INTERNATIONAL MONETARY FUND

GLOBAL FINANCIAL STABILITY REPORT

Markets in the Time of COVID-19

2020
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. . . to indicate that data are not available or not applicable;

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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, as well as by Claudio Raddatz, Advisor, Anna Ilyina, 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 Sergei Antoshin, John Caparusso, Sally Chen, Yingyuan Chen, Martin Čihák, Fabio Cortes, Reinout De Bock, Andrea Deghi, Dimitris Drakopoulos, Alan Xiaochen Feng, Zhi Ken Gan, Rohit Goel, Lucyna Gornicka, Sanjay Hazarika, Frank Hespeler, Henry Hoyle, David Jones, Oksana Khadarina, Will Kerry, Piyusha Khot, Sheheryar Malik, Roland Meeks, Evan Papageorgiou, Thomas Piontek, Patrick Schneider, Can Sever, Juan Solé, Felix Suntheim, Tomohiro Tsuruga, Jeffrey Williams, Akihiko Yokoyama, Yizhi Xu, and Xingmi Zheng. Input was provided by Darryl King, Fabiana Melo, Manuel Fernando Perez Archila, Mahvash Saeed Qureshi, Nobuyasu Sugimoto, and Peter Windsor. Magally Bernal, Monica Devi, Leroy Perumal, and Andre Vasquez were responsible for word processing.

Gemma Diaz from the Communications Department led the editorial team and managed the report's production with editorial assistance from Sherrie Brown, Christine Ebrahimzadeh, David Einhorn, Lucy Scott Morales, Nancy Morrison, Katy Whipple/The Grauel Group, AGS, and Vector Talent Resources.

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, central banks, national treasuries, and academic researchers.

This GFSR reflects information available as of April 9, 2020. The report benefited from comments and suggestions from staff in other IMF departments, as well as from Executive Directors following their discussion of the GFSR on April 7, 2020. 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

The COVID-19 Crisis

The COVID-19 pandemic poses unprecedented health, economic, and financial stability challenges. The first priority, of course, is to save lives. But the necessary containment measures to limit the spread of the virus are causing a dramatic decline in economic activity. As a result, in only three months, the 2020 outlook has shifted from expected growth of more than 3 percent globally to a sharp contraction of 3 percent—much worse than the output loss seen during the 2008–09 global financial crisis. The ultimate impact of the crisis on the global economy, as well as the timing of a recovery, is highly uncertain.

This crisis presents a very serious threat to the stability of the global financial system. Following the COVID-19 outbreak, financial conditions tightened at unprecedented speed, exposing some "cracks" in global financial markets. Market volatility spiked and borrowing costs surged on expectations of widespread defaults. Signs of strain emerged in major funding markets, including the global US dollar funding market. Historically large capital outflows exacerbated domestic shocks in emerging market economies. These developments have raised the risk that the inability of borrowers to service their debts would put pressure on banks and cause credit markets to freeze up. A prolonged period of dislocation in financial markets could trigger distress among financial institutions, which, in turn, could lead to a credit crunch for nonfinancial borrowers, further exacerbating the economic downturn.

To safeguard economic and financial stability and to prevent the emergence of adverse macrofinancial feedback loops, countries are taking decisive actions. *Central banks* have eased monetary policy and are providing liquidity to the financial system, including through foreign-currency swap lines, to maintain the flow of credit to the economy. Thanks to these efforts, funding markets have remained functional and investor sentiment has shown signs of improvement. Supervisors are encouraging banks to prudently renegotiate loan terms for those struggling to service their debts in order to help bridge the period of economic inactivity, and to use existing capital and liquidity buffers, as well as other flexibility in their regulatory and accounting frameworks, to absorb losses. *Country authorities* are supporting people and companies through sizable, timely, temporary, and targeted fiscal measures to put a limit on defaults of firms and households via payment moratoriums and guaranteed credit. Multilateral cooperation has increased the resources available to support the most vulnerable countries and communities. The IMF, with $1 trillion in available resources, is actively supporting its member countries.

These policies are essential to ensure that a temporary shutdown of production does not lead to more permanent damage to the productive capacity of the economy, to the financial system, and to the fabric of society. Once the virus outbreak is under control, policies should be aimed at fostering the recovery as well as assessing and healing the damage inflicted by the pandemic on the balance sheets of nonfinancial firms, financial institutions, and governments.

Tobias Adrian
Financial Counsellor

EXECUTIVE SUMMARY

The April 2020 *Global Financial Stability Report* at a Glance (Chapter 1)

- The outbreak of COVID-19 has dealt an unprecedented blow to global financial markets.
- Risk asset prices have plummeted and borrowing costs have soared, especially in risky credit markets.
- Emerging and frontier markets have experienced the sharpest portfolio flow reversal on record.
- The priority is to save lives and to support the people and companies most affected by COVID-19.
- Fiscal, monetary, and financial policies should be used to support economies stricken by the pandemic.
- International cooperation is essential to tackle this extraordinary global crisis.

The coronavirus (COVID-19) pandemic presents a historic challenge. In mid-February, when market participants started to fear that the outbreak would become a global pandemic, the prices of equities fell sharply, from previously overstretched levels. In credit markets, spreads skyrocketed, especially in risky segments such as high-yield bonds, leveraged loans, and private debt, where issuance essentially came to a halt. Oil prices plummeted in the face of weakening global demand and the failure of the OPEC+ countries to reach an agreement on output cuts, adding a further leg to the deterioration in risk appetite. These volatile market conditions led to a flight to quality, with yields on safe-haven bonds declining abruptly.

A number of factors amplified asset price moves, contributing to a sharp tightening of financial conditions at unprecedented speed. Signs of strain emerged in major short-term funding markets, including the global market for US dollars—a development reminiscent of dynamics last seen during the financial crisis a decade ago. Market liquidity deteriorated considerably, including in markets traditionally seen as very deep. Leveraged investors came under pressure, with some reportedly forced to close out some of their positions in order to meet margin calls and rebalance their portfolios.

However, markets have pared back some of the losses. Decisive monetary and fiscal policy actions, aimed at containing the fallout from the pandemic, have stabilized investor sentiment. Nevertheless, there is still a risk of a further tightening in financial conditions that could expose financial vulnerabilities, which have been highlighted repeatedly in previous *Global Financial Stability Reports*.

Emerging and frontier market economies are facing the perfect storm. They have experienced the sharpest reversal in portfolio flows on record, both in dollar terms and as a share of emerging and frontier market GDP. This loss of external debt financing is likely to put pressure on more leveraged and less creditworthy borrowers. This may lead to a rise in debt restructurings, which could test existing debt resolution frameworks.

Asset managers may face further outflows from their funds and may be forced to sell assets into falling markets, potentially exacerbating price moves. High levels of borrowing by companies and households may lead to debt distress as the economy comes to a sudden stop. Banks have more capital and liquidity than in the past, they have been subject to stress tests, and central bank liquidity support has helped mitigate funding risks, putting them in a better position than at the onset of the global financial crisis. The resilience of banks, however, may be tested in some countries in the face of large market and credit losses, and this may cause them to cut back their lending to the economy, amplifying the slowdown in activity.

This historic challenge necessitates a forceful policy response. The priority is to save lives and to implement appropriate containment measures to avoid overwhelming health systems. Country authorities need to support people and companies that have been most affected by the virus outbreak, as discussed in the April 2020 *World Economic Outlook*.

To that end, authorities across the globe have already implemented wide-ranging policies. The April 2020 *Fiscal Monitor* describes the fiscal support packages that have been announced by governments across the globe. Large, timely, temporary, and targeted fiscal measures are necessary to ensure that a temporary shutdown of activity does not lead to more permanent damage to the productive capacity of the economy and to society as a whole.

Central banks globally have taken bold and decisive actions by easing monetary policy, purchasing a range of assets, and providing liquidity to the financial system in an effort to lean against the tightening in financial conditions and maintain the flow of credit to the economy. As policy rates are now near or below zero in many major advanced economies, unconventional measures and forward guidance about the expected policy path are becoming the main tools for these central banks going forward. Central banks may also consider further measures to support the economy during these challenging times.

Policymakers need to maintain a balance between safeguarding financial stability and supporting economic activity.

- *Banks.* In the first instance, banks' existing capital and liquidity buffers should be used to absorb losses and funding pressures. In cases where the impact is sizable or longer lasting and bank capital adequacy is affected, supervisors should take targeted actions, including asking banks to submit credible capital restoration plans. Authorities may also need to step in with fiscal support—either direct subsidies or tax relief—to help borrowers to repay their loans and finance their operations, or provide credit guarantees to banks. Supervisors should also encourage banks to negotiate, in a prudent manner, temporary adjustments to loan terms for companies and households struggling to service their debts.
- *Asset managers.* To prudently manage liquidity risks associated with large outflows, regulators should encourage fund managers to make full use of the available liquidity tools where it would be in the interests of unit holders to do so.
- *Financial markets.* Market resilience should be promoted through well-calibrated, clearly defined, and appropriately communicated measures, such as circuit breakers.

Many emerging market economies are already facing volatile market conditions and should manage these pressures through exchange rate flexibility, where feasible. For countries with adequate reserves, exchange rate intervention can lean against market illiquidity and thus play a role in muting excessive volatility. However, interventions should not prevent necessary adjustments in the exchange rate. In the face of an imminent crisis, capital flow management measures could be part of a broad policy package, but they cannot substitute for warranted macroeconomic adjustment. Sovereign debt managers should prepare for longer-term funding disruptions by putting contingency plans in place to deal with limited access to external financing.

Multilateral cooperation is essential to help reduce the intensity of the COVID-19 shock and its damage to the global economy and financial system. Countries confronting the twin crises of health and external funding shocks—for example, those reliant on external financing or commodity exporters dealing with the plunge in commodity prices—may additionally need bilateral or multilateral assistance to ensure that health spending is not compromised in their difficult adjustment process. Official bilateral creditors have been called upon by the IMF Managing Director and the World Bank President to suspend debt payments from countries below the International Development Association's operational threshold that request forbearance while they battle the pandemic. The IMF, with $1 trillion in available resources, is actively supporting member countries.

IMF EXECUTIVE BOARD DISCUSSION SUMMARY

The following remarks were made by the Chair at the conclusion of the Executive Board's discussion of the Fiscal Monitor*,* Global Financial Stability Report*, and* World Economic Outlook *on April 7, 2020.*

Executive Directors broadly shared the assessment of the global economic outlook, risks, and policy priorities. They agreed that the outlook is dominated by the global health crisis from the COVID-19 pandemic, and the extreme uncertainty about its course, intensity, and impact. The expected sharp contraction of the global economy in 2020 is likely much worse than during the 2008–09 global financial crisis (GFC), as a significant portion of the global economy has been shut down. Directors noted that the projected global recovery in 2021 is predicated on the pandemic fading in the second half of 2020 and the effectiveness of policy actions to contain its economic fallout.

Directors agreed that, amid the exceptionally large degree of uncertainty, risks of a worse outcome predominate. Some Directors indicated their interest in additional scenario analysis, including possibly more positive developments than assumed in the baseline projections. Directors observed that the economic fallout depends on factors that interact in ways that are hard to predict, including the pathway of the pandemic, the intensity and efficacy of the necessary containment efforts, the extent of supply disruptions, and the repercussions of the substantial tightening in global financial conditions. As a result, many countries face a multi-layered crisis comprising a health shock, domestic economic disruptions, plummeting external demand, and capital flow reversals. For many low-income developing countries, the challenges have been compounded by high and rising debt levels, capacity constraints, and a collapse in commodity prices.

Directors agreed that effective policies are urgently needed to forestall worse outcomes. The immediate priority is to reduce contagion and protect lives, especially by fully accommodating additional health care expenditures to strengthen the capacity and resources of the health sector. Economic and financial policies will need to focus on supporting vulnerable people and businesses, safeguarding the financial system, and reducing scarring effects from the unavoidable severe slowdown. Directors emphasized that these supporting measures should be scaled back gradually and flexibly as the pandemic fades. Once containment measures can be lifted, policy focus will have to shift to securing a robust recovery while ensuring debt overhangs do not weigh on activity over the medium term.

Directors acknowledged that the pandemic has elevated the need for fiscal policy action to an unprecedented level. They noted in particular the need for large timely, temporary, and targeted fiscal support lifelines to protect the most-affected people and viable firms, including government-funded paid sick and family leaves, cash or in-kind transfers, unemployment benefits, wage subsidies, tax relief, and deferral of tax payments. Good governance, including transparency in budget execution and communication, is crucial to manage fiscal risks and maintain public trust. Most Directors acknowledged that broad-based, coordinated fiscal stimulus will be more effective in boosting aggregate demand during the recovery phase, mindful of the need to preserve sound public finances and debt sustainability.

Directors welcomed the extraordinary actions taken by many central banks to ease monetary policy, provide ample liquidity to financial institutions and markets, including through enhanced U.S. dollar swap lines, and maintain the flow of credit to households and firms by setting up emergency facilities. They noted that authorities could consider extending these measures to a broader range of market segments. Some Directors also called for an extension of swap lines to provide foreign currency liquidity to a broader group of countries, and a few encouraged utilizing regional financing arrangements. Directors considered that, as banks generally have larger capital and liquidity buffers now relative to the GFC, they should be

encouraged to use the existing buffers to absorb losses and prudently re-negotiate loan terms for firms and individuals, using the flexibility within existing regulatory frameworks. Any regulatory relief would need to be reassessed once conditions permit.

Directors noted that the pandemic also triggered a record reversal of portfolio flows from emerging and frontier markets. They recommended, where feasible and appropriate, allowing exchange rates to act as a shock absorber, and intervening in foreign exchange markets as needed to reduce excessive volatility and ease liquidity constraints. Macroprudential measures, and in near-crisis situations, temporary capital flow management measures may be necessary as part of the policy package and should be phased out as global financial sentiment recovers. Sovereign debt managers should also develop contingency plans to deal with limited access to external financing.

Directors underscored that both the containment and recovery will also require strong multilateral cooperation to complement national policy efforts. Global cooperation is essential to address shared challenges, especially to channel aid and medical resources to countries with weak health systems, and help financially constrained countries facing twin health and funding shocks. Directors noted that multilateral cooperation is also necessary to ensure a strong global financial safety net and better access to international liquidity across countries. They stressed the critical role for the IMF in supporting its member countries, in collaboration with other international financial institutions. Directors welcomed the IMF's crisis response package, in particular the enhancement of the emergency financing toolkit, provision of debt service relief for the poorest members, and fund-raising for the Catastrophe Containment and Relief Trust.

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CHAPTER 1

GLOBAL FINANCIAL STABILITY OVERVIEW

MARKETS IN THE TIME OF COVID-19

Chapter 1 at a Glance

- Global financial conditions have tightened abruptly with the onset of the COVID-19 pandemic.
- Risk asset prices have dropped sharply as investors have rushed for safety and liquidity.
- Emerging and frontier markets have experienced a record portfolio flow reversal.
- A further tightening of financial conditions may expose financial vulnerabilities:
  - Asset managers may become distressed sellers, exacerbating asset price declines.
  - Leveraged firms may lose market access and defaults may spike.
- Banks' resilience may be tested as economic and financial market stress rise.
- Strong policy response and international cooperation are needed to tackle these challenges.

The COVID-19 Pandemic Triggered a Sharp Market Correction

The coronavirus (COVID-19) pandemic is a historic challenge. The necessary measures imposed by country authorities to slow the spread of the virus and to bolster the capacity of health systems have led to a sudden stop in economic activity and a sharp deterioration of the economic outlook. Global growth is now expected to decline by 3 percent in 2020, which is worse than during the global financial crisis (see the April 2020 *World Economic Outlook* [WEO]). The timing and the shape of future recovery remain highly uncertain.

Early in the year, financial markets were buoyed by a widespread sense of optimism on the back of supportive monetary policies, reduced trade tensions, and tentative signs of stabilization in the global economy. However, as COVID-19 spread globally, the prices of risk assets and commodities started to fall at unprecedented speed while the prices of safe-haven assets, such as gold and US Treasuries, gained as investors reassessed the economic impact of COVID-19 and rushed for safety and liquidity (Figure 1.1, panel 1). Equity markets experienced the fastest drop in history with the S&P 500 falling 20 percent from its peak in just 16 trading sessions. The asset price declines reached about half the magnitude seen in 2008–09 at the worst point of the sell-off, and implied volatility spiked across asset classes, in some cases to levels last seen during the global financial crisis (Figure 1.1, panels 1 and 2). However, markets pared back some of the losses more recently as decisive policy actions to contain the fallout from the pandemic managed to stabilize investor sentiment.

In early March, the failure of the OPEC+ countries to reach an agreement on output cuts to maintain stable oil prices in the face of weakening global demand added fuel to the fire. While spot prices fell the most, the entire oil futures curve shifted down, suggesting that investors expect oil prices to remain low for a long time (Figure 1.1, panel 3). Although the sell-off was broad-based, sectors most exposed to the impact of the virus containment measures—such as airlines, transportation, hotels, and restaurants—or to the energy market came under severe pressure (see Figure 1.1, panel 1).

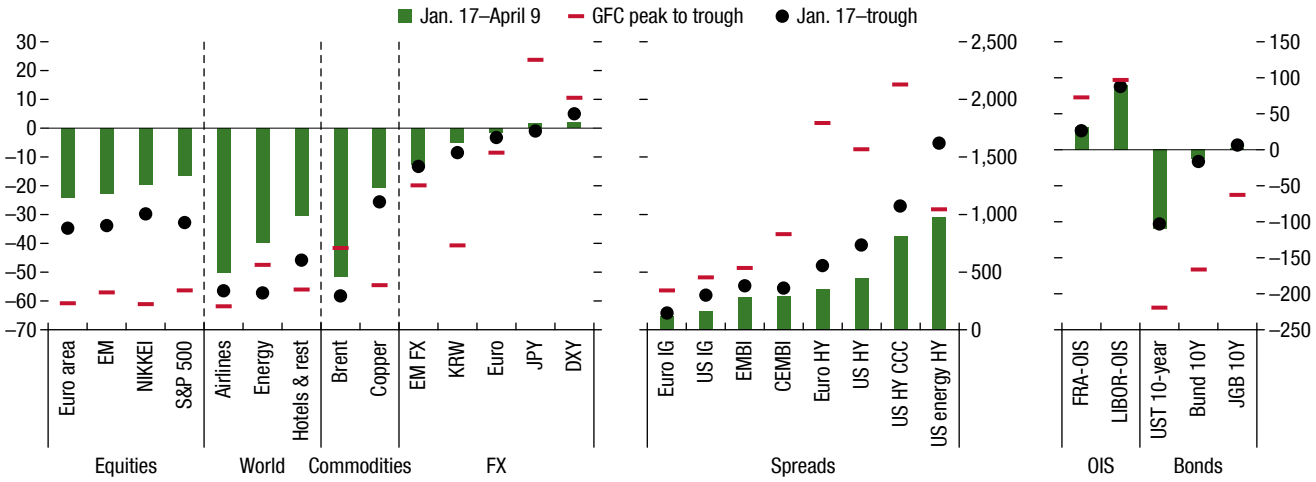
The volatile market conditions throughout February and March sparked a flight to safety and liquidity among investors. Government bond yields in Germany and the United States fell sharply, on net, reflecting both declines in term premiums and a lower expected path of monetary policy (Figure 1.2, panel 1). The

Prepared by staff from the Monetary and Capital Markets Department (in consultation with other departments): Fabio Natalucci (*Deputy Director*), Anna Ilyina (*Division Chief*), Will Kerry (*Deputy Division Chief*), Evan Papageorgiou (*Deputy Division Chief*), Sergei Antoshin, John Caparusso, Sally Chen, Yingyuan Chen, Fabio Cortes, Dimitris Drakopoulos, Rohit Goel, Sanjay Hazarika, Frank Hespeler, Henry Hoyle, David Jones, Piyusha Khot, Sheheryar Malik, Thomas Piontek, Can Sever, Patrick Schneider, Jeffrey Williams, Akihiko Yokoyama, and Xingmi Zheng. Input was provided by Darryl King, Fabiana Melo, Nobuyasu Sugimoto, and Peter Windsor. Magally Bernal and Andre Vasquez were responsible for word processing and the production of this report.

Figure 1.1. Financial Market Developments: Adding Oil to the Fire

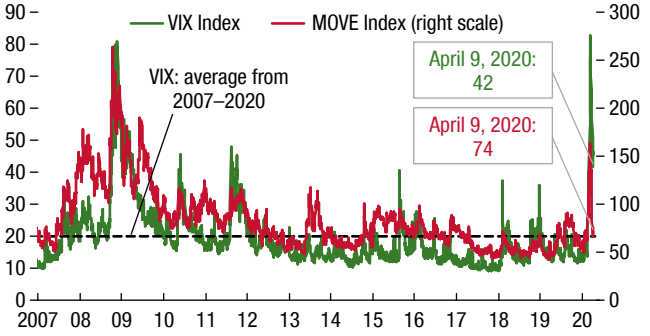
Investors fled risk assets for safe-haven assets, with some risk asset prices falling by more than 25 percent.

1. Asset Market Performance (as of April 9, 2020)
(Percent; basis points; basis points)



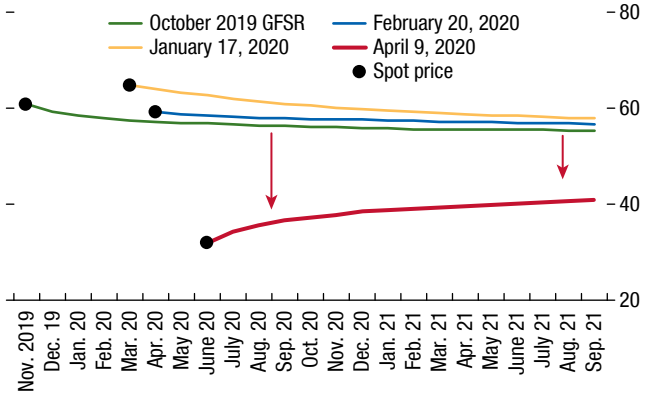
Market volatility spiked as COVID-19 spread globally.

2. Volatility Indexes
(Level in percentage points)



Oil prices collapsed as the OPEC+ deal fell apart on March 6.

3. Oil Spot and Futures Prices
(US dollars)



Sources: Bloomberg Finance L.P.; and IMF staff calculations.
Note: MOVE = Merrill Option Volatility Estimate; VIX = Chicago Board Options Exchange Volatility Index; CEMBI = corporate emerging markets bond index; DXY = dollar index; EM = emerging markets; EMBI = emerging markets bond index; FRA = forward rate agreement; FX = foreign exchange; GFC = global financial crises; HY = high yield; IG = investment grade; JGB = Japanese government bond; JPY = Japanese yen; USD = US dollar; KRW = Korean won; LIBOR = London interbank offered rate; OIS = overnight indexed swap; UST = US Treasury; Y = year.

market-implied probability of inflation falling below 1 percent in any single year over the next five years spiked in Europe and in the United States on concerns about the economic impact of COVID-19 and the fall in oil prices (see Figure 1.2, panel 2).

As central banks responded with decisive monetary policy easing, policy rates in several advanced economies came down close to zero (Figure 1.2, panel 3), and government bond yields are now expected to stay low for even longer. The stock of government bonds with yields of less than 1 percent (shown in light and dark blue in Figure 1.2, panel 4) doubled from about 40 percent of bonds outstanding at the end of 2019 to about 80 percent in March.

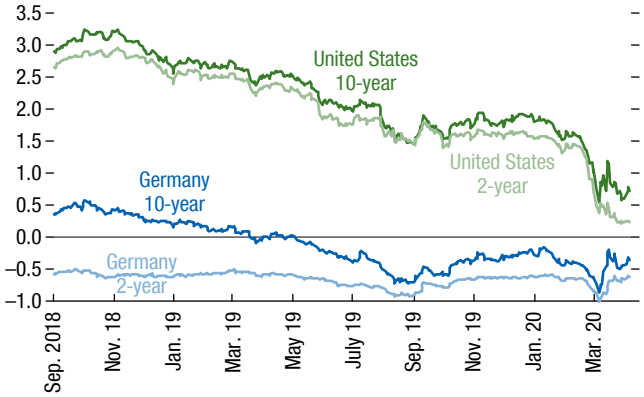
Stress in Credit Markets Was Amplified by Borrowers' Leverage and the Oil Price Collapse

Conditions in the *corporate credit markets* have deteriorated sharply since late February on the back of rising credit and liquidity risks. *Investment grade bond* spreads widened (Figure 1.3, panel 1), as investors started to

Figure 1.2. Advanced Economy Government Bond Markets: Lower for Even Longer

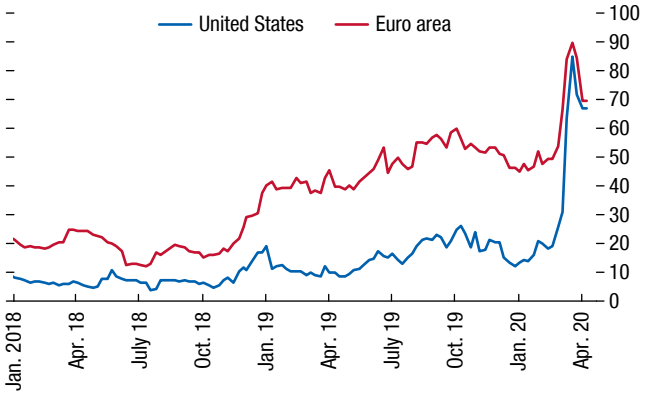
Yields collapsed initially on the back of lower-term premiums and expectations of central bank response ...

1. Advanced Economy Government Bond Yields (Percent)



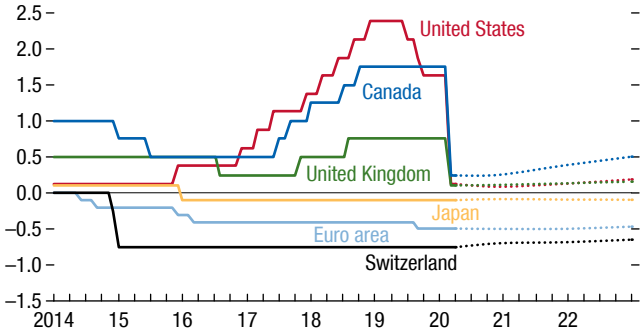
... as the inflation outlook deteriorated on expectations of sustained economic weakness.

2. Probability of Inflation Below 1 Percent over Five-Year Period (Percent)



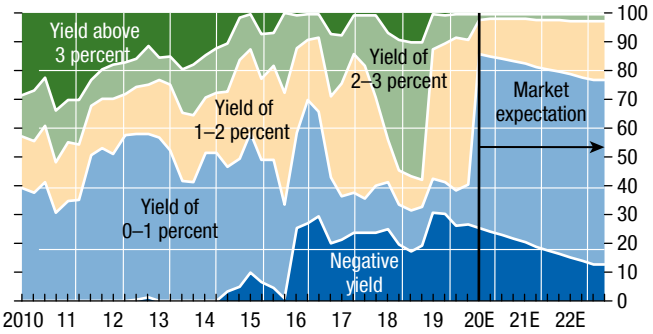
Central banks have cut policy rates aggressively ...

3. Actual and Expected Policy Rates (Percent)



... pushing down yields on government bonds even lower.

4. Advanced Economy Government Bonds (Percent of bonds outstanding, by yield)



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

focus on a large share of BBB credits that are at risk of downgrades and elevated leverage in this market segment (see the April 2019 *Global Financial Stability Report* [GFSR]). In the primary market, European issuance declined, while US issuance surged, reflecting precautionary demand for cash (only partly met by bank credit lines) and strains in the commercial paper market (Figure 1.3, panel 2).

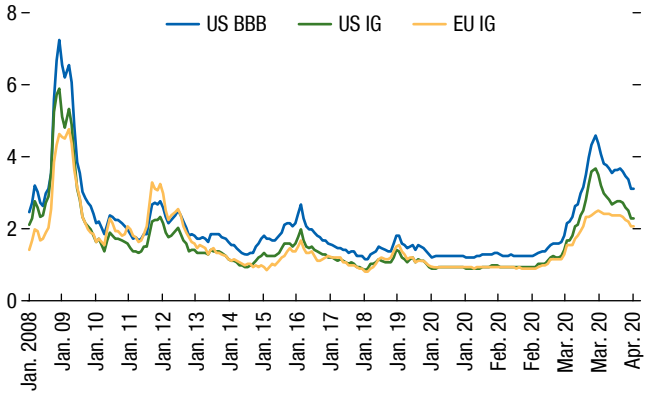
In response to pressures in the corporate bond markets, several central banks, including the US Federal Reserve, the European Central Bank, and the Bank of Japan, rolled out new facilities and expanded existing programs to support issuance and liquidity in corporate debt and commercial paper markets (see "Policy Priorities" section). These actions helped to reverse some of the initial widening of investment-grade bond spreads.

Strains in the *risky credit market segments*—high-yield bonds, leveraged loans, and private debt—continued to be evident through early April. These markets expanded rapidly after the global financial crisis, reaching $9 trillion globally, while borrowers' credit quality, underwriting standards, and investor protections weakened (see Chapter 2 of this report). Since late February, *high-yield bond* spreads have widened dramatically, particularly for energy firms and in sectors most affected by the pandemic, such as transportation (Figure 1.3, panel 3). *Leveraged loan prices* have experienced sharp declines, about half the drop seen during the global financial crisis at the worst point of the March sell-off (Figure 1.3, panel 4). Against a backdrop of already elevated leverage and expected declines in earnings, rating agencies revised up their speculative-grade default forecasts from

Figure 1.3. Corporate Credit Markets: Pricing Higher Default Risk

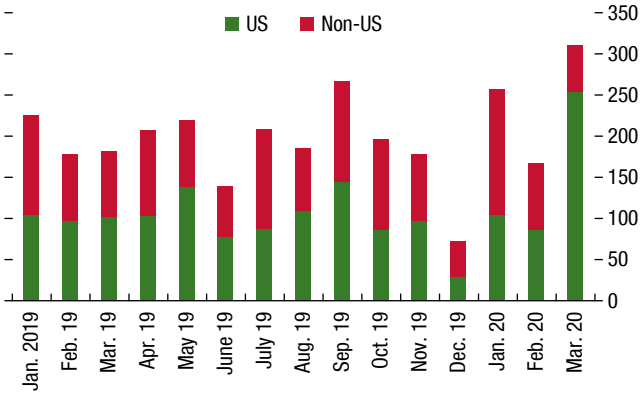
Global investment grade corporate spreads sharply widened.

