INTERNATIONAL MONETARY FUND

GLOBAL FINANCIAL STABILITY REPORT

COVID-19, Crypto, and Climate: Navigating Challenging Transitions

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. . . 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;

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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; Nassira Abbas, Deputy Division Chief; Evan Papageorgiou, Deputy Division Chief; Antonio Garcia Pascual, Deputy Division Chief; Mahvash Qureshi, Division Chief; and Jérôme Vandenbussche, Deputy Division Chief. It benefited from comments and suggestions from the senior staff in the MCM Department.

Individual contributors to the report were Jose Abad, Sergei Antoshin, Parma Bains, John Caparusso, Liumin Chen, Yingyuan Chen, Fabio Cortes, Reinout De Bock, Andrea Deghi, Mohamed Diaby, Dimitris Drakopoulos, Julia Faltermeier, Ken (Zhi) Gan, Deepali Gautam, Rohit Goel, Federico Grinberg, Sanjay Hazarika, Frank Hespeler, Henry Hoyle, Phakawa Jeasakul, Oksana Khadarina, Sheheryar Malik, Junghwan Mok, Natalia Novikova, Dmitri Petrov, Thomas Piontek, Leonardo Alvaro Polack, Patrick Schneider, Nobuyasu Sugimoto, Felix Suntheim, Hamid Reza Tabarraei, Tomohiro Tsuruga, Jeffrey David Williams, Hong Xiao, Yizhi Xu, Dmitry Yakovlev, Antti Yang, Akihiko Yokoyama, and Xingmi Zheng. Magally Bernal, Monica Devi, and Andre Vasquez were responsible for word processing.

Gemma Rose Diaz from the Communications Department led the editorial team and managed the report's production with editorial assistance from Christine Ebrahimzadeh, David Einhorn, Lucy Scott Morales, Katy Whipple/Grauel Group, Harold Medina (and team), and TalentMEDIA Services.

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 September 27, 2021. 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 September 28, 2021. 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

As the world continues to navigate the exit from the global pandemic, an accelerating trend of digitalization and the existential threat from climate change pose both opportunities and challenges ahead. These 3Cs—COVID-19, Crypto, and Climate—offer opportunities for sustaining the ongoing recovery; facilitating more efficient, accessible, and inclusive financial service provision; and greening the economy. But they also require a global concerted effort to counter risks and vulnerabilities, which if left unchecked, could put growth at risk in the medium term or test the resilience of the global financial system.

Financial stability risks have been contained so far thanks to ongoing policy support that has fueled the global rebound. Investors, however, have become increasingly concerned about the economic outlook amid rising virus infections and greater uncertainty about the strength of the recovery. After declining notably through the summer, global long-term yields have risen in late September, in some countries entirely reversing their earlier moves, on concerns that price pressures may be more persistent than initially anticipated.

While such pressures are expected to moderate and gradually subside, risks to the inflation outlook appear to be skewed to the upside in many countries. In emerging markets, inflation pressures have led many central banks to hike policy rates. The pace of domestic emerging market tightening, combined with the potential for sudden tightening of global financial conditions, could hit emerging markets hard. Already, we see higher financing costs for domestic debt in emerging markets (except China) since last year.

Financial conditions eased further in advanced economies and remained easy on balance in emerging markets. At the same time, a prolonged period of extremely easy financial conditions may result in overly stretched asset valuations and fuel financial vulnerabilities. A sudden repricing of risk in markets, should investors reassess the economic and policy outlook, could interact with such vulnerabilities, leading to tighter financial conditions and putting growth at risk in the medium term. Credit conditions have improved in the corporate sector, though they remain uneven across sectors and countries. With the gradual removal of fiscal and regulatory support measures, insolvency may rise in some countries. With the exception of a weak tail of banks in some countries, banks have remained resilient so far through the pandemic. However, banks remain cautious about the credit outlook in most countries. In the nonbank financial intermediary sector, the pandemic has unmasked vulnerabilities that need to be urgently addressed.

Monetary and fiscal policy support continues to be essential in much of the world. Central banks should provide clear guidance about the future stance of monetary policy to avoid an unwarranted tightening of financial conditions and minimize the risk of market volatility. Monetary authorities should remain vigilant and—if price pressures turn out to be more persistent than anticipated—act swiftly to counter any possible unmooring of inflation expectations.

Crypto asset markets are growing rapidly. Crypto asset prices remain highly volatile. Furthermore, the volume of crypto asset transactions has reached macro critical levels in some emerging markets, often as high as those of domestic equities. A sound regulatory framework for crypto assets, and decentralized finance markets more generally, must be a priority on the global policy agenda. This is particularly pressing for stablecoins, for which some business models have been subject to the risk of sudden and severe liquidity pressures. A regulatory level playing field is a key priority.

The forthcoming 26th United Nations Climate Change Conference of the Parties (COP26) presents a pivotal opportunity to speed up the transition and much-needed global climate actions to avoid catastrophic climate change. Achieving net-zero carbon emissions by 2050 requires substantial additional global investment by both the public and private sectors. The global financial sector can play a crucial role in catalyzing private finance and accelerating the transition.

Climate finance is growing rapidly, particularly among asset managers. While assets under management in climate-themed investment funds remain relatively small, inflows have surged, and there is a promise of cheaper funding costs for climate-friendly firms as well as greater climate stewardship by funds. Sustainable fund flows also appear more resilient to adverse shocks, suggesting that climate-friendly investors might be relatively stickier. Further improvements in data, disclosure, and sustainable finance classifications remain the key policy objectives in this area to facilitate the assessment of transition-related risks and prevent greenwashing.

Tobias Adrian
Financial Counsellor

EXECUTIVE SUMMARY

Overall Assessment: Where Do We Stand?

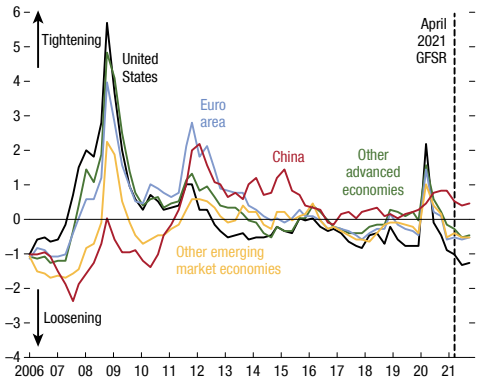
As the world continues to navigate the global pandemic, financial stability risks have been contained so far, reflecting ongoing monetary and fiscal policy support and the rebound of the global economy this year. While financial conditions have eased further in advanced economies, on net, the sense of optimism that had propelled markets in the first half of the year faded somewhat over the summer. Investors have become increasingly concerned about the economic outlook amid rising virus infections and greater uncertainty about the strength of the recovery, particularly in emerging markets. In late September, concerns that inflationary pressures may be more persistent than initially anticipated have pushed nominal yields higher, in some countries entirely reversing their earlier moves. Despite some improvements since the April 2021 *Global Financial Stability Report*, financial vulnerabilities continue to be elevated in a number of sectors, masked in part by massive policy stimulus. Policymakers are confronted with a challenging trade-off: maintaining near-term support for the global economy while preventing unintended consequences and medium-term financial stability risks. A prolonged period of extremely easy financial conditions, while needed to sustain the economic recovery, may result in overly stretched asset valuations and could fuel financial vulnerabilities. Some warning signs—for example, increased financial risk-taking and rising fragilities in the nonbank financial institutions sector—point to a deterioration in the underlying financial stability foundations. If left unchecked, these vulnerabilities may evolve into structural legacy problems, putting medium-term growth at risk and testing the resilience of the global financial system.

Progress since the April 2021 *Global Financial Stability Report*

Financial conditions have eased further, on net, in advanced economies, buoyed by expectations of continued accommodative monetary policy and rising risk asset valuations. By contrast, financial conditions have changed little, on balance, in emerging markets, as monetary policy tightening in response to inflation pressure in some countries has offset gains in risk asset prices (Figure 1).

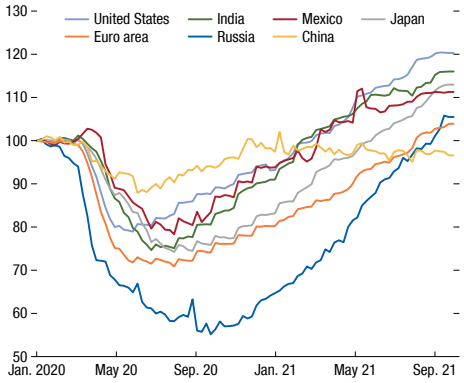
Corporate balance sheets have strengthened overall. A feared substantial pickup in bankruptcies has not

Figure 1. Global Financial Conditions Indices
(Standard deviations from the mean)



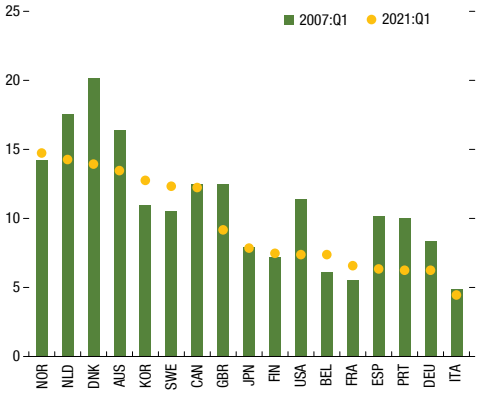
Sources: Bloomberg Finance L.P.; Haver Analytics; national databases; and IMF staff calculations.
Note: GFSR = *Global Financial Stability Report.*

Figure 2. Global 12-Month Forward Earnings per Share Ratio
(Indices; January 2020 = 100)



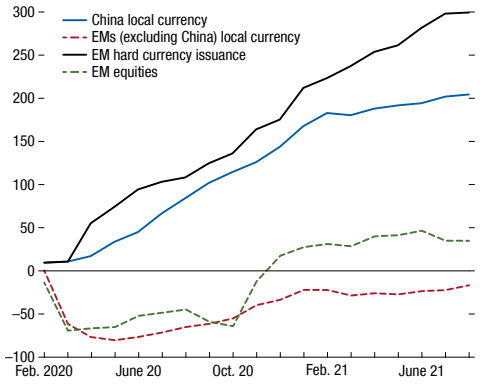
Sources: Thomson Reuters Datastream IBES; and IMF staff calculations.

Figure 3. Global Household Debt Service Ratio
(Percent of income)



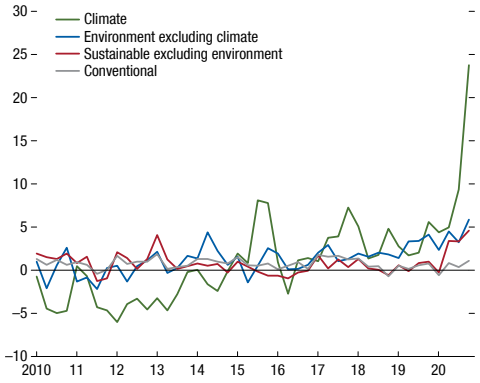
Sources: Bank for International Settlements; Haver Analytics; and IMF staff calculations.
Note: Data labels use International Organization for Standardization (ISO) country codes.

Figure 4. Cumulative Emerging Market Capital Flows
(Billions of US dollars)



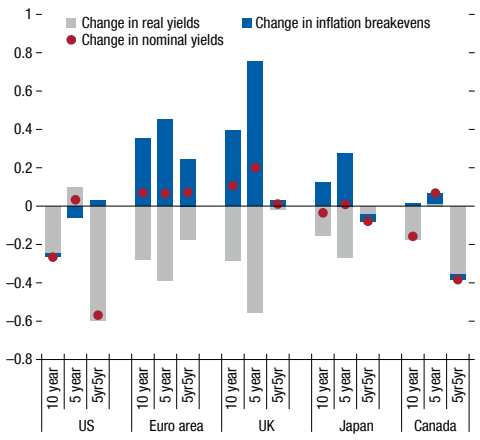
Sources: Bloomberg Finance L.P.; JPMorgan Chase & Co.; national authorities; and IMF staff estimates.
Note: EM = emerging market.

Figure 5. Net Flows into Investment Funds by Fund Label, 2010:Q1–20:Q4
(Percent of assets under management; value-weighted)



Sources: Bloomberg Finance L.P.; Lipper; Morningstar; United Nations Principles for Responsible Investment; and IMF staff calculations.

Figure 6. Decomposition of the Changes in Advanced Economy Nominal Yields since the April 2021 GFSR
(Percentage points)



Sources: Bloomberg Finance L.P.; Federal Reserve; and IMF staff calculations.
Note: GFSR = *Global Financial Stability Report.*

materialized, thanks to targeted fiscal support and unprecedented monetary policy support. Revenues have risen, with profitability surpassing pre-pandemic levels in several economies (Figure 2). Credit quality in speculative-grade bond markets has continued to strengthen, with default rates expected to remain low.

Household financial positions have improved and appear to be stronger than they were during the global financial crisis. Households have benefited from lower interest rates and support for income and interest costs, including debt payment moratoria in some countries. Debt service ratios have fallen in many countries, reducing the risk of defaults on mortgage and other consumer loans (Figure 3).

In emerging and frontier market economies, the outlook for portfolio flows has improved, boosted by the ongoing economic recovery and robust global risk sentiment, even though local currency debt flows have not recovered from the first-quarter weakness. Hard currency issuance has rebounded strongly, with many lower-rated issuers returning to capital markets (Figure 4).

With a solid global capital position, the global banking sector has continued to play a crucial role in supporting the flow of credit to the economy. With the exception of a weak tail in some countries, banks have remained resilient, reflecting years of capital buildup following the global financial crisis reforms and continued unprecedented monetary and fiscal policy support.

The global financial sector—and the investment fund sector in particular—can play a crucial role in catalyzing private investment to accelerate the transition to a low-carbon economy and mitigate climate change (Chapter 3). With investor awareness of catastrophic events rising in the wake of the pandemic, flows into sustainable funds, and into climate funds in particular, have surged since early 2020 (Figure 5). Inflows support climate stewardship and issuance of securities by "green" firms. Sustainable investors may also offer financial stability benefits as they tend to be less sensitive to short-term returns. However, the sustainable fund sector remains small ($3.6 trillion in assets under management at the end of 2020, of which only $130 billion is in climate funds).

However, Risks Remain amid Still-Elevated Financial Vulnerabilities

After declining notably through the summer, global long-term yields have risen in late September, in some countries entirely reversing their earlier moves, on concerns that price pressures may be more persistent than initially anticipated (Figure 6).

While investors still expect recent price pressures to moderate and then gradually subside, concerns about inflation risks have intensified recently in financial markets (Figure 7). In addition to the recent rise in energy and commodity prices, investors have highlighted the possibility that supply chain disruptions and shortages of labor and materials may be more persistent than currently anticipated, feeding into wage dynamics and eventually unmooring inflation expectations.

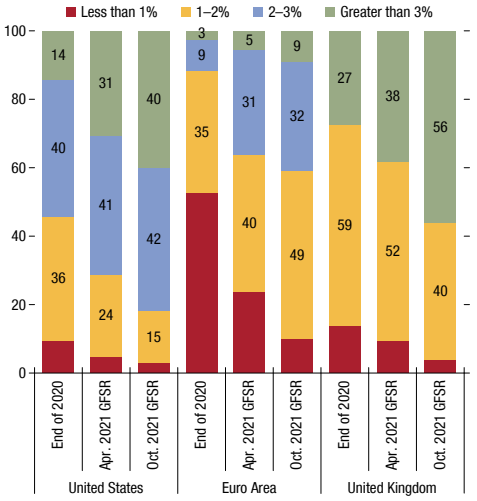
Asset valuations appear to be stretched in some market segments. Despite recent market turbulence, equity prices have risen further, on net, since the April 2021 GFSR, boosted by accommodative monetary policy and strong earnings. However, equity price misalignments (relative to fundamentals-based values) have remained elevated in most markets (Figure 8). Credit spreads have narrowed to below pre-pandemic levels. House prices have risen rapidly in many countries, reflecting, among other factors, the improved outlook, policy support, and shifting household preferences.

Emerging and frontier markets continue to face large financing needs. Local currency government bond yields have increased in many countries on the back of domestic factors (higher inflation and fiscal concerns). The late-September increase in the US Treasury yields may exert additional pressure going forward, leading to higher funding costs for many countries. Inflation pressure has led many central banks to adopt a tighter monetary policy stance. The outlook for capital flows has improved, boosted by the ongoing recovery and robust global risk appetite. Monetary conditions are still broadly accommodative, with deeply negative real rates. But there is a risk that real rates may rise significantly in coming years (Figure 9). A sudden change in the monetary policy stance of advanced economies may result in a sharp tightening of financial conditions, adversely affecting capital flows and exacerbating pressures in countries facing debt sustainability concerns.

Despite improvements during the recovery, financial vulnerabilities remain elevated in several sectors. Among nonfinancial firms, the recovery remains uneven across countries, sectors, and firm sizes. Solvency risks continue to be elevated in sectors hit hardest by the pandemic (for example, transportation and services) and in small firms (Figure 10). In China, credit conditions have tightened, particularly for firms with weak credit ratings and in provinces with weaker public finances.

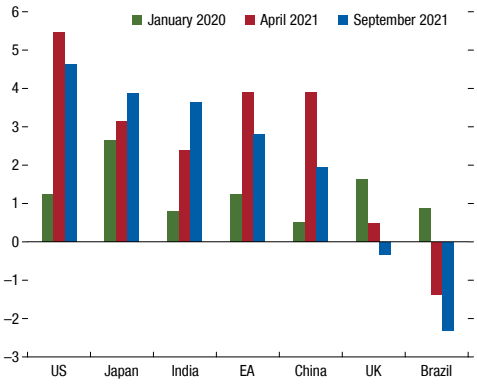
Vulnerabilities in investment funds unmasked by the "dash for cash" in March 2020 remain and risks are rising at some other nonbank financial institutions as they reach for yield to meet nominal return targets. For example, life insurance companies still face elevated asset-liability duration mismatches in many jurisdictions. Seeking to enhance their

Figure 7. Market-Implied Probability of Inflation Outcomes
(Percent, over five years)



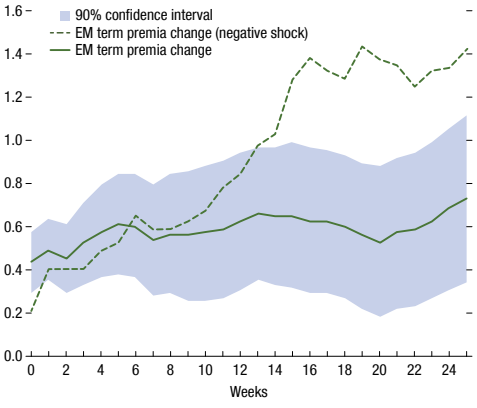
Sources: Bloomberg Finance L.P.; Goel and Malik (forthcoming); Goel, Papageorgiou, and Schneider (2021); Haver Analytics; national authorities; and University of Michigan.
Note: GFSR = *Global Financial Stability Report.*

Figure 8. Global Equity Markets: Price Misalignments
(Relative to fundamentals; standard deviations of monthly returns)



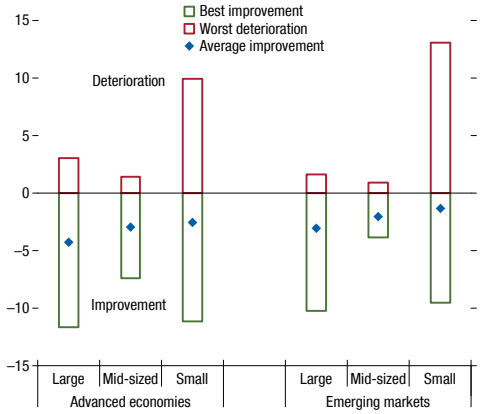
Sources: Bloomberg Finance L.P.; Thomson Reuters Datastream IBES; and IMF staff calculations.
Note: EA = euro area.

Figure 9. Emerging Market Term Premia Response to the US Real Yield Rise
(Percent)



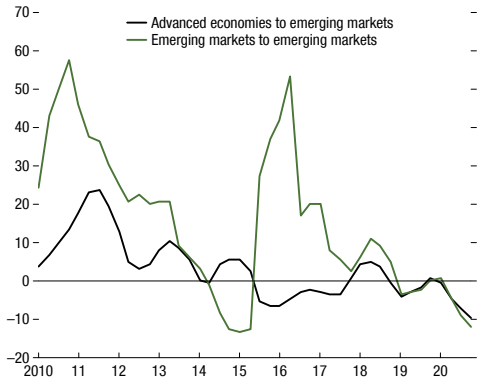
Source: IMF staff calculations.
Note: EM = emerging market. See Chapter 1 for details.

Figure 10. Change in the Share of Firms with High Solvency Risk across Countries
(Between 2020:Q2–Q3 and 2020:Q4)



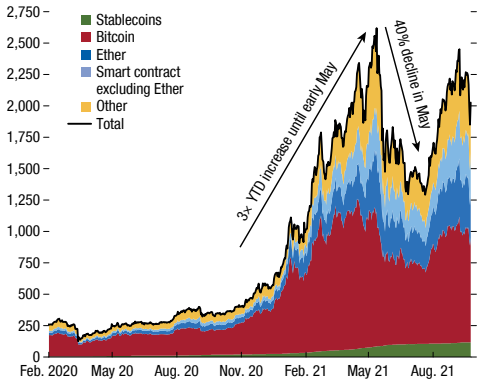
Sources: S&P Capital IQ; and IMF staff calculations.

Figure 11. Changes in International Claims to Emerging Markets
(Percent; year over year)



Sources: Bank for International Settlements; IMF, World Economic Outlook database; national central banks; and IMF staff calculations.

Figure 12. Market Cap of Crypto Assets
(Billions of US dollars)



Sources: CoinGecko; and IMF staff calculations.
Note: YTD = year-to-date.

return on investment, US and European life insurers have increased their share of lower-quality bonds. In the current environment of persistently low interest rates and ample liquidity, greater use of financial leverage to boost returns could prompt volatility in financial markets.

In the banking sector, loan underwriting standards remain restrictive in many countries. According to bank loan officer surveys, this posture is expected to persist, with risks to the credit outlook as the main constraint to loan growth. A slowdown in international bank lending may pose additional downside risks to many emerging market economies (Figure 11).

The crypto ecosystem continues its rapid growth (Figure 12), presenting new opportunities and challenges (Chapter 2). Crypto asset exchanges pose several operational and financial integrity risks through their cross-border operations. Investor protection risks loom large for crypto assets and decentralized finance. For example, stablecoins have generally poor disclosures and can be subject to runs if their reserves come into question. In emerging markets, the advent of crypto assets may be accelerating dollarization and eroding the effectiveness of existing exchange restrictions and capital control management measures. Increased trading of crypto assets by emerging market users can potentially lead to destabilizing capital flows. Emerging market and developing economies faced with these risks should prioritize strengthening macro policies and consider the benefits of issuing central bank digital currencies. And globally, policymakers should work together through the G20 Cross Border Payments Roadmap to make cross-border payments faster, cheaper, more transparent, and inclusive.

Policy Recommendations

While policy support continues to be key to sustaining the ongoing recovery, it should be tailored to country circumstances given the mixed pace of the economic recovery across countries. Central banks should provide clear guidance about their future policy stance to prevent an abrupt tightening of financial conditions. If price pressures turn out to be more persistent than currently expected, monetary authorities should act decisively to prevent an unmooring of inflation expectations. Fiscal policy should continue to support vulnerable firms and individuals. Given policy space, fiscal measures should be targeted and tailored to country characteristics and needs.

In light of the possible need for prolonged policy support to ensure a sustainable and inclusive recovery, policymakers should act decisively to address the potential unintended consequences of unprecedented measures taken during

the pandemic. Policymakers should tighten selected macroprudential tools to tackle pockets of elevated vulnerabilities while avoiding a broad tightening of financial conditions. Due to possible lags between the activation and impact of such tools, they should take early action. If such tools are not available—for example, in the nonbank financial intermediary sector—policymakers should urgently develop them. Given the challenges to designing and operationalizing macroprudential tools within existing frameworks, policymakers should also consider building buffers elsewhere to protect the financial system. In particular, policymakers should urgently address vulnerabilities in investment funds through enhanced prudential supervision and regulation to raise ex ante resilience against liquidity risks. Critically, the global nature of the investment fund business makes it imperative that further reform be achieved on an internationally coordinated basis through the Financial Stability Board.

Emerging and frontier markets remain exposed to the risk of a sudden tightening in external financing conditions. They should, while leveraging the historic general special drawing rights allocation, rebuild buffers as appropriate and implement structural reforms to insulate themselves from the damage from capital flow reversals and abrupt increases in funding costs.

Policymakers in emerging markets must also address the challenges posed by digital dollarization. They should reverse or avert dollarization by strengthening the credibility of monetary policy, safeguarding central bank independence, and maintaining a sound fiscal position. Effective legal and regulatory measures will be necessary to disincentivize foreign currency use. Adequate frameworks for crypto asset service providers must be established, with coordination among national regulators. More generally, countries must reconsider capital flow restrictions in a more digital world, and cross-border collaboration and cooperation are needed to address the technological, legal, regulatory, and supervisory challenges (see Chapter 2).

To foster the growth of the sustainable fund sector and mitigate potential financial stability risks stemming from the transition to a green economy, policymakers should urgently strengthen the global climate information architecture (data, disclosures, sustainable finance classifications). Once this architecture is in place, they could also consider tools to channel savings toward transition-enhancing funds (such as financial incentives for investment in climate funds). Finally, they should conduct scenario analysis and stress testing of the investment fund sector to mitigate potential financial stability risks from the transition.

IMF EXECUTIVE BOARD DISCUSSION OF THE OUTLOOK, OCTOBER 2021

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 September 28, 2021.*

Executive Directors broadly agreed with staff's assessment of the global economic outlook, risks, and policy priorities. They welcomed the continuing recovery, despite the resurgence of the pandemic driven by more contagious new variants of the virus and the ongoing supply shortages that brought the inflation risk to the forefront. Directors acknowledged that economic divergences, especially between advanced economies and low-income countries, brought on by the pandemic seem more persistent, a reflection of differentiated vaccine access and early policy support. In this context, Directors highlighted the importance of global cooperation to ensure universal access to vaccines and a strong financial safety net. To ensure a successful exit from the crisis, these efforts will need to be coupled with sound policy frameworks and ambitious domestic reforms, which would facilitate new growth opportunities, including from digitalization and green technology, while confronting climate change and rising inequality.

Directors concurred that uncertainties around the baseline projections remain large and that the risks to growth outcomes are tilted to the downside. They stressed that the economic outlook continues to depend heavily on the path of the health crisis and the speed at which widespread vaccination can be reached. Directors also acknowledged that the uncertainty surrounding inflation prospects—primarily stemming from the path of the pandemic, the duration of supply disruptions, and how inflation expectations may evolve in this environment—is particularly large. They noted that while inflation expectations appear well-anchored, inflation risks could prompt a faster-than-anticipated monetary normalization in advanced economies. Higher debt levels and large government financing needs in many countries are also a source of vulnerability, especially if global interest rates were to rise faster than expected.

Directors highlighted that policy choices have become more difficult, confronting multidimensional challenges—subdued employment growth, rising inflation, food insecurity, the setback to human capital accumulation, and climate change—with limited room to maneuver. They stressed that multilateral efforts to avoid international trade and supply chain disruptions, speed up global vaccine access, provide liquidity and debt relief to constrained economies, and mitigate and adapt to climate change continue to be essential. Directors further agreed that it is crucial to ensure that financially constrained countries can continue essential spending while meeting other obligations, and highlighted the expected contribution of the recent General Allocation of Special Drawing Rights in providing the much-needed international liquidity. At the national level, Directors agreed that policy priorities should continue to be tailored to local pandemic and economic conditions, aiming to overcome the still-evolving health crisis and promote an inclusive recovery while protecting the credibility of policy frameworks. As the recovery progresses, policymakers will need to shift to measures that aim to reverse scarring from the crisis.

Directors noted that fiscal policy should remain supportive but needs to be well-targeted, carefully calibrated, and tailored to country-specific circumstances. In countries with high levels of vaccination and low funding costs, fiscal policy should gradually shift from pandemic-fighting emergency measures toward promoting a transformation to more resilient and inclusive economies. In countries with lower vaccination rates and tighter financing constraints, health-related spending and protecting the most vulnerable will remain top priorities. As countries converge back to precrisis GDP trends, the focus should shift toward ensuring fiscal sustainability, including through establishing credible medium-term fiscal frameworks, which would also promote fiscal transparency and sound

governance practices. Given likely long-lasting negative impacts on budget revenues in developing economies, further efforts will be needed to mobilize revenues in the medium term and improve expenditure efficiency. While recognizing that the international community provided critical support to alleviate fiscal vulnerabilities in low-income countries, Directors noted that more is needed, including through debt relief in the context of early and timely implementation of multilateral initiatives, such as the G20 Common Framework.

Directors concurred that monetary policy should remain accommodative where there are output gaps, inflation pressures are contained, and inflation expectations are consistent with central bank targets. However, they noted that central banks should be prepared to act quickly if the recovery strengthens faster than expected or if inflation expectations are rising. Directors stressed that transparent and clear communication about the outlook for monetary policy is critical at the current juncture to avoid de-anchoring of inflation expectations and prevent financial instability.

Directors noted that financial vulnerabilities continue to be elevated in several sectors—including nonbank financial institutions, nonfinancial corporates, and the housing market—masked in part by the very substantial policy stimulus. They highlighted that a prolonged period of extremely easy financial conditions, while needed to sustain the economic recovery, may result in overly stretched asset valuations and further fuel financial vulnerabilities. Directors agreed that policymakers should act preemptively to address vulnerabilities and avoid a buildup of legacy problems. They should also tighten selected macroprudential tools to tackle pockets of elevated vulnerabilities while avoiding a broad tightening of financial conditions.

Directors agreed that some emerging and frontier markets continue to face large financing needs. While the outlook for capital flows has improved and monetary conditions remain still broadly accommodative, a sudden change in the monetary policy stance of advanced economies may result in a sharp tightening of financial conditions, adversely affecting capital flows and exacerbating pressures in countries facing debt sustainability concerns. They concurred that the policy response in these countries will need to be centered on implementing structural reforms, rebuilding buffers, and strengthening financial market governance and infrastructure.

CHAPTER 1

GLOBAL FINANCIAL STABILITY OVERVIEW: A DELICATE BALANCING ACT

Chapter 1 at a Glance

- **As the world continues to navigate the global pandemic, financial stability risks have been contained so far, reflecting ongoing monetary and fiscal policy support and the rebound of the global economy this year.** In recent months, however, investors have become increasingly concerned about the economic outlook amid rising virus infections and greater uncertainty about the strength of the recovery. After declining notably through the summer, global long-term yields have risen in late September, in some countries entirely reversing their earlier moves, on concerns that price pressures may be more persistent than initially anticipated. While investors still anticipate such pressures to moderate and gradually subside, risks to the inflation outlook appear to be skewed to the upside in many countries.
- **Financial conditions in advanced economies have eased further, on net, since the April 2021 *Global Financial Stability Report*, buoyed by expectations that monetary policy will remain accommodative.** Notwithstanding some recent turbulence, equity prices have risen and credit spreads have continued to narrow, on balance, leading to stretched valuations in segments of financial markets. House prices have risen rapidly in many countries, boosted by policy support and shifting preferences.
- **Despite some improvement during the recovery, financial vulnerabilities remain elevated in a number of sectors.** A sudden repricing of risk in markets, should investors reassess the economic and policy outlook, could interact with such vulnerabilities, leading to tighter financial conditions and putting growth at risk in the medium term.
- **Financial conditions in emerging and frontier market economies are little changed, but the rapid spread of virus mutations and uneven access to vaccines pose a threat to the economic recovery.** Local currency yields remain elevated amid a significant increase in local currency issuance and inflation pressure in some countries. A sudden change in the monetary policy stance in advanced economies may result in high rates and a sharp tightening of financial conditions, adversely affecting capital flows and adding to debt sustainability concerns, especially for frontier markets.
- **Credit conditions have improved in the corporate sector, albeit unevenly.** Corporate balance sheets have generally strengthened, and profitability has improved. Defaults and bankruptcies have declined, but differences persist across countries, firm sizes, and sectors. Solvency risks remain elevated in sectors hit hardest by the pandemic and for small firms. Tailored support to viable firms remains crucial. In China, credit conditions have tightened, particularly for firms with weak credit ratings and in provinces with weaker public finances, highlighting the urgency of comprehensive restructuring and reform efforts, including to gradually phase out implicit guarantees and to deal with financially weak state-owned entities.

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- **Banks have played a crucial role in supporting the flow of credit to the economy during the pandemic, but bank loan underwriting standards remain restrictive in many countries.** This posture is expected to persist, with loan officer surveys pointing to risks to the credit outlook as the main constraint to loan growth. This raises questions about the ability or willingness of banks to contribute to the recovery once financial and fiscal support measures are withdrawn. A slowdown in international bank credit flows would be particularly deleterious for emerging markets.
- **While monetary and fiscal policy support remains key to sustaining the ongoing economic recovery, it should be more targeted and tailored to country circumstances given the mixed pace of the recovery across countries.** Central banks should provide clear guidance about the future stance of monetary policy to avoid an unwarranted tightening of financial conditions. If price pressures turn out to be more persistent than anticipated, monetary authorities should act decisively to prevent an unmooring of inflation expectations. Fiscal support should shift toward more targeted measures and be tailored to country characteristics.
- **Policymakers should take early action and tighten selected macroprudential tools to target pockets of elevated vulnerabilities.** Given the possible need for prolonged policy support to ensure a sustainable recovery, policymakers should act to address potential unintended consequences of unprecedented measures while avoiding a tightening of financial conditions.
- **Emerging and frontier markets should rebuild buffers and implement structural reforms.** These countries remain exposed to the risk of a sudden tightening in external financial conditions. Rebuilding buffers and implementing long-standing reforms to boost structural growth prospects are key to cushioning the adverse impact of capital flow reversals and an abrupt increase in financing costs.

Navigating a World of Rising Uncertainties

The sense of optimism that had propelled markets in the first half of the year on the back of COVID-19 vaccine rollouts in advanced economies and the rebound in the global economy faded somewhat over the summer. Investors have become increasingly concerned about the global economic outlook amid greater uncertainty about the strength of the recovery. Uneven vaccine access has allowed further mutations of the virus, leading to a resurgence of infections and more divergent economic prospects across countries than anticipated earlier in the year (see the October 2021 *World Economic Outlook* [WEO]). The deterioration in market sentiment since the April 2021 *Global Financial Stability Report* (GFSR) resulted in a significant decline in global long-term nominal yields in the summer, driven by falling real rates. In late September, however, long-term nominal yields have moved higher on concerns that inflationary pressures may be more persistent than initially anticipated, in some countries entirely reversing their earlier moves.

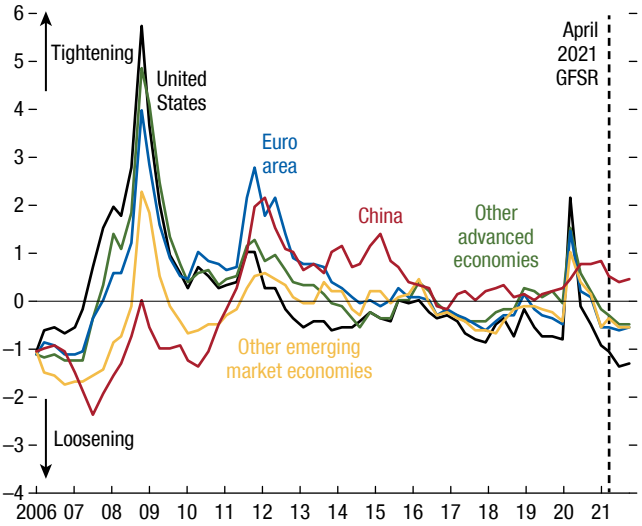
Buoyed by expectations that central banks will maintain an accommodative policy stance for the foreseeable future, financial conditions in advanced economies have eased further, on balance, since the April 2021 GFSR (Figure 1.1, panel 1). Despite recent market declines and increased volatility, equity prices have climbed, on net, supported by robust earnings. Credit spreads have remained tight, as investor concerns about pandemic-related defaults appear to be contained. House prices have risen rapidly in many countries, reflecting, among other factors, the improved economic outlook since the beginning of the pandemic, continued policy support, and shifting household preferences (Figure 1.1, panel 2). By contrast, financial conditions have changed little, on net, in emerging markets, as monetary policy tightening in several countries in response to domestic inflationary pressures has offset gains in risk asset prices.

Global financial stability risks have been contained so far, reflecting ongoing monetary and fiscal policy support and the anticipated economic recovery this year. Looking ahead, global GDP growth is forecast to decline in 2022, and the balance of risks to growth in 2022 is expected to remain skewed to the downside (Figure 1.2, panel 1). The probability of growth falling below zero next year is estimated at about 4 percent,

Figure 1.1. Financial Conditions

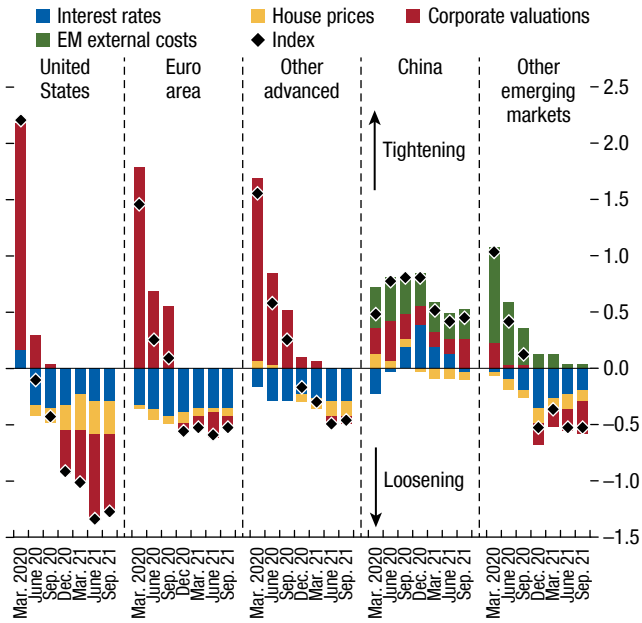
Global financial conditions have eased further, on net, since the April 2021 GFSR ...

1. Global Financial Conditions Indices (Standard deviations from the mean)



... driven by slightly lower interest rates and rising corporate valuations and housing prices, particularly in the United States.

2. Key Drivers of Financial Conditions Indices (Standard deviations from the mean)



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

reflecting slightly elevated downside risks compared with historical norms (Figure 1.2, panel 2).[1]

A year and a half into the COVID-19 pandemic, policymakers are confronted with a challenging trade-off: maintaining near-term support to the global economy while preventing unintended consequences and medium-term financial stability risks. A prolonged period of extremely easy financial conditions, while needed to sustain the economic recovery, may result in overly stretched asset valuations and could fuel financial vulnerabilities. Some warning signs—for example, increased financial risk-taking and rising fragilities in the nonbank financial institutions sector—point to a deterioration in underlying financial stability foundations. If left unchecked and not addressed, these vulnerabilities may evolve into structural legacy problems, putting medium-term growth at risk or testing the resilience of the global financial system.

Despite some improvements, financial vulnerabilities continue to be elevated in a number of sectors, masked in part by massive policy stimulus (Box 1.1). While vulnerabilities have generally decreased in the financial system, the global banking sector and nonbank financial institutions continue to face challenges amid persistently low interest rates. Life insurance companies are still confronting significant asset-liability duration mismatches in many jurisdictions (Box 1.2). In the nonfinancial corporate sector, certain segments are burdened with debt overhang, and progress in strengthening firms' balance sheets remains uneven. Near-term corporate solvency and liquidity risks are still elevated in sectors hit hardest by the pandemic as well as among small firms, both in advanced and emerging market economies.

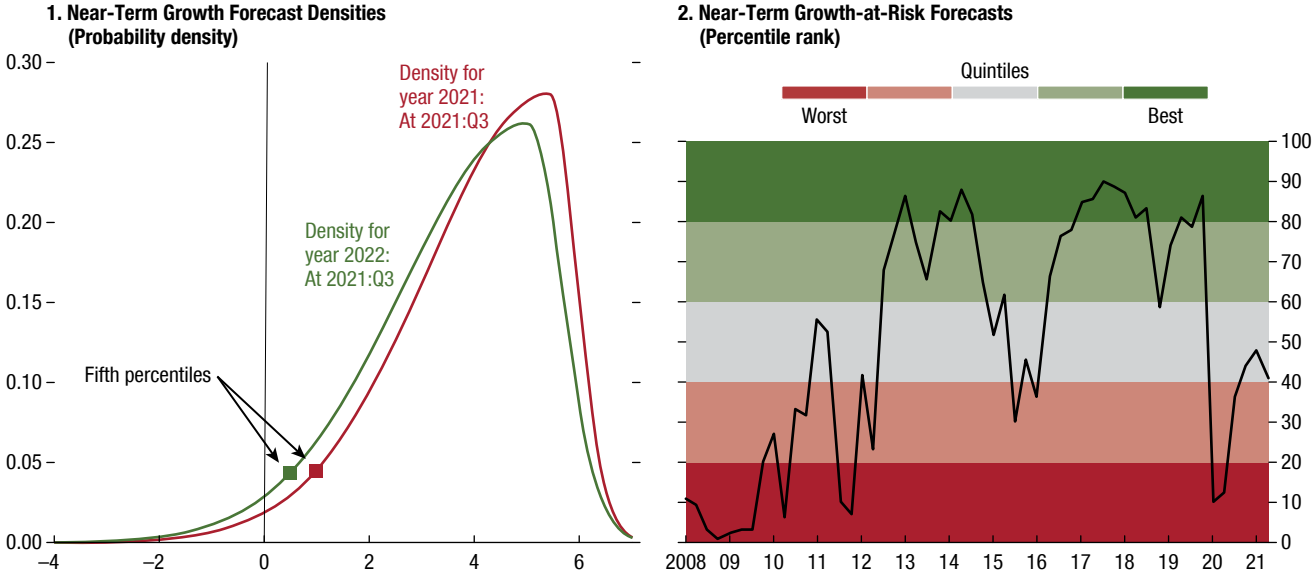
The rebound in economic activity, supported by unprecedented policy measures, has provided an opportunity to invest in technologies expected to boost long-term growth potential—such as infrastructure, digitalization, and environmentally friendly renewable

[1]The growth-at-risk framework employed here quantifies downside risks by gauging how the range of severely adverse growth outcomes (5th percentile of the growth distribution) shifts in response to changes in financial conditions and vulnerabilities (see Chapter 3 of the October 2017 GFSR for details). Assumptions pertaining to macroeconomic shocks and policy responses are captured in the growth-at-risk framework to the extent that they affect the current economic and financial conditions or the WEO baseline growth forecasts. Given the unprecedented nature of the current crisis, model-based growth-at-risk estimates are inevitably subject to larger-than-usual uncertainty bounds.

