100)	Value (Jan 2024)
United States	100	120
India	100	120
Japan	100	100
Europe	100	100
Brazil	100	80
China	100	100
South Africa	100	100

US corporate bond spreads are narrower than model values based on macro fundamentals.

6. Corporate Bond Spread Misalignments

(Deviation from fair value per unit of risk, quarterly averages, left scale; percentile, right scale)

The chart displays the deviation from fair value per unit of risk (left Y-axis) and the percentile ranking (right Y-axis) for US IG, US HY, Euro IG, and Euro HY bonds across four time periods: 2020, 2022, 24:Q1, and 2024:Q1. Blue bars represent the misalignment per risk unit, and black diamonds represent the percentile ranking.

Period	US IG	US HY	Euro IG	Euro HY
2020	-1	-4	-2	-5
2022	0	-3	0	-4
24:Q1	1	-2	1	-3
2024:Q1	0	-1	0	-2

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Figure 1.24. Weaker Tail Corporate Borrowers

Nearly 40 percent and 60 percent of small firms in AEs and EMs, respectively, do not have sufficient cash balances to cover their annual interest expenses if interest expenses increase to levels equivalent to current market yields.

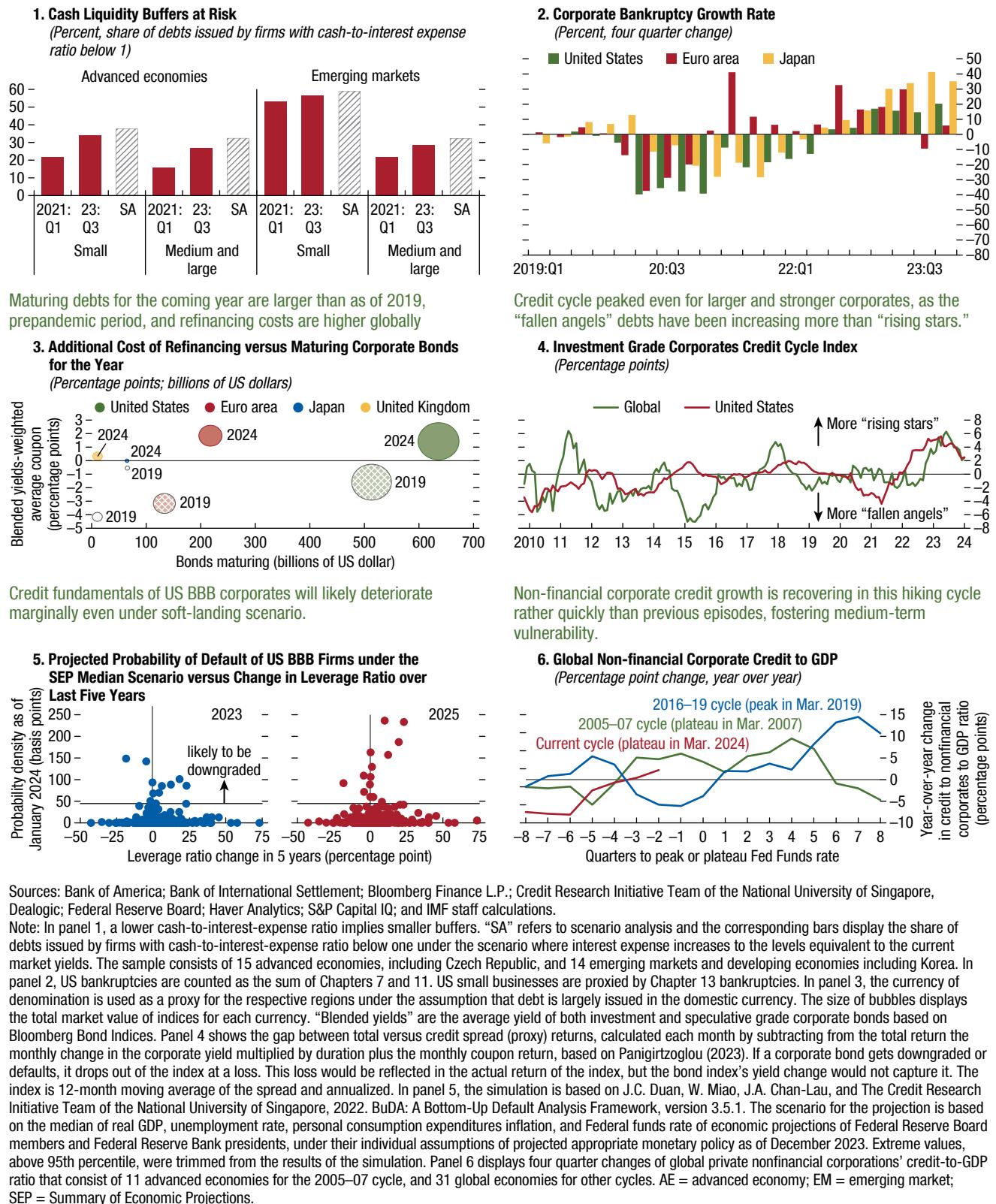
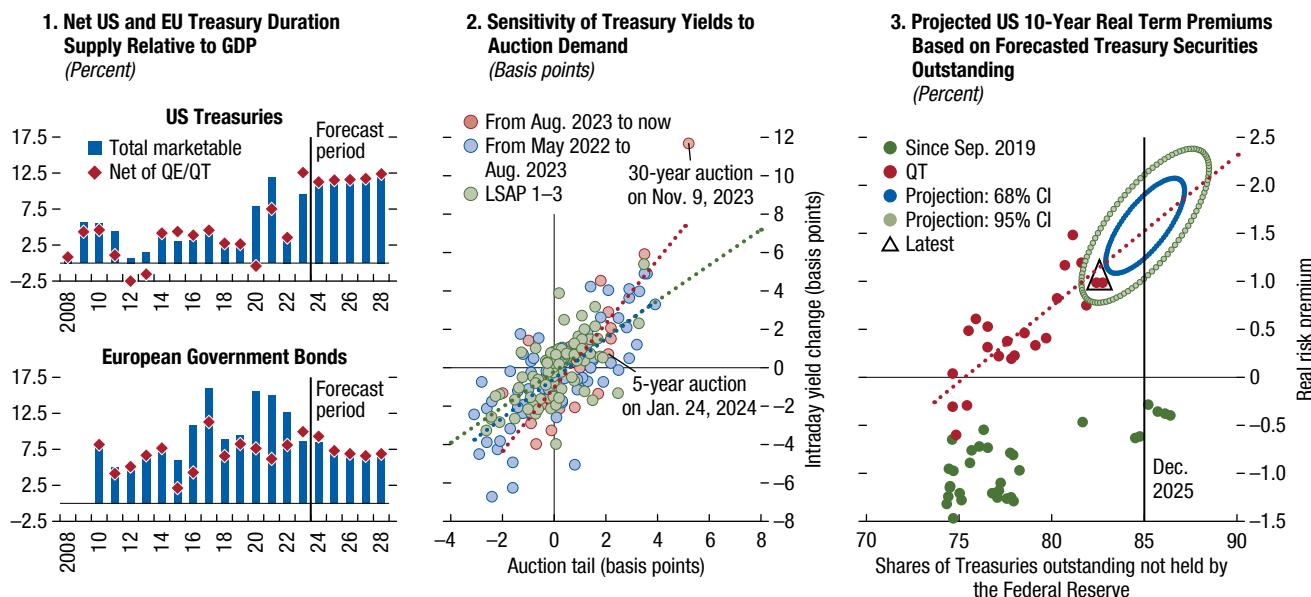


Figure 1.25. Government Bond Supply in Europe and the United States

Net supply of advanced economy bonds to remain elevated ...

... with some evidence that sensitivity of yields to auction demand has increased.

Upward pressure on real term premiums could persist as share of Treasury securities outstanding (net of Fed holding) continues to rise.



Sources: Bloomberg Finance L.P.; Federal Reserve Bank of New York; Haver Analytics; J.P. Morgan; and IMF staff calculations.

Note: Panel 1 shows net duration supply, expressed in terms of 10-year equivalent bonds net of domestic central bank purchases. Given data availability, European Government Bond net issuance estimates start in 2010. Forecasts reflect consensus expectations for bond issuance and domestic central bank purchases. Panel 2 captures intraday yield changes within a narrow event window, spanning five minutes before the start of the Treasury bond auction, to five minutes after. Panel 3 relates the US 10-year real term premium to the share of Treasuries outstanding, net of Federal Reserve holdings, both historical and forecasted. Projections of the real risk premium are obtained using parametric bootstrap techniques and considering a range of forecasts for Federal Reserve holdings by year-end 2025, as shown in the latest Primary Dealer Survey. The ellipses shown delineate the 68 and 95 percent CIs, within which the projected real risk premium is expected to fall. CI = confidence interval; LSAP = large-scale asset purchases; QE = quantitative easing; QT = quantitative tightening.

Advanced Economy Government Bond Supply Will Likely Remain Large

Some advanced economies will likely require heavy government bond issuances in the coming years to fund fiscal deficits (Figure 1.25, panel 1), which are projected to persist, as well as to service debt carrying higher interest rates. As investors become attuned to debt sustainability, elevated issuance will likely weigh on longer-term yields. This can be seen when comparing the auction tail—the difference between the anticipated and actual yields at the conclusion of US Treasury auctions and a price-based measure of demand-supply imbalance—with changes in secondary market yields during an auction. For example, the marked increase in US Treasury bond supply since August 2023 is associated with increased sensitivity of intraday yields to the tail (Figure 1.25, panel 2, red dots), reflecting broader market concerns that yields—especially

the real risk premium component (Figure 1.25, panels 3 and 4)—would need to be higher for bonds to get sold.^{24,25} As the share of outstanding Treasuries net of Federal Reserve holdings is forecast to rise further, some evidence suggests that upward pressure on real term premiums could persist (Figure 1.25, panel 3).

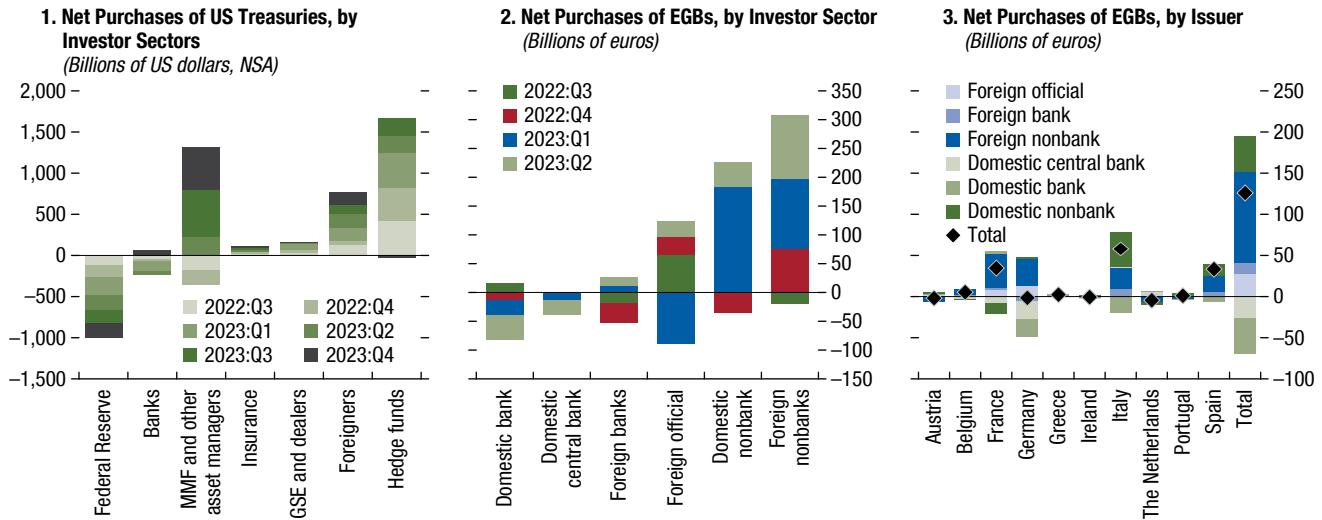
Although the supply of advanced economy government bonds will likely remain heavy, the buyer base has shifted in recent years. In the United States, new

²⁴In May 2023, the Treasury announced a supply of \$547 billion in bonds. For August 2023, the expectation was for \$593 billion, whereas the Treasury announced a supply of \$601 billion (all in in terms of 10-year equivalents).

²⁵In response, primary dealers, as part of their obligation to act as intermediaries in the Treasury market, filled the void. This proved a valuable backstop, containing further spillover into secondary markets. However, primary dealers' constrained balance sheet intermediation capacity suggests a potential challenge in serving as a resilient backstop in the future.

Figure 1.26. Demand Base for Longer-Term Bonds

Hedge funds have become marginal buyers of Treasuries since the start of latest round of QT in the United States.



Sources: Federal Reserve Board; Arslanalp and Tsuda 2012; and IMF staff calculations.

Note: Sovereign bond holdings of domestic hedge funds are included residually in the household category of the flow of funds and investor holdings. Panels 2 and 3 reflect data until 2023:Q2 (latest available). EGB = European government bond; GSE = government-sponsored enterprise; MMF = money market fund; NSA = not seasonally adjusted.

net issuances of Treasury securities are increasingly absorbed by the nonbank sector (that is, households and hedge funds); by contrast, banks have been net sellers (Figure 1.26, panel 1). Similar trends are evident in European countries, where government bond issuance—especially issuance from core euro area countries such as France and Germany—is increasingly purchased by nonbanks such as households, asset managers, and the foreign sector (Figure 1.26, panels 2 and 3). Most of those new marginal buyers of government bonds, notably hedge funds, are arguably more price sensitive and more attuned to debt sustainability than buyers in the past, such as central banks. Such a shift in ownership portends more volatility in bond markets in the medium term, potentially exerting further upward pressure on term premiums.

Quantitative Tightening Is Crucial to Bond and Funding Markets

Part of the shift in the composition of government bond buyers can be attributed to central bank quantitative tightening, which effectively lessens central banks' role as holders of government bonds. With the Bank of England, European Central Bank, and the

US Federal Reserve shedding bonds at annual paces of £100 billion, approximately €300 billion, and \$720 billion, respectively, the effect will not only be felt in longer-term government bond markets, but also short-term funding markets.²⁶

This is because as quantitative tightening progresses, liquidity is withdrawn from the financial system and commercial banks' holdings of central bank reserves typically decline. Ongoing quantitative tightening could result in a scarcity of these reserves—used by banks for transactions, liquidity management, and fulfillment of regulatory requirements—in the banking system, forcing banks without adequate reserves to borrow from the interbank market at higher costs. A demand curve for reserves summarizes this relationship (Afonso and others 2023), with reserves over total bank assets representing the quantity dimension, and

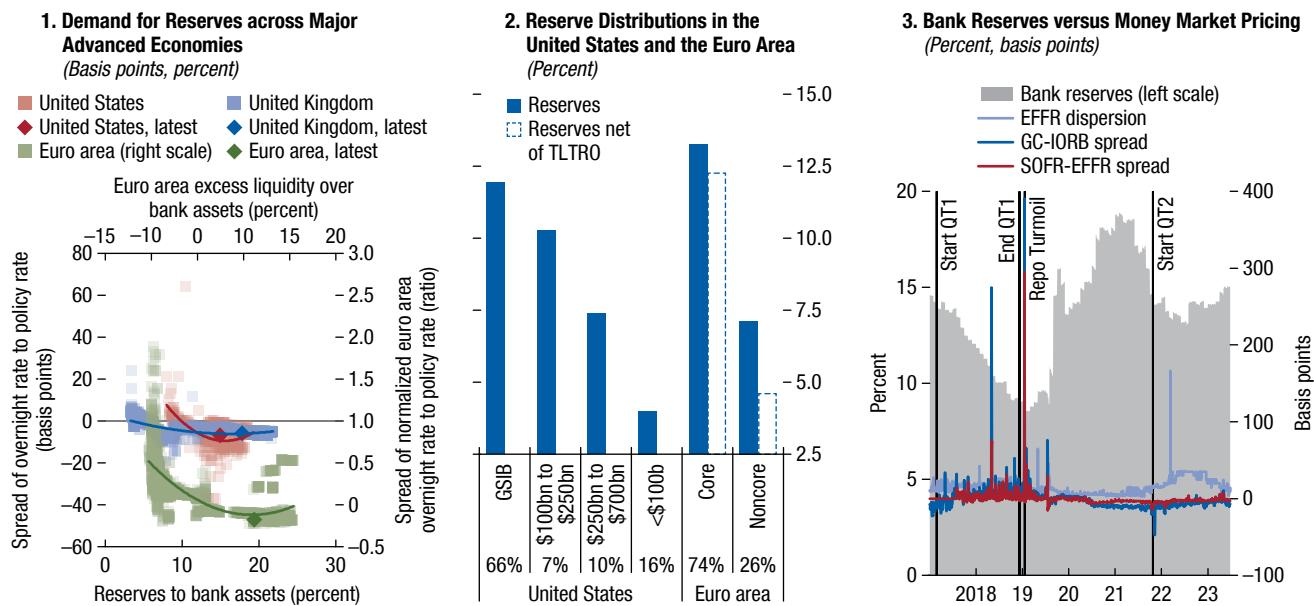
²⁶The BoE announced in September 2023 a reduction of the stock of the UK government bond portfolio by £100 billion over the following year. Redemptions of the government bond portfolio in the ECB's Asset Purchase Program are estimated to reach approximately €260 billion in 2024, with another €45 billion of redemptions announced from redemptions in the Pandemic Emergency Purchase Programme of the ECB. The Federal Reserve is shrinking its Treasury holdings by \$60 billion per month, but may taper quantitative tightening in the second half of 2024.

Figure 1.27. The Impact of Quantitative Tightening

Despite current abundant reserves, it is difficult to estimate when reserves may become scarce.

Heterogeneity in the distribution of reserves suggest these may become scarce sooner for some.

Developments in funding market pricing may offer signals to guide the pace and scope of QT.



Sources: Bloomberg Finance L.P.; Capital IQ; European Central Bank; Federal Reserve Board; Haver Analytics; and IMF staff calculations.

Note: Panel 2 depicts bank reserves in relation to each banking subsector's size. The percentages under each banking subsector indicate its share relative to the total banking sector. Data for the United States are derived from regulatory filings of the 500 largest banks, while data for the Euro Area is sourced from the most recent European Central Bank data, encompassing excess liquidity, TLTRO borrowings, and bank sector market capitalizations per country. Panel 3 shows bank reserves in the United States relative to the size of the banking sector. AE = advanced economy; EFFR = effective federal funds rate; GC = general collateral; GSIB = global systemically important bank; IORB = interest on reserve balances; SOFR = secured overnight financing rate; QT = quantitative tightening; TLTRO = targeted longer-term refinancing operations.

the spread between interbank funding rates and policy rates representing the price dimension (Figure 1.27, panel 1). Major central banks have committed to operate monetary policy under an *ample* reserve regime, that is, away from the steep part of this demand curve where funding rates are sensitive to reserve levels, and closer to the flatter part of the demand curve.^{27,28}

Because liquidity management practices and regulatory requirements have changed over time, pinning down the shape of this demand curve and the level

at which reserves become scarce is challenging in practice, creating uncertainty over the stability of funding rates. Uneven reserves across banks could also exacerbate funding constraints as quantitative tightening unfolds. For example, the reserves holdings of smaller US banks or euro area banking systems not in the core countries, which tend to hold less reserves (Figure 1.27, panel 2), could become scarce sooner. In that case, redistributing liquidity within the system becomes necessary to meet the demand for reserves by all. Experience from 2019 suggests that rate pressures can serve as price signals for strains in this process. In the US, various funding rates, including repurchase agreement or repo rates, have episodically jumped since the last *Global Financial Stability Report*, offering tentative signs that liquidity may not be ample for all (Figure 1.27, panel 3).

So far, quantitative tightening has not drained reserves on a one-for-one basis in many countries

²⁷See Afonso and others (2023) and Bank of England (2023). The Board of Governors of the Federal Reserve has expressed preference toward maintaining reserves at levels "somewhat above ample" (see the minutes from the Federal Open Market Committee, January 30–31, 2024, <https://www.federalreserve.gov/newsreleases/monetary/20240221a.htm>).

²⁸Maintaining reserves at ample levels can enhance functional market intermediation and provide more informative market prices, while the central bank balance sheet can be further wound down to allow for additional policy space in future expansions.

because other components of central bank balance sheets can also adjust, like the Fed's overnight reverse repo facility.²⁹ However, as quantitative tightening progresses further, these other sources of absorption will exhaust; by then, reserve levels, and by extension interbank funding costs, will be more directly affected, increasing the likelihood and magnitude of episodic funding strains. Because funding markets are crucial to the healthy functioning of the financial system—for example, providing leverage to institutions performing arbitrage trades—central banks need to provide funding backstops as quantitative tightening progresses. The pace of quantitative tightening therefore should account for its effect on funding markets to avoid excessive pricing strains.

Leveraged Positions in Treasury Markets Have Remained Large

Despite some recent unwinding, the short positions of leveraged funds in Treasury futures remain large (Figure 1.28, panel 1). There are indications that these positions are related to what is called Treasury market basis trade, which seeks to gain arbitrage profits by capturing the price difference, or basis, between futures and comparable Treasury bonds, with long positions in Treasuries financed by borrowing in repo markets (Figure 1.28, panels 1 and 2).³⁰ Under normal market conditions, these basis trades contribute to market liquidity and efficiency by aligning the cash and futures markets. The trade has also made the hedge

²⁹In the euro area and Australia, banks repaying term liquidity provided by central bank facilities and operations was the main driver of a decline in excess liquidity. With the full repayment taking place by March 2024 in the euro area and by end of June 2024 in Australia, quantitative tightening will remain the key driver behind reserve developments, but the decline will be at a slower pace. Conversely, in the United States, reserves have grown since the Summer 2023 despite ongoing quantitative tightening, mainly because of the buffer provided by the rate for overnight reverse repurchase agreements (ON RRP), a Federal Reserve facility where money market funds can invest cash. RRP balances have declined faster than the quantitative tightening pace since June 2023, as money market funds substituted more than \$1.5 trillion from the facility with alternative investments (primarily Treasury bills). Some cash released from the RRP recirculated in the system, becoming reserves and increasing the level of reserves in the system.

³⁰Federal Reserve Board staff, using proprietary data sets, find that the volume of the basis trade is likely significantly lower than that implied by leveraged funds' Treasury futures positions alone, and estimate that hedge funds have increased basis trades activities by at least \$317 billion since the first quarter of 2022 (see Glicoes and others 2024).

fund sector a key buyer base of Treasury securities (Figure 1.28, panel 2).

However, the scale of this basis trade has also increased leverage in the financial system as volumes of repos have increased substantially over the past year (Figure 1.28, panel 3). Basis trade investors rely on low repo haircuts and low repo rates to leverage their positions and increase basis trade profitability. A spike in repo rates—triggered, for example, by surprises in quantitative tightening (see the section “Quantitative Tightening Is Crucial to Bond and Funding Markets”)—can render the trade unprofitable and could trigger the forced selling of Treasury securities and a brisk unwinding of futures positions as funds seek to quickly delever. This dynamic occurred in late 2019, when a spike in the repo rates began to unwind basis trades and likely exacerbated Treasury illiquidity problems during the pandemic (Figure 1.28, panel 1, black line). Aggressive use of repo financing also makes the basis trade vulnerable to other shocks, such as upside inflationary surprises that lower the value of funds' long bond positions, amplified by leverage.

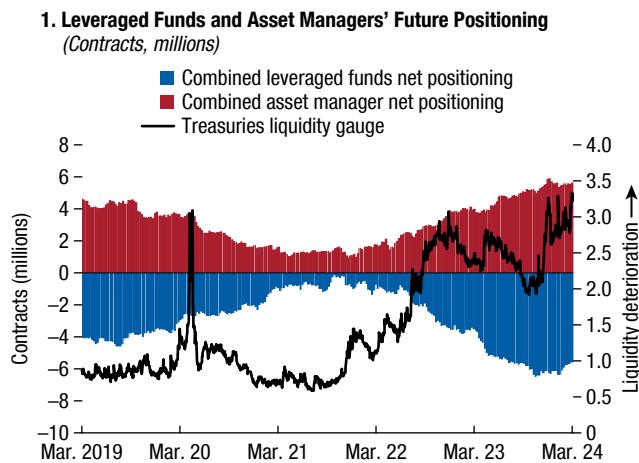
Of greater concern, a concentration of vulnerability has built up, as a handful of highly leveraged funds account for most of the short positions in Treasury futures (Figure 1.28, panel 4). Some of these funds may have become systemically important to the Treasury and repo markets, and stresses they face could affect the broader financial system.

The Banking System Is Broadly Resilient, but a Weak Tail of Banks Remains

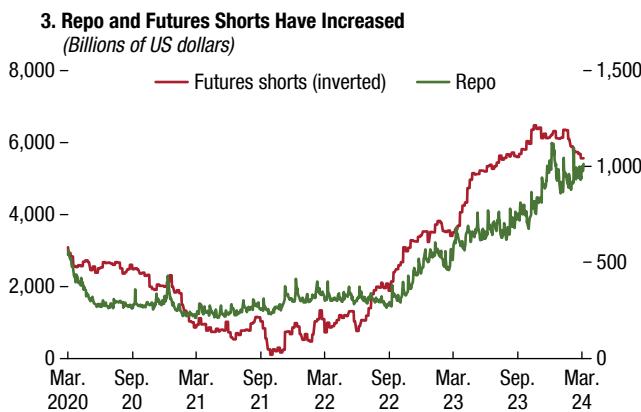
The vast majority of banks demonstrated resilience throughout the banking sector turmoil in 2023. Strong capital and liquidity buffers and improved profitability and higher net interest margins have lifted bank stock prices across regions (Figure 1.29, panel 1). Looking ahead, however, the IMF's key risk indicators (see Chapter 2 of the October 2023 *Global Financial Stability Report*) show that a subset of banks remains vulnerable along certain dimensions. As of the fourth quarter of 2023, banks with an aggregate \$33 trillion in total assets, or 19 percent of global banking assets, breached three of the five key risk indicators (Figure 1.29, panel 2). Chinese and US banks account for most of these banks. In China, capital ratios are thinning, and there are concerns about deteriorating asset quality as lower net interest margins and higher loan delinquencies

Figure 1.28. Leveraged Basis Trades

Leveraged funds continue to increase their short positions in Treasury futures, with asset managers taking the other side.



The volume of repo funding has increased considerably, in line with increased demand basis trades.

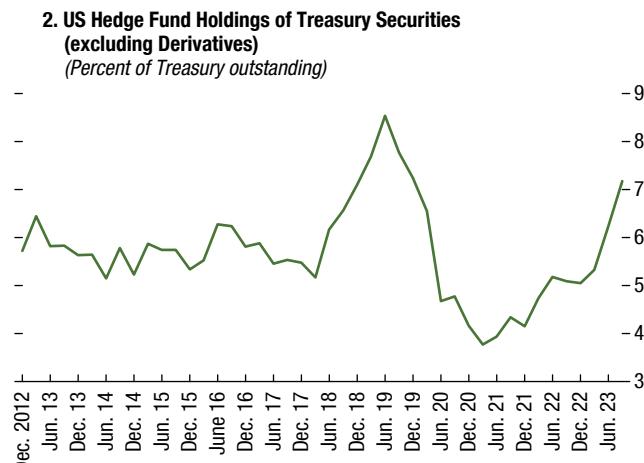


Sources: Bloomberg Finance L.P., Commodity Futures and Trading Commission; Depository Trust and Clearing Company; and IMF staff calculations.
Note: Panel 3 plots data on sponsored repo.

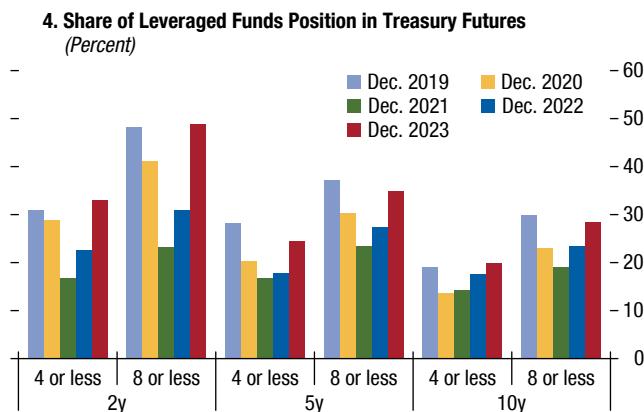
are expected to take hold. In the United States, some regional banks are facing multiple pressures (Box 1.3). These include heightened competition for deposits, leading to increased funding costs, as well as rising credit costs as a result of nonperforming CRE exposures. These banks are also grappling with elevated levels of unrealized losses from their securities portfolios and decreased revenue from trading and investment banking activities.

Banks on the IMF's monitoring list based on key risk indicators (Figure 1.29, panel 3, red line) score significantly worse than banks not on the list (green line) across nearly all indicator categories, including Tier 1 capital ratio, market leverage, and

The share of Treasury bonds held by US Hedge Funds has increased in recent years.



Concentration of leveraged funds' short positions in Treasury futures have increased with nearly half of the two-year positions held by fewer than eight traders.



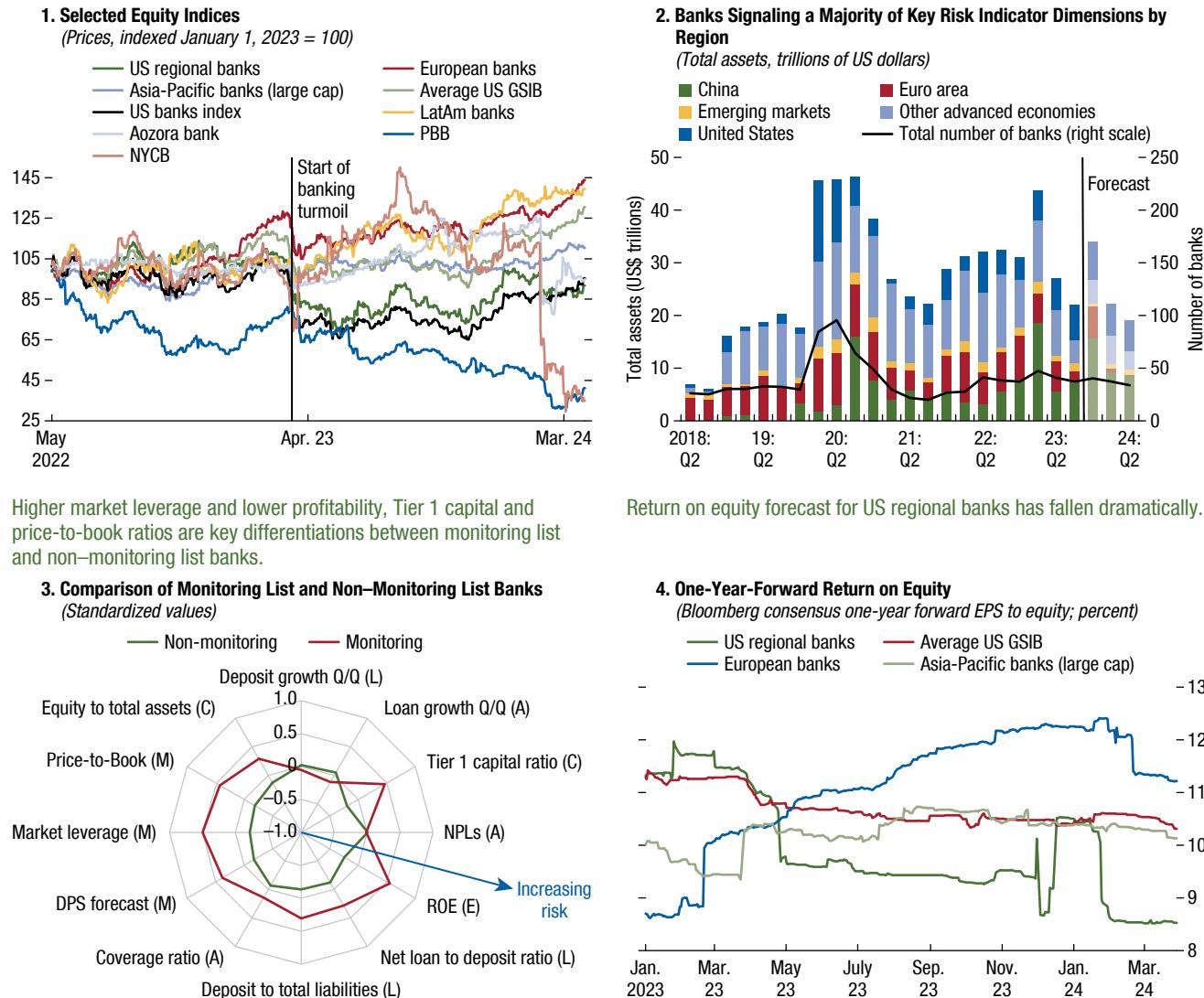
returns on equity. The monitoring list trims somewhat in the first half of 2024, likely reflecting expectations of a soft landing and stable return-on-equity for non-US regional banks (Figure 1.29, panel 4).

The Bank–Sovereign Nexus Has Moderated but Could Rise Again

Sovereign debt outstanding has climbed markedly in both emerging markets and advanced economies as governments have increased spending to cushion the economy from the effect of the pandemic. Absorption of this additional sovereign issuance by banks could

Figure 1.29. Banks Continue to Face Challenges in Higher for Longer Interest Rate Environment

Equity performance continued to rebound from the bank stress in March 2023.



Sources: Bloomberg Finance L.P.; Visible Alpha; and IMF staff calculations.

Note: Panel 2 data include results based on historical data from the first quarter of 2018 to the third quarter of 2023, aggregate consensus forecasts for the fourth quarter of 2023 if actual data were not available, and aggregate consensus forecast data for the first and second quarters of 2024. Values in panel 3 are standardized by z-scores based on aggregate consensus forecast data as of the fourth quarter of 2023; larger values along a given axis signify more risks along that characteristic. A = assets; C = capital; DPS = dividends per share; E = earnings; EPS = earnings per share; GSIB = global systemically important bank; KRI = key risk indicator; L = liquidity; M = market; NYCB = New York Community Bancorp; PBB = Deutsche Pfandbriefbank; Q/Q = quarter over quarter; ROE = return on equity. See Chapter 2 and Chapter 2 Online Annex 2.1 for definitions of KRIs in the October 2023 *Global Financial Stability Report*.