1. Global Investment Grade (IG) Corporate Spreads (Percent)



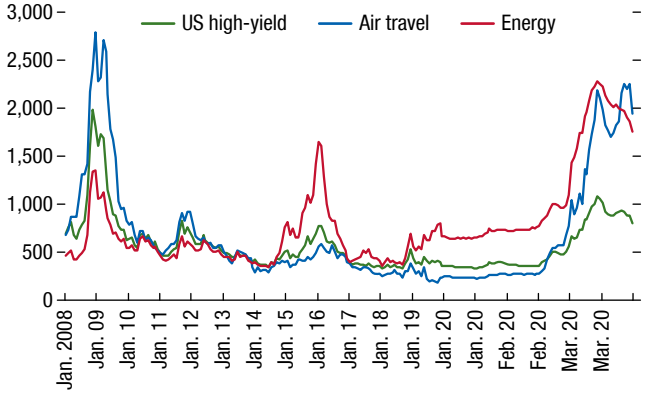
US investment grade firms continued to issue in March—in contrast to European firms—because of increased need for cash and strains in the commercial paper market.

2. Global Investment Grade Bond Issuance (Billions of US dollars)



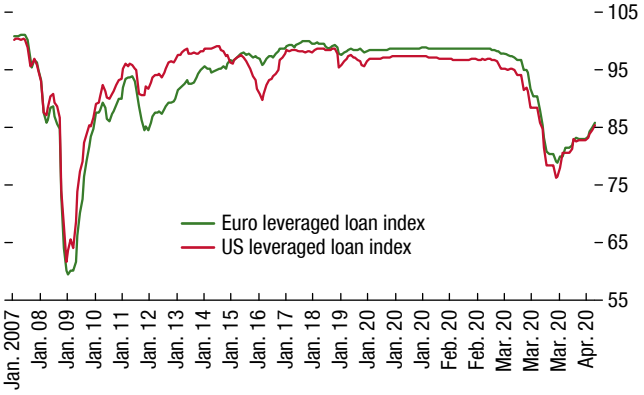
High-yield spreads rose to post-GFC highs, driven by energy and transportation sectors.

3. US High-Yield Corporate Spreads (Basis points)



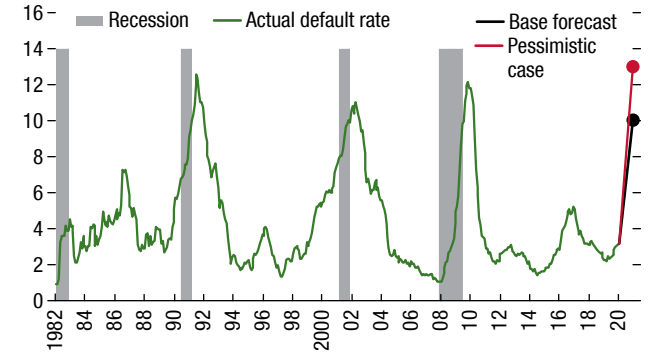
Leveraged loan prices experienced a decline of about half the drop seen during the global financial crisis.

4. Global Leveraged Loan Market Prices (Indices)



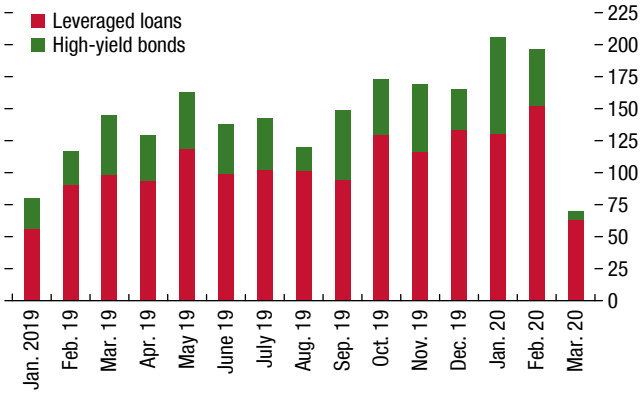
With credit risk rising, rating agencies revised up default forecasts to recessionary levels.

5. S&P US Speculative-Grade Default Rate (Percent of issuers)



The primary market for high-yield bonds and leveraged loans dried up in March.

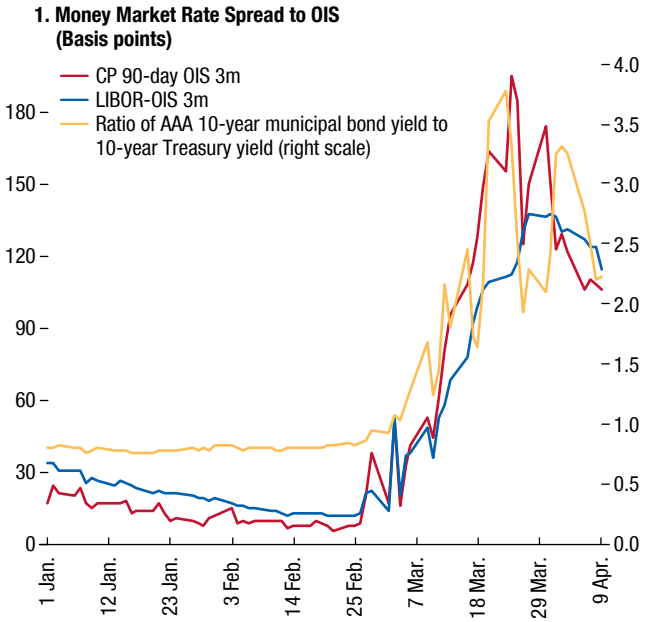
6. Global High-Yield Bond and Leveraged Loan New Issuance (Billions of US dollars)



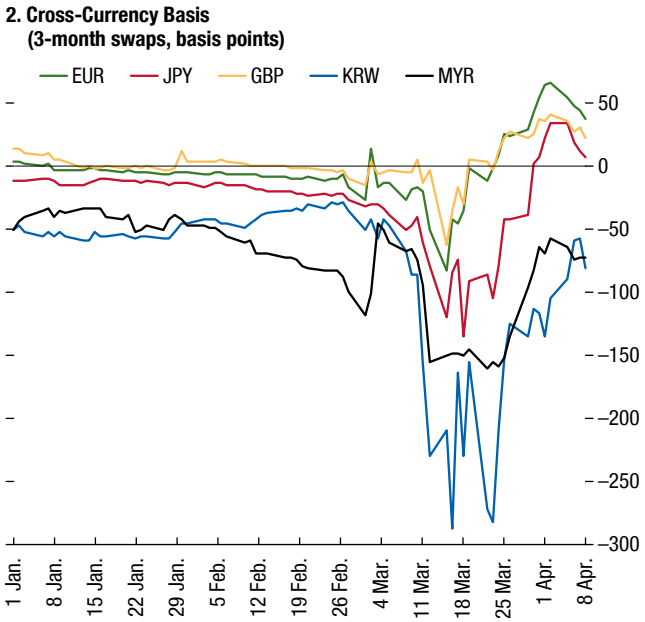
Sources: Bloomberg Finance L.P.; S&P Global Ratings; S&P Leveraged Commentary Data; and IMF staff calculations.
Note: GFC = global financial crises.

Figure 1.4. Short-Term Funding Markets: Under Stress

Commercial paper markets froze as dealers were unable to intermediate ...



... with the strains spilling over to the foreign exchange funding market.



Sources: Bloomberg Finance L.P.; J.P. Morgan & Chase Co.; and IMF staff calculations.
Note: In panel 1, CP 90-day yield is a composite of offered levels for A1/P1/F1 rated US commercial paper programs. 3m = 3 month; CP = commercial paper; EUR = Euro; GBP = British pound; JPY = Japanese yen; KRW = Korean won; LIBOR = London interbank offered rate; MYR = Malaysian ringgit; OIS = overnight index swap.

benign to recessionary levels (Figure 1.3, panel 5). Market-implied US high-yield defaults also rose to 8–10 percent. Global issuance of high-yield bonds came to a halt and issuance of leveraged loans fell considerably (Figure 1.3, panel 6).

However, spreads started to narrow even in these risky credit market segments following the US Federal Reserve decision to extend its emergency facilities to corporate debt, including in early April collateralized loan obligation vehicles, which are one of the largest buyers of leveraged loans (see Chapter 2).

Pressures in Short-Term Funding Markets Were Exacerbated by Dealers' Clogged Balance Sheets

The *US commercial paper market*, which is typically tapped by firms to meet their working capital needs, froze. Two factors contributed to this development. First, prime money market funds sought to reduce their commercial paper holdings to raise cash and build liquidity buffers in response to actual and expected investor outflows. And second, dealer banks were reportedly less able or willing to intermediate these flows as they faced balance sheet constraints and risk limits. As a result, commercial paper spreads widened dramatically (Figure 1.4, panel 1). A similar dynamic occurred in the US municipal bond market, as dealers could not warehouse the surge in supply resulting from outflows from municipal bond funds. Short-term funding markets in Australia, Canada, and the United Kingdom experienced similar pressures. In response, central banks launched several emergency facilities (see "Policy Priorities" section) that have provided some relief to short-term funding markets.

Conditions in global *US dollar funding markets* tightened as well. The spread between LIBOR—the floating rate at which banks lend to each other—and a risk-free rate widened sharply (Figure 1.4, panel 1). The cross-currency basis—a premium paid on the US dollar funding in exchange for local currency—widened for most currencies (Figure 1.4, panel 2). The extent of initial tightening in funding conditions was more severe in economies with large dollar funding

demand but with no swap lines with the US Federal Reserve. In response to these pressures, several central banks agreed to augment the provision of US dollar liquidity through an enhancement to existing swap lines or through new temporary swap lines, including with several emerging market economies (see "Policy Priorities" section for details). Since the end of March, pressures in global US dollar funding markets appeared to have abated somewhat.

Financial Deleveraging and Strained Market Liquidity Aggravated Selling Pressures

The sharp tightening in financial conditions put pressure on *leveraged investors* in March, forcing them to close out some of their positions in order to meet margin calls or to rebalance their portfolios—a dynamic that likely amplified asset price declines. For example, as volatility and correlations across asset classes shot up, *volatility-targeting investors* were apparently forced to liquidate some of their asset holdings, contributing to the sell-off.[1] The two-fold increase in the balances of *central counterparty clearing houses* with the US Federal Reserve in only two weeks is further evidence that leveraged investors faced significant margin calls.

As Treasury yields fell sharply and intraday volatility increased, leveraged investors who had engaged in the so-called *basis trades* in the US Treasury market were forced to unwind their positions.[2] This led to a substantial increase in dealers' holdings of Treasury bonds. With volatility surging, dealers' risk management practices and limits likely constrained their ability to intermediate markets, adding to stress (see Online Annex 1.1[3] for a discussion of dealers' balance sheet constraints and other market fragilities). As a result, liquidity conditions in the US Treasury market deteriorated sharply (Figure 1.5, panel 1).

In response to these developments, the US Federal Reserve took a number of steps aimed at preventing market disruptions, improving liquidity, and mitigating upward pressure on Treasury yields. These included increasing the scale of asset purchases, introducing additional large open-market operations to inject liquidity, allowing foreign central banks to repo their Treasury holdings in exchange for dollars, and temporarily excluding US Treasury securities and reserves from the calculation of the supplementary leverage ratio for bank holding companies (see "Policy Priorities" section for details).

With markets moving deeper into correction territory, *market liquidity* continued to deteriorate across a broad range of markets. According to the IMF staff's high-frequency jump analysis, liquidity conditions have worsened meaningfully since end-February (Figure 1.5, panel 2).[4] In recent weeks, however, liquidity has reportedly improved somewhat along with the market sentiment.

Stretched Asset Valuations Magnified the Speed of Asset Price Declines

In addition to the financial fragilities and amplifiers discussed above, the unwinding of stretched asset valuations (highlighted in previous GFSRs) likely exacerbated the sell-off. Deviations from fair value had reached extreme levels across multiple countries and sectors, before adjusting sharply in late February and March.

In *equity markets*, price-earnings ratios had reached the highest levels since the global financial crisis prior to the COVID-19–induced sell-off (as indicated by the percentiles in Figure 1.6, panel 1). The IMF staff's fundamentals-based assessment of equity price misalignments suggests that equity valuations had become increasingly stretched since the October 2019 GFSR, with the extent of overvaluation approaching

[1]Volatility-targeting investors—such as variable annuities, commodity trading advisors, and risk parity funds—seek to keep expected portfolio volatility at a specific target level. When market volatility is low, greater financial leverage is typically employed to meet volatility targets. However, as volatility and correlations spike, strategies that have less flexibility to deviate from targets (such as variable annuities) may be more likely to shed assets to ensure that they maintain their target volatility.

[2]Before the COVID-19–induced sell-off, some leveraged investors had built up sizable short positions in Treasury futures and long positions in off-the-run cash Treasuries in order to profit from the implied yield differential. Following decisive central bank easing, Treasury yields collapsed to a record low level, but less than the Treasury futures-implied yield. This price action forced many of these leveraged investors to unwind their basis trade positions to stop losses, to meet margin calls, or to keep their risk exposures below targets.

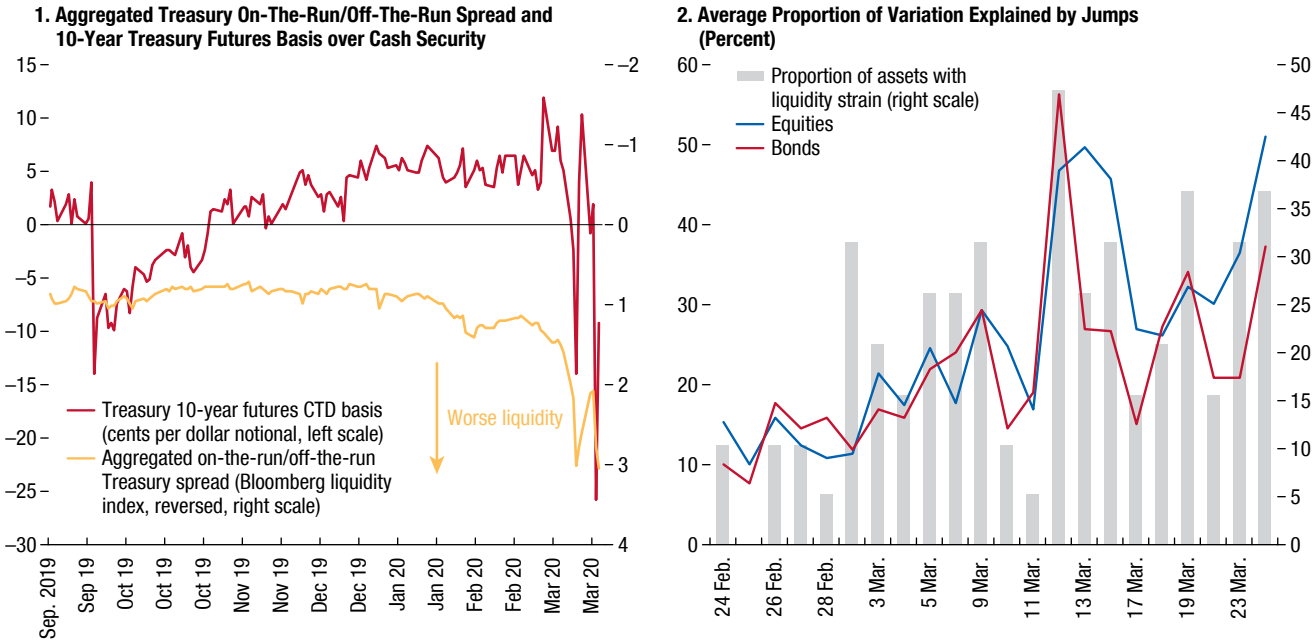
[3]See Online Annex 1.1 at www.imf.org/en/Publications/GFSR.

[4]The analytical framework employed here to detect liquidity stress—introduced in the October 2018 *Global Financial Stability Report* (GFSR) (Box 1.4 and Online Annex 1.1)—relies on examining jumps (or discontinuities) in intraday price evolution. Price jumps can be categorized into two types: "large" (finite activity) jumps that are linked to significant news events or episodic series of "small" (infinite activity) jumps. Since the virus outbreak, an increasingly larger proportion of price variation in global equity and sovereign bond markets has been attributable to discontinuities, or jumps, which are indicative of liquidity stress. See also the April 2019 GFSR ("Special Feature: Liquidity Risks in Capital Markets").

Figure 1.5. Market Liquidity Conditions: Under Strain

Treasury market liquidity has been impaired, partly due to constrained dealer balance sheets.

Liquidity conditions have deteriorated across a broad range of markets.



Sources: Bloomberg Finance L.P.; J.P. Morgan & Chase Co.; and IMF staff calculations.
Note: In panel 1, the Bloomberg liquidity index levels are measured by the root mean squared error between bonds' market yields and theoretical yields based on cubic and exponential spline methodologies. The index can be deemed as a proxy for aggregate on- and off-the-run spreads. In panel 2, the analysis includes equity markets in Brazil, China, euro area, India, Korea, Mexico, Spain, United Kingdom, and United States, and Treasury markets in Brazil, France, Germany, India, Italy, Mexico, Portugal, Spain, United Kingdom, and United States. CTD = cheapest to deliver: economically least valuable cash Treasury security, which a seller of futures contract can deliver to a buyer at settlement.

historically high levels in several countries in the last quarter of 2019 (Figure 1.6, panel 3).

However, after the COVID-19 outbreak, equity prices fell sharply through mid-March, wiping out a significant portion of overvaluation in many markets and sectors. One notable exception is the US equity market, where the decline in prices in March has been outpaced by a sharp deterioration in the fundamentals-based value, leading to an increase in the extent of positive misalignment. The largest contributor to the reduction in the fundamentals-based value has been the dispersion in earnings forecasts, which has spiked to historically high levels (about two times the level seen in the global financial crisis), reflecting both increased economic uncertainty and lags in earnings revisions.[5] Downward revisions in earnings-per-share (EPS) growth forecasts have been material in many markets (Figure 1.6, panel 2), but, as of early April, likely do not fully reflect the extent of expected deterioration of corporate earnings outlook.[6]

In *credit markets*, corporate spreads had continued to tighten between the October 2019 GFSR and early 2020. In fact, the extent of spread misalignment—the difference between market- and fundamentals-based spreads—had increased in the United States and in the euro area, and remained high in the emerging markets high-yield segment in the last quarter of 2019 (Figure 1.6, panel 4), with spreads tightening well below the levels justified by fundamentals (as shown by percentiles at the lowest end of the ranges). After the COVID-19 outbreak, most spreads have widened dramatically, wiping out prior overvaluations.

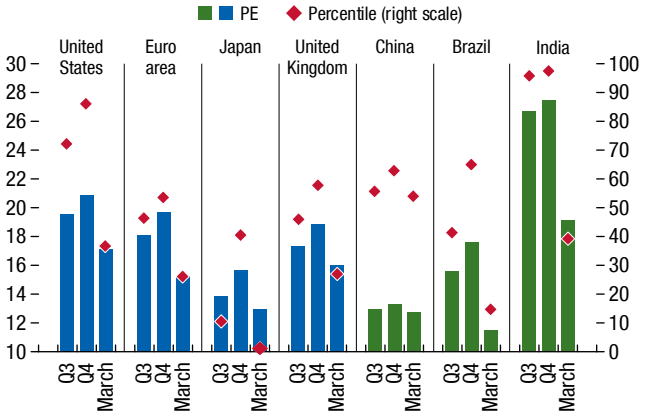
[5]Earnings revisions traditionally lag but such factors have played a particularly important role during this episode given the unprecedented pace of market price declines. Once earnings forecasts have been fully revised, the dispersion in earnings forecasts may decline, likely lessening the extent of overvaluation everything else equal.

[6]For example, estimates of S&P 500 EPS growth in 2020 by analysts at major investment banks range from −8 percent to −33 percent.

Figure 1.6. Asset Valuations: Wild Swings

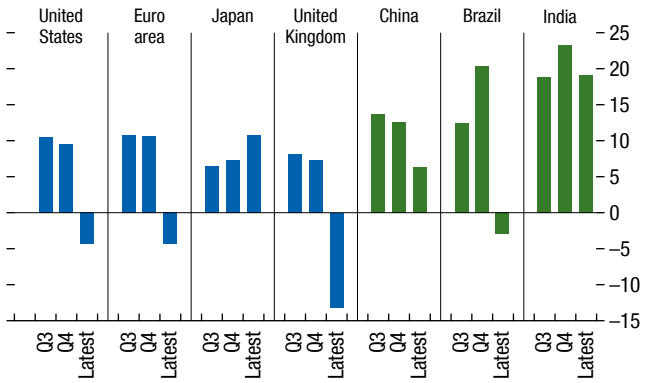
Global equity valuations adjusted as share prices collapsed ...

1. Equity Markets: Price-to-Earnings Ratios
(Percent, quarterly averages, left scale; percentiles based on 2010–2020 period, right scale)



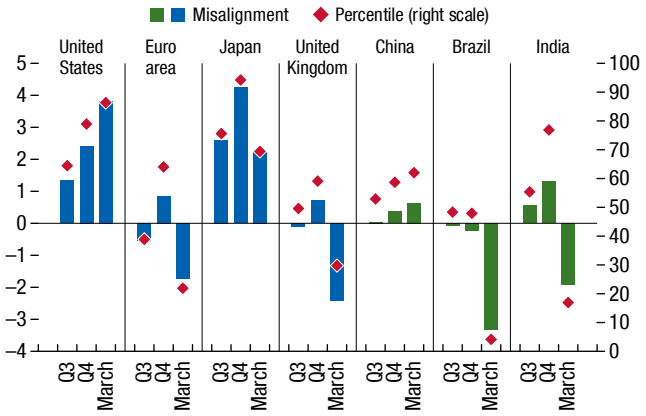
... and earnings growth prospects were downgraded.

2. 2020 Earnings per Share Growth Forecast
(Percent; Latest: April 2)



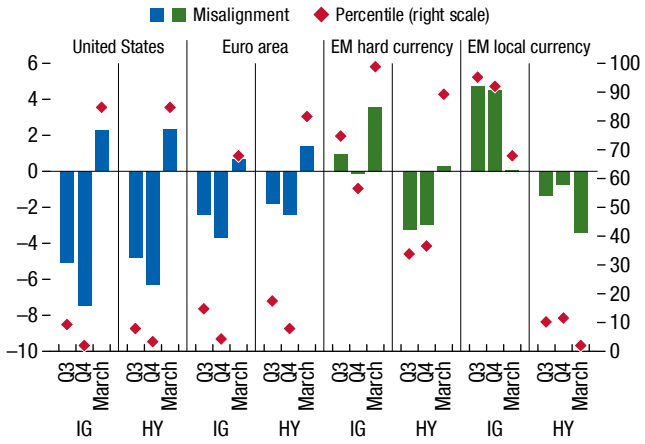
The declines in equity prices wiped out overvaluations in many equity markets ...

3. Equity Markets Misalignments
(Deviation from fair value per unit of risk, quarterly averages, left scale; percentiles based on 1995–2020 period, right scale)



... and most bond markets.

4. Bond Spread Misalignments
(Deviation from fair value per unit of risk, quarterly averages, left scale; percentiles based on 1995–2020 period, right scale)



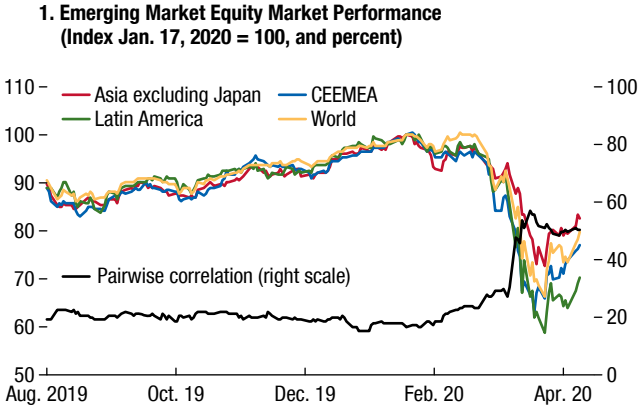
Sources: Bloomberg Finance L.P.; Thomson Reuters Datastream; and IMF staff calculations.
Note: In panels 1–4, blue bars correspond to advanced economies, and green bars correspond to emerging market economies. In panel 3, misalignment is the difference between market and model-based values scaled by the standard deviation of monthly returns. Positive values indicate overvaluation. Intuitively, this measure indicates how many standard deviations of monthly returns (or "units of risk") it would take to get back to fair value. In panel 4, misalignment is the difference between market spread and model-based spread scaled by the standard deviation of monthly spread changes. Negative values indicate overvaluation. Intuitively, this measure indicates how many standard deviations of monthly spread changes (or "units of risk") it would take to get back to fair value. EM = emerging markets; HY = high yield; IG = investment grade; PE = price-earnings ratio.

Emerging and Frontier Markets Are Facing the Perfect Storm

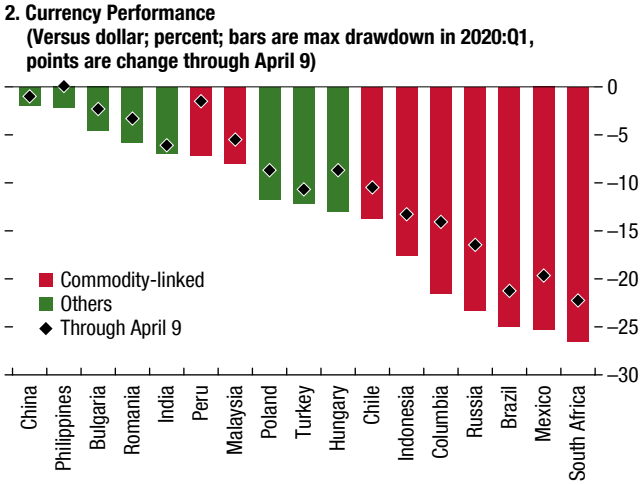
An unprecedented combination of external shocks (COVID-19 pandemic, oil price decline, increased global risk aversion, and a prospect of global recession) led to a broad-based *sell-off in emerging and frontier markets*. Emerging market equity prices have fallen by about 20 percent, on net, since mid-January despite the most recent rebound (Figure 1.7, panel 1). Currencies of commodity-producing economies (such as Brazil, Colombia, Mexico, Russia, and South Africa) tumbled by more than 20 percent against the US dollar in the first quarter of 2020 (Figure 1.7, panel 2). Currencies of other

Figure 1.7. Emerging Equity and Bond Markets: Facing the Perfect Storm

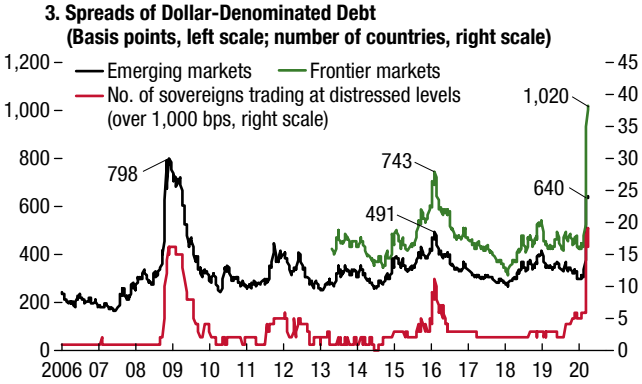
Equity markets sold off in anticipation of a sizable growth contraction ...



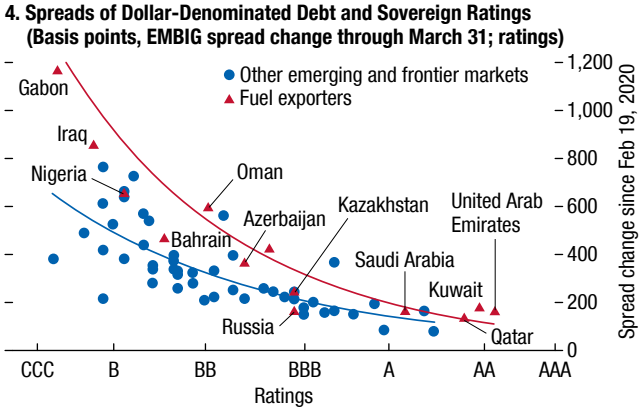
... and currencies depreciated against the US dollar, particularly for the commodity-producing economies.



Dollar debt spreads widened to distressed levels in a record number of countries ...



... and bond spreads spiked more for lower-rated and oil-producing economies.



Sources: Bloomberg Finance L.P.; J.P. Morgan Chase & Co.; and IMF staff calculations.
Note: In panel 3, spreads are weekly average. Bps = basis points; CEEMEA = Central and Eastern Europe and the Middle East; EMBIG = JP Morgan Emerging Market Bond Index Global.

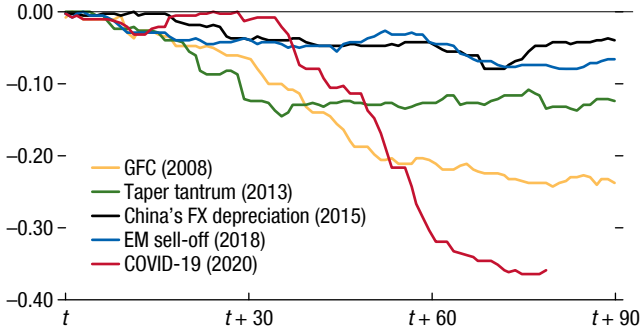
emerging markets have been relatively less affected, likely due to stronger currency interventions, as well as lower external vulnerabilities. Spreads of dollar-denominated emerging market sovereign bonds rose to nearly 700 basis points by the end of March—the highest level since the global financial crisis—although they have narrowed somewhat in recent weeks. But for some weaker economies, the current shock was particularly severe as the number of distressed sovereign issuers (those with spreads over 1,000 basis points) rose to record levels (Figure 1.7, panels 3 and 4). Oil-importing economies have generally fared better, but lower remittances, reduced external funding availability, and lower external demand may outweigh the positive impact of lower oil prices.

Portfolio flows to emerging markets have experienced a very sharp reversal. Nonresident portfolio outflows from emerging markets reached a record level in dollar terms (more than $100 billion since January 21) and the highest ever relative to their aggregate GDP in the first quarter of 2020 (Figure 1.8, panels 1 and 2). Outflows from Asia and from equity markets were initially particularly strong, given their sensitivity to the growth outlook (Figure 1.8, panel 2) (see Chapter 3 of this report). But outflows from bond markets

Figure 1.8. Portfolio Flows to Emerging Markets: A Big Reversal

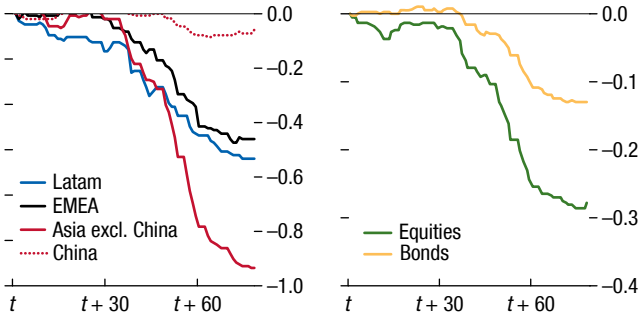
During the COVID-19 sell-off, emerging markets saw the strongest reversal since 2008 both in US dollar terms and relative to GDP.