Figure 1.2. Global Growth-at-Risk Forecasts

The decline in the global growth forecast for 2022 is accompanied by a modest increase in downside risks ...

... which are slightly elevated compared with historical norms.



Sources: Bank for International Settlements; Bloomberg Finance L.P.; Haver Analytics; IMF, International Financial Statistics database; and IMF staff calculations.
Note: Forecast density estimates are centered around the October 2021 *World Economic Outlook* forecasts for 2021 and 2022, respectively. In panel 2, the black line traces the evolution of the 5th 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 from 1991 onward. See the April 2018 *Global Financial Stability Report* for details.

energy—and to foster a more inclusive, greener global economy.[2] The difficulties in controlling the spread of the virus, however, appear to have dampened the initial enthusiasm among investors, as suggested by the sharp decline in forward real interest rates, signaling concerns about medium- to longer-term growth. While low long-term real interest rates support risk asset prices (for a given path of economic growth), a significant downgrade of economic prospects by investors could trigger a sharp decline in risk asset prices, tightening financial conditions. Such a scenario would be particularly difficult for a number of emerging markets, given their more limited monetary and fiscal policy space to cushion a slowdown.

Another risk to macro and financial stability comes from a reassessment of the inflation outlook. While price pressures continue to be viewed as largely driven by pandemic-related circumstances (such as supply disruptions, the surge in commodity prices, and shortages of key components and labor), concerns about inflation risks have intensified recently in financial markets.[3]

[2]See Chapter 3 of the October 2021 WEO.
[3]See the October 2021 WEO, Chapter 1 and Chapter 2.

An abrupt, sustained increase in interest rates from low levels, particularly in the United States, could trigger a tightening of global financial conditions, interacting with existing financial vulnerabilities and resulting in a decompression of market volatility and a sharp fall in asset valuations. A pullback from risk-taking could spill over to emerging markets and adversely affect their ability to access global financial markets at a time when they face daunting financing needs to support the economy and when local currency yields have been on an upward trend.

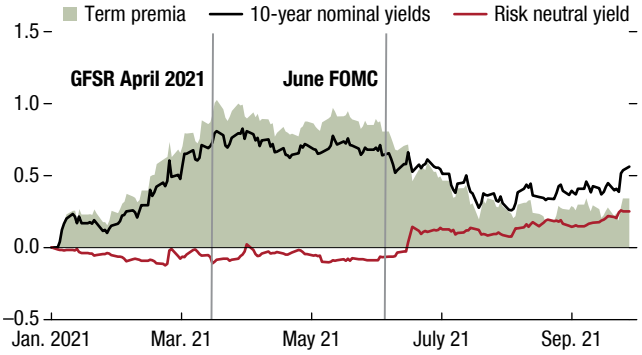
Global Rates in Reverse: Understanding the Recent Moves in Nominal Yields

Global long-term nominal yields have been volatile, albeit little changed on net, since the April 2021 GFSR. After rising more than 80 basis points through the end of March, US 10-year nominal yields have dropped as much as 55 basis points in the summer on concerns about the strength of the recovery (Adrian and others 2021; Goel and Malik 2021). In late September, however, investor anxiety about inflationary pressures has pushed yields higher, with US 10-year yields only 27

Figure 1.3. US Bonds Pivoting to a Low-for-Long Scenario

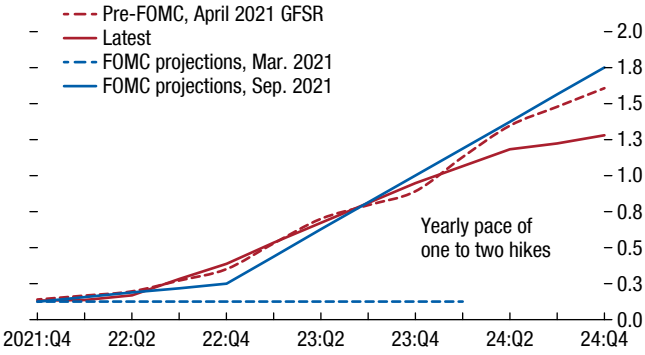
US nominal yields have declined sharply, despite a pickup in rate hike expectations.

1. Cumulative Change in US Nominal Yields (Percent)



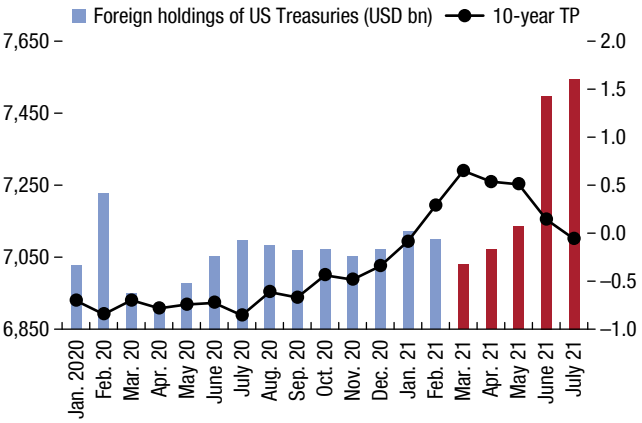
Markets expect a shallow policy rate path over the next few years.

2. Expected Policy Rate Path in the United States (Percent)



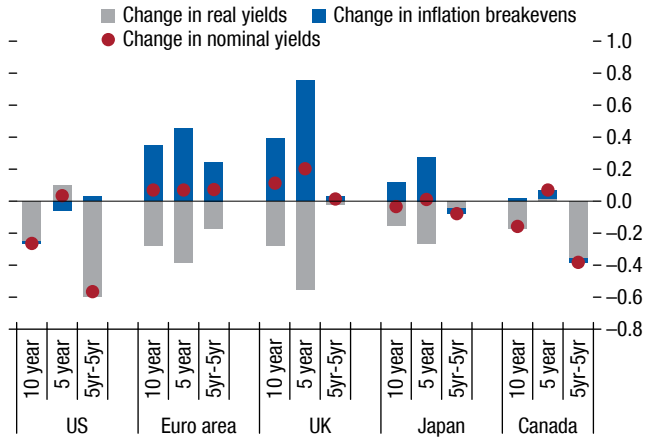
The decline in term premia has coincided with a sharp rise in foreign demand for US Treasuries.

3. Foreign Holdings of US Treasuries and US Term Premia (US dollars, left scale; percent, right scale)



Real yields have declined significantly across most advanced economies.

4. Decomposition of the Change in Advanced Economy Nominal Yields since the April 2021 GFSR (Percentage points)



Sources: Bloomberg Finance L.P.; Federal Reserve; and IMF staff.
Note: bn = billion; FOMC = Federal Open Market Committee; GFSR = *Global Financial Stability Report*; TP = term premium; USD = US dollar.

basis points lower since the April 2021 GFSR. While term premia have fallen, on net, the expected path of monetary policy has moved up following the June Federal Open Market Committee (FOMC) meeting (Figure 1.3, panel 1).[4] The Federal Reserve's median projection of the policy rate has increased notably since March, with the end-2023 projection of the federal funds rate at 1 percent. The market-implied policy rate path, however, is somewhat shallower (Figure 1.3, panel 2).

The net downward trend in term premia seen since the April 2021 GFSR may be attributed, in part, to safe-haven flows into US Treasury securities. As investors' concerns about the spread of the Delta variant have intensified, demand for safe, highly liquid US Treasury securities has increased, as can be seen in higher foreign holdings of these securities (Figure 1.3, panel 3) and greater flows into US nominal bond funds. These developments, in conjunction with a

[4]Bond yields can be decomposed into the average expected short-term rates (or risk-neutral yields), and term premia—where the latter refers to the compensation required by investors for bearing risk of economic and policy uncertainty over the life of the bond. Term premia are, however, also affected by the relative supply of and demand for bonds. Decreased bond supply tends to deflate term premia; see Krishnamurthy and Vissing-Jorgensen (2012), Greenwood and Vayanos (2014), and Vayanos and Vila (2021).

possible reassessment of likely timing of the beginning of normalization in the United States after a recent weaker-than-expected data release, have likely put downward pressure on term premia. Through the end of September, debt ceiling negotiations in the United States have not left any material imprint on financial markets, notwithstanding some distortions in the US short-term Treasury market.

Real yields have declined significantly across most major advanced economies since the April 2021 GFSR (Figure 1.3, panel 4, gray bars).[5] In the United States, the decline has occurred at the back end of the curve, with five-year–five-year forward real yields down 60 basis points, reflecting concerns about long-term-growth prospects.[6] The decline in longer-term real yields is in line with the secular downward trend of real yields, associated with falling trend productivity growth. In other advanced economies, by contrast, the decline in real yields has been more evident at the five-year maturity. Inflation breakevens (a market-implied proxy of future inflation) have risen in some countries (for example, the euro area, Japan, and the United Kingdom) but remain at or below targets (Figure 1.3, panel 4, blue bars). Rising commodity, notably energy, prices have likely exerted some upward pressure on inflation (see Chapter 2 of the October 2021 WEO).

What Are Markets Telling Us about Risks to the Inflation Outlook?

After rising sharply from last year's lows, reflecting the ongoing economic recovery, five-year inflation breakevens in the United States and euro area have moved within a relatively tight range since the April 2021 GFSR (Figure 1.4, panel 1, solid lines, and panel 2; based on Goel and Malik 2021). A similar trend is evident for five-year linked securities, five-year forward inflation breakevens.

The increase in five-year forward inflation breakevens since the beginning of the pandemic has been considerably more contained, pointing to well-anchored long-term inflation expectations. Responses to surveys of inflation expectations at different horizons also suggest only limited pass-through to medium-term inflation expectations, in both the United States and Europe, even though expectations of near-term inflation have moved higher.

Price pressures are expected to moderate and then gradually subside, as evidenced by the downward sloping one-year forward inflation breakeven curve (Figure 1.4, panel 3). However, concerns about upside risks to the inflation outlook have intensified of late, especially in the United States. Investors have highlighted the possibility that supply chain disruptions and shortages of materials and labor may be more persistent than currently expected, possibly leading to an unmooring of inflation expectations (Adrian and others 2021). Market participants have also emphasized the risk that the recent surge in house prices (as is the case in many countries) may put upward pressure on inflation via rising housing rents.[7] If inflation turns out to be more persistent than currently anticipated by investors and policymakers, inflation expectations could become unmoored. The reaction of monetary authorities would be closely scrutinized, especially for central banks that have recently introduced new frameworks, such as the Federal Reserve and the European Central Bank.

Likely reflecting these concerns, flows into inflation-protected securities have been relatively robust this year, notwithstanding a recent slowdown (Figure 1.4, panel 4).[8] Pricing in options markets also suggests that investors are focused on inflation risks. The probability of inflation in the United States being greater than 2 percent (the central bank's target) over the next five years is more than 80 percent, increasing modestly since the April GFSR (Figure 1.4, panel 5). By contrast, investors appear to see inflation risks as more skewed to the downside in the euro area.

Price pressures are also evident in emerging markets. Inflation has risen about 1.5 percentage points above the median emerging market central bank

[5]Nominal yields can also be decomposed into real interest rates and inflation breakevens.

[6]Five-year, five-year forward corresponds to a five-year period that begins five years from current date.

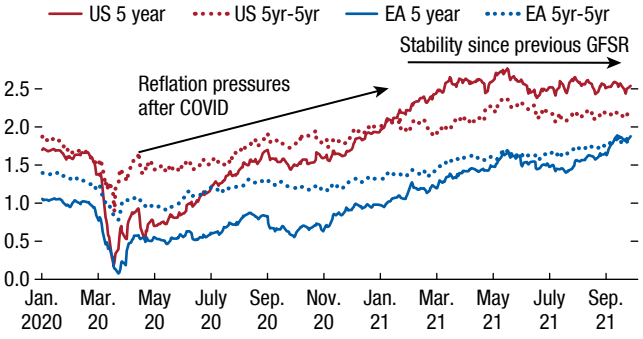
[7]As part of its strategy review, the Governing Council of the European Central Bank has decided to recommend a road map to include owner-occupied housing costs in its headline inflation measure—the Harmonized Index of Consumer Prices—to make it more representative. However, given the complexity of such a change, the road map foresees four stages that could be extended beyond 2026 before moving to a Harmonized Index of Consumer Prices including owner-occupied housing costs as the main index for monetary policy purposes (https://www.ecb.europa.eu/home/search/review/html/inflation-measurement.en.html).

[8]See Chapters 1 and 2 of the October 2021 WEO.

Figure 1.4. What Markets Are Telling Us about Inflation

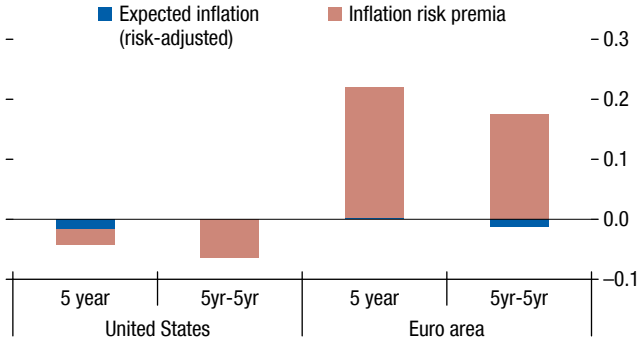
Five-year inflation breakevens for the US have moved within a relatively tight range since the April 2021 GFSR but increased significantly for the euro area.

1. Market Pricing of Inflation Expectations (Percent)



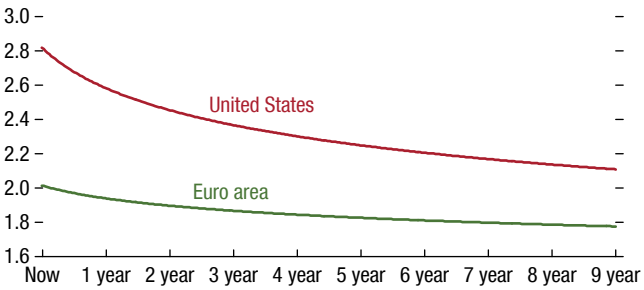
Estimates of expected inflation derived from breakevens have held fairly steady; however, risk premia have risen for the euro area.

2. Cumulative Change in Inflation Breakevens (Percent, since most recent GFSR)



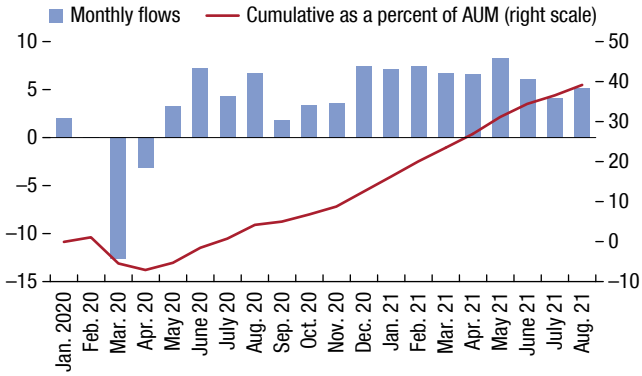
The forward inflation breakeven curve is inverted for both the US and euro area.

3. One-Year Forward Inflation Breakeven Curve (Percent)



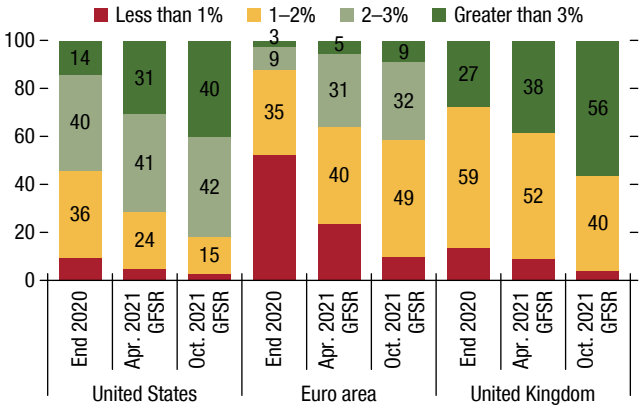
Concerns around US inflation are also reflected in robust flows into US inflation-protected securities.

4. Funds Flows into US Inflation-Protected Securities (US billions; cumulative, percent)



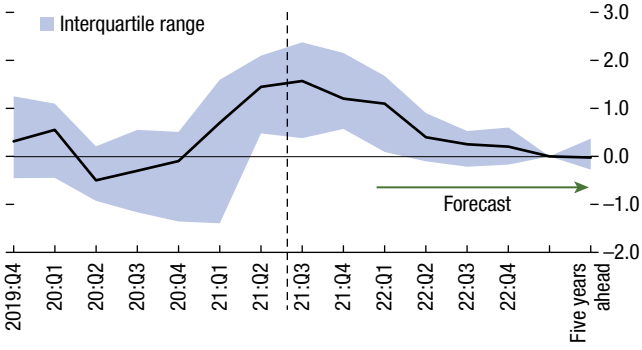
Inflation options indicate that risks remain skewed to the upside for the United States and United Kingdom.

5. Market-Implied Probability of Inflation Outcomes (Percent, over five years)



Emerging market inflation has risen above target, but forward-looking expectations remain well anchored.

6. Emerging Market Survey Expectations versus Inflation Target Midpoint (Difference, based on quarterly year-over-year, interquartile range)



Sources: Bloomberg Finance L.P.; Goel and Malik (forthcoming); Goel and others (2021); Haver Analytics; national authorities; and University of Michigan.
Note: In Panel 1, the market pricing of inflation is derived using Treasury inflation protected securities for the US; and using inflation swaps for Euro Area. In Panel 5, the probabilities are derived using inflation caps and floors. In panel 6, the forecast is based on the survey consensus forecasts. AUM = assets under management; EA = euro area; GFSR = *Global Financial Stability Report*.

target (Figure 1.4, panel 6).[9] However, forward survey estimates show that inflation is anticipated to start trending down soon and come within range over the next 6–12 months (for more details, see the "Emerging Market Local Assets Remain under Pressure" section). Survey responses, in fact, show that five-year-ahead expectations are well anchored for most emerging markets.

Emerging Market Local Assets Remain under Pressure

Local currency government bond yields for most emerging market economies have risen year to date and remain elevated despite the recent declines in US Treasury yields, reflecting the role played by domestic factors in local currency markets (Figure 1.5, panel 1).[10] In the first quarter of this year the rise in bond yields for many emerging market economies was mostly because of higher term premia, but changes in long-term emerging market bond yields since the April 2021 GFSR have been driven primarily by an upward shift in policy expectations, reflecting tighter monetary policy in some countries (Figure 1.5, panel 2). An additional factor likely contributing to the upward pressure on yields and term premia is the significant increase in local currency issuance and broader fiscal risks for some countries amid weak nonresident flows (Figure 1.5, panel 3).[11] While overall stress in local currency bond markets has declined, conditions in some countries (mostly in Latin America) remain tense (Figure 1.5, panel 4).

By contrast, hard currency emerging market bond spreads have been relatively stable this year, after having recovered from their sell-off at the height of the COVID-19 pandemic. Spreads for frontier economies have changed little, on net (Figure 1.5, panel 1). Emerging market hard currency bond issuance has remained robust and is running at a record pace this year (surpassing the record in 2020). While sovereign issuance is broadly in line with its pace in 2020, corporate issuance has been very strong, outperforming 2020 by almost 20 percent. A key exception is China, where corporate issuance has been weak, reflecting tighter credit conditions in certain segments (see the "Financial Vulnerabilities Remain Elevated in China" section). Robust global risk appetite has allowed many lower-rated frontier economies to access offshore markets since the April 2021 GFSR, including Cameroon, Pakistan, and Senegal, among others.

Managing a Gradual Withdrawal of Monetary Accommodation

Central bank balance sheets in advanced economies have grown considerably during the COVID-19 pandemic in an effort to ease financial conditions and maintain the flow of credit to households and firms. Monetary authorities have increased the assets held on their balance sheets to close to 60 percent of GDP, almost double the level prevailing before the pandemic (Figure 1.6, panel 1). Domestic monetary authorities and the foreign official sector now account for close to 40 percent of securities outstanding, even after accounting for the increase in the supply of government bonds to finance the fiscal response to the pandemic.

With the economy rebounding from the pandemic, investors anticipate that the Federal Reserve will commence the policy normalization process in the coming months, with other central banks in advanced economies having already started and more likely to follow suit this year or the next. During this process, a key financial stability challenge faced by the monetary authorities will be to avoid an unwarranted tightening of financial conditions that may hurt the recovery. At this point, there is significant uncertainty about the effect on asset prices, in particular bond term premia, given the larger role central banks play in sovereign bond markets, the anticipated increase in supply, and diverging monetary policy cycles across countries.

Historical precedents may not be a helpful guide, given the paucity of examples, the large size of central bank balance sheets, and the compressed level of term premia. On one hand, for example, a sudden reassessment of the outlook for monetary policy could trigger a spike in volatility and a sharp upward move in term premia, as witnessed during the 2013 "taper tantrum" episode (Figure 1.6, panel 2). On the other hand, the Federal Reserve's 2014 previous tapering episode was

[9]Up to 2 percentage points for the upper end of the interquartile range. Inflation pressure is also quite broad-based, as inflation is above target for almost 60 percent of emerging markets.

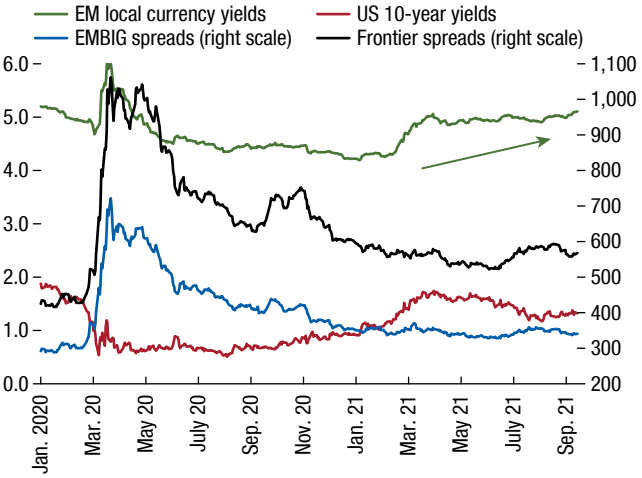
[10]Analysis in Chapter 1 of the 2020 GFSR and Goel and Papageorgiou (forthcoming) indicate that local currency funding costs are more sensitive to domestic fundamentals and growth than hard currency spreads (which are found to be more sensitive to external risk sentiment).

[11]Fiscal risks include the size of the fiscal deficit and uncertainties about fiscal policies.

Figure 1.5. Local Currency Bond Market Developments

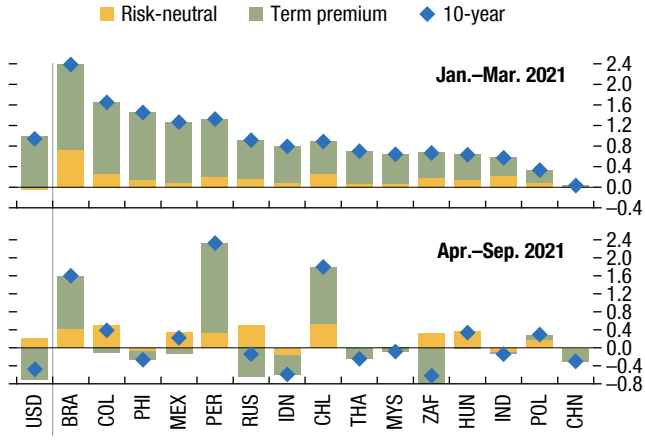
Local currency bond yields remain elevated despite the decline in US rates ...

1. Government Bond Spreads and Yields
(Percent, left scale; basis points, right scale)



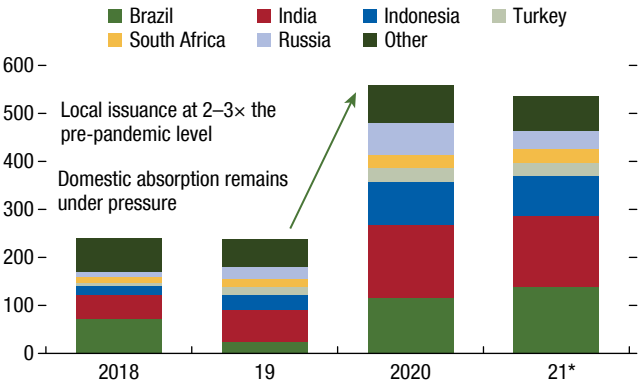
... mostly driven by policy rate expectations more recently, with some exceptions.

2. Change in 10-Year Emerging Market Bond Yield in 2021
(Percent)



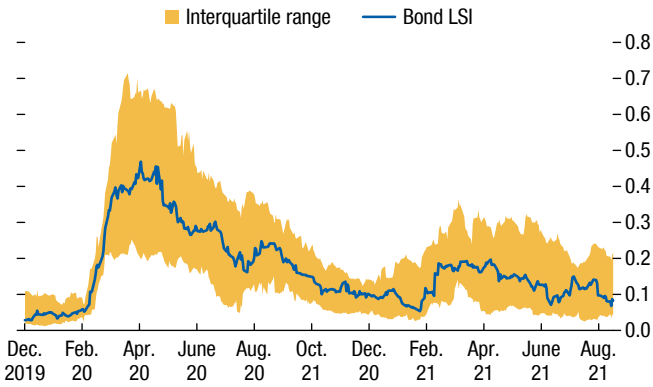
Local currency issuance has increased significantly, reflecting high fiscal needs.

3. Emerging Market Local Currency Bond Issuance
(Billions of US dollars)



Liquidity and stress conditions in bond markets have improved overall, but with some outliers.

4. Emerging Market Local Stress Index
(Index and interquartile range)



Sources: Bloomberg Finance L.P.; JPMorgan Chase & Co.; national authorities; and IMF staff estimates.
Note: In panel 4, the stress index captures the market stress for local currency bonds (the methodology is detailed in the October 2020 *Global Financial Stability Report*). In panel 3, 2021* is an issuance estimate for the whole year (based on market analysts' forecasts). Data labels use International Organization for Standardization (ISO) country codes. EM = emerging market; EMBIG = Emerging Market Bond Index Global; LSI = local stress index.

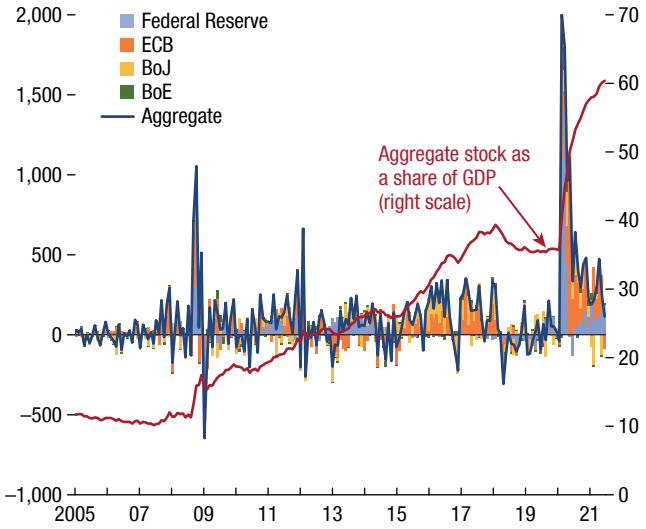
associated with a decline in term premia, although the macroeconomic backdrop was different.

The unprecedented easing in global financial conditions during the pandemic has resulted in a collapse in volatility across asset classes, encouraging investors to take on more risk (Figure 1.7, panel 1). In global equity markets, notwithstanding recent market turbulence, equity prices have risen further on net since the April 2021 GFSR, boosted by extremely low and declining real rates and strong earnings. However, equity price misalignments (relative to fundamentals-based values) have remained elevated in most markets (Figure 1.7, panel 2). Meanwhile, reflecting the varying impact of the recovery on different sectors of the economy, sectoral equity valuations have diverged since late March (Figure 1.7, panel 3). In the corporate bond market, credit spreads—a market-based measure of default risk—have remained tight, reflecting

Figure 1.6. Central Bank Balance Sheets, Monetary Policy Cycles, and Tapering Expectations

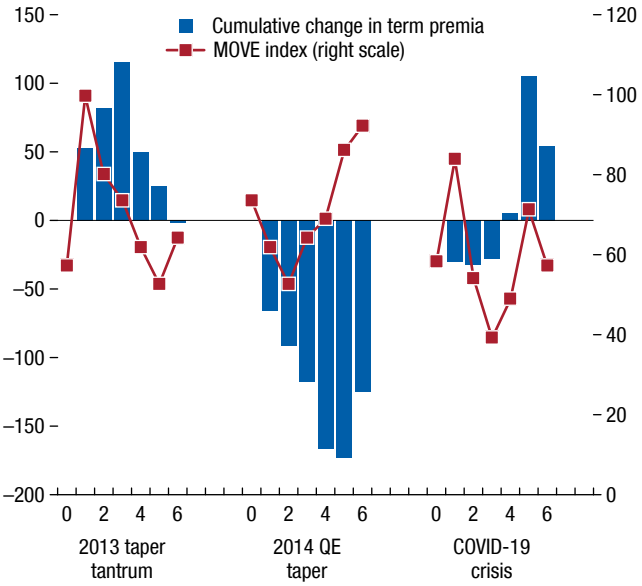
Central bank balance sheets have expanded to unprecedented levels in response to the COVID-19 pandemic.

1. Change in Central Bank Balance Sheet Assets (Month-over-month change, billions of US dollars, left scale; percent of GDP, right scale)



Term premia and volatility have reacted differently during past episodes.

2. US Term Premium and Interest Rate Volatility during Previous US Quantitative Easing Taper Episodes (Quarters since start of episode, basis points, left scale; percent, right scale)



Sources: Bloomberg Finance L.P.; Haver Analytics; and IMF staff calculations.
Note: In panel 2, the MOVE index is a yield-curve-weighted index of implied volatility on one-month Treasury options. BoE = Bank of England; BoJ = Bank of Japan; ECB = European Central Bank; QE = quantitative easing.

investors' benign view of the credit outlook amid ample liquidity and continued policy support.

Investors appear to have become somewhat more cautious, especially in recent weeks, demanding more protection against large declines in risk markets amid increased uncertainty about the economic outlook (Figure 1.7, panel 4). Elevated equity valuations and increased sensitivity of equity prices to government bond prices suggest that equity markets may reprice substantially in the event of a sudden reassessment of the economic outlook or unexpected policy changes, as evidenced in September.

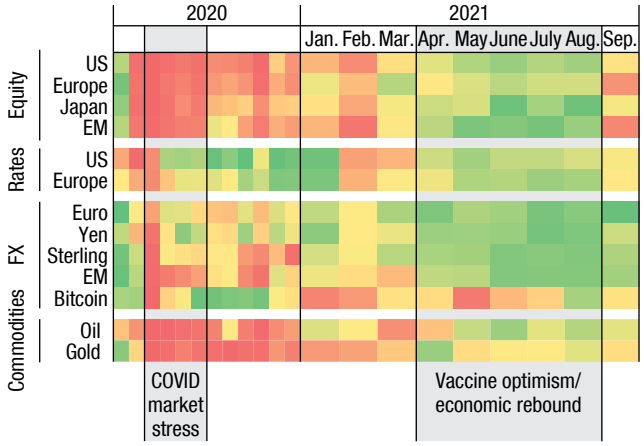
A Tough Act for Monetary Policy in Emerging Markets

Price pressures are also evident in some emerging markets, reflecting a combination of factors, including higher commodity and food prices as well as weaker nominal exchange rates. As in advanced economies, the increase in inflation in emerging markets is expected to be temporary, according to inflation surveys (Figure 1.8, panel 1, red line). Nevertheless, concerns about perceived as being behind the curve in addressing price pressures, the implications of possible domestic currency depreciation, and weak local currency portfolio flows have led some emerging market central banks to adopt a tighter monetary policy stance. Since the April 2021 GFSR, the central banks of Angola, Brazil, Chile, Colombia, Hungary, Mexico, Peru, and Russia, among others, have hiked policy rates, while others have left the door open for similar actions in coming months. Investors now appear to be pricing in a rapid and fairly sharp tightening cycle for many emerging markets, with the median two-year forward policy rate currently at 4.7 percent compared with 3.3 percent at the time of the April 2021 GFSR (Figure 1.8, panel 1, green line). The significantly steeper expected policy path for emerging markets compared with the United States reflects their sensitivity to monetary policy normalization in advanced economies, concerns over potential unanchoring of

Figure 1.7. Cross-Asset Volatility and Valuations of Risky Assets

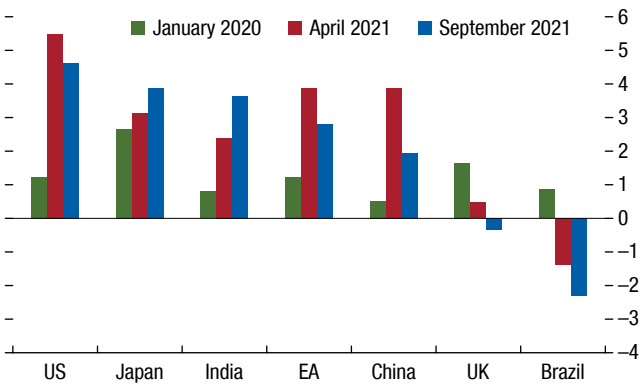
Cross-asset volatility declined before the recent market reversal.

1. Cross-Asset Implied Volatility
(Percentile rank since 2003)



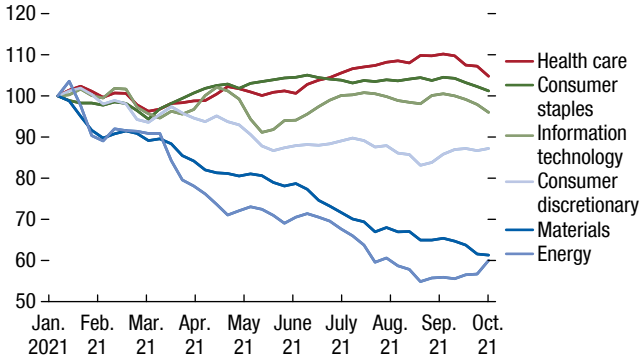
Price misalignments have remained broadly elevated in equity markets.

2. Global Equity Markets: Price Misalignments
(Relative to fundamentals; standard deviations of monthly returns)



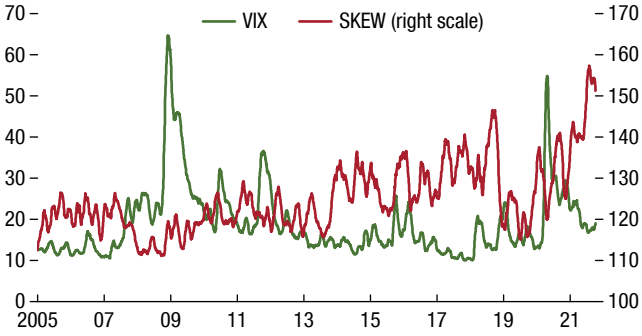
Sectoral valuation metrics have diverged on falling interest rates since March.

3. Global Equity Markets: Forward Price-to-Earnings Ratios by Sector
(Indices; January 2021 = 100)



Investors have demanded more downside risk protection as risky assets remain at high levels.

4. US Stock Market Implied Volatility Measures
(Percentage points)



Sources: Bloomberg Finance L.P.; Thomson Reuters Datastream IBES; and IMF staff calculations.
Note: In panel 1, Bitcoin is based on the percentile rank of 30-day realized volatility since 2011. In panel 2, fundamentals include the mean of analysts' forecasts of future earnings, the dispersion in analysts' forecasts of future earnings, and measures of interest rates. See Online Annex 1.1 of the October 2019 *Global Financial Stability Report* for details. Unit of risk is the standard deviation of monthly returns; values above 2 point to substantial overvaluation. In panel 4, SKEW measures the implied volatility of out-of-the-money options on the S&P 500, estimating the perceived "tail risk." Tail risk is associated with market price declines of more than two standard deviations below the mean. A SKEW value of 100 indicates a low probability of a large market decline. A higher level of SKEW implies higher tail risk.
EA = euro area; EM = emerging market; FX = foreign exchange; VIX = Chicago Board Options Exchange Volatility Index.

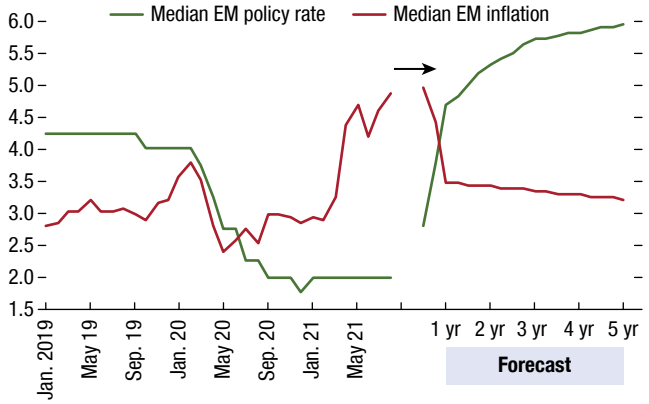
inflation expectations, the strength of the US dollar, and fears of portfolio outflows from local currency bond markets if rate differentials narrow. Asset purchases by some central banks at the height of the pandemic to lessen stress in local currency bond markets pose an additional complication in managing normalization. Most asset purchase programs have now ended or are winding down, but central banks still hold a significant amount of assets on their balance sheets.

Looking ahead, the stance of monetary policy should continue to be informed by specific country circumstances—including the evolution of the pandemic and available policy space, the inflation and economic outlook, the risk of cross-border spillovers, and financial stability considerations. A preemptive tightening of monetary policy may help prevent a possible unanchoring of inflation expectations (as argued in Chapter 2 of the October 2021 WEO) and

Figure 1.8. Developments in Emerging Markets and Low-Income Countries

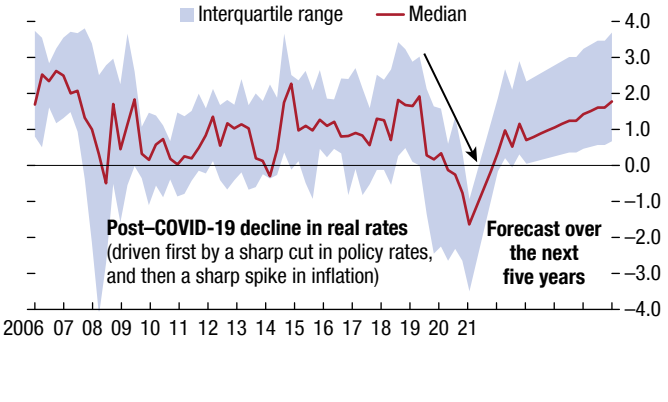
Many emerging market central banks have hiked policy rates.

1. Emerging Market Inflation and Policy Rates: Actual and Market Forecast
(Percent)



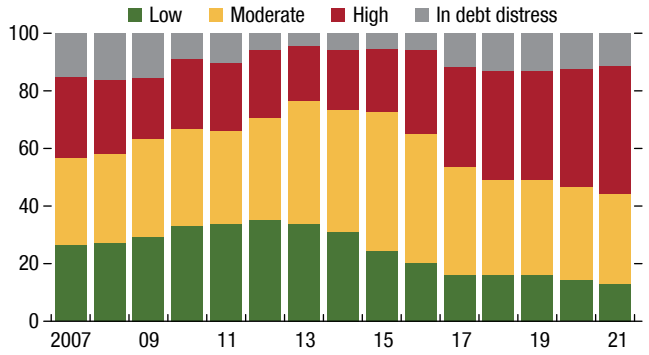
Market pricing of policy rates implies that real rates could rise significantly over the next few years.

2. Real Rates in Emerging Markets
(Percent; actual and market implied)



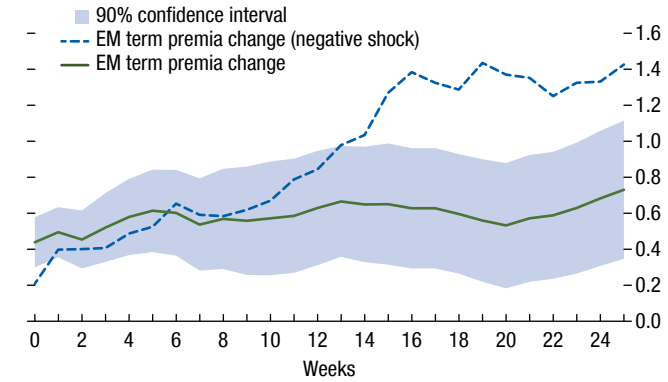
Almost 60 percent of low-income countries are already in or near high debt distress.

3. Share of Low-Income Countries, by Debt Risk
(Percent)



A hawkish surprise in the United States can push emerging market term premia.

4. Emerging Market Term Premia Response to a US Real Yield Rise
(Percentage points)



Source: IMF staff calculations.
Note: In panels 1 and 2, the forecast is based on the survey consensus forecasts. In panel 4, the emerging markets term premia spillover analysis is based on a sample of 16 economies (see also the April 2021 *Global Financial Stability Report*). EM = emerging market.

safeguard the credibility of the central bank. So far, despite the recent hikes, monetary conditions remain broadly stimulative, with real rates deeply negative and supportive of growth. There is a risk, though, that real rates may rise significantly in coming years. The combination of a very rapid policy tightening cycle (in line with market pricing) and declining inflation expectations (based on surveys) suggests that term real rates may return to their prerecession levels fairly quickly in some countries, and even rise to historic highs in some cases over the next few years (Figure 1.8, panel 2).