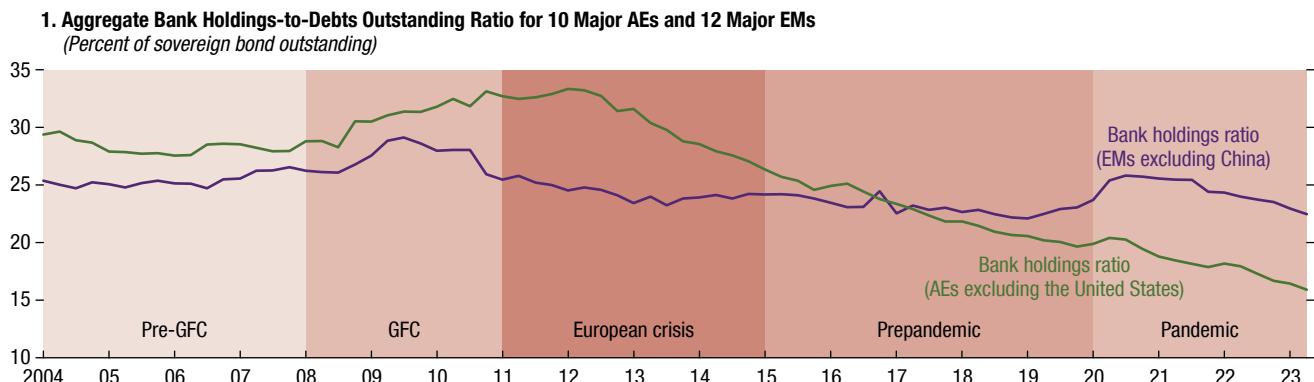
reinforce the “sovereign–bank nexus,” a dynamic whereby the financial health of banks and sovereigns become intertwined, amplifying vulnerabilities in each sector. Specifically, banks whose balance sheets are saturated with sovereign bonds are susceptible to interest rate risks. Governments with already-high

debt have less capacity to help ailing banks, or if they do, their borrowing costs may rise farther, forming a vicious cycle.

Taking a longer-term view, the bank-holdings-to-debt-outstanding ratio in 10 major advanced economies climbed precipitously before the global

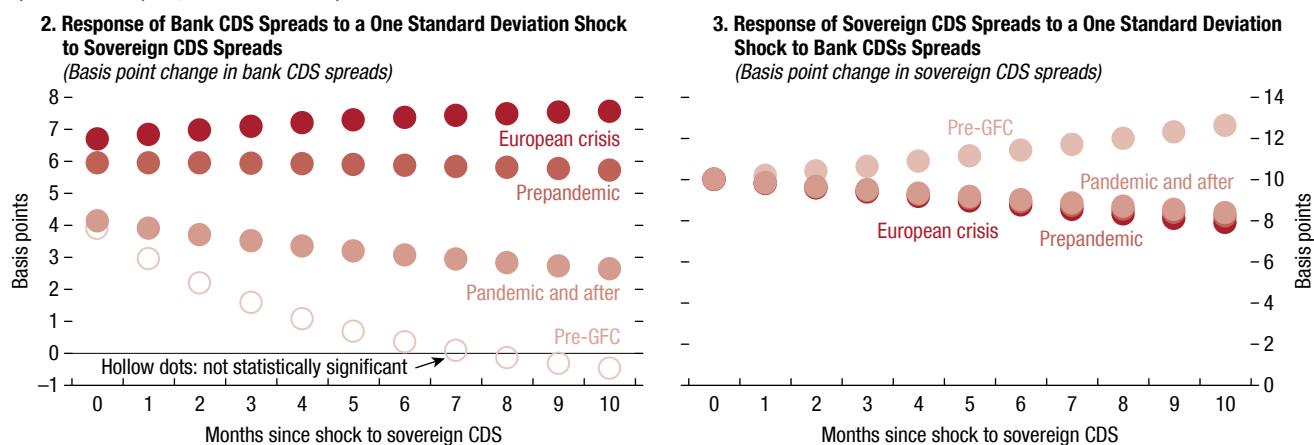
Figure 1.30. Bank-Sovereign Nexus

The bank share of sovereign bonds is once again on the decline.



A shock to sovereign CDS spreads had large impact on bank CDS spreads in the past, more modest impact now ...

... the spillback to sovereign spreads is also more modest now.



Sources: Arslanalp and Tsuda (2012, 2014); Bloomberg Finance L.P.; Capital IQ; and IMF staff calculations.

Note: The ten AE countries used in panels 1, 2 and 3 are Australia, Belgium, France, Germany, Italy, Japan, The Netherlands, Spain, Switzerland, the United Kingdom and the United States. Panel 2 shows the ratio of the aggregated bank holdings of sovereign debt across the ten AEs to aggregated sovereign debt outstanding. The 12 major EMs are Brazil, Chile, Colombia, Hungary, India, Indonesia, Malaysia, Mexico, the Philippines, Poland, South Africa, and Türkiye. Panels 2 and 3 show the impulse response functions to a 10-basis point sovereign spread shock from a panel VAR (1), with sovereign CDS spreads ordered before average bank CDS spreads. Fixed effects are included in the panel VAR. Within a country, CDS spreads for all Global Systemically Important Banks (GSIBs) are averaged. AE = advanced economy; CDS = credit default swap; EM = emerging market economy; GFC = global financial crisis; GSIBs = global systemically important banks; VAR = value at risk.

financial crisis until 2012—the height of the European sovereign crisis—then dropped in the middle part of the past decade before rising again at the onset of the pandemic (Figure 1.30, panel 1). Among 12 major emerging markets, the ratio was on a shallower decline until it spiked during the pandemic, but it has resumed the decline over the past three years. By this metric, the sovereign–bank nexus is now at its lowest point of the past two decades. A more holistic assessment that studies the spillovers and spillbacks between sovereign and bank risks confirms that this is the case. Using data

from the same 10 major advanced economies, a panel vector autoregression that models the dynamic relationship between sovereign credit default swap (CDS) spreads and average bank CDS spreads shows that during the European crisis (2011–14), a 10-basis-point shock to sovereign spreads immediately raises average bank spreads by about 7 basis points (Figure 1.30, panel 2) with persistent effects: 10 months after the shock, bank spreads would still be about 8 basis points higher than had the shock not occurred. In the postpandemic period, however, the sovereign shock has affected banks

significantly less, raising bank CDS spreads by only 4 basis points at the outset. On the other hand, sovereign CDS-spread reactions to their own shock has been more or less the same over the past decade (Figure 1.30, panel 3). Nonetheless, it is evident that the nexus could rise quickly, as was the case during past economic downturns, and vigilant policies to lessen the nexus are needed in jurisdictions where it poses systemic risks.

Liquidity Mismatch at Open-End Investment Funds Is Rising

Open-end investment funds often invest in less-liquid assets while allowing investors to redeem investments daily. Although these funds are integral to the financial system, they could also be viewed as a vehicle for liquidity mismatches and could amplify financial shocks. The amplification mechanism becomes stronger if (1) investment funds hold a substantial share of a given markets' assets, (2) the investment funds are subject to volatile redemption flows, and (3) the underlying market is relatively illiquid, so that any forced sales would have an outsized effect on the market (see Chapter 3 of the October 2022 *Global Financial Stability Report*). High-yield corporate bond, leveraged-loan, and emerging market hard currency bond funds stand out according to these three dimensions because these markets are relatively illiquid, and the funds have historically been subject to large peak outflows (Figure 1.31, panel 1).³¹

The liquidity mismatch at open-end bond funds is a rising concern. Government and investment-grade corporate bond funds have seen strong inflows in recent years (Figure 1.31, panel 2). With interest rates volatile and bond market liquidity low (see the October 2023 *Global Financial Stability Report*), funds could have trouble paying redeeming customers, triggering further outflow pressures.

Large fund outflows are commonly associated with periods of acute market stress, yet economic drivers can lead to large and sustained outflows. For example, in 2021 and 2022, inflation-linked bond funds initially experienced large inflows as inflationary

pressures mounted but subsequently faced substantial drawdowns and peak outflows as inflationary pressures subsided (Figure 1.31, panel 2). Fund types with larger prolonged drawdowns also typically have large peak outflows (Figure 1.31, panel 3).³²

Certain fund types have experienced significant inflows since the onset of the pandemic. Of particular note is the influx of funds dedicated to investment-grade US corporate bonds, which have received close to 70 percent of their prepandemic net asset value in inflows. This surge in inflows adds risks to the financial system, considering the potential for corporate bond liquidity to evaporate during times of stress. Fund flows are highly sensitive to changes in market sentiment and are closely correlated with the performance of the relevant asset class (Figure 1.31, panel 4). Consequently, fund flows can amplify a sell-off, and a sell-off can reinforce fund flows. This relationship is particularly pronounced in the high-yield corporate bond market compared with investment-grade corporate bonds, although it exists for both types of funds.

Policy Recommendations

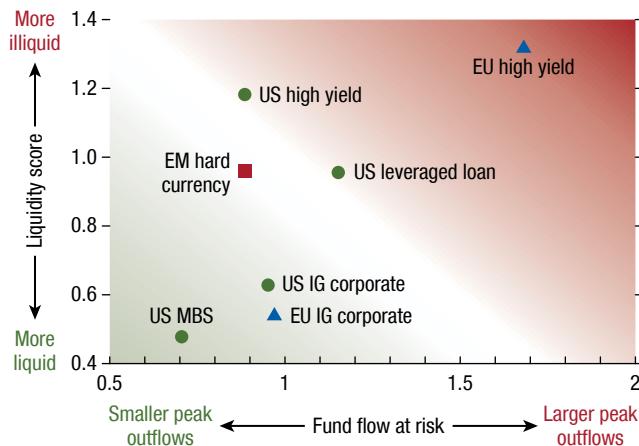
The global effort to bring inflation back to target seems to have entered its last mile, as favorable supply-side developments and monetary policy tightening appear to have restrained price pressures. Yet, core inflation and wage pressures remain elevated in many economies, and substantial uncertainty remains regarding future inflation developments. Bumps along the road—most notably a stalling of the disinflationary process—may surprise investors who are increasingly convinced that the battle against inflation has been already won and that low rates will once again prevail. With economic growth and progress on disinflation differentiated across regions and countries, the stance of monetary policy should reflect country-specific circumstances. In economies still experiencing persistent inflation, central banks should not prematurely ease to avoid backpedaling later. Central banks should also push against overly optimistic investor expectations for monetary policy easing. Where progress on disinflation

³¹High-yield corporate bond funds and emerging market bond funds also have a relatively large footprint in the underlying market, which contributes further to their potential to dislocate markets in times of stress (see Chapter 1 of the October 2023 *Global Financial Stability Report*).

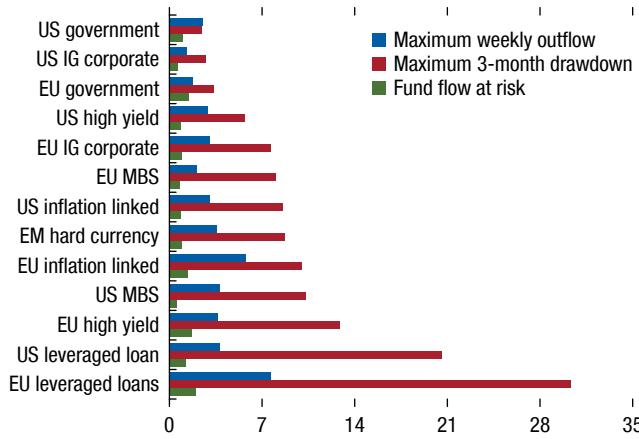
³²The 5 percent fund flow at risk was defined in Chapter 1 of the October 2023 *Global Financial Stability Report*. The value reflects that, historically, outflows surpassed this value, expressed in terms of net asset value, 5 percent of the time.

Figure 1.31. Open-Ended Funds

Fund flows for illiquid assets like high-yield bond, leveraged loan, and emerging market hard currency bond funds are more at risk.

1. Fund Flow at Risk and Market Liquidity
(Liquidity score, y-axis; arbitrary units, percentage, x-axis)

Funds with highest peak outflows typically saw most prolonged drawdowns ...

3. Peak Fund Outflows and Peak Drawdowns since January 2020
(Percentage of net asset value)

Sources: Barclays; EPFR; Haver Analytics; and IMF staff calculations.

Note: Panel 1 focuses on mutual fund flows, while panels 2 and 3 reflect both mutual fund and ETF flows. Fund flow at risk reflects the 5th percentile of weekly fund flows—that is, in 5 percent of the time, fund outflows surpass the fund flow at risk. EU stands for Western Europe, following EPFR's classification. The label "US leveraged loan" links to the EPFR classification of "bank loan funds." In panel 4, asset class performance is based on the Bloomberg Barclays total return indices for US investment grade and high yield corporate bonds. IG = investment grade; HY = high yield; MBS = mortgage-backed securities.

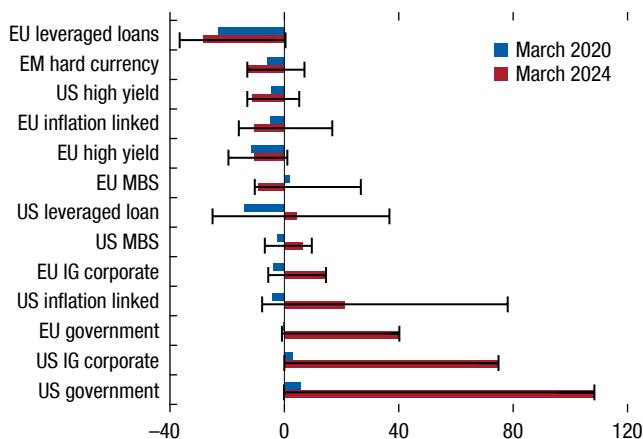
is evident enough to suggest inflation is moving sustainably toward targets, central banks should gradually move to a more neutral policy stance (see Chapter 1 of the April 2024 *World Economic Outlook*). In either case, clear communication remains crucial to avoid unwarranted volatility in markets.

The reduction of central banks' balance sheets has so far been orderly. But central banks should carefully

Liquidity transformation is back as some asset classes saw sizeable cumulative inflows.

2. Cumulative Fund Flows since January 2020

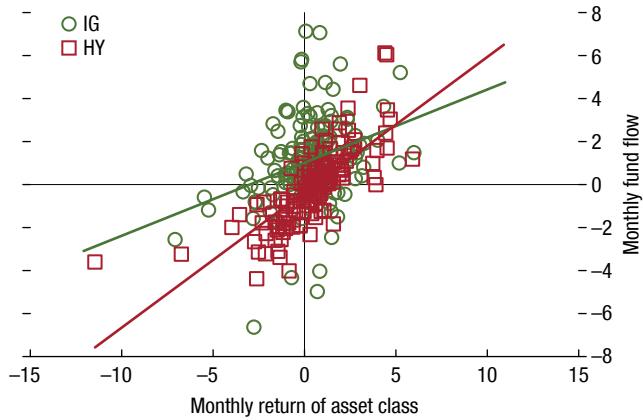
(Percentage of net asset value; black lines with whiskers indicate the minimum and maximum since January 2020)



... and flows can suddenly turn around with a change in market sentiment.

4. US Corporate Bond Fund Flows and Asset Class Returns

(Fund flows as percentage of assets under management, return in percent)



monitor any possible market functioning issues using a broad spectrum of indicators encompassing both liquidity conditions and funding rates in money markets, while standing ready to address market stresses if needed. Authorities should be especially attuned to possible risks from the uneven distribution of liquidity and central bank reserves across banks. Policymakers should clearly communicate the objectives and steps

for removing liquidity, emphasizing the willingness to use all other available liquidity support tools. Clear and timely communication is especially crucial if adjustments are deemed necessary in response to shifts in the macroeconomic outlook or financial market developments, and if the quantitative tightening process continues after central banks start cutting their policy interest rates.

Given that sovereign debt and deficits remain higher than they were before the COVID-19 pandemic, investors might demand higher term premiums, and consequently yields, to hold government debt in both advanced economies and emerging markets. Authorities should closely monitor the changing composition of the demand base for government bonds and assess potential risks associated with this shift. In the United States, the Securities and Exchange Commission recently adopted rules that mandate central clearing in Treasury markets to improve their resilience and transparency. It is crucial to continue developing rules for access to the clearing house and evaluating potential transaction costs to fully realize the benefits of this measure.

Fiscal adjustment can support the last mile of disinflation as central banks take steps to achieve mandated inflation objectives. Fiscal adjustments should primarily focus on rebuilding buffers, lowering term premiums, and containing the rise in debt. The pace and composition of adjustments should depend on the strength of aggregate demand and the available fiscal space. Within budget constraints, governments should reprioritize spending to protect the most vulnerable populations (see Chapter 1 of the April 2024 *Fiscal Monitor* and *World Economic Outlook*).

Continued vigilance is warranted to monitor vulnerabilities in the CRE sector to minimize potential financial stability risks. To ensure resilience in the banking system and inform decisions regarding the adequacy of capital buffers for CRE exposures, authorities should conduct stress-testing exercises that incorporate scenarios of large CRE price declines. These stress tests should include smaller banks with material exposure to CREs. Supervisors should also review banks' CRE valuation assumptions and ensure that provisions are adequate. There is an urgent need to reduce CRE-related systemic risks stemming from nonbank financial institutions by ensuring the effectiveness of liquidity management tools, considering leverage limits, and enhancing data collection. CRE funds should redeem shares at lower frequency and

require long notice or settlement periods. Depending on further analysis, the authorities should also consider requiring that such funds be structured as closed-end funds. Authorities should continue to build buffers to help guard against future losses in the financial sector and to support the provision of credit through periods of stress. For example, authorities may raise counter-cyclical capital buffers or sectoral systemic risk buffers, should circumstances allow. Such buffers could be released if stresses, such as increased defaults, were to materialize. To avoid procyclical effects, the raising of buffers should be conditioned on the absence of signs that credit is already being constrained by the adequacy of banks' capital.

In China, to durably improve confidence and alleviate disinflationary pressures, accommodative macroeconomic policies along with structural and pro-market reforms are needed to bolster near-term activity, mitigate risks, and ensure a smooth transition toward higher-quality and more balanced growth over the medium term. Property sector policies, in particular, should prioritize completing housing and restructuring troubled property developers in a timely manner. Additional monetary policy easing, especially through lower interest rates, and reorientation of public expenditures toward households could bolster near-term recovery, while comprehensive fiscal reforms are needed to ensure the sustainability of local government finances and prevent adverse spillovers to the broader economy. Authorities have made progress in reducing risks in the nonbank financial sector, but additional measures to enhance liquidity and maturity risk management, as well as to close regulatory and data gaps, could help contain future systemic risks. For the banking sector, it is critical to strictly enforce prudential policies, including by phasing out forbearance measures and maintaining adequate loss-absorbing buffers, to strengthen efforts by the authorities to restructure weak banks and safeguard financial stability risks. Authorities should continue to closely monitor developments in the equity market to avoid spillover to the broader financial system.

Progress on inflation in many emerging markets has been notable, but central banks should be cautious about easing policy rates too aggressively to ensure inflation targets are met and to help preserve resilience against external pressures. Countries should integrate their policies, where applicable, using the IMF's Integrated Policy Framework. The use of foreign exchange

interventions may be appropriate as conditions warrant and provided intervention does not impair the credibility of macroeconomic policies or substitute for their necessary adjustment.³³ In the event of imminent crises, capital flow management measures may be an option for some countries as part of a broader policy package to lessen outflow pressures. But those measures should not substitute for warranted macroeconomic adjustments or the development of domestic macro-prudential policies which can help contain systemic risks from capital flows. Any such measures should be part of a plan that resolves underlying macroeconomic imbalances and allows for needed adjustments.

Sovereign borrowers in emerging market economies, frontier economies, and low-income countries should strengthen efforts to contain risks associated with their high debt vulnerabilities, including through communications with creditors, multilateral cooperation, and support from the international community. Countries near debt distress should enhance early contact with creditors. Bilateral and private sector creditors should find ways to coordinate preemptive and orderly restructuring to avoid costly hard defaults and prolonged loss of market access. The Group of Twenty (G20) Common Framework should be used where applicable, including in preemptive restructurings, and further efforts should be made to improve the forum's effectiveness. Continued use of enhanced collective action clauses in international sovereign bonds and the development of majority voting provisions in syndicated loans would help facilitate future debt restructurings. Countries able to access funding should borrow prudently and avoid excessive debt issuance that may compromise medium-term sustainability.

Policymakers should promote the depth of local currency markets in emerging markets and foster a stable and diversified investor base. Emerging market economies with market developmental gaps should strive to (1) establish a sound legal and regulatory framework for securities, (2) develop efficient money markets, (3) improve the transparency of both primary and secondary markets, (4) improve the predictability of issuance, (5) bolster market liquidity, and (6) develop robust market infrastructure. Sustained efforts to deepen domestic markets become more critical as

interest differentials between advanced economies and emerging markets narrow further.

For a comprehensive and timely assessment of risks in credit markets, authorities must ensure access to sufficient and reliable data to analyze vulnerabilities stemming from origination practices and chains of bank and nonbank intermediation in the corporate debt market. With private credit playing an increasingly significant role in financial markets, it is imperative to enhance reporting requirements to improve monitoring and risk management of credit, liquidity, leverage, valuations, and interconnectedness risks. Given the potential macro-criticality of private credit, coupled with its exponential growth and increasing retail participation, authorities may consider adopting a more intrusive supervisory and regulatory approach, as discussed in Chapter 2.

The sizable tail of weak banks in the global financial system and the risk of contagion to healthy institutions highlight the urgent need to enhance financial sector regulation and supervision. Supervisors should ensure that banks have corporate governance and risk management processes commensurate with their risk profile, including risk monitoring by bank boards and capital and liquidity stress tests. In current conditions of deteriorating asset quality, authorities should pay attention to bank asset classification and provisions and to exposures to interest rate and liquidity risks. Full, timely, and consistent implementation of international standards remains an important step to enhance prudential frameworks.

Despite repeated calls from the G20, some major jurisdictions that are members of the Basel Committee on Banking Supervision have delayed implementing the remaining elements of Basel III or have introduced deviations, which could undermine the effectiveness of the standard-setting process and increase regulatory fragmentation. As a first step toward enhancing prudential frameworks, authorities should prioritize the full, timely, and consistent implementation of internationally agreed-upon prudential standards.

Authorities should prepare to deal with financial instability, including by ensuring that banks are prepared to access central bank liquidity and by intervening early to address liquidity stress in the financial sector. All banks should be required to periodically test their access to central bank instruments. Central banks should set up their emergency liquidity assistance frameworks in normal times, anticipating that they would have to

³³See the IMF Integrated Policy Framework (<https://www.imf.org/en/Topics/IPF-Integrated-Policy-Framework>).

intervene in a crisis. Central banks should be ready to provide liquidity against a broad universe of assets while abiding by the appropriate principles concerning collateralization, conditions, and state guarantees.

Further progress on adopting and implementing recovery and resolution frameworks is critical to proactively address the problems of weak or failing banks without undermining financial stability or risking public funds. International resolution standards apply to all banks that may prove to be systemic in times of wider stress. However, planning and preparation for resolution has focused mainly on the largest banks. In many countries the scope of this work should be expanded. Resolution plans must also be more flexible and public backstop funding mechanisms for resolution strengthened. In addition, resolution regimes for systemic and other large nonbank financial institutions, including central counterparties and insurers, should be introduced or further developed.

Regulatory coordination across sectors and jurisdictions is essential to identify risks, undertake effective actions, and manage crisis situations. Internationally coordinated reforms can reduce the risks of cross-border spillovers, regulatory arbitrage, and market fragmentation. Jurisdictions should ensure that their data-sharing arrangements allow for timely coordination to identify cross-sectoral risks and determine further action as needed.

Given the strength and multifaceted nature of the sovereign–bank nexus in certain countries, the policy response must encompass a range of strategies tailored to their specific circumstances. This response should include strengthening medium-term fiscal frameworks in countries with limited fiscal space (see Chapter 1 of the April 2024 *Fiscal Monitor*). Authorities in countries where sovereign–bank nexus could present systemic risks should also consider options to weaken the nexus, such as implementing capital surcharges on banks' holdings of sovereign bonds above specific thresholds and enhancing the banking crisis management framework. Continued efforts to foster a deep and diversified investor base are essential to enhance resilience, particularly in countries with underdeveloped local currency bond markets.

A comprehensive policy and regulatory response are needed to address the risks posed by crypto assets. While some newly launched products, such as spot bitcoin exchange-traded products in the United States, mitigate certain risks for investors (including money laundering, the financing of terrorism, and operational and cyber risks), the spot market remains unregulated, exposing investors to significant risks. Exchange-traded products can attract both retail and institutional investors, increasing their exposure to crypto markets. Authorities should enhance monitoring of the growing linkages between traditional financial institutions and the crypto ecosystem.

Box 1.1. Approval of Spot Bitcoin Exchange-Traded Products Expands the Investor Base

The approval of spot bitcoin exchange-traded products (ETPs) by the US Securities and Exchange Commission in early January 2024 led to a record-breaking volume of inflows, widening the adoption of bitcoin. Net inflows in the top 12 bitcoin funds reached more than \$12 billion in the first quarter after the approval (Figure 1.1.1, panel 1).¹ The bitcoin price has rallied significantly since 2023 to reach a new all-time high of \$73,805 on March 14, 2024 (Figure 1.1.1, panel 2). ETPs have removed certain frictions related to investing in bitcoin, widening the potential investor base. This could drive large shifts in asset allocation by investors as they incorporate Bitcoin into their portfolios.

An efficient frontier analysis can be used to assess whether allocation toward this asset class may be attractive from a portfolio optimization standpoint. A hypothetical investment universe may comprise, for instance, gold, US Treasuries, investment-grade and

This box was prepared by Gonzalo Fernandez Dionis and Yiran Li.

¹Funds included in the analysis are Ark21 Shares Bitcoin ETF, Franklin Bitcoin ETF, Franklin Bitcoin ETF, Grayscale Bitcoin Trust Btc., Hashdex Bitcoin Futures ETF, Invesco Glnx Btcn ETF, Ishares Bitcoin Trust, Fidelity Wise Origin Bitcoin, Proshares Bitcoin Strategy E, Valkyrie Bitcoin Fund, Van Eck Bitcoin Trust, and WisdomTree Bitcoin Fund.

high-yield bonds, and S&P 500 equity returns in addition to bitcoin. Historical year-by-year realized returns are applied to a standard portfolio selection technique: maximizing the portfolio Sharpe ratio (Markowitz 1952; Martin 2021). There have been pronounced fluctuations in the optimal portfolio allocation toward Bitcoin, with minimal or zero exposures in almost half of the years between 2011 and 2023 (Figure 1.1.1, panel 3). This reflects the extreme volatility of the asset class over the sample period.

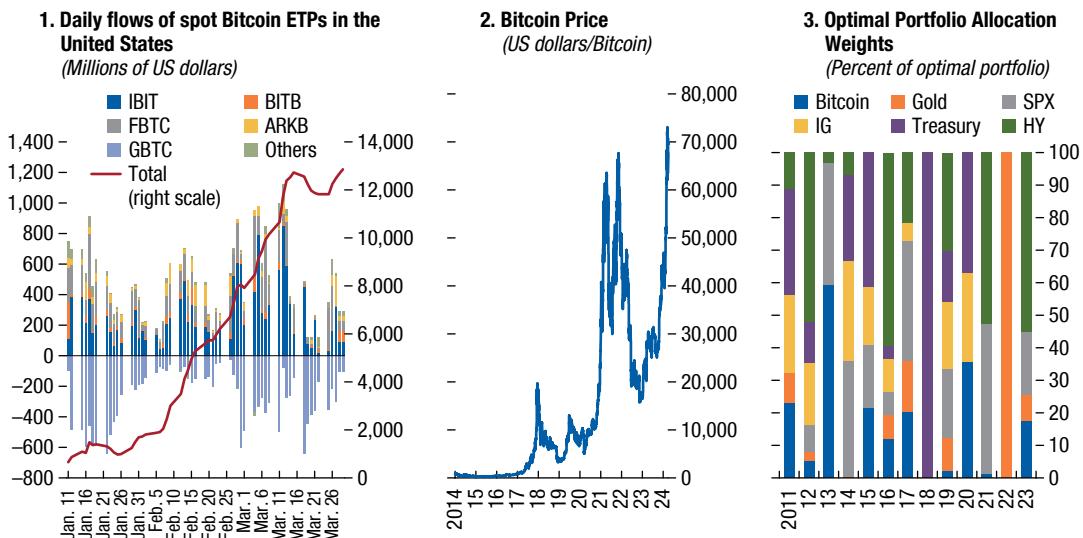
This volatility could change as the bitcoin ecosystem develops. And while financial stability risks do not appear yet to be systemic (see the October 2021 *Global Financial Stability Report*), there is evidence of growing interdependence between financial and crypto assets, suggesting the latter would serve as a conduit for shocks (IMF 2023). The approval of Bitcoin ETPs may lead to a surge in portfolio allocation, potentially adding selling pressure on other asset classes as investors shed other assets to make room for bitcoin investments. In addition, the reduction in frictions to invest can increase interconnectedness, potentially amplifying systemic risk via contagion from crypto markets into other asset classes, particularly if large swings in crypto prices drive large portfolio losses, forcing investors to liquidate positions in other assets.

Figure 1.1.1. Bitcoin Performance

Net inflows into Bitcoin funds reached \$12 billion in the first quarter after approval.

Bitcoin rally surpassed its 2022 peak.

Year-by-year portfolio allocation to Bitcoin would be minimal for most periods.



Sources: Bloomberg Finance L.P.; CoinGecko; Martin 2021.

Note: ARKB = ARK 21Shares Bitcoin ETF; BITB = Bitwise Bitcoin ETF; ETPs = exchange-traded products; FBTC = Fidelity Wise Origin Bitcoin Fund; GBTC = Grayscale Bitcoin Trust; HY = high yield; IBIT = iShares Bitcoin Trust; IG = investment grade.

Box 1.2. Intertemporal Risk Trade-Offs to US Growth under Alternative Scenarios of Credit Growth

Investors are anticipating that major advanced economy central banks will pivot from current monetary policy tightening. Financial conditions—broadly reflecting price of risk—have consequently continued to ease. Easing financial conditions, while stimulating economic activity, could result in policymakers facing an intertemporal trade-off in terms of downside risks to growth. Easy financial conditions may not only alleviate downside risks over the near term but may also come at the expense of higher downside risks over the medium term, for instance, as households and corporates take on more debt. Increasing leverage represents a financial vulnerability—making economies more susceptible to shocks. Amid heightened vulnerabilities, a materialization of an adverse shock may lead to abrupt deleveraging, possibly involving asset fire sales, deteriorating market liquidity, and higher risk premiums (Brunnermeier and Pedersen 2009; Greenwood, Landier, and Thesmar 2015).

In this box, the intertemporal risk trade-off between near- and medium-term horizons is examined in the case of US growth using the IMF's growth-at-risk framework (Adrian and others 2019, 2022); first, given the current state of financial conditions and credit growth (that is, the baseline), and then, under a hypothetical scenario for corporate and household sector credit growth. Specifically, this scenario (Scenario 1) is calibrated on the average quarterly credit growth over the two-year period following the 1972–74, 1977–80, and 1980–81 tightening cycles

This box was prepared by Harrison Kraus and Corrado Macchiarelli.

(Figure 1.2.1, panel 1). These episodes provide a useful parallel to the current period, given all were preceded by high inflation.

Under the baseline, medium-term risks are forecast to be elevated compared with near-term risks given the current state of household and corporate sector credit growth (Figure 1.2.1, panels 3 and 4). Under Scenario 1, household credit grows by about 1.8 percent per quarter, improving risks over the near term, whereas medium-term risks may remain elevated at around the baseline (Figure 1.2.1, panel 3). The same scenario applied to corporate sector credit, where growth is equal to 2.3%, which suggests a shift in intertemporal trade-off with what could typically be expected if vulnerabilities mounted, making the sector (and system) more sensitive to adverse shocks in the medium term (Figure 1.2.1, panel 4). The more pronounced deterioration in medium-term risks owing to higher corporate sector credit may largely be related to shorter average maturity of debt (around eight years for corporate bonds and syndicated loans outstanding; see also Poeschl 2023) than in the household sector, where 30-year mortgage loans make up a large share of debt. Higher household credit growth may instead lead to risks beyond the medium term (Mian, Sufi, and Verner 2017; Jensen and others 2020).

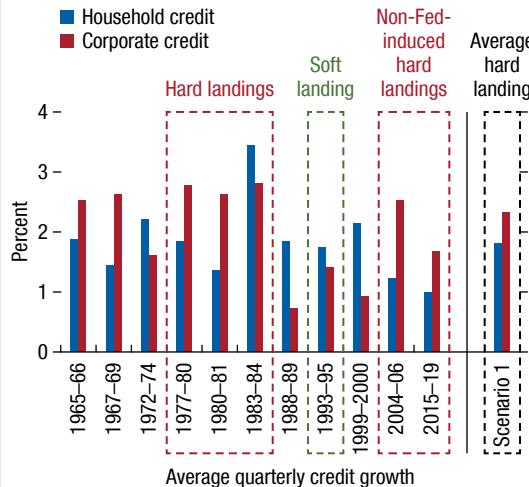
Under an alternative scenario (Scenario 2) in which credit growth is calibrated to the minimum quarterly credit growth over the two-year period after the aforementioned cycles (Figure 1.2.1, panel 2), households' near-term risks would deteriorate considerably relative to baseline, with negligible improvement in medium-term risks (Figure 1.2.1, panel 3).

Box 1.2 (continued)**Figure 1.2.1. Growth-at-Risk for the United States**

A hypothetical scenario (Scenario 1) is calibrated on the average quarterly credit growth over a two-year period after the end of the 1974, 1980, and 1981 tightening cycles.

1. Average Quarterly Credit Growth after Monetary Policy Peak: Two-Year Ahead

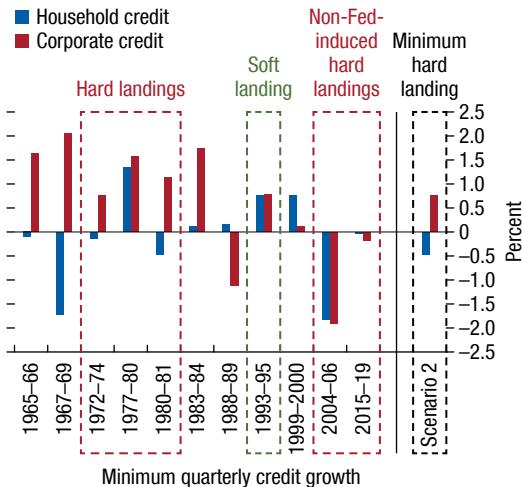
(Tightening cycles identified as in Blinder (2023); average quarterly growth)



Alternatively, in scenario 2, credit growth is calibrated on the minimum quarterly credit growth over two years after these cycles.