1. Cumulative Nonresident Portfolio Flows to Emerging Markets (Percent of GDP, based on daily observations)



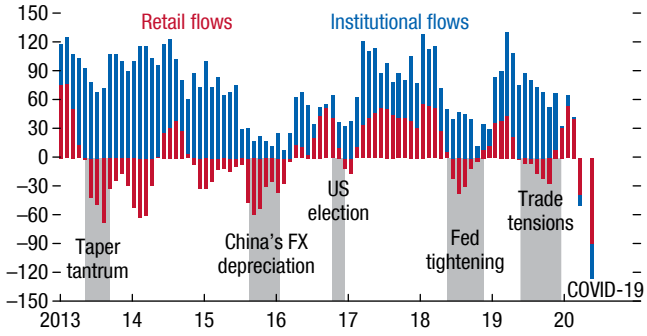
The strongest initial outflows were in emerging Asia (excluding China) and equity markets, while debt outflows accelerated more recently as the crisis widened.

2. Cumulative Nonresident Portfolio Flows to Emerging Markets, Aggregated by Regions and Asset Classes (Percent of GDP, based on daily observations)



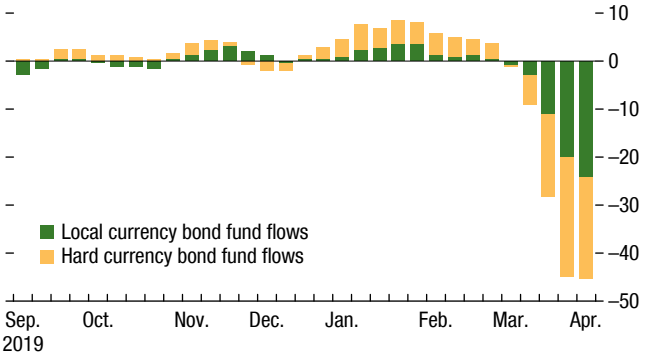
Retail fund outflows were particularly strong, while institutional investor flows also turned negative recently.

3. Estimates of Retail versus Institutional Flows (Billions of US dollars; three-month rolling sum)



Outflows have been significant for both local and hard currency bond funds.

4. Bond Fund Flows across Categories (Billions of US dollars; four-week rolling sum)



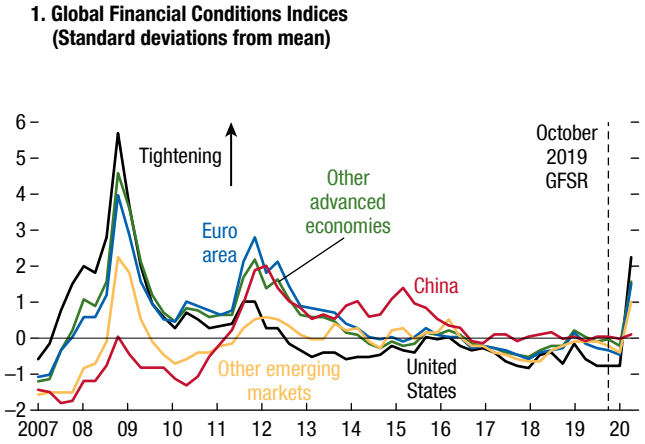
Sources: Bloomberg Finance L.P.; EPFR Global; Haver Analytics; Institute of International Finance; and IMF staff calculations.
Note: In panel 3, retail flows are estimated using EPFR Global data. The last bar is for February and March, adjusted for the full quarter. Economies included in panel 1 are China, Brazil, Hungary, India, Indonesia, Korea, Mexico, Pakistan, Philippines, Qatar, Sri Lanka, South Africa, Taiwan POC, Thailand, Ukraine, and Vietnam. EM = emerging markets; EMEA = Europe, the Middle East, and Africa; FX = foreign exchange; GFC = global financial crisis; Latam = Latin America; Taiwan POC = Taiwan Province of China.

have become significant more recently (Figure 1.8, panel 2, right).

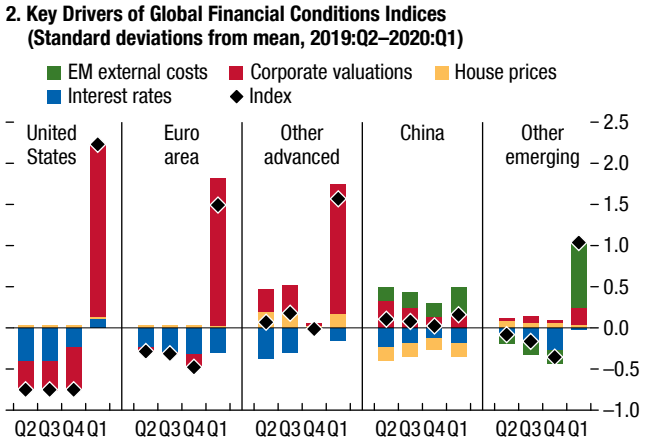
The *breadth of outflows*—in terms of the number of affected countries—was the largest since the global financial crisis. The depth of outflows was significant for many countries, with South Africa and Thailand witnessing outflows of more than 1 percent of GDP in just two months. Moody's downgraded South Africa's local currency rating to sub-investment grade, raising the specter of further outflows by benchmark-driven investors (see the April 2019 GFSR). Retail outflows surged, but institutional investors reportedly also had to reduce positions because of redemptions or risk limits given heightened volatility (Figure 1.8, panel 3). The reversal of bond portfolio fund flows was broad-based, but relatively worse for hard currency bond funds (Figure 1.8, panel 4). To mitigate the impact of outflows on domestic economies, country authorities have stepped up currency interventions, provided liquidity support to the bond market and to the banking system, and sought to establish swap lines with the US Federal Reserve and the European Central Bank (see "Policy Priorities" section for details).

Figure 1.9. Global Financial Conditions: Getting Tighter

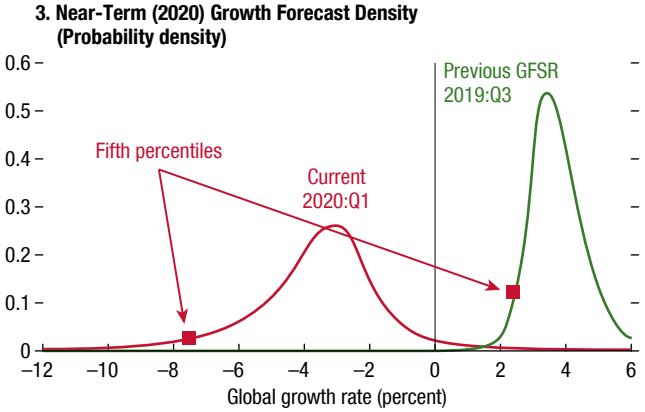
Financial conditions tightened sharply in 2020:Q1 ...



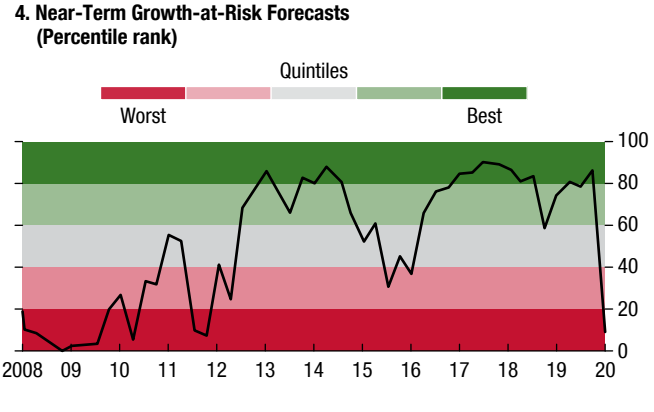
... largely driven by a very significant deterioration in corporate valuations.



Near-term downside risks have increased sharply ...



... approaching the levels last seen in 2008.



Sources: Bank for International Settlements; Bloomberg Finance L.P.; Haver Analytics; IMF, International Financial Statistics database; and IMF staff calculations.
Note: In panels 1–2, the 2020:Q1 = average values for March 2020. In panel 2, the interest rates component contains real short-term interest rates, term spreads or medium-term interest rates, and interbank spreads. In panel 3, near-term refers to the year 2020. Forecast density estimates are centered around the *World Economic Outlook* forecasts for 2020. In panel 4, the color of the shading depicts the percentile rank for the 5th percentile threshold (growth-at-risk) of near-term growth forecast densities from 1991 onward. See the April 2018 *Global Financial Stability Report* (GFSR) for details. EM = emerging market.

The Sharp Tightening of Global Financial Conditions Significantly Increased Risks to Financial Stability

Global financial conditions, which had been easing steadily over the course of 2019 and into the beginning of 2020, tightened sharply in March (Figure 1.9, panel 1).[7] Not only was the tightening very pronounced, but the speed was unprecedented, even compared to the global financial crisis. Falling equity prices and widening corporate spreads were only marginally offset by declines in interest rates across most advanced and emerging market economies (see Figure 1.9, panel 2). Other *emerging markets* (not including China) also experienced a significant tightening of financial conditions mainly driven by a sharp increase in their external funding costs (see Figure 1.9, panels 1 and 2).

China was the first to experience the COVID-19 outbreak. However, financial conditions in China have been broadly stable, in contrast with other countries (Figure 1.9, panels 1 and 2). This may have reflected, among other things, still limited external financial linkages, a strong role of government-owned financial institutions and firms, and early proactive efforts by the authorities that helped stabilize market

[7]The values of the Financial Conditions Indices (FCIs) for 2020:Q1 are based on the March 2020 average.

conditions and sentiment. The central bank maintained highly accommodative interbank liquidity, directed banks to maintain corporate credit growth, and reduced policy rates. Equity markets reversed initial declines on reports about government intervention. That said, financial conditions for specific weaker segments may be worse than headline numbers suggest.

All in all, the sharp tightening of global financial conditions since the COVID-19 outbreak, together with the significant downward revision of the 2020 global growth forecast from 3.3 percent in the January 2020 *World Economic Outlook Update* to −3 percent in the April 2020 WEO, shifted the near-term distribution of global growth dramatically to the left. This shift implies a significant increase in downside risks to growth and financial stability. More specifically, the one-year-ahead forecast distribution based on economic and financial conditions as of March 2020 (Figure 1.9, panel 3) indicates that there is a 5 percent probability (an event that happens once every 20 years) that global growth could fall below −7.4 percent. For comparison, this threshold was above 2 percent in October 2019. In addition, the balance of risks is now skewed to the downside, with the odds of global growth exceeding zero this year close to only 4 percent. Compared to historical norms, the near-term growth-at-risk metric is approaching levels last seen during the global financial crisis (Figure 1.9, panel 4).[8]

The continued spread of COVID-19 globally may require imposition of tougher and longer-lasting containment measures, which might lead to a further tightening of global financial conditions. In such a scenario, policy space may become more limited and investor sentiment may become more fragile. For emerging and frontier markets, authorities may find it challenging to contain destabilizing effects of a sharp reversal of portfolio flows on domestic financial markets. A widespread distress of banks and other financial institutions could lead to a permanent scarring of balance sheets, which may further delay the recovery. The Scenario Box of the April 2020 WEO presents three alternative outcomes for the evolution of the global fight against the COVID-19 virus. In the most severe scenario, where it would take longer than expected to contain the outbreak in 2020 and there is also a second outbreak in 2021, global output would continue to fall throughout 2020 and 2021 and would be almost 8 percent below baseline in 2021.

[8]The growth-at-risk (GaR) framework assesses the downside risks to financial stability 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 policy responses or macroeconomic shocks are captured in the GaR framework to the extent that they affect the current economic and financial conditions, or the baseline growth forecast.

A Further Tightening of Financial Conditions May Expose Financial Vulnerabilities in Banks and Other Financial Institutions

While events are still unfolding, a further tightening in financial conditions may expose more "cracks" in the global financial system. Banks have more capital and liquidity than in the past, and they have been subject to stress tests and greater supervisory scrutiny, putting them in a better position than at the onset of the global financial crisis. The resilience of banks, however, may be tested in some countries in the face of a sharp slowdown in economic activity that may turn out to be more severe and lengthy than currently anticipated—a development that may lead to larger-than-anticipated losses. In addition, a prolonged period of dislocation in financial markets may result in distress among other financial institutions, including asset managers, to an extent that could lead to a credit crunch for nonfinancial borrowers.

Financial vulnerabilities had been elevated in some systemically important economies before the outbreak of COVID-19 (Figure 1.10),[9] and they may become exposed should financial conditions continue to tighten:

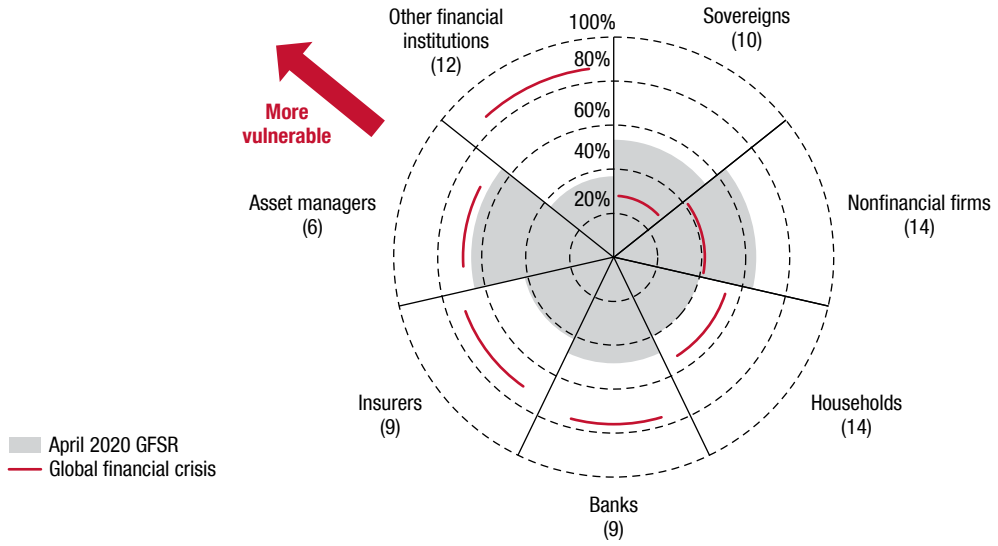
- Vulnerabilities are elevated in *nonfinancial firms*, reflecting high levels of debt. Nonfinancial corporate sector vulnerabilities are significantly higher now than in 2008–09, implying that a prolonged period of negative growth and elevated cost of funding

[9]This assessment is based on the methodology introduced in the April 2019 GFSR, which covers 29 jurisdictions with systemically important financial sectors. In this GFSR, other nonbank financials have been split into asset managers and other financial institutions to help better track the evolution of vulnerabilities in different parts of this large and diverse sector. Asset managers include all collective investment schemes for which sectoral data are publicly available. For Brazil, fund-level data have been aggregated for this purpose. For China, the category includes investment funds, trusts and the off-balance-sheet wealth management products of banks, securities companies, and insurers. The other financial institutions category can include broker dealers, merchant banks, securitization vehicles, finance companies, holding companies, funding companies, credit guarantors, multipurpose nonbank financial corporations, custodians, and different forms of nonbank lending institutions and/or residual aggregates for nonbank financial companies excluding investment funds, pension funds, and insurers.

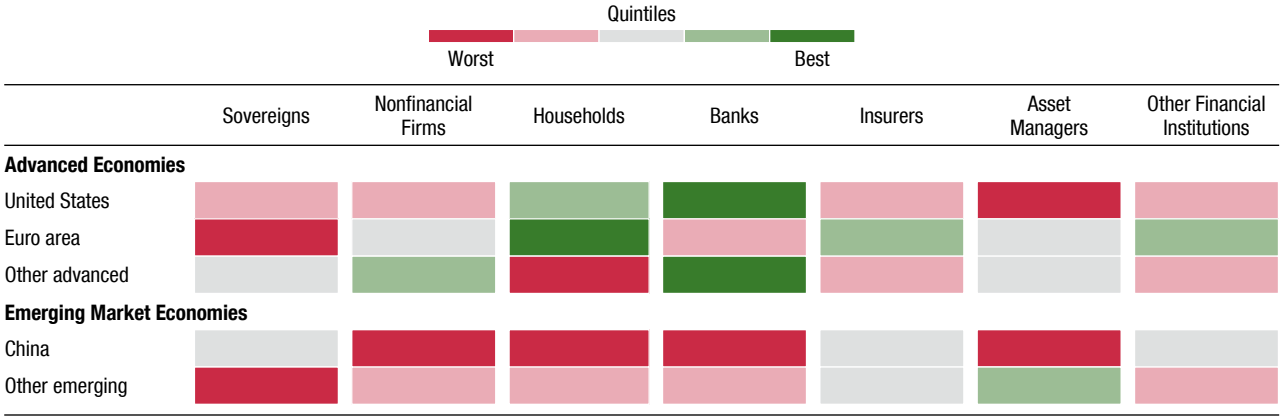
Figure 1.10. Global Financial Vulnerabilities: Preexisting Conditions

Vulnerabilities are elevated in the corporate and sovereign sectors as global nonfinancial sector debt has reached new highs, while asset managers have taken on more risks in the low-yield environment.

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



2. Financial Vulnerabilities by Sector and Region



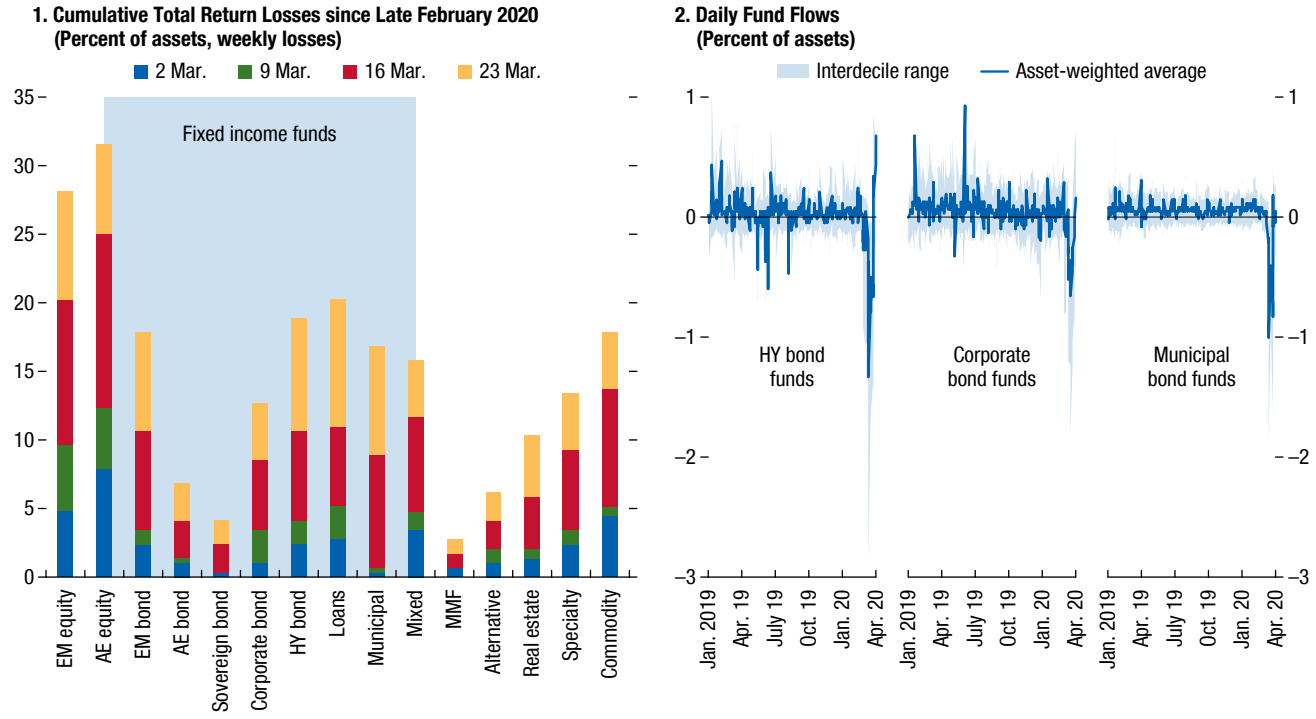
Sources: Banco de Mexico; Bank for International Settlements; Bank of Japan; Bloomberg Finance L.P.; China Insurance Regulatory Commission; European Central Bank; Haver Analytics; IMF, Financial Soundness Indicators database; Reserve Bank of India; S&P Global Market Intelligence; S&P Leveraged Commentary and Data; Securities and Exchange Commission of Brazil; WIND Information Co.; and IMF staff calculations.
Note: In panel 1, global financial crisis reflects the maximum vulnerability value from 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 from 2000–19 (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 firms. Other systemically important advanced economies comprise Australia, Canada, Denmark, Hong Kong Special Administrative Region, Japan, Korea, Norway, Singapore, Sweden, Switzerland, and the United Kingdom. Other systemically important emerging market economies are Brazil, India, Mexico, Poland, Russia, and Turkey.

A number of methodological changes have been introduced in this *Global Financial Stability Report* for *the other nonbank financial sector*. (1) country-specific data series for 10 individual euro area countries have been added to the data set for other financial institutions and asset managers, complementing respective euro area aggregate data; (2) country-level data are aggregated to regional totals using asset-based weights, rather than GDP; (3) the euro area data set has been expanded to include data on nonbank financial institutions beyond securitization vehicles; and (4) a new indicator measuring the gross derivative exposures has also been added. For *insurers*, the country-specific data series for 10 individual euro area countries (Austria, Belgium, France, Finland, Germany, Ireland, Italy, Luxembourg, Netherlands, Spain) were added to the data set for insurers. Previously, the assessment of the euro area insurers was based on the data at the euro area level. A new indicator of profitability was also added. In the computation of the regional and global aggregates, the GDP-based weights were replaced by total assets-based weights.

Figure 1.11. Investment Funds: Losses and Redemptions

As asset prices declined, investment funds' losses began to mount.

Fixed income funds—especially those exposed to risky credit market segments—faced rapidly growing outflows.



Sources: Bloomberg Finance L.P.; Morningstar; and IMF staff calculations.
Note: Panel 2 reports estimated daily net flows for a sample of fixed income funds with assets of more than $700 million. Flow rates have been winsorized at an absolute value of 50 percent. AE = advanced economy; EM = emerging market; HY = high yield; MMF = money market fund.

could lead to a large-scale corporate distress (see the corporate debt-at-risk analysis in Chapter 2 of the October 2019 GFSR).

- Vulnerabilities remain high among *asset managers* and close to the levels seen during the global financial crisis, as discussed in the October 2019 GFSR. Asset managers in several countries (notably, China and the United States) entered the COVID-19 crisis with higher leverage, maturity, and liquidity mismatches. In the euro area and other advanced economies, vulnerabilities are somewhat lower, on aggregate, than in other regions.
- *Bank* vulnerabilities are moderate overall, though there are pockets of weaker institutions. For example, vulnerabilities continue to be high in China and they have increased in other emerging market economies and the euro area.
- In the *global insurance sector*, vulnerabilities appear to be less pronounced in aggregate than in other sectors but are still high in some countries and regions. In the United States, insurers face elevated liquidity mismatches and credit risk, while in other advanced economies insurers also tend to have currency mismatches. In the euro area, vulnerabilities in the insurance sector are less pronounced, but credit risks are elevated and coupled with profitability and solvency challenges from the low-yield environment. Chinese insurers operate with high liquidity mismatches.

Pressures on Asset Managers May Lead to Fire Sales

Asset managers may be forced to sell assets, thus amplifying asset price declines. Since the virus outbreak, investment funds have faced large portfolio losses (Figure 1.11, panel 1). This led to concerns about actual and anticipated redemptions, especially in the case of fixed income funds (Figure 1.11, panel 2). Cash buffers, which typically serve as a first

line of defense against redemptions, are estimated at about 7 percent of assets for an average open-end fixed income fund (see the October 2019 GFSR), and even lower for some riskier credit funds (see Chapter 2 of this report). While on aggregate still smaller than cash buffers, outflows could, if they continue or accelerate, exhaust these buffers and force the sale of other high-quality liquid assets or even less-liquid assets. The latter would reinforce price declines across a number of markets.

These pressures, however, may be partly mitigated by liquidity management mechanisms used by investment funds (including the tapping of credit lines), as well as by central bank purchases of corporate bonds and by liquidity facilities offering relief for money market funds (see "Policy Priorities" section).

Anticipation of weaker liquidity conditions may have led some funds to de-risk portfolios early by selling less liquid and lower-rated credit assets with the aim of strengthening the liquidity of their remaining portfolios. These actions may have initially exacerbated price declines in riskier markets. A further deterioration in market conditions could in turn lead to more redemption pressures, especially for funds with low liquidity buffers or a particularly price-sensitive investor base. So far, there have been very few suspensions of investor redemptions. In the United Kingdom, several property funds were gated. Market reports suggest that some smaller European bond funds were suspended as well, but most of these suspensions were lifted within days.[10]

Banks Could Act as an Amplifier Should the Crisis Deepen Further

In 2007–08, a sharp cutback in bank lending, due to liquidity strains and losses at banks, exacerbated the impact of the global financial crisis on the economy. There is a danger that this could be repeated. The higher levels of capital buffers built since the global financial crisis, however, will help banks to absorb losses. Average Tier 1 capital ratios across economies with large financial systems are more than 400 basis points higher than they were at the end of 2007 (Figure 1.12, panel 1). Bank supervision has been enhanced, including through the use of stress testing to assess bank health, and regulations have been strengthened.

Banks are also holding more liquid assets than in the past. Furthermore, the substantial and coordinated action by central banks to provide liquidity to banks in many economies, including in repo (repurchase) operations and dollars via central bank swap lines, should also help alleviate liquidity strains (see "Policy Priorities" section) and mitigate the impact of higher wholesale funding costs faced by banks (Figure 1.12, panel 2). Greater access to liquidity should also help banks to cope with the drawdowns of credit lines by companies. Total undrawn lines of credit amounted to $10 trillion at the end of 2019 for a sample of almost 400 banks headquartered in Group of Seven (G7) economies—some 50 percent of risk-weighted assets (Figure 1.12, panel 3). Nevertheless, the prospect of large draws on lines of credit may impair banks' ability or willingness to maintain the flow of credit to the economy.

Despite their stronger initial position, banks will likely face both mark-to-market and credit losses as a result of the COVID-19–induced sharp slowdown in economic activity:

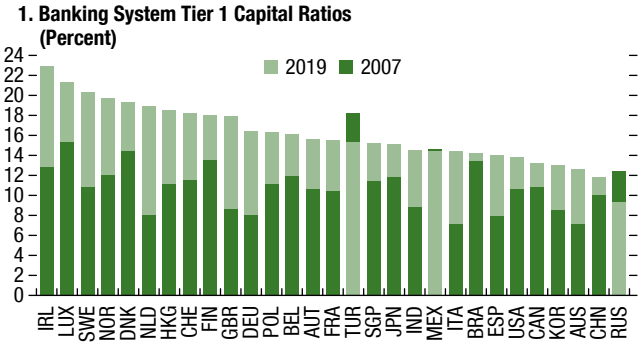
- The declines in asset prices are expected to lead to losses on banks' portfolios of risky securities, though this could be partly offset by gains on their holdings of safe-haven assets. For example, strains have emerged in the commercial real estate sector, with US commercial mortgage-backed security spreads widening by about 400 basis points, on average, from mid-February to their peak (Figure 1.13, panel 1). Furthermore, increases in bond yields for some highly indebted governments may lead to a reemergence of the sovereign-financial sector nexus in some jurisdictions.[11]
- The longer the sudden stop in economic activity continues, the more likely it is that banks will see credit losses on their lending to households and companies. Banks account for a significant portion of lending to commercial real estate, ranging from about 50 percent to 70 percent of debt in this sector (Figure 1.13, panel 2). The fall in the oil price has put energy companies under additional pressure, and banks could also see credit losses on loans to these firms. Finally, banks may also face losses on

[10]Bloomberg Finance L.P. reported on March 20, 2020 on redemptions halts for Swedish funds, and *The Financial Times* reported on March 22 on suspensions of Nordic funds.

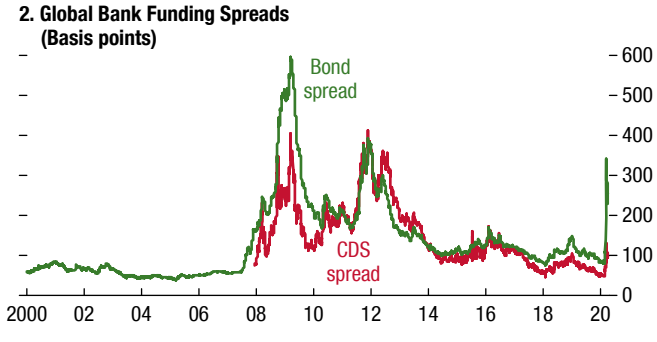
[11]See the April 2019 GFSR for a discussion of the sovereign-bank nexus in the euro area.

Figure 1.12. Banks in Large Economies: Resilience Tested

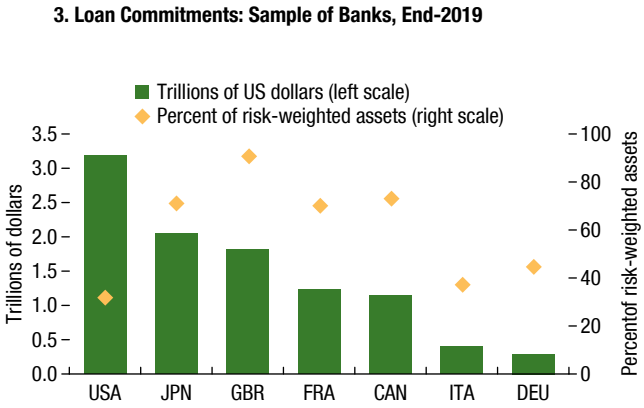
Banks now have more capital to absorb losses ...