Given the considerable slack in some economies, with output gaps persisting through 2024 according to IMF staff estimates (see the October 2021 WEO), a rapid tightening of domestic financial conditions could adversely affect the nascent recovery (see the July 2021 WEO *Update*). In the absence of a strong recovery, higher bond yields could lead to notably higher debt servicing costs and raise debt sustainability concerns. This consideration is especially relevant for low-income countries, many of which are already in or near debt distress (Figure 1.8, panel 3).

The tightening in domestic monetary conditions could be amplified should the normalization process in advanced economies be accompanied by a sudden sharp rise in global rates, especially in the United States. IMF staff analysis shows that emerging market term premia could rise by almost 140 basis points over 16 weeks in the event of a 100 basis point rise in US 10-year real yields following a hawkish surprise—proxied by a dummy variable in which the S&P 500 equity index falls while real rates rise (Figure 1.8, panel 4).[12] In recent months emerging market bond yields have increased relative to the yield on equivalent maturity US Treasuries, primarily on the back of domestic developments (higher inflation and fiscal concerns). Now, the increase in US Treasury yields in late September has the potential to add to this pressure.

Lower Risks to Emerging Market Capital Flows Expected in the Near Term

Overall, the outlook for portfolio flows has improved, boosted by the ongoing economic recovery and robust global risk sentiment (Figure 1.9, panel 1; see Chapter 1 of the April 2020 GFSR for the methodology).[13] But the tale of two emerging market capital flow trends continues (Figure 1.9, panel 2; Goel 2021). Hard currency issuance has rebounded strongly, with many lower-rated issuers (including Cameroon, Mongolia, and Pakistan) returning to capital markets since the April 2021 GFSR (Figure 1.9, panel 3). Local currency debt flows to China have continued to be strong, with cumulative flows of $50 billion year to date. Emerging market equity flows have also recovered since late last year, albeit at a modest pace. By contrast, emerging market (excluding China) local currency debt flows have not recovered from the weakness in the first quarter and remain a weak spot. Cumulative local currency debt flows (excluding China) since January 2020 remain negative, down by more than $20 billion, compared with the record $250 billion cumulative hard currency issuance for emerging market sovereigns.

Behind the aggregate weakness of local currency debt flows, there is wide variation among countries. Colombia and Malaysia have seen strong inflows this year, while Mexico, Poland, and South Africa are notable laggards (Figure 1.9, panel 4). A concern among investors is that the local currency flows have not recovered despite robust global risk sentiment. Flows have not benefited from the rise in policy rate expectations and remain highly sensitive to the growth outlook over the next few years. This suggests that a divergent global recovery will likely continue to weigh on local currency debt flows.[14]

The growing role played by China in the emerging market flow landscape may continue to present a challenge to other emerging markets. China's inclusion in global benchmark indices (Chen, Drakopoulos, and Goel 2019) has led to significant inflows, estimated at $180 billion since 2020. Furthermore, China's sovereign credit rating is significantly higher than that of other emerging markets and has remained stable throughout the pandemic, unlike other emerging markets that have seen record credit rating downgrades (led by the Latin American and sub-Saharan African regions). This puts benchmark-driven investors—key players for emerging markets (excluding China)—at risk.[15] Other factors may support flows to China, even after adjusting for index-inclusion flows. China's earlier recovery compared with that of other emerging markets has resulted in a sharp divergence in domestic growth and fiscal pressures, despite concerns about the impact of recent virus mutations (Figure 1.9, panel 5).

The changing investor base in emerging markets poses risks but also presents an opportunity to strengthen domestic local capital markets[16] and attract new investor types. Against a backdrop of elevated fiscal needs and weak nonresident flows, domestic investors have come to play an increasingly important role as marginal investors in the local currency bond markets. Domestic banks initially, and nonbank

[12]The specification here attempts to evaluate the impact on emerging market term premia from the increase in US real rates seen during the May 2013 taper tantrum.

[13]Capital flows at risk (5th percentile of the predicted distribution) have declined from 2.1 percent of GDP at the end of 2020 to 1.7 percent of GDP.

[14]In line with analysis in Chapter 1 of the April 2020 GFSR and Goel and Papageorgiou (forthcoming), which finds local currency debt flows to be more sensitive to domestic fundamentals and growth than hard currency debt flows (which are more sensitive to external risk sentiment).

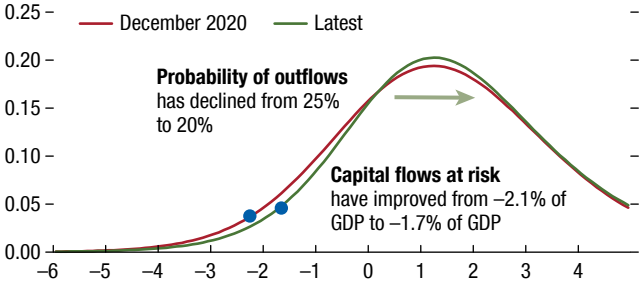
[15]Benchmark-driven investors may either (1) move out of countries seeing rating downgrades or (2) invest more in countries with better fundamentals and a better outlook. These types of investors are becoming very important for emerging markets, with more than $900 billion in assets under management (Chapter 1 of the October 2019 GFSR; Arslanalp and others 2020).

[16]Development of domestic financial markets may reflect fiscal dominance concerns in some cases; thus, the opportunity is likely to be greater when the private sector also benefits from the flows.

Figure 1.9. Capital Flows

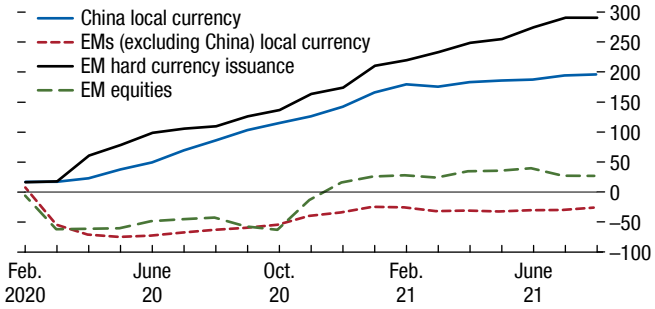
The capital flows outlook has improved, based on the benign risk sentiment and return of growth.

1. Capital Flows Outlook
(End of 2020 and latest; percent of GDP, *x*-axis; probability density, *y*-axis)



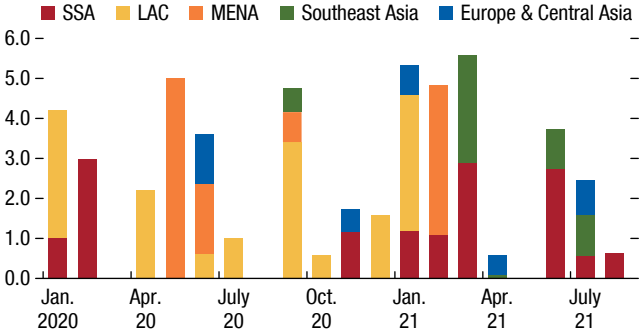
Emerging market (excluding China) local bond flows remain weak.

2. Cumulative Emerging Market Capital Flows
(Billions of US dollars)



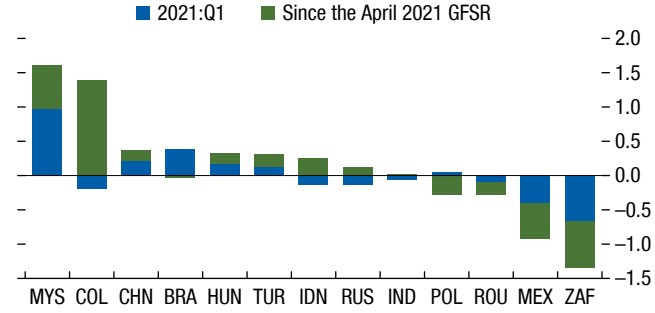
Hard currency bond issuance in frontier market economies continues.

3. Hard Currency Issuance in Frontier Emerging Markets
(Billions of US dollars)



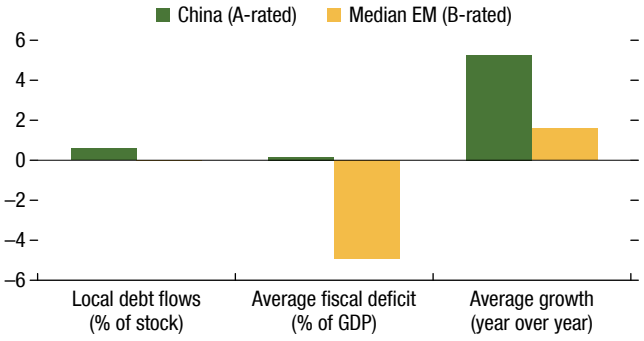
Local currency debt flows vary significantly across countries ...

4. Local Currency Debt Flows across Countries
(Percent of GDP, year to date)



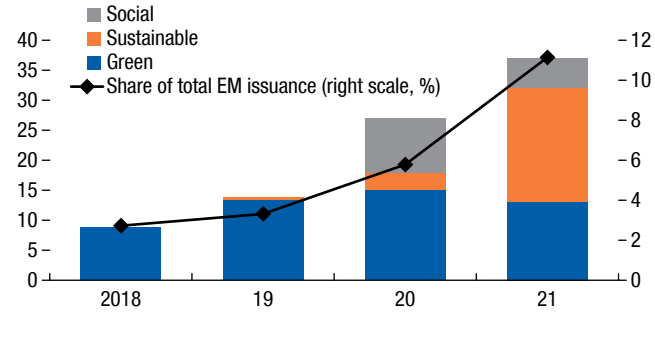
... particularly between China and other emerging markets.

5. China versus Emerging Markets: Comparison on Key Factors
(Percent)



Sustainable debt issuance has picked up sharply in emerging markets.

6. Emerging Market ESG Sovereign and NFC Issuance
(Billions of US dollars, left scale; percent share, right scale)



Sources: Bloomberg Finance L.P.; Bond Radar; Goel (2021); Institute of International Finance; and IMF staff calculations.
Note: In panel 1, the capital flows at risk estimate is based on the methodology discussed in the April 2020 *Global Financial Stability Report*, Chapter 3. For panel 4, 2021 is partial data through August. For panel 5, average fiscal deficit and average growth is averaged over the next three years. Data labels use International Organization for Standardization (ISO) country codes. EM = emerging market; ESG = environmental, social, and governance; GFSR = *Global Financial Stability Report*; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; NFC = nonfinancial corporations; SSA = sub-Saharan Africa.

financial institutions more recently, have absorbed an increasing portion of domestic debt across major emerging markets (see the April 2021 GFSR), highlighting the risk of the financial-sovereign nexus in some countries.[17]

Flows to emerging markets, driven by environmental, social, and governance factors, have grown significantly, even during the pandemic (Figure 1.9, panel 6), although they remain relatively small as a share of total flows (see Chapter 3). Recent proposals, including by the World Bank,[18] suggest that the emphasis should be on the impact of investments, rather than on the environmental, social, and governance score of issuers (which are highly correlated with income levels). These considerations offer an opportunity for emerging markets to commit to investment oriented toward environmental, social, and governance factors to secure steady capital flows. Transition finance—for example, sustainability-linked debt focusing on environmental, social, and governance targets—could become a source of capital for issuers looking to fund long-term improvement strategies.

Credit Risks Have Abated, albeit Unevenly, in the Corporate Sector

In the corporate sector, conditions have generally improved in both advanced and large emerging market economies since the April 2021 GFSR. Corporate revenues have risen, supported by the global recovery and ongoing policy support, and profitability prospects have brightened, surpassing pre-pandemic levels in several economies (Figure 1.10, panel 1). The recovery, however, has been uneven. Near-term solvency and liquidity risks have remained elevated in sectors hit most by the pandemic, such as transportation and services in advanced economies (Figure 1.10, panel 2).[19] By country and firm size, solvency risk has generally fallen since the worst period of the pandemic, but the improvement has been more evident for large firms, while solvency risk has risen in some advanced and emerging market economies, especially among small firms (Figure 1.10, panel 3).

Credit quality in the speculative-grade bond market has continued to strengthen, although with sectoral differentiation, while credit rating upgrades have exceeded downgrades this year. After a sharp decline, US speculative-grade default rates are anticipated to remain low (Figure 1.10, panel 4). As discussed in previous GFSRs, the sharp increase in corporate debt by high-yield bond issuers and by other weak firms remains a key vulnerability, especially if corporate earnings should weaken and effective interest costs rise.

A substantial pickup in bankruptcies has not materialized so far, thanks to targeted fiscal support and unprecedented monetary policy. In the United States, bankruptcies of large and medium-sized firms have declined, with notable sectoral differences (Figure 1.11, panel 1). Bankruptcies of small firms have also fallen (Figure 1.11, panel 2).[20] A similar trend decline in bankruptcies is evident in Japan, thanks to policy support. In contrast, bankruptcies have been rising in Europe—with notable differentiation across countries—despite the ongoing recovery in the region, likely reflecting in part the backlog as a result of court closures and a legal pause on insolvencies in some countries.

Progress in the corporate sector may stall or even reverse should the reopening of the economy be substantially delayed by new COVID-19 variants or if policy support proves to be inadequate or is withdrawn prematurely. Small firms are particularly vulnerable, given that they rely predominantly on bank lending (which could be cut in the event of a deterioration of the outlook) and are more dependent on both direct fiscal support to firms and on banking-sector-specific policy support, such as loan guarantees and deferred interest costs.

Robust merger and acquisition activity this year is expected to support consolidation among small and medium-sized firms (Figure 1.11, panel 3). In addition, private debt funds have continued to expand during the pandemic, accumulating close to $400 billion in dry powder (funds ready to be deployed), and could potentially provide a funding source for distressed and smaller firms (Figure 1.11, panel 4).

[17]Chapter 1 of the April 2020 GFSR and Goel and Papageorgiou (forthcoming) show that when there is a higher proportion of foreign investors, local currency funding costs decrease.

[18]See World Bank (2020).

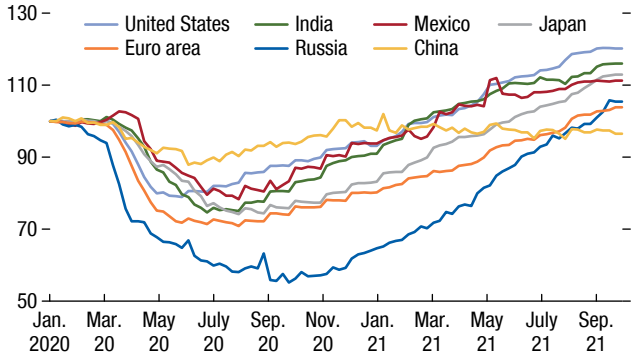
[19]See the April 2021 GFSR for the methodology on the corporate solvency and liquidity risk analysis.

[20]The number of general restructurings—which had expanded during the pandemic, often in lieu of liquidations—has dropped in recent months, while liquidations and partial restructurings of micro firms have remained below pre-pandemic levels.

Figure 1.10. Corporate Balance Sheets amid Concerns about Inflation and Higher Rates

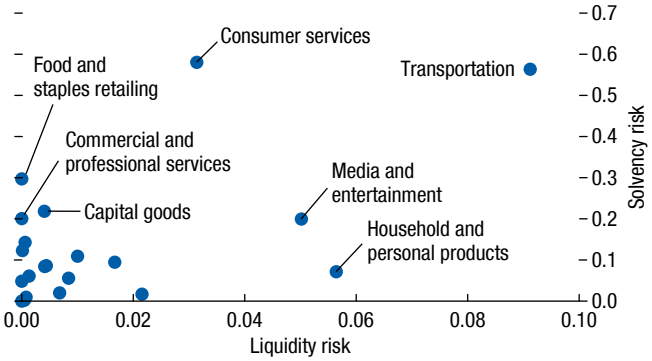
Corporate profitability prospects have improved, albeit at a different pace across economies ...

1. Global 12-Month Forward Earnings per Share Ratios (Indices, January 2020 = 100)



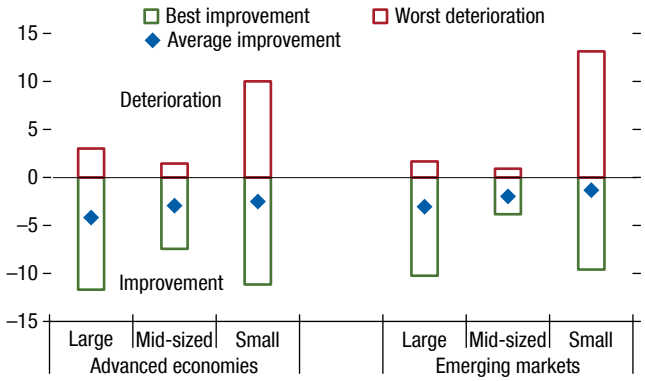
... and several sectors continue to face solvency and liquidity risks in the near term.

2. Advanced Economies: Share of Debt at Firms with High Solvency and Liquidity Risk; as of 2020:Q4



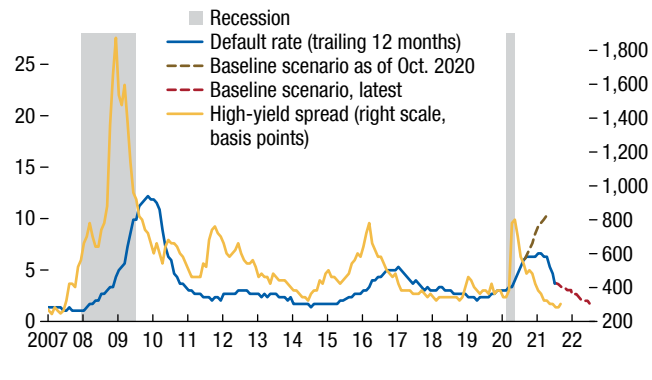
Solvency risk has declined since the height of the pandemic, but less so for small firms.

3. Change in the Share of Firms with High Solvency Risk across Countries (2020:Q2–Q3 versus Q4; percentage points)



Default rates are set to remain low, based on rating agencies' projections and on credit spreads.

4. US High-Yield Corporate Bond Spread, Default Rate, and Rating Agencies' Forecast (Percent, left scale; basis points, right scale)



Sources: Bloomberg Finance L.P.; BofA Securities; Fitch Ratings; Haver Analytics; Moody's Investors Service; Morgan Stanley; S&P Capital IQ; S&P Global Ratings; Thomson Reuters Datastream IBES; and IMF staff calculations.
Note: In panels 2 and 3, solvency risk and liquidity risk are defined based on sets of balance-sheet and market-based indicators described in Online Annex 1.1 of the April 2021 *Global Financial Stability Report*. In panel 4, "Baseline scenario" is the average of default rate forecasts by three rating firms (Fitch, Moody's, and S&P), and each forecast is in line with the firms' macroeconomic forecasts.

Financial Vulnerabilities Remain Elevated in China

Financial vulnerabilities have risen further in China during the pandemic. As shown in Box 1.1, they remain elevated across various sectors, including nonfinancial firms, households, banks, and asset managers. Total social financing, excluding government bonds, had increased to about 230 percent of GDP as of June 2021, up 15 percentage points from the end of 2019. A few state-owned entities defaulted toward the end of 2020, leading investors to reevaluate the assumption of an all-encompassing implicit guarantee for such firms and prompting somewhat greater differentiation of expected state support at the regional level.[21]

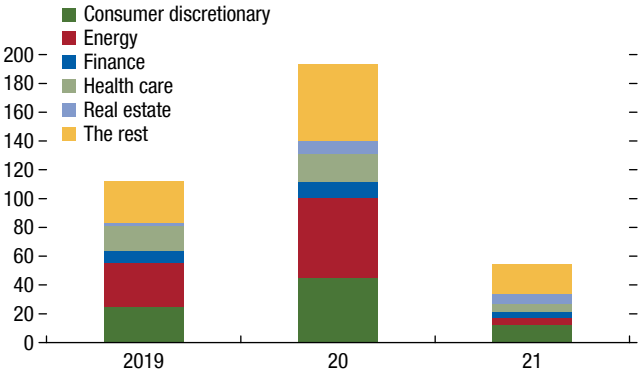
Corporate credit conditions have tightened amid moderating overall credit growth. The tightening has been more pronounced for private and state-owned entities located in provinces with relatively high public debt and/or large fiscal deficits, or with recent local state-owned-enterprise bond defaults, partly

[21]State-owned entities accounted for about half of total onshore corporate bond defaults in 2020–21, up from about 10 percent in 2017–19, while the bond default rate is still very low at 0.7 percent.

Figure 1.11. Corporate Bankruptcies and Consolidation

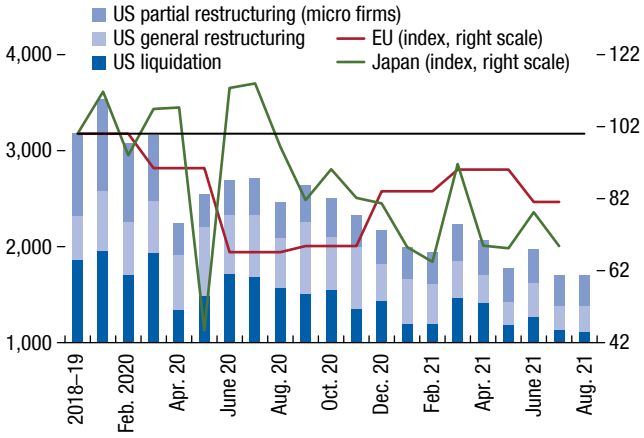
Bankruptcies of large and medium-sized firms in the United States have dropped substantially.

1. US Large and Medium-Sized Firm Bankruptcies, by Sector (With debt > $50 million)



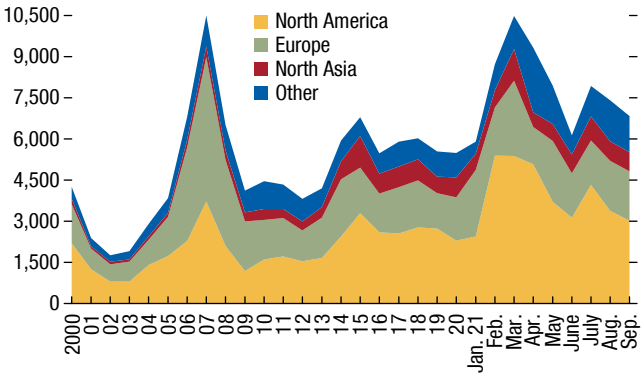
Bankruptcies of small firms have declined in the United States and Japan but have risen in Europe.

2. Advanced Economies: Small Firm Bankruptcies (Numbers for the United States; indices in Japan and the European Union, 2018–19 average = 100)



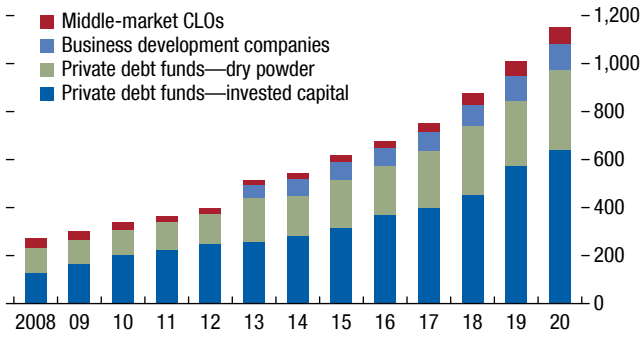
Robust merger and acquisition activity is expected to support the consolidation of small and medium-sized firms ...

3. Global Merger and Acquisition Volumes (Billions of US dollars, annual or annualized amounts)



... and private debt funds have expanded as a potential funding source.

4. Private Debt Assets under Management (Billions of US dollars)



Sources: Bloomberg Finance L.P.; Dealogic; Epiq AACER; Eurostat; Haver Analytics; Preqin; S&P Leveraged Commentary and Data; Tokyo Shoko Research; and IMF staff calculations.
Note: In panel 1, real estate includes both residential and commercial. In panel 2, liquidation, general restructuring, and partial restructuring (micro firms) refer to bankruptcies under Chapters 7, 11, and 13, respectively. In panel 3, 2021 data are annualized. CLO = collateralized loan obligation.

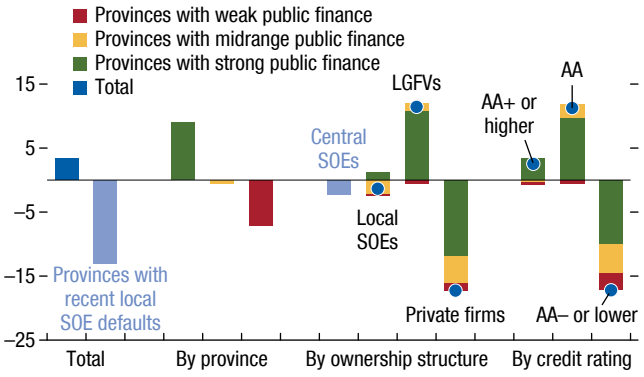
coinciding with the perceived weakening of expected state support (Figure 1.12, panel 1). At the same time, firms with lower credit ratings have faced widening credit spreads and a decline in outstanding bonds, which points to increased risk aversion among investors. Unless carefully managed, the planned transition to a low-carbon economy has the potential to contribute to tighter credit conditions over the medium term and increase financial stability risks (Box 1.4).

Despite the general tightening of credit conditions, financially weak state-owned entities in provinces with relatively strong public finances have retained access to additional bond financing, potentially exacerbating credit misallocation. Historically, local government-owned entities, which comprise local state-owned enterprises and local government financing vehicles, have been the main onshore bond issuers, as they need to borrow funds to finance investment spending and cover operating

Figure 1.12. China's Credit Conditions and Financial Vulnerabilities

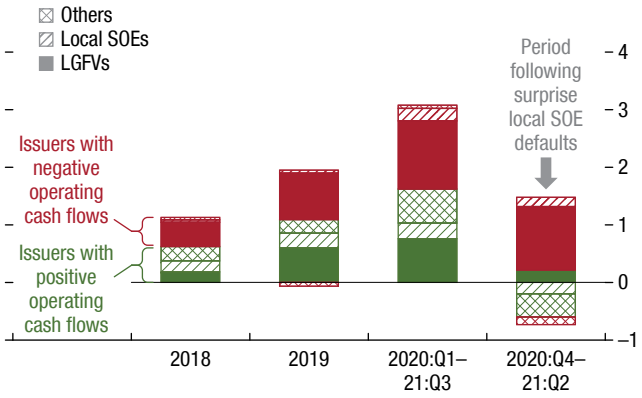
Credit conditions have become more challenging for firms in provinces with weaker public finances, private firms, and firms with lower credit ratings.

1. Chinese Nonfinancial Corporate Bonds: Change in Outstanding Bonds, by Selected Characteristics, 2020:Q4–21:Q2
(Percent)



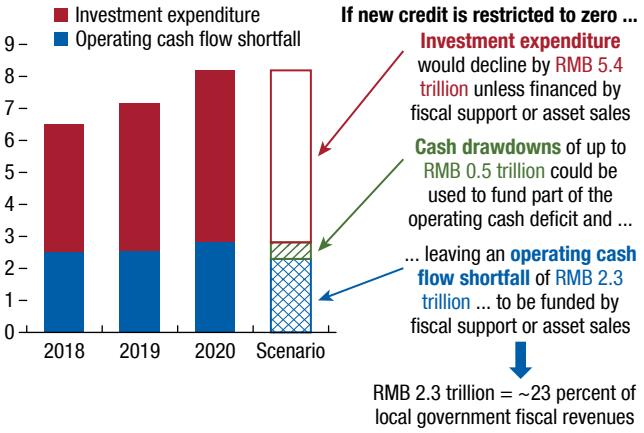
Selected local state-owned enterprises defaulted in 2020:Q4, but many of them with weak cash flows continued to enjoy access to bond markets.

2. Chinese Nonfinancial Corporate Bonds: Net Issuance over Specified Periods
(Trillions of renminbi)



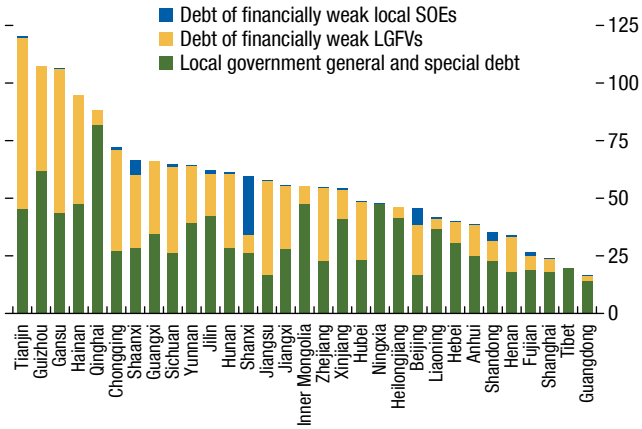
Without restructuring and reform, restricting credit to local government-owned entities could adversely affect investment and local government balance sheets ...

3. Chinese Local Government-Owned Nonfinancial Firms: Uses of New External Financing
(Trillions of renminbi)



... potentially creating destabilizing adverse macro-financial feedback loops, given substantial existing and contingent liabilities of local governments.

4. China's Provinces: Public Debt and Risky Nonfinancial Corporate Debt, 2020
(Percent of regional GDP)



Sources: Bloomberg Finance L.P.; Capital IQ; CEIC; WIND; and IMF staff calculations.
Note: In panel 3, operating cash flow is adjusted to capture estimated interest expense reported as part of financing cash flow. In panel 4, financially weak firms have earnings before interest and taxes below net interest expense for three consecutive years. LGFV = local government financing vehicle; SOE = state-owned enterprise.

cash flow shortfalls.[22] Since the state-owned-enterprise bond defaults in late 2020, nearly all of the net increase in bond issuance has occurred at firms with a history of negative operating cash flows, most of which are local government-owned entities. However, the fact that these firms are located mainly in provinces with relatively strong public finances may suggest that investors are still paying close attention to the perceived ability and willingness of local governments to provide support (Figure 1.12, panel 2).

Chinese authorities have increased their efforts to address financial vulnerabilities. They have continued the reform of wealth management products, imposed new restrictions to contain lending to the property sector, and limited local governments' ability to raise off-balance-sheet financing to backstop local government-owned entities[23,24] (Box 1.5). And they have tightened regulatory and supervisory requirements for fintech companies to address regulatory arbitrage. Investors have been increasingly attuned to regulatory actions to address antitrust and data security concerns, including their implications for global risk asset valuations and capital flows.

Addressing the existing financial vulnerabilities while avoiding adverse macro-financial feedback loops in regions with weak public finances is critical. Should access to credit become significantly constrained in regions with weaker public finances, or more widely, local government-owned entities would have to scale back investment, thus hurting economic growth.[25] A drop in fiscal revenues resulting from a potential economic slowdown and any support provided to local government-owned entities to help finance operating cash flow deficits (estimated at up to RMB 2.3 trillion) would further strain local governments' fiscal resources (Figure 1.12, panel 3). This would in turn reduce their capacity to backstop local firms, further tightening credit conditions and setting off a negative local feedback loop.

The potential for macro-financial feedback loops in an environment of slowing credit growth highlights the urgency of comprehensive restructuring and reform efforts. Given the objective of carrying out policy-oriented investment such as in infrastructure, many local government financing vehicles are unable to generate sufficient earnings to cover interest expense for an extended period. Debt of these financially weak local government financing vehicles is substantial in many provinces (Figure 1.12, panel 4), and some local governments may face significant balance sheet stress should some of such risky debt become contingent liabilities. To safeguard financial stability, Chinese authorities should continue to pursue coordinated efforts across agencies to contain leverage and phase out implicit guarantees. They should also accelerate restructuring of financially nonviable firms, improve governance of local governments' public finances, and enhance sharing of fiscal resources between financially weaker and stronger provinces (for example, through conditional central government transfers).

Pockets of Market Exuberance and Rising Financial Leverage Could Prompt Additional Volatility

While potentially beneficial in terms of restructuring and consolidation, merger and acquisition activity may also be a source of risk, as financial risk-taking, corporate releveraging, and use of financial leverage in deals could exacerbate existing vulnerabilities. Reflecting the continued search for yield amid low interest rates, capital allocation toward leveraged buyouts has become more aggressive alongside a rise in highly leveraged deals (Figure 1.13, panel 1). The growing pool of private debt financing has fueled an increase in sponsor-backed leveraged buyout volumes for smaller middle-market firms—deals accounting for close to two-thirds of all middle-market leveraged loan issuance. Easy financial conditions fueled a surge in initial public offerings in equity markets, including a boom in special-purpose acquisition companies in the first four months of this year, but such activity has since slowed, reflecting in part poor performance of some deals and increased regulatory scrutiny.

The failure of the family office Archegos and the subsequent decline in share prices of some affected

[22]Local government financing vehicles are entities set up by local governments to raise off-budget financing to fund investment projects, mostly for infrastructure.

[23]The asset management rules issued in 2018 are expected to be fully implemented by the end of 2022.

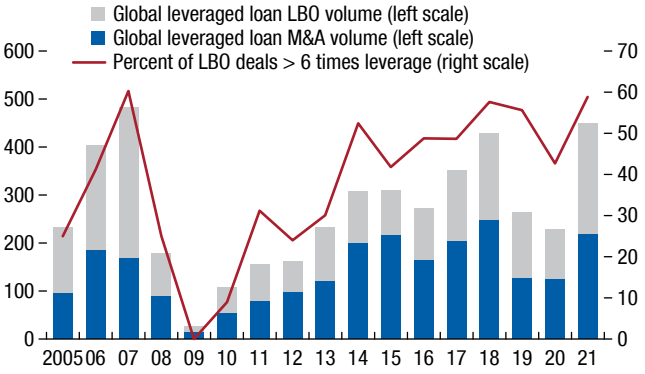
[24]These measures include constraining borrowing by financially weak property developers based on their financial metrics, such as liabilities to assets, net debt to equity, and short-term debt to cash (also known as the "three red lines" policy), and limiting bank lending to property developers and for mortgages.

[25]In 2020, of about 7 trillion renminbi in new external financing, about 4.9 trillion was used to fund investment expenditures; the remaining 2.1 trillion covered operating cash flow deficits.

Figure 1.13. Financial Risk-Taking, Releveraging, and Financial Leverage

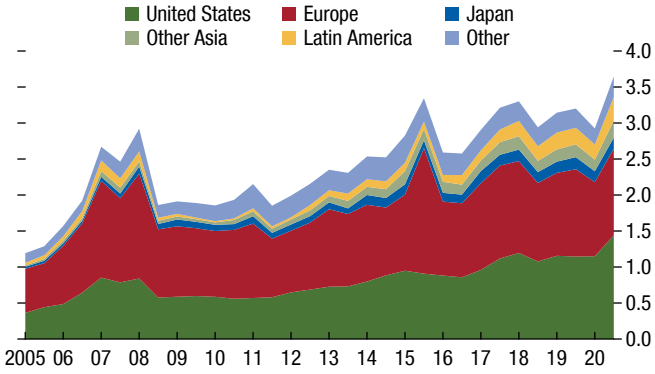
Releveraging reemerged through debt-funded leveraged buyouts.

1. Global Institutional Leveraged-Loan M&As and Leveraged Buyout Volumes
(Billions of US dollars, percent)



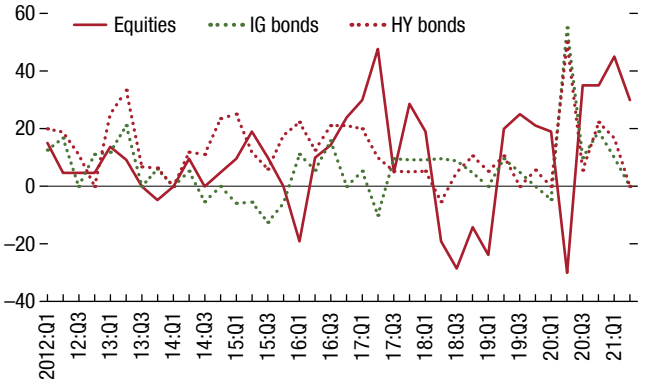
The growing use of equity-linked derivatives suggests a rising degree of financial leverage ...

2. Notional Amount of Over-the-Counter Equity-Linked Swaps and Forwards
(Trillions of US dollars)



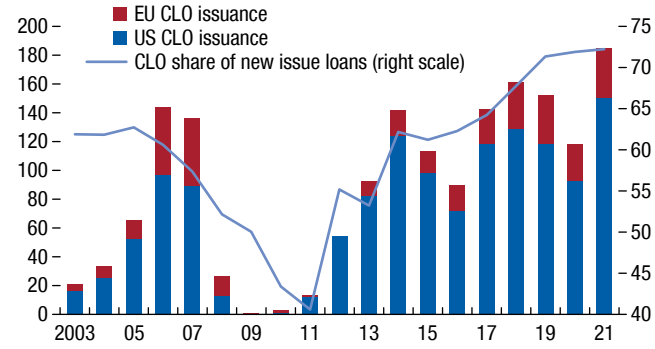
... while surveys point to elevated demand for borrowing to fund equity positions.

3. US Senior Credit Officer Opinion Survey: Respondents Reporting Increased Demand for Funding Assets
(Net percentage)



Collateralized loan obligation issuance has reached record highs.

4. Global Issuance of Collateralized Loan Obligations
(Billions of US dollars; percent of leveraged loan issuance)



Sources: Bank for International Settlements; Bloomberg Finance L.P.; Federal Reserve; Haver Analytics; S&P Leveraged Commentary and Data; and IMF staff calculations.
Note: For panels 1 and 4, 2021 data are annualized to estimate full-year issuance. In panel 1, the right scale shows the percentage of all leveraged buyouts (LBOs) for which the issuer of the leveraged loan has leverage greater than six times debt to EBITDA. CLO = collateralized loan obligation; EBITDA = earnings before interest, taxes, depreciation, and amortization; HY = high-yield; IG = investment-grade; M&A = merger and acquisition.

dealer banks have brought to the fore the financial vulnerabilities stemming from interconnectedness among financial institutions and hidden financial leverage, drawing increased attention on the part of regulators around the globe. For example, financial leverage used to boost returns appears to be increasingly employed in equity markets. While data limitations make it difficult to gain a full picture, available data suggest that the use of equity-linked derivatives has increased (Figure 1.13, panel 2), though the ratio to market capitalization has declined (González Pedraz and van Rixtel 2021). In addition, in surveys, dealers continue to report elevated demand for securities financing to purchase equities (Figure 1.13, panel 3).

In advanced economy credit markets, issuance of collateralized loan obligations has been on a record-setting pace in 2021 (Figure 1.13, panel 4). Although current collateralized loan obligations have less "embedded" leverage than the structures that prevailed before the global financial crisis (that is, the

share accounted for by equity capital has increased), equity and mezzanine debt investors (many of which are new entrants in the asset class or were previously senior debt holders who have shifted to lower-rated tranches in a search for yield) may experience sizable credit losses in a severe market downturn (see the April 2020 GFSR).

While financial vulnerabilities have generally declined at nonbank financial intermediaries, in several advanced economies and China, nonbank financial intermediaries still feature elevated leverage, credit risk exposures, and/or liquidity mismatches, which prop up their vulnerabilities (Box 1.1). In addition, vulnerabilities have increased for life insurers; the sector owns about 20 percent of global bonds and 30 percent of credit investments. A stress scenario of a large and sudden increase in bond yields and corporate spreads could induce mark-to-market losses of 30 percent for insurers in some jurisdictions (Box 1.2). This could lead to the emergence of policy surrenders, forcing life insurers to liquidate investments, which, in the extreme, could reach $1 trillion in the United States and Europe.

Surging House Prices Raise Concerns about a Sudden Reversal

The housing market has been exceptionally strong during the pandemic, buoyed by continued accommodative monetary policy, strong demand for single- and multifamily homes as a result of shifting household preferences for more space, and limited supply available to buyers. While house prices historically tend to drop during recessions, they have surged among major advanced and emerging market economies, while resales have reached all-time highs this year. In some countries (Luxembourg, New Zealand, Turkey) real house prices have risen more than 15 percent since the end of 2019 (Figure 1.14, panel 1). Rising house prices and house-price-to-rent ratios have been evident, even in countries that had witnessed strength before the pandemic (Figure 1.14, panel 2, top and middle tables).[26] Importantly, fiscal support and an improving economic outlook have boosted personal incomes, helping contain a rapid increase in house-price-to-disposable-income ratios (Figure 1.14, panel 2, bottom table).

A potential imbalance between demand and supply can help explain recent housing market trends. The decline in interest rates during the pandemic to record lows and a rise in personal disposable income have improved housing affordability, thus boosting demand.[27] Meanwhile, supply has been slow to respond. Pandemic-related bottlenecks, such as shortages and rising costs of materials and labor, have prolonged construction times and delayed an increase in supply. In addition, structural challenges remain, such as limited building permits in metropolitan areas around the globe. Global housing starts per capita have begun to pick up, although they are still considerably below the levels of the early 2000s, with national measures masking significant differentiation between major metropolitan areas and other areas.

Sustained periods of rapid growth in house prices can create the expectation that such prices will continue to rise in the future, potentially leading to excessive risk-taking and rising vulnerabilities in housing markets (as seen during the global financial crisis). Downside risks to house prices appear to be significant. In a worst-case scenario, the house price decline over the next three years is estimated to be about 14 percent in advanced economies and 22 percent in emerging markets—somewhat higher than their pre–COVID-19 levels (Figure 1.14, panels 3 and 4).[28,29] Across countries, the rise in downside risks to house prices generally reflects an increase in price misalignment (relative to fundamentals). In some emerging market

[26]The analysis examines the dynamics in housing prices using recursive (right-tailed) unit root tests as described in Pavlidis and others (2016). These statistics detect and date periods characterized by a rapid price appreciation above estimated trends.

[27]Housing affordability improves with higher personal income and lower mortgage rates, but declines with higher house prices. See, for example, the definition by the US National Association of Realtors at https://www.nar.realtor/research-and-statistics/housing-statistics/housing-affordability-index/methodology.