2. Minimum Quarterly Credit Growth after Monetary Policy Peak

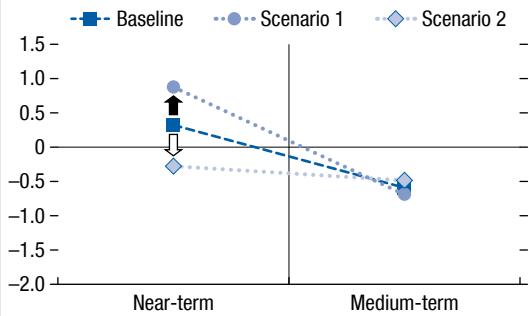
(Tightening cycles identified as in Blinder (2023); minimum quarterly growth)



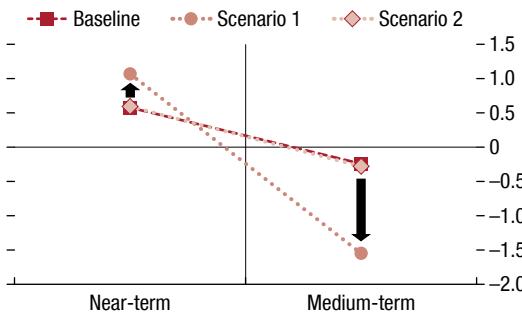
Under the baseline, medium-term risks are elevated, relative to near-term risks. Under Scenario 1, near-term downside risk improves, given developments in household credit. For the corporate sector, improvement in near-term risk is accompanied by more than proportionate deterioration in medium-term risk. Under Scenario 2, near-term risk deteriorates owing to household credit contraction.

3. Near- and Medium-Term Risks for Households, and Impact of Change in Credit Growth

(Term structure of fifth percentiles [GaP] of growth forecast distribution; household quarterly credit growth at 1.8 percent, Scenario 1, and -0.5 percent, Scenario 2)

**4. Near- and Medium-Term Risks for Corporates, and Impact of Change in Credit Growth**

(Term structure of fifth percentiles [GaP] of growth forecast distribution; corporate quarterly credit growth at 2.3 percent, Scenario 1, and 0.8 percent, Scenario 2)



Sources: Bank for International Settlements; Federal Reserve Bank of Chicago; IMF, International Financial Statistics database; and IMF staff calculations.

Note: The definition and identification of tightening cycles in panels 1 and 2 follows Blinder (2023). The conditional forecast density model employed for the United States in panels 3 and 4 augments information on current-quarter credit growth and financial conditions (see the October 2023 *Global Financial Stability Report*) with quarterly credit growth rates for corporate and household sector provided by domestic banks and all other sectors of the economy. Credit data are sourced from the Bank for International Settlements. The medium term is calculated as the average between years 4 and 8. GaR = growth-at-risk.

Box 1.3. Are Regional Banks in the United States “Out of the Woods”?

Regional banks in the United States have broadly recovered since the turmoil of March 2023.¹ After the acute stress triggered by the collapse of Silicon Valley Bank, the aggregate financial indicators of these regional banks have improved: between March 2023 and January 31, 2024, deposit outflows stabilized (+3 percent) and the US regional bank equity index rebounded (+19 percent) (see Figure 1.29, panel 1).

However, some investors and analysts express fears that the failure of another regional institution could

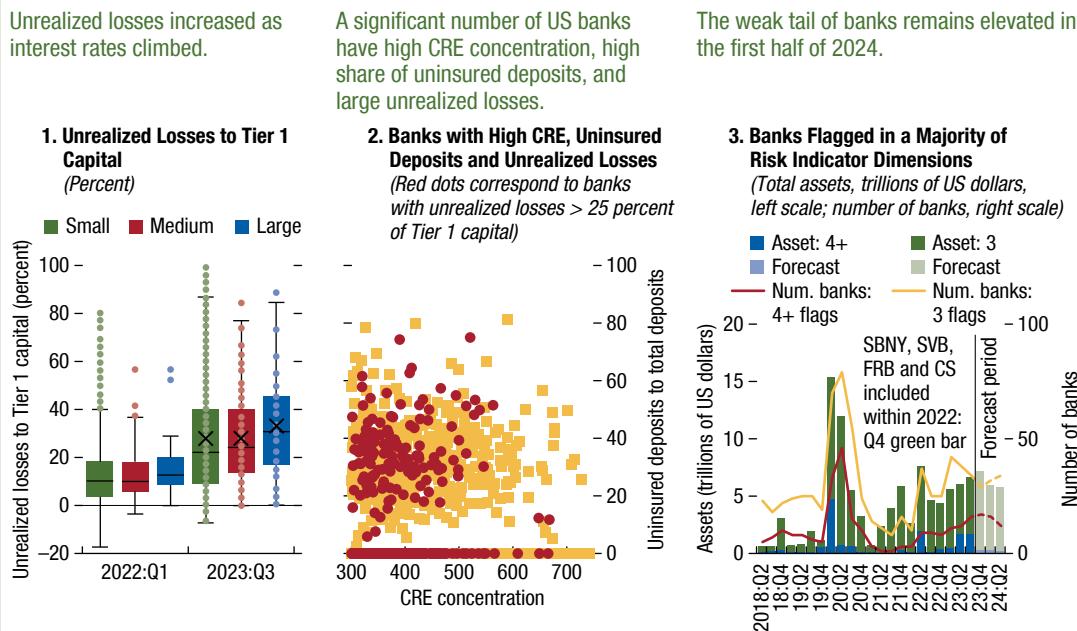
This box was prepared by Silvia Ramirez and Yiran Li.

¹Based on a data set including 4,528 deposit insured banks, accounting for 99.8 percent of total bank assets in the third quarter of 2023. For the purposes of this box, following the Federal Reserve's definitions, small banks are those with less than \$10 billion in total assets, medium banks are those with assets between \$10 billion and \$100 billion, and large banks are those with assets above \$100 billion. For more details, see Board of Governors of the Federal Reserve System, “Understanding Federal Reserve Supervision,” <https://www.federalreserve.gov/supervisionreg/approaches-to-bank-supervision.htm> (accessed February 26, 2024).

precipitate a broader loss of confidence in the sector. In January 2024, shifts in market expectations regarding the timing and pace of interest rate cuts in the United States, coupled with substantial losses announced by a major US regional bank heavily exposed to commercial real estate (CRE), prompted a 10 percent decline in the regional bank stock index. Concerns may be especially salient regarding banks that have a high level of unrealized bond losses stemming from the recent interest rate increase, concentrated exposures to CRE, and large potential liquidity pressures arising from uninsured deposits and other forms of less-stable funding.

Unrealized losses continued to mount alongside rising interest rates and remained elevated at \$477 billion in the fourth quarter of 2023, even after posting a significant drop as a result of the repricing of forward rates in December 2023. The median ratio of unrealized losses to Tier 1 capital is high, and there are large dispersions across banks (Figure 1.3.1, panel 1). One-third of US banks, mostly small and medium-sized

Figure 1.3.1. Banking Sector Challenges for the United States, High Share of Unrealized Losses and Commercial Real Estate Exposures



Sources: S&P Capital IQ; Visible Alpha; and IMF staff estimates.

Note: In panels 1 and 2, unrealized losses and CRE concentration are based on a data set including 4,528 or 98 percent of deposit insured banks, accounting for 99.8 percent of total bank assets in third quarter of 2023. Small banks correspond to banks with less than \$10 billion in total assets, regionals correspond to banks with assets between \$10 billion and \$100 billion, and large banks correspond to banks with assets above \$100 billion. Panel 2, high CRE concentration measured by CRE exposure to Tier 1 capital plus the allowance for credit losses above 300 percent, uninsured deposits based on call report data for banks with total assets of more than \$1 billion, and red dots correspond to unrealized losses of 25 percent or more of Tier 1 capital as of fourth quarter 2023. CRE = commercial real estate; CS = Credit Suisse; FRB = First Republic Bank; SBNY = Signature Bank of New York; SVB = Silicon Valley Bank.

Box 1.3 (*continued*)

ones, hold exposures to CRE exceeding 300 percent of their capital plus the allowance for credit losses, representing 16 percent of total banking system assets. It is of concern that more than 100 banks, which represent about 3 percent of banking system assets, have the triple-whammy of a high concentration in CRE exposure, unrealized losses greater than 25 percent of Tier 1 capital, and a ratio of uninsured deposits to total deposits greater than 25 percent (Figure 1.3.1, panel 2, see also Adrian and others 2024).

In the first quarter of 2024, the number of US banks classified on the IMF's monitoring list on the basis of key risk indicators was expected to remain elevated, as analysts expected significant challenges in earnings, liquidity, and other key risk dimensions. This weak tail of banks, mainly small and medium-sized banks, collectively represents an estimated \$5.5 trillion in total assets, accounting for almost 23 percent of total banking system assets (Figure 1.3.1, panel 3).

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THE RISE AND RISKS OF PRIVATE CREDIT

Chapter 2 at a Glance

- The chapter assesses vulnerabilities and potential risks to financial stability in corporate private credit, a rapidly growing asset class—traditionally focused on providing loans to midsize firms outside the realms of either commercial banks or public debt markets—that now rivals other major credit markets in size.
- Private credit creates significant economic benefits by providing long-term financing to firms too large or risky for banks and too small for public markets. However, credit migrating from regulated banks and relatively transparent public markets to the more opaque world of private credit creates potential risks.
- Firms borrowing private credit tend to be smaller and riskier than their public market counterparts, and the sector has never experienced a severe economic downturn at its current size and scope. Such an adverse scenario could see a delayed realization of losses followed by a spike in defaults and large valuation markdowns.
- The chapter identifies vulnerabilities arising from relatively fragile borrowers, increased exposure of pensions and insurers to the asset class, a growing share of semiliquid investment vehicles, multiple layers of leverage, stale valuations, and unclear interconnections between participants.
- Assessing overall financial stability risks of this asset class is challenging because the data needed to fully analyze these risks are unavailable. Despite these limitations, such risks appear contained at present.
- However, given private credit's size and role in credit creation—now large enough to compete directly with public markets—it may become macro-critical and amplify negative shocks to the economy.
- The rapid growth of private credit, coupled with increasing competition from banks on large deals and pressure to deploy capital, may lead to a deterioration in pricing and nonpricing terms, including lower underwriting standards and weakened covenants, raising the risk of credit losses in the future.
- If the asset class remains opaque and continues to grow exponentially under limited prudential oversight, the vulnerabilities of the private credit industry could become systemic.

Policy Recommendations

- Encourage authorities to consider a more intrusive supervisory and regulatory approach to private credit funds, their institutional investors, and leverage providers.
- Close data gaps so that supervisors and regulators may more comprehensively assess risks, including leverage, interconnectedness, and the buildup of investor concentration. Enhance reporting requirements for private credit funds and their investors, and leverage providers to allow for improved monitoring and risk management.
- Closely monitor and address liquidity and conduct risks in funds—especially retail—that may be faced with higher redemption risks. Implement relevant product design and liquidity management recommendations from the Financial Stability Board and the International Organization of Securities Commissions.
- Strengthen cross-sectoral and cross-border regulatory cooperation and make asset risk assessments more consistent across financial sectors.

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How Private Credit Started and Has Grown

This chapter evaluates how financial stability is affected by the recent evolution of private credit into a major asset class. Private credit (see Table 2.1 for definitions) has grown exponentially and is becoming an increasingly important and interconnected part of the financial system. The sector predominantly involves alternative asset managers who raise capital from institutional investors using closed-end funds and lend directly to predominantly middle-market firms (Figure 2.1). This chapter focuses on performing corporate credit rather than distressed assets, infrastructure, and real estate.

Private credit has provided significant economic benefits during its approximately 30-year existence. It developed as a lending solution for middle-market companies deemed too risky or large for commercial banks and too small for public markets. Loans are typically negotiated directly between borrowers and one or more alternative asset managers. Although usually more expensive than bank loans, private credit

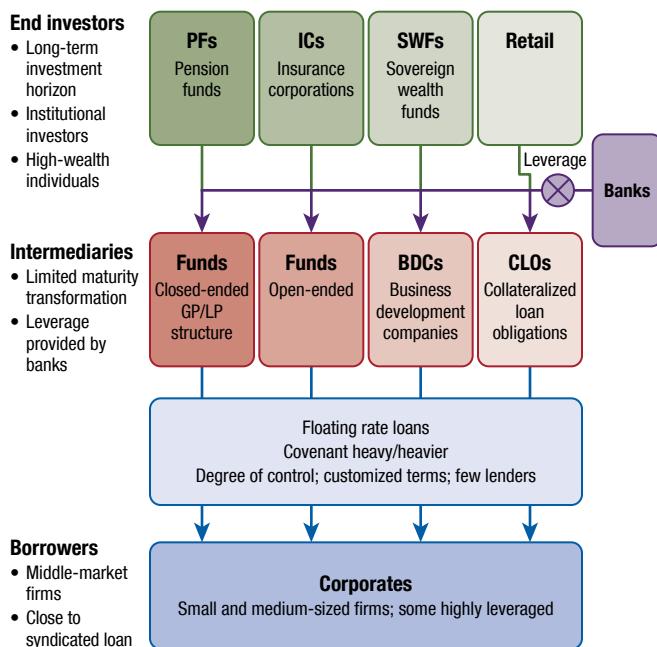
Table 2.1. Key Concepts and Definitions

Key Concept	Definition
Private credit	Nonbank corporate credit provided through bilateral agreements or small “club deals” outside the realm of public securities or commercial banks. This definition excludes bank loans, broadly syndicated loans, and funding provided through publicly traded assets such as corporate bonds.
Broadly syndicated loan	A form of financing provided by a group of lenders, often banks and other financial institutions, to a single borrower. Loans are syndicated when too large or risky for a single lender. Such loans are structured and arranged by one or more lending agents—typically investment banks—that underwrite and facilitate the transaction. Given the broad investor base, larger syndicated loans typically have a relatively deep secondary trading market.
Leveraged loan	A broadly syndicated loan with a high level of corporate leverage. Such a loan is usually rated below investment grade and has a high credit spread.
Middle-market firm	A firm that is typically too small to issue public debt and requires financing amounts too large for a single bank because of its size and risk profile. The size of middle-market firms varies widely. In the United States, they are sometimes defined as businesses with between \$100 million and \$1 billion in annual revenue. In contrast to syndicated loans, loans to middle-market firms are typically unrated, even when multiple lenders are involved.

Figure 2.1. Private Credit Structure

Private credit funds are intermediaries between end investors and corporate borrowers that offer floating rate loans to middle-market firms.

Private Credit, End Investors, and Borrowers



Source: IMF staff.

Note: GP = general partners; LP = limited partners.

offers borrowers a value proposition through strong relationships and customized lending terms designed to provide flexibility in times of stress.¹ In contrast with most broadly syndicated loans, private credit offers terms that include enhanced covenants providing lenders with downside protection.² Private credit managers also claim to have much greater resources to deal with problem loans than either banks or public markets, thereby enabling fewer sudden defaults, smoother restructurings, and lower costs of financial distress. Because private credit deals are idiosyncratic and difficult for outside parties to value or trade, lenders typically rely on long-term pools of locked-up capital for financing.

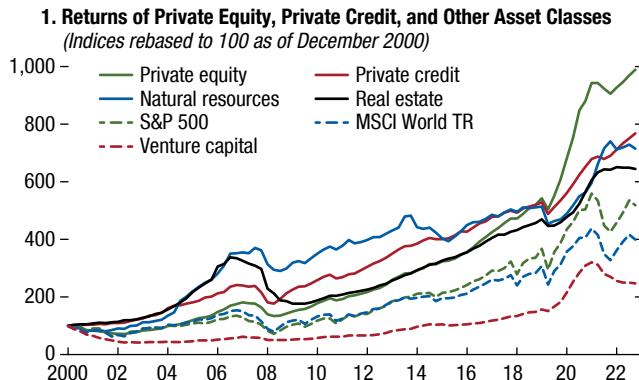
Private credit has grown rapidly since the global financial crisis, taking market share from bank lending

¹Customized lending terms can include, for example, the option to capitalize interest payments (that is, pay in kind) in times of poor liquidity.

²Covenants can vary depending on the transaction and can include, for example, limits for leverage and interest coverage ratios, restrictions on capital expenditures and dividend distributions, restrictions on additional debt, and limitations on asset sales.

Figure 2.2. Overview of Private Credit and Other Traditional Markets and Assets

Private credit funds have delivered comparatively higher gross returns ...



Private credit fund managers based in North America manage a material part of the market in other regions.



... and grown exponentially over the past two decades.



In the United States, private credit size is comparable to leveraged loans and high-yield bond markets.



Sources: Bank of America Global Research; Bloomberg Finance L.P.; PitchBook LCD; Preqin; S&P Capital IQ; and IMF staff calculations.

Note: In panel 1, the private capital indices are rebased to 100 as of December 31, 2000, and are available until June 2023. In panel 2, the measure of assets under management includes those from private credit funds, business development companies, and middle-market collateralized debt obligations, with the last two being mostly US focused, from 2000 to June 2023. In panel 4, bank credit includes both securities, and loans and leases for US commercial banks.

and public markets. Private credit benefitted from the long period of low interest rates that saw a huge expansion of attention to alternative investment strategies. In this context, private credit has appeared attractive, with some of the highest historical returns across debt markets and appears to be relatively low volatility (Figure 2.2, panel 1). At the same time, postcrisis regulatory reforms raised capital requirements for banks and made regulation more risk sensitive, incentivizing banks to hold safer assets. Some end investors (notably insurance companies) were also incentivized to move into private credit because the capital charges are lower and less risk-sensitive than the charges applicable to commercial banks (Cortes, Diaby, and Windsor 2023). There is a concern that tighter bank regulation will

continue to encourage the migration of credit from banks to private credit lenders (Cai and Haque 2024).

As banks appear to have become less willing to lend to middle-market firms with riskier profiles in the United States and Europe, private credit has emerged as a key lender. Private credit assets grew to approximately \$2.1 trillion globally in combined assets and undeployed capital commitments in 2023, with a focus on North America and Europe (Figure 2.2, panel 2).³

³This estimate of the growth in private credit assets includes the assets of private credit funds (\$1.7 trillion globally, as of 2023), business development companies, and private collateralized loan obligations, and therefore underestimates the overall size of private credit globally. This is because some end investors also lend directly to middle-market firms.

For context, such assets are comparable to about three-quarters of the global high-yield market, a more mature but similarly risky market.

Although still focused on middle-market lending, private credit has expanded its remit significantly over the last 20 years, particularly over the last 5. As a result, private credit firms in the United States and Europe can now provide loans to much larger corporate borrowers that would previously fund themselves through broadly syndicated loans or even corporate bonds. Such borrowers may now prefer the customized arrangement of private credit that avoids the disclosures and costs associated with public markets.

Private credit remains focused on North America, but other regions, including Europe and Asia, are experiencing similar growth dynamics. As of June 2023, assets under the management (deployed and committed) of private credit managers located in the United States reached \$1.6 trillion, growing at an average annual rate of 20 percent over the last five years. Private credit now accounts for 7 percent of the credit to nonfinancial corporations in North America, comparable with the shares of broadly syndicated loans and high-yield corporate bonds (Figure 2.2, panel 4). In Europe, private credit also increased rapidly at an average rate of 17 percent per year over the same period, although it has a smaller footprint of 1.6 percent of corporate credit. There is evidence of cross-regional investments, with North American managers financing a significant portion of the private credit funds focused on Europe and Asia (Figure 2.2, panel 3). Asian private credit accounts for about 0.2 percent of credit to nonfinancial corporations, although it has grown at 20 percent annually over the last five years. Private credit in Asia finances mostly smaller deals, targeting high-yield and distressed segments that have limited financing options in emerging market economies (Box 2.1).

Given the low liquidity, higher credit risk, and lack of transparency of private credit, the space is dominated by institutional investors. The most common private credit investment vehicle, accounting for approximately 81 percent of the total market, is a closed-end fund with a capital call structure and limited life cycle, similar to funds used for private equity. An additional 5 percent of the market consists of specialized collateralized loan obligations (CLOs) that invest in middle-market private credit.⁴ Typical investors in these two vehicles are pension funds, insurance companies, sovereign wealth

funds, and family offices. A rapidly growing segment in the United States is known as business development companies (BDCs), which account for 14 percent of the market. BDCs (covered in greater detail later in the chapter) are often public and open to retail investors. In Europe, some funds have adopted more frequent redemption periods (for instance, monthly or even more often) to appeal to a wider investment base.

The growth in private credit has followed the rise in private equity, with which it is closely linked. Managers whose umbrella firm is also active in private equity hold more than three-quarters of private credit assets. For about 70 percent of private credit deals, the borrowing company is sponsored by a private equity firm.

How Private Credit Could Threaten Financial Stability

This chapter assesses private credit vulnerabilities and risks to financial stability and focuses on macrofinancial imbalances that might amplify negative shocks to the real economy (Adrian and others 2019). Specifically, this chapter analyzes the risks from borrowers, liquidity mismatches, leverage, asset valuations, and interconnectedness.

The migration of credit provision from regulated banks and relatively transparent public markets to more opaque private credit firms raises several potential vulnerabilities. Whereas bank loans are subject to strong prudential regulation and supervisory oversight, and bond markets and broadly syndicated loans to comprehensive disclosure requirements that foster market discipline and price discovery, private markets are comparatively lightly regulated and more opaque. Private credit loans, furthermore, are unrated, rarely traded, typically “marked to model” by third-party pricing services, and without standardized terms for contracts. Rising risks and their potential implications may therefore be difficult to detect in advance.

Severe data gaps prevent a comprehensive assessment of how private credit affects financial stability. The interconnections and potential contagion risks many large financial institutions face from exposures to the asset class are poorly understood and highly opaque. Because the private credit sector has rapidly grown, it has never experienced a severe downturn at its current size and scope, and many features designed to mitigate risks have not yet been tested.

At present, the financial stability risks posed by private credit appear contained. Private credit loans

⁴Sources: Prequin, S&P Capital IQ, and PitchBook LCD.

are funded largely with long-term capital, mitigating maturity transformation risks. The use of leverage appears modest, as do liquidity and interconnectedness risks.

The rapid growth of the asset class requires careful monitoring. As private credit assets under management grow rapidly, and competition with investment banks on larger deals intensifies, supply-and-demand dynamics may shift, thereby lowering underwriting standards, raising the chance of credit losses in the asset class, and rendering risk management models obsolete. The private credit sector may also eventually experience falling risk premiums and weakening covenants as assets under management rise rapidly and the pressure to deploy capital increases.

Immediate risks may seem contained, but the sector has meaningful vulnerabilities, is opaque to stakeholders, and is growing rapidly under limited prudential oversight. If these trends continue, private credit vulnerabilities may become systemic:

- *Borrowers' vulnerabilities could generate large, unexpected losses in a downturn.* Private credit is typically floating rate and caters to relatively small borrowers with high leverage. Such borrowers could face rising financing costs and perform poorly in a downturn, particularly in a stagflation scenario, which could generate a surge in defaults and a corresponding spike in financing costs.
- *These credit losses could create significant capital losses for some end investors.* Some insurance and pension companies have significantly expanded their investments in private credit and other illiquid investments. Without better insight into the performance of underlying credits, these firms and their regulators could be caught unaware by a dramatic rerating of credit risks across the asset class.
- *Although currently low, liquidity risks could rise with the growth of retail funds.* The great majority of private credit funds poses little maturity transformation risk, yet the growth of semiliquid funds could increase first-mover advantages and run risks.
- *Multiple layers of leverage create interconnectedness concerns.* Leverage deployed by private credit funds is typically limited, but the private credit value chain is a complex network that includes leveraged players ranging from borrowers to funds to end investors. Funds that use only modest amounts of leverage may still face significant capital calls in a downside scenario, with potential transmission to their leverage providers. Such a scenario could also force the

entire network to simultaneously reduce exposures, triggering spillovers to other markets and the broad economy.

- *Uncertainty about valuations could lead to a loss of confidence in the asset class.* The private credit sector has neither price discovery nor supervisory oversight to facilitate asset performance monitoring, and the opacity of borrowing firms makes prompt assessment of potential losses challenging for outsiders. Fund managers may be incentivized to delay the realization of losses as they raise new funds and collect performance fees based on their existing track records. In a downside scenario, the lack of transparency of the asset class could lead to a deferred realization of losses followed by a spike in defaults. Resulting changes to the modeling assumptions that drive valuations could also cause dramatic markdowns.
- *Risks to financial stability may also stem from interconnections with other segments of the financial sector.* Prime candidates for risk are entities with particularly high exposure to private credit markets, such as insurers influenced by private equity firms and certain groups of pension funds. The assets of private-equity-influenced insurers have grown significantly in recent years, with these entities owning significantly more exposure to less-liquid investments than other insurers. Data constraints make it challenging for supervisors to evaluate exposures across segments of the financial sector and assess potential spillovers.
- *Increasing retail participation in private credit markets raises conduct concerns.* Given the specialized nature of the asset class, the risks involved may be misrepresented. Retail investors may not fully understand the investment risks or the restrictions on redemptions from an illiquid asset class.

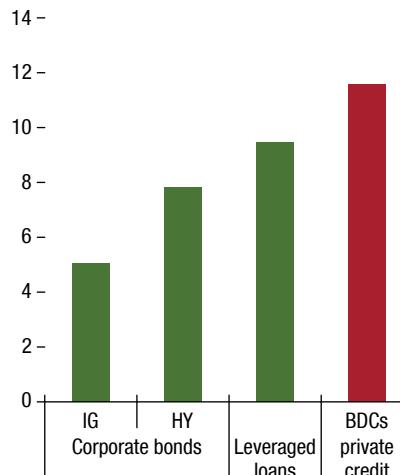
Characteristics of Private Credit Borrowers

Private credit borrowers tend to be riskier than their traded counterparts, such as high-yield bond and leveraged-loan issuers. Borrowers in private credit are also relatively vulnerable to interest rates, as loans have floating rates. However, the support of private equity sponsors and the relatively close and flexible relationship between lender and borrower partially mitigate liquidity and solvency risks. Collateralization and the greater use of covenants provide additional protection for investors.

Figure 2.3. Private Credit Firms Are Medium Sized, Technology Sector Heavy, and Relatively Highly Leveraged Compared to Earnings

The interest rates on private credit loans are typically higher than the yields on market-based debt instruments.

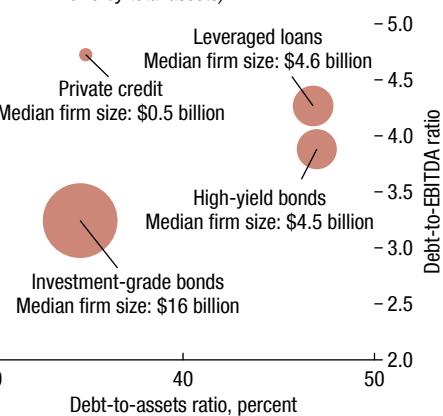
1. US Corporate Debt Yields and Median Private Credit Loan Rates (Percent)



Private credit borrowers are smaller than the typical leveraged loan or bond issuer, and they are more highly leveraged as compared to their earnings.

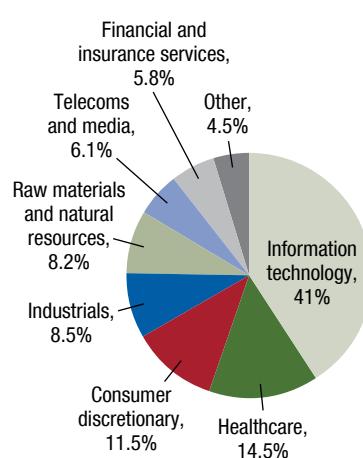
2. Size and Leverage Statistics, by Issuer Type (North America)

(Median debt-to-asset ratio in percent; median debt-to-EBITDA ratio; bubble size reflects median firm size by total assets)



A breakdown of private credit borrowers by sector shows a greater weight of technology and health care sectors.

3. Private Credit Sector Allocation, by Last Three-Year Deal Volume (Percent share by global deal volume)



Sources: Bloomberg Finance L.P.; Prequin; S&P Capital IQ; and IMF staff calculations.

Note: In panel 1, bond yields are based on the aggregate Barclays Bloomberg US corporate bond indices. Leveraged loan yields originate from the LSTA US Leveraged Loan Index. Private credit loan interest rates are based on BDC filings and reflect the median among a sample of loans. The bond and leveraged loan yields reflect the marginal cost of funding, whereas private credit loan interest rates reflect the BDC portfolio. The reference date is year-end 2023. In panel 2, private credit firm fundamentals are based on a sample of private credit transactions from Prequin that have matching data in Capital IQ Pro. This matched sample may therefore be subject to a selection bias given that most private firms do not publicly release financial statements. BDCs = business development companies; EBITDA = earnings before interest, tax, depreciation, and amortization; HY = high yield; IG = investment grade.

Reasons Firms Finance in Private Credit Markets

A key reason driving firms to private credit markets is challenges in accessing traditional funding sources. Evidence suggests that weaker firms with low or negative earnings and high leverage are less likely to secure bank loans and are more inclined to borrow from nonbank sources (Chernenko, Erel, and Prilmeier 2022). Private debt fund managers also believe that they finance companies and leverage levels that banks would not fund (Block and others 2023). In addition, borrowers in the private credit market may be excluded from the syndicated loan market because of their size or their lack of high-quality collateral for bank lenders.

Private credit can also offer benefits in flexibility, speed of execution, and confidentiality. Aspects of each transaction, such as the repayment schedule and collateral requirements, can be tailored to the parties involved. Compared with traditional bank loans and public debt offerings, private credit transactions are often executed more quickly and provide

confidentiality. More recently, these characteristics have attracted larger borrowers that have traditionally accessed other sources of funding. This alternative and flexible funding source for riskier borrowers involves a higher cost; as a result, interest rates on private credit loans tend to exceed yields for market-based alternatives (Figure 2.3, panel 1).

Characteristics and Vulnerabilities of Private Credit Borrowers

Tracking the financial characteristics of private credit borrowers is challenging because of their private nature, resulting in limited availability of their financial statements. To address this challenge, a sample of private credit borrowers was constructed by cross-referencing data from Prequin with corporate fundamentals sourced from S&P Capital IQ.

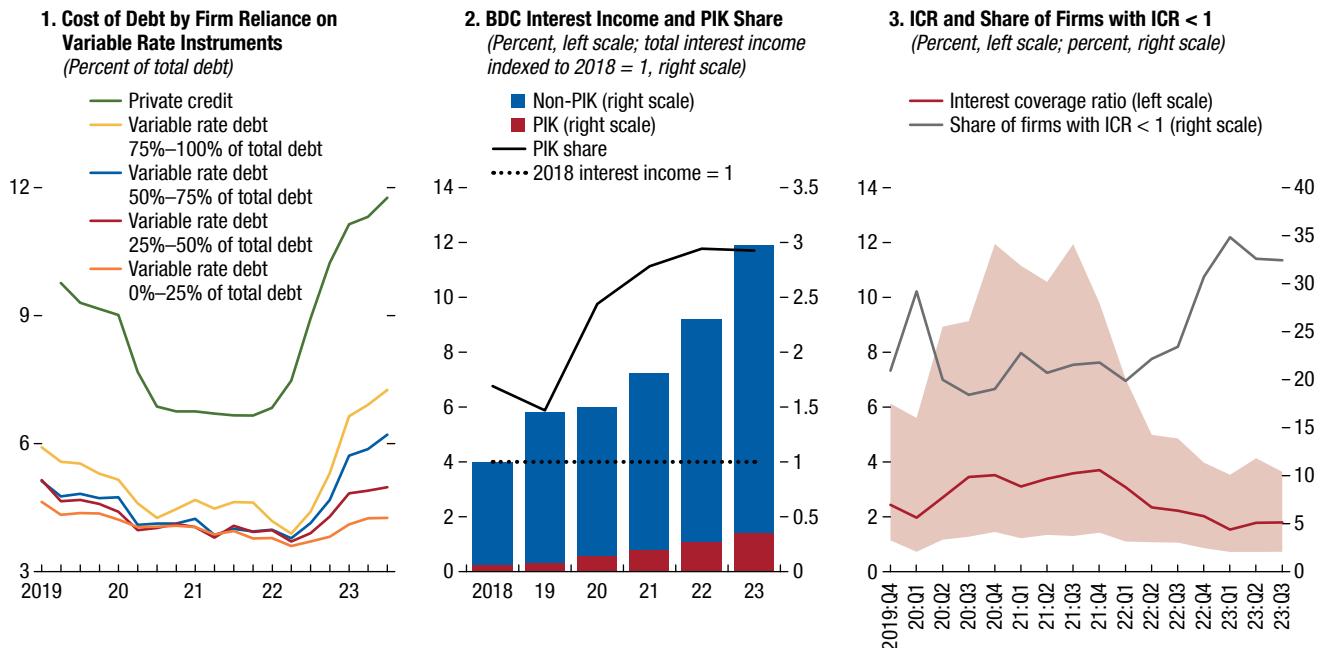
Private credit borrowers are typically highly leveraged middle-market companies. These firms are

Figure 2.4. Private Credit Firms Face a Steep Increase in the Cost of Their Variable Rate Debt

The transmission of higher rates into firms' cost of debt has been more swift for firms with variable rate debt.

Payment-in-kind interest payments have surged for BDC portfolios.

Public firms with size and leverage characteristics similar to private credit firm have shown a deterioration in their ability to pay interest.



Sources: BDC 10-K and 10-Q filings; S&P Capital IQ; and IMF staff calculations.

Note: Panel 1 shows the cost of debt, calculated as interest expense divided by total debt. Medians are taken for each bucket of variable rate debt reliance, whereby this reliance is expressed as the ratio of variable rate debt over total debt. The cost of debt within each bucket varies based on credit fundamentals. Private credit rates are based on a sample of BDC portfolios. In panel 2, when interest is paid in kind, no cash flow occurs. Instead, the interest coupon is added—usually at an extra cost—to the loan's principal. Statistics in panel 3 are based on a sample of public firms located in North America with size and leverage characteristics similar to those of borrowers in the private credit universe. It should be noted that interest coverage and debt/EBITDA ratios are usually not reflected in firm-level databases when earnings are negative. This means that the true number of firms with unsustainable interest expense level is (even) higher than indicated by the ICR = 1 threshold. BDC = business development company; EBITDA = earnings before interest, taxes, depreciation, and amortization; ICR = interest coverage ratio; PIK = payment in kind.

significantly smaller than broadly syndicated loan or high-yield bond-issuing firms. Private credit borrowers have higher debt-to-earnings ratios but better asset coverage than their syndicated loan counterparts.

(Figure 2.3, panel 2) For all these asset classes, high debt levels are often driven by private equity sponsors that enhance returns for their investors by increasing debt on the balance sheets of the firms they acquire (Haque 2023). Private credit borrowers operate across various economic sectors and are overrepresented in the information technology and health care sectors (Figure 2.3, panel 3).⁵

Private credit borrowers are vulnerable to interest rate shocks. Private credit borrowers almost exclu-

sively use floating rate loans. By contrast, only about 29 percent of high-yield corporate bond issuers' total debt is variable rate.⁶ Panel 1 of Figure 2.4 highlights the swifter transmission of interest rates to the cost of debt for firms with a higher share of variable rate debt.

Rising interest rates could ultimately lead to a deterioration in credit quality. The rise in benchmark rates has increased the interest burden for private credit borrowers, prompting some firms to resort to payment-in-kind interest. This flexibility may help borrowers withstand temporary stress, but it can lead to compounding losses if a firm's underperformance cannot be reversed.