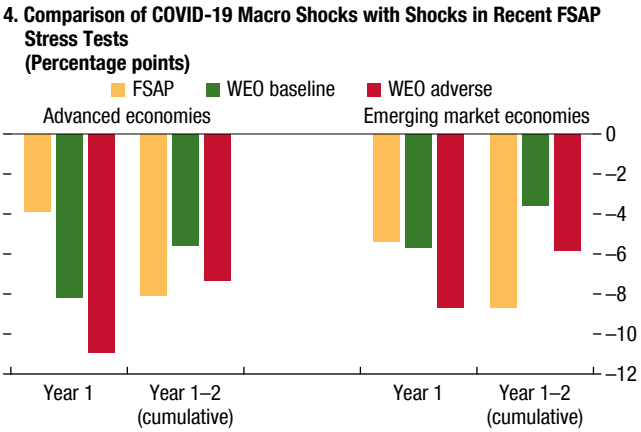
... but are facing sharply higher wholesale funding costs ...



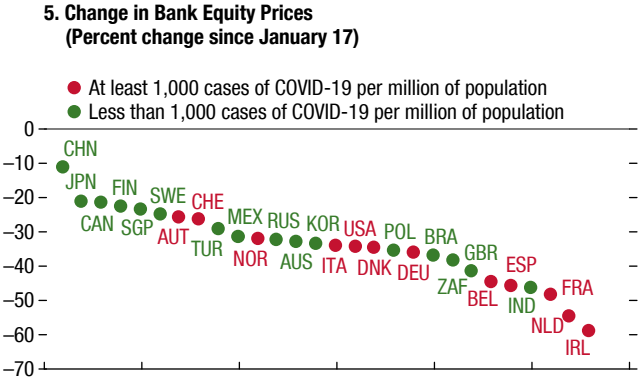
... and calls on lines of credit are adding to liquidity strains.



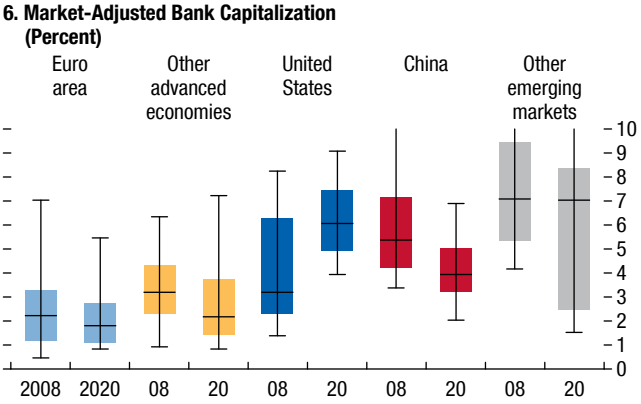
The deterioration of the economic outlook suggests that banks may face losses ...



... as implied by sharp falls in bank equity prices ...



... which have led to low market valuations in some economies.

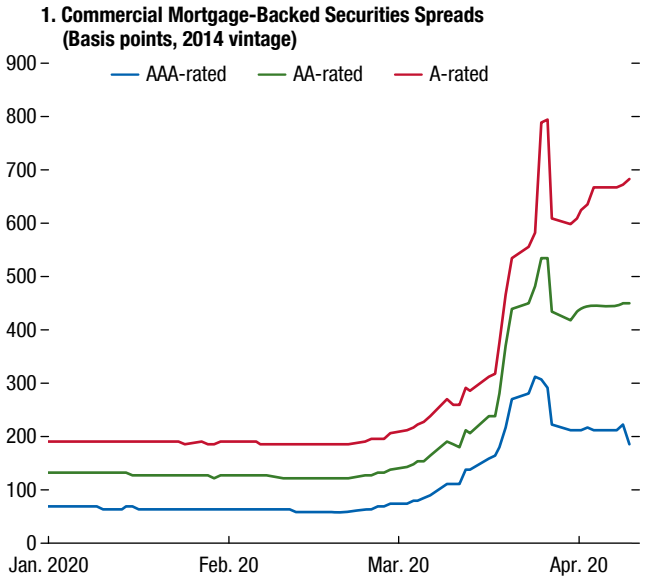


Sources: Bloomberg Finance L.P.; Haver Analytics; IMF, Financial Soundness Indicators database; Refinitiv; S&P Global Market Intelligence; SNL Financial; and IMF staff calculations.

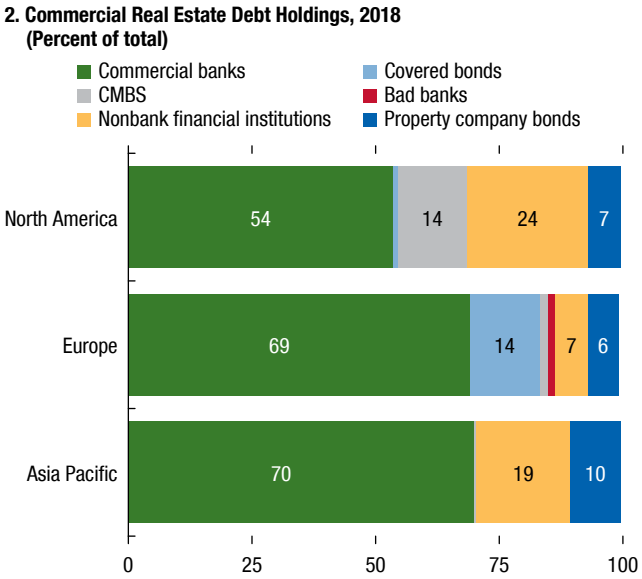
Note: In panel 2, the global credit default swap (CDS) spread is the average of indices for Asia, Europe, North America, and the United Kingdom. Panel 3 is based on a sample of about 400 banks from the seven economies shown in the panel. Commitments include only irrevocable commitments where disclosed, and total reported commitments otherwise. Most banks either distinguish between revocable and irrevocable commitments, or include only revocable commitments. In panel 4, the WEO baseline is the difference between the April 2020 baseline scenario and the forecast in the January 2020 WEO *Update*. The WEO adverse is the difference between the alternative scenario in the WEO with a longer outbreak of COVID-19 in 2020 and the January 2020 WEO *Update*. Advanced economies is the average of the Group of Seven economies, the Netherlands, Spain, and Switzerland. Emerging market economies is the average of Brazil, China, India, Russia, and South Africa. Panel 5 shows the average change in equity prices of banks in each country. Panel 6 shows the range of market-adjusted capitalization of individual banks in each economy. Market-adjusted capitalization is calculated as the product of tangible common equity and the minimum of the price-to-book ratio and 1, all as a percentage of tangible assets (which are adjusted for derivatives netting at US banks). The box shows the 25th to 75th percentile, the vertical lines show the 5th to 95th percentile, while the horizontal lines shows the 50th percentile. The vertical axis has been set to a maximum of 10 percent to aid presentation. In panels 1, 3, and 5, data labels use International Organization for Standardization (ISO) country codes. FSAP = Financial Sector Assessment Program; WEO = *World Economic Outlook*.

Figure 1.13. Commercial Real Estate and Commercial Mortgage-Backed Securities

Spreads of commercial mortgage-backed securities have widened significantly over the past two months ...



... and banks have significant exposures to commercial real estate debt.



Sources: Bloomberg Finance L.P.; Cushman & Wakefield; J.P. Morgan; and IMF staff estimates.
Note: In panel 2, no number labels are included for amounts less than 2 percent. Totals do not add up to 100 due to rounding. CMBS = commercial mortgage-backed securities.

indirect exposures, through their lending to households that are employed in vulnerable sectors.

- The low level of bank profitability in some advanced economies (as discussed in Chapter 4 of this report) means that banks will have less income available to offset losses than in the past.

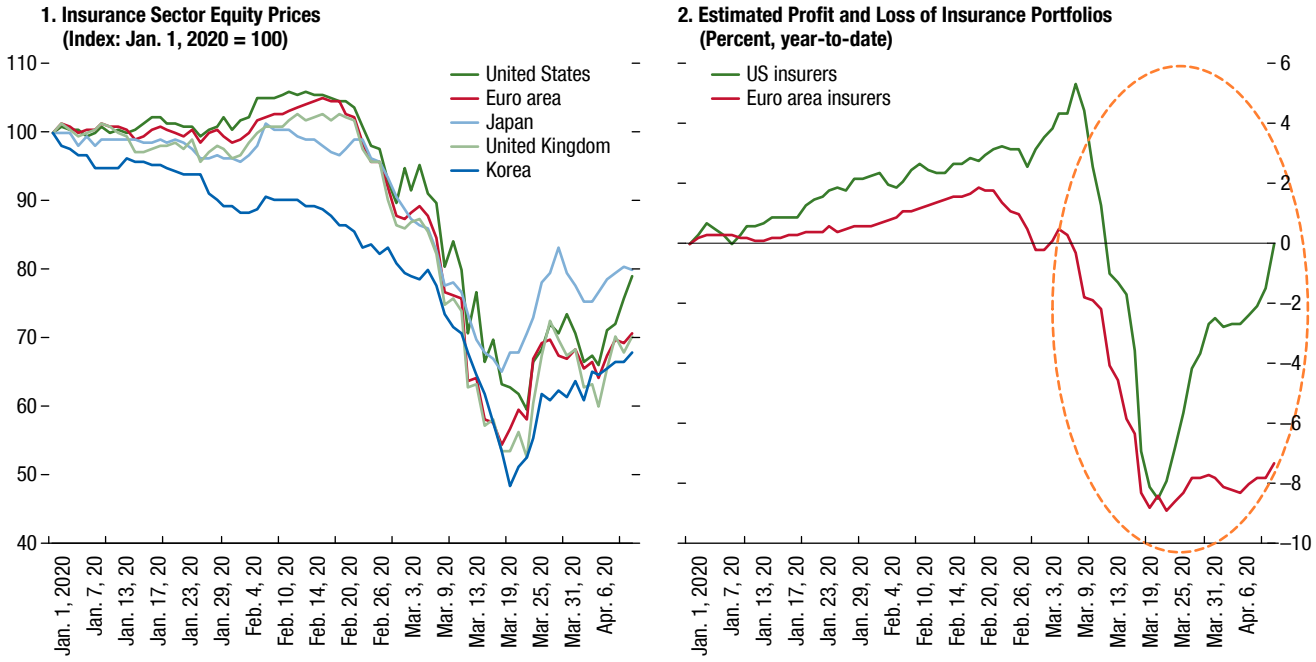
The potential for losses at banks is illustrated by Figure 1.12, panel 4, which shows that the shock to economic activity in the *WEO baseline*—defined here as the change in the baseline economic forecast since the January 2020 *World Economic Outlook Update* (the green bar)—is greater over a one-year horizon than the economic shocks typically assumed in Financial Sector Assessment Program (FSAP) stress tests (the yellow bar). The economic shock in FSAPs over two years tends to be larger than the baseline WEO projections for 2020–21. However, downside risks around the forecasts are significant. For example, even the first alternative scenario in the April 2020 WEO Scenario box—where the fight against the spread of the virus in 2020 takes roughly 50 percent longer than in the baseline (the red bar)—results in a much larger growth shock than typically assumed in FSAP stress tests in the first year. However, bank resilience would likely not be as severely impacted as in the past, since the historical relationship between economic growth and loan impairments, that FSAPs take as given, may be much weaker in the current environment given the large amounts of fiscal and other support measures being provided.

The large declines in bank equity prices since mid-January suggest that investors are concerned about bank profitability and possibly resilience. Equity prices fell by about 35 percent, on average, over this period and by up to 60 percent in some countries (Figure 1.12, panel 5). If market valuations are used to calculate capital ratios at banks, instead of book values, many banks would appear to have weak capitalization—similar to levels during the global financial crisis (Figure 1.12, panel 6). Median market-adjusted capitalization is now higher than in 2008 only in the United States. These considerations underscore the need for decisive policy action to prevent problems at banks leading to a sharp reduction in lending at a time when economic activity is already weak.

Figure 1.14. Insurance Companies: Worries about Potential Losses

The shares of global insurers have been hit hard ...

... with insurance investment portfolios suffering large losses across fixed income and equity exposures.



Sources: Bloomberg Finance L.P.; European Insurance and Occupational Pensions Authority; Haver Analytics; National Association of Insurance Commissioners; and IMF staff calculations.

Note: The estimated year-to-date performance of US and euro area insurance portfolios in panel 2 is meant to serve as an illustration of gross portfolio returns and does not reflect accurately the performance of the portfolios of each insurance company. The estimation uses broad aggregate data for the exposures of insurance portfolios in both jurisdictions as of the third quarter of 2019. For simplification, it excludes all non-fixed income and equity investments. It also assumes that all euro area insurers are invested in the broad Bloomberg Barclays indices for each sector (sovereigns and credit) in the euro area and the Euro Stoxx 50 index. For the United States, Bloomberg Barclays indices and the S&P 500 index are used as proxy.

Insurance Companies May Suffer Losses

Pressures have also been rising for *insurance companies*, limiting their ability to play their traditional countercyclical role. The shares of insurers in major jurisdictions have been hit hard, with most experiencing declines of more than 30 percent before reversing some of their losses in late March to early April (Figure 1.14, panel 1).[12] Their credit default swap spreads also widened alongside those of other financial institutions.

The shares of insurance companies have underperformed broader equity indices since the second week of March, when the widening of corporate credit spreads accelerated and government bond yields started to rise (particularly in the euro area and emerging markets). Because the portfolios of insurance companies are heavily skewed toward long-term sovereign and corporate bonds, heavy losses on fixed income investments have weighed on their portfolio returns through mid-March (Figure 1.14, panel 2).[13] The situation improved for US insurers once the US Federal Reserve stepped in to support the corporate bond markets in late March to early April.

In addition, insurers' bond holdings may be subject to credit downgrades. For example, US insurers are estimated to have over $40 billion of BBB credits at risk of downgrade to sub-investment grade.[14] While this is less than 2 percent of their corporate bond investments, further increases in corporate bond downgrades could increase losses as well as capital

[12]The euro area, Japan, Korea, the United Kingdom, and the United States are five of the largest insurance jurisdictions, accounting for about two-thirds of life premium volumes globally.

[13]This refers to the estimated mark-to-market losses on the investment portfolios of insurers. The ultimate impact of these shocks on insurers will, however, be alleviated somewhat by regulatory mechanisms that can be activated in periods of market stress (see "Policy Priorities" section).

[14]As of March 17, 2020 (source: CreditSights).

requirements for insurers.[15] Some supervisors have already made use of available flexibility in the current framework to mitigate the impact of these shocks on insurers to preserve their operational viability (see "Policy Priorities" section).

Prolonged External Pressures Will Be a Test for Emerging and Frontier Markets

The sudden stop in economic activity and portfolio outflows, together with the oil price shock, represent a severe stress test for many emerging and frontier market economies, especially as many of them entered the COVID-19 crisis with weaker initial conditions than in 2008:

- First, emerging market bond issuers are much more leveraged now than they were in 2008 (see Figure 1.15, panel 1), and they include new issuers with a larger dependence on oil and other commodities (Gulf Cooperating Council member countries), as well as lower-rated issuers (such as frontier markets—see Figure 1.15, panel 2).
- Second, many major emerging market economies have less policy space. Real policy rates in most emerging market economies are now lower than before 2008, especially for those with traditionally much higher interest rates (such as Brazil). Fiscal policy space is generally more constrained as well, with debt at significantly higher levels (as in Brazil, China, and South Africa) and wider structural budget deficits.
- Third, many of the emerging market and frontier economies are now much more reliant on foreign portfolio investors and external funding more generally than in 2008–09 (Figure 1.15, panels 3 and 4; also see Chapter 3 of this report for details).

The *main vulnerabilities* of major emerging and frontier market economies, given the current constellation of shocks, are highlighted in Figure 1.16, panel 1. The sharp decline in economic output and sudden increase in borrowing costs could hurt economies with limited fiscal space, high financing needs, or external financing vulnerabilities, which include Brazil, Colombia, Egypt, Hungary, India, South Africa, and Turkey. Additionally, economic output decline is also likely to be meaningful for Mexico, Russia, and Thailand. Oil exporters are at risk, given the nearly 60 percent oil price collapse in the first quarter of 2020, with Colombia, Nigeria, Russia, and Saudi Arabia being most exposed. As a result of these pressures, Colombia, Mexico, South Africa, and several Middle Eastern economies have been downgraded or put on negative outlook by rating agencies. On the positive side, some economies have large foreign currency reserves and other buffers that can be used to absorb these shocks.

Furthermore, some of the systemic state-owned enterprises have become more vulnerable due to lower oil prices (for example, Mexico's Pemex) or to weaker electricity demand (for example, South Africa's Eskom) as well as higher funding costs (also see the October 2019 GFSR).

Countries where banks have high nonperforming loans, significant exposures to state-owned enterprises, and large holdings of government bonds are vulnerable to an intensification of the sovereign-financial sector feedback loop. For example, in *India*, where nonbank financial institutions had already been under intense funding pressure, following two defaults before the COVID-19 shock, state-owned banks have a sizable stock of bad loans and significant links to nonbank financial institutions. Other countries, notably African economies, may be vulnerable to disruptions in trade financing if cross-border funding and correspondent banking relations become affected.

In *China*, vulnerabilities are particularly elevated in the corporate, banking, and shadow-banking sectors (as discussed in previous GFSRs, and also shown in Figure 1.10). The ongoing health crisis and a significant growth slowdown could increase financial stress through several channels. First, the balance sheets of small- and medium-sized banks will likely weaken further as their limited capacity to support their vulnerable small and private borrowers increases distress among these firms. Second, credit and liquidity risks are rising for the large and heavily indebted property developer sector, which is under heightened pressure due to dollar funding strains and the sharp slowdown in sales. Third, outflows from nonbank financial institutions, some of which operate with significant liquidity and maturity mismatches and often high leverage, could be set off by slumping equity prices, rising bond defaults, or further weakening of investor confidence.

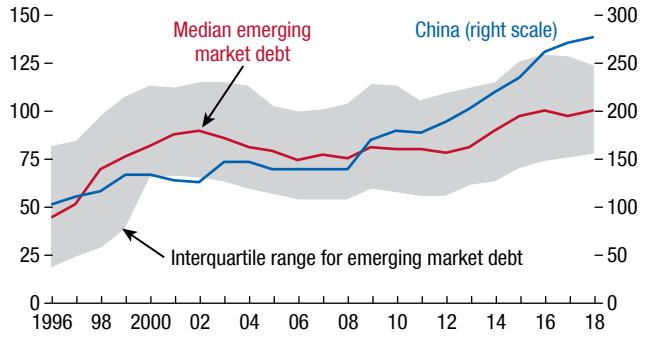
In *frontier market economies*, the fears of global recession pushed borrowing spreads to their highest levels since 2008, at a time when rollover needs are set to

[15]Derivative exposures could also come under pressure and subject insurers to further losses. For example, large life insurers can hold derivatives to hedge the guarantees provided by their variable annuity businesses.

Figure 1.15. Emerging and Frontier Markets: 2008 versus 2020

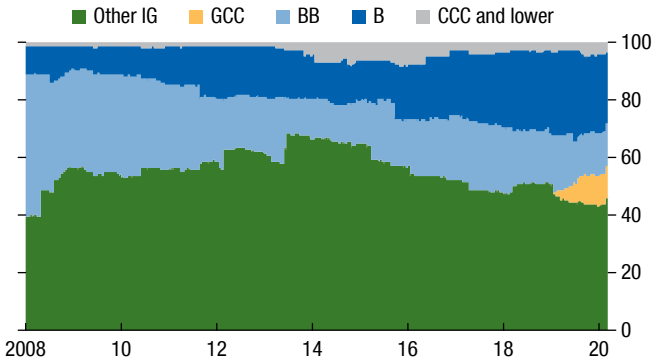
Leverage has risen considerably in emerging market economies, especially in China ...

1. Total Emerging and Frontier Market Debt (Private and public sectors; percent of GDP)



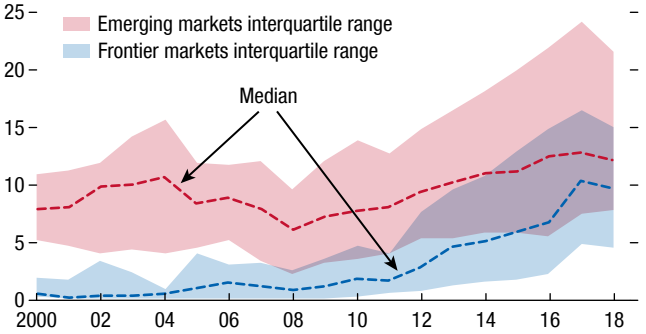
... while more emerging and frontier market debt issuers have weaker credit ratings now than in 2008.

2. Ratings Distribution of the Components of the EMBI Global Index (Percent)



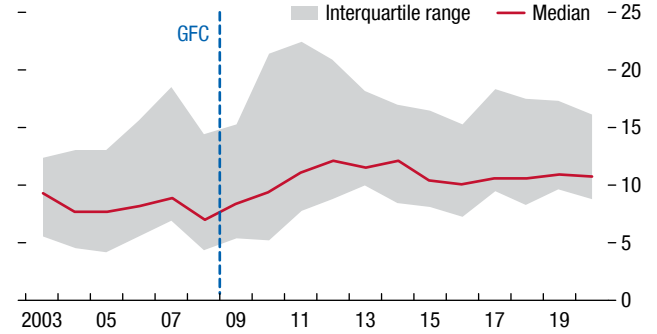
Foreign investors hold a considerably larger amount of debt issued by emerging and frontier market economies than in 2008 ...

3. Portfolio Debt Liabilities (Percent of GDP; international investment position; dotted lines are the median values)



... and dependence on external financing has increased as well.

4. External Financing Requirements (Percent of GDP)



Sources: Bloomberg Finance L.P.; J.P. Morgan Chase & Co.; and IMF staff calculations.
Note: Panel 1 is based on 59 emerging market countries. In panel 3, frontier and emerging market samples include 30 countries each. Panel 4 is based on 20 large emerging market countries. EMBI = J.P. Morgan Emerging Markets Bond Index; GCC = Gulf Cooperation Council; GFC = global financial crisis; IG = investment grade.

rise in many of these countries (Figure 1.16, panel 2). Debt restructuring is under way in Argentina, Ecuador, Lebanon, and Zambia. Frontier markets often lack financial depth and have a shallower domestic investor base, which can impair monetary policy transmission and compound market pressures in times of stress (see Chapter 3 of this report).

Policy Priorities

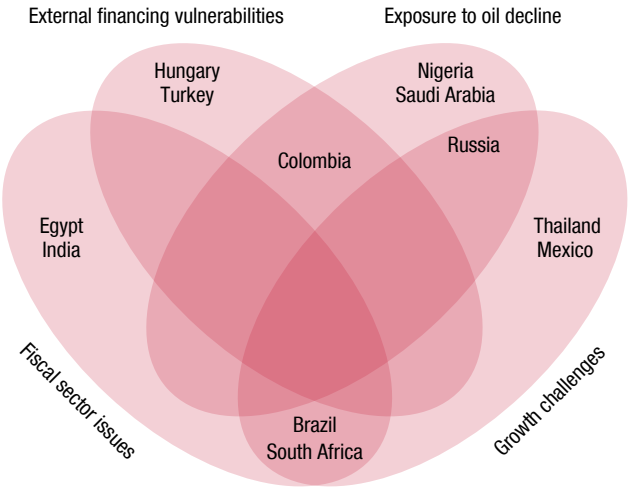
What Has Been Done So Far?

The COVID-19 pandemic has required urgent measures to address health concerns, to safeguard economic and financial stability, and to prevent the emergence of adverse macro-financial feedback loops (see also the April 2020 WEO). Country authorities have taken timely, temporary, targeted fiscal measures, including additional support for health agencies, wage subsidies, cash payments to citizens, government-funded paid sick and family leaves, expanded unemployment benefits, and deferral of tax payments (see the April 2020 *Fiscal Monitor*). Many countries have also implemented measures to support firms and individuals facing payment difficulties through loan moratoria, restructuring of loan terms, or credit guarantees. Several countries have expanded loan programs, including guarantees, for financing

Figure 1.16. Main Vulnerabilities of Emerging and Frontier Market Economies

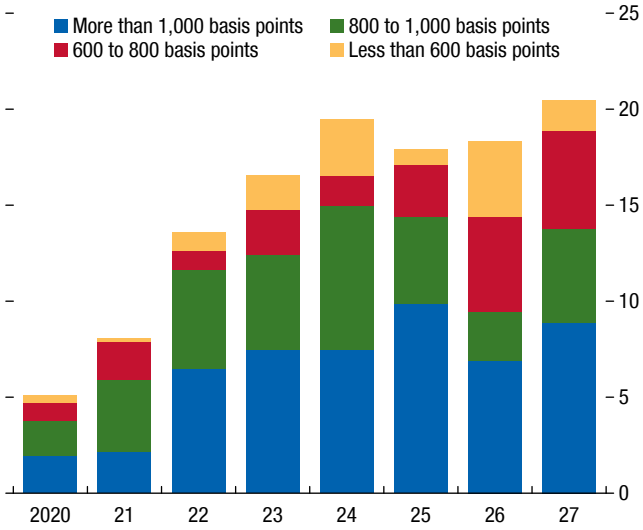
Some emerging market economies show vulnerabilities along several critical dimensions.

1. Key Vulnerabilities of Major Emerging and Frontier Market Economies



Frontier market bond spreads are near or at record high levels, with some issuers facing sizable debt rollovers in the coming years.

2. Frontier International Bond Redemptions by Credit Spread (Billions of US dollars)



Sources: Bloomberg Finance L.P.; J.P. Morgan Chase & Co.; and IMF staff calculations.
Note: In panel 1 the country sample is 18 emerging and frontier markets: Brazil, China, Colombia, Egypt, Hungary, India, Indonesia, Malaysia, Mexico, Nigeria, Peru, Philippines, Poland, Russia, Saudi Arabia, South Africa, Thailand, and Turkey. The countries with elevated vulnerabilities are identified as the ones that are in the bottom quartile when ranked across the multiple indicators in each category. Indicators in the fiscal sector include central government balance (share of GDP), public debt (share of GDP), and gross financing needs (share of GDP). Indicators in the external sector include current account balance (share of GDP), short-term debt to remaining maturity (share of GDP), external debt (share of GDP), foreign holdings of government debt (share of total), and IMF's reserve adequacy metric. Exposure to oil decline is based on oil balance as a share of GDP. Growth challenges are highlighted for the countries where GDP is expected to contract by more than 5 percentage points year-over-year in 2020.

small- and medium-sized enterprises[16] (see Table 1.1 for details).

To preserve the stability of the global financial system, central banks have been the first line of defense in leaning against the tightening in financial conditions. Decisive monetary policy actions have been taken in three main areas (Table 1.1):

- First, central banks have significantly *eased monetary policy* by cutting policy rates by 50–150 basis points in 13 of the 29 jurisdictions with systemically important financial sectors as well as by providing forward guidance and expanding their asset purchase programs to put downward pressure on long-term interest rates and mitigate a rise in long-term borrowing costs for households and firms.
- Second, most central banks have provided *additional liquidity* to banking systems, including by lowering bank reserve requirements, easing collateral terms, upsizing liquidity repo operations, and extending the term of such operations.[17] Some country authorities activated or enhanced programs to provide funding support to banks.[18]

[16]For example, the Bank of England introduced several loan schemes (such as the Coronavirus Business Interruption Loan Scheme [CBILS] and a new Term Funding Scheme with additional incentives for small- and medium-sized enterprises [the TFSME]) to support small- and medium-sized enterprises.

[17]For example, the US Federal Reserve continues to offer repo operations for at least $175 billion in overnight repo each day, at least $45 billion in two-week term repo twice per week, and $500 billion in one-month term repo and $500 billion in three-month term repo each week.

[18]For example, the European Central Bank has made the terms of its targeted longer-term refinancing operations (TLTROs) more favorable, raised the borrowing allowance to 50 percent of the stock of a bank's eligible loans, and reduced lending performance threshold to 0 percent. For further details, see https://www.ecb.europa.eu/press/pr/date/2020/html/ecb.pr200312_1~39db50b717.en.html. The Bank of England has also provided a term funding facility to banks (see https://www.bankofengland.co.uk/markets/market-notices/2020/term-funding-scheme-market-notice-mar-2020).

Table 1.1. Monetary and Financial Policy Responses to COVID-19

(In 29 jurisdictions with systemically important financial sectors)

	Advanced Economies																						Emerging Market Economies						
	Euro Area										Other Europe					N. America		Asia-Pacific											
	AUT	BEL	FRA	FIN	DEU	IRL	ITA	LUX	NLD	ESP	DNK	NOR	SWE	CHE	GBR	CAN	USA	AUS	HKG	JPN	KOR	SGP	CHN	BRA	IND	MEX	POL	RUS	TUR
Monetary Policies																													
1. Policy rate cuts (basis points)	—	—	—	—	—	-	—	—	—	—	-	125	-	-	65	150	150	50	114	-	50	-	30	50	75	50	50	-	100
2. Central bank liquidity support	—	—	—	—	—	Y	—	—	—	—	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
3. Central bank swap lines	—	—	—	—	—	Y	—	—	—	—	Y	Y	Y	Y	Y	Y	Y	Y	-	Y	Y	Y	-	Y	-	Y	-	-	-
4. Central bank asset purchase schemes	—	—	—	—	—	Y	—	—	—	—	-	-	Y	-	Y	Y	Y	Y	-	Y	-	-	-	-	-	-	Y	-	-
External Policies																													
1. Foreign currency intervention	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	Y	-	Y	Y
2. Capital flow measures	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Financial Policies for Banks																													
1. Easing of the countercyclical capital buffer	-	Y	Y	-	Y	Y	-	-	-	-	Y	Y	Y	Y	Y	-	-	-	Y	-	-	-	-	-	-	-	-	-	-
2. Easing of systemic risk or domestic capital buffer	-	-	-	Y	-	-	-	-	Y	-	-	-	-	-	-	Y	-	-	-	-	-	-	-	-	-	-	Y	Y	-
3. Use of capital buffers	—	—	—	—	—	Y	—	—	—	—	-	Y	Y	Y	Y	-	Y	Y	-	Y	-	-	-	Y	Y	-	Y	Y	Y
4. Use of liquidity buffers	—	—	—	—	—	Y	—	—	—	—	Y	Y	Y	Y	Y	Y	Y	-	-	Y	-	-	Y	-	-	-	Y	Y	Y
5. Adjustments to provisioning requirements	—	—	—	—	—	Y	—	—	—	—	Y	Y	Y	-	Y	-	Y	Y	-	-	-	-	Y	Y	-	Y	Y	Y	Y
Financial Policies for Borrowers																													
1. State loans or credit guarantees	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	-	-	-	-	Y	-
2. Restructuring of loan terms or moratorium on payments	-	Y	Y	Y	-	Y	Y	Y	Y	Y	-	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y	Y	-	-	-	Y	Y	Y

Source: IMF staff.