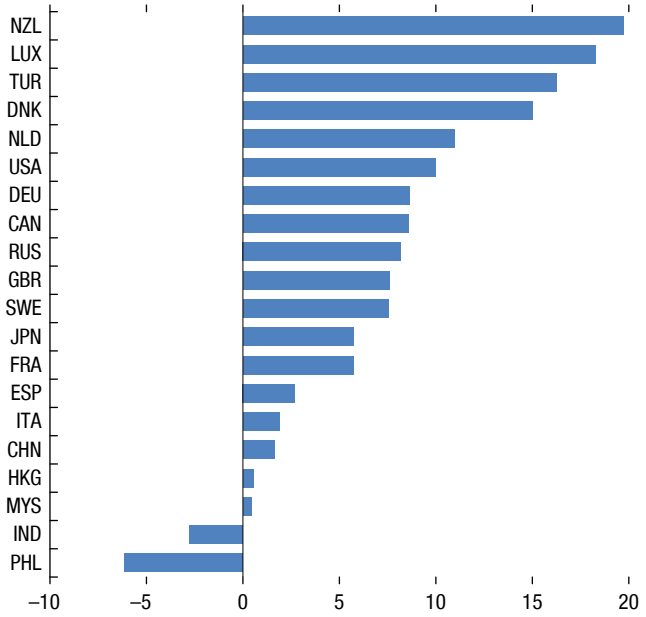
[28]Formally, house prices at risk corresponds to downside risks to house prices, defined as the forecast house price growth at the 5th percentile of the house price distribution. The house-prices-at-risk model controls for past growth in house prices, financial conditions, real GDP growth, the presence of credit booms, and an overvaluation indicator capturing the degree of deviation of prices from fundamental valuation levels. For further details on the methodology, see Chapter 2 of the April 2019 GFSR.

[29]The current distribution of predicted house price growth is qualitatively similar to the estimated distribution ahead of the global financial crisis. That said, the banking system is much more resilient today than it was in 2007–08, thanks to postcrisis regulatory reforms. Should a significant house price adjustment occur, stress in the financial system is likely to be more contained, even though financial vulnerabilities are elevated in a number of sectors, including among nonbank financial intermediaries.

Figure 1.14. Global Housing Prices

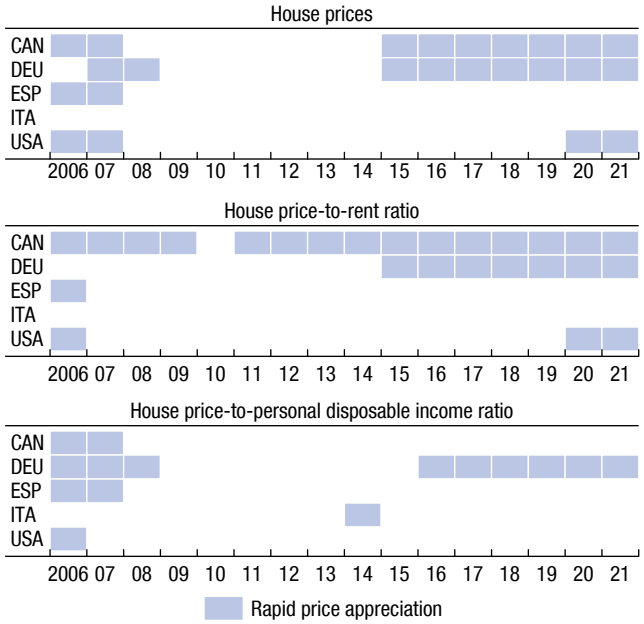
House prices have surged in several countries ...

1. Real House Price Growth, 2019:Q4–21:Q1 (Percent)



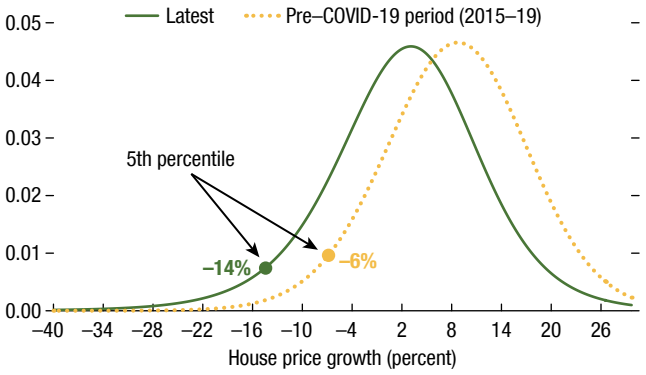
... with rising house prices already evident in some countries prior to the pandemic.

2. Indicators of Rapid Price Appreciation (Indicator variable)

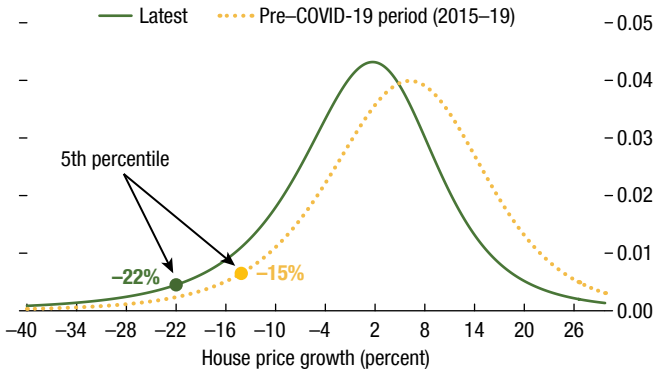


Downside risks have increased in advanced and emerging market economies.

3. Advanced Economies: House-Prices-at-Risk Model (Probability density)



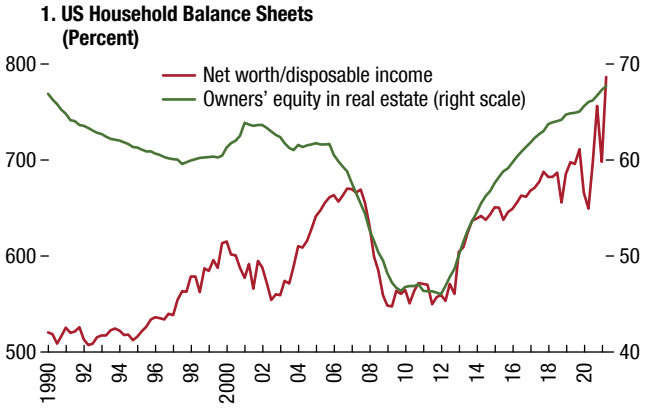
4. Emerging Market Economies: House-Prices-at-Risk Model (Probability density)



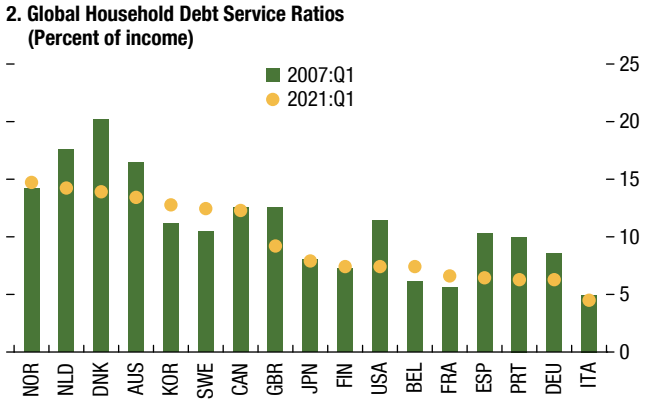
Sources: Bank for International Settlements; Bloomberg Finance L.P.; Haver Analytics; and IMF staff calculations.
Note: In panel 1, nominal house prices are adjusted for inflation using the consumer price index. In panel 2, the indicators are based on recursive (right-tailed) unit root tests to detect periods with rapid price appreciations. Shaded areas correspond to periods during which the estimated backward sup augmented Dickey-Fuller statistics exceed the corresponding 95th percentile critical value from their limit distribution, implying that prices are overshooting their underlying trend. Panels 3 and 4 show the estimation results from a house-prices-at-risk model. The model allows prediction of house price growth in a worst-case scenario; that is, the range of outcomes in the lower tail of the future house price distribution. Probability densities are estimated for the three-year-ahead (cumulative) house price growth distribution across advanced economies (panel 3) and emerging market economies (panel 4). Filled circles indicate the worst-case price decline with a 5 percent probability (5th percentile). Data labels use International Organization for Standardization (ISO) country codes.

Figure 1.15. Household Balance Sheets and Mortgage Lending

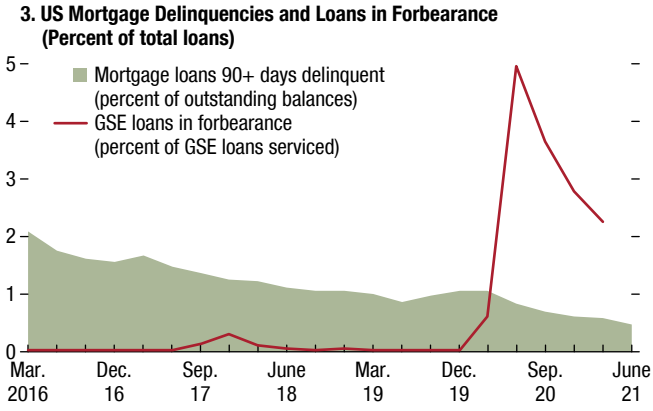
The financial position of households is stronger than before the global financial crisis.



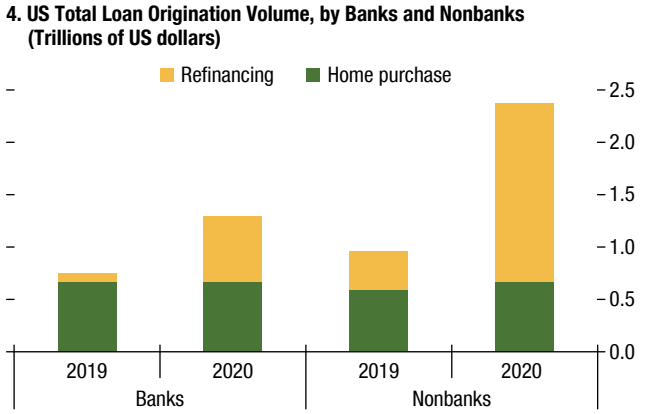
Households have benefited from low interest rates.



Mortgage delinquencies have remained low during the pandemic, largely due to forbearance.



Nonbank lenders have become predominant institutions in the mortgage origination market.



Sources: Bank for International Settlements; Bloomberg Finance L.P.; Federal Reserve; Haver Analytics; HousingWire; The Motley Fool; and IMF staff calculations.
Note: Data labels use International Organization for Standardization (ISO) country codes. GSE = government-sponsored enterprise.

economies, such as China and Malaysia, a tightening in financial conditions also contributed to the buildup of vulnerabilities in housing markets.[30]

New Risks Emerging in the Housing Market

Compared with conditions during the global financial crisis, household financial positions now appear to be stronger, based on household net worth and owners' real estate equity (Figure 1.15, panel 1). Households have generally benefited from lower interest rates and measures to support income and interest costs, including debt payment moratoria in some jurisdictions, with debt service ratios falling in many countries and thus reducing the risk of default on mortgage and other consumer debt (Figure 1.15, panel 2). However, there is a risk that the financial position of households may deteriorate should the unprecedented fiscal support be withdrawn prematurely.

In the run-up to the global financial crisis, loose underwriting standards and lending to households with low credit scores played an important role in the eventual bust of the housing sector. During the

[30]The overvaluation variable adopted in this analysis is a simple valuation metric for housing, which captures the degree of deviation from fundamental valuation levels. Specifically, the measure is constructed as the deviation of house prices to GDP per capita from an estimated trend.

pandemic episode, by contrast, banks have been more selective, limiting their credit risk exposure. Product risk is also less pronounced: there are fewer mortgages with variable interest rate payments, and standards for cash-out refinancings are more stringent. In addition, pandemic-related forbearance provisions have prevented a sharp rise in bank mortgage delinquencies (Figure 1.15, panel 3). Subsequently, loans in forbearance have started to diminish as households have brought their mortgage payments up to date.

Nevertheless, risks may be emerging elsewhere in the housing sector. Nonbank mortgage lenders have become more prominent in the US mortgage origination market, notably so during the pandemic in terms of refinancings (Figure 1.15, panel 4). These specialized mortgage lenders do not retain mortgages on their balance sheets and usually sell them to government-sponsored enterprises within one quarter and thus have limited credit risk exposure. However, they do not hold deposits and obtain liquidity from banks and fund themselves in the wholesale market, making their lending posture vulnerable to a sharp tightening in funding market conditions. In addition, there is a high degree of concentration among nonbank lenders, leaving the US mortgage origination market susceptible to exit risk by key lenders, potentially resulting in a decline in credit. Nonbank mortgage originators often also act as mortgage servicers, exposing themselves to credit risk from several months of missed payments.[31]

Will Banks Support the Economic Recovery?

With the exception of a weak tail of banks in some jurisdictions, the global banking sector has remained resilient through the pandemic, reflecting years of capital buildup following the global financial crisis reforms and continued unprecedented monetary and fiscal policy support (see the April 2021 GFSR for a detailed analysis). Consistent with the improving economic outlook, restrictions on capital distributions have been removed or relaxed in several jurisdictions. In some countries, notably the United States, banks have begun to bolster capital by writing back precautionary reserves.

Despite the ongoing economic recovery, banks' loan underwriting standards (a proxy for "loan supply") remain restrictive in most countries, with bank credit officers expecting that lending posture to persist (see the April 2021 GFSR). While the banking system has so far proved resilient—reflecting, importantly, post-global-financial-crisis reforms—a correction in risk asset prices combined with a deterioration in borrowers' balance sheets could spill over to banks if the pandemic continues. These risk factors have raised concerns that tepid bank loan growth may constrain economic activity.

To assess this risk, this section looks at the relationship between economic growth and bank lending behavior, focusing on the credit intensity of growth and bank loan growth relative to total credit growth (Figure 1.16, panel 1).[32] In each country, the credit intensity of growth was volatile from year to year but generally stable over 2010–19. While the credit intensity of growth varies widely across countries, its ratio has been greater than 1 in almost all countries over the past decade. Bank loan growth relative to total credit growth also affects the relationship between bank lending and economic growth. When the ratio is lower than 1 it points to a shift in the composition of total credit away from bank loans.

The assessment of whether bank lending growth may fall short of levels associated with expected economic growth depends importantly on assumptions regarding the relationship between bank lending and GDP growth. The following exercise assumes that the credit intensity of growth remains at the 2010–19 average over the next few years—a reasonable consideration, given that it has not changed meaningfully over the past 10 years. The analysis also assumes that bank loans will grow at the same pace as total credit over the next few years.

Using these assumptions, consensus estimates of loan growth (based on analyst forecasts for listed banks) are generally below loan growth consistent with the IMF 2022 GDP forecast ("GDP-consistent" loan growth) in most countries (Figure 1.16, panel 2). Barring a sudden change in the credit intensity of

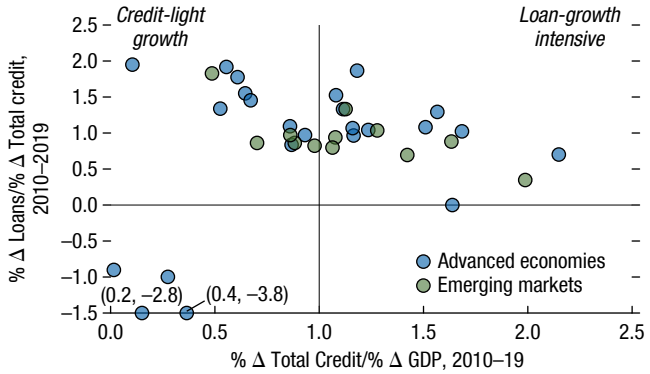
[31]FSOC (2019) identifies the issue of "servicing advances." Indeed, US mortgage lenders were subject to significant stress in March–April 2020, which resulted in a request for emergency liquidity support (see Scuffham 2020). In the United States, the Government National Mortgage Association, or Ginnie Mae, issued a request for input in July 2021 that proposed risk-based capital and other requirements for nonbank mortgage lenders (see Ginnie Mae 2021).

[32]Loan growth/GDP growth = (total credit growth/GDP growth) x (loan growth/total credit growth).

Figure 1.16. GDP Growth and Loan Growth: The Impact of Growth Shortfalls

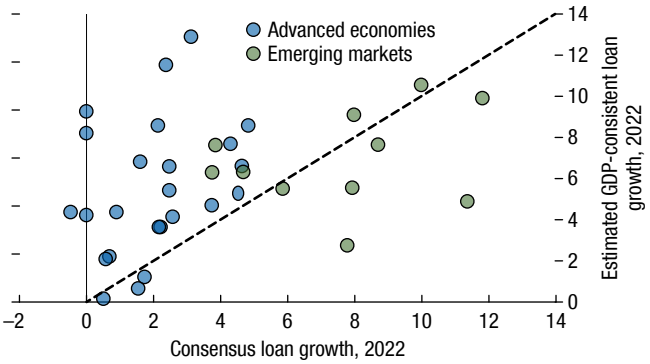
Countries vary in credit intensity of growth and bank loan growth relative to total credit growth.

1. Credit Intensity of Growth and Bank Loan Growth Relative to Total Credit Growth



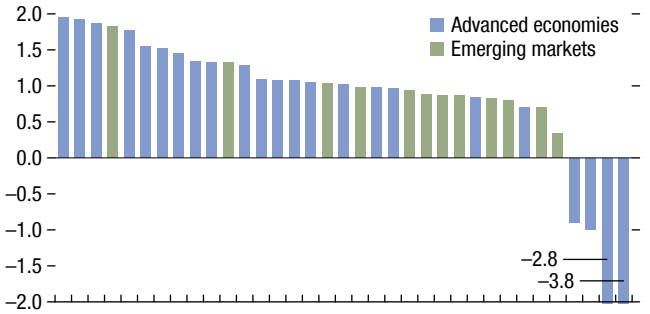
Loan growth associated with the GDP forecast falls short of market forecasts in many countries.

2. Consensus and "GDP-Consistent" 2022 Loan Growth (Percent)



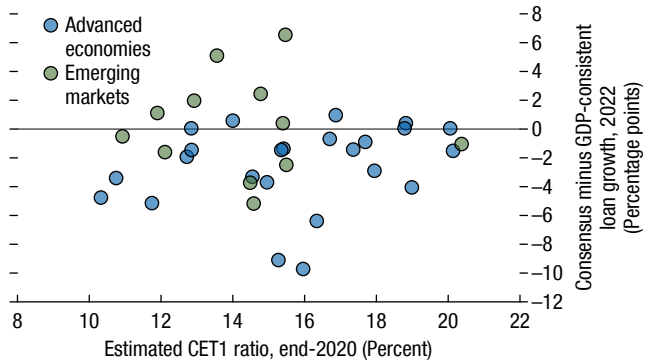
Bank loan growth has been slower than the growth of total credit in many countries.

3. Loan Growth Relative to Total Credit Growth, 2010–19 (Times)



The capital position of banks does not appear to explain the gap between consensus and GDP-consistent loan growth.

4. System CET1 Ratio and Consensus Minus GDP-Consistent Loan Growth in 2022 (Percentage points, percent)



Sources: Bank for International Settlements; Bloomberg Finance L.P.; CEIC; Haver Analytics; national authorities; and IMF staff calculations.
Note: "GDP-consistent" loan growth in panel 2 assumes that the total credit intensity of GDP growth remains at the same level observed over the last 10 years and that the loan share of total credit remains at 2020 levels. Consensus estimates of loan growth are based on analyst forecasts for listed banks. Data labels use International Organization for Standardization (ISO) country codes. CET1 = common equity tier 1.

growth or a decline in the bank loan credit share relative to 2010–19, this finding points to potential downside risks to the IMF's GDP forecasts.[33]

The share of total credit accounted for by bank loans has evolved in structurally significant ways. In most countries, bank loans have grown at a slower pace than total credit (Figure 1.16, panel 3). While in some countries these dynamics have been driven by deleveraging in the banking sector, in many others, this points to a rise in the share of credit extension outside of the banking sector, reflecting the confluence of market structure changes (development and deepening of capital markets), regulatory changes after the global financial crisis, and technology advances. It is significant that economic growth appears to be more closely related to overall credit growth than to the growth of bank loans, which suggests that capital markets may play an important role in supporting the recovery.

There may be important trade-offs to consider between incentivizing credit extension to support economic growth and possible risks to financial stability. Nonbank lenders may have a different appetite

[33]Other factors may support a recovery even with moderate credit dynamics, since high precautionary savings may be used to repay loans.

for risk and a greater capacity to absorb losses, given the longer time horizon of some investors, thus limiting the transmission of shocks to the broader financial system relative to banks. But there are also risks, including limited visibility into the nonbank financial institution sector, use of opaque financial leverage, often weaker underwriting standards, and the possibility of poorly understood linkages with banks. Policymakers should consider whether available tools allow for careful monitoring and assessment of risks in the nonbank financial institution sector, whether additional tools may be needed, and whether the regulatory perimeter should be broader to include some of these corners of the financial system (Box 1.3 discusses related issues for fintech nonbanks).

One important corollary of the analysis is that bank capital ratios do not appear to be related to the gap between consensus loan growth and GDP-consistent bank loan growth (Figure 1.16, panel 4). According to loan officer opinion surveys, bankers see the uncertainties around the economic and credit risk outlook rather than their own internal risk factors as their main constraints on loan growth. Such constraints are likely to persist until the virus is brought firmly under control and there is more clarity regarding possible credit losses once guarantees, moratoria, and other support measures are phased out. Expiration and runoff of these support policies could drive defaults higher and require banks to increase provisions (see the April 2021 GFSR for the estimated impact on bank capital ratios).[34] This suggests that, at least at this stage, lending appetite may be more sensitive to policies that improve the credit quality environment, such as support for borrower solvency and policies to improve credit information and bad debt recoveries, than solely to considerations related to capital positions.

International Bank Credit: An Additional Risk for Emerging Markets

A slowdown in international bank credit extension could be a source of a credit shortfall in emerging markets. International bank credit flows have played a key role in promoting both economic growth and financial deepening in emerging markets. However, greater reliance on foreign lending makes countries more vulnerable to credit reversals during periods of domestic stress (pull factors) or in the context of sudden changes in external conditions (push factors).

Banks have cut back international lending to emerging markets in recent years (Figure 1.17, panel 1). Increased regulation, such as higher capital requirements, has contributed to a general retrenchment from capital-intensive activities in emerging markets. Global banks based in advanced economies have cut back most forcefully, motivated in part by the decline in the profitability of foreign operations relative to domestic banking operations since the early 2000s (Caparusso and others 2019).

Emerging market banks have partially offset this trend, substantially increasing their footprint in international lending. Although emerging market banks still account for a relatively small fraction of aggregate global banking volumes, their market share in global cross-border lending tripled (to 15 percent) between 2008 and 2018 (Figure 1.17, panel 2). In addition, cross-border interlinkages between emerging markets are substantial and growing rapidly, particularly in Asia, Africa, and eastern Europe. Close to 40 percent of cross-border lending to emerging markets is from banks based in other emerging markets (Figure 1.17, panel 2) (see BIS 2018). However, lending by emerging market banks appears to be more volatile compared with advanced economy banks, raising the potential vulnerability of recipient countries to credit withdrawals in times of stress (Figure 1.17, panel 1, green lines).

Foreign banking operations have played an increasing role in many jurisdictions (Figure 1.17, panel 3). Financial centers (such as New York, London, and Hong Kong SAR) have a substantial foreign bank presence; banks in those financial centers are supervised mostly by their home countries and have much better flexibility to move liquidity across borders. In several emerging markets, the majority of the banking system is in fact foreign-owned, and foreign banks generally operate as subsidiaries that are supervised by the host country and held to the same capital and liquidity standards as local banks.

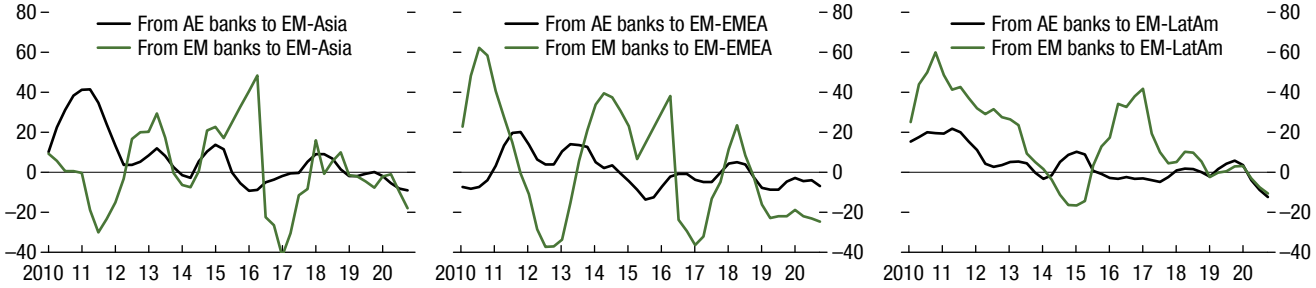
The stability of international bank credit differs based on provision channels. Pure cross-border lending, where the lender has no presence in the borrower country, is the least stable form and the most

[34]Most banks would remain resilient after the phaseout of public guarantees and moratoria (April 2021 GFSR), although in some cases the negative impact on capital could exceed 100 basis points of CET1 ratios. Close monitoring of the phaseout of these borrower support measures remains essential.

Figure 1.17. International Claims and Foreign Bank Participation

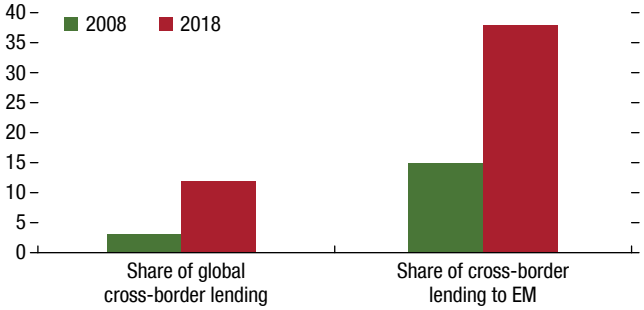
International banks have cut back lending to emerging markets.

1. International Claims on Emerging Markets, by Lender Group
(Percent, year over year)



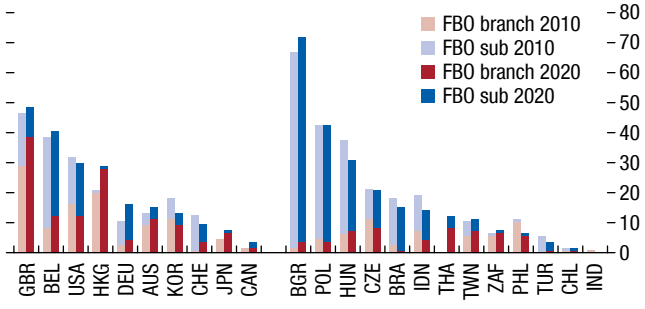
There are growing emerging-market-to-emerging-market interlinkages.

2. Share of Emerging Market Lenders in Cross-Border Lending
(Percent)



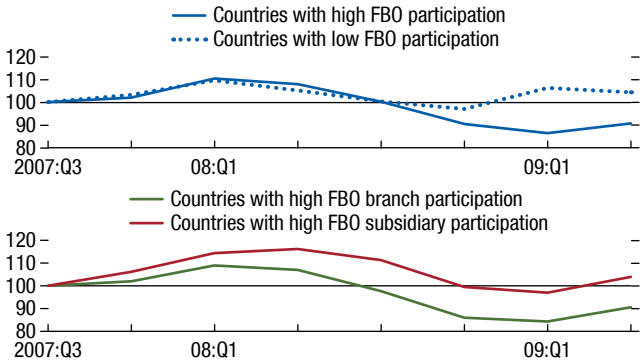
High foreign bank participation is a potential amplifier to credit withdrawals.

3. Foreign Bank Participation
(Percent of total banking sector assets)



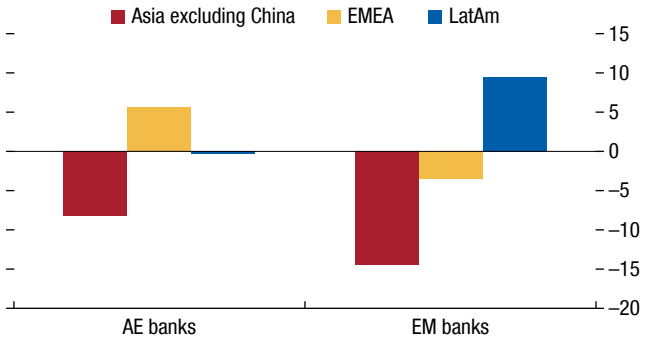
Countries with higher foreign bank participation experienced larger and faster outflows under stress.

4. Changes in International Claims during the Global Financial Crisis
(Index to 2007:Q3)



Risks of continued weak international lending remain.

5. Estimated Changes in International Claims under Shock
(Percent, with one-standard-deviation shock)



Sources: Bank for International Settlements (BIS); IMF, World Economic Outlook database; national central banks; and IMF staff calculations.
Note: Panels 1, 4, and 5 are based on international claims from BIS Consolidated Banking Statistics. Panel 2 is based on cross-border claims from BIS Locational Banking Statistics. Panel 3 is sourced from Caparusso and Chen (forthcoming). In panel 4, high (low) participation is defined as the top (bottom) quartile within the sample countries in panel 3. Data labels use International Organization for Standardization (ISO) country codes. AE = advanced economy; EM = emerging market; EMEA = Europe, Middle East, and Africa; FBO = foreign banking organization; LatAm = Latin America.

sensitive to events of stress in either the lender or the borrower country. International lending through foreign bank branches, which relies mainly on wholesale and intragroup funding, is also relatively prone to outflows during periods of stress. Lending by foreign bank subsidiaries (incorporated, capitalized, and mainly funded locally) is the most stable. During stress, high foreign bank participation, especially the presence of foreign bank branches, could amplify the risk of credit withdrawals. Indeed, in past stress episodes (the global financial crisis, euro area crisis, COVID-19 pandemic), countries with higher foreign bank participation experienced larger and faster outflows, with particular weakness in countries with higher foreign bank branch participation (Figure 1.17, panel 4).

Looking ahead, there are several risk factors that could lead to tightening financial conditions or weaker fundamentals in emerging markets, including policy normalization in advanced economies, inflation pressures leading emerging market central banks to tighten monetary policy, or a reimposition of lockdowns in the event of virus mutations and uneven access to vaccines. Significant emerging-market-to-emerging-market interlinkages and rising foreign bank participation could amplify these risks. In a simulation exercise, the historical growth rates of bilateral international claims were decomposed into lenders' financial conditions and borrowers' macro and financial conditions, largely following Shim and Shin (2018). A one standard deviation shock to both lender and borrower factors could drive a 5 percent decline in international lending. Emerging market Asia (excluding China), where the COVID-19 Delta variant is spreading rapidly, is particularly vulnerable (Figure 1.17, panel 5). Emerging market banks are expected to cut back more than advanced economy banks.

Policy Recommendations to Secure a Sustainable Recovery and Limit Financial Stability Risks

While monetary and fiscal policy support continues to be crucial to sustaining the ongoing recovery, it should be tailored to country-specific circumstances given the uneven pace of the economic recovery across countries. Against a backdrop of new virus mutations and greater uncertainty about global economic prospects, policymakers should remain vigilant, helping maintain the flow of credit to households and firms to secure the recovery while mitigating financial stability risks. The eventual normalization and removal of unprecedented policy support will have to be well telegraphed, gradual, tailored to country-specific circumstances, and recalibrated along the way as dictated by the evolution of the recovery.

Central banks should provide clear guidance about the future stance of monetary policy. Against a backdrop of rising inflation and heightened economic uncertainty, central banks face challenges to meet their mandates. With price pressures anticipated to moderate and then gradually subside, monetary authorities in advanced economies have indicated that they will look through such pressures until the underlying price dynamics become clearer to avoid an unwarranted tightening of financial conditions that could imperil the recovery. However, inflation may ultimately be more persistent than currently expected; indeed, investors appear to judge risks to the inflation outlook as tilted to the upside, especially in the United States, where they are still gauging the implications of the Federal Reserve's new monetary policy framework. It is therefore crucial that central banks provide clear guidance about the future stance of policy, including progress toward the policy normalization process, to avoid unnecessary volatility in financial markets and an unwarranted tightening in financial conditions. If, in the end, price pressures turn out to be more persistent than anticipated, monetary authorities should act decisively to avoid an unmooring of inflation expectations. With a number of emerging market central banks already tightening policy amid an increasingly asynchronous global recovery, an abrupt and rapid increase in US rates could lead to significant spillovers to emerging and frontier markets, further widening the recovery gap. For emerging market central banks that have implemented asset purchase programs during the pandemic, transparency and clear communication with respect to their objectives are crucial to avoid damaging their credibility. In most cases, asset purchase programs should be limited in time and scale and be linked to clear objectives (see also Chapter 2 of the October 2020 GFSR). Where risks to the inflation outlook call for policy normalization, exit strategy plans should be communicated early on and guided by clear parameters to minimize the risk of market volatility.

Policymakers should act preemptively to address vulnerabilities and avoid a buildup of legacy problems. In light of the possible need for prolonged policy support to ensure a sustainable and inclusive recovery,

policymakers should act decisively to address the potential unintended consequences of unprecedented measures taken during the pandemic. Risk asset valuations continue to be stretched in some segments of the financial system, supported by ample liquidity and robust risk appetite globally. Financial vulnerabilities remain elevated in the nonbank financial intermediary sector, while small nonfinancial firms continue to face liquidity and solvency risks. Policymakers should tighten selected macroprudential tools to tackle pockets of elevated vulnerabilities while avoiding a broad tightening of financial conditions. Due to possible lags between the activation and impact of such tools, they should take early action. If such tools are not available—for example, in the nonbank financial intermediary sector—policymakers should urgently develop them. Given the challenges to designing and operationalizing macroprudential tools within existing frameworks, policymakers should also consider building buffers elsewhere to protect the financial system.

Authorities should tailor the type and size of fiscal support to the stage of the economic recovery and to country-specific characteristics and needs.[35] Fiscal policy has played a crucial role alongside monetary policy in supporting the economic rebound and should continue to foster a sustainable and inclusive recovery. However, given limited fiscal space in some countries, it is essential to give priority to the most vulnerable households and businesses, particularly where financing conditions are tight and access to market funding is limited. As the recovery takes hold, targeted support should increasingly be concentrated on borrowers deemed temporarily distressed but likely viable.[36] Policy measures aimed at raising growth potential and fostering a greener economy will play a crucial role in the path toward a more sustainable global economy.

Policy Recommendations to Address Specific Financial Stability Risks

Authorities should rebuild buffers and implement structural reforms in emerging and frontier markets. Against the backdrop of volatile global risk appetite and high economic uncertainty, emerging and frontier markets remain exposed to the risk of a sudden tightening in external financial conditions. In such an environment, emerging and frontier markets need to rebuild buffers and implement long-standing reforms to boost structural growth prospects to insulate themselves from the adverse impact of capital flow reversals and an abrupt increase in financing costs. To that end, the recent allocation of special drawing rights by the IMF for all countries (IMF 2021a) will provide liquidity relief and help ease policy space constraints. Selected macroprudential policies and prudent macro-financial risk management should be employed where financial vulnerabilities are building. This targeted approach may help tackle pockets of elevated vulnerability while avoiding a broad tightening of financial conditions.

Policymakers should promote the depth of emerging market local currency markets and foster a stable and diversified investor base. Local currency markets continue to be a key funding channel for emerging markets. Measures should strive to (1) establish a sound legal and regulatory framework for securities, (2) develop efficient money markets, (3) enhance transparency of both primary and secondary markets as well as the predictability of issuance, (4) bolster market liquidity, and (5) develop a robust market infrastructure.

Tailored support measures to viable firms in the nonfinancial corporate sector is crucial. While corporate balance sheets have strengthened thanks to unprecedented policy support, there is still a significant divergence across firms and regions. Solvency risk has in fact deteriorated for small firms in some countries. In countries with developed financial markets, firms benefiting from market access should be encouraged to take advantage of favorable financial conditions and seek private funding. It is crucial that policymakers undertake structural measures, such as strengthening insolvency frameworks via a fast-track process to facilitate an orderly exit of nonviable firms to address solvency risk and ensure orderly debt restructuring.

Policymakers should activate appropriate macroprudential policy measures to lean against the surge in house prices. To mitigate possible unintended consequences of policy support, authorities should carefully monitor developments in the housing markets. As house prices surge in some countries, households may be taking on larger loans, becoming overexposed to potentially rising debt service once monetary conditions normalize and mortgage loans reprice. Rapidly increasing house prices could also lead to a buildup of vulnerabilities among lenders in the real estate sector, including nonbank

[35]See Chapter 1 of the October 2021 *Fiscal Monitor*.
[36]See Chapter 1 of the April 2021 *Fiscal Monitor*.

financial institutions. While the global financial system is more resilient than at the time of the global financial crisis, reflecting to a large degree postcrisis regulatory reforms, significant house price declines may still have financial stability implications. National authorities should deploy stringent stress tests to estimate the potential impact of a sharp fall in house prices on household balance sheets and ultimately on financial institutions. On the macroprudential policy front, policymakers should review whether existing tools (such as stressed debt service and loan-to-value ratios) require tightening to keep vulnerabilities in check.

Financial regulators and supervisors should gradually normalize financial policies where appropriate. Against a backdrop of continued economic recovery, previous global stress test results suggest that a gradual withdrawal of monetary and fiscal support, along with the normalization of financial policy measures enacted during the pandemic, is unlikely to threaten financial stability. Nonetheless, for a weak tail of banks and nonbank credit providers solvency may be affected. While financial policy normalization is increasingly appropriate, it should continue to reflect uncertainties surrounding the outlook and be calibrated to the pace of each country's recovery, balancing the benefits of continued support against the future cost of higher defaults resulting from extending borrower support.[37]

Policymakers should urgently address vulnerabilities in nonbank financial intermediaries unmasked by the pandemic through enhanced prudential supervision and regulation.[38] Investment funds can be subject to fire sale externalities, illiquidity spirals, and run risk. The incentives of investors to "front-run" others when adverse shocks occur can be best addressed by increasing the value of waiting to sell fund shares. In addition, the risks inherent in investment funds' liquidity and maturity transformation can be reduced through a combination of liquidity management tools of increasing intensity to be deployed sequentially. In terms of liquidity backstops, market-based solutions should be the first line of defense, buttressed in the event of tail episodes by central bank emergency liquidity support. Critically, the global nature of the investment fund business and the fungibility of financial flows makes it imperative that further reform be achieved on an internationally coordinated basis.[39] In addition, policymakers should monitor risks in the life insurance sector that emerge from the sector's need to meet high-return targets in a low-yield environment. Authorities should conduct stress tests to assess the impact of a sudden increase in yields on the solvency of insurers and encourage greater reporting transparency, including more homogenous disclosure standards.

[37]See Kongsamut, Monaghan, and Riedweg (2021) for further guidance regarding the choice of pace and strategy of financial sector policy normalization.

[38]For a detailed discussion of the policy proposals and how to address them, see IMF (2021b).

[39]Given the growing importance of exchange-traded bond funds, participants must be able and willing to arbitrage in response to fund price dislocations if these funds are to function properly. To this end, policies targeting authorized participant leverage are more effective in strengthening authorized participants' arbitrage than existing regulatory capital requirements.

Box 1.1. How Vulnerabilities Shape Up across Sectors: Indicator-Based Framework Update

With the recovery gaining traction, global financial vulnerabilities have declined somewhat on balance across most sectors (Figure 1.1.1, panel 1).[1] In advanced economies, vulnerabilities have lessened, in particular among nonfinancial firms, but they remain elevated in some sectors, such as sovereigns and insurers. In emerging markets, the improvement has been less evident, and vulnerabilities are still high in a number of sectors (Figure 1.1.1, panel 2).

Looking across sectors, *sovereigns* have seen debt levels rise further—and at a faster pace in advanced economies relative to emerging markets—as many governments have used fiscal policy aggressively during the pandemic and need to finance the fiscal response. Accommodative financial conditions have helped many emerging markets meet external financing needs, but domestic concerns around inflation, COVID-19, and vaccine availability have weakened nonresident capital flows and kept external vulnerabilities elevated.

Balance sheet fundamentals at *nonfinancial firms* have continued to improve as strong earnings have so far outpaced debt growth. Leverage (measured as debt to earnings) has declined across most advanced and emerging market economies, reflecting the rebound in earnings associated with the rebound of the economy. While corporate liquidity buffers have dipped since firms increased dividends, started to invest again, and used cash to fund mergers and acquisitions, liquidity ratios remain well above historical averages and near record highs in some regions.

In the *household* sector, the net financial asset position has improved, particularly in the euro area and the United States. The household debt-to-GDP ratio has edged higher in the United States but remains close to the lows reached after the global financial crisis, and debt servicing capacity remains resilient. Debt levels have continued to rise in a number of major economies, where liquid assets held by households have also declined, increasing liquidity mismatches. In emerging markets, household vulnerabilities have stayed elevated.

In the *financial* sector, the global banking system has continued to recover from the initial pandemic shock, with more than half of bank assets in systemically important economies now in low-risk categories. Leverage and capital measures have continued to improve across advanced economies, while better liquidity measures driven by ample deposit inflows have reduced vulnerabilities in some emerging markets.

Among *nonbank financial institutions*, vulnerabilities in the insurance sector have intensified in many jurisdictions (particularly the United States and the euro area), driven by a deterioration in credit and leverage indicators. Outside this sector, however, vulnerabilities have generally decreased. Among asset managers, a decline in leverage and credit exposures has led to marginal improvements in most advanced and other emerging market economies. By contrast, vulnerabilities remain elevated at Chinese entities due to rising maturity mismatches and financial interconnectedness with banks. Recent market reverberations around the property developer Evergrande highlighted such vulnerabilities. The euro area saw improvements at other financial institutions due to lower interconnectedness risks and reduced liquidity and maturity mismatches.