⁵For comparison, the weights of the technology and health care sectors in the S&P 500 Index are 30 percent and 12 percent, respectively, whereas these shares are 24 percent and 11 percent for the Bloomberg World Large and Mid Cap Index.

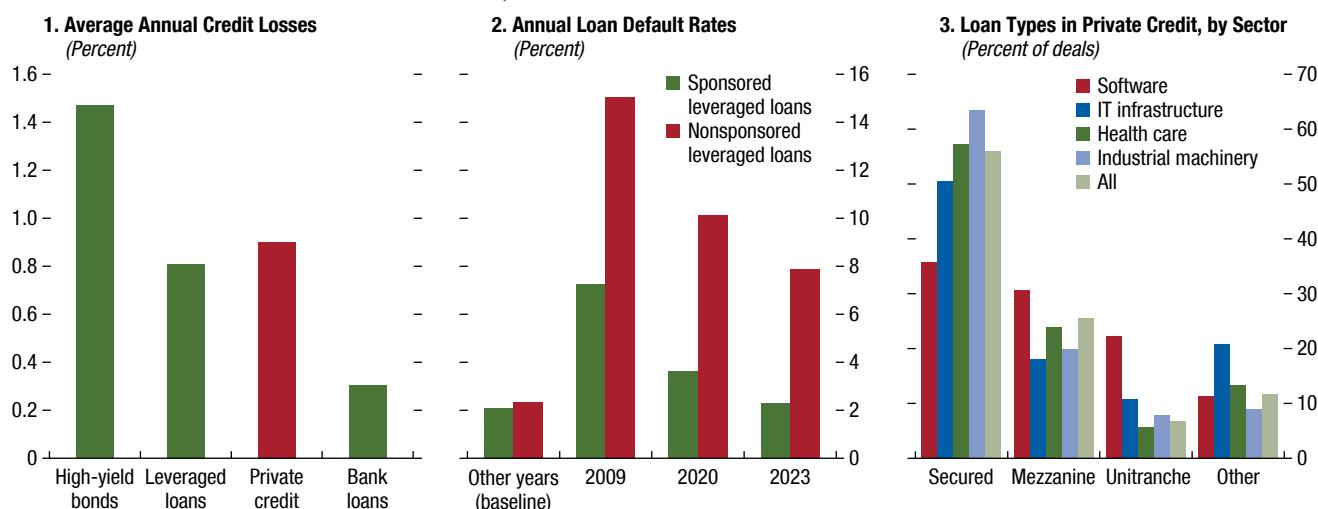
⁶For a sample of 518 North American and 157 European high-yield corporate bond issuers, the average share of variable rate debt is 29.4 percent, at the end of 2022. Sources: S&P Capital IQ; and IMF staff calculations.

Figure 2.5. Private-Equity-Sponsored Firms Show Lower Default Rates during Times of Stress, and Overall Credit Losses in Private Credit Have Historically Not Been Outsized because of Risk Mitigants

Private debt credit losses fall below high-yield bond and bank loan credit losses.

Private-equity-sponsored leveraged loans have shown significantly lower default rates during periods of stress compared with nonsponsored firms.

In some sectors and industries, secured loans are less common. This is likely related to the amount of available collateral.



Sources: Cliffwater; Federal Reserve; Fitch Ratings; Preqin; and IMF staff calculations.

Note: In panel 1, “bank loans” refers to US banks’ commercial and industrial business loans. Average annual credit losses are computed for a 10-year window between 2013 and 2022. In panel 2, “other years” refers to the 2007–22 period, with the exception of 2009 and 2020. IT = information technology.

The share of payment-in-kind interest in BDC interest income has doubled since 2019 (Figure 2.4, panel 2). In addition, the proportion of firms with unsustainable interest coverage ratios has increased to over one-third among firms with size and leverage characteristics similar to those of private credit borrowers (Figure 2.4, panel 3).

during periods of stress than other firms (Figure 2.5, panel 2). This strategy may lessen defaults in a short-lived downturn. To help boost recovery rates in case of liquidation, most private credit loans are secured, which mitigates credit losses. Collateralization can be lower in some sectors, such as the software industry, where unitranche and mezzanine loans are more common (Figure 2.5, panel 3).

Mitigating Factors of Credit Risk

Despite the risky profile of private credit borrowers, their credit losses have not historically exceeded losses in high-yield bonds and are comparable to leveraged loans (Figure 2.5, panel 1). Headline default rates for private credit indices tend to be relatively high, but these include covenant defaults, which often lead to renegotiated terms rather than a true payment default.

Sponsorship by private equity firms also mitigates private credit risks. Private equity sponsors want to preserve the long-term value of their investments and may inject additional capital in their portfolio firms if they believe that stress will be transient. Evidence from the leveraged-loan market illustrates that firms sponsored by private equity have lower default rates

Private Credit Cyclicity

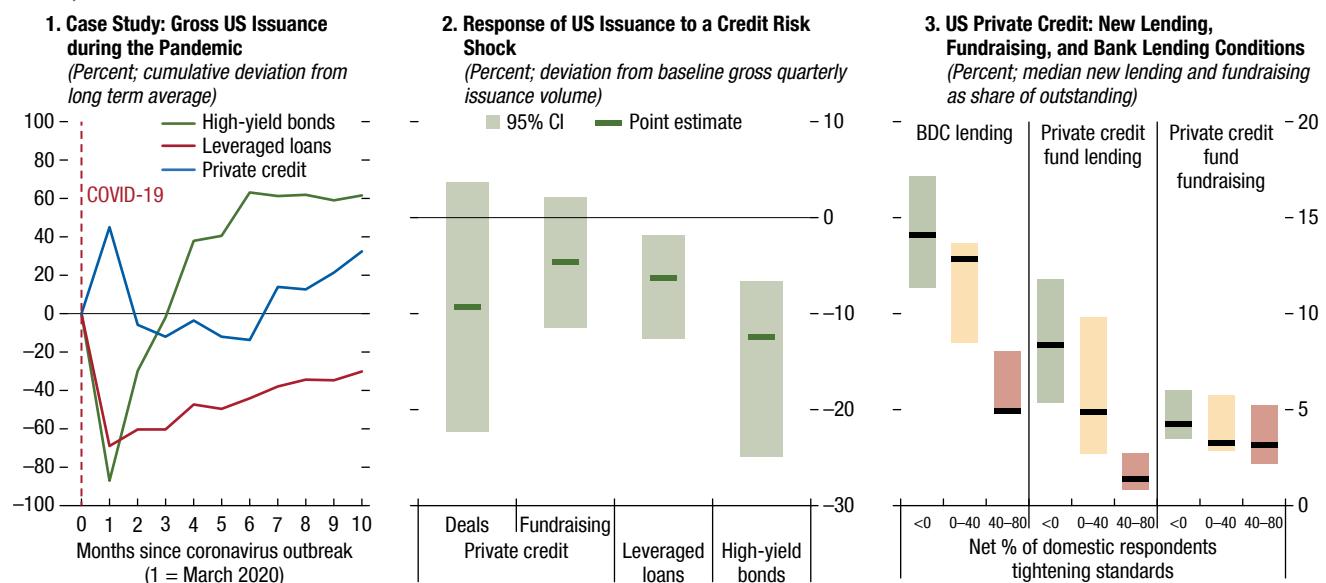
Evidence is mixed regarding the cyclicity of private credit lending. Private credit managers argue that private credit remains accessible during economic downturns, whereas traditional funding sources often contract. There is evidence suggesting that private credit’s relationship with private equity sponsors facilitated lending during the COVID-19 pandemic (Jang 2024). In March 2020, private credit lending did not “dry up,” while high-yield bond and leveraged-loan issuance contracted strongly (Figure 2.6, panel 1). Private credit lending subsequently proved more stable than similarly floating rate leveraged loans. A structural analysis shows private credit market activity is less

Figure 2.6. Private Credit and Pro cyclicality

New private credit lending did not show the same drop as high-yield bond and leveraged-loan issuance in March 2020, and also remained more stable in subsequent months.

The response of new private credit deals and fundraising to a credit shock is not as consistently negative as the response of leveraged-loan and high-yield bond issuance.

New BDC lending seems to be more correlated with bank lending conditions than private credit, where fundraising in particular shows a weaker relationship to bank lending conditions.



Sources: Bloomberg Finance L.P.; Federal Reserve; PitchBook LCD; Preqin; S&P Capital IQ; and IMF staff calculations.

Note: In panel 1, issuance is benchmarked versus the average cumulative issuance over the same months in the five preceding years. In panel 2, the response of issuance volumes is based on Structural Vector Autoregression models containing quarterly high-yield corporate bond spreads and issuance volumes, whereby the identification is based on the Cholesky ordering spreads (first) and issuance (second). The number of lags included is based on the Akaike information criterion. One lag is included for leveraged loan, high-yield bond issuance and private credit deal volume, two for fundraising. In panels 3 and 4, bank lending conditions are based on the Net Percent of Domestic Respondents Tightening Standards for Commercial & Industrial Loans for Large/Medium Firms, as reported in the Senior Loan Officer Opinion Survey on Bank Lending Practices. BDC = business development company; CI = confidence interval.

responsive to a sudden credit shock than the high-yield bond and leveraged-loan markets (Figure 2.6, panel 2). Yet there is also evidence of procyclical behavior. The Bank for International Settlements found that capital deployment in private equity and private credit is positively correlated with stock market returns (Aramonte and Avalos 2021). In addition, data from the BDC markets indicate that new private credit loans contract when banks tighten their lending standards (Figure 2.6, panel 3). New lending by private credit funds seems to be less procyclical than BDC lending.

Liquidity Risks of Private Credit Funds

Although private credit funds hold highly illiquid underlying assets, their structure is designed to minimize liquidity and maturity transformation risk through long-term lockups and other constraints

for investors to redeem their capital. Most private credit fund investors, such as insurance companies and pension funds, lock in a certain portion of their investments for a period compatible with the life cycle of closed-end funds. However, liquidity stress could arise from the credit facilities offered by private credit funds to borrowers. In addition, the recent shift toward semiliquid evergreen structures could increase liquidity risks over time.

Limited Redemptions

Private credit funds invest primarily in private corporate loans, assets characterized by their illiquidity, and an incipient secondary market. Asset managers mitigate the risk of holding these assets by setting structures with low maturity transformation. Private credit CLOs and closed-end funds do not

typically allow redemptions during their life span. This significantly reduces the liquidity risks arising from such funds.

Redemptions are more common for semiliquid structures that aim to provide liquidity to investors while investing in illiquid assets. Unlike traditional closed-end funds, semiliquid funds provide investors with limited windows during which they can redeem their shares. BDCs, for instance, often use semiliquid structures to appeal to a wider investor base, especially individual investors. Even in semiliquid structures, however, redemptions are often constrained by gates, fixed redemption periods, and suspension clauses. Although these liquidity management tools may seem adequate in principle, they have not been tested in a severe runoff scenario, and redemption pressures have sometimes forced certain large private credit fund managers to allow redemptions above the established limits. In addition, certain funds, particularly in Europe, have adopted more frequent redemption periods (for instance, monthly or even more often), which may exacerbate liquidity risks.

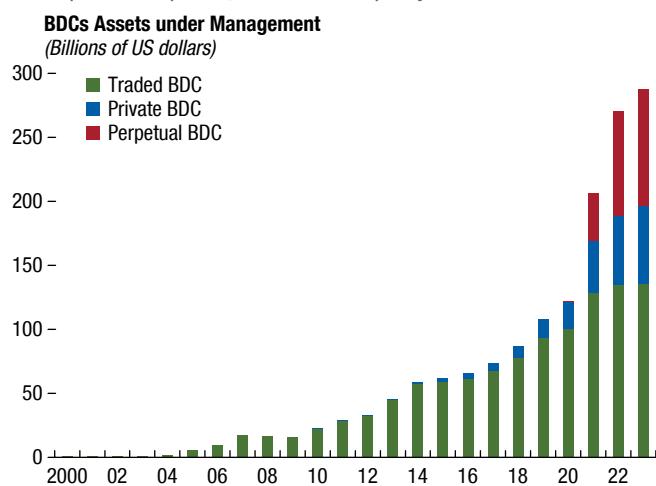
Potential liquidity pressures could also arise from credit and liquidity facilities offered to portfolio companies. Private credit funds often combine loans with revolving facilities. There is a risk that, like the “dash for cash” in 2020, firms simultaneously and unexpectedly withdraw their credit balances, suddenly increasing private credit funds’ need for cash. Private credit funds might also transfer the liquidity stress to end investors through their committed capital (see the “Interconnectedness” section later in this chapter).

Risks from the Increasing Share of Retail Investors and Semiliquid Funds

The recent trend toward the use of semiliquid structures has the potential to increase maturity transformation within the private credit industry. This trend is exemplified by the active creation of semiliquid funds, such as perpetual nontraded BDCs (Figure 2.7). One primary motivation behind this trend is to access a broader investor pool, particularly individual investors. As institutional investors reach their limits on investment in private capital, funds seek to broaden their capital sources. Recent legislation in Europe on the European long-term investment funds (ELTIFs) and in the United

Figure 2.7. Private Credit Liquidity

An increase in semiliquid products, such as perpetual business development companies, can increase liquidity risk.



Sources: S&P Capital IQ; and IMF staff calculations.

Note: The data comes from the aggregation of 143 business development companies, 50 of them being traded. BDCs = business development companies.

Kingdom on the long-term asset funds (LTAFs) may further support this trend.

Although designed to enable access for individual investors, the operational efficiencies and liquidity potential of semiliquid structures may also appeal to institutional investors. Insurance companies and pension funds have transformed their business models over the years, prompted by the prolonged low interest rate environment. They have shifted from traditional, capital-intensive, long-term guaranteed products to unit-linked insurance products⁷ and from defined-benefit to defined-contribution pension plans. By transferring the performance and loss of investments to end investors (that is, clients), insurers and pension funds enable clients to switch between available investment plans. This flexibility reduces the effective duration of the liabilities of insurers and pension funds, potentially increasing their demand for liquidity in underlying investments and further

⁷Unit-linked insurance products provide both insurance coverage and investment exposures—typically through investment funds—and the insurance benefits are linked to the investment returns. Policyholders are often subject to a minimum lock-in period, additional fees, and taxes for early surrender, which discourage the policyholders from early surrender and redemption. Despite these constraints, insurers often allow policyholders to change their investment allocations among the selected investment funds.

pushing the trend toward semiliquid structures in private credit.

Leverage in Private Credit

Leverage deployed by private credit funds appears to be low compared with other lenders such as banks, but the presence of multiple layers of hidden leverage within the broader private credit system raises concerns. Leverage may not always be at the fund level, and the entire private credit system can form a complex network involving several potentially leveraged participants, including borrowers. Assessing the financial stability implications of these multiple layers of leverage is challenging because of data limitations.

Multiple Layers of Leverage

Private credit investors, funds, and borrowers deploy leverage extensively, forming a complex multilayered structure. Investors such as insurance firms and pension funds may use leverage (Figure 2.8, channel 1), making them vulnerable to the deterioration of the credit outlook and an increase in credit downgrades and defaults. These investors are also subject to margin and collateral calls during periods of high market volatility, which, given their large footprint, may exacerbate stress in financial markets (see the “Interconnectedness” section).

Private credit investment vehicles may employ leverage directly within a fund, through special-purpose vehicles or holding companies (Figure 2.8, channel 2). Leverage can also be increased through more complex strategies such as collateralized fund obligations, in which the interests of the fund’s limited partners are transferred to a special-purpose vehicle to loosen cash flows and access a wider investor base (IOSCO 2023). These opaque structures can also include cross-border entities, which are often used for regulatory and tax purposes.

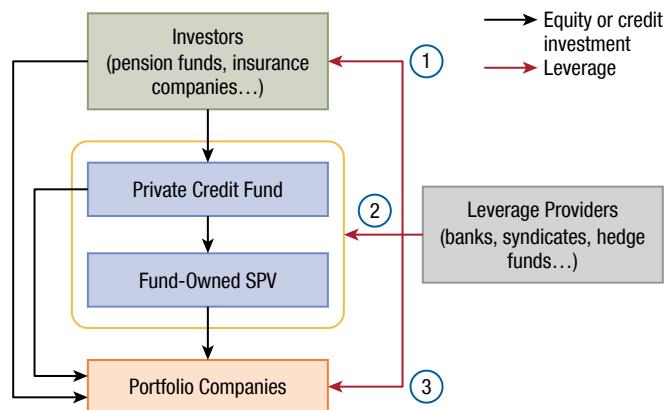
In addition, private credit borrowers extensively deploy leverage (Figure 2.8, channel 3). As discussed earlier in the “Mitigating Factors of Credit Risk” section, most firms borrowing from private credit funds are backed by private equity sponsors, leading to higher debt for the firms or leverage ratios deemed excessive by banks.

These multiple layers of leverage throughout the value chain, often hidden by gaps in reporting, could magnify losses and trigger spillovers to other markets during

Figure 2.8. Leverage in Private Credit

Investors, funds, and borrowers extensively deploy leverage, forming a complex multilayers structure.

Multiple Layers of Leverage



Sources: IOSCO 2023; and IMF staff.

Note: SPV = special purpose vehicle.

a downside scenario of forced deleveraging. In such scenarios, vulnerabilities among borrowers may lead to large, unexpected losses for funds and end investors. Even funds that deploy modest amounts of leverage may still face significant capital calls, potentially affecting their leverage providers. This situation could compel the entire network to simultaneously reduce exposures, spilling over to other markets and the broader economy. Evaluation of leverage in private credit markets from a network perspective by prudential authorities is therefore critical but is currently impeded by data constraints.

Leverage of Private Credit Funds

Private credit funds deploy leverage to enhance returns for equity investors. The specific debt structure varies by type of investment vehicle (Table 2.2). As for most nontraded private credit products, information on the deployment of leverage by closed-end funds is scarce. One of the few in-depth studies of closed-end funds was recently conducted by the US Federal Reserve using confidential regulatory data.

According to this study, most closed-end private credit funds are unleveraged but some use financial and synthetic leverage (Federal Reserve 2023). Those funds at the 95th percentile have borrowing-to-assets ratios of about 1.27 and derivatives-to-assets ratios of about 0.66.

Table 2.2. Characteristics of Leverage in Private Credit Vehicles*Private credit investment vehicles deploy leverage in different forms.*

	Closed-End Funds	BDCs	Middle-Market CLOs
Debt-to-equity ratios	~0 to 1.3x	~0.8 to 1.2x	All debt-to-equity: ~6x AAA to other classes: ~1x
Leverage sources	Portfolio financing, NAV loans, subscription lines, derivatives	Secured bank lines of credit and secured/unsecured bonds	Term leverage through structured notes
Rollover risk	Yes	Yes	No
Collateral call frequency	Varies (typically quarterly)	Varies (typically quarterly)	None (cash-flow structure)
Main lenders	Banks, insurers, pension funds	Banks, insurers, pension funds	Insurers, pension funds, hedge funds, banks
Total AUM (United States)	~\$1.2 trillion	~\$300 billion	~\$100 billion

Sources: IOSCO 2023; and IMF staff.

Note: AUM = assets under management; BDCs = business development companies; CLOs = collateralized loan obligations; NAV = net asset value.

Sources of debt for BDCs seem more diversified, as they issue unsecured bonds and notes (Figure 2.9, panel 1). BDCs are subject to a regulatory limit on leverage and often establish internal limits that are more conservative than the regulatory ones.⁸ Nevertheless, BDCs' leverage has steadily increased over the past 20 years (Figure 2.9, panel 2). Anecdotal evidence suggests that closed-end funds exhibit the same behavior.

Private credit CLOs use securitization structures that enable investors to acquire different tranches based on their risk appetite.⁹ Insurance companies, pension funds, hedge funds, and banks are the main investors in CLO securities. The ratio of CLO non-equity tranches over the equity tranches varies but is often about 6 to 1.

Although leverage at the fund level appears limited, private credit funds may still be subject to rollover risks, particularly in a sharp downturn. Leverage provided by commercial banks often has loan-to-value triggers, and thus, private credit funds may face large collateral calls on leveraged portfolios during times of stress. Leverage providers may decide to mark assets down significantly, given the riskiness of borrowers and the lack of comparable public pricing data. In addition, private credit funds often provide their borrowing firms with revolvers or other credit lines. Sudden and significant correlated drawdowns of these credit lines

could create considerable funding needs for the private credit funds. Anecdotal evidence suggests that private credit funds maintain significant cushions to mitigate this risk, yet industry commentary suggests that such pressures were seen during the height of COVID-19 stress in 2020. Unlike banks, private credit providers did not have access to central bank lending facilities, nor were central banks able to buy private credit assets to support asset prices (see the April 2023 *Global Financial Stability Report*). Evaluating the potential extent of these risks is challenging given the lack of publicly available information on maturity profiles and often even on the composition and amount of debt.

Private Credit Valuations

Private credit loans tend to suffer from stale valuations because of the absence of secondary markets, limited comparable transactions, and irregular appraisals. In a downside scenario, stale valuations could create a first-mover advantage and increase the risk of runs for private credit funds. This risk, however, can be significantly mitigated by restrictions on investors redeeming their investments (see the “Limited Redemptions” section earlier in the chapter). The lack of information about vulnerable borrowers, as discussed in the previous section, combined with stale valuations, nevertheless makes it challenging for outsiders to assess potential losses promptly and could fuel a loss of confidence in the segment.

Valuation Practices and Requirements

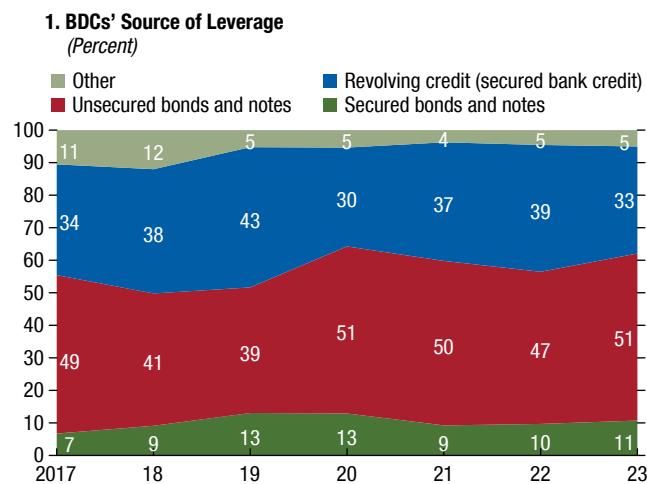
Valuing private credit assets is inherently challenging because of their illiquid nature. Private credit loans

⁸The regulation of BDCs caps their debt-to-equity ratio at 2, which was increased from 1 in 2018. Under the framework for loan origination funds in the European Union, leverage caps may apply to private credit fund managers irrespective of whether the underlying investors are retail.

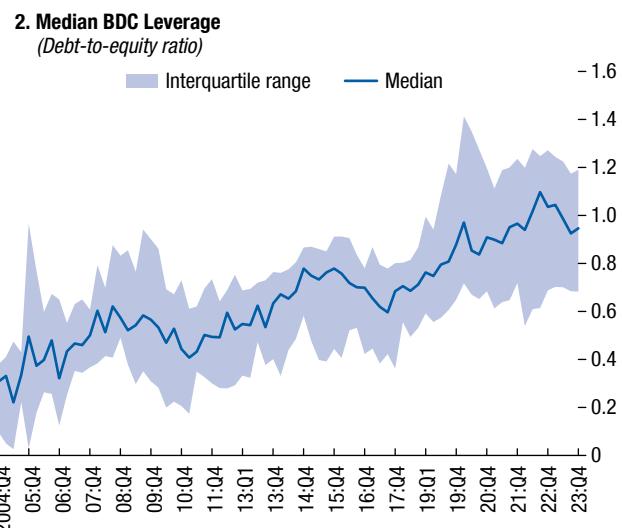
⁹Private credit CLOs are structured finance vehicles that pool a portfolio of privately originated loans and securitize them into debt securities. They differ from traditional middle-market CLOs that include underlying loans not originated in private markets.

Figure 2.9. Leverage of Business Development Companies

BDCs have a relatively diversified source of financial leverage that includes secured and unsecured bonds and notes.



The debt-to-equity ratio of BDCs has increased steadily, although still substantially below the regulatory cap of 2.



Sources: S&P Capital IQ; and IMF staff calculations.
Note: BDCs = business development companies.

can be tailored to the financing needs of borrowers and lenders, making it difficult to identify comparable transactions. In the absence of observable price inputs, the firms must resort to mark-to-model approaches to estimate market prices that are inherently subjective and can increase the potential for managerial manipulation (Ball 2006; Dudycz and Pražníkow 2020). To address these concerns and mitigate risks, asset managers frequently seek third-party pricing services.¹⁰

Private credit fund managers must adhere to accounting principles outlined in relevant standards, such as generally accepted accounting principles in North America or the International Financial Reporting Standards. These accounting standards offer guidance but do not mandate any specific technique for asset valuation, granting managers significant discretion. The current regulatory framework, similarly, does not specify asset valuation methodologies, focusing on policy documentation, governance frameworks, and investor disclosures. Evidence from disclosure forms of traded private credit funds suggests that markdowns often result from impairments of a borrower's financial position.

¹⁰Third-party valuation may not fully address the risks, as evidence suggests that profit-driven service providers, appointed and compensated by clients, may prioritize client retention over impartiality (Efing and Hau 2015; Short and Toffel 2016).

Private Credit Stale Valuations

To assess private credit valuation practices, the analysis conducted for this chapter benchmarked them against the prices of similar publicly traded assets, focusing on BDCs. BDCs are specific investment funds created in the United States to encourage the flow of capital to smaller companies. BDCs' granular reporting of their investment portfolios—consisting of loans, common and preferred equity investments, various tranches of CLOs, and asset-backed securities—along with the quarterly position-by-position accounting fair-value marks, provides a valuable window into the normally opaque world of private credit.¹¹

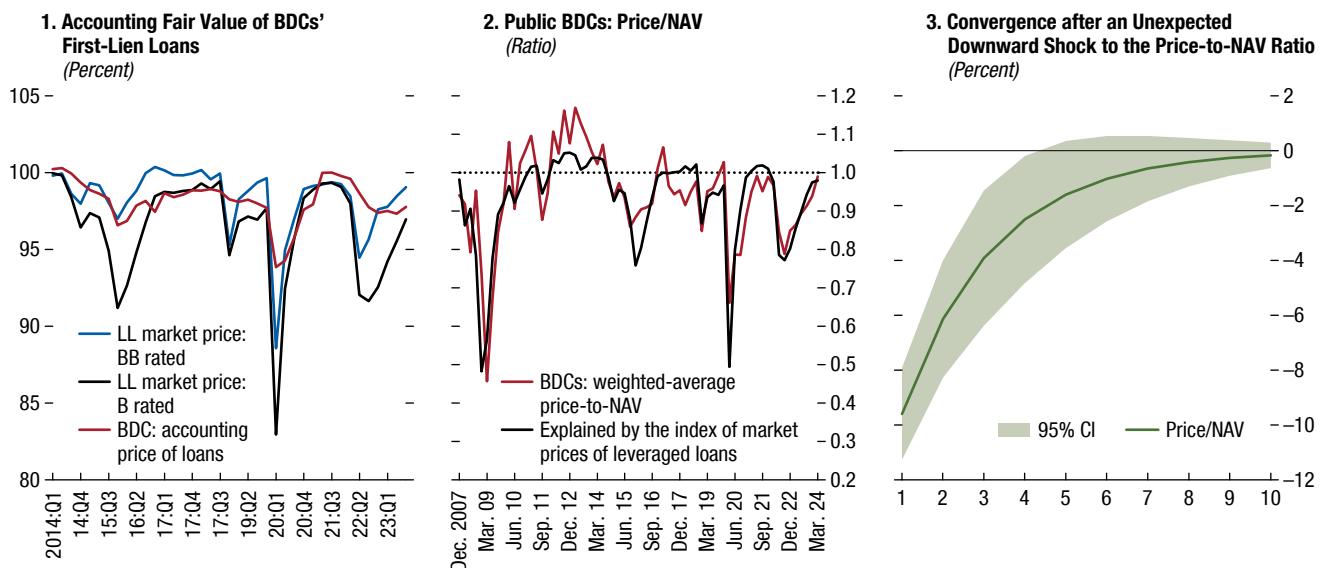
¹¹Most BDCs have portfolios concentrated in first- and second-lien senior secured loans, which typically represent 70 to 90 percent of their investment portfolios. These loans are distributed across multiple industries and borrowers, often ranging from 100 to 200. In addition to private credit loans, BDC portfolios often contain equities and bonds of varying liquidity. To focus on credit valuations, the analysis excludes price changes arising from other types of assets. The US Securities and Exchange Commission requires all BDCs to disclose Forms 10-Q and 10-K. Public BDCs provide additional transparency, as they cater to a broad range of equity and bond investors. The disclosure reports of BDCs are prepared in accordance with the US generally accepted accounting principles, following accounting and reporting guidance ASC 946, and fair value of level 3 assets is determined in line with ASC 820–10.

Figure 2.10. Valuation of Private Credit Assets

Adjustment of the valuation of private credit loans is insufficient during market shocks ...

... which is offset by the additional discount of market price to NAV.

Price and NAV take at least four quarters to converge after an unexpected shock.



Sources: 10-Q/10-K disclosures of BDCs; Bloomberg Finance L.P.; S&P Capital IQ; and IMF staff calculations.

Note: Panel 3 shows the impulse response function to a sudden deviation of the price-to-NAV ratio. The impulse response function is based on an AR(1) model using quarterly data. The panel shows that—based on the historical price-to-NAV ratio patterns—it takes at least four quarters for the price and the NAV to converge after a shock. The shock is sized to one standard deviation. BDC = business development company; CI = confidence interval; LL = leveraged loan; NAV = net asset value.

The analysis shows that private credit prices move less than in high-yield and leveraged-loan markets, even though private credit borrowers are riskier. In Figure 2.10, panel 1 shows that the reaction of BDC loans to credit shocks is much smaller than that of B-rated leveraged loans, despite the lower credit quality of BDCs' loan portfolios. The smaller valuation adjustment is offset by an additional discount applied to market prices of BDC shares (Figure 2.10, panel 2). The discount widens during stress periods, and the widening is proxied by the general market repricing of credit risk (proxied by the LSTA US Leveraged Loan 100 Index).

Evidence suggests that adjustments to the values of private credit loans are smaller and slower than those observed in public markets. Panel 3 of Figure 2.10 shows that such deviations tend to persist for several quarters, after which share prices and net asset value per share converge. Markets differentiate BDCs on the basis of their qualitative and quantitative characteristics, such as the sector to which each BDC is exposed, its ability to grow organically, and its transparency. For other nontraded private credit investment funds,

evidence suggests that the discounts are even larger because of the lack of transparency.

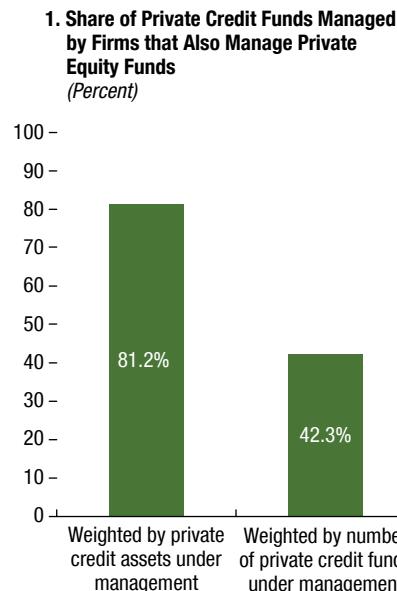
Potential Risks and Benefits from Infrequent Valuations

Stale valuations could offer a first-mover advantage and increase runoff risks for private credit funds, but this risk appears significantly mitigated at present. In a downside scenario, stale valuations might overvalue a fund's assets, potentially prompting investors to exit before asset values are marked down. As outlined in the "Vulnerabilities to Liquidity Stress and Spillovers to Public Markets" section, however, private credit funds impose substantial obstacles for investors seeking to redeem their investments, thus mitigating this risk.

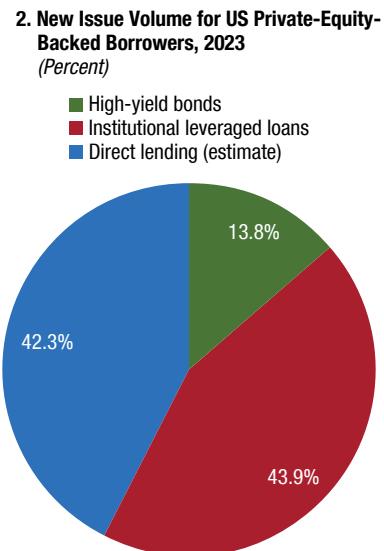
Industry commentary suggests that in illiquid asset classes such as private credit, valuations are inherently uncertain and subjective, potentially diminishing the advantages of more frequent mark-to-market practices. Beyond the associated costs and risk of mispricing, frequent mark-to-market assessments could exacerbate procyclical tendencies and increase

Figure 2.11. Links between Private Credit and Private Equity

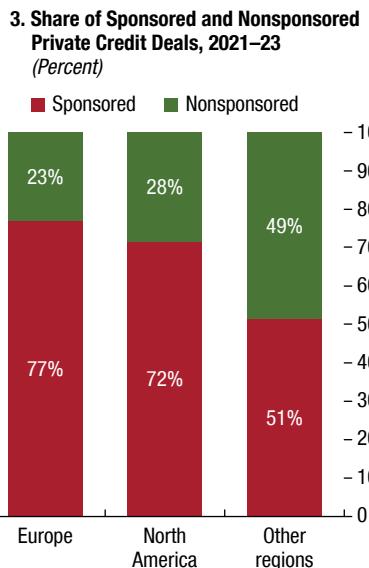
Many firms that manage private credit funds also manages private equity funds.



Private-equity-backed firms borrow on the leveraged-loan, high-yield bond, and private credit markets.



About 70 percent of private credit deals are sponsored by private equity firms.



Sources: PitchBook LCD; Preqin; and IMF staff calculations.

market volatility. Moreover, the emphasis on frequent valuations might incentivize investors and managers to prioritize short-term performance, undermining the long-term advantage offered by the buy-and-hold nature of private credit. Institutional investors are also incentivized to avoid balance sheet volatility and demand more frequent and rigorous valuations from investment managers.

However, stale valuations could also distort capital allocation, exacerbate conflicts of interest, and undermine confidence in private credit markets. Inaccurate or infrequent mark-to-market practices hinder investors from making informed decisions and managing risks effectively. Stale valuations could also affect market integrity when incentives are not aligned. For example, managers may have incentives to maintain high valuations during fundraising periods to reference historically higher returns. Conflicts of interest also arise from managers' fees based on valuation. Stale valuations make it difficult for stakeholders to assess potential losses in a timely manner and, in a downturn scenario, could fuel a loss of confidence in the segment.