Note: The table shows policy measures for 29 economies with systemically important financial sectors. The table does not include details on all of the central bank measures that have been introduced, but rather groups them under "central bank liquidity support" or "central bank asset purchase." "Foreign currency intervention" includes central bank interventions in the foreign exchange spot and derivatives markets, as well as other measures, such as changes in foreign exchange reserve requirements. "Easing of the countercyclical capital buffer" includes an easing from announced or effective levels, or an easing of the sectoral countercyclical capital buffer. "Restructuring of loan terms or moratorium on payments" includes both official actions and measures taken by banks. Data labels in the table use International Organization for Standardization (ISO) country codes. For more details, see www.IMF.org/COVID19policytracker.

- Third, several central banks have agreed to *enhance the provision of US dollar liquidity* through swap line arrangements to ameliorate tighter conditions in the global US dollar funding market.[19]

To enhance the liquidity and functioning of *short-term funding markets* as well as to maintain the *flow of credit to the broader economy*, several central banks launched facilities aimed at a number of markets, including commercial paper, municipal bonds, asset-backed securities, as well as corporate debt. By stepping in as "buyers of last resort" in these markets and effectively setting an upper limit on the cost of credit, central banks aim to ensure that households and firms continue to have access to credit at an affordable price. Table 1.2 provides examples of such facilities in G7 countries, but similar measures have been implemented in other countries as well, including in emerging market economies.[20]

To counter foreign currency funding pressures and mitigate damage to their economies from *unprecedented capital flow reversals*, central banks in emerging market economies have implemented a number of measures. Some (Brazil, Indonesia, Mexico, Russia, Thailand) have restarted or continued foreign currency intervention programs to mitigate excessive volatility in their domestic currencies; several countries have reduced foreign currency reserve requirements (for example, Indonesia and Turkey) or increased availability of foreign currency swaps and repos (for example, Brazil, Indonesia, Mexico, and Russia).

[19]On March 15, the Bank of Canada, the European Central Bank, the Bank of England, the Bank of Japan, and the Swiss National Bank started offering US dollars with 84-day terms, in addition to the existing one-week operation. On March 19, the Federal Reserve announced the establishment of temporary US dollar swap lines with nine central banks including four emerging market economies.

[20]See www.IMF.org/COVID19policytracker.

Table 1.2. Selected Central Bank Facilities to Support Funding Markets

	Money Markets and Government Securities	Corporate Bonds	Other Markets
Bank of Canada	**Bankers' Acceptance Purchase Facility** Purchases of eligible bankers' acceptances to maintain credit to small- and medium-sized businesses. **Provincial Money Market Purchase Program** Purchases of provincial money market securities in the primary market. **Commercial Paper Purchase Program** Purchases of eligible commercial paper in the primary and secondary markets to maintain the smooth flow of credit to corporations.		
Bank of England	**Asset Purchase Facility** A £200 billion increase in the central bank's holdings of UK government bonds and sterling nonfinancial investment-grade corporate bonds to a total of £645 billion. **COVID-19 Corporate Financing Facility** For 12 months the central bank and Treasury will purchase commercial paper of maturities up to one year issued by companies making a material contribution to the UK economy.		
Bank of Japan	**Outright purchases of commercial paper and corporate bonds** A temporary (until the end of September 2020) increase in holdings of corporate bonds and commercial paper, moving from reinvesting proceeds of maturing assets into making net purchases. **Policy actions to enhance the liquidity and functioning of short-term funding markets** The Bank of Japan announced funds-supplying operations against pooled collateral and purchases of Japanese government securities with repurchase agreements. In addition, it conducted unscheduled outright purchases of Japanese government bonds and expanded its Securities Lending Facility.		**Purchase of Exchange Traded Funds and Real Estate Investment Trusts** A doubling in the pace of exchange-traded fund (ETF) purchases.
European Central Bank	**Pandemic Emergency Purchase Program** Purchases of private and public sector securities, until the end of 2020, up to a total amount of EUR 750 billion. Expanded European Central Bank Asset Purchase Program, with additional EUR 120 billion in asset purchases focusing on the corporate sector. The collateral eligibility was amended to promote inclusion of corporate sector securities.		
US Federal Reserve	**Primary Dealer Credit Facility** Provision of credit to primary dealers in exchange for a broad range of collateral for term funding with maturities up to 90 days. **Commercial Paper Funding Facility** Purchases from eligible issuers, via a Special Purpose Vehicle (SPV), of three-month US dollar–denominated commercial paper. **Money Market Mutual Fund Facility** Provision of liquidity to eligible money market mutual funds.	**Primary Market Corporate Credit Facility** Purchases of investment-grade bonds and some bonds recently downgraded from investment grade from eligible issuers, via an SPV, and loans to eligible borrowers. **Secondary Market Corporate Credit Facility** Purchases of investment-grade corporate bonds and some bonds recently downgraded from investment grade in the secondary market from eligible issuers. Purchases of investment grade exchange-traded funds (ETFs) along with the remaining funds allocated to high-yield ETF purchases.	**Term Asset-Backed Securities Loan Facility** Loans to holders of certain AAA-rated asset-backed securities, including collateralized loan obligations and commercial mortgage backed securities, based on newly and recently originated consumer and small business loans. **Municipal Liquidity Facility** Purchases of short-term notes issued by US states, counties, and cities.

Sources: National central banks. See URLs in the reference list for more details.

Regulators and supervisory authorities have implemented a range of financial policy measures:

- To allow *banks* to absorb losses and support the flow of credit to the economy, some countries (see Table 1.1) have released *macroprudential buffers* (such as the countercyclical capital buffers, or domestic systemic risk buffers) and issued supervisory expectations that *capital and liquidity buffers* included in the Basel III framework should be used (for example, enabling banks to operate below normal liquidity requirements and to use the capital conservation buffers). Some countries have also temporarily adjusted *supervisory priorities* and eased certain *regulatory requirements*, including delaying stress tests, introducing flexibility for banks in their treatment of nonperforming exposures, or easing other requirements.[21] Some supervisory authorities have also recommended restricting bank dividend payouts.
- Many *insurance* supervisors have focused on regulatory actions to support business continuity and fair treatment of policyholders, for example by supporting a grace period on premium payments for the affected policyholders and allowing more flexibility on supervisory reporting.[22] A few National Competent Authorities have gone beyond the measures set out in the Solvency II framework. Some supervisory authorities have also recommended insurers to restrict dividend payments in order to ensure the health of their capital position in balance with the protection of the insured.
- *Asset managers* have been supported by some targeted measures as well. For example, the US Securities and Exchange Commission halted enforcement actions against affiliated parties' purchases of assets from money market funds and temporarily permitted other open-end mutual funds to borrow from affiliated parties and related funds. Supervisors in several jurisdictions have extended deadlines for regulatory filings.
- *Short-sale bans* have been introduced in many countries to reduce the risk of downward price spirals and prevent further deterioration in liquidity conditions that could create systemic risk. *Circuit breakers* have been triggered in many markets over recent weeks to halt trading temporarily to ensure orderly trading conditions. Some exchanges also reparametrized their circuit breakers.

What Are the Next Steps?

Given that events are still unfolding, it is not possible to fully assess the effectiveness of policies implemented so far, although market sentiment has shown signs of improvement in response to policymakers' actions and risk asset prices have retraced through early April some of their earlier declines. It is clear that a combination of monetary, fiscal, and financial sector policies will continue to be needed going forward to support the stability of the global financial system and to preserve soundness of financial institutions, especially if economic activity remains paralyzed for longer than expected. Some difficult questions, such as maintaining adequate capital at banks, as needed, and providing liquidity support to a broad range of market participants, including nonbank financial institutions, may have to be addressed if the situation evolves according to a more severe scenario.[23]

Furthermore, some constraints on policy options may emerge. Given that policy rates in most advanced economies are now close to or below zero (Figure 1.17, panel 1), asset purchases and forward guidance about the expected policy path will likely be the main tools in the central banks' monetary policy arsenal going forward, but room may be reduced given already very low long-term rates. In terms of macroprudential tools, only about a third of systemically important jurisdictions had the option of releasing the countercyclical capital buffers before the virus outbreak (Figure 1.17, panel 2), though some countries may also be able to ease other macroprudential tools. Given that some countries have limited or no fiscal space, it may be challenging for them to provide credible fiscal backstop.

While the central bank emergency facilities have been extended to many segments of financial markets, there are still some that are beyond the reach of current

[21]For example, the US Federal Reserve has temporarily relaxed supplementary leverage ratio requirements to exclude on-balance-sheet holdings of US treasuries and deposits at the Federal Reserve from ratio's denominator to enhance the ability of large bank holding companies to provide market liquidity. For further details, see https://www.federalreserve.gov/newsevents/pressreleases/bcreg20200401a.htm.

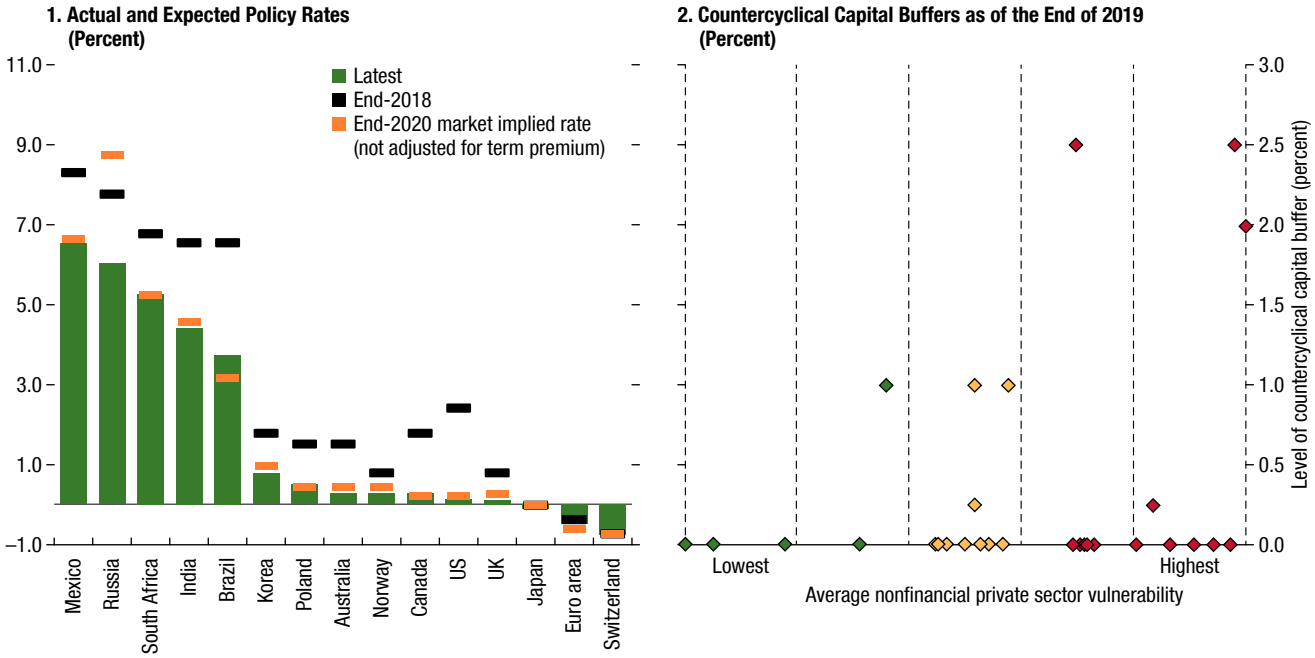
[22]The European Insurance and Occupational Pensions Authority issued a statement noting Solvency II provides flexibility in extreme situations in the ladder of supervisory interventions, including measures to extend the recovery period of affected insurers.

[23]For example, the European Commission has introduced the temporary state aid framework, which provides significant flexibility and waives burden-sharing requirements for government support to banks including via precautionary recapitalizations.

Figure 1.17. Shrinking Monetary and Macroprudential Policy Space

Policy rates are close to or below zero in many countries, and few additional rate cuts are expected.

Despite rising vulnerabilities, relatively few countries had built up countercyclical capital buffers before the pandemic.



Sources: Bank for International Settlements; Bloomberg Finance L.P.; Haver Analytics; and IMF staff calculations.
Note: Panel 2 shows the latest data on the countercyclical capital buffer (CCYB) levels in 29 systemically important jurisdictions with low (1) to high (5) vulnerabilities in the nonfinancial private sector (average of the household and nonfinancial corporate sectors weighted by the level of debt in each sector), based on the information used to draw Figure 1.10. Green diamonds are used for the lower two quintiles, yellow for the middle quintiles, and red for the upper two quintiles. The CCYB rates are as of February 2020.

facilities, such as riskiest credit markets. In several countries, efforts are under way to close these gaps.[24] Central bank measures to support the *corporate sector* appear to have improved market functioning, eased near-term liquidity stress, and boosted market sentiment, as discussed above. However, there were still some signs of bifurcation in the risky credit markets through early April, with the gap between investment- and speculative-grade spreads widening and limited issuance in riskier credit markets. Should financial conditions deteriorate further, and credit downgrades and defaults rise meaningfully, authorities may consider further measures to support the flow of credit to the broader economy.

[24]For example, the US Federal Reserve is rolling out the Main Street New Loan Facility (MSNLF), the Main Street Expanded Loan Facility (MSELF), and the Paycheck Protection Program Lending Facility (PPPLF). The Main Street facilities are backed by $600 billion from the CARES act with $75 billion in equity from the US Treasury and will provide loans to businesses. The PPPLF will provide term financing to lenders backed by Paycheck Protection Program (PPP) loans to small businesses that are 100 percent guaranteed by the Small Business Administration.

What Should Be the Guiding Principles for Financial Sector Policies?

The regulatory and supervisory responses to deal with the impact of the pandemic would need to maintain the balance between preserving financial stability, maintaining soundness of financial institutions, and supporting economic activity:

- *Loan restructuring:* In the face of the unprecedented but temporary shock, and of the substantial official sector response, supervisors should encourage banks to prudently renegotiate loan terms for companies and households struggling to service their debts. This should be done without lowering loan classification and provisioning standards. While a loan restructuring may not automatically lead to an increase in credit risk or loan losses, if borrowers remain likely to repay their obligations, banks need to assess their customers' creditworthiness on an ongoing basis and reflect any deterioration in asset quality in a timely manner. In cases where authorities have announced a loan moratorium or repayment holidays, banks may not be

able to reliably assess the implications of the crisis on their customers within a short period of time. Banks should, however, aim to update their assessments as soon as feasible, taking into account the implications of any supporting mechanisms provided by governments and guidance by supervisors.[25]

- *Accounting treatment of credit losses:* Regulators globally have provided guidance on how to apply IFRS 9 Expected Credit Loss (ECL) requirements in light of COVID-19. They have clarified that the requirements should not be applied mechanically and that forward-looking ECL estimates should be reasonable and supportable, taking into account the expected nature of the shock (likely temporary), the impact of the economic support measures, and the scarcity of available and reliable information.
- *Banks:* In the first instance, banks' existing capital and liquidity buffers should be used to absorb financial costs of any customer loan restructuring and to relieve pressures on banks' funding and liquidity using full flexibility within the existing regulatory frameworks. In cases where the impact is sizable and longer lasting and bank capital adequacy is affected, supervisors should take targeted actions, including asking banks to submit credible capital restoration plans. In such cases, authorities may also need to step in with fiscal support to banks' clients—either direct subsidies or tax relief to help borrowers to repay their loans and finance their operations—or provide credit guarantees to banks. Throughout this process, transparent risk disclosure and supervisory expectations on dealing with the implications of the outbreak will be important for market discipline to work effectively. Supervisors should also discuss operational risks associated with the COVID-19–related containment measures and business continuity plans with banks.
- *Insurance companies:* Insurance solvency frameworks in many jurisdictions include a ladder of supervisory intervention that allows for some flexibility of regulatory actions in cases of extreme market stress, including measures to extend the allowed recovery period of affected insurers. While temporary regulatory accommodation may be necessary, supervisors should not signal a lowering of standards. Supervisors should ask insurers to prepare credible plans to ensure that they can maintain or restore their solvency positions while continuing to provide necessary insurance cover to policyholders. Supervisors should also consider the macroprudential implications so that the actions they take do not incentivize the fire sale of assets through enhanced liquidity risk monitoring and management.
- *Asset managers:* Regulators should ensure that risk management frameworks are being applied in a robust and effective manner. Regulators should support the availability of the widest possible set of liquidity management tools (such as gates/deferred redemptions, swing pricing) and encourage fund managers to make full use of the available tools where it would be in the interests of unitholders to do so. Depending on the asset classes within the portfolio, a fund manager may face difficulties in obtaining timely and reliable valuations. Authorities should monitor developments and seek to provide clarity to fund managers on their expectations, including on the circumstances in which use of liquidity management tools, including a (temporary) suspension of redemptions, may become appropriate.
- *Financial markets:* For circuit breakers, volatility controls, and other market resilience measures to be effective, they need to be well calibrated, clearly defined, and appropriately communicated. When adopting temporary restrictions, such as the use of short selling, authorities should consider the potential negative impact on liquidity and price discovery and ensure that they are justified to support market confidence and financial stability. The restrictions should be temporary and only implemented within a predictable and reliable framework.
- *Liquidity provision by central banks:* Central banks may intervene to prevent impairment in money, securities, and foreign exchange markets that could emerge in the wake of financial disruptions, that is, when funding or market liquidity deteriorates substantially relative to normal conditions or if dealers are not able to trade assets at reasonable prices and without excessive price fluctuations. The lending operations may involve short- and long-term repo operations (reverse repurchase agreements), discount window (possibly at longer maturities), and foreign exchange swaps. The outright asset purchases, which can take the form of a program to buy securities or foreign exchange, may be appropriate to improve market liquidity. To effectively target the source of the market disruption, central banks may need to expand the range of eligible

[25]In its April 3, 2020, statement, the Basel Committee provided clarifications on how various extraordinary support measures should be treated in the regulatory framework (such as using the sovereign risk weight in relation to loans guaranteed by governments and the treatment of moratoria). See https://www.bis.org/press/p200403.htm.

collateral (for both lending and outright operations) beyond what they accept during normal times while also expanding the range of counterparts with whom they deal. Central banks should also carefully assess which markets are critical to support in order to maintain financial stability, while ensuring the design of the program, as much as possible, minimizes moral hazard and the risks to the central bank.

How Should Emerging and Frontier Markets Address External Pressures?

Emerging market and developing countries may be particularly hard hit by the virus outbreak given their dependence on external funding, increased leverage, and high reliance on commodity production for some economies (as discussed in Chapter 3 of this report):

- *Manage exchange rate pressures:* Many emerging markets are already facing volatile market conditions due to sharp reversals of portfolio flows. Exchange rate flexibility should be used, where feasible. Multilateral and bilateral swap lines may be needed to alleviate foreign currency funding pressures. For countries with adequate reserves, exchange rate intervention can lean against market illiquidity and thus play a role in muting excessive volatility. However, interventions should not prevent necessary adjustments in the exchange rate. Interventions should be planned on the basis that the pressures arising from the current crisis might last several months or longer. If macroprudential buffers exist, their relaxation can reduce the impact of the current shock on market conditions and on the overall economy. For example, foreign currency reserve requirements can be relaxed to mitigate foreign-exchange funding pressures.
- *Managing capital outflows:* In the face of an imminent crisis, introducing outflow capital flow management measures (CFMs) could be part of a broad policy package, but CFMs cannot substitute for warranted macroeconomic adjustment. Considerations to introduce CFMs need to have due regard to the country's international obligations. CFMs generally need to be broad-based and effectively enforced to reduce capital outflows. Such measures should be implemented in a transparent manner, be temporary, and be lifted once crisis conditions abate.
- *Prepare for longer-term external funding disruptions:* Sovereign debt managers should put in place contingency plans for dealing with limited access to external funding markets for a prolonged period. From the perspective of the trade-off between cost and risk, reducing rollover risks should take priority over concerns about containing costs when there are large downside risks stemming from potential loss of market access. Using cash buffers may become necessary, and some countries may need to seek bilateral and multilateral assistance (see the April 2020 WEO). For those countries that are facing rapidly deteriorating debt dynamics, limited market access, high external financing requirements, or high volatility, it may become necessary to preemptively and cooperatively seek a debt resolution with their creditors, including official creditors.

What Should Be the Focus of International Policy Coordination?

Multilateral cooperation can help mitigate the health impact of the COVID-19 pandemic and its damage to the global economy and financial system. In the first instance, cooperation is needed to avoid price controls and ease trade restrictions on essential medical supplies. Bilateral and multilateral swap lines may need to be provided to a broader range of emerging markets. Greater international coordination may also be needed to reduce broader capital flow disruptions. Furthermore, the considerable international efforts to bolster regulation of the financial system since the global financial crisis should be maintained and any rollback of regulation, or fragmentation through domestic actions that undermine international standards, should be avoided.

The IMF, with $1 trillion in available resources, is actively supporting member countries through various lending facilities. The recent doubling of access limits of the IMF's emergency financing facilities will allow the Fund to meet an expected demand of $100 billion in emergency financing, provided through the Rapid Credit Facility and the Rapid Financing Instrument, of which the former is only for low-income countries. The Catastrophe Containment and Relief Trust can currently provide about $500 million in debt service relief, including the recent $185 million pledge by the United Kingdom and $100 million provided by Japan, as immediately available resources. Official bilateral creditors have been called upon by the IMF Managing Director and the World Bank President to suspend debt repayment from International Development Association countries that request forbearance. This action would help with their immediate liquidity needs to address the challenges of the pandemic.

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CHAPTER 2

RISKY CREDIT MARKETS

INTERCONNECTING THE DOTS

Chapter 2 at a Glance

- High-yield bond, leveraged loan, and private debt markets have grown significantly over the past decade and have become more complex.
- Key vulnerabilities include weaker credit quality of borrowers, looser underwriting standards, liquidity risks at investment funds, and increased interconnectedness.
- On the positive side, use of financial leverage by investors and direct exposures of banks have declined.
- In a severe adverse scenario, total losses at nonbank financial institutions could be substantial, while risk to the banking sector appears to be lower.

Risky corporate credit markets have expanded rapidly since the global financial crisis. The role of nonbank financial institutions has increased, and the system has become more complex and opaque. This chapter maps out the financial ecosystem of these markets and identifies potential vulnerabilities, which include weaker credit quality of borrowers, looser underwriting standards, liquidity risks at investment funds, and increased interconnectedness. On the positive side, the use of financial leverage by investors and direct exposures of banks—which were crucial amplifiers during the global financial crisis—have declined. Run risks have lessened in some segments because of a prevalence of long-term locked-in capital in the private debt and collateralized loan obligation (CLO) markets. In an illustrative severe adverse scenario, losses on risky credit exposures at banks are estimated to be manageable, in aggregate, although losses at a few large banks could be substantial. However, losses at nonbank financial institutions could be high. Given the now-limited role played by banks, this could impair credit provision in these markets and make a recession more severe. The coronavirus (COVID-19) crisis, which has resulted in price declines in risky credit markets of about two-thirds of the severity of the global financial crisis through late March (before reversing a portion of these declines), could further expose the vulnerabilities highlighted in this chapter. Policymakers should now act decisively to contain the economic fallout of COVID-19 and support the flow of credit to firms. Once the crisis is over, they should assess the sources of market dislocations and tackle the vulnerabilities that have been unmasked by this episode.

Rapid Growth of Risky Credit Has Raised Red Flags

Corporate debt has been rising steadily over the past decade, leading to a weakening of corporate credit quality (see the October 2019 *Global Financial Stability Report* [GFSR]). This chapter, which focuses on the risky segments of credit markets (high-yield bonds, leveraged loans,[1] and private debt) aims to map out the financial ecosystem (the investor base and linkages between banks and nonbank financial institutions) and identify key vulnerabilities. It also explores key risk transmission channels and the extent of potential credit and mark-to-market losses that financial institutions could be exposed to under a severe adverse scenario.

As discussed in Chapter 1, market conditions in the risky credit markets have deteriorated sharply since the COVID-19 outbreak. By late March, US and Euro-

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[1]Leveraged loans refer to speculative-grade loans based on their credit rating or credit quality ratios, such as net-debt-to-earnings, debt-to-assets, or debt-to-equity ratio. Leveraged loans are predominately syndicated—that is, several (a syndicate of) lenders participate in the issuance of a loan.

pean markets for high-yield bonds and leveraged loans had experienced market declines of nearly two-thirds of the falls seen during the global financial crisis, as investors grew concerned about the deterioration of the economic outlook. Liquidity deteriorated significantly, with exceptionally high bid-ask spreads—a development that likely amplified asset price moves. Meanwhile, reflecting expectations of a worsening of firms' fundamentals, ratings agencies increased their forecasts of speculative-grade defaults to recessionary levels. Since late March, however, credit spreads have retraced a portion of their earlier widening and bid-ask spreads have largely normalized, owing to rapid and bold policy responses by major central banks and governments (see "Policy Priorities" section in Chapter 1). Nonetheless, earnings forecasts have continued to decline, and credit rating downgrades have gained momentum in risky credit markets.

Risky credit markets have grown rapidly over the past decade, supported by investor search for yield and favorable borrowing terms for firms. This rapid expansion has attracted the attention of regulators and market observers. Furthermore, nonbank financial institutions have become increasingly important players in credit markets in advanced economies, though their behavior over the full credit cycle has not been tested yet. Recent studies by international organizations and national supervisors have focused on the size, riskiness, and investor base in some of these markets.[2]

One area of risky credit markets—leveraged loans—has grown particularly rapidly since the global financial crisis. Issuance of floating-rate institutional leveraged loans moderated in 2019 due to reduced investor demand for floating-rate instruments in an environment of declining interest rates. After a brief surge early this year, issuance of leveraged loans slowed sharply following the COVID-19 outbreak (Figure 2.1, panel 1). High-yield bond issuance has also fallen from the high levels early this year during the COVID-19 outbreak, but it appears to have recovered somewhat in April.

On net, global leveraged loans outstanding grew through the end of 2019 (especially in the United States), reaching $5 trillion globally, of which $4 trillion was in advanced economies (Figure 2.1, panel 2). In addition, the formation of new CLOs remained robust before the most recent COVID-19–related slowdown, partly ameliorating the decline in demand from interest-rate-sensitive investors (Figure 2.1, panel 3).[3] CLOs outstanding more than doubled since 2010 (Figure 2.1, panel 4), driven by activity in the United States. Reportedly, investors have been attracted by the benefits of risk diversification, more resilient structures since the global financial crisis, funding stability, and transparency to investors.

The high-yield bond market had also grown significantly by the end of 2019, climbing to $2.5 trillion globally, of which $2 trillion was in advanced economies. Growth was faster in Europe than in North America in recent years (Figure 2.1, panel 5).

Finally, the private debt market also boomed, reaching nearly $1 trillion (Figure 2.1, panel 6).[4] This growth in private debt is part of a secular trend away from public markets, which first started in equity markets. In addition, the search for yield in the low-interest-rate environment by investors that have long investment horizons and are not subject to mark-to-market requirements—and may therefore be willing to give up liquidity to reach a higher yield target—has reinforced this trend.

The Credit Ecosystem Has Become More Complex

Banks' direct exposures to credit risk have declined as banks have shifted from an originate-to-retain to an originate-to-distribute business model. A broadening of the investor base beyond banks over the past few decades has contributed to the distribution of exposures to a wider set of creditors with varying risk profiles. This has likely reduced some risks to the banking system, but it has also increased the complexity and opacity of credit markets, possibly introducing new risks and shock transmission channels.

Mutual funds and exchange-traded funds (ETFs) play a key role in the US high-yield bond market, while CLOs and banks account for a large share of leveraged loan holdings globally (Figure 2.2, panels 1 and 2). In the US market, banks are exposed to CLOs primarily through AAA tranches. Asset managers and

[2]See the April 2018, April 2019, and October 2019 GFSR; Bank of England 2019; ECB 2019; FSB 2019; IOSCO 2018; and IOSCO 2020.

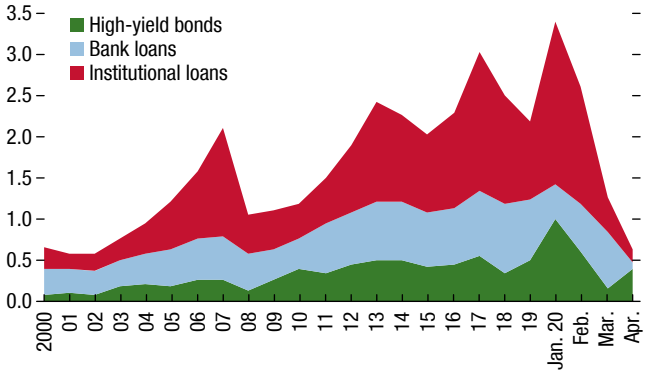
[3]A collateralized loan obligation is a structured finance product collateralized predominantly by broadly syndicated leveraged loans.

[4]Private debt refers to financing that is directly negotiated, typically between a nonbank lender and a borrower without the involvement of a syndicate bank.

Figure 2.1. Market Developments: Issuance and Size

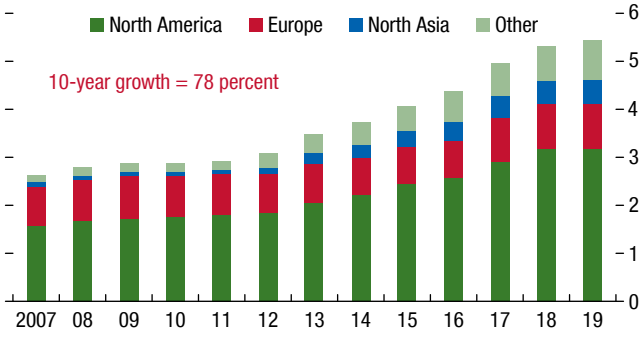
Issuance of risky credit was strong before the COVID-19 outbreak, but has slowed sharply since late February.

1. Global Gross Issuance of High-Yield Bonds and Leveraged Loans (Trillions of US dollars)



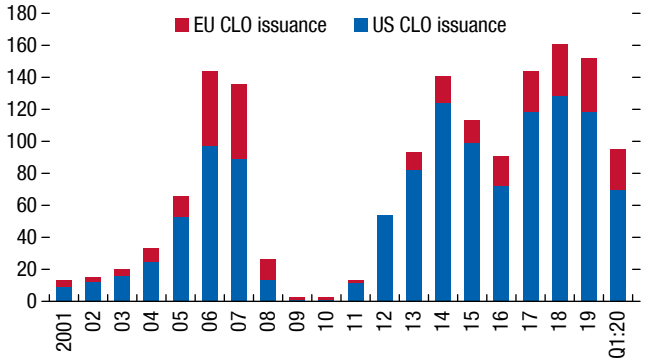
On net, the leveraged loan market grew through the end of 2019 to $5 trillion globally, $4 trillion of which was in advanced economies.