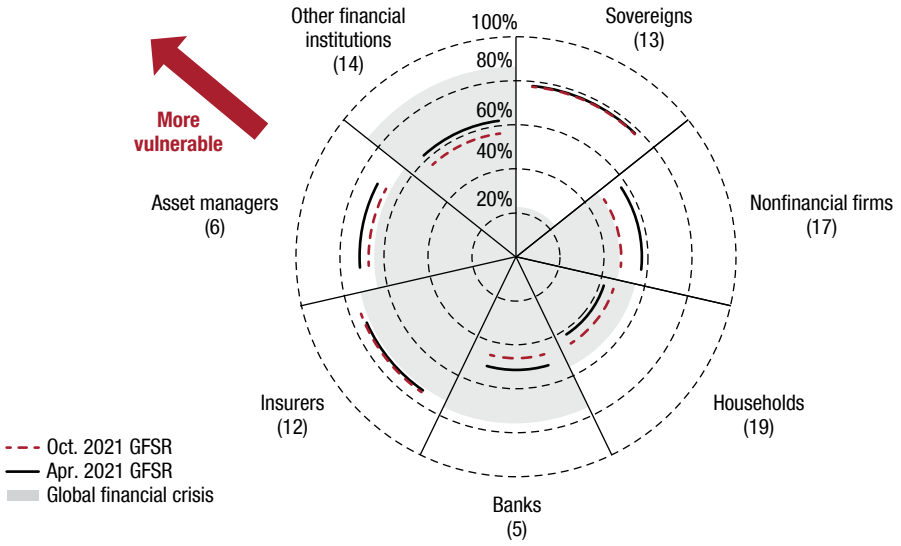
The authors of this box are Sergei Antoshin, Yingyuan Chen, Fabio Cortes, Rohit Goel, Frank Hespeler, and Tom Piontek.

[1]The focus of the framework is restricted to on-balance-sheet vulnerabilities, given the absence of available data for off-balance-sheet vulnerabilities for a cross-section of countries. Due to the nature of the data and their reporting frequency, most of the current data points are through the fourth quarter of 2020. For further details on the methodology employed in the framework, see Online Annex 1.1 of the April 2019 *Global Financial Stability Report*.

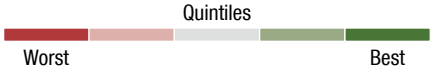
Box 1.1 *(continued)*

Figure 1.1.1. Global Financial Vulnerabilities

1. Proportion of Systemically Important Economies with Elevated Vulnerabilities, by Sector
(Percent of countries with high and medium-high vulnerabilities, by GDP [assets of banks, asset managers, other financial institutions, and insurers]; number of vulnerable countries in parentheses)



2. Financial Vulnerabilities, by Sector and Region



	Sovereigns		Nonfinancial Firms		Households		Banks		Insurers		Asset Managers		Other Financial Institutions	
	Apr. 2021	Oct. 2021	Apr. 2021	Oct. 2021	Apr. 2021	Oct. 2021	Apr. 2021	Oct. 2021	Apr. 2021	Oct. 2021	Apr. 2021	Oct. 2021	Apr. 2021	Oct. 2021
Advanced Economies														
United States														
Euro area														
Other advanced														
Emerging Market Economies														
China														
Other emerging														

Sources: Banco de Mexico; Bank for International Settlements; Bank of Japan; Bloomberg Finance L.P.; China Insurance Regulatory Commission; European Central Bank; Haver Analytics; IMF, Financial Soundness Indicators database; IMF, World Economic Outlook database; Reserve Bank of India; S&P Global Market Intelligence; S&P Leveraged Commentary and Data; Securities and Exchange Commission of Brazil; Securities and Exchange Board of India; WIND Information Co.; and IMF staff calculations.
Note: In panel 1, global financial crisis reflects the maximum vulnerability value during 2007–08. In panel 2, dark red shading indicates a value in the top 20 percent of pooled samples (advanced and emerging market economies pooled separately) for each sector during 2000–21 (or longest sample available), and dark green shading indicates values in the bottom 20 percent. In panels 1 and 2, for households, the debt service ratio for emerging market economies is based on all private nonfinancial corporations and households. In panel 2, the vulnerability value for euro area asset managers in 2020:Q4 is just below the threshold for the third quintile but has been overruled by expert judgment based on data availability. Euro area asset managers hence remain in the third vulnerability quintile in 2020:Q4. Other systemically important advanced economies are Australia, Canada, Denmark, Hong Kong SAR, Japan, Korea, Norway, Singapore, Sweden, Switzerland, and the United Kingdom. Other systemically important emerging market economies are Brazil, India, Mexico, Poland, Russia, and Turkey. GFSR = *Global Financial Stability Report*.

Box 1.2. Walking a Tightrope: Challenges for Life Insurers

The insurance industry is at the center of fixed-income markets, holding about 20 percent and 30 percent, respectively, of outstanding global bonds and corporate bonds. Given their long-dated liabilities, life insurers represent a critical source of demand for bonds with long maturities.[1] This box looks at the challenges they face in a low-for-long yield environment and assesses the impact of different scenarios for bond yields on their assets.

While a gradual yield increase would help mitigate life insurers' long-term challenges—by reducing asset-liability duration mismatches and the negative spread of investment yields to guaranteed policy rates—a stress scenario with a large, sudden increase in bond yields and widening of corporate spreads could hurt them significantly. Importantly, if a large increase in policy surrenders were to occur in such a scenario, life insurers might be forced to liquidate investments—a procyclical response that would amplify the initial shock.

Life insurers are still facing elevated asset-liability-duration mismatches, particularly in some jurisdictions (Figure 1.2.1, panel 1). At the same time, although life insurers have made inroads in reducing average guaranteed policy returns in recent years, the spreads of investment yields to such guaranteed returns remain negative, at historically wide levels (Figure 1.2.1, panel 2). Seeking to improve their return on investments, US and European life insurers have increased their share of lower-quality bond investments; in Japan, the life insurers' portion of higher-yielding foreign investments has risen (Figure 1.2.1, panel 3).

A scenario of a rapid and disorderly increase in bond yields—triggered, for example, by inflation fears—could pose challenges to life insurers, particularly if coupled with wider corporate bond spreads.[2] Panel 4 of Figure 1.2.1 shows that life insurers with longer durations and a greater share of riskier corporate bonds in their portfolios would be hit the hardest by a sudden increase in yields. US and UK life insurers are particularly sensitive to a worst-case yield increase and wider corporate spread scenario, with estimated losses exceeding 30 percent of their assets compared with less than 10 percent in the more modest yield increase scenario (see details in the note to Figure 1.2.1 for a description of the three scenarios).

A severe scenario of a sudden spike in yields could also lead to policy surrenders. Most life insurance policies have a series of protections against the risk that policyholders lapse their policies, including exit penalties, accumulated bonuses embedded in guarantees, and tax disincentives. Therefore, it is unlikely that life insurers would face a sharp increase in surrenders in most scenarios. However, a scenario of bond yields increasing 200 basis points or more—similar to the worst-case yield increase and wider corporate stress scenario—could be associated with a significant increase in lapse rates as policyholders may surrender their policies for new policies or other financial products offering higher yields.[3] In its most stressed scenario, the European Insurance and Occupational Pensions Authority (EIOPA 2020) estimates that surrender volumes could increase to €372 billion in Europe.[4] This would generate a shortfall of about €340 billion, which could be covered through asset sales. Assuming that US life insurance companies faced similar lapse rates, surrenders could amount to over $550 billion in the United States, about $1 trillion in combined surrenders. While this is less than 2 percent of the total market value of US and European fixed-income markets, its impact could be significant if it coincides with selling pressure from other investors in a stressed scenario.

The authors of this box are Fabio Cortes and Deepali Gautam.

[1]Life insurers account for almost half of global insurance premiums.

[2]Sample: Austria, Belgium, France, Germany, Italy, Japan, The Netherlands, Norway, Portugal, Spain, Sweden, United Kingdom, United States. These countries represent over two-thirds of insurance premiums globally. The stress scenarios are described in the note to Figure 1.2.1.

[3]Moody's (2021) estimates that $500 billion (31 percent of US life insurance policies) is surrenderable with low penalty; ESRB (2015) calculates that 90 percent of contracts can be surrendered with a penalty lower than 15 percent of the policy value.

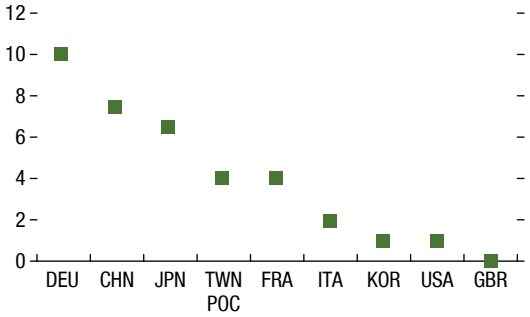
[4]EIOPA (2020) estimates surrender volumes of €372 billion after assuming a lapse rate of 25 percent for traditional life contracts with surrender penalties and a lapse rate of 75 percent for traditional life contracts without surrender penalties.

Box 1.2 *(continued)*

Figure 1.2.1. Challenges of Life Insurers: Assessing the Impact of a Sudden Spike in Yields

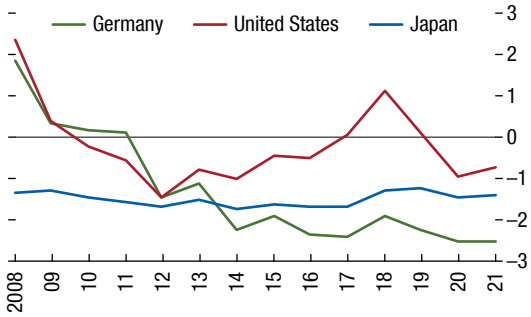
The asset-liability mismatches of some life insurers remain large ...

1. Average Asset-Liability Duration Mismatches (Years)



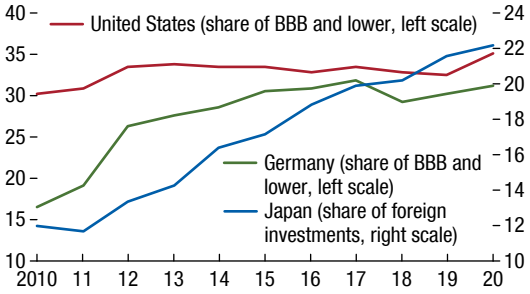
... with spreads of investment yields to guaranteed returns negative and close to record lows.

2. Spread of Investment Yields to Average Guaranteed Returns (Percent)



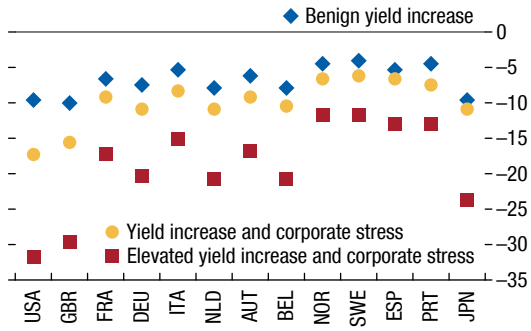
Life insurers' risk-taking is elevated as a result ...

3. Share of BBB-Rated and Lower-Rated Bonds in Fixed Income Portfolios, and Share of Foreign Investments (Percent of total bond holdings and percent of assets)



... making them particularly sensitive to a sudden yield spike and wider credit spreads.

4. Simulated Mark-to-Market Shock to Assets (Percent)



Sources: Bloomberg Financial L.P.; European Insurance and Occupational Pensions Authority; General Insurance Association of Japan; Moody's; National Association of Insurance Commissioners; SNL Financial; and IMF staff calculations.
Note: The investment yields in panel 2 are estimated as the average yield on the fixed-income portfolios of life insurers in each jurisdiction, and may underestimate actual investment yields as they exclude any yield from investments in other asset classes, equities and real estate in particular. Bloomberg Barclays domestic bond indices are used as proxies, with the calculations assuming all of the Japanese foreign exposure is invested in an equally weighted mix of US corporate and 10-year Treasury bonds. Moody's is the source for the average guaranteed returns in each jurisdiction. The calculations in panel 3 include investments in both corporate and sovereign bonds and aggregate data for individual life insurance companies in each jurisdiction. Shocks in the sensitivity scenarios in panel 4 are applied to aggregate sector balance sheets of life insurers as of December 2020 (Europe and United States) and February 2021 (Japan). The data include detailed asset class exposure by rating as well as duration. Derivative positions and loss absorption by policyholders and by taxes and regulatory adjustments are not taken into account. This implies that results should be considered an upper-bound impact. Panel 4 runs three yield increase scenarios: benign yield increase (sovereign bond yield increases but no corporate stress), yield increase and corporate stress (greater sovereign bond yield increases at lower ratings and wider corporate spreads), and elevated yield increase and corporate stress (much greater sovereign bond yield increases across all ratings and wider corporate spreads; larger losses in equity and real estate markets). The following shocks are applied in the benign yield increase scenario: equity (–5 percent), real estate (–2 percent), and all sovereign and corporate bond yields up +100 basis points regardless of credit rating. The shocks for the yield increase and corporate stress scenario are equity (–10 percent); real estate (–6 percent); sovereign bond yields AAA-A (+100 basis points), BBB (+150 basis points), and <BBB (+200 basis points); and corporate bond yields AAA-A (+150 basis points), BBB (+250 basis points), and <BBB (+300 basis points). The shocks for the elevated yield increase and corporate stress scenario are equity (–20 percent); real estate (–10 percent); sovereign bond yields AAA-A (+200 basis points), BBB (+250 basis points), and <BBB (+300 basis points); and corporate bond yields AAA-A (+250 basis points), BBB (+350 basis points), and <BBB (+400 basis points). To put the magnitude of these shocks in context, the European Insurance and Occupational Pensions Authority (EIOPA) ran a yield curve up scenario in 2018 where the shocks applied to the balance sheets of life insurers were close to the elevated yield increase and corporate stress scenario. For example, EIOPA's stress test assumed a +175 basis point increase in 10-year US Treasury yields, a +222 basis point increase in 10-year Spanish government bond yields, a 40 percent drop in equities, and a +235 basis point and +256 basis point increase in US AA-rated nonfinancial and financial corporate bonds, respectively. See EIOPA (2018) for further details. Data labels use International Organization for Standardization (ISO) country codes.

Box 1.3. Fintech Lending: Lessons Learned from the COVID-19 Crisis

Financial technology (fintech) lending is considered to promote financial inclusion and support credit provision to households and firms that may not have access to traditional lenders. Fintech banks compete with traditional banks to provide online and mobile banking services, such as account opening, transfers, and loans, while nonbanks provide payment platforms as well as secured and unsecured small loans to consumers and small and medium-sized enterprises. As fintech lending is a relatively new phenomenon, little is known about the ability of such lenders to withstand economic shocks. This box analyzes the performance of fintech lenders in 20 economies during the pandemic to draw early lessons.[1]

In the run-up to the pandemic, fintech lending increased steadily, growing by about 60 percent for banks and 125 percent for nonbanks over 2013–19 (Figure 1.3.1, panel 1). By contrast, the assets of traditional banks and nonbanks increased by 39 percent and 50 percent, respectively, over the same time period. The nonperforming asset ratio of fintech banks has generally been lower than that of traditional banks, but that of fintech nonbanks has been significantly higher than their traditional counterparts (Figure 1.3.1, panel 2).

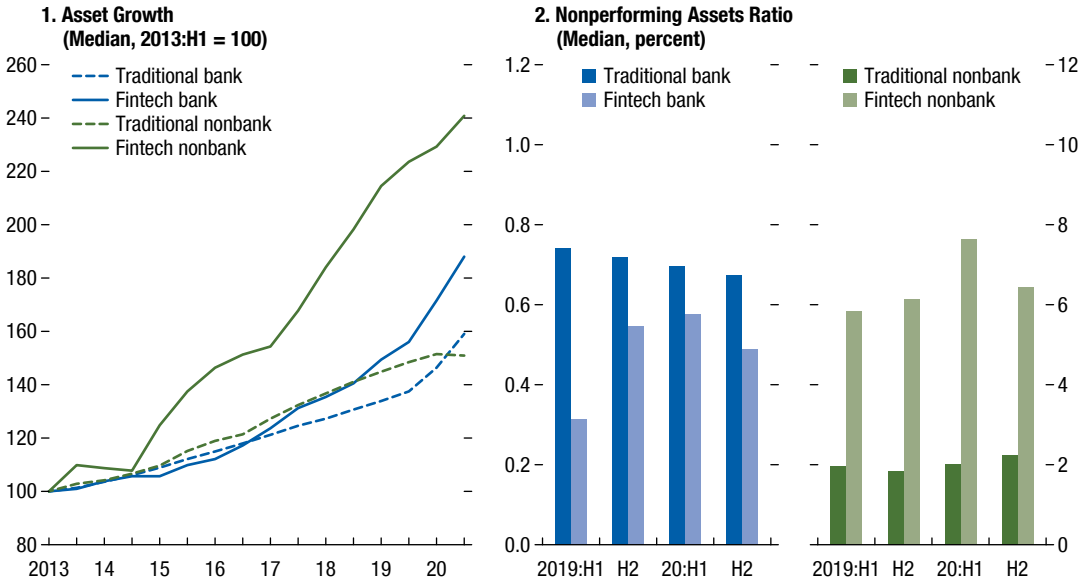
The authors of this box are Junghwan Mok and Tomohiro Tsuruga.

[1]In this exercise, four categories of lenders are considered: traditional banks, traditional nonbanks (for example, credit card issuers, sales finance companies), fintech banks (for example, internet banks), and fintech nonbanks (for example, online consumer lending platforms). The sample covers 2013:Q1–2021:Q1. The regression controls for macroeconomic conditions and lender characteristics and includes the ratio of COVID-19 infection cases to population, lagged GDP growth, total capital ratio, log of total assets, quarter dummies, and fintech dummies.

Figure 1.3.1. Performance of Fintech Lenders during the COVID-19 Crisis

Fintech lenders have grown steadily over the years, and the trend continued in 2020.

However, the nonperforming assets ratios also picked up during the COVID-19 crisis.



Sources: S&P Capital IQ; S&P Global Market Intelligence; and IMF staff calculations.
Note: Sample comprises 13 advanced economies (CAN, DEU, ESP, FRA, GBR, HKG, ITA, JPN, KOR, NZL, SGP, SWE, USA), and seven emerging market economies (ARG, BRA, CHN, IDN, MEX, RUS, ZAF) where the three-digit codes are International Organization for Standardization (ISO) codes. Banks and nonbanks are classified as fintech if (1) they are labeled by S&P Capital IQ as a technology-related service (for example, "data processing and outsourced services," "consumer digital lending," "commercial digital lending," and so on), (2) their corporate description contains technology-related words (for example, "digital," "online," and so on), (3) there are fewer than three branches, and (4) they were established after 1995. Entities with subsidiaries, parents, alliances, and suppliers that meet (1)–(3) are also classified as fintech.

Box 1.3 *(continued)*

The COVID-19 crisis does not appear to have had much negative impact on the asset growth of fintech lenders. Assets for fintech banks and nonbanks increased by 18 percent and 7 percent, respectively, over 2019–20, outpacing asset growth of traditional lenders. However, the nonperforming asset rate of fintech lenders also increased during the pandemic, while that of traditional lenders stayed broadly constant.

What might explain these observations? Containment measures implemented in response to the pandemic are likely to have prompted a shift in economic activities from physical to digital, increasing the demand for fintech credit. Moreover, the severe economic downturn accompanying the pandemic hit retail borrowers and small and medium-sized enterprises particularly hard, which may have impacted their ability to access credit from traditional banks, inducing them to shift to fintech lenders. This would explain both the expansion in fintech credit and the deterioration in fintech asset quality. Indeed, a simple regression analysis shows that an increase in COVID-19 infection cases (a proxy for the stringency of containment measures) is associated with higher asset growth of fintech nonbanks and a decline in their return on assets.

These findings suggest that, while fintech lending may be a useful resource to reach a broader range of borrowers, it could also undermine financial system stability, as the borrower base of such creditors could be weak. National authorities should therefore closely monitor the activity and risk management practices of fintech lenders to strike the right balance between financial inclusiveness and stability.

Box 1.4. Climate Change and Financial Vulnerabilities in China

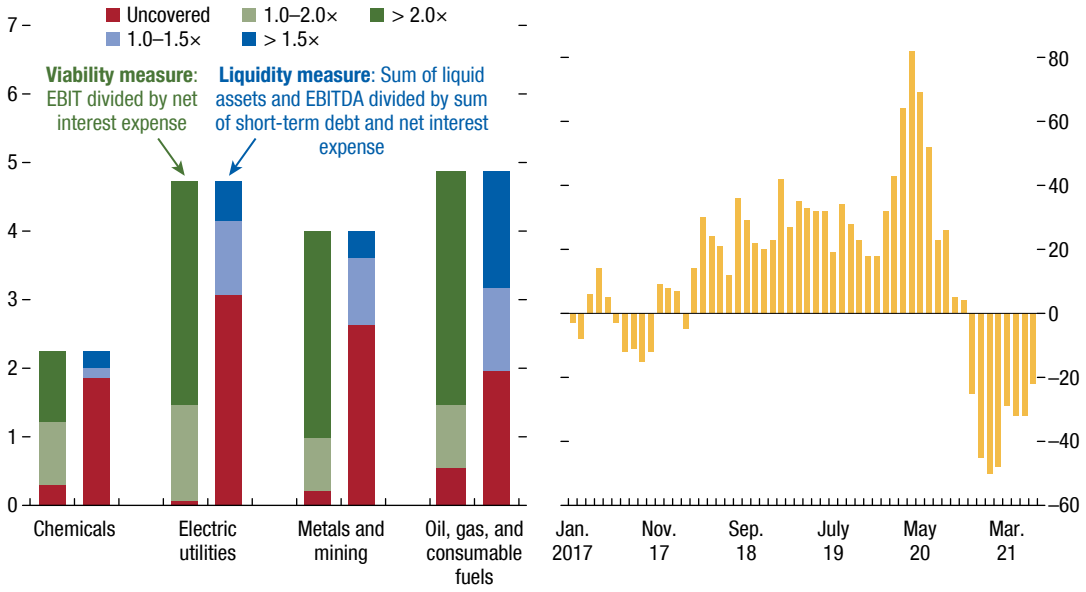
The prospect of more restricted access to credit for weak borrowers in China may have financial stability implications during the planned transition to carbon neutrality by 2060 if not managed carefully. In carbon-intensive sectors, many firms face liquidity risk, as their combined interest expense and short-term debt are greater than their combined earnings and liquid assets. With credit extended to firms with liquidity risk totaling about 10 percent of GDP, policy coordination among Chinese agencies is essential to ensure an orderly transition (Figure 1.4.1, panel 1). Net bond issuance of firms in carbon-intensive sectors (chemicals, coal operations, metal and mining, and oil and gas) moderated after the carbon-neutrality commitment announced in September 2020 and then turned negative after local state-owned-enterprise bond defaults in late 2020 (Figure 1.4.1, panel 2). This partially reflects concerns about more limited state support for such industries. Relative to their GDP size, provinces with weaker public finances also tend to be exposed to larger corporate debt from these sectors.

The authors of this box are Henry Hoyle, Phakawa Jeasakul, and Hong Xiao.

Figure 1.4.1. China: Credit Conditions and Financial Vulnerabilities

Climate-related financial risks could rise, with many carbon-intensive firms facing weak profitability and/or liquidity vulnerabilities.

New decarbonization policies could put additional market pressure on borrowers in carbon-intensive sectors whose net bond issuance has recently already been negative.



Sources: Bloomberg Finance L.P.; S&P Capital IQ; and IMF staff calculations.
Note: In panel 1, the electric utilities sector excludes renewable energy firms. In panel 2, the carbon-intensive sectors include coal operations, chemicals, metals and mining, and oil and gas. EBIT = earnings before interest and taxes; EBITDA = earnings before interest, taxes, depreciation, and amortization.

Box 1.5. Recent Developments at Evergrande

Against the backdrop of a regulatory campaign to rein in the large and highly leveraged real estate sector, market participants have become increasingly concerned about a possible default by Evergrande, one of China's largest property developers. Evergrande, with about $304 billion in total liabilities, including some in offshore markets, has recently seen its bond prices reach distressed levels and its share price fall more than 70 percent since mid-2021 (Figure 1.5.1, panel 1). Contagion so far has been limited to other financially weak property developers and lower-rated firms. However, while the authorities have the tools to step in if the situation were to escalate, there is a risk that broader financial stress may emerge, with implications for both the Chinese economy and financial sector as well as global capital markets at the extreme.

There are a number of macro-financial channels through which strains could be transmitted.

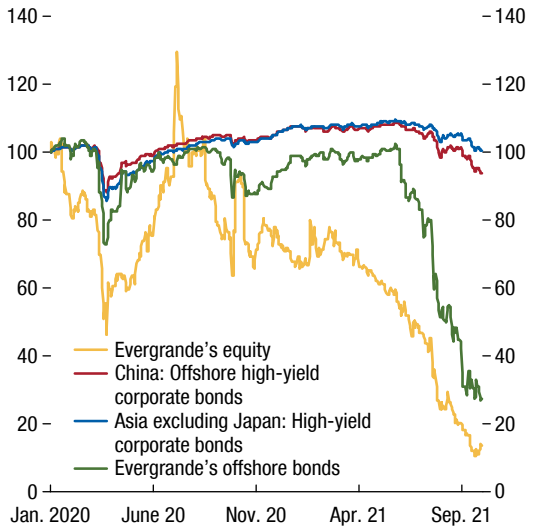
- In terms of potential domestic financial effects, aggregate direct exposures of Chinese banks to Evergrande appear to be limited, although smaller banking institutions with weaker capital positions may face challenges. However, should stress spread widely to the broader property development sector, the exposures of the financial system would be meaningfully larger. A number of financial institutions are involved (including banks, trust companies, and other shadow banking entities), directly through loans, bonds, and other credit instruments, as well as indirectly via guarantees and contingent liabilities, often through opaque and difficult-to-quantify channels that create a high degree of interconnectedness within the financial system. In addition, with property developers accounting for a notable share of borrowing in offshore markets, these markets could come under stress and create funding challenges also for other issuers.

The authors of this box are Fabio Natalucci and Helge Berger.

Figure 1.5.1. China: Evergrande and Property Developers under Pressure

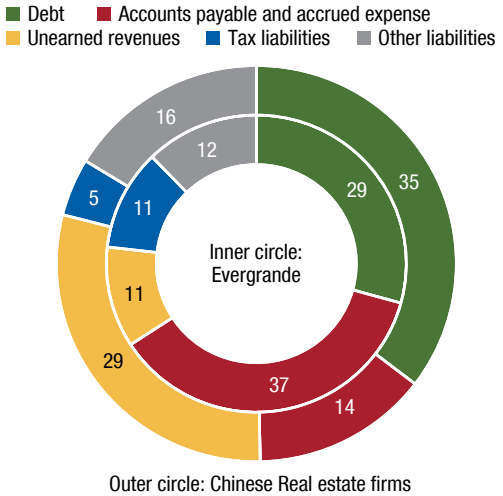
Contagion so far has been limited ...

1. China Evergrande: Share and Bond Prices (January 1, 2020 = 100)



... but Chinese real estate firms have sizable non-debt liabilities.

2. Chinese Real Estate Firms: Composition of Liabilities as of End-2021:Q2 (Percent of total liabilities)



Sources: Bloomberg Finance L.P.; S&P Capital IQ; and IMF staff calculations.
Note: In panel 1, Evergrande's bond prices are a weighted average by issuance amounts. In panel 2, Evergrande's total liabilities amounted to $304 billion, and the real estate sector's total liabilities amounted to $4.84 trillion.

Box 1.5 *(continued)*

- Macroeconomic repercussions could greatly magnify the impact of financial stress, with a feedback loop back to financial conditions. Knock-on effects on real estate firms could adversely impact growth given sizable liabilities to various counterparts (Figure 1.5.1, panel 2). A sustained fall in house prices could weigh on consumer confidence and spending. Local government land sale revenues could fall, forcing local governments to reduce public investment and reinforcing investor concerns about state support for local government-owned entities, especially in provinces with weak public finances.
- Finally, a slowdown in economic growth and a tightening in financial conditions in China could bring spillovers to the rest of the world—for example, through direct exposures of international investors to Chinese financial assets (which has been growing as a result of the inclusion of China in global benchmark indices), a deterioration in global risk appetite at a time when asset valuations are stretched, and a tightening in financial conditions in emerging markets.

What are Chinese policymakers to do? Longer term, corporate restructuring and insolvency frameworks need to be strengthened to facilitate market-based exit of nonviable firms. In the short term, the tools are available to contain and manage potential financial stress and lessen any adverse impact on the economy. But there are challenging trade-offs in terms of the extent of support to affected financial entities and sectors and the timing of the intervention. The broader the support measures, especially if accompanied by an actual or perceived relaxation of the broader effort to delever the financial system over time, the greater the risk of financial fragilities reemerging in the future. Similarly, earlier and clearly communicated intervention would likely minimize the risk of contagion, although at the cost of reinforcing a perception of individual firms being too big to fail. Postponing support to the financial system to instill market discipline may, however, require broader measures to manage financial stress.

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CHAPTER 2

THE CRYPTO ECOSYSTEM AND FINANCIAL STABILITY CHALLENGES

Chapter 2 at a Glance

- The crypto ecosystem continues its rapid growth, presenting both opportunities and challenges. This chapter discusses the latest developments and financial stability challenges posed by the crypto ecosystem, with a focus on emerging market and developing economies.
- Crypto assets come in different flavors and have evolved to meet varying needs for speculative investment, store of value, currency conversion, and payments. Decentralized finance (DeFi) is gaining momentum by offering new services to users.
- Financial stability risks are not yet systemic, but risks should be closely monitored given the global implications and the inadequate operational and regulatory frameworks in most jurisdictions.
- Challenges posed by the crypto ecosystem include operational and financial integrity risks from crypto asset providers, investor protection risks for crypto assets and DeFi, and inadequate reserves and disclosure for some stablecoins.
- In emerging markets, the advent of crypto assets has benefits but can accelerate *cryptoization* and circumvent exchange and capital control restrictions. Increased trading of crypto assets in these economies could lead to destabilizing capital flows.
- Policymakers should implement global standards for crypto assets and enhance their ability to monitor the crypto ecosystem by addressing data gaps. As the role of stablecoins grows, regulations should correspond to the risks they pose and the economic functions they perform. Emerging markets faced with *cryptoization* risks should strengthen macroeconomic policies and consider the benefits of issuing central bank digital currencies.

Introduction

The rapid growth of the crypto ecosystem presents new opportunities. Technological innovation is ushering in a new era that makes payments and other financial services cheaper, faster, more accessible, and allows them to flow across borders swiftly. Crypto asset technologies have potential as a tool for faster and cheaper cross-border payments. Bank deposits can be transformed to stablecoins that allow instant access to a vast array of financial products from digital platforms and allow instant currency conversion. Decentralized finance could become a platform for more innovative, inclusive, and transparent financial services.

Despite potential gains, the rapid growth and increasing adoption[1] of crypto assets also pose financial stability challenges. This chapter discusses the implications of the expansion of the crypto ecosystem and provides an assessment of their associated financial stability risks. For emerging market and developing economies, greater use of crypto assets presents some benefits, but also macro-financial risks, especially with respect to asset and currency substitution—referred to in this chapter as *cryptoization*. The chapter concludes with a set of eight actionable policy recommendations. For readers less familiar with the terminology and developments, Online Annex 2.1 provides a brief description of the taxonomy of crypto assets as well as a brief primer on the crypto ecosystem.[2] The IMF has discussed many critical issues relating to regulatory frameworks with respect to crypto assets and digital money. Some topics that are not covered in detail in this chapter can be found in IMF (2020a) and IMF (2021) along with analysis of financial integrity issues,

The authors of this chapter are Parma Bains, Mohamed Diaby, Dimitris Drakopoulos (co-lead), Julia Faltermeier, Federico Grinberg, Evan Papageorgiou (co-lead), Dmitri Petrov, Patrick Schneider, and Nobu Sugimoto. The chapter was written under the supervision of Tobias Adrian, Fabio Natalucci, Dong He, and Aditya Narain.

[1]"Adoption" refers to the degree of use of crypto assets by users for transferring and storing value.

[2]A stablecoin is a type of crypto asset that aims to maintain a stable value relative to a specified asset or a pool of assets. Online Annex 2.1 offers more information on definitions. All online annexes are available at www.imf.org/en/Publications/GFSR.

such as anti–money laundering and combating the financing of terrorism (AML/CFT) (IMF 2020a; IMF 2020b); central bank digital currencies (CBDCs); and more (He and others 2016; Mancini-Griffoli and others 2018; IMF 2019).

Crypto Assets Continue to Grow through Ups and Downs

The market capitalization of crypto assets has grown significantly amid large bouts of price volatility. Through early May, the market capitalization almost tripled in 2021 to an all-time high of $2.5 trillion (Figure 2.1, panel 1). This was followed by a 40 percent fall in May as concerns from institutional holders about the environmental impact of crypto assets grew and global regulatory scrutiny of the crypto ecosystem escalated. The sharp declines during May were likely exacerbated by high use of leverage (Figure 2.1, panel 2), which led to automatic liquidations[3] of margin and futures positions by exchanges. Since then, the market value of crypto assets has increased again to more than $2 trillion—a 170 percent increase year to date at the time of writing.

Despite significant price appreciation, the returns of non-stablecoin crypto assets are less impressive when adjusted for volatility. For example, the risk-adjusted returns of Bitcoin over the past year are similar to the performance of broader technology equities or the S&P 500 (Figure 2.1, panel 3). However, investors are exposed to larger drawdowns. The relative attractiveness of these crypto asset returns can be higher when compared with other asset classes that also experience large drawdowns, such as local currency bonds and equities in some emerging market and developing economies with weak fundamentals. Another argument often put forward in favor of non-stablecoin crypto assets is their low correlation with other assets, offering diversification benefits to investor portfolios (see the April 2018 *Global Financial Stability Report*). Although this is true to some extent, the correlation between these crypto assets and some key asset classes increased significantly during recent episodes of market stress (for example the COVID-19 sell-off in 2020). The diversification benefit could also decline over time if there is continued involvement of institutional holders that are affected by common factors.

[3]Liquidations happen when investors do not meet margin requirements and exchanges automatically close the positions.

A key component of the rise in market capitalization is increasing investor interest in stablecoins; newer technologies, such as Ethereum; other "smart contract" blockchains; and decentralized finance.

- *Stablecoins:* Their market capitalization has quadrupled in 2021 to more than $120 billion (Figure 2.1, panel 4). Tether is the largest stablecoin, but its market share has declined sharply as major centralized crypto exchanges have introduced their own versions (for example, USD Coin by Coinbase and Binance USD by Binance). Stablecoin trading volumes outpace those of all other crypto assets (Figure 2.1, panel 5) primarily because they are highly usable for settlement of spot and derivatives trades on exchanges. The price stability for the top stablecoins continues to improve, as can be seen in the declining price deviations from the targeted 1:1 peg with the dollar and other currencies in 2021.[4] Their relative price stability has shielded users from the volatility of other crypto assets, which means they do not have to move their funds outside the crypto ecosystem.
- *Ethereum and other "smart contract" blockchains:* Bitcoin remains the dominant crypto asset, but its market share has declined sharply in 2021 from more than 70 percent to less than 45 percent. Market interest has grown for newer blockchains that use smart contracts and aim to solve the challenges of earlier blockchains by introducing features to ensure scalability, interoperability, and sustainability.[5] The most prominent is Ether, which surpassed Bitcoin trading volumes earlier in 2021 (Figure 2.1, panel 5).
- *Decentralized finance (DeFi):* The size[6] of DeFi grew from $15 billion at the end of 2020 to about $110 billion as of September 2021 (Figure 2.1, panel 6) largely due to the rapid growth of (1) decentralized exchanges that allow users to

[4]The pricing dynamics of stablecoins have been examined in several studies (see discussion in Lyons and Viswanath-Natraj 2020) that generally identify stablecoins as safe havens during periods of crypto asset turbulence.

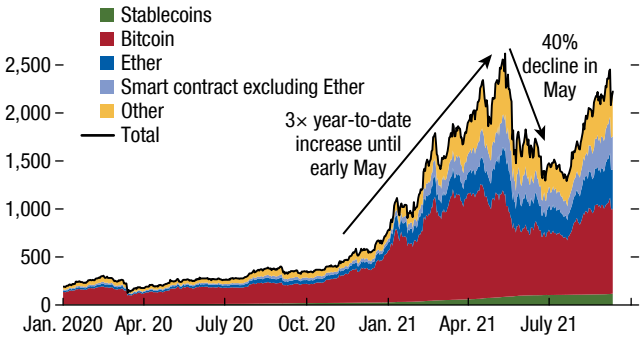
[5]*Scalability* refers to the ability to handle large transaction volumes. *Interoperability* is the ability to connect with other blockchains as well as off-chain data. *Sustainability* is the ability to scale in an environmentally sustainable way while retaining a robust governance structure.

[6]Size refers to the total value locked, or the total dollar value of all collateral deposited in DeFi platforms. The term "locked" is misleading, given that this collateral can be removed quickly by users. Moreover, collateral can be reused between platforms, inflating the overall total value locked.

Figure 2.1. Crypto Ecosystem Market Developments

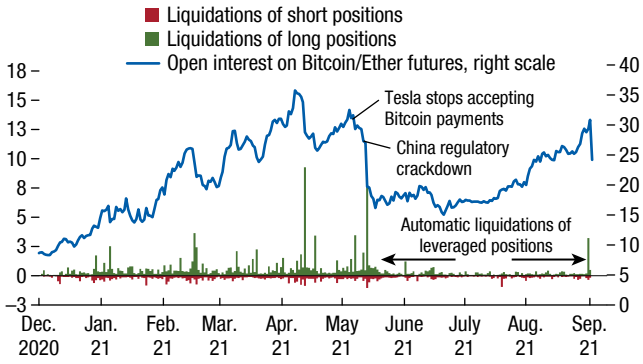
The market value of the ecosystem increased dramatically in 2021 and expanded beyond Bitcoin.

1. Market Capitalization for Crypto Assets
(Billions of US dollars)



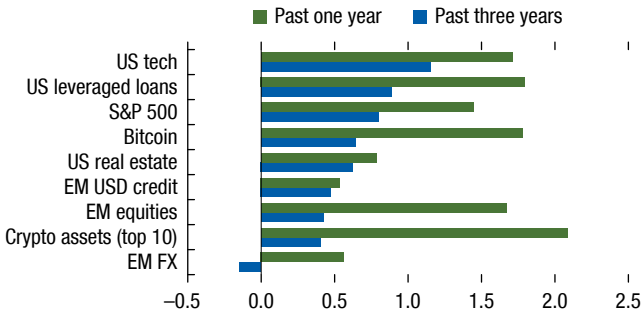
The April/May 2021 sell-off was accompanied by a sharp unwinding of leveraged positions from all-time highs.

2. Liquidations of Futures and Open Interest
(Billions of US dollars)



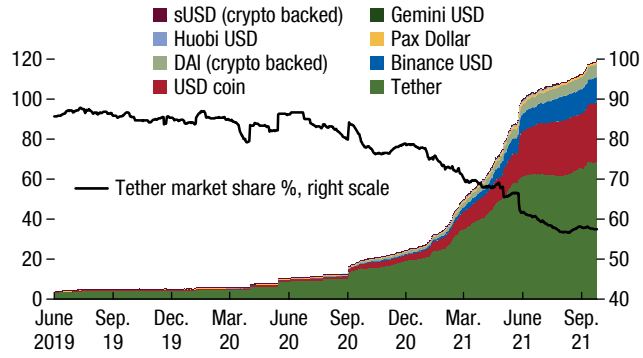
Risk-adjusted returns of non-stablecoin crypto assets are comparable to other mainstream benchmarks.

3. Risk-Adjusted Returns
(Sharpe ratio)



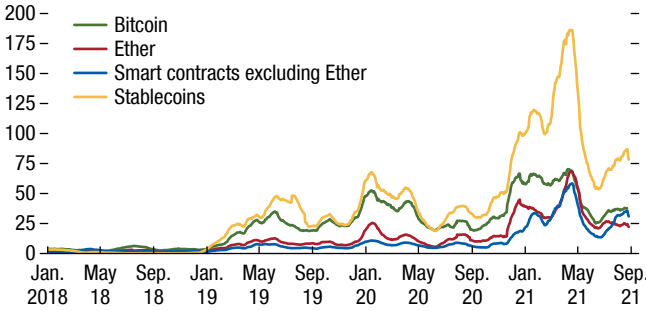
The market cap of stablecoins has quadrupled in 2021 while Tether's dominance has declined.

4. Stablecoin Market Capitalization
(Billions of US dollars and percent share)



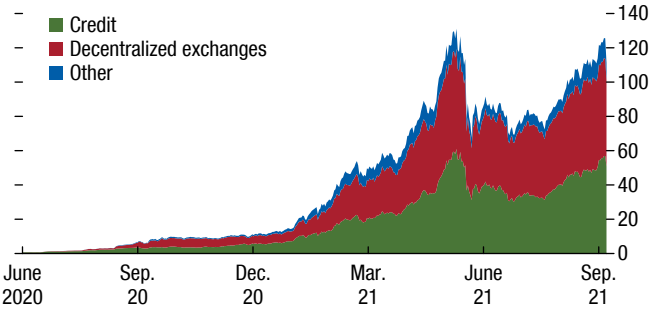
Trading volumes of stablecoins, Ether, and other smart contracts rose rapidly in 2021.

5. Daily Trading Volumes on Exchanges
(Billions of US dollars, 30-day rolling average)



The collateral "locked" in decentralized finance has risen sharply, led by decentralized exchanges and credit platforms.

6. Total Value Locked in Decentralized Finance
(Billions of US dollars)



Sources: Bloomberg Finance L.P.; Bybt; CoinGecko; CryptoCompare; DeBank; and IMF staff calculations.
Note: Liquidation data are provided by Bybt. Post–April 27 liquidations are likely to be underestimated, given changes in Binance's application programming interface that stopped real-time data feeds. In panel 3, Sharpe ratios are calculated on a rolling 12-month basis and annualized. EM = emerging market; FX = foreign exchange; USD = US dollar.

trade crypto assets without an intermediary and (2) credit platforms that match borrowers and lenders without the need for a credit risk evaluation of the customer (Figure 2.1, panel 6). These services operate directly on blockchains (usually) without customer identification requirements. Most of DeFi is built on the Ethereum blockchain and uses Ethereum-based tokens, including stablecoins. DeFi is also one of the main drivers of the rapid growth of stablecoins and warrants close attention. Chainalysis (2021b) highlights that DeFi users for now are primarily institutional players from advanced economies, whereas adoption among retail users and emerging market and developing economies in general is lagging.