Interconnectedness

Private credit funds have ties with various financial institutions. These institutions include private equity firms, which sponsor most private credit deals; banks, which are the primary providers of leverage; and institutional investors, which invest capital in the form of equity and debt investments in private credit funds.

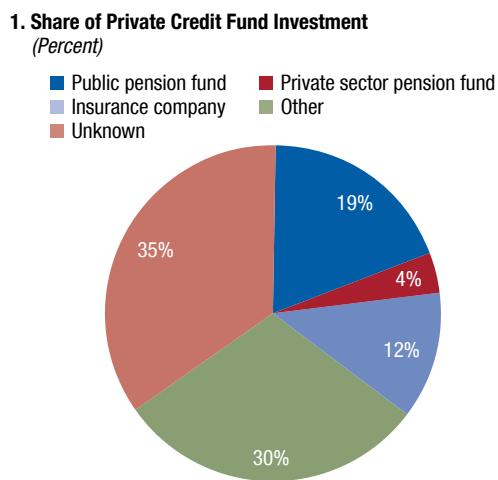
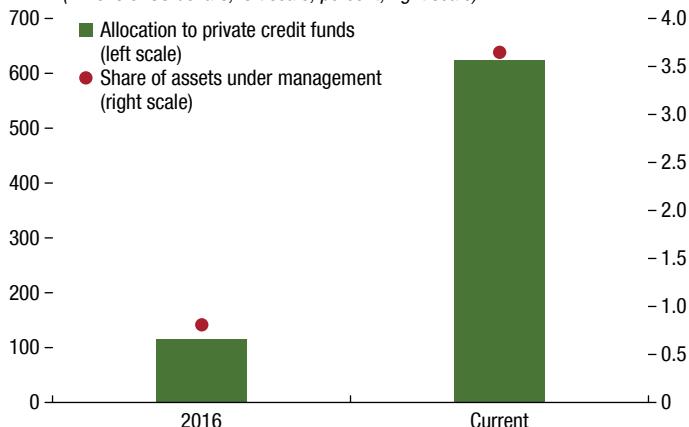
Interconnections between Private Credit and Private Equity Firms

The private credit and private equity industries are closely intertwined through two primary channels. First, many managers of private credit funds are also managers of private equity funds (Figure 2.11, panel 1). This interconnectedness becomes even more pronounced when considering the size of private credit funds, given that managers of the largest private credit funds are more likely to be involved in the private equity segment. Second, private credit is a key funding source for firms sponsored by private equity (Figure 2.11, panel 2), with a large share of

Figure 2.12. Exposures of Traditional Financial Institutions to Private Credit Funds

Pension funds and insurers are the main investors in private credit funds globally ...

... and they are rapidly increasing their exposure.

**2. Investment in Private Credit Funds by Pension Funds and Insurance Firms (Billions of US dollars, left scale; percent, right scale)**

Sources: Preqin; and IMF staff calculations.

Note: In panel 1, “Unknown” is related to those investors not disclosing the amount of their allocation to private credit funds publicly. This includes pension funds and insurers that are known to have an allocation to private credit but do not disclose the exact amount. It also includes other investors, family offices, and sovereign wealth funds, in particular, that do not disclose data on their holdings. In addition to private credit funds, insurers have substantial exposures to private credit through their investments in structured credit and their participation in direct lending. The share labeled “Other” includes asset managers, investment banks, private equity firms, endowment plans, and more.

the borrowing firms in private credit deals having a private equity sponsor (Figure 2.11, panel 3). This is an important connection because, as discussed in the “Characteristics of Private Credit Borrowers” section, private equity sponsors greatly mitigate credit risk. Overall, these connections suggest that vulnerabilities in one segment of the private financing industry could spill over to the other. Close ties between the two industries also raise questions about possible conflicts of interest, given that managers may have multiple connections through portfolio firms and investors (that is, limited partners).

Exposure of Traditional Financial Institutions to Private Credit

Potential risks to financial stability arising from direct exposures of banks to private credit currently appear to be contained. Banks are one of the primary providers of leverage to private credit firms, yet their aggregate exposure remains low. In aggregate, private credit funds in the United States borrowed about \$200 billion from US banks at the end of 2021, representing less than 1 percent of the banks’ assets (Federal Reserve 2023).

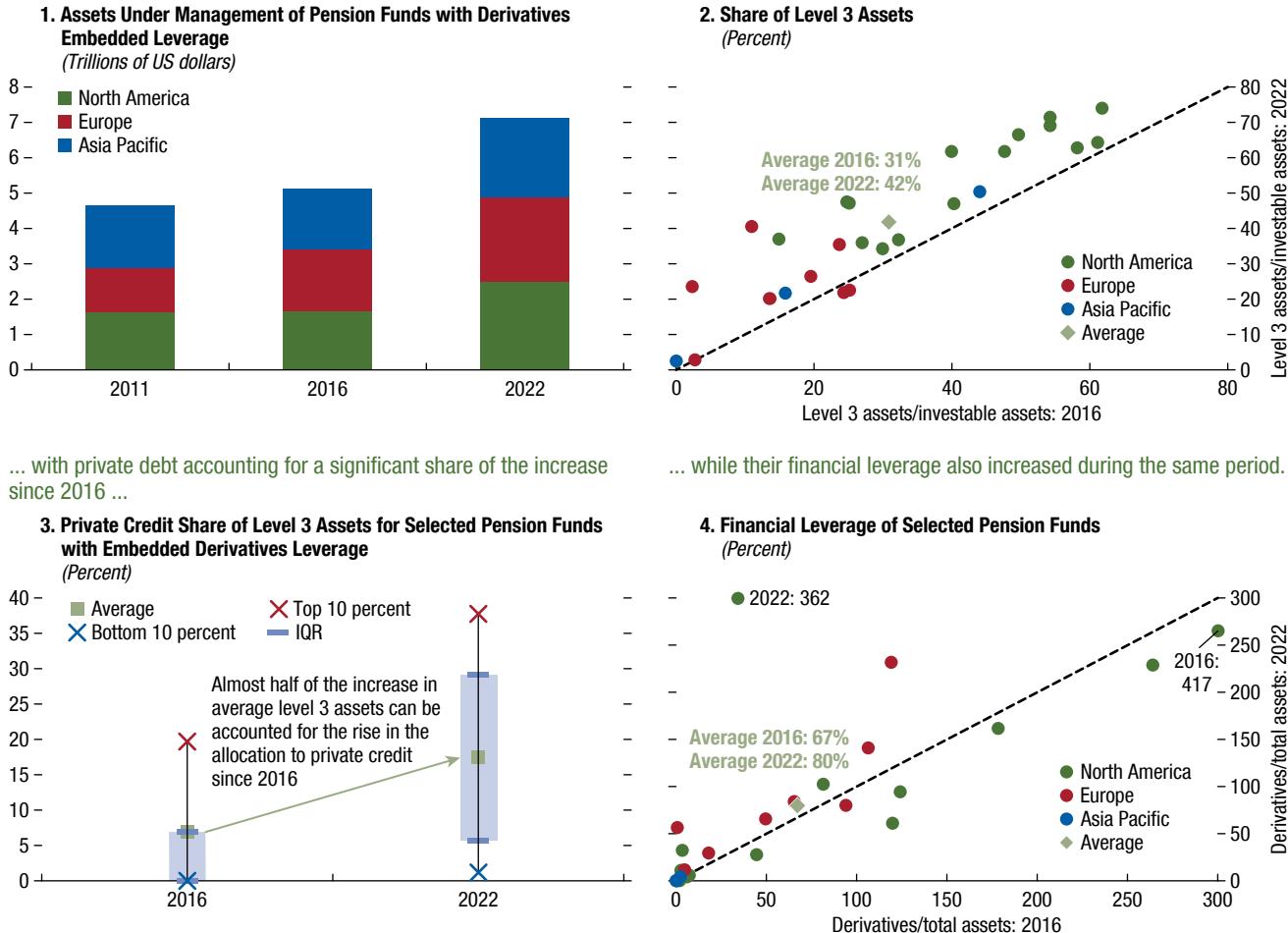
Credit risks to banks are also mitigated by the secured nature of the loans. However, the lack of data does not allow ruling out the possibility that some banks exhibit concentrated exposure to the sector.

In their search for yield, pension funds and insurance companies have emerged as important end investors in private credit, with significant investment growth in recent years (Figure 2.12, panels 1 and 2). Although private credit exposures are expanding rapidly, they remain relatively small for most institutions, accounting for only a low single-digit percentage of total assets under management (Figure 2.12, panel 2). Certain segments exhibit substantially higher exposure. Specifically, some large pension funds and selected private-equity-influenced insurers in advanced economies have increased their exposures significantly in recent years, as investors in not only private credit funds but also structured credit, participation in direct lending, and the leverage providers to private credit investment vehicles.¹²

¹²For example, such segments have increased their exposure by investing in collateralized loan obligations and buying bonds and notes issued by BDCs and other private credit investment vehicles.

Figure 2.13. Pension Funds with Financial Leverage and Illiquid Investments

The assets of a sample of pension funds with derivatives embedded leverage have risen to more than \$7 trillion ...



Sources: Bloomberg Finance L.P.; individual annual reports of selected pension funds; Preqin; and IMF staff calculations.

Note: The calculation in panel 1 is based on a sample of 26 large pension funds in 10 jurisdictions that disclose data on the gross notional exposure of derivatives in their annual reports. These 26 funds are among the largest 150 pension funds worldwide and have combined assets under management of more than \$7 trillion, which is about 17.5 percent of global pension fund assets. Note that the calculation in panel 3 is based on 21 of the pension funds in the sample for which data on allocation to private credit funds was found in Preqin. This calculation excludes other types of private credit investment, including direct lending or investment in structured private credit vehicles such as collateralized loan obligations. Panel 4 uses the gross notional exposure of derivatives as a proxy for the financial leverage of pension funds. These funds can be also active users of repurchase agreements, which can further increase their financial leverage. IQR = interquartile range.

Vulnerabilities to Liquidity Stress and Spillovers to Public Markets

Private credit is increasing the share of illiquid assets held by pension funds and insurers, giving rise to concerns about potential market disruptions. Some of the world's largest pension funds, with assets exceeding \$7 trillion, have significantly increased their allocation to illiquid investments while actively using derivatives and other forms of leverage

(Figure 2.13, panels 1 and 2).¹³ Rising allocations to private credit are estimated to account for almost half of the increase in level 3 assets, reflecting

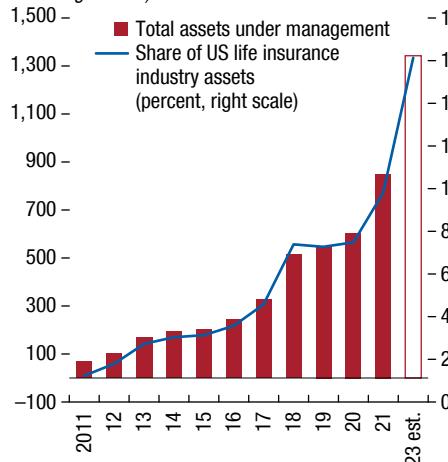
¹³The sample consists of 26 large pension funds—ranked among the largest 150 pension funds in assets globally—that disclose data on the gross notional exposure of derivatives in their annual reports. These funds have combined assets under management of more than \$7 trillion, which is about 17.5 percent of global pension fund assets.

Figure 2.14. Private-Equity-Influenced Life Insurers

The assets of private-equity-influenced insurers have grown sharply ...

1. Assets of US Private-Equity-Influenced Life Insurers

(Billions of US dollars, left scale; percent, right scale)



... have much larger illiquid exposures than the median large insurer globally ...

2. Share of Level 3 Assets (Percent)

● 90th percentile — Median
● 10th percentile

Private-equity-influenced insurers

Global insurers

... and their capital adequacy is weaker than the median US insurance firm.

3. Risk-Based Capital Ratios (Percent)

● 90th percentile — Median
● 10th percentile

US private-equity-influenced insurers US insurers

Sources: A.M. Best; individual annual reports of selected private-equity-influenced life insurers; S&P Capital IQ; websites of individual private-equity-influenced life insurers; and IMF staff calculations.

Note: The 2023 estimate in panel 1 is calculated using information from the websites of 28 individual US private-equity-influenced life insurers. The global insurers estimate in panel 2 is calculated from a sample of 50 selected large insurance groups from 19 jurisdictions across Europe, North America, Asia, and Australia. The sample of large insurers has assets of more than \$15 trillion, or about 40 percent of all insurance assets globally. The calculation for private-equity-influenced life insurers is based on a sample of 15 entities for which Level 3 asset information was found in their annual reports. Panel 3 includes 16 US private-equity-influenced life insurers for which risk-based capital ratios were found. The US insurers' risk-capital ratio is based on a sample of the largest 20 US insurers. This calculation was possible only for the United States, as its risk-based capital ratios are not directly comparable with other jurisdictions. est. = estimation.

the growing popularity of this asset class among institutional investors (Figure 2.13, panel 3). Pension funds, moreover, have sizeable investments in private equity, which are also illiquid and can be related to the same private credit investments the funds hold (see the previous section). This change in asset composition heightens pension funds' vulnerability to margin and collateral calls that could arise from their derivative exposures. These calls may exacerbate stress in global financial markets, particularly markets in which pension funds have a large footprint, such as government bonds, equities, and corporate bonds. The financial leverage of those pension funds rose to 80 percent of assets in 2022 from 67 percent in 2016. Panel 4 of Figure 2.13 shows outliers with significantly higher-than-average metrics. Pension funds can also actively engage in repurchase agreements, further increasing their financial leverage.

Private-equity-influenced life insurers, which constitute a fast-growing sector, have also elevated their

illiquid exposures.¹⁴ Their assets have risen sharply in recent years, with US private-equity-influenced life insurers managing well more than \$1 trillion, over 15 percent of all US life insurance assets (Figure 2.14, panel 1). Insurance companies can provide private equity firms with a stable supply of premiums that can be invested in private credit, structured credit, real estate, and infrastructure funds arranged and controlled by the private equity firms themselves (Cortes, Diaby, and Windsor 2023). Private-equity-influenced life insurers appear to have more exposure to less-liquid investments than other insurers (Figure 2.14, panel 2). Their median exposure to level 3 assets is currently 20 percent of assets, compared with 6 percent for a sample of the largest 50 insurers globally. Most of their illiquid exposure is invested in structured credit

¹⁴Private-equity-influenced life insurers are those that were acquired (fully or partly) by private equity firms, with the latter exercising decisive influence in the management of their assets and liabilities. See Cortes, Diaby, and Windsor (2023) for further details.

(36 percent) and direct credit lending (23 percent).¹⁵ Despite greater exposure to illiquid investments, their solvency capital ratios appear to be weaker than the average (Figure 2.14, panel 3). This means that their regulatory capital could be eroded much faster in a scenario of rapid increases in corporate defaults; the severity of such a scenario potentially aggravated by the embedded leverage in structured credit investments, such as CLOs and other asset-backed securities, which constitute a significant part of their illiquid exposures.

Different regulatory frameworks in the insurance sector have incentivized life insurers to reinsure their portfolios with offshore reinsurers, which often invest in more illiquid assets. Life insurers influenced by private equity have established offshore reinsurers, primarily in Bermuda. A significant regulatory difference between Bermuda and the life insurers' home jurisdictions lies in the discount rates applied when valuing reinsurance liabilities. The discount rates tend to be higher than international best practices would dictate, thereby resulting in potentially higher solvency ratios. These private-equity-influenced reinsurers have expanded their assets to over a \$1 trillion, constituting about 4 percent of total life insurance assets globally (Cortes, Diaby, and Windsor 2023).

Pension funds and insurance companies can also face liquidity pressures arising from capital calls by private credit funds. These funds may require investors to provide capital within days, and investors have limited control over the timing of these calls. The Federal Reserve (2023) estimates that, as of the end of 2021, US pension funds had \$69 billion in uncalled capital commitments, and insurers had \$23 billion. The total amount of uncalled capital (or “dry powder”) suggests that insurers and pension funds might have commitments even higher than their existing allocations to private credit funds.

The increased share of investment in private credit might also create tensions related to the shift of insurers and pension funds toward defined-contribution products.¹⁶ Because final clients bear the performance and loss of the investments, insurers and pension

¹⁵The composition of investment is estimated from a reduced sample of selected private-equity-influenced life insurers that report a breakdown of their level 3 assets in their annual reports.

¹⁶For example, the share of unit-linked products of European insurers rose to 24 percent in June 2023 from 18 percent at the end of 2017. Sources: European Insurance and Occupational Pensions Authority and IMF staff calculations.

funds allow clients to switch frequently between available investment funds. For example, Australian superannuation funds are required to allow clients to switch between different investment options, generally within three business days. Private credit investments are widely available among superannuation members, and even default funds include a small percentage of private credit investment. Recent pension reforms in the United Kingdom follow a similar pattern,¹⁷ encouraging defined-contribution pension funds and unit-linked products to allocate their investments into illiquid assets, including private credit loans. This change will require fund managers to consider the interaction between the long-term commitment necessary for investments in private credit funds and the ability of their clients to switch between available investment funds. This could create redemption pressures in the private credit industry.

Competition with Banks and Deterioration of Underwriting Standards

Private credit has expanded rapidly in recent years, intensifying competition with banks in the syndicated loan markets. While most deals still focus on middle-market firms, private credit funds in the United States and Europe now provide loans to much larger corporate borrowers, previously funded in the broadly syndicated loan market or corporate bond market. Recently against a backdrop of easy financial conditions and increased risk appetite as investors anticipate central banks to lower rates, private credit funds have both faced renewed competition from banks for larger deals. In some cases, private credit funds have also partnered up with banks and other institutional investors to finance such deals. Industry commentary suggests that underwriting standards and covenants have already deteriorated in this segment of the market.

This deterioration in pricing and nonpricing terms requires careful monitoring. In the event of an

¹⁷See Chancellor of the UK Exchequer Jeremy Hunt's Mansion House speech in July 2023, when he stated, “Defined contribution pension schemes [DC] in the UK now invest under 1 percent in unlisted equity, compared to between 5 and 6 percent in Australia . . . The [Mansion House] Compact—which is a great personal triumph for the Lord Mayor—commits these DC funds, which represent around two-thirds of the UK's entire DC workplace market, to the objective of allocating at least 5 percent of their default funds to unlisted equities by 2030” (Hunt 2023).

economic downturn, a sharp rise of defaults could result in significant losses for bank and nonbank lenders, especially if credit risk is not properly priced when credit is extended.

Policy Recommendations

Given the potential risk private credit poses to financial stability, authorities could consider a more proactive supervisory and regulatory approach to this fast-growing, interconnected asset class. Regulation and supervision of private funds was strengthened significantly after the global financial crisis. Yet, the rapid growth and structural shift of borrowing to private credit requires that countries undertake a further comprehensive review of the regulatory requirements and supervisory practices where the private credit market or exposures to private credit are becoming material.

Several jurisdictions have already undertaken initiatives to enhance their regulatory framework in order to more comprehensively address potential systemic risks and challenges related to investor protection. The US Securities and Exchange Commission (SEC) is making substantial efforts to enhance regulatory requirements for private funds, including enhancing their reporting requirements. The European Union has recently amended the Alternative Investment Fund Managers Directive—commonly referred to as AIFMD II—to include enhanced reporting, risk management, and liquidity risk management. AIFMD II has additional specific requirements for managers of loan origination funds with respect to leverage caps (175 percent for open-end and 300 percent for closed-end funds) and design (a preference for closed-end structures and additional requirements for open-end funds), among others. Regulatory authorities in other countries (such as China, India, and the United Kingdom) have also enhanced the regulation and supervision of private funds. With the growth of the private funds sector in general, supervisors have also increased scrutiny over various aspects of private funds, particularly on conflicts, conduct, valuation, and disclosures.

To address data gaps and enable the accurate, comprehensive, and timely monitoring of emerging risks, the relevant authorities should enhance their reporting requirements and supervisory cooperation on both cross-sectoral and cross-border bases. Although the private nature of private credit remains crucial to market functioning, regulators need access to appropriate data

to understand potential vulnerabilities and spillovers to other asset classes or systemic institutions. As later described, there are cross-border and cross-sectoral risks. Relevant regulators and supervisors should coordinate to address data gaps and enhance their reporting requirements to monitor emerging risks.

Credit Risks

The current regulatory requirements for insurers and pension funds do not consider the credit performance of underlying loans. Prudential requirements are often determined by the legal form and rating of the instrument, without considering the performance of the underlying loan portfolio. These limited regulatory requirements, coupled with limited supervisory scrutiny, allow insurers and pension funds to rely heavily on valuations by investment managers and ratings by rating agencies. Moreover, the multiple layers of leverage make it harder for end investors to monitor underlying loan performance and the quality of collateral.

Supervisors of insurers and pension funds with high exposure to private credit should enhance their monitoring of aggregate portfolio risks in private credit. Given that loan portfolio supervision is central to bank oversight, insurance and pension supervisors should adopt some banking supervisory practices regarding credit risk. These supervisors should strengthen their assessments and corresponding prudential requirements of the credit exposures through both structured products and direct lending. In addition, supervisors of private credit funds should also closely monitor their underwriting practices and credit risks, particularly from their potential to exacerbate systemic risks through transformation into liquidity, leverage, and interconnectedness risks.

Liquidity Risks

Liquidity mismatch risks in most private credit funds appear minimal, yet the growth of semiliquid structures raises concerns. Although securities regulators have introduced requirements for liquidity management tools to reduce liquidity mismatch risks, many countries still permit open-end structures and frequent redemptions (sometimes even daily) for private credit funds that invest in highly illiquid assets. This permits existence of structures with a high potential of liquidity mismatch, and the mitigating tools used by semiliquid funds have not been tested by a sys-

temic event. The “retailization” trend, moreover, means that individual investors new to the sector who do not fully understand the liquidity features may become significant investors, potentially creating herd behavior toward redemption during stress episodes.

Securities regulators should adopt the recent recommendations of the Financial Stability Board and International Organization of Securities Commissions (IOSCO), particularly regarding product design and liquidity management tools. In line with Financial Stability Board recommendations, private credit funds should create and redeem shares at lower frequency than daily or require long notice or settlement periods, and the relevant authorities should consider requiring that such funds be closed-end. Regulators should also consider stringent requirements to ensure private credit firms use liquidity management tools and stress testing when product design permits significant liquidity mismatch. Securities market regulators should also ensure that, in funds that permit retail participation, regulatory requirements include comprehensive and clear disclosures on potential risks and redemption limitations.

Leverage Risks

Current reporting requirements are insufficient and prevent a comprehensive assessment of the leverage used in private credit. At present, the potential transmission of funding shortfalls from leverage providers cannot be fully evaluated. Fund-level reporting requirements to securities, insurance, or pension fund supervisors may not capture the complex and multi-layered sources of leverage, including the subscription lines and leverages special-purpose vehicles or feeder funds deploy. Reporting is also fragmented across borders and sectors. These data gaps, along with the lack of a comprehensive overview, prevent supervisors from monitoring leverage at the macro level.

When banks or other supervised institutions provide private credit firms with leverage, regulators should enhance risk management practices regarding potential funding needs. This will likely require that the private credit funds borrowing from supervised institutions engage in some thematic reviews of liquidity management practices. Such exercises should incorporate stress scenarios featuring tightening of funding availability, markdowns of levered portfolios, and sudden and significant drawdowns of credit facilities by private credit funds’ corporate borrowers.

Regulators should fill data gaps by enhancing comprehensive reporting of leverage across the value chain, with close cooperation domestically and internationally. Insurance and pension supervisors should address excessive risk taking by adjusting prudential requirements under the principle of “same activity, same risk, same regulation.” In the event that such monitoring finds excessive leverage that may have systemic implications, securities regulators should consider suitable regulatory tools such as leverage caps.

Asset Valuation Risks

Regulatory requirements for private credit funds currently focus on policy documentation, governance, and investor disclosures but do not specify how assets should be valued. The overall regulatory framework for private funds tends to have a light touch, including on valuation, because the institutional investors are sophisticated, the primary expectation being that investors have the capacity and incentive to seek relevant information from asset managers and adjust their own valuations. Unlike other aspects of a private credit fund, however, the main investors (insurance companies and pension funds) may not have incentive to challenge fund managers’ valuations because they desire to maintain the stability of their investments. The managers’ significant discretion also results in wide variation in valuation for the same asset across funds and entities. An IOSCO survey also found that the approach to valuation varies significantly by country. IOSCO’s agreement with the International Valuation Standards Council to identify potential approaches to enhance the quality of valuations is welcome in this context.¹⁸

Supervisors should closely monitor the valuation approaches and procedures of private credit funds, insurers, and pension funds and in case of heightened valuation risks, strengthen regulation on valuation independency, governance, and frequency. To address these concerns, some regulators have already strengthened regulation concerning independent audits (for example, the US SEC) and intensified supervision (for example, US SEC, UK Financial Conduct Authority, European Securities and Markets Authority) relating to valuation of private funds. Supervisors

¹⁸See the recent statement of cooperation between the IOSCO and the International Valuation Standards Council (“IOSCO IVSC Statement of Cooperation,” October 18, 2022, <https://www.iosco.org/library/pubdocs/pdf/IOSCOPD716.pdf>).

should continue to thoroughly assess valuation governance and controls through intrusive supervision, including on-site inspection, on the valuation practices of private credit funds.¹⁹ Improper or fraudulent valuation should be followed by timely and strict actions, including enforcement. Proper and timely loss recognition will become even more important for private credit funds with semiliquid structures and funds after expiration of lock-up periods. If such supervisory efforts indicate heightened valuation risks, regulators should consider mandating independent external valuations and audits while strengthening the managers' internal governance mechanisms on valuation procedures. Regulators may also consider increasing the frequency of external valuations and audits, if necessary.

Interconnectedness Risks

Risk taking is concentrated in some jurisdictions and subsectors (Cortes, Diaby, and Windsor 2023). Differences in regulatory requirements across sectors might have encouraged insurance companies, in particular those influenced by private equities, and pension funds to hold excessive exposure to private credit. Banks continue to provide leverage to the private funds and their affiliates. If the trend continues, excessive concentration in private credits and interconnectedness among private equity firms, insurance companies, and pension funds could exacerbate systemic risks. Data gaps often hinder the monitoring of concentration and interconnectedness risks.

Supervisors should fill data gaps and cooperate with each other, including across borders, to ensure effective monitoring of interconnectedness risks. The authority in charge of systemic risk monitoring should lead in analyzing overall trends in private credit markets and assessing potential contagion risks to the financial system. All sector regulators should actively coordinate to address data gaps and gain a better understanding of interconnectedness risks. Cross-border cooperation assumes importance where cross-border interconnections are significant and concentrated. International bodies, such as the Financial Stability Board and IOSCO, can aid in improving data gaps globally.

¹⁹US SEC (2024) and the UK Financial Conduct Authority (2023) are reviewing valuations in private markets.

If regulatory arbitrage across sectors and borders persists, and if it leads to excessive concentration, relevant regulators should coordinate efforts to address such arbitrage by ensuring more consistent risk assessments and corresponding prudential treatments.²⁰

Conduct Risks

Increasing retail participation in private credit markets raises concerns about conduct risks that require close supervision by conduct supervisors. The regulatory framework has so far assumed that investors are sophisticated and has applied a light touch to investor protection safeguards.²¹ Although existing regulatory requirements cover conflicts of interest in detail, conduct risks will increase if the investor mix moves toward more retail participation, considering that more frequent redemptions may exacerbate conduct concerns regarding valuations and follow-on investments.²²

Conduct supervisors should closely monitor conduct risks and enhance disclosure requirements, particularly relating to conflicts of interest. Regulatory requirements for conduct with retail investors should be stringent. Supervisors should monitor private credit funds' distribution channels and marketing practices, and tailor suitability tests to prevent mis-selling.²³ Conduct supervisors should ensure that retail investors (including holders of unit-linked products and defined-benefit plans) fully understand the higher credit and liquidity risk of private credit investments and their limitations on redemptions. Supervisors should also continue to monitor potential conflicts of interest in sponsored deals involving affiliated private debt and private equity managers, particularly given that privately negotiated transactions lack market pricing.

²⁰Consistent risk assessment does not necessarily mean applying identical capital requirements but rather undertaking holistic assessment of the various risks end investors face on a subject exposure.

²¹Separate regulatory frameworks for certain types of retail-oriented private credit vehicles (for example, BDCs) provide stringent requirements for leverage caps, redemption and liquidity risk requirements, investor disclosures, and reporting, among others.

²²IOSCO (2023) discusses manager-led secondary markets and continuous funds as examples where conflicts of interest could arise.

²³According to IOSCO (2023, p. 37), "Wealth barriers to accredited investor status . . . have also lessened as a mechanical function of inflation. . . . Some funds are also experimenting with innovative ways to reduce distribution costs."

Box 2.1. Small But Growing Private Credit Funds in Asia

Private credit is experiencing robust growth in Asia (Figure 2.1.1, panel 1). An increasing number of mature companies are seeking funding for acquisitions and diversification of their creditor base, while long-term investors, such as pension funds and wealth managers, are drawn to potentially attractive yields. In recent years, several international alternative asset managers have launched Asia-focused funds. A recent industry survey showed that many institutional investors in the region intend to increase allocations to private credit.¹

Despite growth, Asia's private credit market remains relatively small, totaling about \$93 billion and accounting for about 5 percent of the global total. Most investors are local and focus on smaller deals. Global allocation to private credit in Asia remains limited (0 to 5 percent of assets under management) and is relatively less appealing because of tighter spreads and high foreign exchange hedging costs. Regions with highly liquid banking systems or those

experiencing modest growth tend to have small or nonexistent private credit markets. China, India, and Indonesia are emerging as key examples, whereas Australia and New Zealand have more mature markets with active participation from superannuation funds. Many credit funds have investment teams based in Hong Kong SAR and Singapore. Private credit in Korea has also grown steadily.

Unlike in the United States, where the private credit market acquired the ability to finance relatively large transactions, Asia's market primarily fills the gaps banks leave. In this context, private credit funds focus on acquisition financing, asset-light businesses, and distressed debt, providing financing to the high-yield segment, which remains underdeveloped in many emerging markets and developing economies in the region (Figure 2.1.1, panel 2). The Asian market remains fragmented, as the regional portfolios are complicated by differences in currencies, regulatory environments, and investor protection regimes.

Most funds are closed-end structures of 6 to 8 years for performing credit and up to 10 years for distressed assets. Covenants tend to be tighter in emerging market Asia, given weaknesses in investor protection.

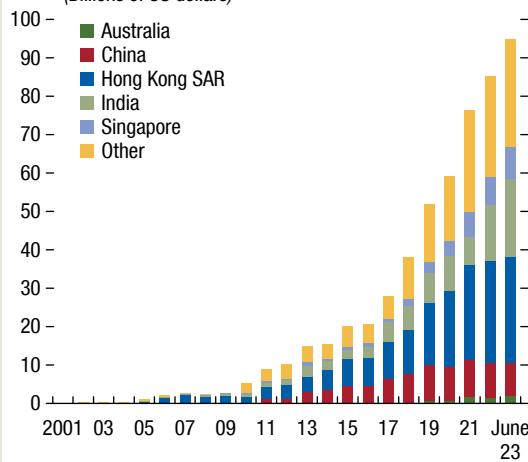
This box was prepared by Natalia Novikova.

¹BlackRock's 2023 Global Private Markets Survey (<https://www.blackrock.com/hk/en/institutional-investors/insights/global-private-markets-survey>).

Figure 2.1.1. Private Credit in Asia

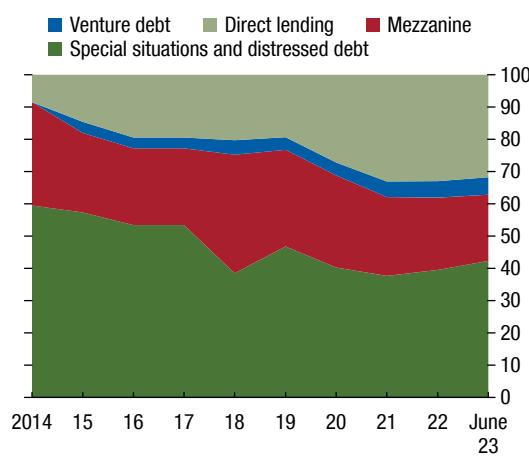
Asia's private credit market is growing rapidly ...

**1. Asian Private Credit Asset under Management
(Billions of US dollars)**



... with about half of the capital raised for special situations, although direct lending is gaining share.

**2. Shares of Market Segments in Asian Private Credit
(Percent)**



Sources: Preqin; and IMF staff calculations.

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Chapter 3 at a Glance

- The number of cyberattacks has almost doubled since before the COVID-19 pandemic.
- Most direct reported losses from cyberattacks are small, around \$0.5 million, but the risk of extreme losses—at least as large as \$2.5 billion—has increased.
- The financial sector is highly exposed to cyber risks, with nearly one-fifth of all incidents affecting financial firms.
- Although cyber incidents have thus far not been systemic, severe incidents at major financial institutions could pose an acute threat to macrofinancial stability through a loss of confidence, the disruption of critical services, and because of technological and financial interconnectedness.
- Cyber legislation at the national level and better cyber-related governance arrangements at firms can help reduce the frequency of cyber incidents.
- According to an IMF survey, cybersecurity policy frameworks have generally improved in emerging market and developing economies but remain inadequate in several countries.

Policy Recommendations

- Cyber resilience of the financial sector should be strengthened by developing an adequate national cybersecurity strategy, appropriate regulatory and supervisory frameworks, a capable cybersecurity workforce, and domestic and international information-sharing arrangements.
- Reporting of cyber incidents by financial firms to supervisory agencies should be strengthened to allow for more effective monitoring of cyber risks.
- Supervisors should hold board members responsible for managing the cybersecurity of financial firms and promoting a conducive risk culture, cyber hygiene, and cyber training and awareness.
- Financial firms should develop and test response and recovery procedures to remain operational in the face of cyber incidents. National authorities should also develop effective response protocols and crisis management frameworks to deal with systemic cyber crises.

Introduction

Cyber-related incidents have become much more frequent over the past two decades, and especially since 2020.¹ In particular, the number of cyber incidents

with a malicious intent (“cyberattacks”—such as cyber extortions or malicious data breaches—have almost doubled relative to the period before the COVID-19 pandemic (Figure 3.1, panel 1).²

The authors of this chapter are Rafael Barbosa, Benjamin Chen, Oksana Khadarina, Tatsushi Okuda, Ravikumar Rangachary, Enyu Shao, Felix Suntheim (lead), and Tomohiro Tsuruga, under the guidance of Fabio Natalucci and Mahvash Qureshi. René M. Stulz served as an expert advisor.