2. Global Leveraged Loans Outstanding (Trillions of US dollars)



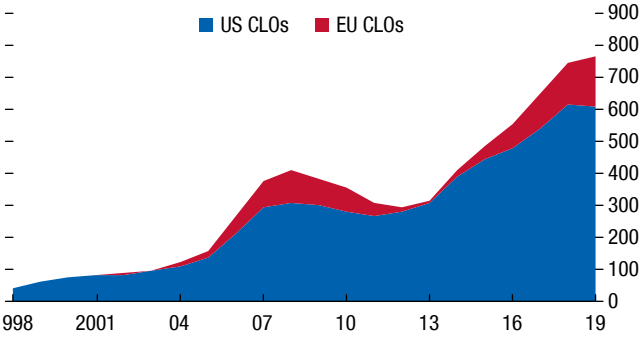
Issuance of CLOs remained robust before the COVID-19 outbreak, but declined sharply thereafter.

3. US and EU New Issue CLO Volume (Billions of US dollars)



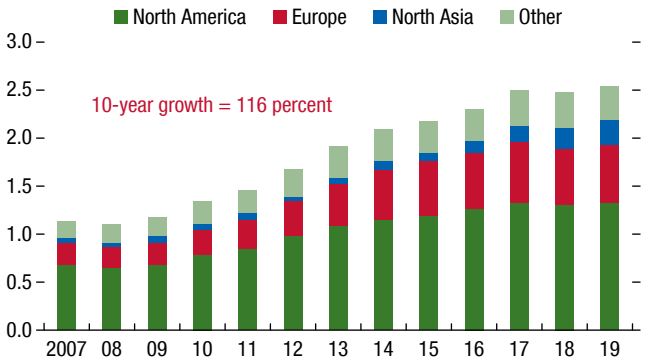
CLO volume surged through 2019, providing risk diversification and credit protection for investors in the leveraged loan market.

4. US and EU CLOs Outstanding (Billions of US dollars)



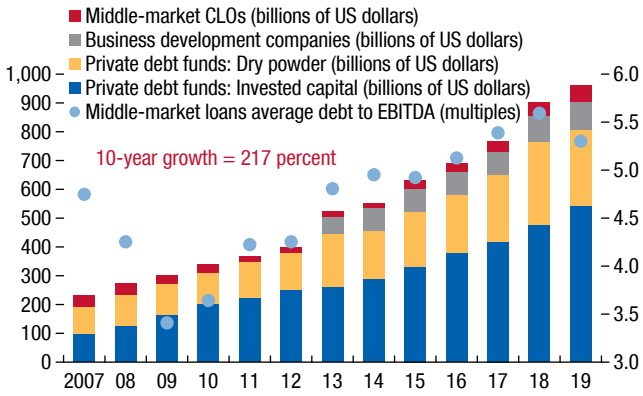
The high-yield bond market had climbed to $2.5 trillion globally by the end of 2019, benefiting from falling interest rates.

5. Global High-Yield Bonds Outstanding (Trillions of US dollars)



The private debt market also boomed on the back of demand from institutional investors seeking long-term investments.

6. Private Credit Assets under Management and Leverage (Billions of US dollars, left scale; multiples, right scale)

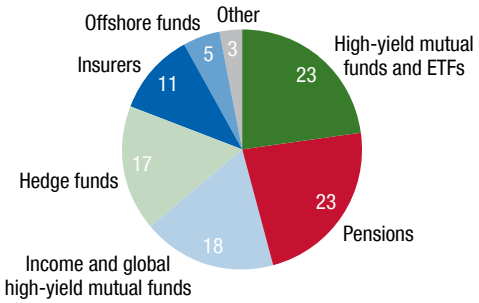


Sources: Bank of America Merrill Lynch; Dealogic; S&P Leveraged Commentary and Data; Securities Industry and Financial Markets Association; Preqin; Association for Financial Markets in Europe; and IMF staff calculations.
Note: In panel 1, monthly data are annualized. In panel 3, the estimate for 2020 is annualized Q1 data. In panels 2 and 5, Europe refers to the European Union and the United Kingdom; North America refers to Canada and the United States; and North Asia refers to China, Japan, and South Korea. In panel 6, dry powder refers to capital that has been committed but not yet invested. Middle market refers to firms with earnings below $50 million. CLOs = collateralized loan obligations; EBITDA = earnings before interest, taxes, depreciation, and amortization; EU = European Union.

Figure 2.2. Investors in Risky Credit Markets

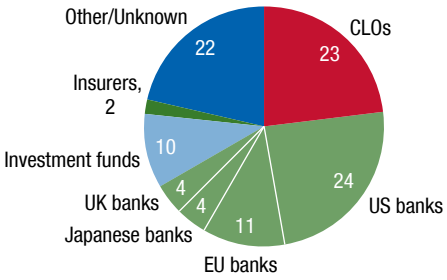
High-yield dedicated and multisector investment funds hold almost half of the high-yield bond market ...

1. US High-Yield Bond Investor Base (Percent, as of 2019)



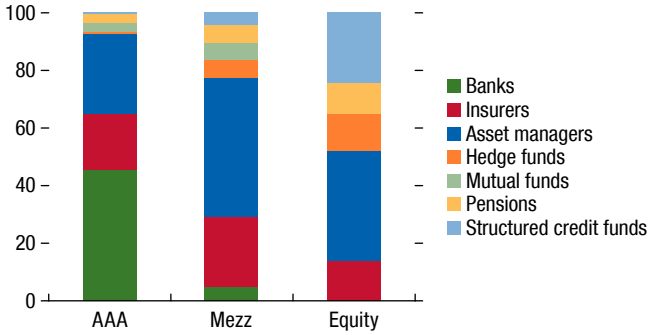
... while, globally, banks are the largest holders of leveraged loans.

2. Global Holders of Leveraged Loans (Percent, as of 2018)



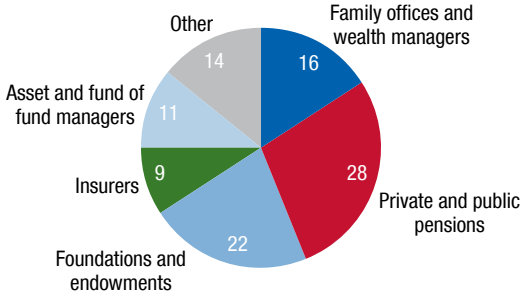
Asset managers and hedge funds are most exposed to riskier tranches of CLOs.

3. US CLO Investor Base (Percent, as of 2019)



Pension funds are the largest investors in private debt vehicles.

4. Institutional Investors in US Private Debt Funds, by Type (Percent, as of 2019)



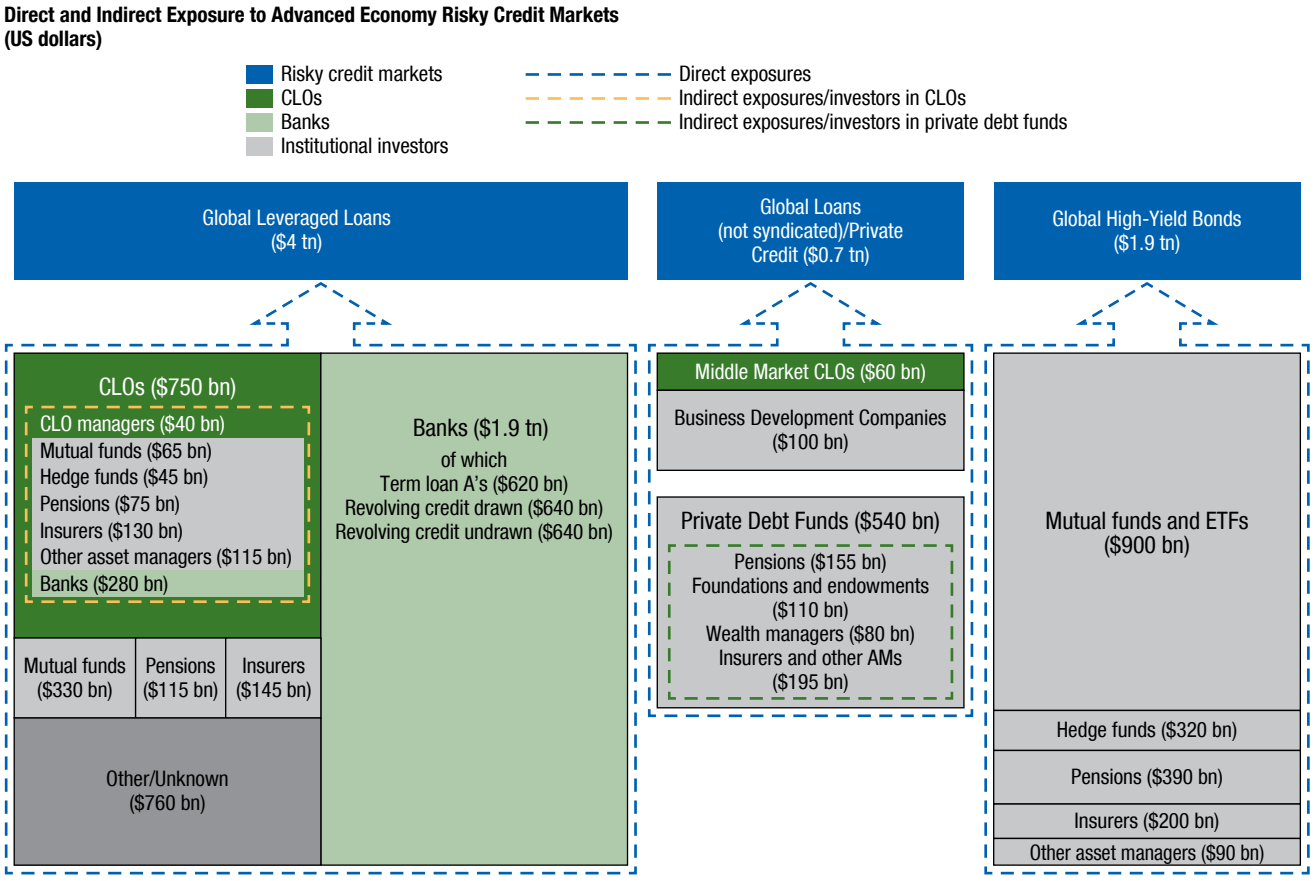
Sources: Barclays Capital; Citigroup; Financial Stability Board; Moody's; Preqin; S&P Leveraged Commentary and Data; and IMF staff calculations.
Note: For panel 2, the Other/Unknown category is based on estimates from the Financial Stability Board and includes other financial and nonfinancial US organizations based on Treasury International Capital data. CLO = collateralized loan obligation; ETFs = exchange-traded funds; EU = European Union; Mezz = mezzanine.

insurance companies, by contrast, invest across the capital structure. Investors in the CLO equity and mezzanine debt tranches are a more diverse group, also comprising hedge funds and other structured credit funds (Figure 2.2, panel 3). In the US private debt market, growth has been partly driven by institutional investors with long-term locked-in capital who are not required to mark their positions to current market prices (Figure 2.2, panel 4). This has reduced liquidity risks, albeit at the expense of increasing the opacity of the market.

Figure 2.3 provides a visualization of the global ecosystem of risky credit markets:

- *Banks remain vital to the functioning of risky credit markets*, where they provide senior secured loans and credit lines. Before the market stress surrounding the COVID-19 outbreak, half of bank credit lines were estimated to be undrawn, but companies have more recently been looking to shore up cash positions by calling on the capacity of credit lines (see Chapter 1). The undrawn credit lines may help absorb some of the refinancing pressures in a market downturn (if covenants are not breached) but can also increase credit and liquidity risk at banks. Banks also have indirect exposures through CLOs and various forms of financing and leverage.
- *CLOs hold about one-quarter of global leveraged loans and are the largest investor in the institutional leveraged loan market*, accounting for more than 60 percent of institutional loans outstanding. CLOs benefit from stable funding sources in the form of long-term locked-in capital, so run risk related to

Figure 2.3. Ecosystem of Global Risky Credit Markets



Sources: Bloomberg Finance L.P.; Financial Stability Board; S&P Leveraged Commentary and Data; and IMF staff calculations.
Note: The estimates for the global high-yield bond investors is based on the percentage allocated for the US high-yield bond investor base in Figure 2.2, panel 1, and applied to global high-yield bonds outstanding. The estimate for private debt funds excludes uninvested capital, also known as dry powder. Numbers are rounded to $5 billion. AMs = asset managers; bn = billion; CLOs = collateralized loan obligations; ETFs = exchange-traded funds; tn = trillion.

maturity mismatches is limited. They also provide steady demand for loans, particularly during the reinvestment period, when CLO managers can actively manage their portfolios. CLOs generally face pressure when the share of assets rated CCC or below increases, or when they are failing key overcollateralization tests put in place to protect senior noteholders.[5]

- *Mutual funds and ETFs are important players in global risky credit markets.* Investment funds and ETFs account for about half of the demand for high-yield bonds; these funds have also supported strong growth in the leveraged loan market. Open-ended investment funds may face liquidity mismatches, often offering investors daily redemption, despite the relatively illiquid nature of the underlying instruments.
- *Main nonbank lenders in private debt markets are private credit funds, business development companies, and middle-market CLOs.* Unlike banks, these vehicles typically do not carry maturity or asset-liability mismatches and appear to employ limited financial leverage. Such leverage is provided by banks in the form of credit lines and capital call lines.[6] Private

[5]An overcollateralization test measures the ratio of the aggregate principal value of pooled assets to the outstanding debt tranches that comprise the CLO capital structure. A typical overcollateralization test ranges by tranche, and thresholds are usually between 5 percent and 20 percent.

[6]A capital call line is a line of credit typically provided by a bank to a private equity firm. It can be used to enhance debt fund returns or provide bridge financing for limited partnership capital.

credit funds also have large amounts of capital that have been committed but not yet invested—so-called dry powder—that can be sourced and put to work in a downturn.
- Estimates of indirect exposures suggest that international banks, including large banks in advanced Asia, hold about one-third of global CLOs. Insurance companies have become the second-largest CLO buyer. For private debt funds, the primary source of capital appears to come from institutional investors, such as global private and public pension funds, foundations, and endowments.

Vulnerabilities in Risky Credit Markets Have Grown

The main vulnerabilities in global risky credit markets are highlighted in Table 2.1, which is based on the GFSR indicator-based framework (see Online Annex 1.1 of the April 2019 GFSR)[7] and discussions with market participants. These vulnerabilities include weaker credit quality of borrowers, looser underwriting standards, eroded investor protections, liquidity risk in investment funds, and higher concentration of lenders within a lender type, as well as a high degree of interconnectedness in the ecosystem. The complexity and opacity of credit markets have also increased, particularly in the private debt market. On the positive side, financial leverage and direct exposures of banks—which were crucial amplifiers during the global financial crisis—have declined, and run risk has diminished because of a prevalence of long-term locked-in capital in the CLO and private debt markets. These vulnerabilities are explored by type in the discussion that follows.

Increased Borrower Leverage

The combination of increased borrower leverage and weaker earnings has uniquely exposed risky credit markets to the COVID-19 shock (Figure 2.4, panel 1). The share of highly leveraged deals in the United States has risen more rapidly for deals financed by nonbank financial institutions than for those with loans held by banks. Leverage is also higher for smaller companies than for larger firms. Finally, deals sponsored by private equity firms—typically to fund leveraged buyouts or mergers and acquisitions—have increased considerably faster in terms of leverage multiples.

In addition, leverage in the US loan market appears to be underestimated because of significant earnings adjustments (Figure 2.4, panel 2) and inflated goodwill (see the October 2019 GFSR). This issue is widely recognized by market participants, who are said to perceive potential repricing associated with unrealized earnings addbacks as a key risk. Moreover, despite very low interest rates, interest coverage ratios have continued to decline steadily (Figure 2.4, panel 3), particularly for smaller, middle-market firms (firms with earnings below $50 million). Finally, underwriting standards and investor protections have deteriorated in recent years in both the high-yield and leveraged loan market, as summarized by weaker covenants and thinner loss-absorbing buffers of loans (Figure 2.4, panels 4 and 5). As a result, recovery values for leveraged loans in the event of default may be lower in this economic downturn. More recently, since the COVID-19 outbreak, the primary market for risky credit has reportedly become more disciplined, with higher spreads, more protections, and less leverage, as lenders have apparently applied more conservative underwriting standards.

Decreased Financial Leverage

The deterioration in ratings quality in leveraged loan markets, including the expansion of B-rated credit, has been more pronounced during the current long credit cycle (Figure 2.5, panel 1). As a result, risk ratings for CLOs have also deteriorated (Figure 2.5, panel 2). However, compared with the CLO structures that prevailed before the global financial crisis, current CLOs have less "embedded" leverage—that is, they have a higher share of equity and mezzanine debt (rated A and below) as a cushion intended to protect AAA tranche holders (Figure 2.5, panel 3). This implies that investors in AAA tranches are less likely to suffer credit losses, even in a severe market downturn, as was the case during the global financial crisis. By contrast, equity and mezzanine debt investors may experience credit losses, as shown in a simulation based on a typical CLO (Figure 2.5, panel 4).

During the global financial crisis, one of the key amplifiers was financial leverage—that is, the leveraging-up of risk positions through the use of derivatives, repurchase agreements, and bank lines of

[7]All annexes are available at www.imf.org/en/Publications/GFSR.

Table 2.1. Key Vulnerabilities in Risky Credit Markets

	Vulnerability Type							
	Size	**Valuations**	**Borrower's Leverage**	**Embedded and Financial Leverage**	**Liquidity, Maturity, FX Mismatches**	**Concentration**	**Interconnectedness**	**Complexity and Opacity**
High-Yield Bond Market	$1.9 trillion	High valuations before the COVID-19 outbreak	• High firm leverage • EBITDA add-backs • Large share of B credit • LBO activity	Active CDX market	Fund outflows can be sizable	Top borrowers represent a sizable share of the market	• Borrowers in both HY and LL markets • Correlations of HY and LL credit • Crossover funds' investments in both HY and LL	Low transparency of the riskiness of investors' exposures
Leveraged Loan Market	$4.0 trillion			• Repo, TRS, CLO warehouse lines have declined • Bank credit lines can be quickly repriced		Top lenders account for a large share of the market		
Private Debt Market	$0.7 trillion	• Limited data on prices • High return targets		Capital call lines of credit	Large locked-in capital and HTM positions		Lenders in both LL and PD markets	Low visibility of borrowers, investors, and transactions

Sources: Bloomberg Finance L.P.; Dealogic; and IMF staff calculations.
Note: "Complexity and Opacity" refers to a lack of data on prices, transactions, and investor positions in some areas of risky credit markets. CDS = credit default swap; CDX = credit default swap index; CLOs = collateralized loan obligations; EBITDA = earnings before interest, taxes, depreciation, and amortization; FX = foreign exchange; HTM = held to maturity; HY = high-yield; LBO = leveraged buyout; LL = leveraged loan; PD = private debt; repo = repurchase; TRS = total return swap.

credit. Since then, the use of financial leverage appears to have declined significantly in the United States. For example, the use of repurchase transactions to fund CLO AAA tranches is reportedly limited. Similarly, investors do not appear to widely employ total-return swaps to gain leveraged exposure to the loan market. Banks also appear to be more conservative when it comes to the amount of underwritten risk in new loans they will hold—so-called pipeline risk. Finally, CLO warehouse lines (lines of credit to finance new CLO formation) now often assign the portfolio manager or third parties to take first-loss risks, not the banks (Figure 2.5, panel 5).

Overall, banks appear to have cut some of their indirect exposure through financial leverage, likely reducing the potential for an amplification of price moves during periods of stress. However, interconnectedness between banks and other financial institutions may be increasing. For example, bank lending to nonbank financial institutions has nearly doubled since 2013, reaching $1.4 trillion in the United States (Figure 2.5, panel 6).

Refinancing and Liquidity Risks

While refinancing risks for high-yield bonds and leveraged loans seem manageable in the short term, their maturity profile appears more challenging over the medium term, with a record amount of loans maturing in five years (Figure 2.6, panel 1). In addition, maturing debt is concentrated in lower-rated loans (Figure 2.6, panel 2), raising the specter of possible downgrades and defaults in this economic downturn.

As fixed-income funds with relatively illiquid holdings have grown significantly over the past decade, large withdrawals may contribute to asset price moves and deteriorating liquidity conditions, especially for funds not managing liquidity risk properly. In addition, fund outflows appear to have become more volatile (Figure 2.6, panel 3). For example, US open-ended high-yield bond and leveraged loan funds experienced $42 billion in outflows in the fourth quarter of 2018, when financial conditions tightened markedly. While these funds were able to meet redemptions without severe dislocations to market functioning, reflecting varying strategies of liquidity management across funds and sufficient liquidity buffers in aggregate, the fourth quarter of 2018 stress episode was short-lived and took place against a backdrop of continued growth (Figure 2.6, panel 4).[8]

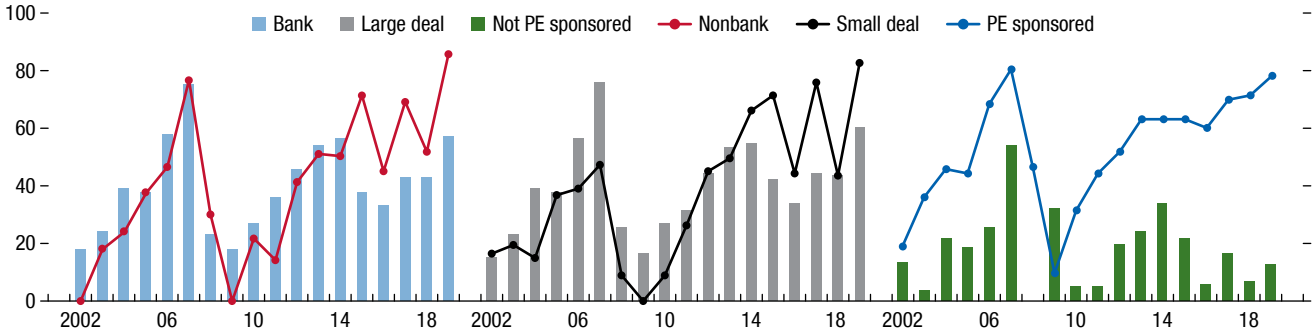
So far, between late February and the end of March 2020, US open-ended high-yield bond and leveraged loan funds have experienced $34 billion in outflows. While more recently high-yield bond funds have seen

[8]According to Emerging Portfolio Fund Research data, cumulative fourth-quarter 2018 outflows from US high-yield bond funds accounted for 7 percent of assets under management, while outflows from US loan funds totaled 12 percent of assets under management.

Figure 2.4. Balance Sheet Leverage and Credit Risk

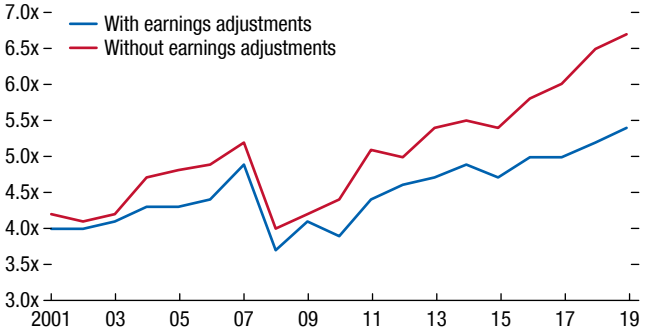
Leverage has risen in the loan market, primarily for deals financed by nonbank financial institutions, smaller deals, and private equity-sponsored transactions.

1. Leveraged Loan Deals with Leverage >5 (Percent)



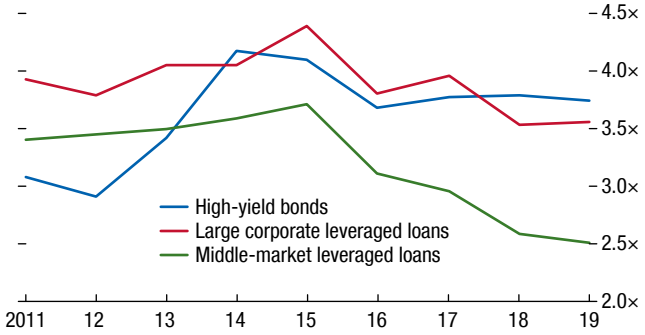
Leverage in the loan market may be understated because of significant earnings adjustments ...

2. Total Debt-to-EBITDA Ratio for Newly Issued US Leveraged Loans (Ratio)



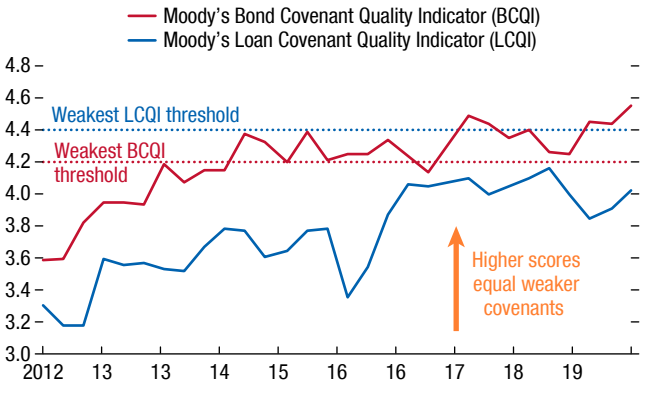
... while debt-service ability has steadily weakened since 2015, particularly in middle-market firms.

3. Interest Coverage Ratios for Newly Issued US Leveraged Loans (EBITDA-to-interest-expense ratio)

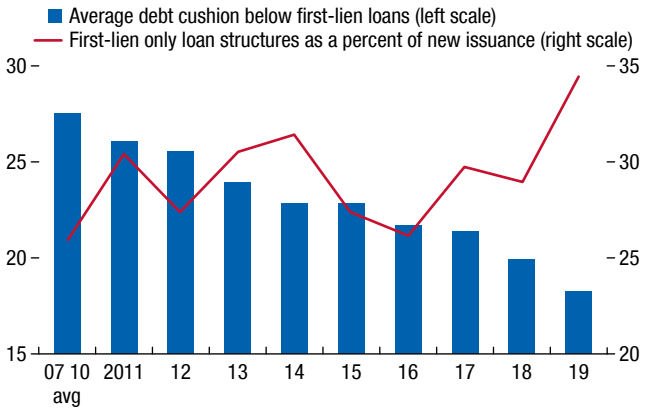


In this economic downturn, recovery values may be lower because of weaker covenants and reduced loss absorption capacity in the leveraged loan market.

4. North American Bond and Loan Covenant Quality Indices (Index level)



5. New Issue Leveraged Loan Debt Cushions and First Lien Only Structures (Percent of new issuance)

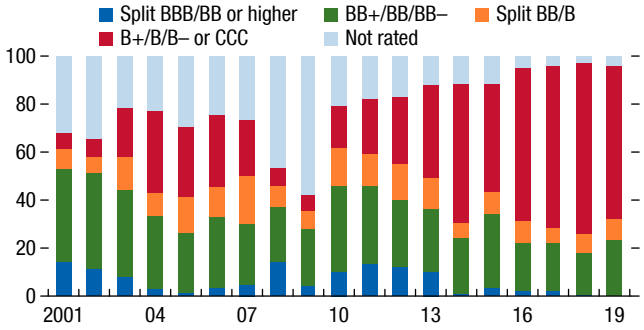


Sources: Bank of America Merrill Lynch; Moody's; S&P Leveraged Commentary and Data; and IMF staff calculations.
Note: In panel 2, the EBITDA for US leveraged loans is adjusted by adding back projected cost savings from restructuring, synergies, transaction costs, management fees, and nonrecurring operating expenses to compute the average total debt-to-EBITDA for loan deals without EBITDA addbacks. In panel 4, North America refers to Canada and the United States. The weakest threshold for the BCQI and LCQI refers to the level at which a CQI score would enter the fifth (CQ5) or weakest range of the index score that ranges between 0 and 5. The covenant quality score reflects the overall level of covenant protection based on a five-level scale of covenant quality ranging from CQ1 (strong) to CQ5 (weakest). Avg = average; EBITDA = earnings before interest, taxes, depreciation, and amortization; PE = private equity.

Figure 2.5. Embedded and Financial Leverage

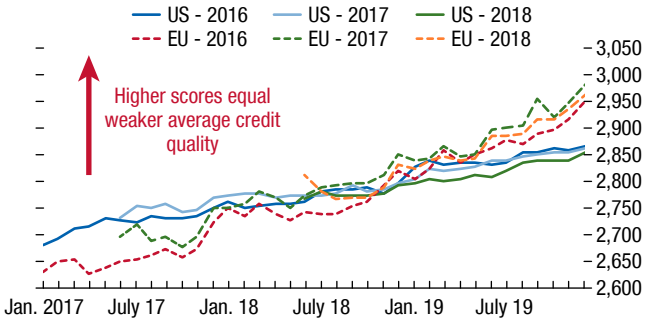
A growing concentration of lower-rated credit has raised the potential impact of rating downgrades ...

1. US Leveraged Loan Issuance, by Rating (Percent)



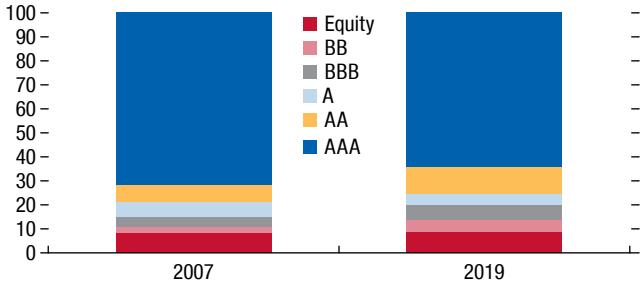
... and has already translated into a deterioration in risk ratings for CLOs.

2. Median Weighted Average Risk Factor for Outstanding CLO Deals, by Vintage (Index value)



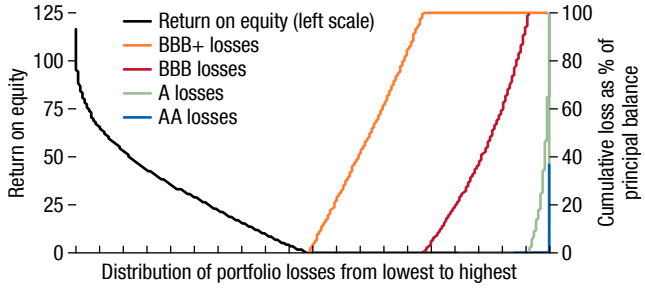
New CLOs have a larger equity cushion than precrisis CLOs ...

3. Average US CLO Liabilities, by Type and Credit Rating (Percent)



... but it can erode quickly, bringing in losses to equity holders and even investors holding lower-rated debt.