What Are the Financial Stability Implications of Crypto Assets?

In October 2018 the Financial Stability Board concluded that crypto assets did not pose a material risk to global financial stability (FSB 2018) but identified several transmission channels that could change its assessment. These channels include risks from the size of market capitalization, investor confidence effects, risks arising from direct and indirect exposures of financial institutions, and risks from the use of crypto assets for payments and settlements.

Since then, some of these channels have grown notably, and new sources of risk have emerged.

- *Market capitalization* has grown by a factor of 10 and is now comparable to some established asset classes (for example US high-yield bonds). It is still small, however, compared with government bond and stock markets in major advanced economies.
- Episodes of *loss of confidence in crypto assets* so far have had limited spillovers to broader markets despite large fluctuations in crypto asset valuations. Confidence effects from failures of crypto asset providers have also been limited so far. However, their importance is rising as trading volumes in some countries' exchanges have increased dramatically and, in some cases, are comparable to the volumes of their respective domestic stock exchanges.
- *Exposures to crypto assets* in the banking system are growing, albeit from a low base. Exposures appear to be growing faster among some nonbank institutions, most notably hedge funds,[7] which can lead to increased indirect exposures of the banking system.
- The *use of crypto assets for payments and settlements* is still limited, with some exceptions (see the "Cryptoization" section). This channel can accelerate rapidly, given that several global payment companies have only recently started to integrate with the crypto ecosystem, in particular with stablecoins.

Finally, *new sources of risk* are emerging, such as stablecoins and DeFi, which did not exist on a large scale in 2018. In the future, a widely used stablecoin or DeFi service with a reach and use across multiple jurisdictions could scale up quickly and become systemically important.

Innovations that have given rise to the crypto ecosystem are significant and can create tangible benefits for countries, but the risks should be kept in check. At a global level, financial stability risks appear contained for now,[8] but the macro-criticality of crypto assets, and in particular stablecoins, can be significantly higher for some emerging market and developing economies where adoption has progressed fast. The next sections focus on the following issues (Table 2.1): (1) challenges from the crypto ecosystem arising from operational risks, market integrity, data availability, and cross-border activities; (2) stablecoin-specific issues linked to their design, use, and regulation and supervision at the domestic and global levels; and (3) macro-financial stability issues such as cryptoization, which are more prominent in emerging market and developing economies.

Challenges Posed by the Crypto Ecosystem

The rapid growth of the ecosystem has been accompanied by the entrance of new entities, some of which

[7]These are some examples: Coinbase reported that 10 percent of the 100 largest hedge funds were using their platform as of 2021:Q2; a Goldman Sachs (2021) survey shows that 15 percent of family offices have exposures to crypto assets, and close to half are potentially interested in initiating exposures.

[8]The April 2018 *Global Financial Stability Report* reached a similar conclusion about the macro-criticality of crypto assets at that time.

Table 2.1. Financial Stability Challenges

Crypto Ecosystem	• Operational, cyber, and governance risks • Integrity (market and AML/CFT) • Data availability/reliability • Challenges from cross-border activities
Stablecoins	• How stable are stablecoins? • Domestic and global regulatory and supervisory approaches
Macro-Financial	• Cryptoization, capital flows, and restrictions • Monetary policy transmission • Bank disintermediation

Source: IMF staff.
Note: AML/CFT = anti–money laundering/combating the financing of terrorism.

have poor operational, cyber risk management, and governance frameworks.[9]

- *Operational risks* can result in significant downtime when failures and disruptions prevent the use of services and even result in large losses of customer funds. Such risks have coincided with periods of high transaction activity and can result from poorly designed systems and controls. For example, on May 19, when liquidations of leveraged positions peaked, major exchanges reported outages, citing "network congestion."
- *Cyber risks* include high-profile cases of hacking-related thefts of customer funds. Such attacks take place on centralized elements of the ecosystem (for example, wallets and exchanges) but can also arise on the consensus algorithms that underpin the operation of blockchains.
- *Governance risks* involve the lack of transparency around issuance and distribution of crypto assets and have resulted in investor losses.

So far, losses as a result of such risks have not had a significant impact on financial stability, globally or domestically. However, as crypto assets grow, the macro-criticality of such risks is likely to increase. In addition, the crypto ecosystem remains exposed to concentration risks, given its large reliance on a few entities (for example, Binance handles more than half of trading volumes, and Tether has issued more than half the supply of stablecoins).

With limited or inadequate disclosure and oversight, the crypto ecosystem is exposed to consumer fraud and market integrity risks. Most crypto assets are highly volatile, speculative assets. One notable recent example was the increased investor interest in "meme tokens" (Figure 2.2, panel 1). Some of these tokens were created for speculation purposes, and their price was highly influenced by social media trends. Relatedly, investors are also likely to face losses from tokens ceasing to exist—something that is less common in regulated securities markets. For example, more than 16,000 tokens have been listed on various exchanges over time, but around 9,000 exist today.[10] Risks can be further amplified by the use of leverage offered in crypto exchanges, which has been as high as 125 times the initial investment. In response to such risks, many jurisdictions have taken action or issued public warnings over the past few months, such as the central banks of Argentina (BCRA 2021), Mexico (Banxico 2021), and Thailand (Thai SEC 2021), which prohibited exchanges from offering tokens with certain characteristics; others imposed regulatory limits or banned derivative products across several exchanges (for example, Japan FSA 2021; UK FCA 2020).

DeFi products can expose users to even larger risks. Products can be more complex and less transparent,

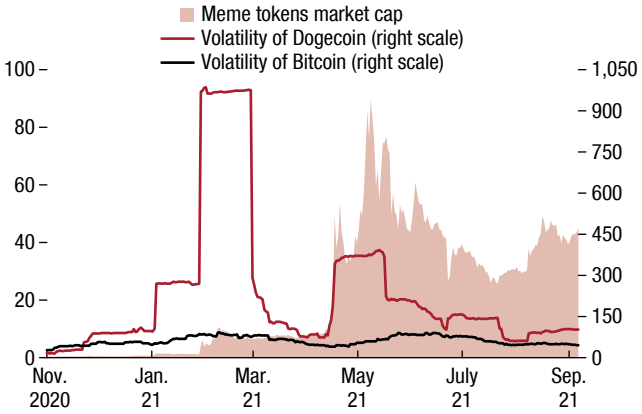
[9]Some notable examples include hacking thefts in Japan (Coincheck in 2018) and Singapore (KuCoin in 2019); the temporary closure of the Philippines Digital Asset Exchange in 2021, reportedly due to large unfunded transactions; the outright collapse of exchanges in Turkey in 2021 (Thodex, Vebitcoin), with claims of billions in stolen assets; and the sudden price collapse and rapid outflows amid flawed collateral management at Bitmex in 2020.

[10]This statistic is based on the number of tokens listed on www.CoinGecko.com.

Figure 2.2. Crypto Ecosystem Challenges

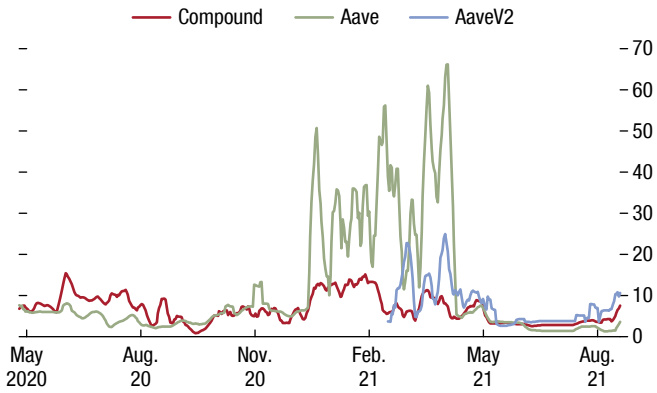
Highly speculative investments, such as meme tokens, experienced large volatility in 2021, even when compared with Bitcoin.

1. Market Capitalization and Realized Volatility (Billions of US dollars and percent)



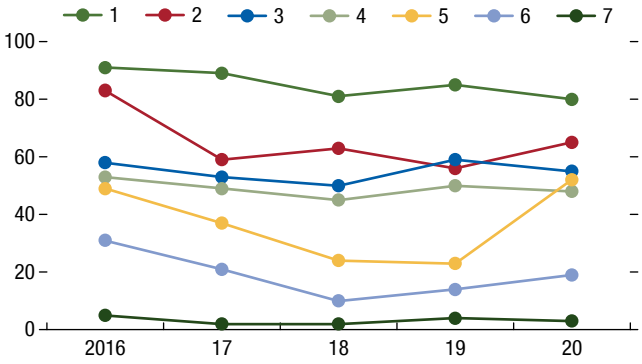
Decentralized finance platforms have been offering attractive but volatile interest rates to users.

2. Borrowing Rates of USD Coin Stablecoin (Percent)



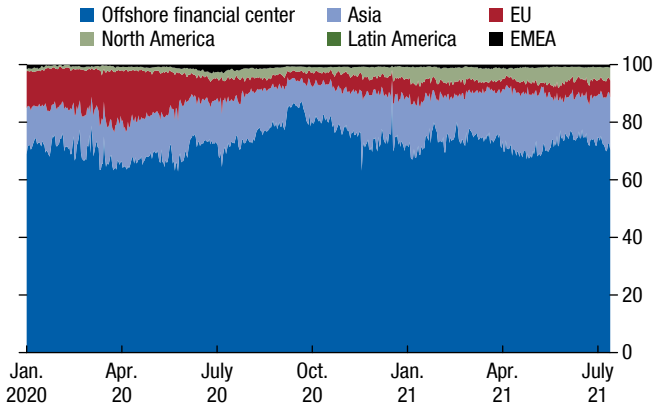
Data gaps can be significant when estimating on-chain activity.

3. Estimated Share of P2P Bitcoin Transactions, Based on Various Data Providers (Percent share)



Crypto exchange trading activity occurs primarily through entities in offshore financial centers.

4. Trading Activity of Exchanges, by Registration (Percent share)



Sources: CoinGecko; CryptoCompare; Debank; Financial Action Task Force; and IMF staff calculations.
Note: Panel 1 market capitalization is based on 10 meme tokens from CoinGecko. Panel 3 data come from the Financial Action Task Force (2021) report; the series represent different data providers. The offshore financial center definitions follow IMF (2000). EMEA = Europe, Middle East, and Africa; EU = European Union; P2P = peer to peer; USD = US dollar.

with large technological and governance risks arising from faulty computer code. The lack of central intermediaries complicates authorities' efforts to monitor and regulate these products. As a result, many DeFi products contain risk disclosures that do not adequately warn against their large and volatile returns[11] (Figure 2.2, panel 2). In addition, DeFi has been the victim of hacking, such as the record $0.6 billion hack of Polychain in August, and scams, such as *rug pulls*, in which developers abandon projects but keep investors' funds.

The anonymity of crypto assets and limited global standards create significant data gaps for regulators. Although authorities may be able to trace transactions that are executed on blockchains,[12] they may not be able to identify the parties to a transaction. In addition, the crypto ecosystem falls under varied regulatory

[11]The volatility and lack of disclosure are more prominent in complex products, such as "liquidity mining" (which is offered by decentralized exchanges and compensates users who provide liquidity to automated market makers) and "yield farming" (which aims to optimize returns for liquidity and collateral provision across DeFi services).

[12]One exception is "privacy tokens," which also conceal transaction data (for example, addresses, amounts).

frameworks across countries, which results in little or no monitoring and information sharing across jurisdictions. Despite some progress through the AML/CFT obligations for crypto asset providers set out by the Financial Action Task Force (FATF), their implementation is still at an early stage (FATF 2021), with notable delays in key areas such as the "travel rule."[13]

Monitoring the activity of crypto asset service providers is complicated by limited, fragmented, and, in some cases, unreliable data. Public data sharing by crypto asset providers is currently mostly voluntary and lacking standardization. For example, while most major crypto exchanges report their trading activity, the information content varies widely, ranging from minimal information to full real-time order books. In addition, given that data are self-reported, there are incentives to manipulate the reporting of higher volumes so as to rank higher on exchange rankings.

Analyzing on-chain[14] activity is also challenging, given that data analysis techniques are at an early stage. On-chain data analytics companies have so far focused on detecting illicit activities, as opposed to providing reliable macro-relevant metrics regarding on-chain activity. The FATF recently published a survey (FATF 2021) on the peer-to-peer (P2P) transactions of seven data companies in an attempt to detect the possibility that illicit P2P transfers are growing, given that such transfers are not explicitly subject to FATF standards. The survey shows large variation: one company estimated that 80 percent of the dollar value of Bitcoin transactions in 2020 occurred without a crypto asset provider, while another estimated it at only 3 percent (Figure 2.2, panel 3). The data also show large uncertainty regarding the illicit use of crypto assets, with no clear indication whether activities are moving toward P2P transactions—making it difficult to ascertain the full degree of illicit crypto asset use.

Crypto asset providers offer and market their services in many jurisdictions, which makes their regulation and supervision more challenging. They are often headquartered in jurisdictions with favorable regulatory, tax, and legal frameworks. For example, most transactions on crypto exchanges take place through entities that operate primarily in offshore financial centers (Figure 2.2, panel 4). In addition, many countries do not have conduct or prudential regulations in place that encompass the activities of crypto asset service providers. And even though some jurisdictions require some type of registration or authorization process, the scope of such regulations in many cases is limited to AML/CFT.

The absence of effective supervision and regulatory frameworks can create regulatory arbitrage and curtail enforcement. For example, users can access crypto assets through global crypto exchanges or wallets, even though these providers lack domestic banking relationships. The use of sovereign currencies on these platforms can occur through third-party payment processing companies taking advantage of regulatory loopholes. Some jurisdictions, such as Malaysia, Nigeria, and Turkey, recently imposed restrictions on payments and/or transactions through global exchanges, such as Binance. However, such actions cannot prevent on-chain transactions—for example, P2P transfers through online chat rooms or the use of decentralized exchanges (see the "Cryptoization" section).

Issues Specific to Stablecoins

The term "stablecoin" captures a very diverse set of crypto assets and can be misleading.[15] While all aim to anchor their value to a specific asset (typically the US dollar) or a group of assets, stablecoins can be classified across a spectrum, depending on the type and credit quality of their collateral backing as well as their price stabilization mechanisms (see Figure 2.3, panel 1, for the collateral composition of the four largest stablecoins):

- *Cash-based:* Fully backed by cash or liquid and safe assets (such as bank deposits and US government bills). These stablecoins are redeemable by the issuer at face value. Their reserves are normally maintained by regulated entities, such as onshore US banks, and they may also provide a higher level of transparency, such as detailed disclosure of reserve assets and clear documentation of redemption rights, including full segregation from other corporate assets.

[13]Under the "travel rule," crypto asset providers must obtain, hold, and exchange information about the originators and beneficiaries of crypto asset transfers.

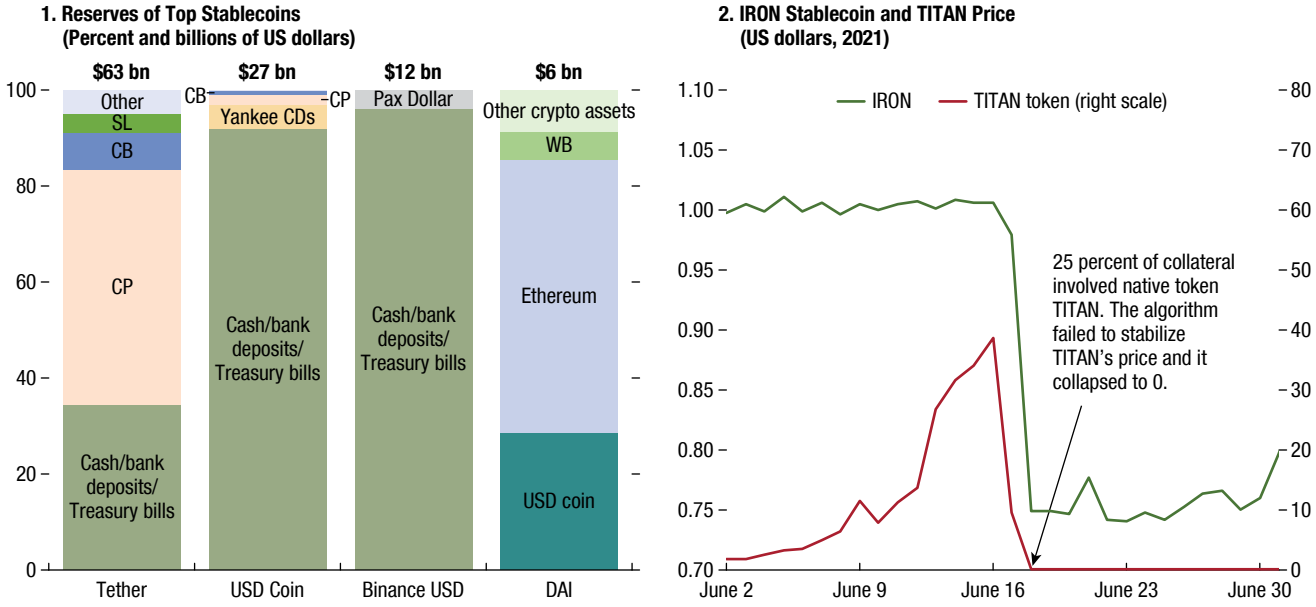
[14]On-chain transactions are recorded and verified on a blockchain. Off-chain transactions take place on a specific platform (for example, a crypto exchange) and not on the blockchain.

[15]For example, the latest consultation of the Basel Committee on Banking Supervision (2021) proposes that the capital requirements for stablecoin exposures be based on a set of conditions that include (1) the regulatory and supervisory status of the entities performing key functions and (2) the effectiveness of the price stabilization mechanism. The so-called stablecoins backed by other crypto assets and algorithms are not deemed to meet the stabilization condition.

Figure 2.3. Stablecoins

Stablecoins vary considerably with respect to their reserve composition.

An algorithmic stablecoin experienced a "bank run" in June as part of its collateral collapsed in value.



Sources: CoinGecko; and company websites.
Note: Panel 1 reserves data are as of June 2021 for Tether, August 2021 for USD Coin, July 2021 for Binance USD, and August 2021 for DAI. At the time, DAI collateralization was more than 200 percent, while the other stablecoins had assets whose value was at least equal to their outstanding issuance. USD Coin consolidates cash and cash equivalents in its disclosure (accounting for about 60 percent of reserves), with cash equivalents defined as securities with an original maturity less than or equal to 90 days, in line with US generally accepted accounting principles. Circle announced that, as of September 2021, 100 percent of USD Coin reserves would be moved to cash and cash equivalents. Binance USD is issued in collaboration with Paxos, with 4 percent of its reserves in Pax Dollar (USDP), a separate native stablecoin of Paxos with under $1 billion in outstanding supply, itself secured by Treasury securities and Federal Deposit Insurance Corporation–insured bank deposits. bn = billion; CB = corporate bonds; CDs = certificate of deposits; CP = commercial paper; SL = secured loans; USD = US dollar; WB = wrapped bitcoin.

- *Asset-based:* Fully backed by noncash equivalent assets (for example, corporate bonds, commercial paper, or commodities) and cash. These stablecoins are akin to money market funds prior to the reforms that followed the global financial crisis. Issuers and exchanges may market these stablecoins as immediately redeemable at face value, but in some cases—especially during periods of market stress—some issuers may be able to defer redemption, offer in-kind redemption, or impose higher redemption fees.
- *Crypto-asset-based:* Backed by other crypto assets. For example, DAI is (over-) collateralized by a portfolio of crypto assets, such as Ether, Bitcoin, and USD Coin. These stablecoins are usually structured on a decentralized, noncustodial basis and are considered part of DeFi. A further category comprises "algorithmic" stablecoins (also referred to as "noncollateralized") that aim to maintain their peg using algorithms that increase or decrease the supply of tokens according to market conditions.

The regulation of stablecoins varies substantially across jurisdictions, inviting concerns about regulatory gaps, inconsistent regulatory treatment, and regulatory arbitrage.[16] The following are three categories of regulation:

- *Comprehensively regulated:* Currently, no stablecoin arrangement fully meets this status.[17] An example of such a stablecoin would be one issued by a commercial bank, subject to comprehensive prudential, conduct, and governance requirements.
- *Partially regulated by existing regimes:* Elements of stablecoin arrangements (for example, for reserve managers) are regulated for conduct and prudential purposes or for limited purposes (for example, AML/CFT).

[16]It is also worth noting that some widely adopted stablecoins can also become a vehicle for money laundering and terrorism financing (FATF 2020).

[17]"Arrangement" refers to all functions behind the stablecoin, including its governance body, reserves manager, exchange selling it to clients, and so on. See FSB (2020) for a full definition.

Some stablecoin issuers, such as trust companies and money transmitters, have been licensed and regulated by the existing regulatory frameworks in the United States. Regulators may be able to access information, but regulatory tools may be limited and unable to address all the risks of stablecoin issuers. Furthermore, some exchanges and wallet providers that support stablecoins may fall only under AML/CFT requirements, while some reserve managers and custodians may be regulated entities.

- *Nonregulated:* No prudential or conduct regulation of stablecoin arrangements. Many regulators are still in the process of developing applicable regulations, as many stablecoins currently fall into this category. Some US dollar stablecoin issuers that have chosen to be headquartered offshore and operate through offshore banks are nonregulated.

Currently, many stablecoins suffer from poor disclosure. Although stablecoin issuers are improving in this regard, there is a need for substantial upgrades to meet the same level of disclosure standards as commercial banks and money market funds. For example, Tether, the world's largest stablecoin by market capitalization, has disclosed the composition of its reserve assets. However, such disclosure is not yet audited by independent accountants, and some important information is still missing, including domicile, denomination of currencies, and sector of commercial paper holdings.

Moreover, the recent disclosure by Tether reveals a higher degree of liquidity mismatch than for other major stablecoins. Even though Tether allows direct and "immediate" 1:1 redemption for US dollars for a small fee, only one-third of its reserves are backed by cash and Treasury bills; about half is invested in commercial paper.

Some stablecoins can be subject to runs, with repercussions for the financial system. This could be driven by doubts about their redeemability at a 1:1 peg due to the value of their reserves or the speed at which reserves can be liquidated to meet potential redemptions. In June 2021 a small algorithmic stablecoin (IRON) experienced a run (Figure 2.3, panel 2) as one-quarter of its reserves were backed by another token (TITAN) whose market value went to zero. Even if stablecoins are, for the time being, not large enough to be deemed "systemic," there are financial stability implications for large banks in the event of fire sales of the assets that back stablecoins. An investor run in one country can also lead to cross-border spillovers if large global crypto exchanges are involved. The concentrated ownership of stablecoins by market makers could also trigger wider contagion.

Run risks could also trigger a fire sale of commercial paper. In many jurisdictions, including the United States, the liquidity of commercial paper is worse than that of other short-term assets, such as government bills, especially during periods of market stress (as seen during the COVID-19 sell-off in 2020). The contagion risk can be much higher where reserve assets are concentrated in particular issuers or sectors. Although this risk might be Tether-specific for now, given its size and types of holdings, this kind of contagion risk could evolve for other stablecoins in the future.

Cryptoization

Crypto adoption in some emerging market and developing economies has outpaced that of advanced economies. According to a recent survey, the top five countries using or owning crypto assets in 2020 were emerging market and developing economies, whereas the lowest adopters were generally advanced economies (Statista 2021).[18] Another recent survey (Finder 2021), with a more limited set of countries, also reaches similar conclusions, placing emerging market economies in Asia among the top and advanced economies, such as the United Kingdom and the United States, among the bottom. Some emerging market country-specific surveys also show a large jump in adoption over the past year.[19]

Beyond surveys, tracking country-specific adoption can be challenging. So far, there is no reliable way to estimate the stock or flow of crypto assets based on country residency. A commonly used proxy is residency estimates based on internet visits to websites of crypto asset providers. These confirm the survey data to show the popularity of several global crypto exchanges among emerging market and developing economies (Figure 2.4, panel 1), but they cannot measure the actual use of crypto assets. Another metric is the size

[18]The Statista survey is based on a relatively limited sample of 1,000–4,000 respondents a country among a group of 74 countries.

[19]The Finder survey is based on 42,000 people across a sample of 27 countries that excludes many emerging markets. Examples include local surveys in Turkey (CoinTelegraph 2021) and Indonesia (Tokenomy 2021), as well as estimates of volumes in crypto exchanges in Brazil (CoinDesk 2021) and Thailand (Bloomberg 2021).

Figure 2.4. Cryptoization Risks

EMDE residents are among the top visitors of major crypto exchange websites.

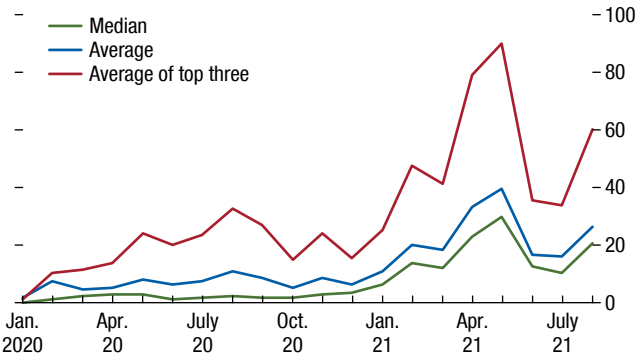
1. Geographic Breakdown of Internet Visitors (Unique visitors, October 2020–June 2021)

Economies	BINANCE	HUOBI	COINBASE	KRAKEN	FTX	BITHUMB	BITFINEX
Top economy 1	Turkey	China	United States	United States	Turkey	Korea	Russia
Top economy 2	Russia	Ukraine	United Kingdom	Germany	Korea	Russia	Taiwan Province of China
Top economy 3	United Kingdom	Vietnam	Spain	France	China	Turkey	Germany
Top economy 4	Brazil	United States	Germany	United Kingdom	Taiwan Province of China	United States	Ukraine
Top economy 5	Argentina	Russia	France	The Netherlands	Hong Kong SAR	Poland	Brazil

Exchange

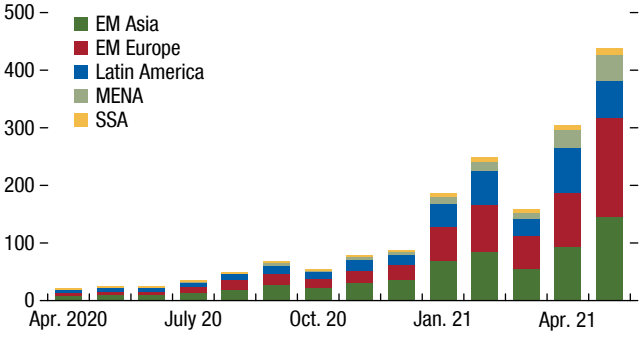
Volumes in local exchanges have grown rapidly and are comparable to some equity markets.

2. Volumes of EMDE Registered Crypto Exchanges (Percent share of local equity exchange volumes)



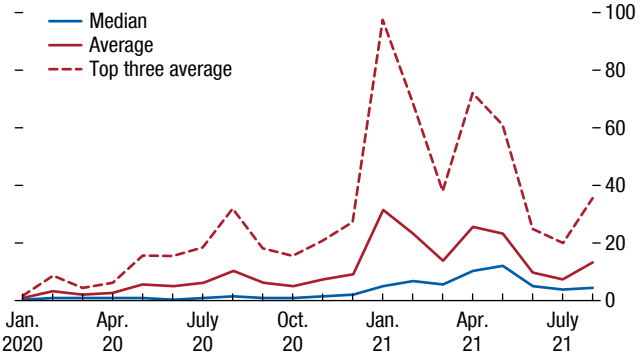
The amount of value received on-chain has grown rapidly by some estimates.

3. Value Received On-Chain among 50 EMDEs (Percent of GDP)



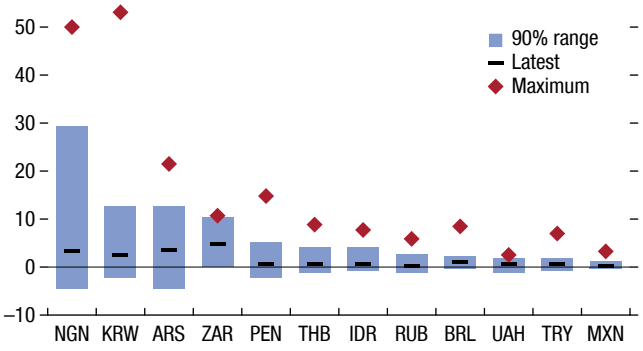
Off-chain trading volumes against some EMDE FX pairs have shown large volatility in 2021.

4. Volumes of EMDE FX on Crypto Exchanges (Share of interbank FX volumes)



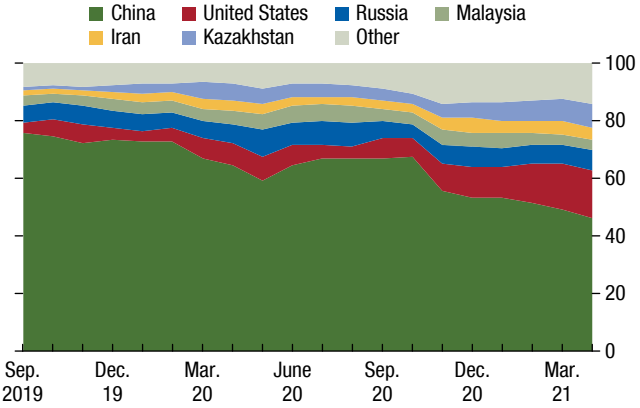
Demand and supply imbalances and capital flow management measures can lead to large market segmentation.

5. Bitcoin Premiums in Local Currency Markets (Percent deviation since 2018)



The migration of crypto mining can lead to higher electricity usage and on-chain revenues in EMDEs.

6. Bitcoin Mining Activity by Country (Share of global hashrate)



Sources: Bloomberg Finance L.P.; Cambridge Centre of Alternative Finance; Chainalysis; Cryptocompare; Kaiko; Similarweb; and IMF staff calculations.
Note: Samples for panels 2 and 4 comprise 10 countries. Panel 3 is based on residency estimates from Chainalysis. In panel 5, the Bitcoin premium is calculated as (Bitcoin/LCL × LCL/USD) / (Bitcoin/USD) – 1, in which LCL is the local currency on the *x*-axis. For Nigeria and Argentina, a parallel FX-rate estimate is used. Data labels use International Organization for Standardization (ISO) currency codes. Hashrate measures the computing power used in crypto mining. EMDE = emerging market and developing economy; FX = foreign exchange; MENA = Middle East and North Africa; SSA = sub-Saharan Africa; USD = US dollar.

of trading volumes of crypto exchanges that operate only in specific countries rather than globally. Among a sample of such exchanges in emerging market and developing economies, the reported traded volume in 2021 rose sharply and, in some cases, volumes have become comparable to the activity on the local stock exchange (Figure 2.4, panel 2).[20] Finally, some blockchain analytics companies (for example Chainalysis 2020; Chainalysis 2021a) attempt to infer the residency of on-chain crypto asset flows. Similar to surveys, their data show that adoption in emerging market and developing economies is rising and has outpaced that in advanced economies, but the interpretation of the data poses significant challenges (Figure 2.4, panel 3).[21]

There are several driving forces for cryptoization. Unsound macroeconomic policies combined with inefficient payment systems in some emerging market and developing economies boost crypto adoption. Some potential pull factors for crypto adoption, such as speculative retail investing, may be common across countries (Table 2.2), but some of the recent drivers are likely more specific to a subset of emerging market and developing economies. For example,

- Weak central bank credibility and a vulnerable banking system can trigger asset substitution as domestic residents seek a safer store of value. Dollarization[22] pressures are a persistent risk for several emerging market and developing economies.[23] The crypto ecosystem can help domestic residents convert some of the headwinds of traditional dollarization—such as exchange rate restrictions and challenges in accessing and storing foreign assets—into tailwinds. For example, global crypto exchanges or other less secure methods, such as P2P transfers, can be used to bypass capital flow management measures; private wallets can act as a form of offshore bank account to store wealth.
- Inefficiencies in payment systems and limited access to financial services can also be a driver of dollarization. One prominent example of inefficiencies is the lack of interoperability among various domestic payment systems, which can be a problem for remittances as well as trade.[24] Given the large share of unbanked people in some emerging market and developing economies, remittances often take place through cumbersome cash-based methods, such as those of post offices and other transfer operators. The payment rails of crypto assets can make some of these services faster and cheaper, especially through the integration of stablecoins, which allow for a stable unit of account. Of course, such gains rely on access to the internet and other technologies, which are scarce in many countries.

Table 2.2. Pull and Push Factors Related to Crypto Adoption

Potential Adoption Drivers for Emerging Market Users
Pull Factors
Returns from speculative investment
Relative transaction costs and speed
Competitive financial products
Reduced AML/CFT standards
Convenience of "on-chain" custody
Push Factors
Unsound domestic macro policies
FX restrictions
Vulnerable banking sector
Exclusion from other financial services

Source: IMF staff.
Note: AML/CFT = anti–money laundering/combating the financing of terrorism; FX = foreign exchange.

Macro-financial challenges depend critically on the degree of adoption.

- A *limited degree of adoption*—for example, small-scale use of crypto assets for remittances—will pose some of the challenges discussed earlier (see the "Challenges Posed by the Crypto Ecosystem" section) but will have a marginal impact on monetary policy or capital flows. Even when crypto payment rails are used, the underlying crypto assets will likely

[20]The presence of multiple exchanges quoting the same trading pairs could lead to double counting, as a buyer on one exchange can be a seller on another.

[21]For example, large volumes might result from on-chain transfers between wallets of crypto asset providers rather than increased use of crypto assets by retail users. In addition, residency-based estimates usually rely on web traffic data, which can be compromised by the use of technologies that mask online activity, hence reducing their accuracy.

[22]Dollarization here refers to the de facto adoption of a foreign currency (not necessarily the dollar) or asset that displaces the domestic currency, driven by the preferences of the economy's residents. The primary driver of the adoption can be a new means of payment and unit of account (currency substitution) or a safer store of value (asset substitution).

[23]For example, among a sample of 65 emerging market and developing economies that are not de jure dollarized, 2020 data showed that about one-third have foreign currency exceeding 30 percent of both total loans and deposits.

[24]See the discussion in IMF and BIS (2021) for some well-known issues with international remittances. Chainalysis (2020) discusses the increasing use of crypto assets for remittances and trade.

be held for only a short time (for example, the duration of the remittance) before users exchange them for local currency to make purchases domestically.

- *More extensive degrees of adoption*[25]—such as the adoption of stablecoins[26] as means of payment and store of value—can pose more significant challenges by reinforcing dollarization forces in the economy. Dollarization can impede central banks' effective implementation of monetary policy and lead to financial stability risks through currency mismatches on the balance sheets of banks, firms, and households. This can be further amplified by liquidity risks, as central banks are not able to provide liquidity backstops in foreign units of account (IMF 2020a). Cryptoization could moreover pose a threat to fiscal policy: crypto assets can facilitate tax evasion, and seigniorage revenue may also decline due to the shrinking role of central bank money in the economy.

The adoption of a crypto asset as the main national currency carries significant risks and is an inadvisable shortcut. Adrian and Weeks-Brown (2021) discuss such risks to macro-financial stability, financial integrity, consumer protection, and the environment. For now, the probability of such a scenario occurring due to a choice of households and businesses is low for most countries, given that the value of non-stablecoin crypto assets is too volatile and unrelated to the real economy to become the main unit of account. Such a scenario, however, could arise in countries with weak monetary and exchange rate policies where the risks associated with the use of volatile crypto assets is still a relative improvement over existing policies.

Increased demand for crypto assets could facilitate capital outflows that affect the foreign exchange market. Crypto exchanges play the crucial role of facilitating the conversion of local currency to crypto assets and vice versa. The natural[27] demand and supply for conversions can easily become unbalanced over the 24/7 trading period of crypto asset markets. For markets to clear, some market makers must provide liquidity by trading more liquid pairs (such as US dollar–Bitcoin and US dollar–local currency) to determine the price of the less liquid pair (local currency–Bitcoin). This type of triangular arbitrage is usually facilitated by institutional participants that have access to larger pools of liquidity in markets that do not include domestic retail participants (for example, offshore funding markets). In periods when domestic demand for crypto assets rises substantially, these institutional participants can act as gateways for conversion of crypto asset demand to capital outflows through the exchange rate market. The recent sharp rise in trading volumes of crypto assets against some emerging market and developing economy currencies (Figure 2.4, panel 4) may have been the source of spillovers in the exchange rate market that led to recent restrictions imposed by authorities.

Policy measures can be somewhat effective at ring-fencing the impact of rising crypto asset demand in the foreign exchange market. Capital flow management measures and other crypto-asset-specific measures can have a notable impact in terms of creating market segmentation (see Makarov and Schoar 2020). For example, in Korea, Bitcoin purchases had premia as high as 50 percent in 2018 due to strong domestic demand and restrictions that kept arbitrage activities at bay (Figure 2.4, panel 5).[28] However, such restrictions on crypto asset trading may trigger new leakages as trading moves away from exchanges and over to peer-to-peer[29] and other less formal or less visible channels (such as chat rooms on the instant messaging system Telegram).

A migration of "mining" activity to emerging market and developing economies can also have serious implications for capital flows as well as for energy consumption. Validating on-chain transactions for many crypto assets is done by so-called proof-of-work or mining, whereby members of the network solve a complex mathematical problem using computing power. Following a crackdown on mining activity in China in early 2021, mining activity started to migrate to other emerging market and developing economies and to the

[25]A challenge that is not covered in this chapter is the capacity of blockchains to process large amounts of payments in an economy, given their scalability problems; more recently, some newer technologies (such as layer 2 networks) have made it more feasible to solve such problems.

[26]Compared with other volatile crypto assets, stablecoins are likely to be a more desirable store-of-value, given their link to a familiar unit of account (usually the US dollar) and such features as anonymity and access to DeFi.

[27]For example, natural sellers can be recipients of remittances, while buyers can be speculators that want to position for a rally in Bitcoin.

[28]Korea is classified as an advanced economy, but its relatively large crypto ecosystem offers meaningful lessons.

[29]For example, Binance has increased its presence in P2P markets in Africa, and other P2P platforms, such as Paxful, have seen a notable increase in volumes there.

United States (Figure 2.4, panel 6). This movement can have important implications for

- *Energy consumption:* Miners use electricity to power their hardware. By some estimates, mining in the Bitcoin network consumes about 0.36 percent of the world's electricity—comparable[30] to the consumption of Belgium or Chile. Large migration of mining activity can lead to a significant rise in domestic energy use, especially in countries that subsidize energy costs. However, future generations of Ethereum and other smart blockchains are expected to consume much less energy than Bitcoin.
- *Capital flows:* Miners are rewarded for their activities on-chain in the form of crypto assets. For example, the value of mining revenues in 2021 has exceeded $1 billion a month, on average, for each of the Bitcoin and Ethereum blockchains. Mining revenue can potentially be used to circumvent capital flow restrictions as well as international financial sanctions, given that the main operating costs of miners (for example, electricity) are normally paid domestically in local currency, but their revenues are paid on-chain in the form of crypto assets.

The banking sector can also come under pressure if the crypto ecosystem becomes an alternative to domestic bank deposits or even loans. Stronger competition for bank deposits through stablecoins held on crypto exchanges or private wallets may push local banks toward less stable and more expensive funding sources to maintain similar levels of loan growth. Beyond the direct loss in net interest income, a loss of customer relationships and data on transactions would also undermine credit risk assessment for clients and their ability to offer targeted products to clients.

Policies to Ensure Macro-Financial Stability

Fintech innovation, including the crypto ecosystem, has the potential to improve fundamental aspects of the macroeconomy with better financial services and greater financial inclusion, especially in emerging market and developing economies. Policymakers need to balance enabling financial innovation and reinforcing competition and the commitment to open, free, and contestable markets, on one hand, against challenges to financial integrity, consumer protection, and financial stability. As a first step, regulators and supervisors need to be able to monitor rapid developments and the risks they create. Depending on country circumstances, various forms of crypto assets may be adopted, and their economic functions may vary. Different countries have different policy priorities arising from the degree of crypto adoption and their existing vulnerabilities. For example, the risks connected with adoption for transaction purposes differ from those arising from widespread use as a store of value or a new unit of account. Risks to financial integrity are high from crypto assets operating on anonymous platforms, but they may be addressable for some stablecoins.

This chapter offers policy recommendations relating to three main areas: (1) regulation, supervision, and monitoring of the crypto ecosystem; (2) stablecoin-specific risks; and (3) managing the macro-financial risks in emerging market and developing economies. Table 2.3 summarizes the policy advice that builds on findings presented in this chapter and other IMF work (IMF 2019; IMF 2020a; IMF 2021).

Table 2.3. Main Policy Recommendations

Standards, Supervision, and Data	• National regulators should prioritize the implementation of global standards applicable to crypto assets • Regulators need to control the risks of crypto assets, especially in areas of systemic importance • Coordination among national regulators is key for effective enforcement and less regulatory arbitrage • Regulators should address data gaps and monitor the crypto ecosystem for better policy decisions
Stablecoins	• Regulations should be proportionate to the risk and in line with those of global stablecoins • Coordination is needed to implement recommendations in areas of acute risk; enhanced disclosure, independent audit of reserves, fit and proper rules for network administrators and issuers; and more
Managing Macro-financial Risks	• Enact de-dollarization policies, including enhancing monetary policy credibility; a sound fiscal position; effective legal and regulatory measures; and the implementation of central bank digital currencies • Capital flow restrictions need to be reconsidered with respect to their effectiveness, supervision, and enforcement

Source: IMF staff compilation.

[30]For a discussion of the merits of these types of comparisons of energy usage, see https://cbeci.org/cbeci/comparisons.