¹The cyber-related terminology in this chapter follows Financial Stability Board (2023), where “cybersecurity” is defined as the preservation of confidentiality, integrity, and availability of information through the cyber medium. “Cyber incidents” are events that adversely affect the cybersecurity of an information system or the information the system processes, stores, or transmits, thus resulting in “cyber risk.” This chapter covers malicious and nonmalicious cyber incidents (excluding events related to breaches of privacy primarily directed at

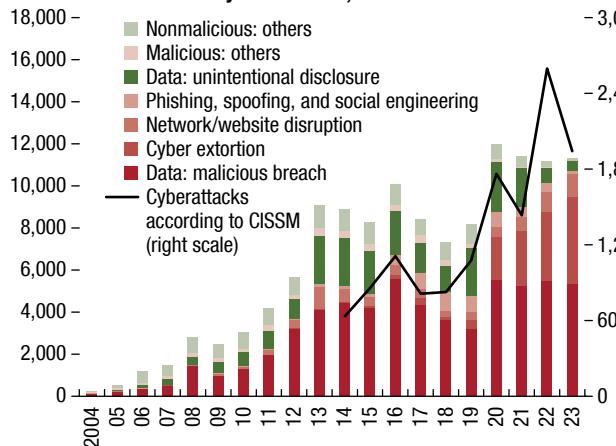
individuals, such as unauthorized data collection and unauthorized contact or disclosure) but focuses specifically on malicious incidents in some of the analytical exercises. Malicious events (cyberattacks) include cyber extortion, malicious data breaches, network and website disruption, phishing, spoofing, social engineering, skimming, and physical tampering. See Online Annex 3.1.

²The rise in cyber incidents over time could partly be attributed to improved reporting by firms, but the total number of cyber incidents and losses may still be underestimated for several reasons. These include a lag in reporting of incidents, firms’ concerns about their reputation, and lack of formal requirements for firms to report cyber incidents in many countries, particularly in emerging market and developing economies.

Figure 3.1. Cyber Risks Are Increasing

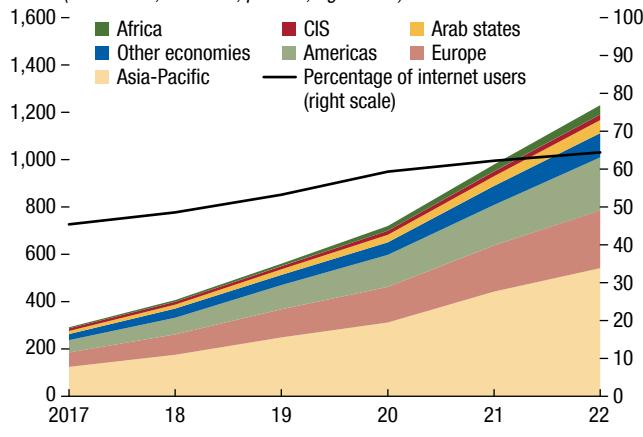
The number of cyber incidents, especially of a malicious nature, has increased sharply over the past two decades ...

1. Global Number of Cyber Incidents, 2004–23



Growing digital connectivity has likely contributed to the growth in cyber incidents.

3. Internet Use and International Bandwidth Use (Trillion bits, left scale; percent, right scale)



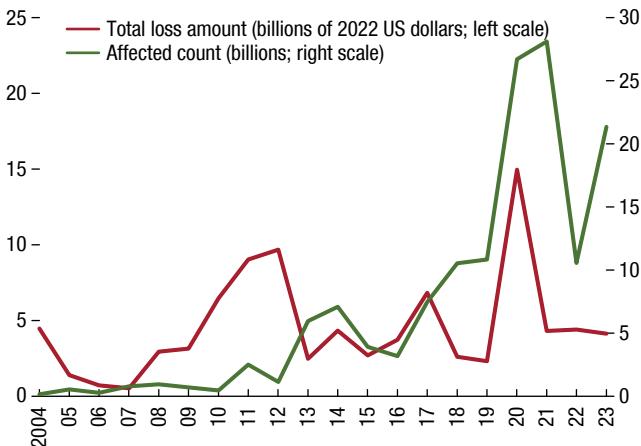
Sources: Advisen Cyber Loss Data; CISSM (Harry and Gallagher 2018); International Telecommunication Union publication; and IMF staff calculations.

Note: Panels 1 and 2 show data from Advisen (excluding events classified as “unauthorized data collection” and “unauthorized contact or disclosure”), as of February 22, 2024, using Advisen’s classification of cyber incidents (see Online Annex 3.1). In panel 1, the black line shows data on cyberattacks from the CISSM. In panel 2, loss amounts are deflated using the US GDP deflator (2022 = 100). “Affected count” is the total accumulated number of parties with data breached or stolen, or devices compromised, depending on the type of event. Advisen covers a larger number of cyber incidents than CISSM, including nonmalicious incidents. Delayed reporting may lead to the underestimation of cyber events and related losses in more recent periods. CIS = Commonwealth of Independent States; CISSM = Center for International and Security Studies at Maryland.

Cyber incidents can impose substantial costs on firms. Since 2020, the aggregated reported direct losses from cyber incidents have amounted to almost \$28 billion (in real terms), with billions of records stolen or compromised (Figure 3.1, panel 2). Total direct and indirect costs of these incidents, however, are most likely substantially higher (Kamiya and others 2021). Estimates range from 1 to 10 percent of global

... resulting in billions of affected records and large direct reported losses.

2. Total Loss Amounts and Number of Affected Records



The number of cyberattacks has surged in the wake of Russia’s invasion of Ukraine in February 2022.

4. Number of Cyberattacks before and after Russia’s Invasion of Ukraine, February to March 2022



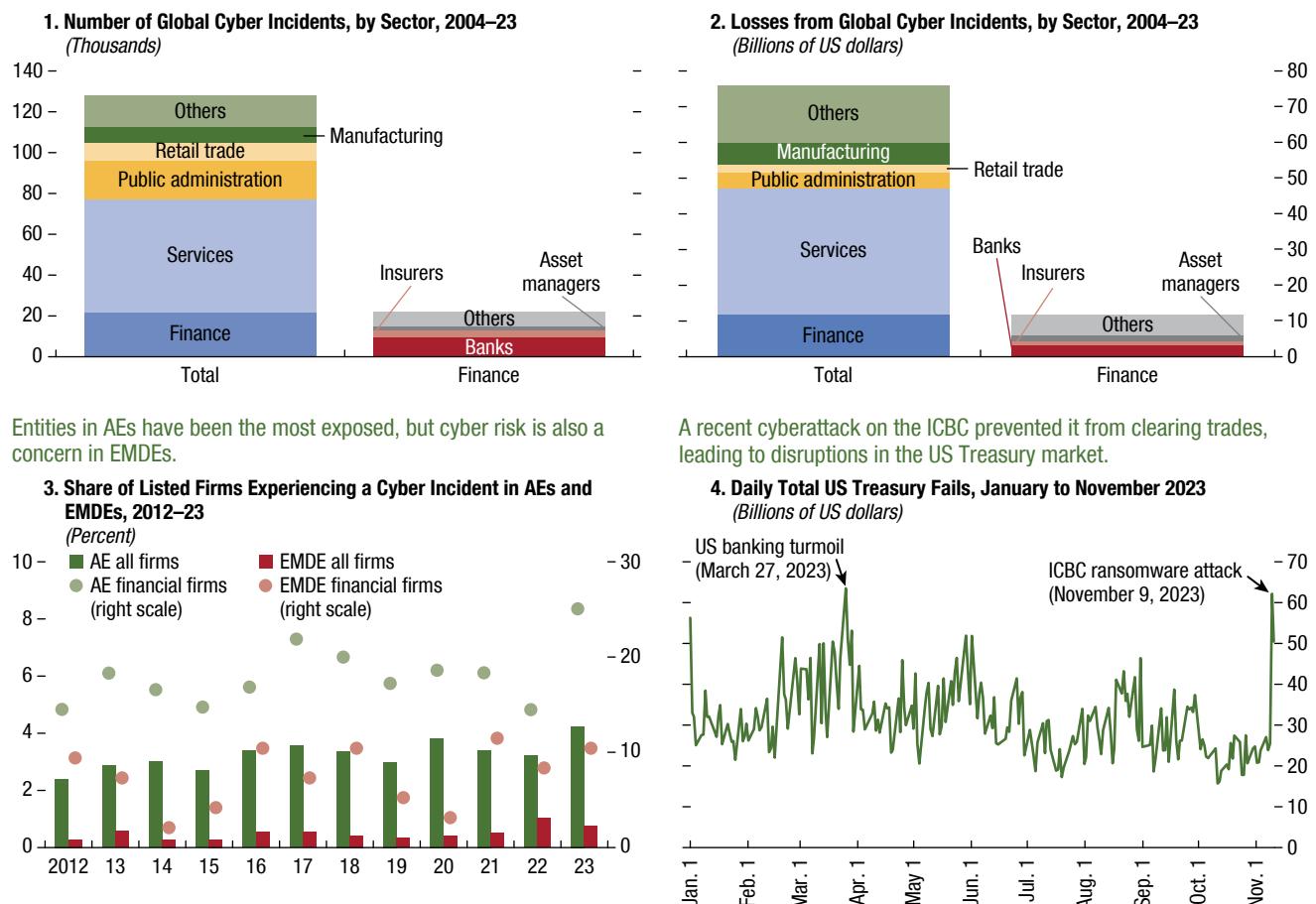
GDP (Center for Strategic and International Studies 2020; Statista 2022).³

³Direct losses include, for example, the amount spent to remedy damages, fines and penalties, the extortion amount, or the loss of business income from operational disruptions. Indirect losses include reputational damages, declines in future business, increased cybersecurity investments, and lower productivity.

Figure 3.2. The Financial Sector Is Highly Exposed to Cyber Risk

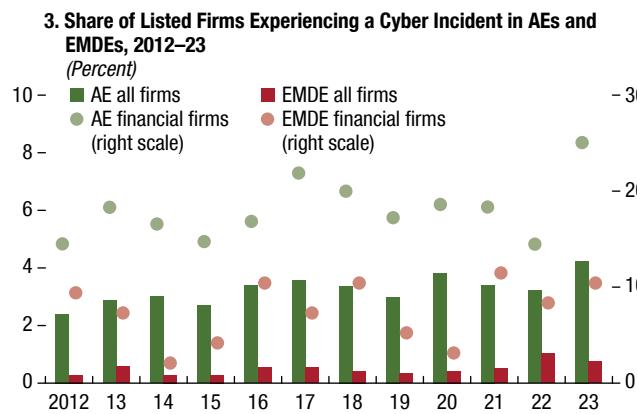
Financial institutions, especially banks, are vulnerable to cyber incidents ...

... and have experienced notable direct losses from cyber incidents.

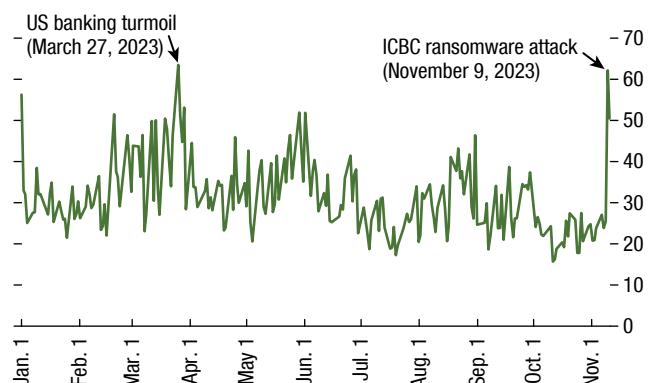


Entities in AEs have been the most exposed, but cyber risk is also a concern in EMDEs.

A recent cyberattack on the ICBC prevented it from clearing trades, leading to disruptions in the US Treasury market.



4. Daily Total US Treasury Fails, January to November 2023 (Billions of US dollars)



Sources: Advisen Cyber Loss Data; Depository Trust and Clearing Corporation; and IMF staff calculations.

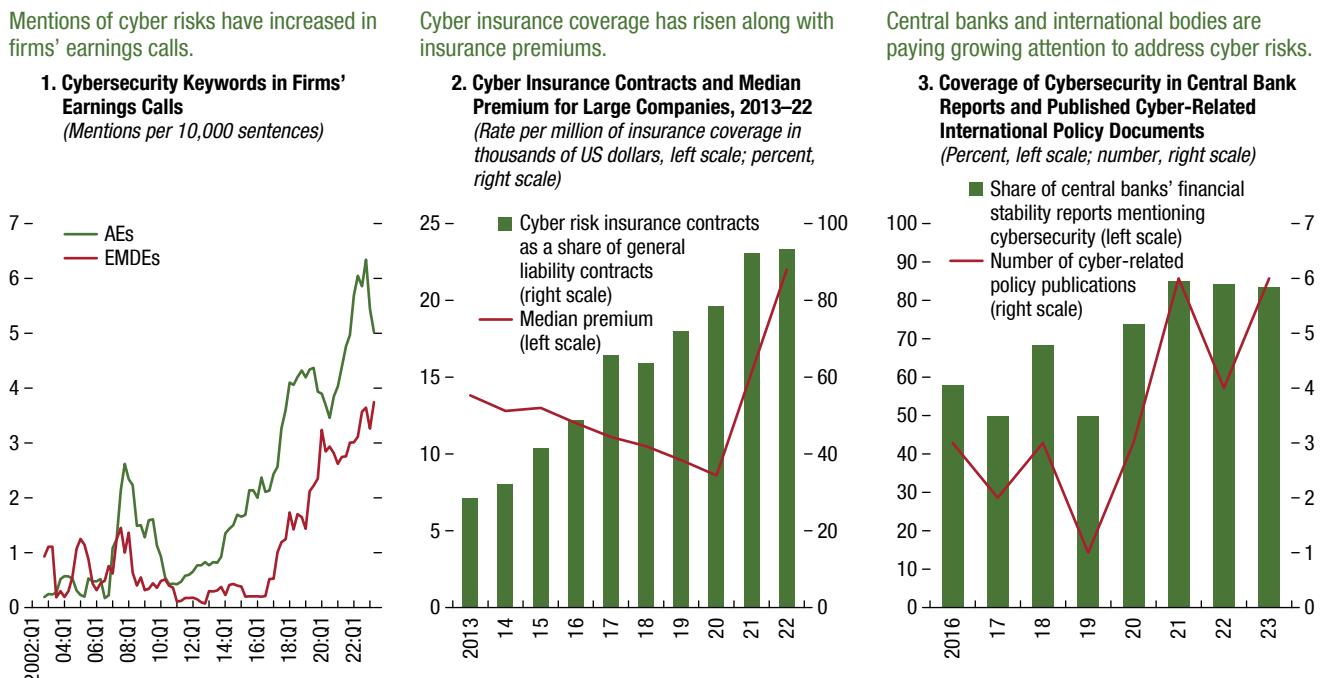
Note: Panels 1 and 2 are based on Advisen data as of February 22, 2024. Data for more recent periods may be underestimated because of delayed reporting of cyber events. Failures to deliver US Treasuries occur when either sellers fail to deliver or buyers fail to receive securities in time to settle a trade. AEs = advanced economies; EMDEs = emerging market and developing economies; ICBC = Industrial and Commercial Bank of China.

Many factors contribute to the rise in cyber incidents. Rapidly growing digital connectivity—accelerated by the COVID-19 pandemic (Jamilov, Rey, and Tahoun 2023), increasing dependency on technology, and financial innovation—is likely to be associated with a rise in cyber risks (Figure 3.1, panel 3). Geopolitical tensions may also be a contributing factor, considering the surge of cyberattacks after Russia's invasion of Ukraine in February 2022 (Figure 3.1, panel 4).⁴

⁴Information obtained from the Center for International and Security Studies at Maryland (Harry and Gallagher 2018), as of February 2024, indicates a similar pattern for the ongoing conflict in the Middle East, where the number of cyberattacks on both Israel and Palestine increased notably at the onset of the recent conflict in October 2023.

The financial sector is highly exposed to cyber risk. Almost one-fifth of the reported cyber incidents in the past two decades have affected the financial sector, with banks being the most frequent targets followed by insurers and asset managers (Figure 3.2, panel 1). Financial firms have reported significant direct losses, totaling almost \$12 billion since 2004 and \$2.5 billion since 2020 (Figure 3.2, panel 2). Financial institutions in advanced economies, particularly in the United States, have been more exposed to cyber incidents than firms in emerging market and developing economies (Figure 3.2, panel 3). JPMorgan Chase, for example, the largest US bank, recently reported experiencing 45 billion cyber events per day while spending \$15 billion on technology

Figure 3.3. Cyber Risks Are Receiving Increasing Attention



Sources: Advisen; NL Analytics; and IMF staff calculations.

Note: Panel 1 shows the number of mentions of words related to cybersecurity (such as “cybersecurity,” “cyberattack,” “cyber threat,” “data loss,” “data integrity,” “data security,” “information theft,” “data breach,” “phishing,” “malware,” “ransomware”) per 10,000 sentences in firms’ earnings call reports. In panel 2, the green bars show the ratio of the total number of new cyber risk insurance contracts to the number of new general liability contracts for large firms (defined as those with annual revenues larger than \$100 million) in a given year. The red line shows the median premium associated with the cybersecurity insurance contracts. In panel 3, the green bars show the share of financial stability reports and annual reports issued by central banks in the G20 nations that cover cyber risks, and the red line shows the number of policy publications on cybersecurity and related topics by prominent international organizations (Basel Committee on Banking Supervision, Financial Stability Board, International Association of Insurance Supervisors, International Organization of Securities Commissions, and the G7). AEs = advanced economies; EMDEs = emerging market and developing economies; G7 = Group of Seven; G20 = Group of Twenty.

every year and employing 62,000 technologists, many focused on cybersecurity.⁵

Cyber incidents are a key operational risk that could threaten financial institutions’ operational resilience and adversely affect overall macrofinancial stability. A cyber incident at a financial institution or at a country’s critical infrastructure could generate macrofinancial stability risks through three key channels: loss of confidence, lack of substitutes for the services rendered, and interconnectedness (Adelmann and others 2020). While cyber incidents thus far have not been systemic, ongoing rapid digital transformation and technological innovation (such as artificial intelligence) and heightened global geopolitical tensions exacerbate the risk. Recent signif-

icant cyber incidents—such as the ransomware attack on the US arm of China’s largest bank, the Industrial and Commercial Bank of China, on November 8, 2023, which temporarily disrupted trades in the US Treasury market—further underscore that cyber incidents at major financial institutions could threaten financial stability (Figure 3.2, panel 4).

The private sector has become more attuned to cyber risks. Business leaders and financial sector participants consider cyber insecurity a top risk to global macrofinancial stability (Bank of Canada 2023a; Bank of England 2023; Depository Trust and Clearing Corporation 2023; World Economic Forum 2023; EY/IIF 2024). Mentions of cyber risks have surged in firms’ earning call reports in the past few years, indicating that firms and analysts are paying greater attention to the issue (Figure 3.3, panel 1). Concerns about cybersecurity are also reflected in the growing share of firms taking out insurance to protect against financial losses from cyber incidents relative to general liability insurance contracts (Figure 3.3, panel 2).

⁵“Cyber events” refers here to observed activity, malicious and nonmalicious, collected from JPMorgan’s technology assets. Such events can include collecting user logins and scanning for network vulnerabilities (Owen Walker, “JPMorgan Suffers Wave of Cyber Attacks as Fraudsters Get ‘More Devious,’” *Financial Times*, January 17, 2024, <https://www.ft.com/content/cd287352-cb3b-48d8-a85b-668713b80962>).

Central banks and financial regulators are viewing cybersecurity as a material risk.⁶ The European Systemic Risk Board, the Financial Stability Oversight Council in the United States, and the Bank of England's Financial Policy Committee have recognized cyber risk as a source of systemic risk (European Systemic Risk Board 2020; Financial Stability Oversight Council 2023; Bank of England, 2024b). Central banks and financial supervisors increasingly consider cyber risk in financial stability reports and supervisory stress tests (Figure 3.3, panel 3, green bars).⁷ Global efforts to mitigate cyber risks in the financial sector have also accelerated, and multiple standard-setting bodies have published policy documents and guidelines to strengthen cyber resilience (Figure 3.3, panel 3, red line).⁸

⁶Cybersecurity of central banks and financial regulators is also crucial for financial stability. For example, in January 2024, the social media account of the US Securities and Exchange Commission was hacked and a fraudulent announcement regarding the approval of a bitcoin exchange-traded fund released, increasing market volatility (Krisztian Sandor, "Bitcoin Jumps, Then Dumps to \$45K as Fake News about Spot Bitcoin Approval Liquidates \$50M," *CoinDesk*, January 9, 2024, <https://www.coindesk.com/markets/2024/01/09/bitcoin-jumps-then-dumps-to-45k-as-fake-news-about-spot-bitcoin-approval-liquidates-50m/>). Overall, however, the number of incidents at such institutions has been relatively stable at 10 to 20 incidents per year (see Online Annex Figure 3.1.1, panel 3).

⁷In 2021, US Federal Reserve Chairman Jerome H. Powell remarked that "the risk that we keep our eyes on the most now is cyber risk" (*CBS News*, April 12, 2021). For references to increased cybersecurity risks, see Bank of France (2022), Bank of Mexico (2022), ECB (2022), US Department of the Treasury (2022), and Bank of Canada (2023b). In 2022, the Bank of England launched cyber stress tests as a complementary exercise to its operational resilience policy, and in March 2024 its Financial Policy Committee published a macroprudential approach to operational resilience which considered cyber risks (Bank of England 2024a). The European Central Bank plans to conduct a thematic stress test on banks' cyber resilience in 2024.

⁸The role of standard-setting bodies has gained momentum with the Basel Committee on Banking Supervision (2021) principles for operational resilience, which assume that cyber incidents will occur and that the financial sector needs the capacity to deliver critical business services during disruptions. Enhancing cyber and operational resilience is also a key element of the Financial Stability Board, which has focused on promoting convergence in cyber incident reporting, effective practices for cyber incident response and recovery, maintaining the cyber lexicon, as well as current work to design a format for incident reporting exchange (FIRE). Moreover, the Financial Stability Board published a toolkit to enhance third-party risk management and oversight for financial authorities, financial institutions, and service providers (FSB 2023). In addition, the Committee on Payments and Market Infrastructures and IOSCO (2016) issued guidance on cyber resilience to help financial market infrastructures strengthen cybersecurity; IOSCO (2021) outsourcing principles cover information security, business resilience, continuity, and disaster recovery; the International Association of Insurance Supervisors followed up a 2016 report on cyber risk with a 2023 report on operational resilience; and the G7 cyber expert group has issued several papers that help financial sector entities better understand cybersecurity topics (2016, 2017, 2018, 2020, 2022a, 2022b).

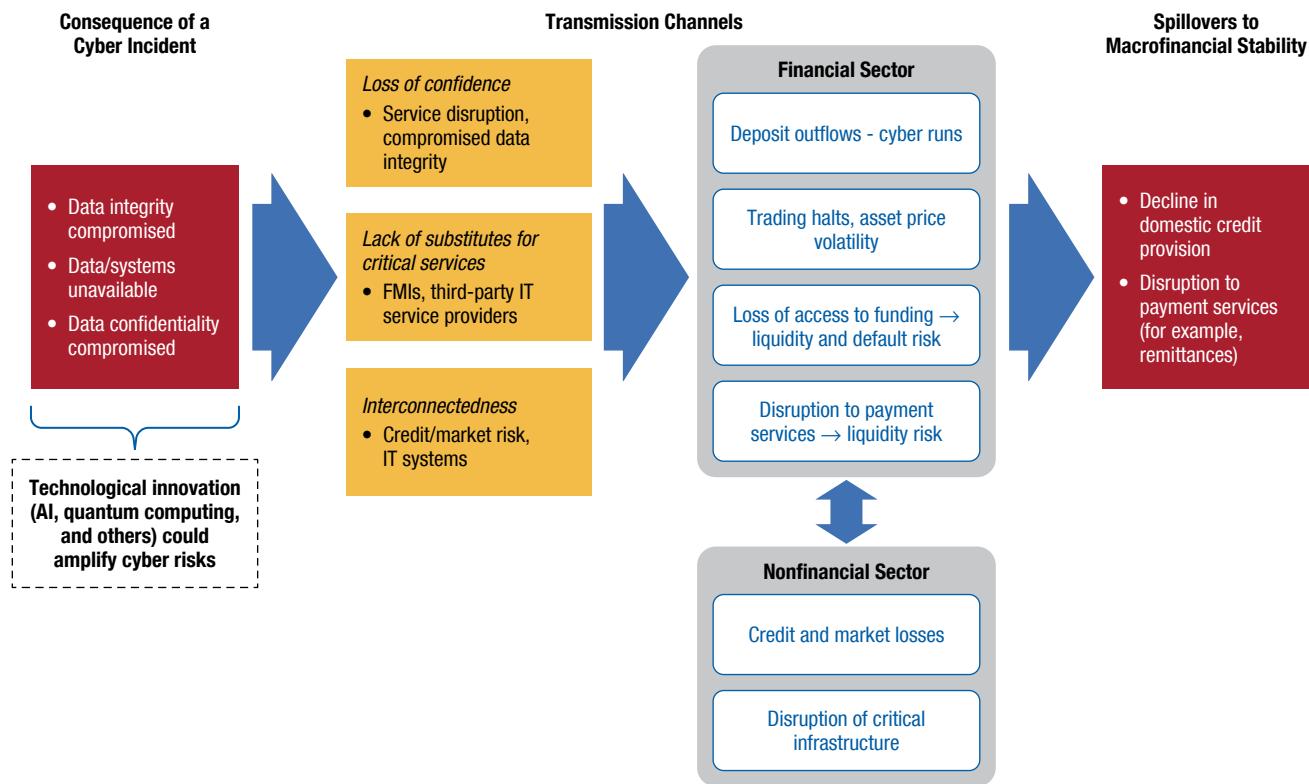
Against this backdrop, the chapter assesses the potential financial stability implications of cyber risks and discusses policy options to mitigate such risks. The chapter begins by presenting a simple conceptual framework on the potential channels through which cyber risks can disrupt macrofinancial stability. It then empirically examines three key questions. First, how large are firm-level losses from cyber incidents? Second, what factors explain the occurrence of cyber incidents? Third, how vulnerable is the financial sector to cyber risk? To address these questions, the chapter relies on various data sources, including a comprehensive firm-level data set on more than 170,000 cyber events reported by approximately 90,000 companies globally.⁹ Because private incentives to address cyber risks may differ from the socially optimal level of cybersecurity, public intervention may be necessary (Kopp, Kaffenberger, and Wilson 2017; Kashyap and Wetherilt 2019). Through a survey, the chapter offers insights into the preparedness of central banks, financial regulators, and financial supervisors, particularly in emerging market and developing economies. The chapter then discusses policy options to strengthen the resilience of the financial system to systemic cyber risks.¹⁰

Transmission of Cyber Risks to Macrofinancial Stability

A cyber incident at a financial institution could threaten macrofinancial stability through three key

⁹Advisen Cyber Loss Data cover 40 advanced and 125 emerging market countries. This data set is compiled from reliable and publicly verifiable sources (news media, governmental and regulatory sources, state data breach notification sites, and third-party vendors). Details on the data used for the analyses are provided in Online Annex 3.1.

¹⁰The chapter contributes to an emerging literature on the effect of cyber incidents on firms and financial stability: A few studies have assessed the effect of cyberattacks on firm-level stock returns and accounting performance by relying on event studies (Amir, Levi, and Livne 2018) or textual analysis to capture cybersecurity risk for a cross-section of firms (Florakis and others 2023; Jamilov, Rey, and Tahoun 2023). Aldasoro and others (2022) concentrate on the drivers of losses from cyberattacks for US firms, whereas Crosignani, Macchiavelli, and Silva (2023, p. 437) show that a "supply chain attack" can cause a systemic shock. Focusing on the financial sector, Duffie and Younger (2019) show the possibility of cyberattacks leading to bank runs resulting from withdrawal of wholesale depositors. Eisenbach, Kovner, and Lee (2022) use transaction data from Fedwire to conduct a scenario analysis on the spillover effects of cyberattacks on the largest US banks. This chapter extends the literature in several dimensions—for example, by considering a larger set of countries and by examining the role of a potentially wider set of firm- and country-level characteristics in explaining the occurrence of cyber incidents, including governance and geopolitical risk. It also assesses the exposure of financial institutions to cybersecurity risks, including the likelihood of cyber runs, through different types of analyses.

Figure 3.4. Cybersecurity and Macrofinancial Stability: Channels of Transmission

Sources: Adelmann and others 2020; and IMF staff.

Note: AI = artificial intelligence; FMs = financial market infrastructures; IT = information technology.

channels (Figure 3.4). First, a cyber incident, such as a data breach, may lead to a *loss of confidence* in the viability of the targeted institution, raising liquidity risks through, for example, deposit withdrawals or runs on banks—“cyber runs” (Duffie and Younger 2019). Such liquidity risks could result in solvency issues and possibly spill over to related parties in the financial system. Second, risks to financial stability could materialize quickly if a cyber incident were to affect a key institution or financial market infrastructure that is not easily *substitutable*. For example, a ransomware attack on major bank that participates in payment systems, the failure of key cloud service providers, hacking of a central bank, or disruption of key hubs in the financial system (such as electronic trading systems or clearing houses) could all cascade rapidly and undermine financial stability (Healey and others 2018). Third, *interconnectedness* of an institution through technological linkages (such as multiple firms using the same software) or financial linkages (such

as the interbank market and settlement systems or common asset holdings) could propagate the effect of a cyber incident across the financial system (Eisenbach, Kovner, and Lee 2022). Major cyber incidents could thus adversely affect macroeconomic outcomes, for example, through a decline in the provision of credit or a disruption of payment systems.

Financial stability could also be undermined from cyber incidents at nonfinancial institutions. For example, a cyberattack on critical infrastructure (such as electricity grids) could make it difficult for financial institutions to operate normally, with the effects spilling over to the macroeconomy (Figure 3.4). Severe cyber incidents at systemic nonfinancial institutions could also raise credit or liquidity risks for financial institutions. These effects could be amplified given the potential increase in cyber risk during adverse financial conditions (Eisenbach, Kovner, and Lee 2023). Cyber incidents at public institutions could similarly disrupt government functioning. For example, an attack could

disrupt the management of government debt, adversely affecting the financial sector directly or indirectly through the rise in sovereign risk premia (April 2022 *Global Financial Stability Report*).

Emerging technologies and innovation in financial services could exacerbate cyber risks. Although advances in artificial intelligence (AI) could help improve the detection of risk and fraud, for example, by observing anomalous behavior, AI could also be exploited for malicious activities (Boukherouaa and others 2021).¹¹ Most notably, through generative AI (GenAI), more sophisticated phishing messages or deepfakes could be used for identity theft or fraud (Boukherouaa and Shabsigh 2023).¹² For example, in January 2024, scammers tricked employees of a multinational firm into transferring HK\$200 million (US \$26 million) by creating a group video call using deepfake technology.¹³ In addition, AI exposes firms to the risk of data set leakages, for example, of data used to train AI algorithms or of data analyzed by third-party AI providers.¹⁴ Looking ahead, the advent of quantum computing and its potential ability to quickly break encryption algorithms used in financial systems could also magnify losses from cyberattacks (Sedik and others 2021; Office of the President of the United States 2022).

Losses to Firms from Cyber Incidents

Direct losses reported by firms from cyber incidents have thus far been generally modest but could become very large. Based on available data, the median reported direct loss to a firm from all cyber incidents has been about \$0.4 million, and three-fourths of the reported losses are below \$2.8 million (Figure 3.5, panel 1). Although losses from malicious incidents have been more than five times as large as those from nonmalicious incidents, at around \$0.5 million, the magnitude of losses in

¹¹AI systems could also be vulnerable to special types of attacks, such as data poisoning attacks whereby training data sets are manipulated so that algorithms incorrectly “learn” to classify or recognize information.

¹²In a survey of senior cybersecurity experts at large US companies, 46 percent expect GenAI to make organizations more vulnerable to attacks and 85 percent believe that recent attacks have been powered by GenAI (Deep Instinct 2023).

¹³Jeanny Yu, “Deepfake Video Call Scams Global Firm out of \$26 Million: SCMP,” *Bloomberg*, February 3, 2024, <https://www.bloomberg.com/news/articles/2024-02-04/deepfake-video-call-scams-global-firm-out-of-26-million-scmp>.

¹⁴As of June 2023, there were seven recorded instances in Advisen related to AI companies losing data after a cyber incident.

absolute terms has been generally modest as well. For example, most cyber extortions, such as ransomware attacks, or malicious data breaches have resulted in losses of up to \$12 million. The distribution is, however, heavily skewed, with some incidents imposing losses of hundreds of millions of US dollars (Figure 3.5, panel 2). Such extreme losses could result in liquidity problems for firms and even jeopardize their solvency.¹⁵

The risk of extreme losses caused by cyber incidents has been increasing. Because large losses from cyber incidents are rare, accurately quantifying their probability is challenging. To address this issue, this chapter estimates a generalized extreme value distribution—an approach often used in engineering to approximate the distribution of extreme outcomes of random experiments that are highly skewed.¹⁶ The results show that the median maximum loss in a country in a given year, or in other words, the maximum loss expected to occur in most years, has more than doubled since 2017 to \$141 million in 2021, equivalent to about 50 percent of the average firm’s operating income (Figure 3.5, panel 3). The analysis also suggests that once every 10 years, a cyber incident is expected to result in a \$2.5 billion loss, about 800 percent of the average firm’s operating income, potentially threatening the liquidity and solvency of the affected firm. Looking specifically at financial firms, the estimated maximum losses in a year are comparable—about \$152 million in a median year and up to \$2.2 billion once every 10 years (Figure 3.5, panel 4).

The reported direct losses of firms may not fully capture the total economic costs of cyber incidents. Firms typically do not report indirect losses from cyber incidents—such as lost business, reputational damage, or investments in cybersecurity—because these losses could be difficult to capture or may unfold over time. However, overall losses from cyber incidents (that is, both direct and indirect losses) can be estimated using the stock price reaction to

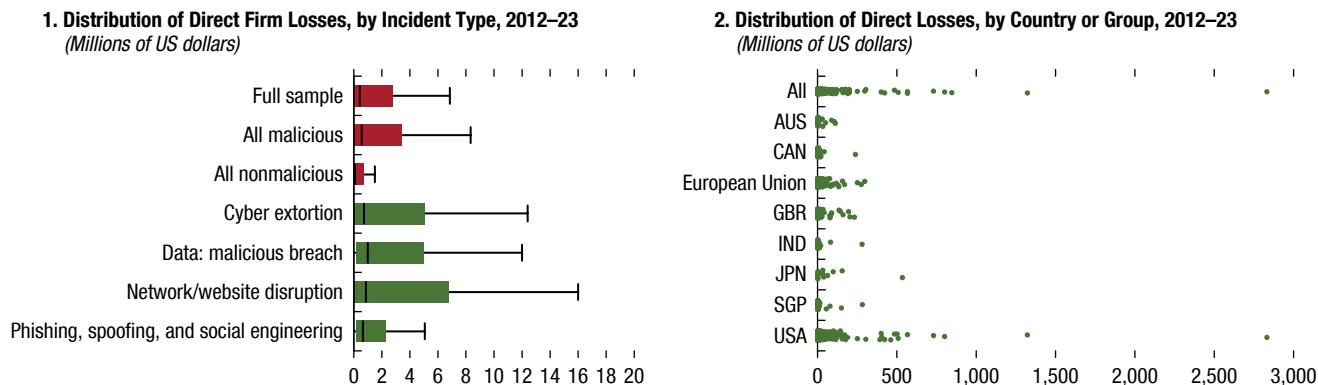
¹⁵For example, in 2019, Moody’s lowered the credit rating outlook of Equifax, a credit reporting agency, from “stable” to “negative” after a large breach of consumer data in 2017.