4. Returns on CLO Equity and Debt Tranches (Percent)



Financial leverage appears to have declined significantly since the global financial crisis ...

5. Estimated Lines of Credit and Derivatives in US Leveraged Loan Markets

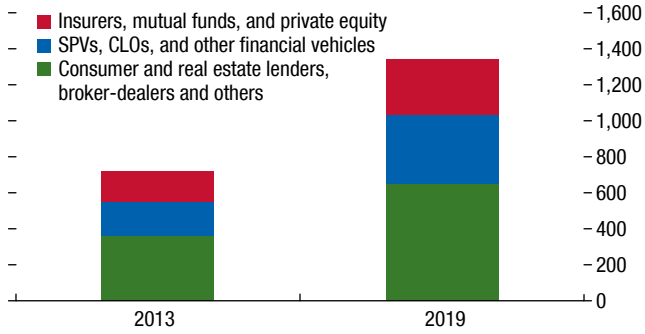
Loan Pipeline or Bridge Risk Is Lower		Risk Management Has Improved for CLO Warehouses	
Total Loans and Bonds		**CLO Warehouses**	
2007	$330 billion	2007	$40–50 billion
Today	~$50 billion	Today	$15 billion

Less Investor Leverage in the Loan Market

Total Return Swap Lines	Total	Leverage
2007	$250 billion	8–10×
Today	~<$75 billion	~3–4×

... but banks have increased their exposures to nonbank lenders.

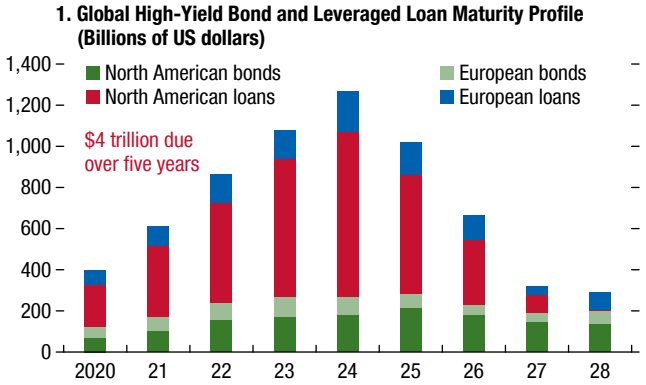
6. US Large Bank Lending to Nonbank Financial Firms, Committed Amounts (Billions of US dollars)



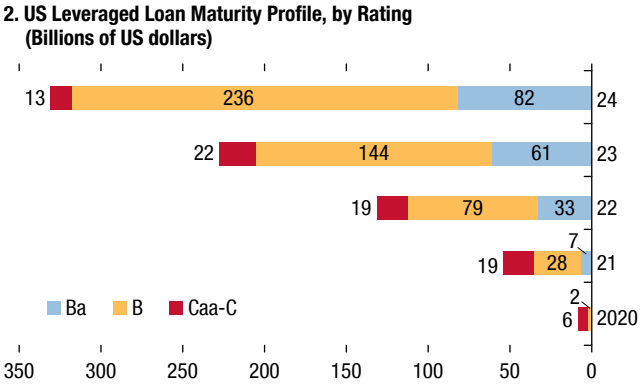
Sources: Barclays Capital; Citigroup; Federal Reserve; JPMorgan Chase & Co; Moody's; S&P Leveraged Commentary and Data; and IMF staff calculations.
Note: For panel 2, the weighted average risk factor (WARF) is the weighted average of the ratings for each loan in the portfolio, where a higher WARF score reflects a weaker weighted average credit strength. For panel 4, the estimation is based on a Monte Carlo simulation of a representative CLO. For individual loans in the portfolio, their expected default rate is dispersed around the expected default rate associated with each credit rating. The Monte Carlo simulation is run 10,000 times assuming varying levels of such dispersion. The portfolio consists of 100 senior secured first lien loans, with an adjusted weighted average life of 4.894 years, a weighted average rating of B, and an expected portfolio default rate of 15.9 percent. On the liability side, the CLO has an equity tranche equivalent to 11.8 percent of liabilities. The liability structure further consists of: A–1 notes (rated AAA and par amount equal to 60.5 percent of liabilities); A–2 notes (rated AA and par amount equal to 11.5 percent of liabilities); a B tranche (rated A and par amount equal to 6.4 percent of liabilities); a C tranche (rated BBB and par amount equal to 6.4 percent of liabilities); and a D tranche (rated BB and par amount equal to 3.4 percent of liabilities). Yields on loans and CLO tranches are derived from JPMorgan market rates. Probabilities of default and assumed recovery values are from S&P historical values. The Monte Carlo simulation is run using S&P's Global CDO Evaluator v 8.1 and employing default settings. In panel 5, bridge risk refers to short-term financing provided by banks to leveraged loan issuers that could be at risk for repayment if investor appetite, liquidity, or market demand significantly declines during the period of temporary financing. For panel 5, numbers are based on estimates provided by JPMorgan Chase & Co. CLOs = collateralized loan obligations; EU = European Union; SPVs = special purpose vehicles.

Figure 2.6. Maturity and Liquidity Mismatches

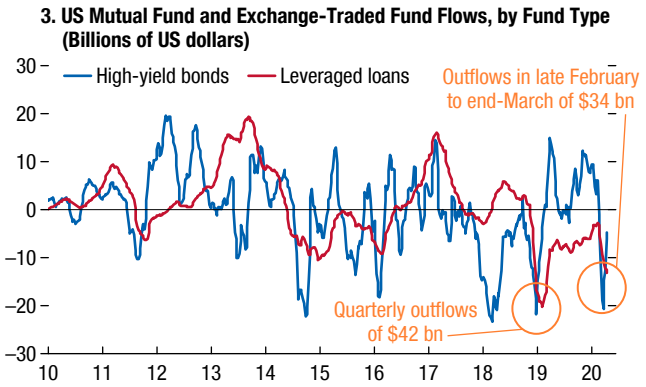
A substantial amount of high-yield bonds and leveraged loans will mature over the next five years ...



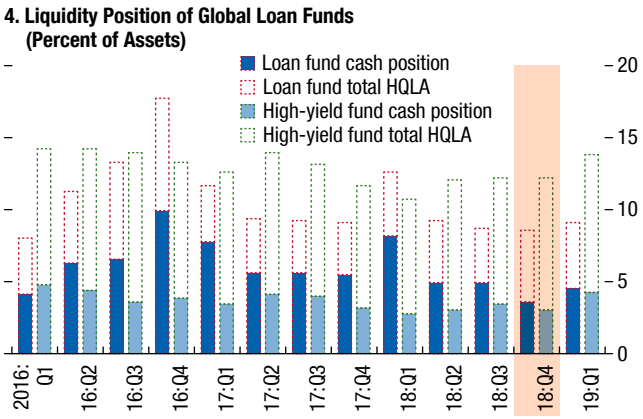
... and a significant portion of maturing loans is accounted for by companies rated single-B and lower.



Recent episodes of market stress showed that outflows can be sizable ...



... though liquidity buffers proved to be sufficient, on aggregate, in the 2018:Q4 episode.



Sources: EPFR Global; Moody's; Morningstar; S&P Leveraged Commentary and Data; and IMF staff calculations.
Note: In panel 1, Europe refers to the European Union and the United Kingdom; North America refers to Canada and the United States. Bn = billion; ETFs = exchange-traded funds; HQLA = high-quality liquid assets.

inflows, and outflows from leveraged loans have slowed markedly—reflecting both institutional investors' quarter-end portfolio rebalancing and renewed demand for exposure to risky credit markets—longer-lasting episodes of market distress, especially if accompanied by a recession, may lead to more severe liquidity strains in the future.

Concentration Risk and Interconnectedness

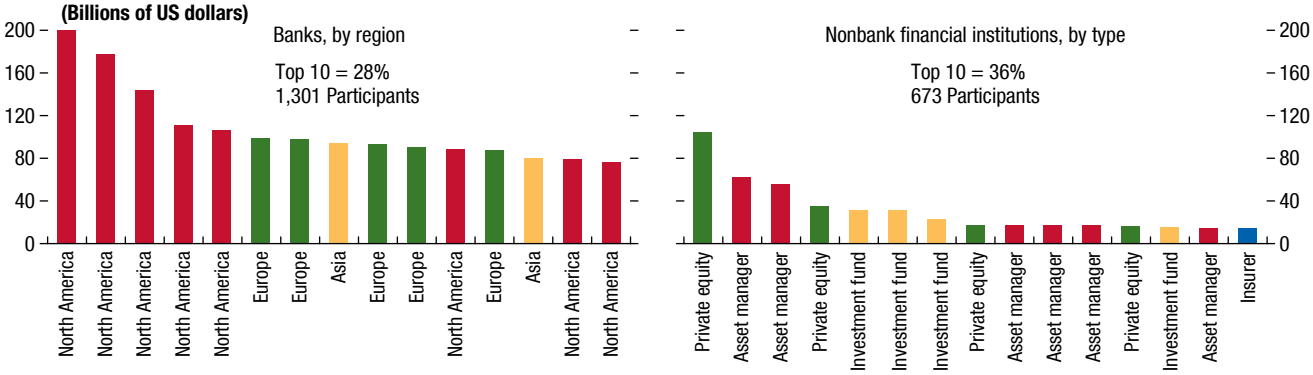
Concentration risk in risky credit markets is significant and may accelerate adverse asset price market moves should key participants decide to exit the markets. In the primary market for leveraged loans, exposures are concentrated among a few large global banks and nonbank financial institutions (Figure 2.7, panel 1). Similarly, in the secondary markets for speculative-grade credit (which includes leveraged loans and high-yield bonds) and for CLOs, several large banks account for significant portions of these markets (Figure 2.7, panel 2).[9] Large non-US banks are heavily involved, have higher sensitivity to rating downgrades because of steeper capital charges under the new Basel securitization framework, and are more exposed to changes in hedging costs. In the US high-yield bond market, large investment funds can have sizable

[9]Speculative-grade credit exposures in Figure 2.7, panel 2, are estimated by using individual institutions' Pillar 3 disclosures and, thus, include leveraged loans and high-yield bonds, as well as some small- and medium-sized-enterprise loans and some emerging market loans.

Figure 2.7. Concentration and Interconnectedness

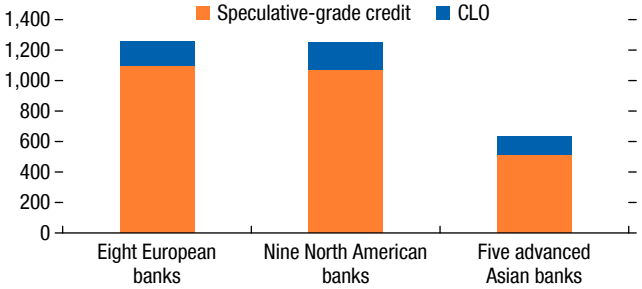
Top banks and nonbank financial institutions account for a large share of the primary loan market.

1. Amounts Outstanding of Credit Provided by Bank and Nonbank Lenders in the Primary Market for Global Leveraged Loans (Billions of US dollars)



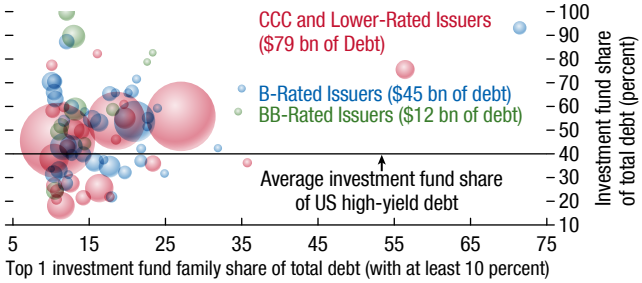
Several large banks account for significant portions of the speculative-grade credit and CLO markets.

2. Holdings of Global Risky Credit and CLOs by Top Banks (Billions of US dollars)



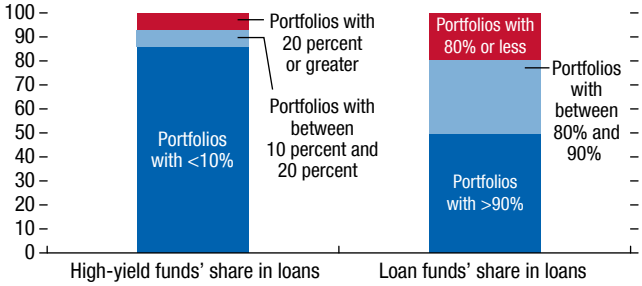
Large fund families hold concentrated positions in the lower-rated segment of the bond market.

3. Concentration of Investment Fund Families in Individual US High-Yield Bond Issuers (Percent)



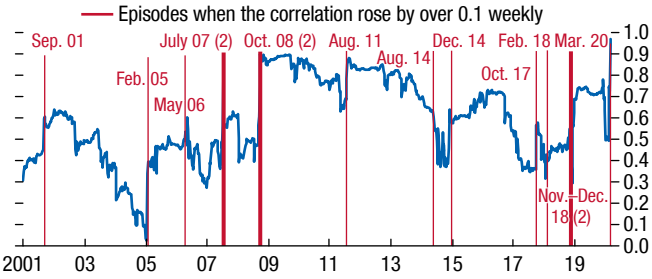
Cross-asset holdings by high-yield and loan funds could trigger price spillovers during market stress ...

4. Global High-Yield and Loan Fund Sector Investments in Loans (Percent)



... punctuated by spikes in correlations between returns of bonds and loans during recent market stress episodes.

5. US Leveraged Loan—High-Yield Bond Index Correlation (One-year rolling)



Sources: Banks' own Basel Pillar III disclosures; Bloomberg Finance L.P.; Dealogic; Morningstar; and IMF staff calculations.
Note: Panel 1 shows the initial exposures by lender's region in the primary market from loan tranche-level data from Dealogic. Loan tranches are sorted by type. Term loan A's and revolving lines of credit are assigned to banks, and term loan B's are assigned to nonbanks. Then, depending on the tranche type, the amount of each tranche is split equally among either banks or nonbanks participating in the syndicate. Finally, for each lender active in the global leveraged loans market, its exposure is calculated as the sum of outstanding amounts across all loan tranches. Panel 2 shows speculative-grade and collateralized loan obligation (CLO) exposures for selected global systemically important banks and other large banks that are active in the leveraged loan and CLO markets. Speculative-grade credit exposures are estimated by using individual institutions' Pillar 3 disclosures, as a summation of exposures at default (EAD) to corporates under both the standardized approach (SA) and internal ratings-based approach. The template CR5 is used to estimate credit risk exposures under SA, based on EAD with riskweights equal to or larger than 75 percent. The template CR6 is used to estimate credit risk exposures under the internal ratings-based approach, based on EAD with probability of default equal to or higher than 0.5 percent. Speculative-grade exposures include high-yield bonds, leveraged loans, some small- and medium-sized enterprise loans, and some emerging market loans. CLO exposures are estimated by using SEC1 as a summation of holdings as originator, sponsor, and investor in the banking book. Panel 3 is based on the issuers of all bonds included in the Bloomberg Barclays US Corporate High-Yield Total Return Index. The *x*-axis shows the share of individual borrowers/debt that a single fund family holds, indicating that CCC borrowers have greater concentration risk than higher-rated high-yield credits. The *y*-axis represents the share of the debt of the same individual borrowers that is owned by all investment fund investors. It shows that those borrowers with greater concentration risk by a single fund family are also more exposed to redemption risks than the average US high-yield borrower. This is because their total investment fund ownership often exceeds the 40 percent share that investment funds own of all US high-yield debt. CR = credit risk; SEC1 = securitization exposures in the banking book.

positions in individual credits, especially in those rated CCC (Figure 2.7, panel 3). More than $130 billion in high-yield debt is subject to concentration risk—defined specifically as debt issued by firms where an investment fund family owns more than 10 percent of debt. In addition, these firms are exposed to concentration risk because investment funds, in aggregate, own a larger-than-average portion of their debt.

The risky segment of credit markets has become more interconnected. On the borrower side, companies issue debt opportunistically both in the high-yield bond and the loan market, and some companies are switching from syndicated loans to private debt based on pricing and opportunities. On the investor side, high-yield and loan funds have material holdings across debt markets (Figure 2.7, panel 4), which could increase price correlations during a stress episode. Indeed, correlation between leveraged loan and high-yield bond returns tends to rise during market downturns, including during the COVID-19 episode (Figure 2.7, panel 5).

Layers of Leverage Could Interact with Bank-Nonbank Linkages

As discussed above, leverage played an important role in amplifying shocks during the global financial crisis. Leverage in the market can come in three forms: debt issued by firms; leverage embedded in structured finance vehicles, such as CLOs; and financial leverage in the credit system (Aramonte and Avalos 2019). What matters is not simply the levels of various forms of leverage, but also the feedback loops between them—that is, the layering of leverage on top of leverage, which could amplify downward price moves (Figure 2.8). For example, capital call lending is a growing asset class for banks, driven largely by private debt funds looking to enhance returns. This form of financial leverage can worsen losses at private debt funds in a downturn and increase credit and liquidity risks for banks.

Financial leverage is difficult to monitor: availability of data has been an ongoing issue since the global financial crisis and, because it can take novel forms, an assessment of the use of financial leverage is primarily qualitative. At this point, it appears that the use of financial leverage in credit markets (in the form of various credit lines, repurchase agreements, or derivatives) is limited compared with the period preceding the global financial crisis. However, given the complexity of the ecosystem and the opacity of some of the structures, links in the intermediation chain and interconnectedness of bank and nonbank lenders may entail risks to the banking system, whereby adverse shocks may be transmitted broadly across financial institutions and possibly amplified by the layering of visible and invisible leverage.

An Economic Downturn Could Trigger Large Losses

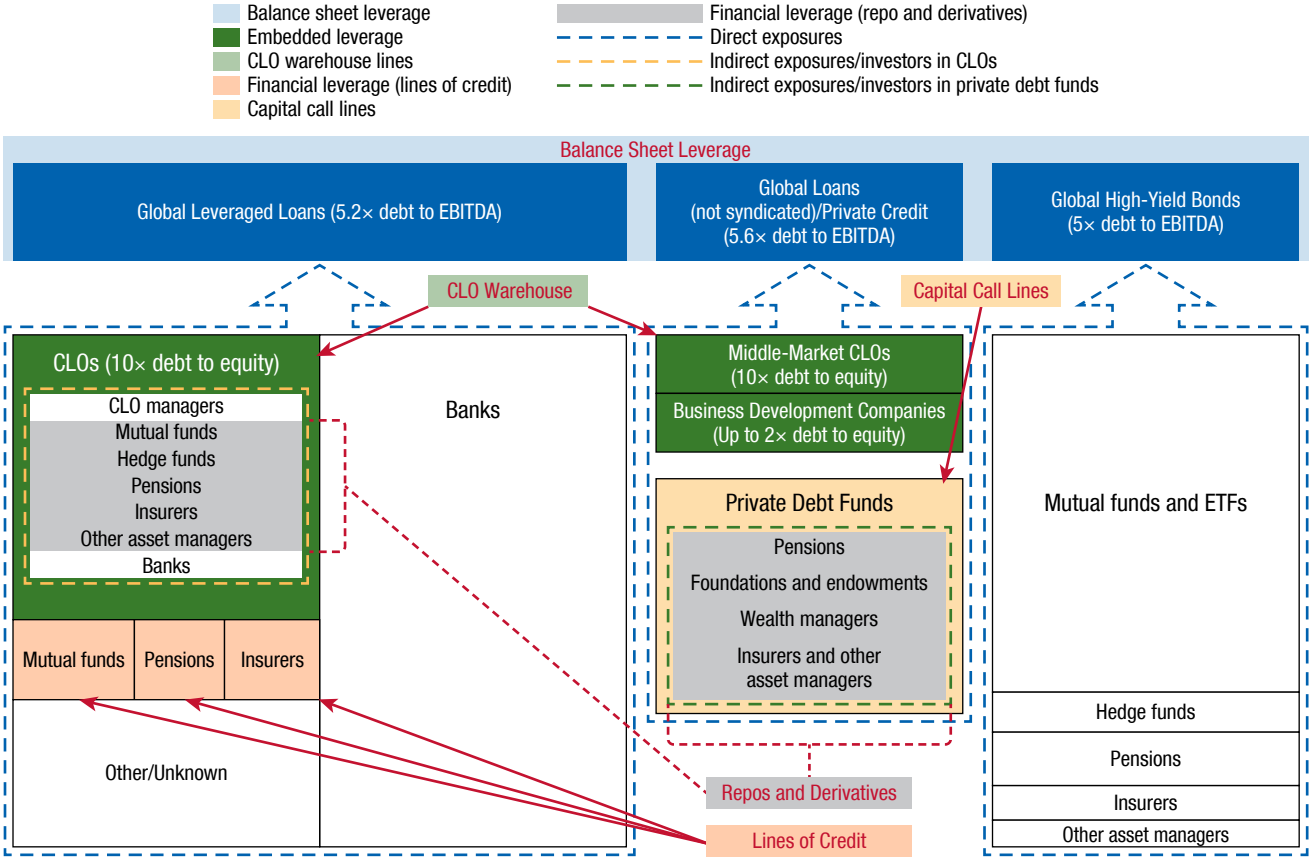
The ecosystem shown in Figures 2.3 and 2.8 is a useful starting point to assess the impact of adverse shocks. An illustrative severe adverse scenario is considered below (Table 2.2, panel 1).[10] The scenario applies the credit rating transition matrix estimated for speculative grade credit after the global financial crisis to the current credit rating compositions of the high-yield bond and leveraged loan markets to obtain downgrades and defaults in these markets. The scenario has the same recovery rate on high-yield bonds as that experienced during the global financial crisis. The recovery rate on leveraged loans is assumed to be 20 percentage points lower than during the global financial crisis to account for reduced credit protections (such as lighter covenants and less debt subordination) and a repricing of earnings addbacks. Market prices experience the same declines as during the global financial crisis. While banks are admittedly more resilient than before the financial crisis and use of financial leverage is more limited, additional amplification mechanisms are assumed to be at play, including sales by investment funds and a reduction in CLO demand for leveraged loans—trends that were already evident during the COVID-19 outbreak.

This scenario analysis considers only the losses resulting from the *direct exposures* of banks, nonbank financial institutions, and CLOs to risky credit markets. Second-round effects, however, could be significant and include, for example, the impact on banks from their lending to nonbank lenders that have suffered losses in these markets. In addition, the losses

[10]The analysis relies on global data for the investor base for leveraged loans, speculative-grade downgrade and default rates, the price shock to high-yield bonds, and individual banks' exposures to speculative-grade credit, and on US data for the investor bases for high-yield bonds, private debt, and CLOs, the price shock to leveraged loans, and the structure of a median CLO.

Figure 2.8. Risky Credit Market Ecosystem

Layers of Leverage in Advanced Economy Risky Credit Markets (Average leverage, end of 2019)



Sources: Bloomberg Finance L.P.; Financial Stability Board; S&P Leveraged Commentary and Data; and IMF staff calculations.
Note: CLOs = collateralized loan obligations; EBITDA = earnings before interest, taxes, depreciation, and amortization; ETFs = exchange-traded funds; Repos = repurchase agreements.

Table 2.2. Severe Adverse Scenario—Key Assumptions

The scenario is calibrated based on defaults and market price declines experienced during the global financial crisis.

Credit, mark-to-market, and CLO-related losses are computed based on exposures by lender type.

1. Assumptions about Defaults, Recoveries, and Market Price Declines, by Asset Class (Percent)

	High-Yield Bonds	Institutional Leveraged Loans	Private Debt
Defaults, recoveries on HY, and market price declines are the same as in the GFC. Recoveries on LL are 20 ppts lower.			
Three-year default rate	24	27	27
Recovery rate	25	45	45
Credit loss rate	6	12	12
Market price decline	–34	–40	. . .

2. Assumptions about Types of Losses, by Asset Class and Lender Type

	High-Yield Bonds	Institutional Leveraged Loans	Bank Leveraged Loans	Private Debt	CLO Equity and Mezzanine Debt
Banks	. . .	. . .	Credit	. . .	. . .
Insurers	Credit	Credit	. . .	. . .	. . .
Pension Funds	Credit	Credit	. . .	. . .	. . .
Mutual Funds and ETFs	Market	Market	. . .	. . .	Model
Hedge Funds	Market	Market	. . .	. . .	Model
Others (AM, SMA, BDC)	Market	Credit	. . .	Credit	Model
Private Debt Funds	. . .	. . .	. . .	Credit	. . .

Sources: Bloomberg Finance L.P.; Financial Stability Board; Moody's; S&P Leveraged Commentary and Data; S&P Ratings; and IMF staff calculations.
Note: Credit losses on CLO highly rated debt for banks, insurers, and pension funds are assumed to be zero. AM = asset managers; BDC = business development companies; CLO = collateralized loan obligations; ETFs = exchange-traded funds; GFC = global financial crisis; HY = high-yield bonds; LL = leveraged loans; ppts = percentage points; SMA = separately managed accounts.
"Credit" refers to held-to-maturity exposures that incur credit losses.
"Market" is for mark-to-market exposures that incur market losses.
"Model" is for exposures to CLO mezzanine debt and equity that are mark-to-market based on a standard overcollateralization test.

from this scenario are *partial*—that is, they encompass only the losses incurred in risky credit markets. However, the deterioration in these markets is assumed to be triggered by a recession—which would bring about wider losses in global equity and investment-grade bond markets. Thus, overall losses at financial institutions are likely to be greater than in the scenario considered, given the large size of other markets.

In this illustrative scenario, credit, mark-to-market, and CLO-related losses are computed based on exposures of various lender types to each of the risky credit markets (Table 2.2, panel 2). Each dollar of exposure is assumed to face only one type of loss. Banks, insurers, pension funds, and private debt funds have mostly held-to-maturity positions and are assumed to incur only credit losses. Mutual funds and ETFs, hedge funds, asset managers, and others are expected to mark their positions to market and are subject to market losses. Market losses can be reversible (as they were after the global financial crisis) after the end of the scenario, but that eventuality is not captured here.

Investors in CLOs experience "mark-to-model" losses based on a standard overcollateralization test in which "excess" CCC and D credits are marked to market based on the weakest credits. CLO mark-to-model losses are not necessarily recorded as mark-to-market losses by investors because CLOs are typically not forced sellers. CLO losses represent lost cash income to equity and mezzanine debt tranche investors, given that the income is diverted to deleverage the CLO or to improve its asset quality composition. This exercise does not incorporate mark-to-market losses on CLO tranches if investors sell them in the secondary market.

Because of a larger proportion of B credit than in the past, a median CLO's credit quality deteriorates quickly in the scenario considered (Figure 2.9, panel 1). Mark-to-model losses affect 27 percent of the capital stack, reaching mezzanine debt (A and below) in the scenario (Figure 2.9, panel 2), while leaving AAA–AA investors unaffected. For comparison, during the recent COVID-19 outbreak, weaker CLOs—with a high share of CCC credits—have already started to incur mark-to-model losses amid mounting credit rating downgrades.

Overall losses are substantial, totaling more than $1¼ trillion (or almost 20 percent of total exposures) in the scenario (Figure 2.9, panel 3). Among institution types, investors in CLO equity and mezzanine debt tranches and those with mark-to-market positions, such as mutual funds and ETFs, have higher nominal losses (Figure 2.9, panel 4). Bank losses appear to be manageable, in aggregate. In addition, banks have the lowest loss rates (defined as a share of exposures) across investors because they hold mostly senior loans with the highest recovery rates and highly rated CLO debt with negligible losses (Figure 2.9, panel 5). By contrast, hedge funds and mutual funds and ETFs with CLO equity tranche holdings and mark-to-market exposures have the highest loss rates.[11]

Many large banks incur losses in excess of 10 percent of their total buffers—that is, the sum of capital and loan loss reserves, in the severe adverse scenario (Figure 2.9, panel 6). Profits would be the first line of defense against shocks, but they are likely to decline during a recession, and Chapter 1 shows that forecast earnings have already been revised down considerably during the COVID-19 outbreak. In addition, given that these estimated losses represent only the direct and partial impact from risky corporate credit markets, bank capital and loan loss reserves may need to be used to cover wider losses from other exposures—equities, investment-grade corporate bonds and loans, lending to households, and credit to nonbank financial institutions, including those that are exposed to risky credit markets.

Policy Implications

Policymakers should act decisively to contain the economic fallout of the COVID-19 outbreak and support the flow of credit to firms.[12] Once the crisis is over, they should assess the sources of market dislocations and tackle the vulnerabilities in risky credit markets that have been unmasked by this episode.

Crisis Management Tools Are the First Priority

- As discussed in Chapter 1, authorities in major economies are providing considerable support through monetary, fiscal, and financial policies

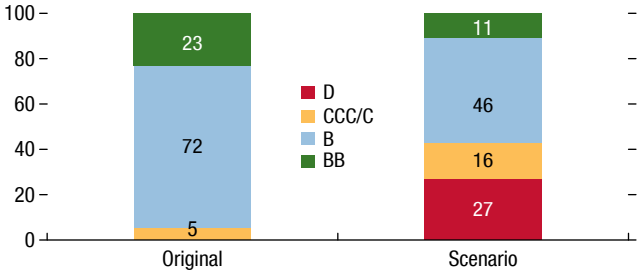
[11]Although mutual funds/ETFs and hedge funds have similar loss rates, mutual funds/ETFs have substantially larger nominal losses than hedge funds because they have considerably larger exposures to risky credit than hedge funds. One notable source of uncertainty in the estimation of losses for hedge funds is their exposure to leveraged loans due to the lack of direct estimates.

[12]For a list of policy actions taken to date see the IMF's Policy Tracker: https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19.

Figure 2.9. Severe Adverse Scenario: Impact on Collateralized Loan Obligations and Overall Losses

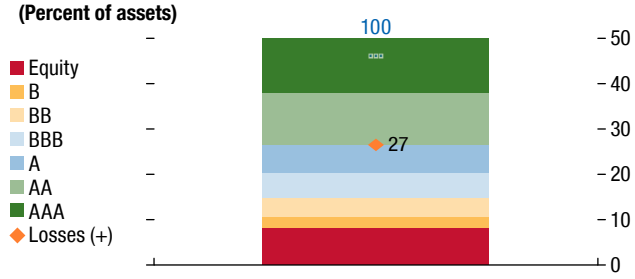
CLOs have a high share of lower-rated credits, which deteriorate quickly in the severe adverse scenario ...

1. Median US CLO 2.0: Assets, by Credit Rating (Percent of assets)



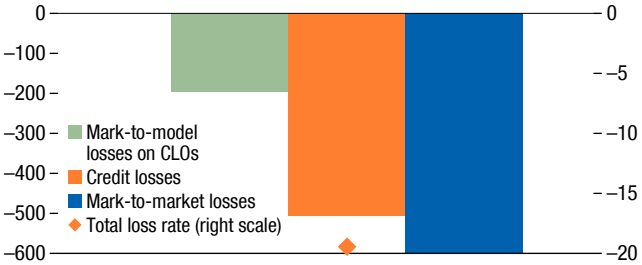
... which leads to substantial mark-to-model losses on the equity and mezzanine debt tranches.