Standards, Supervision, and Data

National regulators should prioritize the implementation of complete global standards applicable to crypto assets. Although standards applicable to crypto assets are currently limited to AML/CFT (FATF) and proposals on the exposure of banks to crypto assets (BCBS), other standards—such as those of the International Organization of Securities Commissions (IOSCO) and the Committee on Payments and Market Infrastructures' Principles for Financial Market Infrastructures (CPMI/PFMI)—provide a robust groundwork for regulation and supervision of crypto assets.[31] For example, standards regarding the powers and independence of supervisors, operational resilience, disclosure, and governance have existed for some time, but still lack adequate implementation. If crypto exchanges deal with tokens that meet the definition of securities, those entities should be subject to existing international standards for securities intermediaries. All jurisdictions should implement such standards. Globally, policymakers should prioritize making cross-border payments faster, cheaper, more transparent and inclusive through the G20 Cross Border Payments Roadmap (G20 2020). The IMF can support such efforts through Financial Sector Assessment Programs and technical assistance.

Robust and globally consistent standards are needed to mitigate financial stability risks. Where standards have not yet been developed, regulators need to use existing tools to control risk and implement a flexible framework for crypto assets. The growing systemic implications of crypto assets may indeed warrant immediate regulatory action in some countries. Regulators must use existing measures and international standards by focusing on areas of acute risk, such as wallets, exchanges, and financial institutions' exposures. Authorities should ensure that the regulatory framework is flexible enough to be adjusted in the future, in line with forthcoming international standards. Interim measures should be taken, including clear consumer warnings and investor education programs, especially where crypto adoption has been fast, such as in some emerging market and developing economies.

National regulators should enhance cross-border coordination of supervision and enforcement actions. For example, because it is difficult to implement and enforce an adequate regulatory framework, some authorities have taken strong actions, such as banning unregulated crypto asset activities. Although bans can have a direct impact on the business of crypto exchanges, individuals are still likely to be able to trade and exchange crypto assets by alternative means. Therefore, jurisdictions should actively coordinate with the relevant authorities and international standard-setting bodies to maximize the effectiveness of their enforcement actions and minimize regulatory arbitrage. Greater cross-border collaboration can enhance enforcement actions, but the resources needed for such enforcement may present a greater challenge for emerging market and developing economies.

Swiftly tackling data gaps is central to inform policy decisions. Greater data standardization can lead to better oversight of new developments and a more accurate understanding of risks and can support proportionate regulation of crypto asset markets. In that regard, an international agreement on common minimum principles for data should be developed. A globally consistent taxonomy can help data standardization and cooperation. There is also scope for international coordination on compilation and sharing of data sources from private companies for regulatory and public policy purposes.

Stablecoins

Stablecoins require regulations proportionate to their risk and the economic functions they serve, taking into account recommendations put forward by the Financial Stability Board, which recently finalized 10 high-level recommendations comprehensively covering requirements—such as governance, risk management, transparency, and redemption rights—with the underlying principle of "same business, same risk, same rules." As a matter of priority, authorities should ensure that widely used stablecoins have effective risk management frameworks with regard to credit and liquidity risks as well as operational, AML/CFT, and cyber risks, among others. Regulation and supervision of stablecoins could be enhanced through cooperation agreements between country authorities that consider the various types of risks stablecoins pose for each country. Certain US dollar–linked stablecoins seek to base their operations in chartered banks in the United States. Meeting banking license requirements would resolve many regulatory challenges.

[31]The IMF has previously highlighted the relevance of existing underlying principles of financial regulation that are applicable to crypto assets (see Cuervo, Morozova, and Sugimoto 2020).

There are areas of acute risk in stablecoin arrangements that require more immediate attention. Various functions, including reserves management, network administration and governance, custody, and exchange services, can generate risks to consumer protection, financial stability, market and financial integrity, and operational and cyber resilience. Authorities should consider measures—such as enhanced disclosure requirements, independent audit of reserves, fit and proper rules for network administrators and issuers, and rules around enhanced operational and cyber resilience—to reflect the increased reliance on digital platforms and various types of distributed ledger technology. Where stablecoins generate systemic risk, their regulatory obligations should reflect this position, with rules aligned with traditional entities that provide similar products (for example, bank deposits, digital payments, money market funds, and so on).

Managing Macro-Financial Risks

Reversing or averting dollarization requires strong macroeconomic policies, but these may not by themselves be enough. Crypto assets on their own do not change the economic forces that lead to the international use of currencies or increased dollarization. Yet the technological advance of the crypto ecosystem, and especially stablecoins, could reinforce the incentives behind currency and asset substitution and ease adoption. Hence, the tolerance for policy missteps is greatly reduced (IMF 2020a). Countries that want to fend off dollarization will need to strengthen monetary policy credibility, safeguard the independence of central banks, and maintain a sound fiscal position along with effective legal and regulatory measures to disincentivize foreign currency use. Similarly, although simply issuing central bank digital currencies does not automatically change the incentives to hold foreign currencies, central bank digital currencies may help reduce dollarization if they help satisfy a need for better payment technologies. A number of countries have launched similar projects to modernize their payment systems, taking advantage of the latest developments in digital technology and using the domestic currency for instant payments.

The design of capital flow restrictions in a digital world needs to be reconsidered, including via stablecoin regulations. Applying established regulatory tools to manage capital flows may be more challenging when value is transmitted on new platforms that are not bound by existing capital flow management measures (IMF 2021). Because of the way private entities organize or relocate their activities, the effectiveness of regulation, supervision, oversight, and enforcement of capital flow management measures faces challenges at jurisdictional levels. Therefore, there is a need for cross-border collaboration and cooperation to address the technological, legal, regulatory, and supervisory challenges (IMF 2021; IMF and BIS 2021). In particular, the host authorities where stablecoins are more widely used should be encouraged to establish a close coordination mechanism with the home regulator where stablecoin reserves are managed.

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CHAPTER 3

INVESTMENT FUNDS: FOSTERING THE TRANSITION TO A GREEN ECONOMY

Chapter 3 at a Glance

- The sustainable investment fund sector can be an important driver of the global transition to a green economy but, at the current juncture, is too limited in size and scope to have a major impact and faces challenges related to greenwashing.
- Total assets under management of sustainable investment funds are small but growing rapidly, more than doubling over the past four years to reach $3.6 trillion in 2020. However, climate-oriented funds accounted for only $130 billion of that total.
- Flows into sustainable funds appear to support climate stewardship and encourage the issuance of securities by firms with a more favorable sustainability rating.
- Sustainable investors could also bring financial stability benefits as they are less sensitive to short-term returns.
- Climate-related news has not had a meaningful impact on investment fund returns and flows in the past, but large and sudden transition risk shocks could be disruptive in the future.
- A survey of asset managers suggests that lack of adequate data is a key obstacle to implementing sustainable investment strategies.
- For the sustainable fund sector to become an effective driver of the transition, policymakers should:
  - Urgently strengthen the global climate information architecture (data, disclosures, sustainable finance classifications including climate taxonomies) both for firms and investment funds.
  - Ensure proper regulatory oversight to prevent greenwashing.
- After those elements are in place, tools to channel savings toward transition-enhancing funds (such as financial incentives for investments in climate-oriented funds) could be considered to complement other critical climate-change-mitigation measures, such as a carbon tax.
- To mitigate potential financial stability risks stemming from the transition, policymakers should implement a climate policy consistent with an orderly transition and conduct scenario analysis and stress testing of the investment fund sector.

Introduction

The forthcoming 26th United Nations Climate Change Conference of the Parties (COP26) presents a pivotal opportunity to speed up the transition to a low-greenhouse-gas economy and avoid catastrophic climate change. Global warming resulting from greenhouse gas emissions (especially carbon dioxide from fossil fuels) is an existential threat. To reach the objective of limiting global warming to well below 2°C by 2100, as set out during the Paris conference six years ago, a global transition to a low-greenhouse-gas ("green") economy is required over the next three decades (IPCC 2021). In recent years, the costs of adopting technologies to facilitate the transition have been declining, making such technologies increasingly competitive.[1] Moreover, a growing number of governments have committed to net-zero domestic greenhouse gas emissions by the middle of this century to achieve the transition. Yet emissions continue to rise, and under current policies global warming is expected to miss the Paris Agreement goal by a wide margin

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[1]For example, IRENA (2021) documents that renewables are increasingly the lowest-cost source of electricity in many markets.

(Climate Action Tracker 2021). In this regard, COP26 could be a watershed moment for much needed global climate policy actions to reverse the trend of growing emissions and mitigate climate change.[2]

A successful transition demands a deep economic transformation, requiring the mobilization of private finance on a large scale. According to estimates, achieving net-zero carbon emissions by 2050 will require additional global investments in the range of 0.6 to 1 percent of annual global GDP over the next two decades, amounting to a cumulative $12 trillion to $20 trillion (IEA 2021; IMF 2021a).[3] These investments would need to be oriented away from the fossil fuel sector and toward renewables as well as toward low-emissions solutions within sectors. A green investment push is thus essential and urgent to facilitate the transition (see the October 2020 *World Economic Outlook*).

The global financial sector can play a crucial role in catalyzing private investment and accelerating the transition. In recent years, sustainability considerations encompassing environmental, social, and governance concerns have been increasingly embedded in investment strategies and philosophies, boosting so-called sustainable finance (see the October 2019 *Global Financial Stability Report*). Investors with a sustainability focus may be driven by a pure financial objective (seeking to "do well" by factoring in the increasing relevance of sustainability for financial returns) or by a sustainability objective (seeking to "do good" to actively promote a more sustainable economy and, in the case of climate change, a faster transition) along with the financial objective.

Within the sustainable finance landscape, the investment fund sector is particularly relevant because of its expanding size and focus on sustainability-related issues. The sector has grown significantly since the global financial crisis and now represents about one-third of the assets held by the nonbank financial institution sector.[4] It is at the heart of the paradigm shift toward the integration of sustainability considerations—including climate change mitigation—into investment decisions. This is evidenced by the growing number of networks of investors and asset managers that have demonstrated their commitment to incorporate sustainability issues and support decarbonization efforts.[5] Recent survey evidence also suggests that investment funds—especially those with a sustainable investment mandate—are paying increasing attention to climate change and the transition (Krueger, Sautner, and Starks 2020), and studies indicate that financial markets have started to price in the transition.[6] Pricing in the transition, at least directionally, is important to foster it and to avoid allocating excess capital to firms and projects that do not have a positive impact on climate change mitigation.

Although the investment fund sector can foster the transition, financial stability concerns related to that transition are also pertinent. The exact pathway of the transition to a green economy is still highly uncertain, including how it could play out across countries. It could occur at different speeds and through multiple paths, depending on countries' transition policies, the development and adoption of new clean technologies, and shifts in the preferences of consumers and producers toward low-greenhouse-gas products and services (see the October 2019 *Fiscal Monitor* and the October 2020 *World Economic Outlook*). Different possible transition paths could represent opportunities (such as new investment projects offering high rates of return) but could also be sources of transition risks stemming from the decline in future cash flows of firms adversely

[2]The ongoing COVID-19 pandemic appears to have raised awareness about the possibility of catastrophic events, including climate change, and shifted the momentum (see the October 2020 *Global Financial Stability Report*).

[3]These estimates may be conservative. For example, the Energy Transitions Commission (2020) suggests that, on average, additional investments of about $1.6 trillion a year will be required over the next 30 years to decarbonize the world economy, of which more than $1.3 trillion would be needed in the power sector. BloombergNEF (2021) estimates that annual investment in the energy sector alone will need to rise from about $1.7 trillion today to somewhere between $3.1 trillion and $5.8 trillion, on average, over the next three decades. IEA (2021) estimates that 30 percent of the required investment would come from public sources and 70 percent from private sources.

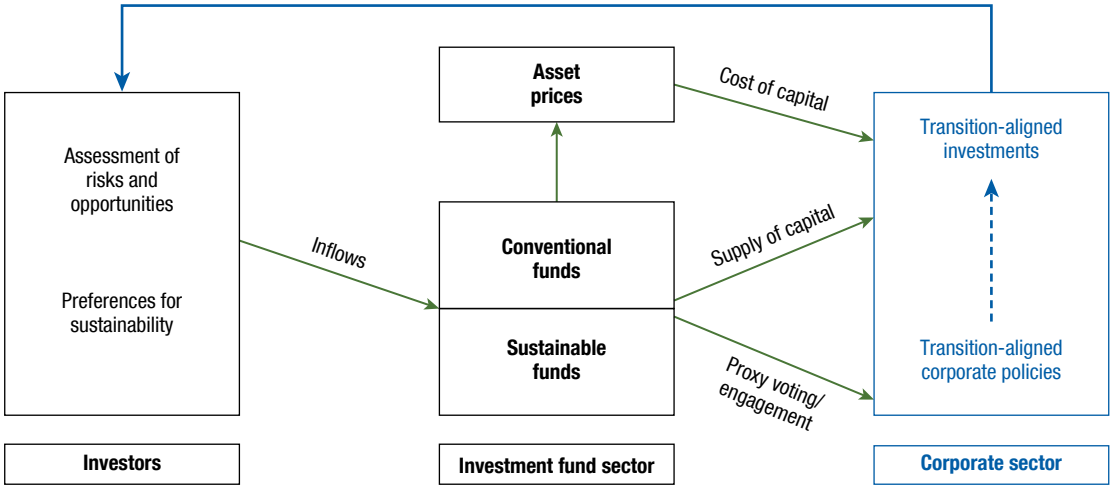
[4]Collective investment vehicles, which cover a diverse range of entities, including hedge funds, money market funds, and other investment funds, grew at an average annual rate of 11 percent over 2013–19 and represented 31 percent of nonbank financial institutions' assets as of the end of 2019 (FSB 2020b).

[5]Such networks and initiatives include the Principles for Responsible Investment, the Climate Action 100+ initiative, the Portfolio Decarbonization Coalition, the UN Zero Carbon Asset Owners Alliance, the Net-Zero Banking Alliance, the COP26 Private Finance Hub, and the Glasgow Financial Alliance for Net Zero.

[6]For example, US climate policy uncertainty is reflected in equity options prices (Ilhan, Sautner, and Vilkov 2020), and global equity investors demand a higher transition risk premium in countries with stricter climate policies (Bolton and Kacperczyk 2021).

Figure 3.1. The Sustainable Investment Fund Sector Can Speed Up the Transition to a Green Economy

Flows into sustainable funds can encourage investments geared toward emissions reductions. Through proxy voting and shareholder engagement, sustainable funds can influence firms' strategies to adopt more sustainable business models.



Source: IMF staff compilation.

affected by the adoption of cleaner technologies (such as those in the fossil fuel sector). Recent analyses have documented that investment funds' exposures to the sectors most sensitive to the transition—including fossil fuels, utilities, energy-intensive manufacturing, and transportation—are indeed significant (Battiston and others 2017; ECB 2021; ESMA 2021). A large and unforeseen transition shock (for example, a sudden realization of the need for rapid significant change across the global economy) could lead to a large repricing of the affected assets, generating financial stability risks.

Against this backdrop, this chapter analyzes the interplay between the global investment fund sector and the transition to a low-greenhouse-gas economy from both the perspective of fostering the transition and the perspective of financial stability risks. In particular, it focuses on two key questions: How do sustainable investment funds—defined as funds with both a financial and a sustainability objective—facilitate the transition? And what has been the impact of transition shocks on the investment fund sector to date?[7] To address these questions, the chapter first develops a simple conceptual framework analyzing the interlinkages between the investment fund sector and the transition. It then draws on that framework to conduct empirical analysis using a sample of more than 54,000 open-end funds—mostly equity, fixed-income, and allocation funds.[8]

Investment Funds and the Transition: A Conceptual Framework

The shift toward sustainable investment funds can support the transformation of the economy through two main channels (Figure 3.1). First, investors make portfolio decisions based on their preferences for sustainability and their assessment of risks and opportunities, and these decisions create inflows into sustainable

[7]Climate-related physical risk is not the focus of this chapter. See Chapter 5 of the April 2020 *Global Financial Stability Report* for an analysis of physical risk and equity prices.

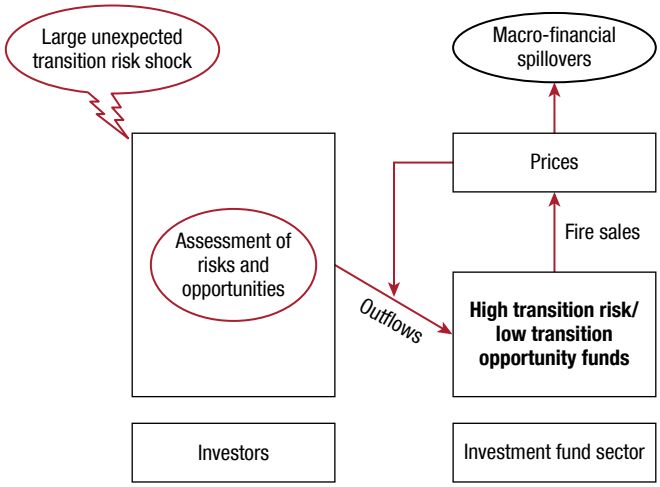
[8]As of the end of 2020, 36,500 funds were still active and totaled $49 trillion in assets under management. The sample covers the period 2010:Q1–20:Q4. Most of these funds are domiciled in advanced economies. At the end of 2020, the shares of equity, fixed-income, and allocation funds (that is, funds with varying allocations across asset classes) were 39.2 percent, 27.6 percent, and 19 percent, respectively. The sample does not capture separately managed accounts, which may account for a significant share of flows into sustainable finance. For example, in Europe they represented about 45 percent of total assets under management at the end of March 2021 (EFAMA 2021). In the chapter's regression analyses, funds are included only if assets under management exceeded $500 million at least once over the entire sample period. See Online Annex 3.1 for a fuller description of the sample and variable definitions.

funds that increase the supply of capital available to firms supporting the transition. This in turn reduces their cost of capital and encourages transition-aligned investments geared toward emissions reductions.[9,10] Second, sustainable funds can influence firms' strategies through stewardship, supporting the move toward more transition-aligned corporate policies. This entails exerting influence through engagement and proxy voting to improve sustainability practices, outcomes, and disclosures.[11] A positive feedback loop could thus emerge through the investment fund sector, with investors' sustainability concerns leading to more investments in climate-change-mitigating projects reflecting risk management and rate-of-return considerations, thus increasing the pace of the transition.

The investment fund sector could also amplify the impact of sudden transition shocks on financial stability. The transition to a green economy could be a source of financial stability risk for firms adversely affected by the accompanying economic transformation as well as for financial institutions that hold claims on these firms. Sudden and larger-than-expected transition shocks—such as a delayed and abrupt tightening in carbon policy—could be amplified by vulnerabilities in the investment fund sector and have a meaningful impact on financial stability.[12] In such a scenario, investors would reassess risks, likely triggering outflows from funds with high exposure to transition risk, potentially leading to runs on these funds and fire sales and causing a further fall in asset values (Figure 3.2).

Figure 3.2. The Transition Could Be a Source of Financial Stability Risk

A large and sudden transition shock could trigger outflows from funds that have large transition-sensitive exposures—a development that could lead to fire sales, thus causing a further fall in asset values and macro-financial spillovers.



Source: IMF staff compilation.

Structural vulnerabilities in the investment fund sector (such as liquidity mismatches between funds' asset holdings and redemption features, credit exposure, and use of financial leverage) could amplify the impact. If large and abrupt, the drops in asset prices could then spill over to other parts of the financial sector and to the real economy through tighter financial conditions.

This chapter employs several empirical approaches to evaluate transition-related opportunities and risks. In particular, the approaches aim to:

- Assess the extent to which the investment fund sector is supporting the transition by examining (1) the evolution of the sustainable fund segment and the exposure of these funds to the transition, (2) the importance of sustainability labels in attracting fund flows, and (3) the role of sustainable funds in climate stewardship and in encouraging the issuance of securities by more environmentally friendly firms.
- Evaluate risks to the investment fund sector from the transition by examining whether (1) climate-related news in the past had any effect on fund flows, performance, and portfolio composition; (2) the size of liquidity buffers is related to funds' exposure to the transition; and (3) sustainable investors ameliorate financial stability risks due to their possibly lower sensitivity to short-term returns.

[9]Funds can also provide debt financing for specific assets and infrastructure geared toward climate change mitigation, including debt that has received a climate bond label. As of September 1, 2021, year-to-date aggregate climate bond issuance amounted to $258.8 billion. For more information, see the Climate Bonds Initiative website at www.climatebonds.net/.

[10]It is possible that the shift in the supply of capital toward firms supporting the transition also raises the cost of capital of firms not necessarily supporting the transition.

[11]Proxy voting is a central feature of corporate governance that allows shareholders to participate in the governance of public firms. Many large asset managers have developed stewardship practices specific to environmental, social, and governance considerations.

[12]Although climate-related physical risks are not considered in this chapter, transition risks could be amplified to the extent that policymakers, consumers, and investors react to the materialization of ever-larger climatic disasters. Climate-related risks are different from other financial risks because the probability of their occurrence is not well reflected in past data and because of their far-reaching impact in terms of breadth and magnitude, the nonlinearities embedded in climate tail risks, and the substantial uncertainty associated with the need to assess risks over an extended time horizon (NGFS 2019; FSB 2020a).

Sustainable Investment Funds Have a Small Market Share but Are Growing Fast

A sustainable investment fund differs from a conventional fund because it has a sustainability objective alongside the traditional risk-return objective. In other words, sustainability considerations are a significant part of the fund's investment focus while seeking financial returns (ICI 2020). To achieve sustainability objectives, funds tend to rely on multiple investing strategies, such as *negative screening* (that is, not investing in certain firms or sectors), *positive screening* (that is, selecting firms that satisfy specific sustainability criteria), or *impact investing* (that is, aiming to make a measurable sustainability impact alongside a financial return). Some sustainable funds have a specific theme, such as the environment or climate change, while others may have a broader focus on environmental, social, and governance issues.

Sustainable investment funds represent only a small fraction of the investment fund universe. A fund's title and description of objectives indicate whether its focus is related to sustainability, the environment, or climate change.[13] In a sample of more than 36,500 funds active as of the end of 2020 analyzed for this chapter, about 4,000 had a sustainability label, of which nearly 1,000 had an environment theme and a little more than 200 had a climate-specific theme (Figure 3.3, panel 1).[14] The size of the sustainable fund segment, and of climate funds in particular, is also small compared with the overall size of the investment fund sector. While total assets under management of the funds in the sample amounted to about $49 trillion as of the end of 2020, sustainable funds, including those with a climate-specific label, totaled about $3.6 trillion. Funds with a specific climate focus accounted for only $130 billion of that total (Figure 3.3, panel 2).

However, sustainable investment funds (and climate funds in particular) have grown faster than their conventional peers in the recent past. Net flows into sustainable funds (as a percent of assets under management) moved broadly at the same pace as those into conventional funds during 2010–19 but increased notably in 2020 (to about 5 percent of lagged assets under management in the fourth quarter of 2020) (Figure 3.3, panel 3). Over the same period, net flows into climate-labeled funds rose significantly, remaining above net flows into conventional funds since 2017 and surging by a staggering 48 percent of assets under management over the four quarters of 2020. One possible reason for the stark increase in flows in 2020 could be the COVID-19 crisis, which raised investor awareness about catastrophic events, including those related to climate change.

Conventional investment funds are also increasingly factoring environmental, social, and governance considerations into their traditional investment processes. In addition, such funds have started to employ negative screens based on these considerations and are using stewardship to influence firms' behavior with respect to them (and related disclosures). Accordingly, the number of asset managers and asset owners that are signatories to the Principles for Responsible Investment—thereby committing to incorporate environmental, social, and governance considerations into investment analysis and decision-making processes—more than doubled from about 1,400 in 2015 to more than 3,000 in 2020 (Figure 3.3, panel 4).

The Exposure of Investment Funds to the Transition Has Remained Broadly Stable

In addition to the specific label, a common way to obtain sustainability information on an investment fund is through scores related to environmental, social, and governance considerations. Data providers collect information about sustainability issues from firms' disclosures, synthesize it through individual scores for each of the three environmental, social, and governance pillars—as well as for their underlying components—and then construct an overall score. Fund-level sustainability scores (also called "ESG [environmental, social, and governance] scores") can then be derived by matching the firm-level scores with information on portfolio holdings of securities. Similar fund-level scores can be computed for each of the three pillars and their components. However, currently available environmental, social, and governance data suffer from several deficiencies in terms of coverage and

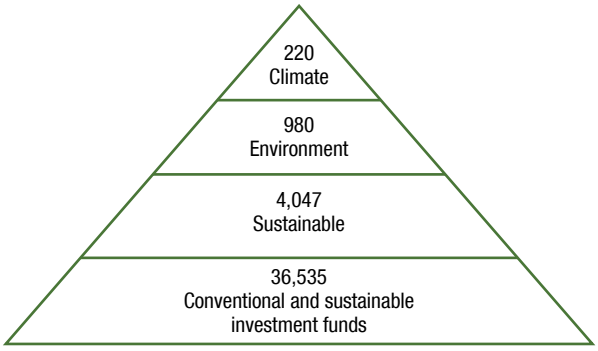
[13]See Online Annex 3.1 for details on the methodology used to classify funds.

[14]As of the end of 2020 the shares of equity, fixed-income, and allocation funds within the subsample of thematic climate funds were 56 percent, 21 percent, and 17 percent, respectively. The share of passive funds was higher for funds with a climate focus (22 percent) compared with conventional funds and other sustainable funds (about 13 percent). Fees of sustainable funds were also slightly higher than those of their conventional peers.

Figure 3.3. Sustainable Investment Funds Have a Small Market Share but Have Grown Fast Recently

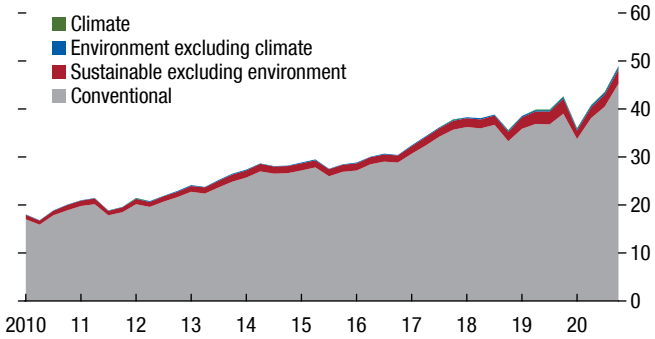
Climate-focused funds account for only a small share of funds ...

1. Number of Funds in the Sample, by Fund Label, 2020:Q4



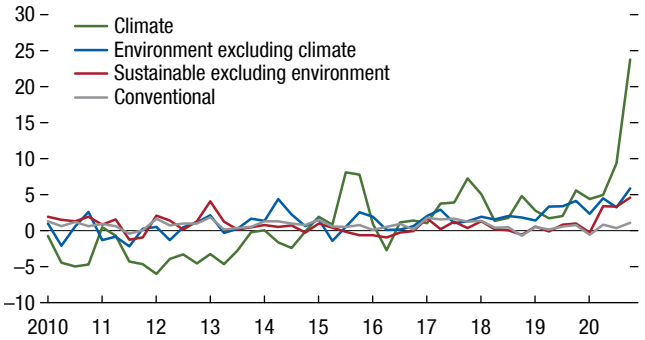
... and of the investment fund sector's total assets under management ...

2. Assets under Management, by Fund Label, 2010:Q1–20:Q4 (Trillions of US dollars)



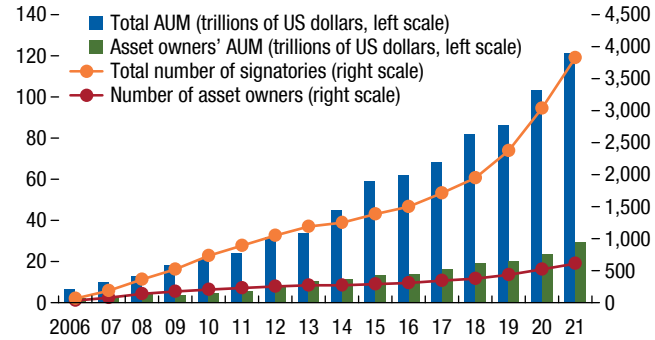
... but they have seen strong inflows in recent years.

3. Net Flows into Funds, by Fund Label, 2010:Q1–20:Q4 (Percent of lagged assets under management; value-weighted)



Conventional funds have increasingly integrated sustainability considerations into their investment processes.

4. Number of Signatories to the Principles for Responsible Investment and Their Assets under Management, 2006–21 (Number, and trillions of US dollars)



Sources: Bloomberg Finance L.P.; Lipper; Morningstar; United Nations Principles for Responsible Investment; and IMF staff calculations.
Note: Fund labels are constructed from fund names and information in prospectuses (see Online Annex 3.1). Panels 2 and 3 show mutually exclusive fund labels. In panel 4, asset owners are organizations that represent the holders of long-term retirement savings, insurance, and other assets, such as pension funds, sovereign wealth funds, insurance companies, and other financial institutions that manage deposits. Data for panel 4 are as of March 2021. AUM = assets under management.

comparability—scores can differ significantly across data providers, though this is less of an issue for the environmental pillar scores (IOSCO 2021a; Gibson Brandon, Krueger, and Schmidt, forthcoming).[15] Portfolio managers often cite data quality issues, multiple disclosure standards, and the lack of a globally agreed-upon taxonomy as obstacles to properly measuring risks, opportunities, and impact related to sustainability (Box 3.1).[16] In fact, only about 55 percent of the equity funds in the sample have sufficient ESG data to be included in the chapter's quantitative analysis.

This chapter constructs two key scores to summarize a fund's exposure to the transition: transition opportunity and carbon intensity. The transition-opportunity

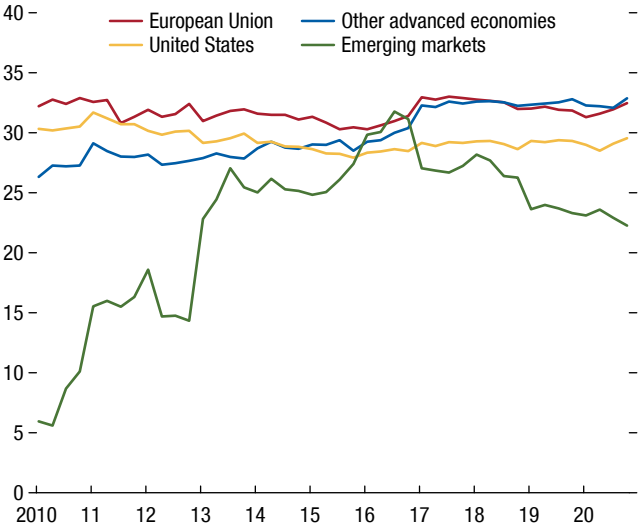
[15]In general, ESG scores—as well as the environmental pillar score—reflect a range of issues much broader than those related to the climate transition. Consistent with ESG scores not fully capturing climate transition efforts, Elmalt, Igan, and Kirti (2021) show that firms' emissions reductions are only weakly associated with their ESG and environmental pillar scores.

[16]In the realm of firm-level climate data, gaps include poor coverage of so-called Scope 3 emissions—that is, indirect greenhouse gas emissions that occur in a firm's value chain net of emissions from the generation of purchased electricity, steam, heating, and cooling consumed by the reporting firm. For a more detailed discussion of climate data gaps, see FSB (2021) and NGFS (2021a). Data quality issues could also be pertinent to the chapter's analysis and could bias some of the chapter's findings. See Online Annexes 3.2 to 3.7 for robustness tests aimed at addressing some of these issues.

Figure 3.4. The Transition-Related Scores of Funds Have Been Broadly Stable

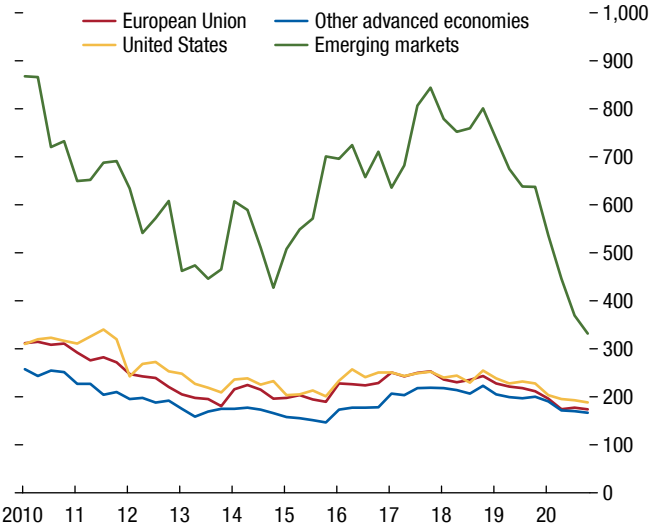
Transition opportunities have remained stable in advanced economies ...

1. Average Transition-Opportunity Score by Fund Domicile, 2010:Q1–20:Q4 (Score 0–100)



... and the average carbon intensity has declined only slightly outside of emerging markets.

2. Average Carbon Intensity by Fund Domicile, 2010:Q1–20:Q4 (Tons of CO_2-equivalent per million US dollars of revenue)



Sources: FactSet; Morningstar; Refinitiv; and IMF staff calculations.
Note: See Online Annex 3.1 for details on the score construction methodology.

score is a composite measure based on a range of metrics that underlie the environmental pillar, such as a company's carbon-reduction and overall environmental management policies and systems, the development of products or technologies related to renewable energy, broader environmental research and development, and a public commitment to divest from fossil fuels.[17] All else equal, a higher score implies that the fund's relative financial performance will likely benefit from a faster transition. By contrast, the carbon-intensity score measures a firm's so-called Scope 1 and Scope 2 greenhouse gas emissions relative to revenue, with a higher score implying that the fund is more likely to be hurt by a quicker transition to a low-carbon economy, all else equal.

In the global investment fund sector, transition opportunities have remained stable while carbon intensities have gradually declined. This is particularly true for funds domiciled in advanced economies (Figure 3.4). For funds domiciled in emerging markets, the scores have been more volatile over time, but nonetheless exhibit a converging trend toward their advanced economy counterparts, at least with respect to carbon intensity.[18]

On average, investment funds with climate labels hold securities with higher transition-opportunity scores than their conventional counterparts. At the same time, however, the carbon intensity of their portfolios is also higher than that of conventional funds (Figure 3.5, panels 1 and 2). This may be because climate-focused funds tend to invest in firms that are more likely to significantly reduce their emissions levels during the transition or facilitate the

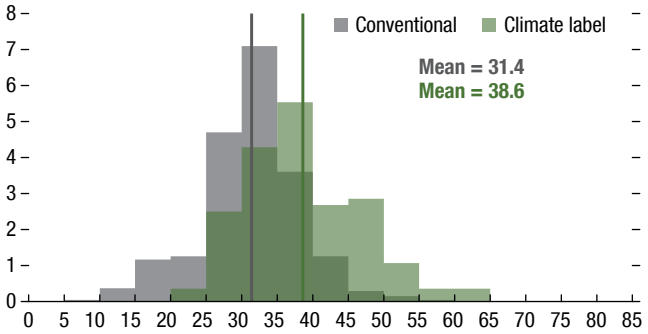
[17]The transition-opportunity score is constructed from Refinitiv's firm-level environmental innovation score (combined with data on portfolio holdings from FactSet) and Morningstar's fund-level carbon management score. The former reflects a company's capacity to reduce environmental costs and burdens for its customers, thereby creating market opportunities through new environmental technologies and processes or eco-designed products. The latter evaluates a company's preparedness and track record in managing carbon operations and products. Both scores are highly positively correlated. See Online Annex 3.1 for detailed information on data sources and the methodology to construct the scores used in the analysis.

[18]The statistics pertaining to emerging market funds should be interpreted with caution as the sample is unbalanced and the number of funds with data on transition-opportunity scores and carbon intensity is small (but increased from about 40 funds in 2017 to about 500 by the end of 2020). In the aggregate, considering both advanced economies and emerging markets, changes in portfolio scores are driven predominantly by funds' portfolio allocations and to a lesser extent by changes in firms' scores (Online Annex 3.2).

Figure 3.5. Climate Investment Funds Have a Strong Tilt toward Transition Opportunities

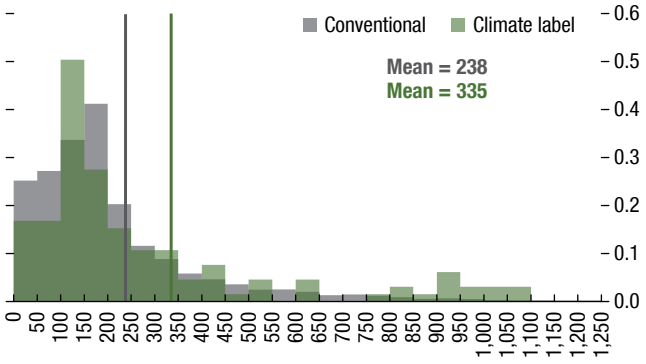
On average, climate funds have higher levels of transition opportunities ...

1. Transition-Opportunity Score Distribution, Climate versus Conventional Funds, 2020:Q4
(*x*-axis: score between 0 and 100; *y*-axis: percent)



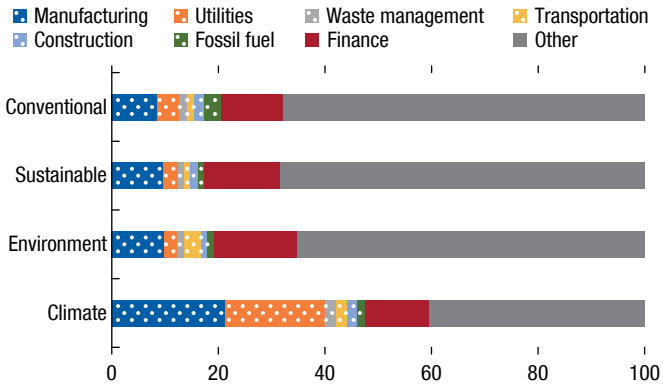
... but portfolios with slightly higher levels of carbon intensity.

2. Carbon-Intensity Score Distribution, Climate versus Conventional Funds, 2020:Q4
(*x*-axis: tons of CO_2-equivalent per million US dollars of revenue; *y*-axis: percent)



Funds with a climate label are more heavily invested in transition-sensitive sectors.

3. Industry Composition of Holdings by Fund Type, 2020:Q4
(Percent, transition-sensitive sectors are dotted)



Sources: Bloomberg Finance L.P.; FactSet; Lipper; Morningstar; Refinitiv; and IMF staff calculations.
Note: Panel 3 shows the asset-weighted average industry composition using the North American Industry Classification System at the two-digit level. The transition-sensitive industries are defined similarly to the "climate-policy-relevant sectors" in Battiston and others (2017). Industries that are not transition-sensitive, apart from finance, are included in the "Other" category. See Online Annex 3.1 for details on the score construction methodology. All three panels are based on mutually exclusive fund labels.

reduction of emissions in other parts of the economy, rather than in those with already low levels of emissions.[19] Indeed, consistent with this hypothesis, climate funds have a substantially larger exposure to firms in transition-sensitive sectors—utilities, manufacturing, transportation, waste management, construction, and fossil fuels—than conventional funds, or those with a sustainability or environmental label (Figure 3.5, panel 3).[20]

The Role of Investment Fund Labels in Driving Fund Flows

Fund labels are an important driver of fund flows. Despite the less-than-perfect matching between fund labels and transition-related metrics, labels still rep-

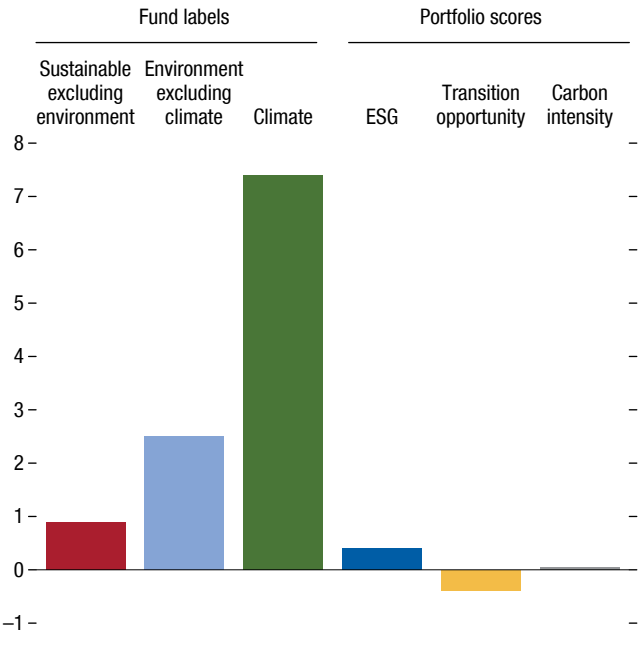
[19]This is, however, not true for funds labeled as sustainable. On average, these funds hold fewer assets with high carbon intensities than conventional funds, even though their transition-opportunity scores are not substantially higher. Climate-themed funds are also more involved in carbon solutions. See Online Annex 3.2.

[20]This finding is robust to using alternative definitions of transition opportunities, such as a narrowly defined measure constructed only with indicators directly related to emissions and portfolio exposures to carbon solutions (Online Annex 3.2).

Figure 3.6. Climate and Sustainability Labels Matter for Flows

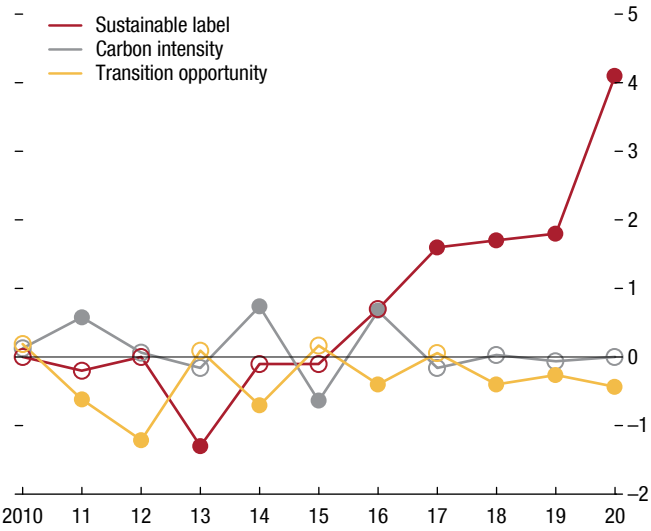
Labels help to attract flows ...

1. Sensitivity of Quarterly Flows to Fund Labels and Portfolio Scores (Percent of lagged total net assets)



... and their importance has increased over time.