¹⁶The generalized extreme value distribution is estimated here using data of losses caused by cyber incidents from 2012 to 2021 while controlling for country characteristics such as size (that is, GDP) and information technology infrastructure (for details, see Online Annex 3.2). Because the sample of the analysis includes only countries with more than 10 incidents per year, the results should be interpreted as the extreme loss for such countries conditional on the occurrence of cyber incidents.

Figure 3.5. Reported Direct Losses Resulting from Cyber Incidents

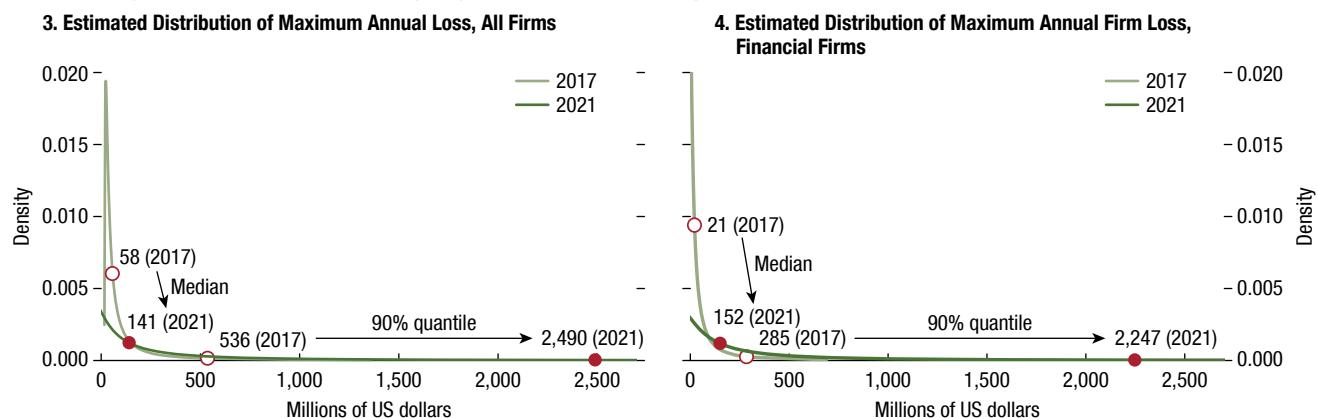
Median reported direct losses of cyber incidents to firms are modest, at about \$0.4 million ...

... however, very large losses can occur.



The probability of a firm experiencing an extreme loss of \$2.5 billion as a result of a cyber incident is about once every 10 years ...

... and, for financial firms, this extreme loss could be about \$2.2 billion, up from about \$300 million in 2017.



Sources: Advisen Cyber Loss Data; Capital IQ; and IMF staff calculations.

Note: In panel 1, boxes show the interquartile range and medians of losses greater than zero; whiskers represent the maximum losses (excluding outliers). In panel 2, the dots show losses greater than zero. In panel 3, data labels use International Organization for Standardization (ISO) country codes. Panels 3 and 4 show the estimated posterior density function of the highest loss of all firms and financial firms in a year.

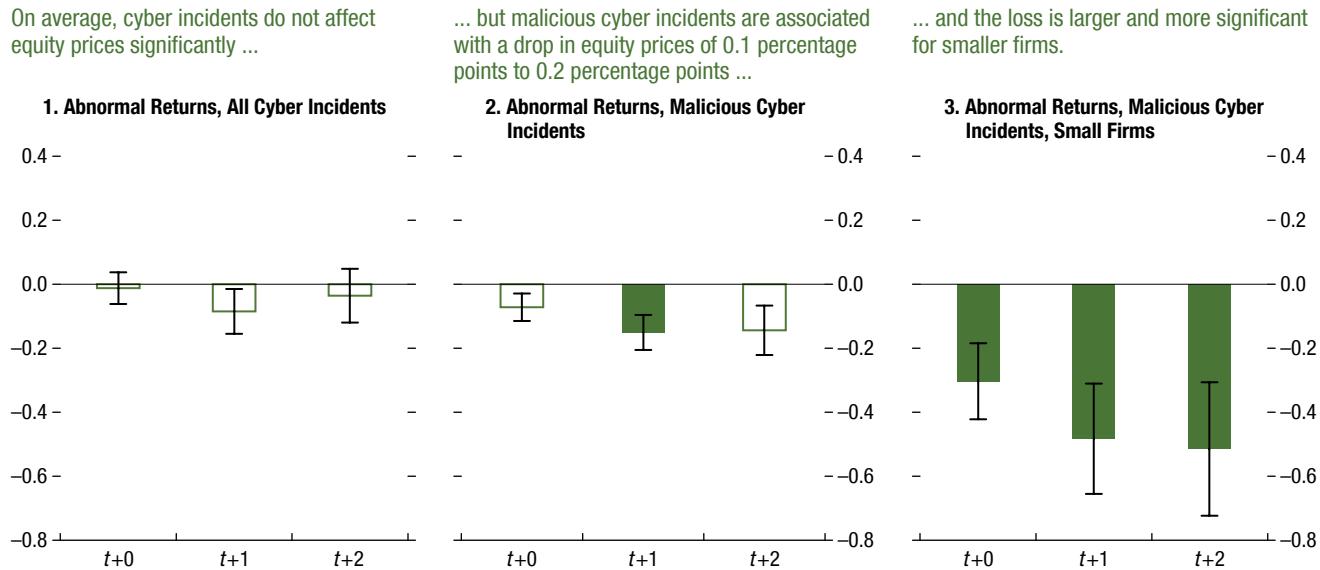
cyber incidents because equity markets are forward looking and reflect market participants' assessment of firms' value (Kamiya and others 2021).¹⁷ The analysis reveals that when controlling for market movements and other relevant factors, stock prices do not on average react strongly to cyber incidents

(Figure 3.6, panel 1).¹⁸ Stock prices do, however, seem to respond to cyberattacks. On average, firms' stock returns fall by 0.1 percentage points to 0.2 percentage points, although the effect is not statistically

¹⁷For example, the stock price of Facebook fell by about 3 percent in 2018 when the company announced that hackers had gained access to nearly 50 million user accounts (Deepa Seetharaman and Robert McMillan, "Facebook Finds Security Flaw Affecting Almost 50 Million Accounts," *Wall Street Journal*, September 28, 2018, <https://www.wsj.com/articles/facebook-flaw-allowed-hackers-to-take-over-user-accounts-1538153947>).

¹⁸The analysis relies on the assumption that equity price movements appropriately reflect losses shortly after an event is observed. The results are conditional on a cyber incident being reported, which could introduce a selection bias in the estimates. The analysis controls for overall market movements which, for major incidents, could be affected by a cyberattack on a firm. The lack of systemic cyber incidents in the past, however, suggests that cyberattacks are unlikely to affect market movements. See Online Annex 3.3 for a detailed description of the empirical methodology and robustness tests.

Figure 3.6. Total Losses from Cyber Incidents
(Percentage points)



Sources: Advisen Cyber Loss Data; Capital IQ; and IMF staff calculations.

Note: In panels 1 and 2, results are based on event studies of 836 and 644 cyber incidents at listed firms, respectively. Small firms are firms with total assets below the 25th percentile of the sample distribution. In all panels, the whiskers represent the one-standard-deviation error band. Malicious events include cyber extortion, malicious data breach, identity fraudulent use/account access, network and website disruption, phishing, spoofing, social engineering, skimming, and physical tampering (see Online Annex 3.1). The solid bars represent significance at the 10 percent level. See Online Annex 3.3 for additional details.

strong (Figure 3.6, panel 2).¹⁹ The losses are largest and most significant for small firms, ranging from 0.3 percent to almost 0.6 percent, suggesting that small firms have less capacity to deter and deal with the potential losses from cyberattacks (Figure 3.5, panel 3). Overall, these stock market reactions correspond to losses of up to \$90 million of firms' market value and are substantially larger than firms' reported direct losses.²⁰

Drivers of Cyber Incidents

Understanding the factors that contribute to the occurrence or prevention of cyber incidents is crucial for developing robust cybersecurity policies and strategies. Cyber incidents are determined by both a firm's overall exposure to cyber incidents and its ability to

prevent them. For example, large and profitable firms that have an extensive digital presence and that depend heavily on informational and communication technology could be a more attractive target for a cyberattack than smaller firms with a limited digital footprint. At the same time, such firms could also have a greater capacity to invest in cybersecurity and strengthen resilience, making them less vulnerable to cyber incidents. Firms located in countries facing geopolitical tensions may also have a greater likelihood of falling victim to a cyberattack caused by threats from rival countries. Firms with mature cyber governance and firms that operate in countries with strong cyber laws, in contrast, may be more likely to prevent a cyber incident.²¹

Econometric analysis suggests that digitalization and geopolitical tensions significantly raise the

¹⁹The sample used in the analysis consists of firms incorporated in different countries with different reporting standards. Results are comparable across countries.

²⁰At the firm-incident level in the sample, the loss in market capitalization was larger than the reported direct loss in about 90 percent of cases.

²¹Kamiya and others (2021) studied the likelihood of cyberattacks that involve the loss of personal information in a sample of US firms. They found that firms that experience such cyberattacks are larger and older; are more profitable; are less risky; have better future growth opportunities, higher leverage, and more asset intangibility; and invest less in capital expenditures and research and development.

risk of cyber incidents.²² For example, moving from the 10th percentile on the United Nations' Telecommunication Infrastructure Index (the level of Madagascar or Malawi) to the 90th percentile (the level of Spain) raises the likelihood of a cyber incident from 0.5 percent to more than 2 percent.^{23,24} This represents a notable increase, considering that the mean likelihood of experiencing a cyber incident in a given year in the sample is 1.2 percent. Countries with heightened exposure to geopolitical tensions are at a similar increased risk of experiencing a cyber incident.²⁵ Larger firms and those with a higher share of intangible assets—typically firms in the information technology (IT) sector—also face a notably higher probability of experiencing a cyber incident (Figure 3.7, panel 1).²⁶ By contrast, firms in countries with more developed cyber legislation are less likely to be targets of a cyber incident.²⁷

Firms that shifted to telework during the COVID-19 pandemic were more likely to have experienced a cyber incident. Results show that cyber incidents increased more in firms that relied only moderately on telework before the pandemic but shifted to teleworking during the pandemic (Figure 3.7, panel 2). Before the pandemic, firms in sectors with a high propensity to telework were more likely to experience cyber incidents than other firms, possibly because they relied more on IT infrastructure. After the pandemic, however, the probability of such

²²To study the drivers of cyber incidents, a probit model is estimated using global firm-level data covering 16,945 firms in 42 countries from 2014 to 2022. See Online Annex 3.4 for details.

²³The Telecommunication Infrastructure Index is constructed by the United Nations and is a composite of four indicators: (1) estimated internet users per 100 inhabitants, (2) number of mobile subscribers per 100 inhabitants, (3) active mobile-broadband subscription, and (4) number of fixed broadband subscriptions per 100 inhabitants.

²⁴The likelihood of observing a cyber incident could also be influenced by differences in reporting across countries.

²⁵Geopolitical tensions are captured by the Geopolitical Risk Index (Caldara and Iacoviello 2022), which consists of a measure of adverse geopolitical events and risks based on a tally of newspaper articles.

²⁶These results are consistent with those of Kamiya and others (2021).

²⁷Cyber legislation is captured by the Maplecroft Cyber Legislation Index, which captures the adoption of e-commerce legislation related to e-transactions, consumer protection, data protection and privacy, and cybercrime. The index indicates whether a country has adopted legislation or has a draft law pending adoption.

firms experiencing cyber incidents declined.²⁸ Firms with less telework capacity before the pandemic, conversely, were unlikely to shift to telework and were not strongly affected by cyber incidents during the pandemic.

Insufficient governance arrangements related to cybersecurity may have amplified vulnerabilities during the COVID-19 pandemic. One plausible explanation for the finding that cyber incidents increased for firms that shifted to teleworking during the pandemic but declined for those accustomed to telework before the pandemic could be that the latter had relatively stronger cybersecurity and governance arrangements, as well as a better-prepared workforce. Indeed, as shown in Figure 3.7 (panel 3), firms in sectors with a high propensity to telework before the pandemic had better governance arrangements to mitigate cyber risks. Such firms were more likely to have board members with cybersecurity expertise, to have cybersecurity and data privacy policies, and to have scored higher on an index capturing firms' ability to manage data privacy risks. The firms also further improved governance along these dimensions during the pandemic.

Firms tend to bolster their cyber defenses after an incident, indicating that managing cyber risks includes a dynamic learning process. For example, the probability of a cyberattack is 1.2 percentage points lower for firms that experienced an attack in the past two years (Figure 3.7, panel 4). Consistent with cyber governance being an important factor in preventing the occurrence of cyber incidents, there is some evidence that firms increase the number of board members with cyber expertise after a cyber incident.²⁹

The Cyber Threat Landscape in the Financial Sector

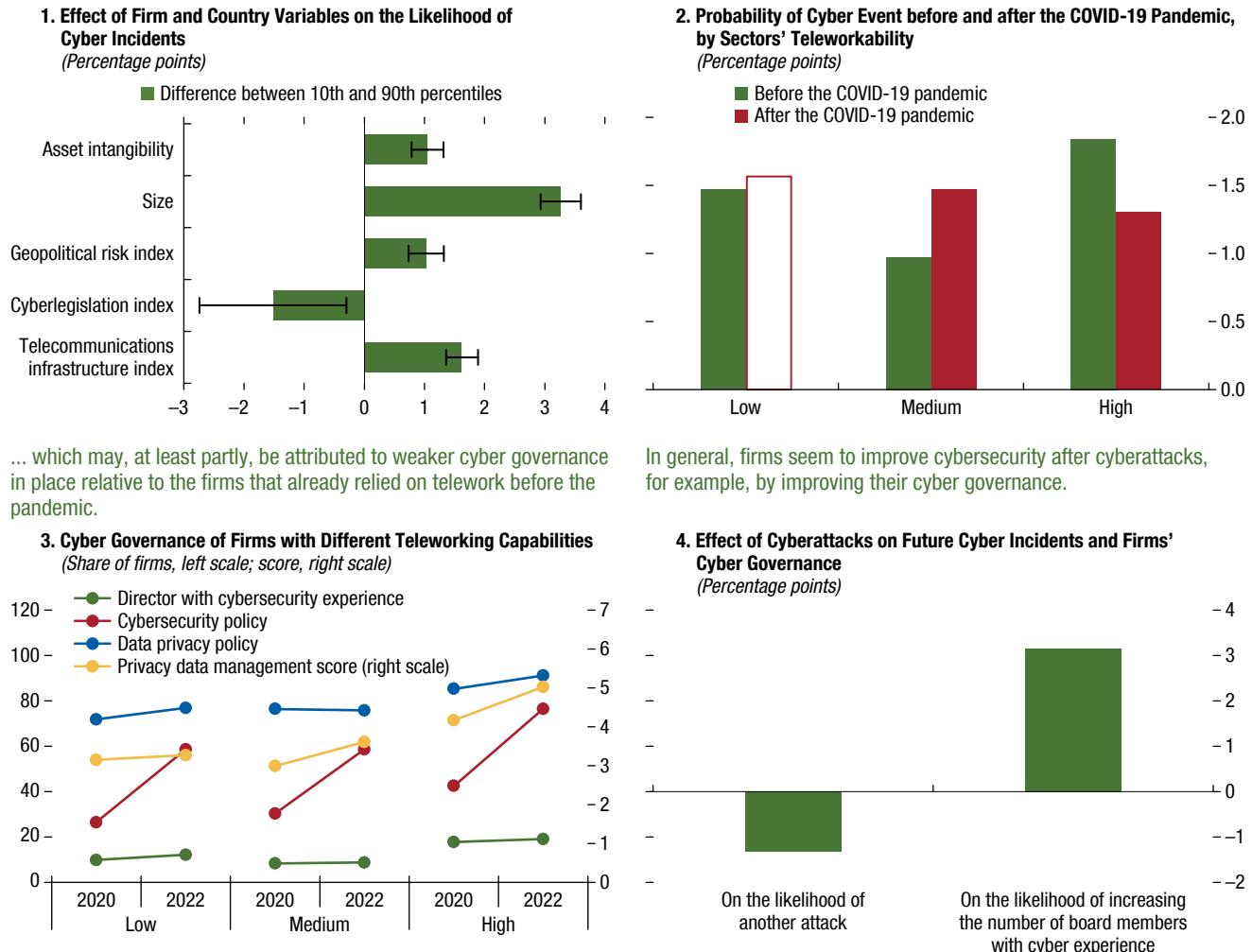
The financial system is notably exposed to cyber risk. Financial firms handle large amounts of customer data and transactions, potentially making them a target of choice for cybercriminals seeking

²⁸The ability to telework is identified at the sectoral level based on the share of the workforce capable of working remotely before the COVID-19 pandemic (Dingel and Neiman 2020).

²⁹See Online Annex 3.4 for additional details on modeling of the effect of past cyber incidents on vulnerability and robustness checks.

Figure 3.7. Drivers of Cyber Incidents

Firms in countries with more advanced technology, weaker cyber legislation, and greater exposure to geopolitical risks have a higher likelihood of experiencing a cyber incident.



... which may, at least partly, be attributed to weaker cyber governance in place relative to the firms that already relied on telework before the pandemic.

During the COVID-19 pandemic, firms in sectors that had to switch to remote working had a higher probability of experiencing a cyber incident relative to prepandemic levels ...

Sources: Advisen Cyber Loss Data; Caldara and Iacoviello 2022; Capital IQ; Dingel and Nieman 2020; Maplecroft; MSCI; Orbis; Refinitiv; United Nations; and IMF staff calculations.

Note: Panel 1 shows the difference in the estimated likelihood of a cyber incident when moving from the 10th percentile to the 90th percentile of the sample distribution of the specified variable while holding all other variables at mean values. Panel 2 shows the predicted probability of cyber incidents before and after the COVID-19 pandemic for firms with different levels of teleworkability, holding other variables at mean values. Panel 3 shows the share of firms with different cybersecurity-related governance mechanisms, before and after the COVID-19 pandemic, for firms with different levels of teleworkability. Teleworkability groups (low, medium, high) are based on Dingel and Nieman (2020). In panel 4, the bar on the left shows the change in likelihood of a cyberattack in a given year when a firm experienced a malicious cyber incident in the previous two years, and the bar on the right shows the change in likelihood of a firm increasing the number of board members with cyber expertise after the firm experienced a cyberattack in the previous year. The econometric models control for a range of firm-level factors and fixed effects. See Online Annex 3.4 for detailed descriptions of the econometric models and variable construction. In panel 1, the whiskers show 90 percent confidence intervals. In panels 1, 2, and 4, the solid bars represent significance at the 10 percent level.

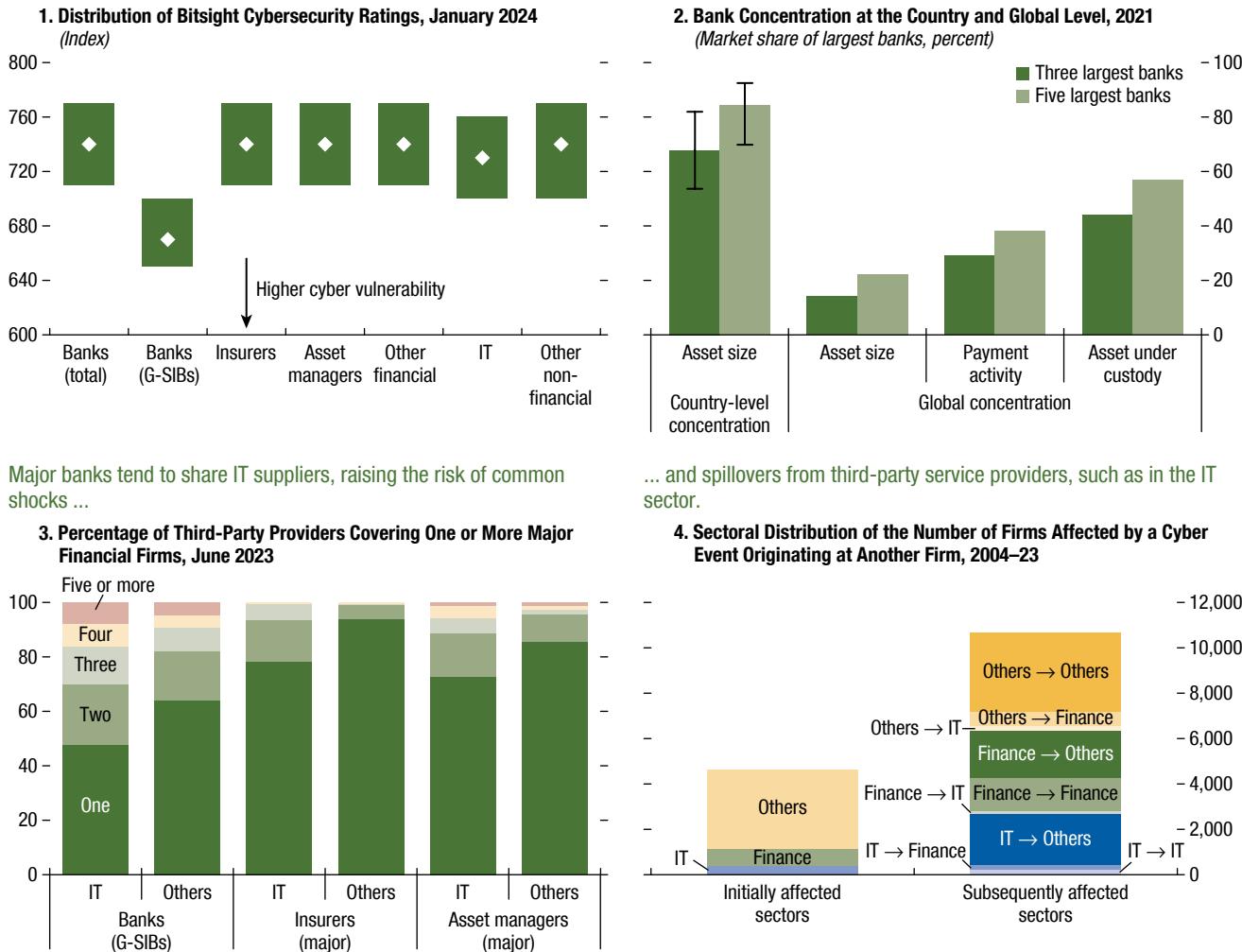
monetary gains or disrupting economic activity. As shown in Figure 3.2 (panel 1), cyber incidents in the financial sector constitute a sizeable share of all cyber incidents, with banks facing about half of the sector's incidents. Large banks are particularly vulnerable, as

suggested by ratings that capture an organization's overall cybersecurity performance—presumably because they are more often targeted, even though they may have more sophisticated cybersecurity practices in place (Figure 3.8, panel 1, and Online

Figure 3.8. Cyber Risk in the Financial Sector

Large banks are considered particularly vulnerable to cyberattacks.

High market concentration of banks—for example, in payment and custody services—underscores the importance of cybersecurity and operational resilience.



Sources: Advisen Cyber Loss Data; Bank for International Settlements; Bitsight; FactSet; Orbis; and IMF staff calculations.

Note: In panel 1, Bitsight Cybersecurity Ratings measure an organization's security performance. Ratings range from 250 to 900, where higher values indicate lower risk. The diamonds indicate the median, and the boxes indicate the interquartile range of the ratings. In panel 2, for “country-level concentration,” the bar and whiskers indicate the median and first-to-third quartile of sample countries, respectively. The “global concentration” sample covers all banks included in the 2021 G-SIB assessment. “Asset size” in country-level and global concentrations, respectively, indicate total asset and total exposures. Panel 3 indicates the proportion of third-party IT providers and other providers with one or more clients within a financial subsector (FactSet supply chain data rely on publicly available information and may be incomplete). Online Annex 3.1 indicates the definition of major financial firms. Panel 4 shows cyber events that hit one firm and affected multiple firms. The left bar shows the sectors of the firms originally affected, and the right bar shows which sectors were subsequently affected. G-SIBs = global systemically important banks; IT = information technology.

Annex 3.5).^{30,31} This vulnerability underscores the critical importance of managing and mitigating cyber risk to maintain global financial stability.

Three key characteristics amplify the vulnerability of financial institutions to cyber incidents:

- First, *market concentration* of banks is high at the country and global levels when considering critical services such as payment services and custody banking (Figure 3.8, panel 2).³² In general, banks' payment networks are a critical part of the financial system infrastructure. Cyber incidents could disrupt these networks to severely affect economic activity (Eisenbach, Kovner, and Lee 2022). Beyond banking, financial market infrastructures that include payment and securities settlement systems, central securities depositories, central counterparties, and trade repositories are typically characterized by high market concentration and lower substitutability, making a successful cyberattack on a financial market's infrastructure a major vulnerability of the financial system (Box 3.1).
- Second, operations of financial firms are becoming increasingly dependent on *common third-party IT providers* because of economies of scale and network effects. This includes adopting common software solutions, acquiring similar hardware components, and migrating to a select set of global cloud or critical service providers. As shown in Figure 3.8 (panel 3), more than 50 percent of IT providers of global systemically important banks supply their products and services to two or more global systemically important banks, implying a widespread overlap. IT providers of about 20 percent of insurers and 25 percent of asset managers, similarly, supply services to two or more institutions in their respective groups. These dependencies—which can be international (see Online Annex Figure 3.5.4)—have grown with the digitalization of the financial sector. Although third-party IT providers can benefit financial institutions, such as with improved operational resilience, they also carry risks.³³ If not properly managed, a high degree of overlap in the provision of third-party services could expose the financial system to common shocks, disrupt critical services in the event of cyber incidents, and pose significant risk to financial institutions and financial stability (Financial Stability Board 2023; US Department of the Treasury 2023). For example, cyber incidents in the IT sector have often spilled over to firms in other sectors (Figure 3.8, panel 4).³⁴
- Third, a high degree of *interconnectedness* among financial institutions could exacerbate contagion and lead to a higher probability of cyber incidents having systemic implications. For example, a cyber incident that disrupts payment processing at an individual financial firm could cause a ripple effect on the liquidity and operations of other firms. Similarly, a severe cyber incident at a financial institution could undermine trust in the financial system more broadly and, in extreme cases, lead to market selloffs or runs on banks (Duffie and Younger 2019).

³⁰Bitsight Security Ratings is an example comprehensive cybersecurity assessment tool. Its ratings cover three risk vectors: (1) diligence—the steps an organization has taken to prevent attacks, their best practice implementation, and risk mitigation; (2) compromised systems—the presence of malware or unwanted software, which is evidence of security controls failing to prevent malicious or unwanted software from running within an organization; and (3) user behavior—employee activities, such as file sharing and password reuse, that can introduce malware to an organization or result in a data breach.

³¹According to Modi and others (2022), US banks' IT expenses have increased threefold from 2011 to 2021, and large banks have been increasing their IT spending at a much faster pace than small banks. He and others (2023) supports this finding, reporting that IT spending among larger US banks, normalized by asset sizes and noninterest expenses, tends to be higher than that of smaller banks. Moody's 2023 Cyber Survey (Moody's 2023) of 1,700 global firms, including financial institutions, indicates that cybersecurity spending rose by 70 percent from 2019 to 2023.

³²Market concentration in the financial sector, including banking, has been relatively stable since the 2010s (see Online Annex 3.5).

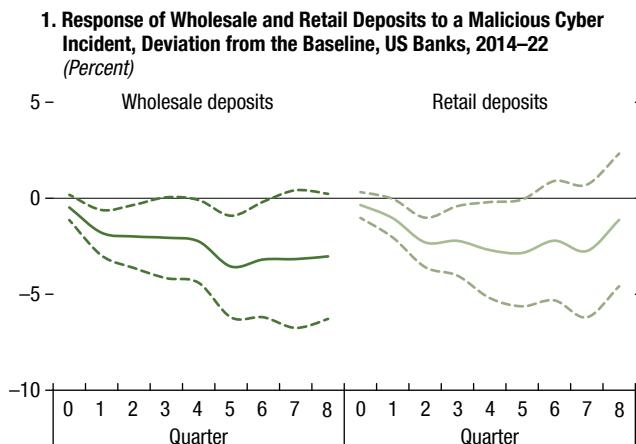
or more global systemically important banks, implying a widespread overlap. IT providers of about 20 percent of insurers and 25 percent of asset managers, similarly, supply services to two or more institutions in their respective groups. These dependencies—which can be international (see Online Annex Figure 3.5.4)—have grown with the digitalization of the financial sector. Although third-party IT providers can benefit financial institutions, such as with improved operational resilience, they also carry risks.³³ If not properly managed, a high degree of overlap in the provision of third-party services could expose the financial system to common shocks, disrupt critical services in the event of cyber incidents, and pose significant risk to financial institutions and financial stability (Financial Stability Board 2023; US Department of the Treasury 2023). For example, cyber incidents in the IT sector have often spilled over to firms in other sectors (Figure 3.8, panel 4).³⁴

³³Third-party IT providers to large financial firms generally have cybersecurity ratings as high as those of the financial firms themselves (see Online Annex 3.5).

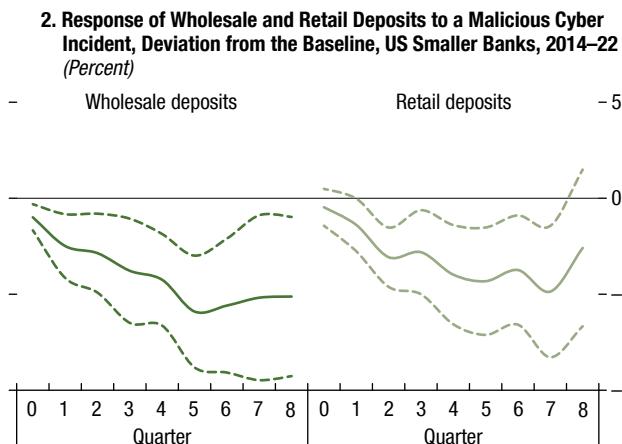
³⁴A ransomware attack on Trellance, a cloud IT service provider, in December 2023 caused outages at 60 US credit unions (Sean Lyngaas, "Ransomware Attack Causes Outages at 60 Credit Unions, Federal Agency Says," CNN, December 4, 2023, <https://www.cnn.com/2023/12/01/politics/ransomware-attack-credit-unions/index.html>). An update to an accounting software in 2017 was infected by the NotPetya virus, which resulted in the malware spreading to many firms, including across borders (Crosignani, Macchiavelli, and Silva 2023). Thousands of customers of a software supplied by SolarWinds were exposed to a potential cyberattack when the company updated the software in 2020 (US Government Accountability Office 2021).

Figure 3.9. Cyber Incidents and Deposit Flows

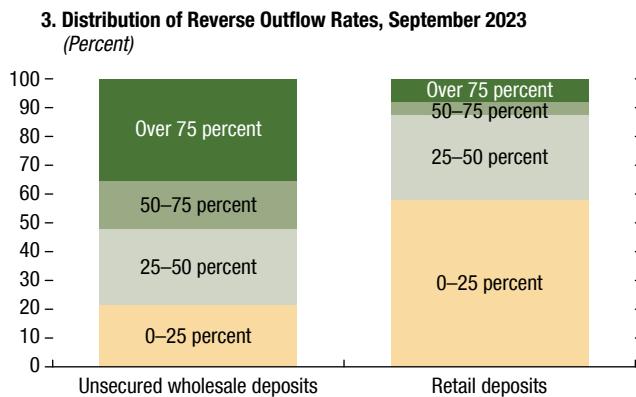
Past cyberattacks have modestly depressed deposit flows in the United States ...



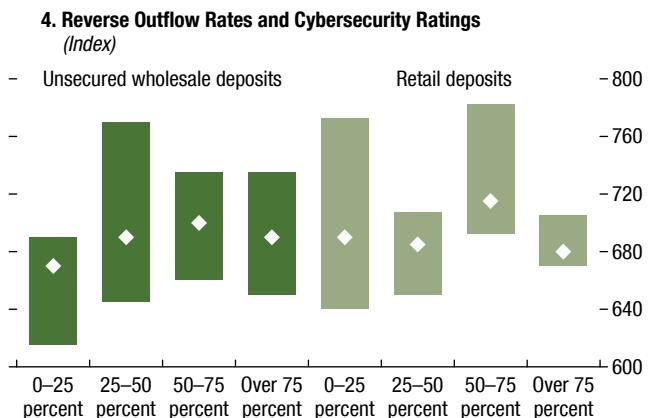
... and the effects have been more severe in smaller banks.



Banks that are more vulnerable to liquidity risk from outflows of wholesale and retail deposits ...



... also tend to have lower median cybersecurity ratings.



Sources: Advisen Cyber Loss Data; Bitsight; bank disclosures; Federal Financial Institutions Examination Council; Orbis; and IMF staff calculations.

Note: In panels 1 and 2, the solid lines represent estimates of the cumulative response of banks' domestic deposits to the occurrence of malicious cyber incidents in a given quarter. Dotted lines indicate the 90 percent confidence intervals (cross-section cluster robust standard errors). Malicious incidents include cyber extortion, malicious data breach, identity fraudulent use/account access, network and website disruption, phishing, spoofing, social engineering, and skimming and physical tampering (see Online Annex 3.1). Banks with total deposits below the two-thirds percentile are classified as small. The sample period is the first quarter of 2014 to the fourth quarter of 2022. Panels 3 and 4 cover a sample of 88 large banks included in the 2022 assessment of global systematically important banks. In panels 3 and 4, "reverse outflow rates" on the x axis are the outflow rates (percent) from unsecured wholesale (retail) deposits that lower bank's liquidity coverage ratio to 100 percent. In response to deposit outflows, banks are assumed to sell their high-quality liquid assets. In panel 3, the left (right) bar shows the percentage of banks with hypothetical outflow rates from unsecured wholesale (retail) deposits that would lower their liquidity coverage ratios below 100 (in intervals of 0 to 25 percent, 25 to 50 percent, 50 to 75 percent, and more than 75 percent). In panel 4, the diamonds indicate the median, and the boxes indicate the ranges of 25th to 75th percentiles of cybersecurity ratings as of January 2024. For further details, see Online Annex 3.6.

payment obligations and therefore swiftly redeem their deposits as a precautionary measure, potentially leading to cyber runs. Cyber incidents such as data breaches of depositor information could also cause potentially long-lasting reputational damage for banks, resulting in reduced net deposit flows. Although no significant cyber runs have yet occurred, as cyber incidents have had limited effect on financial transactions, empirical analysis suggests modest and somewhat persistent deposit outflows at US banks after a cyberattack

(Figure 3.9, panel 1).³⁵ In addition, Figure 3.9, panel 2, shows that smaller banks are more susceptible to outflows after cyber incidents, suggesting that such

³⁵In this exercise, in a sample of US banks over 2014–22, cumulative changes in wholesale and retail deposits are regressed on a dummy variable that takes the value of 1 if a cyber incident occurs in a bank and 0 if otherwise. To control for the effect of business cycle fluctuations and bank characteristics, period effects and bank fixed effects are included in the model. Smaller banks are defined as those with deposit holdings below the two-thirds percentile. See Online Annex 3.6 for details.

banks may not be able to regain depositor confidence quickly after a cyberattack. On average, retail and wholesale deposits at smaller banks tend to decline by about 5 percent in cumulative terms some six quarters after a cyber incident.³⁶

Banks that are potentially more exposed to liquidity risk are also more vulnerable to cyber risk. To assess the possible effect of cyber incidents on large banks' liquidity positions, the deposit outflow rate is computed at which a bank's liquidity coverage ratio would drop below the 100 percent regulatory requirement (called the reverse outflow rate).³⁷ The results show a large variation in the reverse outflow rates for unsecured wholesale and retail deposits across a sample of 80 large global banks. When facing 25 percent outflows of wholesale (retail) deposits, the liquidity coverage ratios of about 20 (60) percent of banks would drop below 100 (Figure 3.9, panel 3).³⁸ Those banks that are relatively more vulnerable to liquidity risks from deposit outflows also have lower cybersecurity ratings, indicating that relatively large banks are exposed to cyber and liquidity risks (Figure 3.9, panel 4).³⁹

The rapid evolution of fintech introduces additional cyber risks.⁴⁰ Fintech firms have increased the financial system's exposure to cyber threats through their digitalized operations and interconnectedness.⁴¹ Decentralized finance—crypto-market-based financial intermediation—has grown rapidly since 2020 and cyberattacks on decentralized finance, which employs

smart contracts,⁴² have been common, often causing large losses (Online Annex 3.8; April 2022 *Global Financial Stability Report*). Although central bank digital currencies have not experienced any known successful cyberattacks, there could be unknown and unpredictable risks from cyberattacks because they may rely on novel technologies, such as distributed ledger technology, for which there is no widely accepted cybersecurity framework (Bank for International Settlements 2023a). Hackers have also frequently targeted crypto assets, and cyberattacks on crypto exchanges have increased. As crypto assets become more integrated into the financial system, their vulnerability may pose risks for the financial system, for example, from cyber runs on fiat-backed stablecoins (Box 3.2).

Cybersecurity Preparedness across Countries

With the global financial system facing significant and growing cyber risks, policy and governance frameworks to mitigate the risks must keep pace. This need is being recognized by standard setters and major regulators, as noted earlier (Figure 3.3, panel 3). Yet across many countries—especially in emerging market and developing economies, where cyber threats are growing in lockstep with digitalization—legal frameworks and firm-level cyber governance arrangements remain inadequate, as suggested by several indicators of cybersecurity legislation and regulation (Figure 3.10, panels 1 and 2; Online Annex Figure 3.5.1).

According to a 2021 IMF survey of central banks and supervisory authorities, cybersecurity policy frameworks in emerging market and developing economies often remain insufficient. The survey, covering 74 emerging market and developing economies, comprised 43 questions on various aspects of cybersecurity and was originally conducted in 2021 (Adrian and Ferreira 2023) with a follow-up in 2023.⁴³ It showed that only 47 percent of the surveyed countries had formulated a national and financial-sector-focused cybersecurity strategy (Figure 3.10, panel 3). About half had implemented dedicated

³⁶“Wholesale deposits” are defined as deposits from private nondepository institutions.

³⁷More specifically, the “reverse outflow rate” represents outflows from deposits with a maturity of less than 30 days (or undetermined maturity).

³⁸Limited empirical evidence exists on the possible outflow rates after a severe cyber incident. On June 27, 2014, Bulgaria’s largest domestic bank, First Investment Bank, experienced a 10 percent retail deposit run after false e-mails and social media rumors suggested the bank had a liquidity shortage (Bouveret 2018). Duffie and Younger (2019) consider scenarios with 50 percent and 75 percent 30-day cumulative outflows of unsecured wholesale deposits.

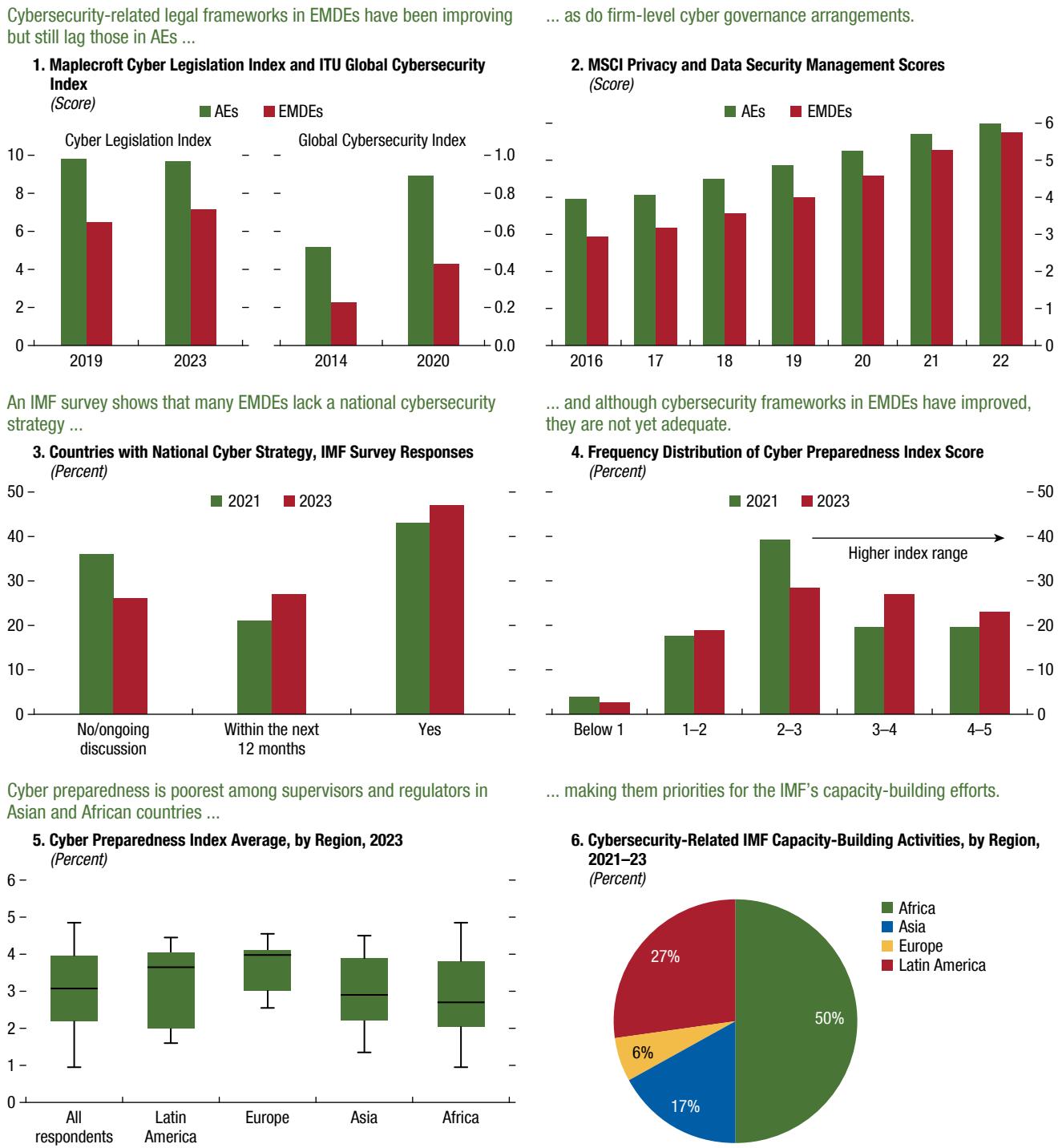
³⁹Although banks face regulatory capital requirements that take operational risk (including cyber risk) into account, liquidity requirements are not primarily designed on the basis of stress scenarios that include cyber incidents (Duffie and Younger 2019).

⁴⁰Fintech (financial technology) is technological innovation in financial activities (see Chapter 3 of the April 2022 *Global Financial Stability Report*).

⁴¹For example, open finance facilitates innovation in financial products and services by allowing financial firms to share customer data with other firms through digital channels.

⁴²Smart contracts are self-executing computer programs that automatically enforce contract terms. Because smart contracts are publicly viewable, hackers can scan them for vulnerabilities.

⁴³Of the 74 countries surveyed in 2023, 37 were low-income developing countries. See Online Annex 3.7 for the list of countries and the survey questions.

Figure 3.10. Emerging Market and Developing Economies Have Gaps in Their Cybersecurity Preparedness

Sources: ITU; MSCI; Verisk Maplecroft; and IMF staff calculations.

Note: The Maplecroft Cyber Legislation Index in panel 1 ranges from 0 to 10 and captures the adoption of e-commerce legislation in e-transactions, consumer protection, data protection/privacy, and cybercrime. In panel 2, the MSCI Privacy & Data Security Management Score measures how well a company manages the risk and opportunities, with higher scores indicating better management. Panels 3 to 5 are based on an IMF survey of 74 EMDEs comprising 43 questions on various aspects of cybersecurity. In panels 4 and 5, the Cyber Preparedness Index ranges from 0 to 5 and captures the quality of cyber strategies and regulation, supervisory practices, incident reporting arrangements, approaches to cybersecurity testing, awareness building, and supervisory capacity building. See Online Annex 3.7 for the survey questions, the list of countries covered, and details on the construction of the index. In panel 6, capacity-building activities include IMF regional workshops and bilateral technical assistance missions. AEs = advanced economies; EMDEs = emerging market and developing economies; ITU = International Telecommunication Union.

cybersecurity regulations and 54 percent had adopted data privacy laws.

Analyzing the various dimensions of the survey shows that approaches to cybersecurity supervision and testing in emerging market and developing economies have improved somewhat since 2021:

- Half of the surveyed emerging market and developing economies reported that they have specialized cyber risk supervision units, and 72 percent mandate regular cyber tests and exercises, with 22 percent actively managing such tests.⁴⁴
- Almost half of the surveyed jurisdictions have the power to examine third-party service providers—a crucial development given the increasing number of financial institutions migrating operations to the cloud.⁴⁵
- Formal cyber risk stress tests remain less common, with 27 percent of the surveyed economies including cyber risk in their stress test programs.⁴⁶ Only 8 percent of jurisdictions had developed a cyber map that identifies the main technological and service connections between financial institutions.
- Information-sharing arrangements in the financial sector help prevent cyber threats, but only 28 percent of jurisdictions report that financial entities systematically share information and intelligence with one another. Although central banks and supervisory authorities increasingly participate in domestic industrywide information sharing, the number of countries that share data with other jurisdictions did not increase (about 50 percent). Only 49 percent of countries have cybersecurity incident reporting regimes.

The Cybersecurity Preparedness Index captures the regulatory and supervisory capacity to address cyber risks, revealing gaps among emerging market and developing economies. Based on the survey results,

⁴⁴Regular cyber tests include vulnerability assessments, penetration testing, and red team testing (that is, threat intelligence-based testing).

⁴⁵In the 2023 survey, 38 percent of countries noted that several or most financial institutions in their jurisdiction are migrating to the cloud, up from 27 percent in 2021.

⁴⁶Cyber risk stress tests, an emerging practice, typically focus on testing the financial systems' resilience to cyber events. An example is testing whether contingency plans are in place to deliver critical services through disruption. These tests are also referred to as cyber resilience stress tests.

the Cybersecurity Preparedness Index has been created across countries to summarize the quality of cyber strategies and regulation, supervisory practices, incident reporting arrangements, approaches to cybersecurity testing, awareness building, and supervisory capacity building (Figure 3.10, panel 4). The index ranges from 0 to 5, with a score of 5 representing the highest level of cyber preparedness—comparable, for example, to the level of the United States.⁴⁷ The average score of the index across emerging market and developing economies in 2023 is 3 (slightly up from 2.8 in 2021), which indicates a moderate level of cyber preparedness. Half of the countries score below 3, and more than one-fifth score below 2, highlighting serious shortcomings in their capacity to mitigate cyber risks.

A regional breakdown of the index suggests relatively lower levels of cyber preparedness across Africa and Asia. While regulatory and supervisory capacity appears to have improved in Latin America, cyber preparedness in African and Asian countries remains, on average, relatively low (Figure 3.10, panel 5). About two-thirds of recent IMF capacity-building initiatives related to regulatory and supervisory aspects of cybersecurity have focused on these regions (Figure 3.10, panel 6).

Consistent with the survey results, IMF surveillance and capacity-building activities suggest that countries, especially among emerging market and developing economies, need to do more to address cyber risk. The IMF and World Bank Financial Sector Assessment Programs that have considered cybersecurity regulation and supervision have often found (1) gaps in national and financial sector cybersecurity strategies and coordination among stakeholders; (2) deficiencies in boards' cyber competence and effective oversight of third-party service providers; and (3) weaknesses in cybersecurity regulations and supervision, incident reporting regimes, and cyber testing requirements.⁴⁸ Lack of awareness, resources constraint, and competing priorities often hinder further progress.

⁴⁷See Online Annex 3.7 for a detailed explanation of the construction of the Cybersecurity Preparedness Index.

⁴⁸The regulation and supervision of cyber risk is increasingly covered in the IMF and World Bank's Financial Sector Assessment Programs, for example, for Iceland (2022), Mexico (2022), South Africa (2022), the United Kingdom (2022), and Sweden (2023).

Conclusion and Policy Recommendations

Cyber risks pose an evolving threat to financial stability. Cyber incidents, particularly of a malicious nature, are becoming more frequent globally. The analysis in this chapter shows that losses from cyber incidents have generally been modest in the past, but they could be extreme in some cases. Although the financial sector has not yet seen a systemic cyberattack—suggesting that cybersecurity at financial firms may have been commensurate with past threat levels—the risks have increased substantially against a backdrop of growing digitalization, evolving technologies, and rising geopolitical tensions. Cyber incidents now pose an acute threat to macrofinancial stability because the sector is characterized by exposure to sensitive data, high levels of concentration, and strong interconnectedness—including with the real economy.

Private incentives to address cyber risks may differ from the socially optimal level of cybersecurity, making public intervention necessary. Firms may not fully account for the systemwide effects of cyber incidents when investing in cybersecurity—especially in the financial sector, where disruptions to critical services or a loss of confidence in the financial system can have far-reaching consequences. Firms may also underestimate risks from common vulnerabilities, for example, when using the same services or software, or lack incentives to sufficiently monitor third-party service providers. They can also be reluctant to share information on cyber incidents, for example, for reputational reasons, even though sharing such information would be desirable from a financial stability perspective to understand common vulnerabilities and prevent incidents across firms.

A cybersecurity strategy for the financial sector, accompanied by effective regulation and supervisory capacity, can help build resilience (Gaidosch and others 2019). Adequately skilled cyber risk supervision units need to be established to periodically conduct on-site assessments and collect relevant data for off-site supervision to assess the cybersecurity landscape. Mapping financial and technological connections should be carried out to identify potential systemic risks from interconnectedness and concentrations in third-party service providers (Adelmann and others 2020). Supervisors should also encourage cyber “maturity” among financial sector firms. This entails board-level access to cyber expertise, a three-lines-of-defense approach

(managing risk at the business, risk management, and audit levels), cyber hygiene to improve firms’ online security and maintain system health (such as anti-malware and multifactor authentication), and cyber training and awareness.⁴⁹

To effectively monitor cybersecurity, reporting of cyber incidents to supervisory agencies should be strengthened. Lack of data is a critical impediment to effective supervision and financial stability analysis as well as to firm-level risk management. Firms’ reporting of cyber incidents and of the associated losses has improved in recent years, but it remains incomplete and is available with a lag (see Online Annex Figure 3.1.1, panel 1). Data collection of cyber incidents needs to be prioritized globally, and information should be shared among financial sector participants to enhance their collective preparedness.

Supervisors should require financial firms to develop and test response and recovery procedures to remain operational amid cyber incidents. Banks are subject to significant capital requirements to recover from operational risk (Afonso, Curti, and Mihov 2019), including cyber risk. Yet being able to deliver critical services during disruptions is equally important to limit potential disruptions of the financial system. To this end, firms need to identify their critical business services and ensure that tested disaster recovery plans and a crisis management framework are in place. National authorities should also develop effective response controls and crisis management frameworks to deal with systemic cyber crises.

The monitoring of cyber-related liquidity risk is warranted. Deposit outflows in the aftermath of cyber-attacks have been modest in the past, and liquidity requirements on banks appear to have generally been sufficient to address them (Figure 3.9, panels 1 and 2). However, looking ahead, when assessing adequacy of liquidity under stress scenarios firms will need to consider cyberattacks and be prepared. Moreover, central bank business continuity contingency plans should factor in cyber risk, including for the provision of liquidity in a crisis.

⁴⁹According to Microsoft (2023), the majority of cyberattacks are preventable by practicing cyber hygiene, such as enabling multifactor authentication, applying zero trust principles, using antimalware, and keeping software up to date. Training and awareness among stakeholders and a security-oriented culture can also contribute to better cybersecurity. Encryption of data helps ensure that it cannot be used when it is stolen.

Given the global nature and systemic implications of cyberattacks, cross-border coordination is crucial to mitigate cyber risks. Cyberattacks often emanate from outside a financial firm's home country and proceeds can be routed across borders, which impedes the process of holding attackers accountable and recovering the money. It is essential, therefore, to develop international protocols on cooperation to address cybersecurity issues successfully. Furthermore, reporting of cyber incidents needs to be harmonized across countries to facilitate information sharing across borders.⁵⁰

Governments need to facilitate institutional arrangements to preserve cybersecurity. Cybersecurity laws that criminalize cyberattacks and a national cybersecurity strategy that includes identifying critical infrastructure, establishing computer incident response teams, and spreading public awareness on cyber hygiene can all contribute to enhancing cyber preparedness.

Cyber insurance could help offset cyber risks but is restricted in terms of availability and uptake.⁵¹

⁵⁰The Financial Stability Board (2023) has issued recommendations to achieve greater convergence in cyber incident reporting. If implemented, these recommendations should help countries establish an effective incident reporting regime that gathers required information on cyber incidents. The Financial Stability Board is also designing a format for incident reporting exchange (FIRE), which provides an approach to promote common information elements and requirements for incident reporting.

⁵¹The availability of insurance, particularly if it covers ransomware, could also facilitate ransom payments and thus make attacks more attractive.

Firms are increasingly relying on cyber insurance to protect against financial losses from cyber incidents (Figure 3.3, panel 2), but coverage limits remain low. About 60 percent of insurance policies in the United States have coverage limits below \$1 million, and almost all have coverage below \$10 million.⁵² Lack of data—particularly on total losses from cyber incidents, on attacks that were attempted but did not materialize, and on key risk indicators such as investments in cybersecurity—might contribute to the restricted availability of cyber insurance.

The IMF actively helps member countries conduct cyber risk assessments and strengthen cybersecurity frameworks for the financial sector. This is mainly done through the Financial Sector Assessment Programs as well as other capacity-building initiatives such as training courses, workshops, and technical assistance missions. The IMF has also developed the Cyber Risk Supervision Toolkit comprising model regulation, a risk assessment tool, a supervisory process document, and a supervisory manual. In addition, the IMF is vital in the development of international-level cyber-related policies, contributing to efforts by standard-setting bodies such as the Basel Committee on Banking Supervision, the Financial Stability Board, and the International Organization of Securities Commissions.

⁵²Insurance policy coverage limits are based on data from Advisen Client Insight.

Box 3.1. Cyber Risk for Financial Market Infrastructures

Financial market infrastructures play a critical role in the global financial system by facilitating the clearance and settlement of payments, securities, derivatives, and other financial transactions. Financial market infrastructures include payment systems, central securities depositories, securities settlement systems, central counterparties, and trade repositories. Because financial market infrastructures conduct significant transaction volumes (Figure 3.1.1, panel 1), cyberattacks could affect the entire financial system.

Although major cyberattacks have not yet disrupted the operations of financial market infrastructures, payment systems have experienced outages. In 2020, a software error disrupted the payment and settlement operation of the European Central Bank's TARGET2 system for approximately 11 hours, leading to a complete failure of all payment transactions in the system. Backup systems and contingency modules were also initially unable to function. In 2021, an operational error caused nearly all US Federal Reserve Board services, such as Fedwire and FedACH, to be unavailable or significantly limited for 3 hours. In December 2023, a cyberattack disrupted the national payment system in Lesotho, preventing local banks from conducting interbank transactions in the country.

The dependence of financial market infrastructures on critical service providers, such as IT infrastructures or telecommunications services, could increase cyber risk. For example, banks and their payment systems are often attacked in the form of fraudulent payment messages passed through the SWIFT system—a messaging platform for financial transactions used by more than 11,000 financial institutions in more than 200 countries (Figure 3.1.1, panels 2 and 3). During these attacks, many of which are targeted at banks in emerging market and developing economies, hackers gain access to victims' credentials and send fraudulent payment orders, sometimes routed through advanced economy banks and central banks.

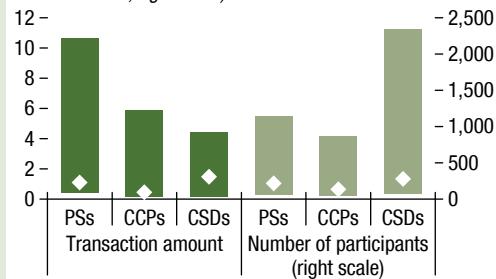
Among all SWIFT-related cyberattacks, the Bangladesh Bank heist in February 2016 caused the largest known losses, whereby hackers stole credentials from the bank and sent fraudulent transfer requests to the Federal Reserve Bank of New York that held the Bangladesh Bank's account. Although the New York Federal Reserve could block most transactions (totaling \$850 million), approximately \$101 million was transferred to foreign bank accounts and \$81 million was later funneled through casinos, making it challenging to track the lost money. In response to such incidents, SWIFT

Figure 3.1.1. Size and Interconnectedness of Financial Market Infrastructures

Financial market infrastructures facilitate transactions globally through connections with financial firms.

1. Transaction Amount and Number of Participants of the Top 20 Financial Market Infrastructures, 2022

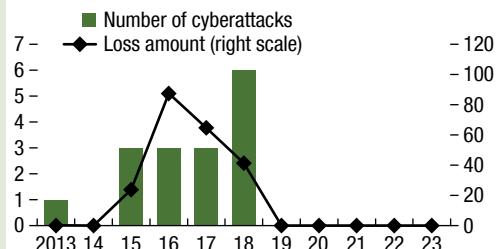
(Transaction value divided by world GDP, left scale; number, right scale)



Emerging market and developing economies have experienced cyberattacks through fraudulent SWIFT messages ...

2. SWIFT-Related Cyberattacks, 2013–23

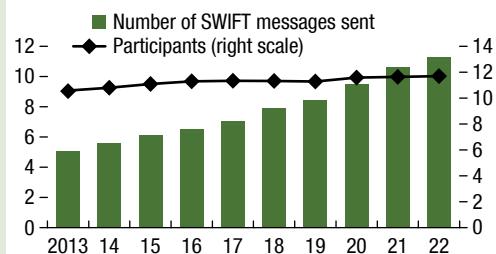
(Number, left scale; millions of US dollars, right scale)



... while activity on SWIFT has been expanding.

3. SWIFT Message Flows and Participants, 2013–22

(Billions, left scale; thousands, right scale)



Sources: Advisen Cyber Loss Data; Bank for International Settlements; and IMF staff calculations.

Note: In panel 1, diamonds indicate the median and boxes indicate the ranges of 10th to 90th percentiles. The top 20 financial market infrastructures are based on the ranking of the transaction amounts in each category. PSs includes the Continuously Linked Settlement international payments system, which provides foreign exchange settlement services. CCPs = central counterparties; CSDs = central securities depositories; PSs = payment systems.

Box 3.1 (continued)

established the Customer Security Controls Framework in 2016, which includes control guidelines for users to securely manage their SWIFT environment.¹ Still, in May 2018, Banco de Chile suffered a \$10 million theft after cyberattacks on 9,000 computers and 500 servers obscured a fraudulent SWIFT transfer. To secure accounts, the bank disconnected workstations and suspended operations at 400 branches for two weeks.² Since 2019, however, SWIFT-related cyberattacks have been less successful, suggesting that the framework has been effective and highlighting the importance of coordinated efforts to improve users' preparedness.

Ensuring the cyber resilience of financial market infrastructures and strengthening their response and

¹The Customer Security Controls Framework has three objectives: (1) “Secure the environment” by restricting internet access and protect critical systems from the general IT environment, reducing attack surface and vulnerabilities and physically securing the environment; (2) “Know and limit access” by preventing compromise of credentials, managing identities, and segregating privileges; and (3) “Detect and respond” by detecting anomalous activity in systems or transaction records and planning incident response and information sharing. To achieve these objectives, the SWIFT Customer Security Controls Framework v2024 contains 32 security controls, 25 of which are mandatory (SWIFT 2023).

²For details of these SWIFT-related cyberattacks, see Carnegie Endowment for International Peace, “Timeline of Cyber Incidents Involving Financial Institutions,” <https://carnegieendowment.org/specialprojects/protectingfinancialstability/timeline>.

recovery capabilities is critical for the overall resilience of the financial system. Significant international efforts have been devoted to addressing cyber risk in financial market infrastructures, such as guidance by the Committee on Payments and Market Infrastructures and International Organization of Securities Commission (2016) on establishing and operationalizing a cyber-resilience framework. The IMF has also received several requests for capacity development and training on cyber risk of financial market infrastructures since 2022. Yet cybersecurity of some financial market infrastructures may still fall short. According to the Committee on Payments and Market Infrastructures and International Organization of Securities Commission (2022), some financial market infrastructures lack cyber response and recovery plans to meet the objective of a two-hour recovery time in the event of an extreme cyberattack scenario or cannot meet the objective at. Many financial market infrastructures, furthermore, do not conduct cyber resilience testing that meets the standards set by the guidance.³

³A total of 37 financial market infrastructures from 29 jurisdictions voluntarily participated in the assessment. The assessment was conducted based on a self-assessment questionnaire. For details, see CPMI-IOSCO (2022).

Box 3.2. Cyber Risk and Crypto Assets

As crypto assets become more widely adopted, they are increasingly targeted by cyberattacks (Figure 3.2.1, panel 1). These attacks frequently focus on crypto asset exchanges, platforms, and hot wallets,¹ and on major crypto assets (such as bitcoin and ether). For example, in 2014, the crypto exchange Mt. Gox suffered a loss of 850,000 bitcoins because of hacks. In 2016, \$60 million in ether was stolen from the DAO, a member-owned decentralized autonomous organization on the Ethereum platform. In 2021, more than \$600 million was taken from the decentralized finance platform Poly Network.²

Crypto assets are not only vulnerable to cyberattacks but are also used in ransomware attacks, which have greatly increased since 2019 (Figure 3.2.1, panel 1). For example, in 2017, attackers using WannaCry ransomware demanded that victims pay ransom in bitcoin to unlock their encrypted files. In 2021, Colonial Pipeline paid hackers a ransom of nearly 75 bitcoins (equivalent to \$4.4 million) in exchange for a decryption tool.³

While spillovers from cyberattacks on crypto assets to the broader financial system have been limited, crypto assets—in particular, stablecoins—raise the risk because

¹Hot and cold wallets are the primary means of storing and exchanging crypto assets. Hot wallets are internet-enabled and online, whereas cold wallets are offline and come in the form of a physical device, such as a USB stick. The theft of crypto assets from exchanges, such as Coincheck and Zaif, in 2018 was done via hot wallets.

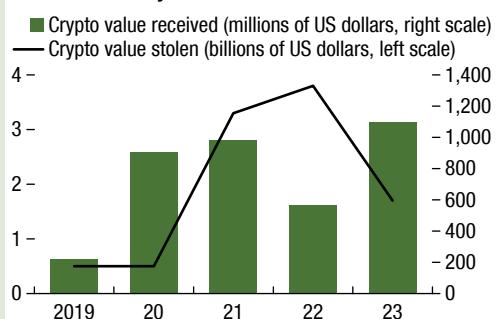
²For details of cyber incidents affecting Mt. Gox, DAO, and Poly Network, see Mark Memmott, “Mt. Gox Files for Bankruptcy; Nearly \$500M of Bitcoins Lost,” *NPR*, February 28, 2014, <https://www.npr.org/sections/thetwo-way/2014/02/28/283863219/mtnox-files-for-bankruptcy-nearly-500m-of-bitcoins-lost>; David Z. Morris, “CoinDesk Turns 10: 2016—How The DAO Hack Changed Ethereum and Crypto,” *Consensus*, May 9, 2023, <https://www.coindesk.com/consensus-magazine/2023/05/09/coindesk-turns-10-how-the-dao-hack-changed-ethereum-and-crypto/>; and Eliza Gkritsi and Muyao Shen, “Cross-Chain DeFi Site Poly Network Hacked; Hundreds of Millions Potentially Lost,” *Consensus*, August 10, 2021, <https://www.coindesk.com/markets/2021/08/10/cross-chain-defi-site-poly-network-hacked-hundreds-of-millions-potentially-lost/>.

³For details of the WannaCry ransomware attacks in 2017 and the cyberattack on Colonial Pipeline, see Paul Vigna, “Hackers Just Stole \$66,000 in Bitcoin. Now What?” *Wall Street Journal*, May 16, 2017, <https://www.wsj.com/articles/hackers-just-stole-66-000-in-bitcoin-now-what-1494937394>; and Collin Eaton and Dustin Volz, “Colonial Pipeline CEO Tells Why He Paid Hackers a \$4.4 Million Ransom,” *Wall Street Journal*, May 19, 2021, <https://www.wsj.com/articles/colonial-pipeline-ceo-tells-why-he-paid-hackers-a-4-4-million-ransom-11621435636>.

Figure 3.2.1. Cyberattacks on Crypto Assets and Cyber Run Risk of Stablecoins

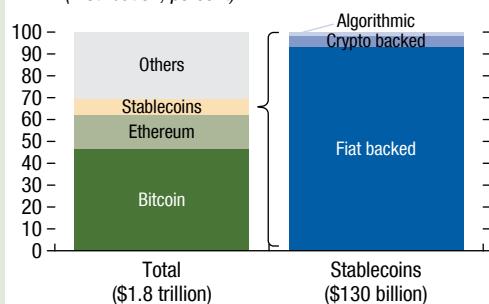
Crypto assets are vulnerable to cyberattacks and are frequently used to make ransomware payments.

1. Value Stolen in Crypto Hacks and Crypto Value Received by Ransomware Attackers



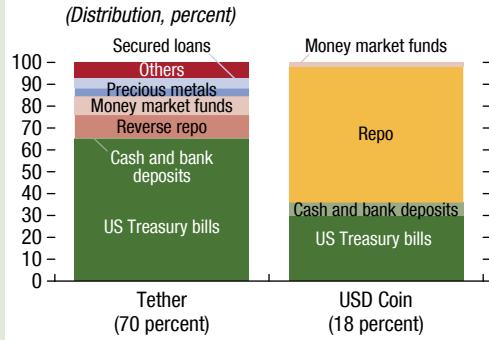
Stablecoins represent about 10 percent of the crypto market, and most of them are fiat-backed ...

2. Crypto Market Capitalization, December 2023 (Distribution, percent)



... which increases their link to the traditional financial system through asset holdings.

3. Reserves of Fiat-Backed Stablecoins, December 2023 (Distribution, percent)



Sources: Chainalysis; CoinGecko; Defillama; disclosure statements of stablecoins; and IMF staff calculations.

Note: In panel 2, the numbers in parentheses under the x axis labels indicate the total market capitalization of crypto assets and stablecoins as of December 31, 2023; In panel 3, the numbers in parentheses represent the share of Tether and USD Coin in all stablecoins as of December 31, 2023.

Box 3.2 (continued)

they are increasingly connected with the traditional financial sector. The current stablecoin market is dominated by fiat-backed stablecoins designed to mirror the values of traditional currencies like US dollars and euros (Figure 3.2.1, panel 2) by holding assets such as US Treasuries, money market funds, and bank deposits, often with high levels of concentration (Figure 3.2.1, panel 3). A major cyber incident affecting such a stablecoin could lead to it depegging from the underlying asset, creating run risk and forced sales of financial assets that could ultimately spill over to the financial system (Adachi and others 2020; Ma, Zeng, and Zhang 2023).⁴ For example, in August 2022, hackers exploited a bug in a newly deployed liquidity pool, resulting in the minting of 3 billion Acala USD and the depegging of Acala USD from the US dollar, with substantial outflows from the crypto-backed stablecoin protocol (see Online Annex 3.8). The run, however, did not result in significant spillovers to the financial system.⁵

⁴The total amount of fiat-backed stablecoin reserves is comparable to the average daily transaction volume of US Treasury bills—about \$120 billion in 2022, according to the Securities Industry and Financial Markets Association, <https://www.sifma.org/resources/research/us-treasury-securities-statistics/>.

⁵For details of this incident, see Gareth Jenkinson, “Another Depeg: Acala Trace Report Reveals 3B aUSD Erroneously Minted,” *Cointelegraph*, August 17, 2022, <https://cointelegraph.com/news/another-depeg-acala-trace-report-reveals-3b-ausd-erroneously-minted>.

Institutional investors have been increasingly investing in crypto assets (Huang, Lin, and Wang 2022), and some large banks may also have nontrivial crypto exposures, both direct and through assets under custody (Bank for International Settlements 2023b).⁶ Because the prices of crypto assets tend to drop significantly after a cyberattack (Milunovich and Lee 2022; Chen, Chang, and Yang 2023),⁷ monitoring of crypto exposures is warranted to preserve financial stability.⁸

⁶On January 10, 2024, the Securities and Exchange Commission approved the listing and trading of a number of spot bitcoin exchange-traded products (<https://www.sec.gov/news/statement/gensler-statement-spot-bitcoin-011023>).

⁷Cyberattacks on crypto assets could affect the price of crypto assets by (1) placing a large amount of stolen cryptocurrency on the market that results in short-term oversupply, (2) disrupting market infrastructures, and (3) adversely affecting investor sentiment through the theft of personal financial information.

⁸In this context, in December 2022, the Basel Committee on Banking Supervision finalized standards for banks on how to monitor and manage exposures to crypto assets. These standards revised the Basel Committee’s prudential regulations, specifying how banks should treat crypto asset exposures. Although the standards are effective immediately, they lack legal force, prompting the Basel Committee to urge national regulators to implement the standards by 2025. For details, see Bank for International Settlements (2022).

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