2. Sensitivity of Quarterly Flows to Fund Label and Portfolio Transition Scores, 2010–20 (Percent of lagged total net assets)



Sources: Bloomberg Finance L.P.; FactSet; Lipper; Morningstar; Refinitiv; and IMF staff calculations.
Note: Panel 1 shows the impact of different fund labels and one standard deviation increases in portfolio scores. Panel 2 shows the impact of funds' sustainability label, one standard deviation increases in fund transition-opportunity scores, and a one standard deviation increase in funds' carbon intensity on quarterly flows, estimated by year. In both panels, estimates are based on regression models that control for the natural logarithm of fund size, fund age, expense ratios, past flows, past returns, region by year fixed effects, and Morningstar broad category by year fixed effects. Solid bars and circles indicate significance at the 10 percent level or less. ESG = environmental, social, and governance.

resent a convenient and salient way to summarize a fund's investment strategy and its approach to engagement and stewardship. In fact, after controlling for a range of fund characteristics (including funds' portfolio transition-opportunity score, carbon intensity, ESG score, past returns, and asset class), labels are shown to be an important driver of fund flows (Figure 3.6, panel 1). Moreover, the importance of sustainability labels appears to have increased in recent years (Figure 3.6, panel 2).

Investment fund labels—and by implication sustainable finance classifications (including climate taxonomies) to align investments with climate goals—can be a key tool for channeling flows to sustainable and climate-focused funds. Sustainable finance classifications can help guide the behavior of firms and facilitate investors' assessment of firms' transition pathway—and thus contribute to the scaling up of sustainable finance markets. Looking ahead, they can play an important role in defining what is sustainable and thus in determining the flow of capital toward sustainable projects. Proper regulatory oversight needs to be in place to prevent "greenwashing"—that is, deceptive marketing used to persuade the public that an organization's products, aims, and policies are environmentally friendly—and to ensure that labels fairly represent funds' investment objectives. One effort in this direction is the European Union's Sustainable Finance Disclosure Regulation, which went into effect in March 2021 and requires environmental, social, and governance disclosures of certain financial market participants.[21]

Sustainable and Climate Investment Funds Can Facilitate the Transition

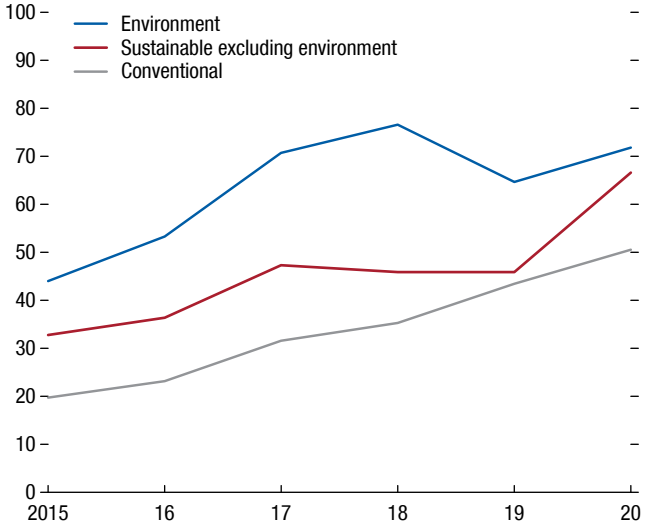
Climate-related shareholder resolutions put to a vote at firms' annual general meetings—for example, on emission-reduction targets or climate-related

[21]So are the recent UK Financial Conduct Authority's guiding principles for the design, delivery, and disclosure of sustainable investment funds.

Figure 3.7. Sustainable Investment Funds Appear to Be Leaders in Climate Stewardship

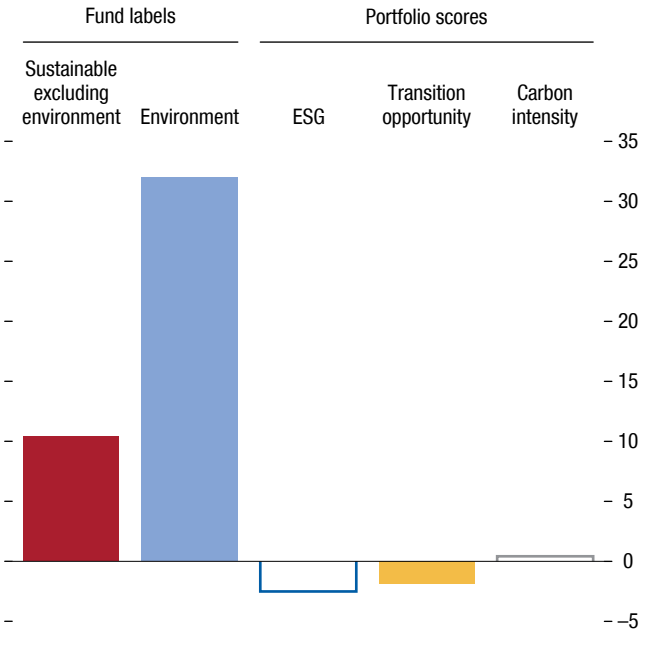
Sustainable and environment funds support climate-related shareholder resolutions more than their conventional peers.

1. Share of Votes in Favor of Climate-Related Resolutions, by Fund Label, 2015–20 (Percent)



Beyond portfolio scores, labels are useful for identifying funds' climate stewardship.

2. Effect of Fund Labels and Transition Scores on the Share of Votes in Favor of Climate-Related Resolutions (Percent)



Sources: Bloomberg Finance L.P.; FactSet; Lipper; Morningstar; Refinitiv; and IMF staff calculations.
Note: Panel 2 shows the impacts of different fund labels and one standard deviation increases in fund portfolio scores on the probability that a fund will vote in support of a climate-related resolution. Estimates are based on regression models that control for the natural logarithm of fund size, fund age, expense ratios, whether a fund is managed passively, region by year fixed effects, and fund category by year fixed effects. There are not enough funds with a climate label in the sample to analyze their proxy voting behavior separately from the broader category of environment-labeled funds. The analysis is based on shareholder resolutions in US publicly traded companies. Solid bars indicate significance at the 10 percent level or less. ESG = environmental, social, and governance.

disclosures—can be an important driver of corporate behavior.[22] Looking at the proxy voting behavior of funds in the sample, it is noteworthy that the support for climate-related shareholder resolutions has trended up over time, indicating that investors are increasingly taking climate-related issues seriously. This support has been significantly greater for sustainable and climate funds than for conventional funds (Figure 3.7, panel 1). Importantly, labels are useful for investors to identify funds' climate stewardship activity: funds with a "sustainable" label, especially those with an "environmental" label, are more likely to support a climate resolution (Figure 3.7, panel 2). Meanwhile, portfolio-level transition scores do not appear to be a good indicator of funds' voting behavior on these resolutions.[23] This finding suggests that sustainable investment funds could help firms adopt a more climate-friendly business model and that a sole focus on funds' portfolios may miss

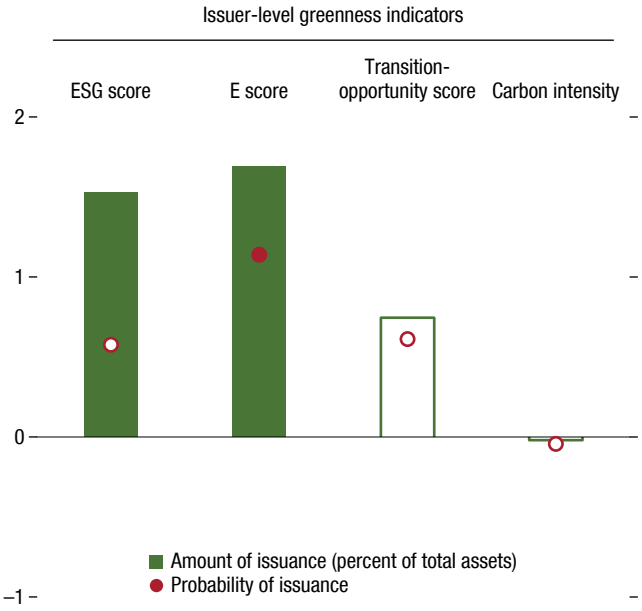
[22]Even though most shareholder resolutions are nonbinding, Flammer (2015) finds that for US publicly traded companies about half of shareholder resolutions on corporate social responsibility are being implemented and that these proposals are associated with a 1.77 percent abnormal return, suggesting that shareholder resolutions influence managerial behavior. Consistent with the view that shareholder activism affects firms' behavior, Flammer, Toffel and Viswanathan (2021) find that shareholder activism increases the voluntary disclosure of climate change risks. In the United States in 2021 there were 66 proposals specifically related to climate change, as well as additional proposals about climate lobbying and disclosure (*Proxy Preview* 2021).

[23]There are not enough funds with a climate label in the sample to analyze their proxy voting behavior separately from the broader category of environment-labeled funds.

Figure 3.8. Flows into Sustainable Funds Have Boosted Bond and Equity Issuance of Green Firms

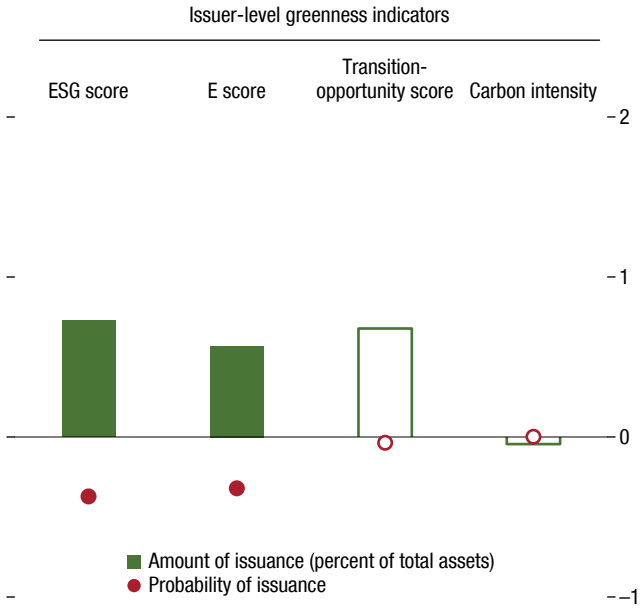
Increased net inflows into sustainable funds result in a higher likelihood and an increased amount of bond issuance by green firms ...

1. Effect of Inflows into Sustainable Funds on Quarterly Bond Issuance Amount and Likelihood of Issuance by Green Firms Relative to Less Green Firms (Percent)



... and an increased amount of equity issuance by green firms relative to less green firms.

2. Effect of Inflows into Sustainable Funds on Quarterly Equity Issuance Amount and Likelihood of Issuance by Green Firms Relative to Less Green Firms (Percent)



Sources: Bloomberg Finance L.P.; Dealogic; FactSet; Lipper; Morningstar; Refinitiv; and IMF staff calculations.
Note: The figure shows the impact of a one standard deviation increase in a firm-specific measure of net inflows into sustainable investment funds on the probability of issuance and the issuance volume of green firms relative to that of less green firms. "Green" firms are defined as those in the 75th percentile of the ESG score, E score, transition-opportunity score, and negative carbon intensity. "Less green" firms are defined as those in the 25th percentile of these scores. Equity issuance may require a longer time to react to financing supply shocks and to the fact that only seasoned equity offerings are considered in this analysis (initial public offerings are not considered). Solid bars and circles indicate statistical significance at the 10 percent level. See Online Annex 3.4 for the methodology. E score = environmental score; ESG = environmental, social, and governance.

an important element of sustainable finance—climate stewardship.

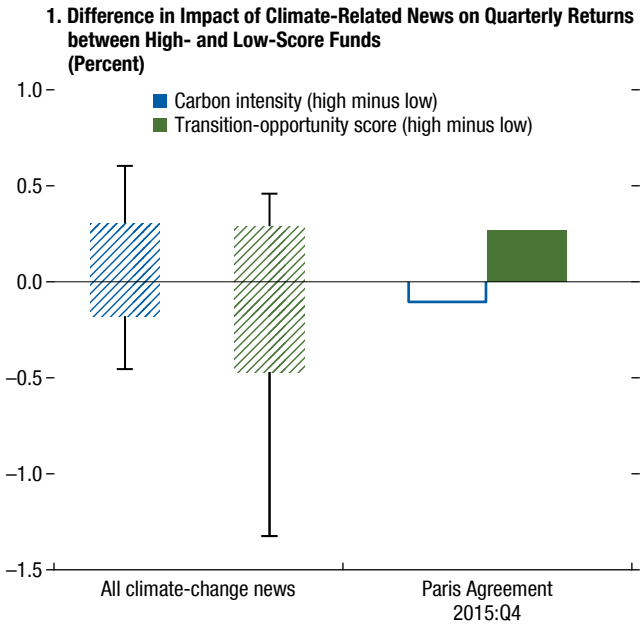
Flows into sustainable investment funds increase the availability of private capital to firms with a more favorable sustainability rating ("green" firms).[24] Firms in transition-sensitive sectors with high ESG or environmental pillar scores are more likely (relative to other firms) to issue bonds and in larger amounts when inflows into sustainable funds increase during a quarter (Figure 3.8, panel 1). Similar results are true for equity issuance, where the amount of equity issued by firms with high ESG or environmental pillar scores increases, even though they issue equity somewhat less frequently (Figure 3.8, panel 2).[25] Interestingly, similar effects are not evident in variables more closely aligned with the transition, such as the transition-opportunity score or carbon intensity. Taken together, this suggests that while sustainable funds have been boosting issuance of firms aligned with the funds' sustainability objective, they may lack the size or focus to foster issuance by firms supporting the transition.

[24]The analysis of securities issuance is based on a sample of 6,449 firms, of which 5,446 issued equities at least once and 3,722 issued bonds at least once during the period 2010:Q1–21:Q1. To establish a direct link between flows into sustainable funds and security issuance, this chapter looks at issuance as a function of flow-driven buying pressure, building on Zhu (2021). The measure of flows used in this analysis captures both flows and firm-specific exposures to flows. See Online Annex 3.3 for methodological details.

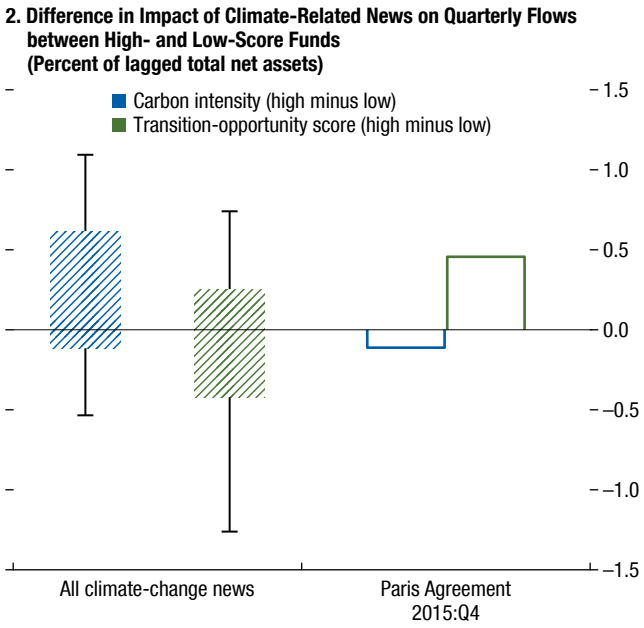
[25]Additional analysis finds that flows into sustainable funds lead to a significant contemporaneous increase in abnormal returns for firms with a high ESG score and high environmental pillar scores (Online Annex 3.4).

Figure 3.9. Fund Returns and Flows Have Barely Reacted to Climate-Related News over the Past 10 Years

Climate-related news has had a small impact on fund returns ...



... and on flows into these funds.



Sources: FactSet; Morningstar; Refinitiv; and IMF staff calculations.
Note: Results are based on panel regressions of flows and returns on nine climate-related event dummies and their interaction with carbon intensity and the transition-opportunity score. Control variables are past returns and flows, the logarithm of fund size, fund expense ratios, and fund age, as well as region-year and fund-type-year fixed effects. Bars depict the differential impact of a shock on funds at the 25th and 75th percentiles of the carbon-intensity and transition-opportunity score distributions. Within the whisker bars in panel 1, three of the carbon-intensity coefficients and four of the transition-opportunity coefficients are insignificant. In panel 2, six of the carbon-intensity coefficients and five of the transition-opportunity coefficients are insignificant. For the Paris Agreement event, solid bars indicate significance at the 10 percent level or less. See Online Annex 3.5 for methodological details.

The Transition Has Not Yet Been a Source of Financial Instability

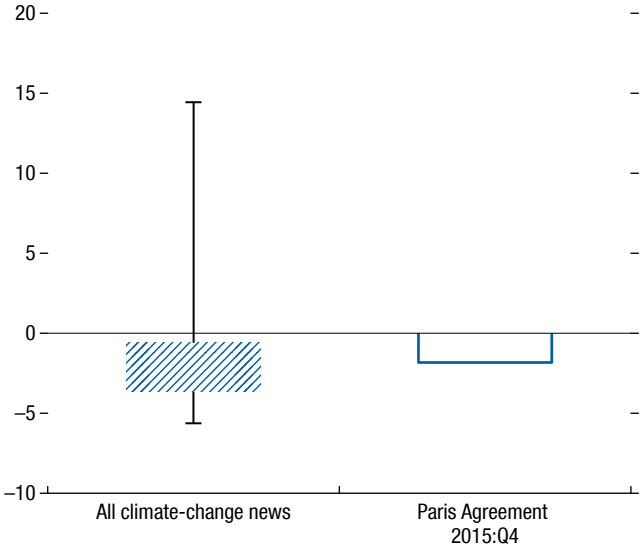
Past climate-related news has not had a systematic impact on investment fund returns and flows.[26] Events containing information about changes in climate risk are likely to lead to coverage in news outlets (Engle and others 2020). The most relevant climate-related news events over the past decade show a relatively small impact on the quarterly return of a fund with a high transition-opportunity score relative to that of a fund with a low score (Figure 3.9, panel 1, green whisker bar). A similar result holds with respect to the return of a fund with high carbon intensity compared with one with low carbon intensity (Figure 3.9, panel 1, blue whisker bar). The impact of climate-related news has also been limited to date in terms of flows (Figure 3.9, panel 2, blue and green whisker bars). A major transition-enhancing event that can be unambiguously associated with widespread climate-related news is the Paris Agreement in the fourth quarter of 2015. As Figure 3.9 shows, the direction of its effects are in line with priors (high-transition-opportunity -score funds and low-carbon-intensity funds benefit), but the size of the effect is small, which suggests that the event did not significantly alter investors' perception of the speed of the transition.

The limited impact of climate-related news on fund flows and performance may explain why such news has not triggered any major portfolio adjustment by investment funds. In general, funds should react to climate-related news by adjusting their transition-related exposures in a direction that makes

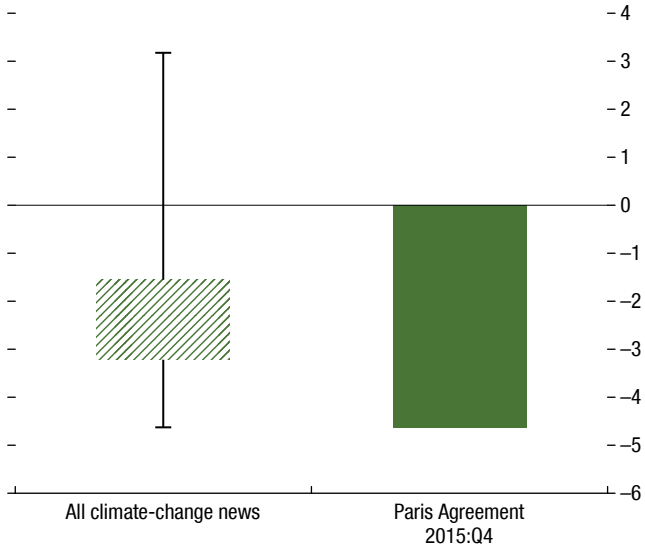
[26]To analyze the impact of transition shocks on fund performance, the chapter first identifies relevant climate-related news by exploiting existing climate-related news indices back to 2010. These indices reflect the occurrence of climate-related phrases, articles, or search queries across several major news sources, namely the *New York Times*, *Wall Street Journal*, and Google News. The *Wall Street Journal* index is obtained from Engle and others (2020), and two *New York Times* indices were kindly provided by Brian Reis and Bob Engle. A total of nine quarters over the sample period with heightened attention to climate change are identified, a few of which correspond to significant transition-related events such as the Paris Agreement in 2015:Q4 (see Online Annex 3.5).

Figure 3.10. The Impact of Climate-Related News on Funds' Transition-Related Scores Has Been Limited

Funds' carbon-intensity scores have not reacted consistently in response to climate-related news ...



... and neither have funds' transition-opportunity scores.



Sources: FactSet; Morningstar; Refinitiv; and IMF staff calculations.
Note: Results are based on panel regressions of carbon-intensity and transition-opportunity scores on nine climate shock dummies. Control variables are past returns and flows, the logarithm of fund size, fund expense ratios, and fund age, as well as region-year and fund-type-year fixed effects. Within the whisker bar in panel 1, six coefficients are insignificant. Within the whisker bar in panel 2, one coefficient is insignificant. For the Paris Agreement event, solid bars indicate significance at the 10 percent level or less. See Online Annex 3.5 for methodological details.

them less exposed to large shocks of the same nature in the future.[27] Yet neither the carbon-intensity nor the transition-opportunity scores of funds appear to have responded meaningfully to climate-related news. For example, both the carbon-intensity and transition-opportunity scores declined slightly following the Paris Agreement in the fourth quarter of 2015, when intuitively this event should have had opposite effects on those scores (Figure 3.10, panels 1 and 2).

Transition-related scores also appear to have some bearing on investment funds' liquidity buffers. For the investment fund sector, a key factor in the ability to absorb or amplify a large transition shock is the size of the buffer provided by liquid assets. An analysis of the relationship between funds' cash holdings and transition-related scores reveals that fund portfolios with a higher transition-opportunity score are associated with lower cash buffers (Figure 3.11, panel 1, green bar), particularly if initial buffers exceed the sector median. At the same time, however, funds with a higher level of carbon intensity also appear to hold less cash than those with lower carbon intensity (Figure 3.11, panel 1, blue bar).[28] This result holds mainly for funds with already-high cash buffers (that is, above the median), suggesting that funds may engage in such behavior only beyond a certain threshold (Figure 3.11, panel 2). While it is not entirely obvious why this is the case, it could be that highly carbon-intensive funds are more tilted toward maximizing financial returns and reach for yield by holding relatively lower liquidity buffers.

A fuller assessment of the ability of investment funds to withstand transition-related liquidity strains would require a comprehensive scenario analysis. Several studies suggest that security-level valuation effects

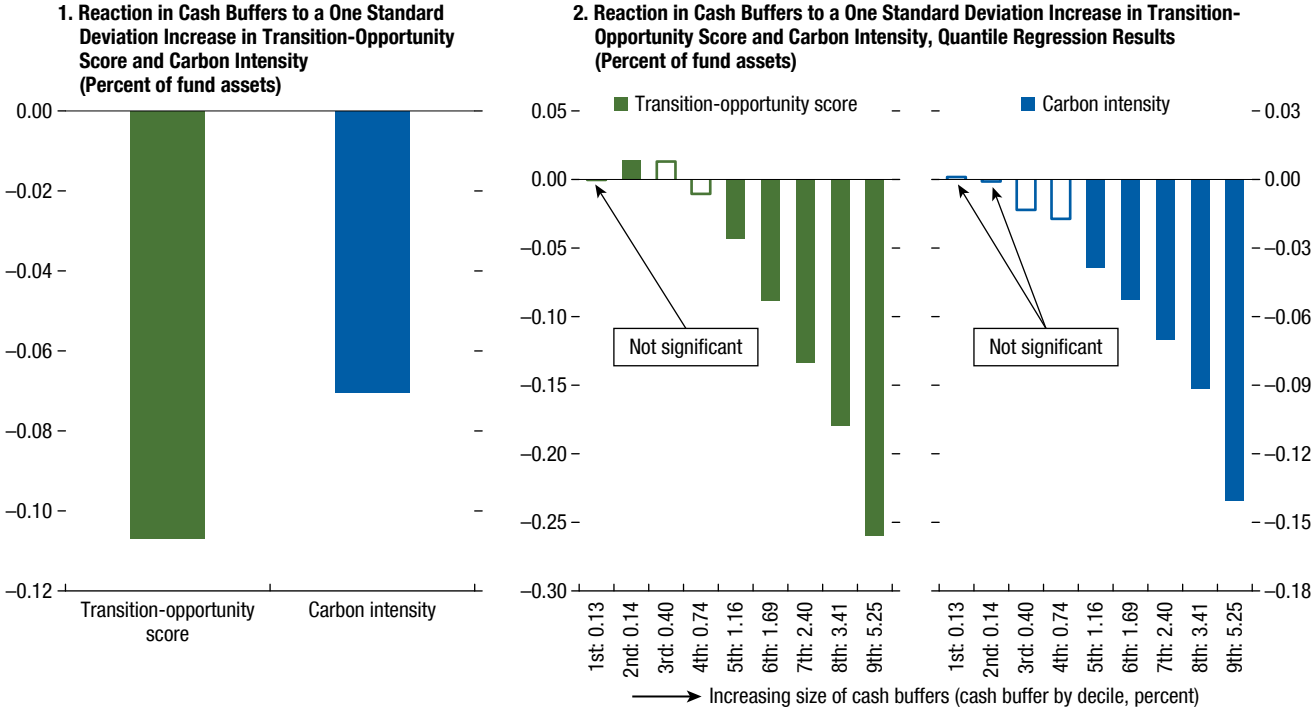
[27]Engle and others (2020) find that portfolios based on ESG scores can be used to hedge against climate-related news events. Hong and Kacperczyk (2009) find that "sin" stocks—companies involved in producing alcohol, tobacco, and gaming—are held less by norm-constrained institutions such as pension plans than by mutual or hedge funds.

[28]For example, a fund with a 2.4 percent cash buffer (which corresponds to the mean) will hold 13.5 basis points less cash if its transition-opportunity score increases by one standard deviation. The same fund will reduce its buffer by 7 basis points if its carbon-intensity score increases by one standard deviation.

Figure 3.11. Sensitivity of Cash Buffers to Transition-Related Scores

Funds with a greater transition-opportunity score hold, on average, less cash, as do funds with greater carbon intensity ...

... but both effects kick in only if funds feel sufficiently comfortable with the initial size of their cash buffers.



Sources: Bloomberg Finance L.P.; FactSet; Morningstar; Refinitiv; and IMF staff calculations.
Note: Results are based on ordinary least squares and unconditional quantile regression models regressing cash and cash equivalent buffers on a dummy denoting whether a fund is labeled as sustainable, on transition-opportunity and carbon-intensity scores as well as their interactions with the sustainability label, and on lagged flows, the logarithm of fund size, fund management fees, a dummy denoting exchange-traded funds, the Chicago Board Options Exchange Volatility Index, a term spread, a credit risk spread, a proxy for US interest levels, and a basket of major exchange rates versus the US dollar. The models include region-year and fund-type-year fixed effects. Solid bars indicate significance at the 10 percent level or less. In panel 2, labels on the *x*-axis indicate deciles and their rank. See Online Annex 3.5 for methodological details.

as a result of transition shocks could be potentially large (ECB 2021; ESMA 2021) and highly sector- and firm-specific (Aberdeen Standard Investments 2021), suggesting significant heterogeneity in performance across funds and scenarios. This underscores the importance of conducting scenario analysis and stress testing of the investment fund sector, though such an exercise is beyond the scope of this chapter.

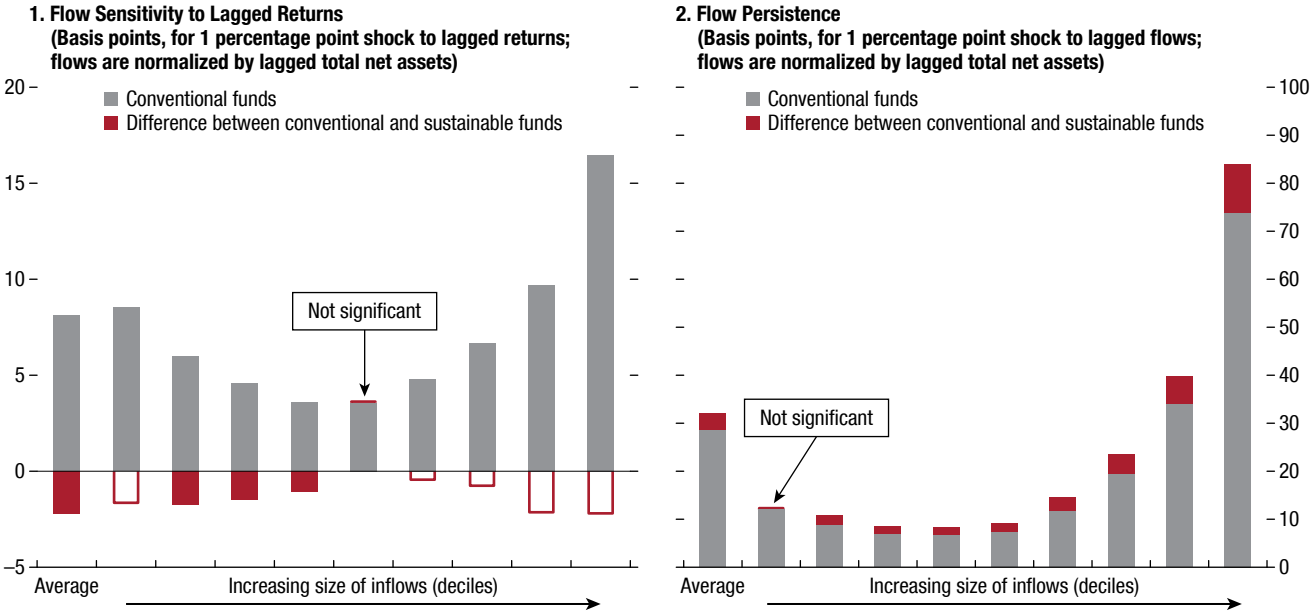
Regardless of the transition scenario that actually plays out, there seem to be financial stability benefits associated with the growth of the sustainable fund sector. Sustainable funds appear to attract investors who are less performance-sensitive and not too short-term-oriented—they thus may be less prone to large redemptions. Following lower returns, flows decline, on average, less for sustainable funds than for conventional funds (Figure 3.12, panel 1, far-left bar).[29] Moreover, the lower sensitivity of sustainable investors tends to be more pronounced when funds are experiencing outflows or smaller inflows (Figure 3.12, panel 1, other bars). Flows to sustainable funds also appear to be more persistent than flows to conventional funds, especially for funds experiencing inflows above the median (Figure 3.12, panel 2). This finding is consistent with the currently observed growth momentum in the sustainable fund sector and indicates that this sector has lower redemption risks and a more stable investor base. On the whole, these results suggest that sustainable funds could be important from

[29]This finding is consistent with El Ghoul and Karoui (2017), who find the behavior of investors with sustainability objectives to be more persistent and less sensitive to past performance.

Figure 3.12. Flow-Performance Relationship

Flows to sustainable funds are less sensitive to past performance than flows to their conventional peers, especially in funds facing outflows.

Flows are persistent for the entire sector, but more so for sustainable funds. This effect is more pronounced for funds facing inflows.



Sources: Morningstar; Refinitiv; and IMF staff calculations.
Note: Results are based on mean and unconditional quantile panel regressions of fund flows on a sustainability label dummy, lagged returns and flows, the interaction of these two variables with the sustainability dummy, the logarithm of fund size, fund expense ratio, fund age, and region-year and fund-type-year fixed effects. See Online Annex 3.6 for additional robustness tests. Solid bars indicate significance at the 10 percent level or lower.

a financial stability perspective and act as a source of stable financing for green investments.

Conclusion and Policy Recommendations

The sustainable investment fund sector can be an important driver of the transition to a green economy, supporting pro-transition corporate behavior through stewardship and potentially boosting investment expenditures of firms that could foster the transition.[30] The sector remains small, however, and fund managers face a number of challenges—including data gaps, risk of corporate greenwashing, multiple disclosure standards, and a lack of globally accepted taxonomies—in implementing investment strategies that support the transition.

To facilitate the assessment of transition-related risks and opportunities in the corporate sector by portfolio managers, investors, and financial authorities, as well as to prevent greenwashing and foster climate finance markets, policymakers should urgently seek convergence on a global climate information architecture (Ferreira and others, forthcoming). Such an architecture should include:

- A harmonized and consistent set of climate-related disclosure standards. Progress is in sight in this area (IFRS 2021).
- High-quality, reliable, and comparable data on climate-related metrics, including forward-looking metrics underpinned by mechanisms such as verification and audits to improve the quality of data. Initiatives are ongoing to fill these data gaps (FSB 2021; NGFS 2021a).
- Globally agreed-upon principles for sustainable finance classifications (including climate taxonomies) to align investment flows with climate goals. Sustainable finance classifications need to be well defined and dynamic to enable effective climate change mitigation through finance, and must also be suitable for adoption across all country groups (advanced, emerging market, and developing economies). A decisive global effort is needed to move forward on this front.

[30]Hong, Wang, and Yang (2021) argue that sustainable finance mandates can be an effective tool to mitigate climate change.

With regard to investment funds, efforts must continue to strengthen disclosures on how they promote sustainability and the transition, including through stewardship and capital allocation. This chapter's findings clearly point to the importance of fund labels and sustainable finance classifications (including taxonomies) to attract inflows. However, proper regulatory oversight and verification mechanisms are essential to avoid greenwashing.[31]

Once the climate information architecture is in place and regulatory oversight is well established, policymakers could also consider tools to channel savings toward transition-enhancing funds to complement other critical climate-change-mitigation policies, such as a carbon tax. These tools could take the form of enhanced eligibility of climate-themed funds for favorable tax treatment in savings products (such as retirement plans or life insurance products).[32,33] Additional research is needed to better understand the optimal design of such fiscal incentives.

To help raise awareness about climate-focused funds and attract investors with specific environmental and climate objectives, asset managers could emphasize the distinction between the broad concept of sustainability (which encompasses environmental, social, and governance issues) and purely climate considerations. They could also increase offerings of funds with well-defined and specific climate-change-mitigation objectives. While several large asset managers have already taken the initiative, others could also publish a description of their stewardship in climate change mitigation specifically.

Although past transition shocks have not been a source of financial instability for the investment fund sector, sudden and large shocks in the future could be disruptive, especially if structural vulnerabilities in the sector (such as liquidity mismatches) are not addressed.[34] To mitigate potential financial stability risks stemming from the transition, policy efforts should be geared toward implementing an orderly transition, using scenario analysis and stress testing to assess the vulnerability of the investment fund sector (NGFS 2021b). In addition, to make the sector more resilient to sudden asset price and redemption shocks, reforms to improve the availability of liquidity and redemption management tools are warranted (FSB 2020c; IMF 2021b).

[31]For example, it would be desirable to have labels and other sustainable finance classifications such as taxonomies based on credible emission-reduction targets of portfolio companies or on funds' active engagement with companies to reach those commitments. See IOSCO (2021b) for a discussion of current and planned regulatory approaches with respect to sustainability-related practices by asset managers.

[32]In addition, regulatory and legal barriers to investing in sustainable funds through retirement plans could be removed. In the United States, legislation was introduced in May 2021 in the House of Representatives and the Senate that seeks to make 401(k) retirement plan sponsors more comfortable with sustainable investing (Hallez 2021). In 2019, 3 percent of 401(k) plans had an environmental, social, and governance option, representing 0.1 percent of plan assets (Norton 2021).

[33]An example of a tax incentive to promote sustainable fund investments is the reform to Luxembourg's "subscription tax" in 2021, which makes the rate of the annual subscription tax applied to investment funds a decreasing function of the share of their investments in sustainable assets, as defined in the EU Taxonomy Regulation (see https://www2.deloitte.com/lu/en/pages/sustainable-development/articles/reduced-subscription-tax-rate.html).

[34]Such large and sudden transition shocks are more likely to occur if efforts to address climate change are delayed, requiring abrupt and intense policy action to address the issue.

Box 3.1. Management of Risks and Opportunities Related to Climate Change Mitigation: Survey of Asset Managers

This box discusses results from a short survey of investment fund managers and other asset management company representatives on the integration of climate change considerations into portfolio management practices as well as on their perception of climate-related risks and opportunities. The survey includes responses of 26 portfolio managers and representatives from 11 asset management firms and one asset owner, with more than $16 trillion in combined assets under management, based in Asia, Europe, and the United States. See Online Annex 3.7 for details on the survey.

Survey participants indicated that sustainability considerations—including climate change considerations—were fully or almost fully integrated into risk management practices in their companies. Within sustainable investing, which typically represents about 10 percent of assets under management, a range of approaches is used. The most common approach relies on exclusionary criteria (for example, excluding certain types of fossil fuel companies); least frequently mentioned approaches were those that rely on positive screening (Figure 3.1.1, panel 1). Some portfolio managers expressed skepticism that a positive impact on climate change mitigation could be achieved by investing solely in firms that are already performing well from an emissions perspective. Although many of the asset managers surveyed also offered impact funds, the relative size of these funds compared with the overall assets under management in sustainable funds was typically small. This is because asset managers found it difficult to measure impact precisely.

This box was prepared by Felix Suntheim and Jérôme Vandenbussche.

To implement their sustainable investment strategies, all survey respondents said they relied on measures of the portfolio carbon footprint and frequently also on measures of expected emissions reduction, often calculated relative to a benchmark (Figure 3.1.1, panel 2). About three-quarters of respondents noted that they use proprietary valuation models. Sector or industry classifications were often considered too crude a tool, with less than half of respondents incorporating them into their investment process. Third-party environmental, social, and governance databases were more widely used as an input (82 percent of respondents). Respondents were often skeptical about the reliability and comparability of aggregate scores and preferred using raw metrics to generate their own scores.

Regarding implementation challenges, the overwhelming majority of respondents thought that lack of data, including the lack of forward-looking data, was a pressing issue to be addressed and that it represented a greater obstacle than the lack of commonly accepted disclosure standards and taxonomies (Figure 3.1.1, panel 3). The lack of data was thought to be particularly acute in private markets.

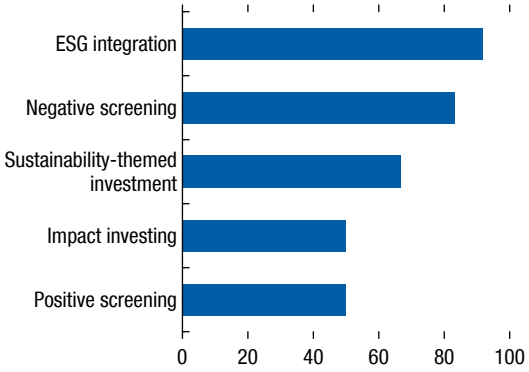
Finally, portfolio managers expressed very heterogeneous beliefs about climate-related risks in the short to medium term (Figure 3.1.1, panel 4). Across a list of five risk factors, policy risk—such as an increase in the price of carbon or a tightening of emissions regulations—was ranked highest by a majority of respondents, followed by physical risk. In terms of opportunities from the transition, respondents considered technological change or changes to consumer preferences to be the most important drivers (66 percent of respondents).

Box 3.1 *(continued)*

Figure 3.1.1. Survey Responses

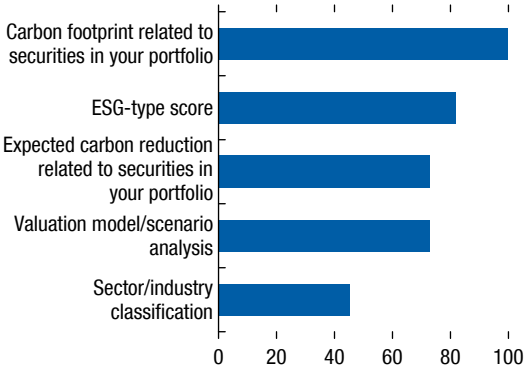
All surveyed asset managers integrate environmental, social, and governance considerations into their investment processes. Negative screening approaches are extremely common, while positive screening and impact investing are relatively less widespread.

1. Approaches Used by Asset Managers to Incorporate Climate Change Mitigation into Sustainable Investment Strategies (Percent of respondents)



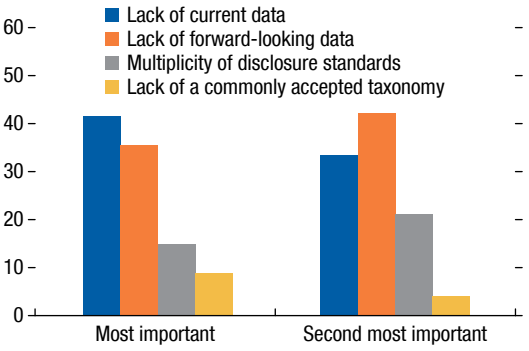
All asset managers analyze the carbon footprint of their investment products. A range of other tools is also very common.

2. Tools Used to Incorporate Risks and Opportunities Related to the Transition into Asset Managers' Investment Decisions (Percent of respondents)



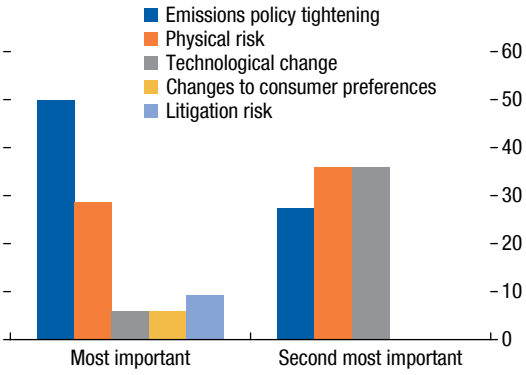
Data gaps were considered the most pressing issues that need to be addressed to facilitate transition-related investing.

3. The Two Most Important Obstacles Faced by Survey Respondents When Integrating Transition-Related Risks and Opportunities into Investment Decisions (Percent of respondents)



Emissions policy tightening was seen as the most important climate-related risk factor, but views varied widely across institutions and fund managers.

4. The Two Most Important Climate-Related Risk Factors over the Next Three Years (Percent of respondents)



Source: IMF staff calculations.
Note: See Online Annex 3.7 for details on the survey. ESG = environmental, social, and governance.

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