2. Median US CLO 2.0: Debt, Equity, and Losses (Percent of assets)



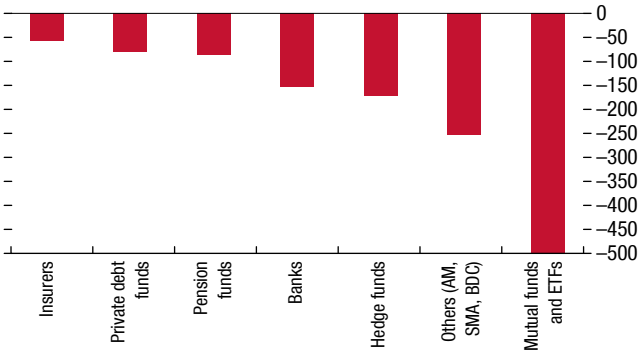
Overall losses are substantial in the scenario.

3. Losses, by Loss Type (Billions of US dollars, left scale; percent of amounts outstanding, right scale)



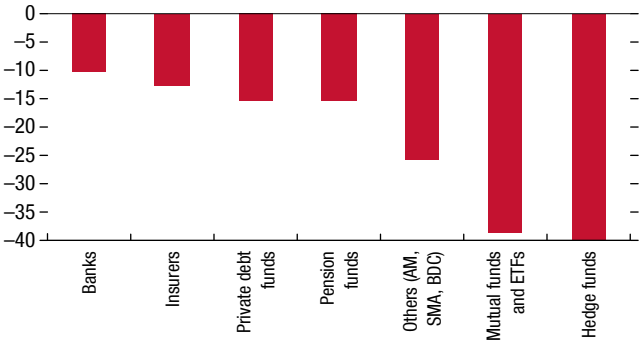
Investors with mark-to-market exposures have higher nominal losses, while investors in CLO equity and mezzanine debt tranches incur lost cash income.

4. Losses, by Investor Type (Billions of US dollars)



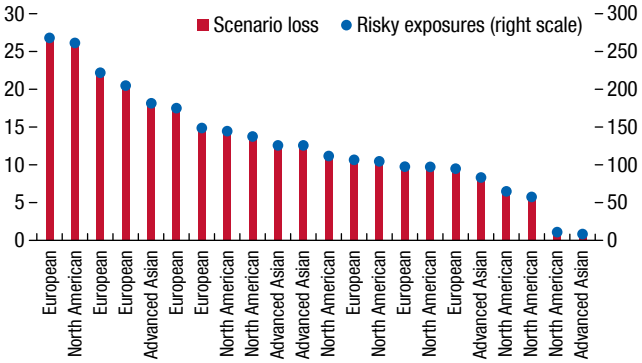
Banks have the lowest loss rates, which are still above the worst charge-offs on mortgages during the global financial crisis.

5. Loss Rates, by Investor Type (Percent of own exposures)



Many large banks incur losses in excess of 10 percent of their total buffers in the scenario.

6. Speculative-Grade Exposures and Losses by Banks (Percent of CET1 capital and loan loss reserve)



Sources: Banks' own Basel Pillar III disclosures; Bloomberg Finance L.P.; Financial Stability Board; Moody's; Morningstar; Preqin; S&P Leveraged Commentary and Data; and IMF staff calculations.

Note: In panel 2, the *y*-axis is cut off at 50 percent, though AAA debt amounts to 68 percent of assets. In panel 6, the sample of banks includes selected global systemically important banks and other large banks that are active in the leveraged loan and CLO markets. Speculative-grade credit exposures are estimated by using individual institutions' Pillar 3 disclosures, as a summation of exposures at default (EAD) to corporates under both the standardized approach (SA) and internal ratings-based approach. The template CR5 is used to estimate credit risk exposures under SA, based on EAD with risk weights equal to or larger than 75 percent. The template CR6 is used to estimate credit risk exposures under the internal ratings-based approach, based on EAD with probability of default equal to or higher than 0.5 percent. Speculative-grade exposures include high-yield bonds, leveraged loans, some small- and medium-sized enterprise loans, and some emerging market loans. Individual large banks' regions are shown instead of bank names. CET1 capital refers to Common Equity Tier 1 capital. Advanced Asia refers to Japan. Europe refers to the European Union and the United Kingdom. North America refers to Canada and the United States. AM = asset managers; BDC = business development companies; CLO = collateralized loan obligations; ETFs = exchange-traded funds; GFC = global financial crisis; SMA = separately managed accounts.

to cushion the impact of the crisis on the *broad corporate sector*. Major advanced economy central banks have initiated or increased purchases of investment-grade corporate debt.[13] Furthermore, in early April, the US Federal Reserve extended support to some investment-grade bonds downgraded to speculative grade after March 22, some ETFs invested in high-yield bonds, newly issued highly rated CLO tranches, and some small- and medium-sized enterprises whose leverage remains below specific thresholds.[14] In late April, the European Central Bank also expanded its eligible collateral for loans to banks to include investment-grade bonds downgraded to speculative grade after April 7. These measures appear to have improved market functioning and eased near-term stress in these markets, as evidenced by the narrowing in corporate credit spreads and the gradual reopening of the primary market for high-yield bonds and leveraged loans.

- Should financial conditions deteriorate further, and credit downgrades and defaults rise meaningfully, authorities may consider *further extending their support to risky credit markets*. Measures directed at maintaining the flow of credit in these segments would help prevent severe and prolonged disruptions that would affect firms and the broader economy. Because *no direct support has been provided to the bulk of risky credit markets thus far* (bonds that are deeply downgraded from investment grade, CLOs that were issued before late March and those that are actively managed, and small- and medium-sized enterprises with high leverage are not currently eligible for these facilities), credit markets have shown signs of divergence, with a still considerable gap between investment- and speculative-grade spreads.
- During the crisis, firms have relied on bank credit lines as an important source of liquidity. Supervisors should continue to monitor the banking sector to *ensure banks are in a good position to provide funding to speculative-grade firms*, while banks' existing capital and liquidity buffers should be used to absorb financial costs of any customer loan restructuring and to relieve pressures on banks' funding and liquidity using full flexibility within the existing regulatory frameworks.

The Crisis has Uncovered Many of the Vulnerabilities Discussed in this Chapter

- While market price declines in the high-yield-bond and leveraged-loan markets reached two-thirds of the descent during the global financial crisis in March, the speed of deterioration has been unprecedented, driven by sharp increases in credit and liquidity risks.
- Preexisting concerns about elevated borrower leverage, earnings addbacks, sectoral structural weaknesses, weak covenants, reduced investor protections, and large shares of weak credit have likely magnified investors' perception of *credit risk*, as reflected in sharply wider credit spreads and significantly higher forecasts of rating downgrades and defaults.
- Selling pressure triggered by broad-based demand for cash has raised *liquidity risk*, as evidenced by the sharp declines in the new issuance of risky credit during the COVID-19 outbreak, alongside record-high bid-ask spreads on corporate bonds and deep ETF price discounts in March. Interconnectedness across risky credit markets and the global nature of their investor base have likely contributed to market dislocations. Mutual funds, which were seen as one of the main pressure points in terms of liquidity risks, have experienced large outflows, even though outflows have moderated more recently. Capital committed but not yet invested (dry powder) does not appear to have been deployed yet, likely reflect-

[13]The US Federal Reserve established two facilities for investment-grade corporate debt—the Primary Market Corporate Credit Facility for new bond and syndicated loan issuance and the Secondary Market Corporate Credit Facility to provide liquidity for outstanding corporate bonds and ETFs. The European Central Bank expanded its Corporate Sector Purchase Program to include nonfinancial commercial paper, the Bank of England increased the size of its Corporate Bond Purchase Scheme, and the Bank of Japan increased the auction amounts of outright purchases of commercial paper and corporate bonds.

[14]As part of the Federal Reserve's Primary and Secondary Market Corporate Credit Facilities, the definition of eligible issuers for purchase was expanded to include those that were rated at least BBB–/Baa3 as of March 22, 2020, but are subsequently downgraded and rated at least BB–/Ba3 at the time the facility makes a purchase. The eligibility criteria for ETF purchases includes a preponderance of ETF holdings of those funds whose primary objective is exposure to US investment-grade corporate bonds, and the remainder will be in ETFs whose primary objective is exposure to US high-yield corporate bonds. The Federal Reserve's Term-Asset Loan Facility expanded the eligible collateral to include AAA tranches of static CLO deals issued after March 23, 2020. The Main Street New Loan Facility limits eligibility to borrowers that do not have debt higher than four times 2019 adjusted earnings before interest, taxes, depreciation, and amortization (EBITDA), while the Main Street Expanded Loan Facility has a debt limit of six times 2019 adjusted EBITDA.

ing uncertainties about the impact of the virus on the economy.

After the Crisis, Medium-Term Vulnerabilities Should Be Tackled

- Once the COVID-19 crisis is contained, authorities should conduct a comprehensive analysis to identify the sources of market dislocations and assess vulnerabilities that have been unmasked.
- Given the large role of nonbank financial institutions in risky credit markets, and based on the behavior of these institutions during the recent episode, authorities may consider whether *a widening of the regulatory and supervisory perimeter to include nonbank financial institutions active in risky credit markets* may be warranted. A framework for macroprudential regulation of nonbank financial institutions should be developed, taking into consideration the global nature of these markets. Such a framework is largely absent. The macroprudential toolkit should be expanded to account for the growing importance of nonbank financial institutions (see the October 2019 GFSR).
- *Policymakers should promote greater transparency in credit markets.* To enable proper assessment of risks in these markets, authorities should ensure that they have sufficient data to analyze risks stemming from current origination practices and chains of intermediation in the corporate debt market. Cross-border and global exposures to risky credit markets should be better measured.
- Bank supervisors in key economic areas should collaborate on data sharing to take account of macro-financial interconnections domestically and internationally. Given the commonality of corporate exposures at large banks and links across banks and nonbank financial institutions, as well as cross-border features of global credit markets, greater international collaboration on data sharing may be desirable to gauge risks in the banking system.

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MANAGING VOLATILE PORTFOLIO FLOWS

Chapter 3 at a Glance

- The COVID-19 pandemic led to an unprecedented sharp reversal of portfolio flows, highlighting the challenges of managing such volatility in emerging and frontier markets.
- This chapter shows that:
  - Changes in global financial conditions tend to influence portfolio flows more during surges and reversals than in normal times.
  - Stronger domestic fundamentals do not always lead to surges in portfolio flows but do help mitigate outflows.
  - Greater foreign investor participation in local currency bond markets can help reduce borrowing costs, but it may also increase price volatility where domestic markets lack depth, especially in frontier markets.

The dramatic reversal of emerging market portfolio flows following the global spread of coronavirus (COVID-19) highlights the challenges of managing volatile portfolio flows and risks they may pose to financial stability. A prolonged period of low interest rates had encouraged both borrowers and lenders to take on more risk. Surges of portfolio inflows into riskier asset markets contributed to the buildup of debt and, in some cases, resulted in stretched valuations. This chapter quantifies the sensitivities of different types of portfolio flows and the associated cost of funding to global and domestic factors during "normal" times as well as during periods of weak or strong flows. Analysis suggests that both bond and equity flows are much more sensitive to global financial conditions during periods of extreme flows than in normal times, while domestic fundamentals may matter incrementally more for equities and local currency bond flows. Furthermore, greater foreign investor participation in local currency bond markets that lack adequate depth can greatly increase the volatility of bond yields. Dealing with immediate capital outflow pressures calls for using reserves to reduce excessive volatility, deploying capital flow management measures, and preparing for long-term external funding disruptions.

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Foreign Funding in Times of Uncertainty

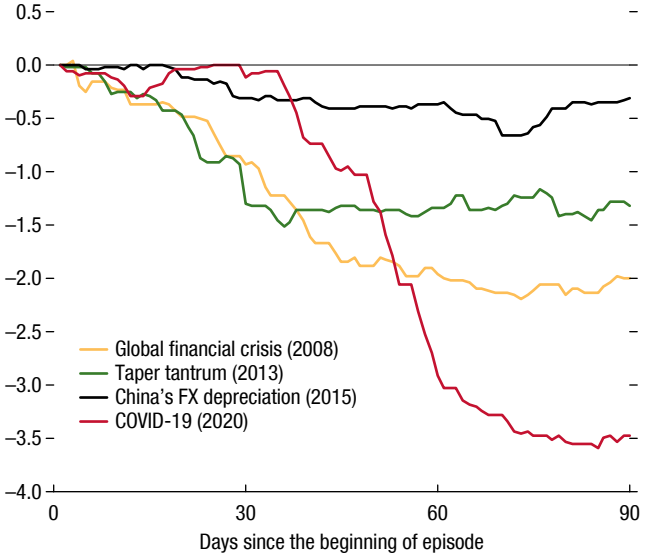
The COVID-19 pandemic has led to historic portfolio outflows from emerging and frontier markets (see also Chapter 1). After a strong resumption of portfolio flows to emerging markets through early 2020, driven by increased optimism about economic recovery amid easing trade tensions, total portfolio flows reversed dramatically in March, with more than $100 billion in outflows (or 3½ percent of asset holdings) since January 21, led initially by equity outflows (Figure 3.1, panel 1). The volatility of nonresident flows to equity and local currency bond markets during the trough of the sell-off reached unprecedented levels, despite policy rate cuts and measures to support economic activity (Figure 3.1, panel 2).

Foreign portfolio flows are an important source of funding for emerging market sovereigns and corporations. Nonresident portfolio investment can help expand and diversify the investor base for emerging market assets, lower the cost of funding, and ultimately contribute to stronger economic growth and economic development (see Hannan 2018 for a literature review). However, reliance on foreign financing can also entail risks. Heightened uncertainty in the global economy resulting from trade tensions, geopolitical events, and pandemics (as is currently the case with COVID-19) can lead to a significant tightening of global financial conditions and increased portfolio flow volatility.

Figure 3.1. Recent Trends in Portfolio Flows to Emerging Markets

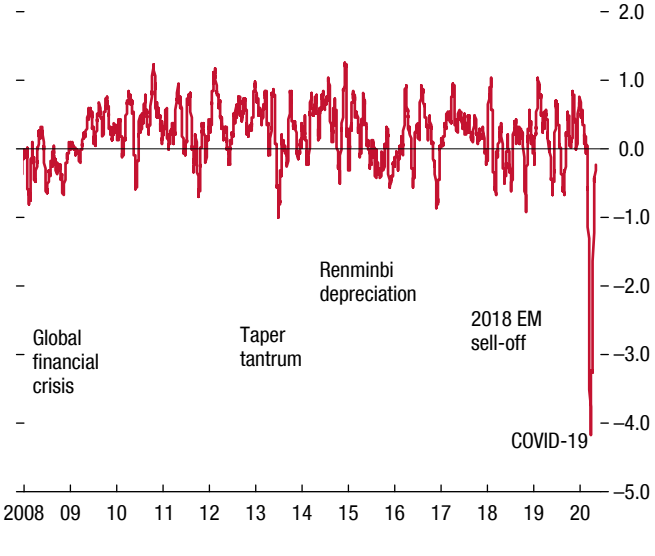
Concerns about the economic fallout of the COVID-19 pandemic on emerging markets led to strong portfolio outflows ...

1. Comparison of Portfolio Outflow Episodes
(Percent of IIP; cumulative flows based on daily observations)



... as well as historically high volatility at the trough of the sell-off.

2. Nonresident Portfolio Flows to Emerging Markets
(Daily, 28-day moving average; billions of US dollars)



Sources: IMF, World Economic Outlook database; national authorities; and IMF staff calculations.
Note: Economies included in panel 2 are Brazil, China, Hungary, India, Indonesia, Korea, Mexico, Pakistan, Philippines, Qatar, Sri Lanka, South Africa, Taiwan Province of China, Thailand, and Ukraine. EM = emerging market; FX = foreign exchange; IIP = international investment position.

Moreover, the strong and persistent portfolio inflows seen in earlier periods can create vulnerabilities by encouraging excessive domestic credit creation and an overvaluation of local currency and other financial assets. These risks need to be managed.

Emerging and frontier markets have become more reliant on foreign portfolio flows over the years. Foreign participation in emerging and frontier markets[1] has grown significantly in the 10 years since the global financial crisis, aided by accommodative policies in advanced economies (Figure 3.2, panel 1). Foreign debt portfolio investment in frontier market economies has risen rapidly and is now on par with cross-border loans. Even in equity markets, where nonresident participation has traditionally been smaller than in debt markets, foreign investors currently own a significant share of outstanding assets in some countries (Figure 3.2, panel 2).

Risks related to portfolio flows may be more acute in the context of high levels of overall debt in emerging market economies. Total debt for the median emerging market economy rose to 100 percent of GDP in 2018 from 75 percent before the global financial crisis, and to more than 250 percent of GDP in China from 140 percent in 2007. These increases are the result of greater public sector borrowing in many emerging markets and a strong rise in corporate sector leverage in China.

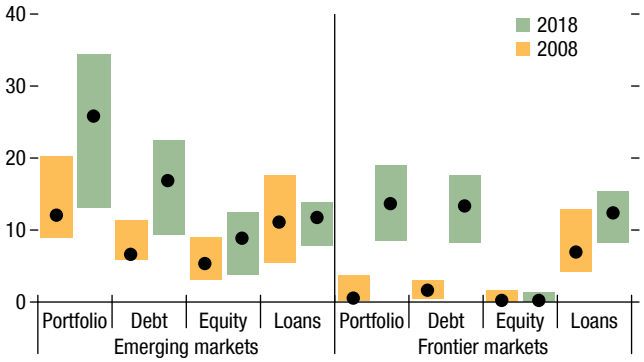
Many emerging market sovereigns have stepped up issuance of local currency debt in recent years (Figure 3.2, panels 3 and 4). At face value, this reduction in the so-called "original sin" affords countries greater insurance from episodes of domestic currency volatility or tightening of external financial conditions. But increased foreign participation in debt markets, particularly in many frontier market economies, exposes them to changes in global financial conditions through the behavior and preferences of foreign investors, such as the current volatility around the COVID-19 pandemic. During periods of risk aversion, when local currencies weaken and domestic assets sell off, foreign investors are likely to reduce their exposure and might not roll over maturing positions, thereby triggering outflows, which could disrupt bond markets. Even in the absence of outflows, increased foreign

[1]See Online Annex 3.1 for definitions of frontier market economies. All annexes are available at www.imf.org/en/Publications/GFSR.

Figure 3.2. Emerging and Frontier Market Economy Debt

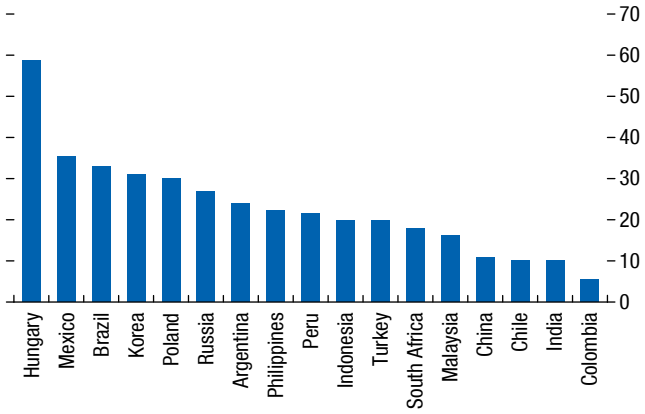
Portfolio investment has grown quickly for most emerging and frontier market economies, led by debt.

1. Portfolio and Cross-Border Loan Liabilities IIP (Percent of GDP, interquartile range, median)



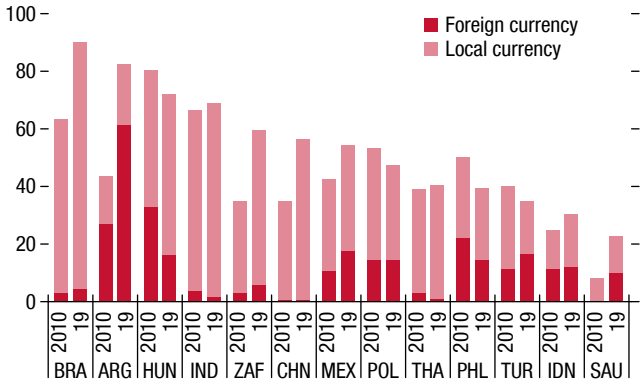
Foreign participation in equity markets is also significant in some emerging market economies.

2. Equity International Investment Position (Liabilities, percent of market capitalization, 2019:Q2)



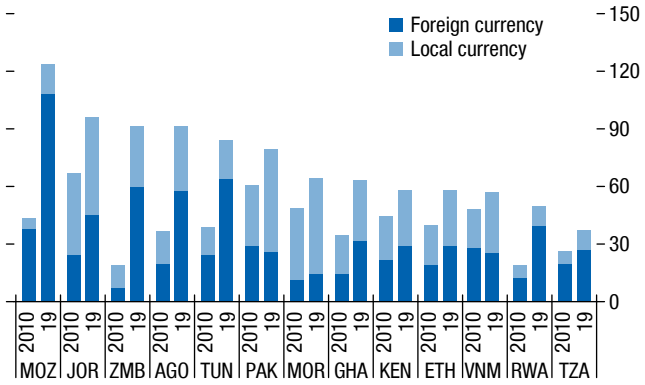
The steady rise in government debt in the past decade was mostly a result of greater local currency issuance in emerging markets ...

3. Emerging Market Government Debt, 2010 and 2019 (Percent of GDP)



... as well as in some frontier market economies, where government debt increased dramatically in many cases.

4. Frontier Market Government Debt, 2010 and 2019 (Percent of GDP)



Sources: Bloomberg Finance L.P.; IMF, World Economic Outlook database; JPMorgan Chase & Co; and IMF staff calculations.
Note: For more information on the sample of countries, see Online Annex 3.1. "Portfolio" is the sum of debt and equity, excluding loans; the interquartile range is calculated separately. In panels 3 and 4, data labels use International Organization for Standardization (ISO) country codes. EMs = emerging markets; IIP = international investment position.

currency hedging could exert substantial pressure on the exchange rate and the cost of funding.

This chapter aims to provide an empirical assessment of the trade-offs between raising additional foreign funding or reducing funding costs, on one hand, and increasing rollover risks or volatility in asset prices, on the other. The analysis involves two elements:

- *Dynamics of portfolio flows:* The drivers of nonresident bond and equity portfolio flows to emerging markets during surges and reversals and in normal times, and
- *Funding costs:* The sensitivity of the level and volatility of funding costs to portfolio flows and other domestic and common global factors, including the capacity of domestic institutional factors to mitigate the volatility of funding costs.

The empirical analysis presented in this chapter shows that the outlook for debt flows tends to be influenced more by global (common) factors than by country-specific (idiosyncratic) factors, while the outlook for equity flows is more heavily influenced

by domestic factors, such as growth. For both bond and equity flows, changes in global financial conditions tend to affect the "tails" of their predicted portfolio flow distributions (the likelihood of future surges or reversals) more than the likelihood of median flows. The outlook for local currency bond flows has greater sensitivity to domestic vulnerabilities than the outlook for hard currency (primarily dollar and euro) bond flows. For instance, strong growth prospects can limit the likelihood of future outflows from local currency bond markets but can also amplify future surges. Domestic bond yields are highly sensitive to external factors, especially for low-rated economies. The current circumstances of large outflows due to the COVID-19 global health emergency illustrate the effects of tighter global financial conditions and lower domestic growth prospects on different types of portfolio flows.

The findings from the empirical analysis can be used to assess the circumstances under which reliance on foreign investors (such as by frontier market economies) may be considered excessive, given the state of these countries' fundamentals. The analysis in this chapter suggests that a rise in foreign investor participation in the local currency bond market beyond a certain critical threshold—controlling for the domestic investor base—can significantly increase yield volatility. However, greater depth of domestic financial markets and the local investor base can help reduce the volatility of local currency bond prices. Some frontier markets already exceed that threshold. The high secondary market bond price volatility during the first quarter of 2020 under the COVID-19 shock underscores the need to find a better balance between attracting foreign investors and further developing their financial markets, particularly for frontier market economies. This includes improving the liquidity of foreign currency markets and the availability of hedging instruments.

Some Stylized Facts

Nonresident bond portfolio flows dominate equity flows in aggregate, given the larger investible universe of assets and the postcrisis boost from lower global rates (Figure 3.3, panel 1). Foreign portfolio investment in emerging market debt is still predominantly in foreign currencies, but consistent with the reduction in "original sin," there has been a long-term shift to debt denominated in local currencies since the Asian financial crisis (Figure 3.3, panel 2).

Portfolio flows to emerging markets have been more volatile since the global financial crisis compared with the previous decade. Since 2013 the periods of inflows have become shorter, while outflow episodes have lasted longer (Figure 3.3, panel 4). Equity portfolio flows to emerging markets (excluding China) have been especially volatile in recent years. And despite a generally benign global economic backdrop, steady year-to-date inflows came to a sudden halt in August 2019 on fears about an escalation of US–China trade tensions and the outcome of the primary election in Argentina.

Developments in local currency government bond markets have played an important role in shaping debt portfolio flow trends (Figure 3.3, panel 5), given the increasing share of local-currency-denominated external debt (Figure 3.3, panel 2). Watershed events for large emerging market economies—such as inclusions in global bond indices (China, Mexico, South Africa) or crises elsewhere (Brazil, Russia)—along with large systemic events—such as the taper tantrum, synchronized central bank easing, and the emerging market sell-off in 2018—have had large effects on aggregate portfolio inflows to emerging market economies.

Key Drivers of Portfolio Flows to Emerging Markets

Factors driving surges of portfolio inflows to emerging markets may differ from factors driving large outflows.[2] The extensive literature on capital flows has stressed the role of both domestic "pull" and global "push" factors in explaining the dynamics of flows to emerging markets.[3] However, almost all of the past work has looked separately, on one hand, at the drivers of average capital flows and, on the other, at the drivers of capital flow surges and sudden stops. In contrast, the analytical framework of the capital-flows-at-risk methodology (see Online Annex 3.1) considers the joint impact of multiple drivers on the entire predicted distribution of portfolio flows.[4] Looking at the

[2]Calvo and Reinhart (1999); Guidotti, Sturzenegger, and Villar (2004); and Cecchetti and others (2020) discuss the risks of portfolio flows in periods of "sudden stops" and "surges."

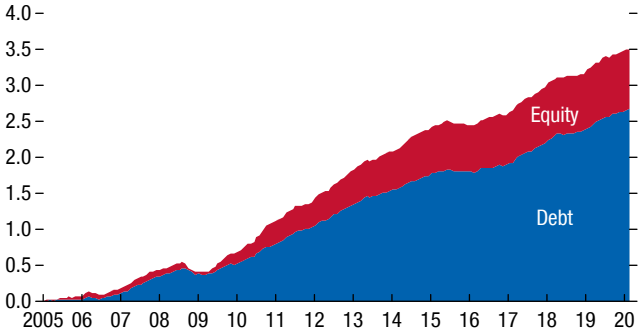
[3]See Koepke (2019) for an overview of the literature.

[4]For details of the capital-flows-at-risk methodology, see the October 2018 *Global Financial Stability Report* (GFSR), and Gelos and others (2019). For more information on the model specifications used in this chapter, see Online Annex 3.1.

Figure 3.3. Trends in Portfolio Flows to Emerging Markets

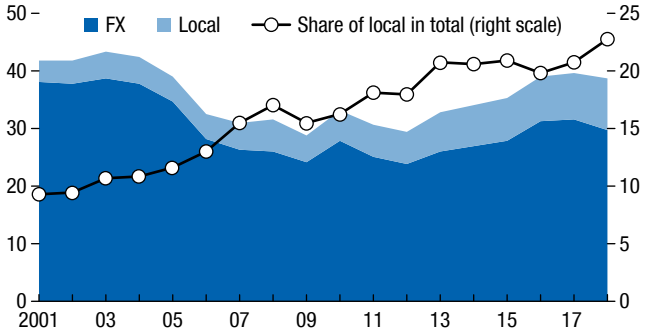
Nonresident emerging market portfolio flows have traditionally been significantly bigger for debt than for equities.

1. Cumulative Portfolio Flows to Emerging Market Assets
(Trillions of US dollars, since 2005)



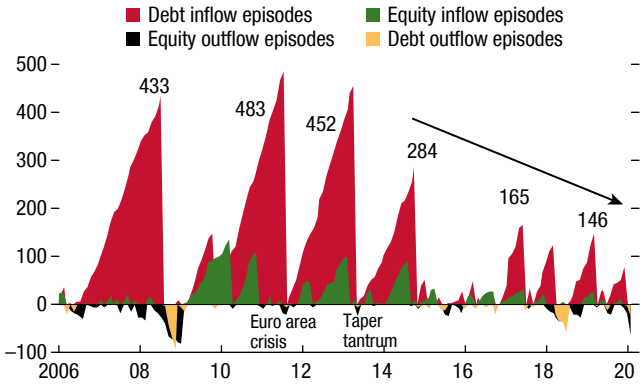
The share of foreign participation in local currency debt markets grew from 10 percent of the total in 2000 to almost 25 percent recently.

2. External Debt of Emerging Market Economies by Currency
(Left scale: total debt as percent of GDP; right scale: percent)



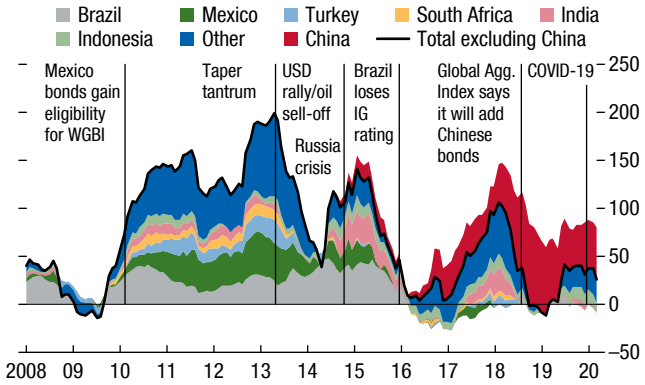
Since 2013, portfolio inflow episodes have been shorter, particularly for debt ...

3. Cumulative Emerging Market Portfolio Inflows and Outflows from the Start of an Episode
(Billions of US dollars; China not included)



... and this shortening is partly explained by significant idiosyncratic and global market developments.

4. Nonresident Flows to Emerging Market Local Currency Government Debt
(Billions of US dollars)



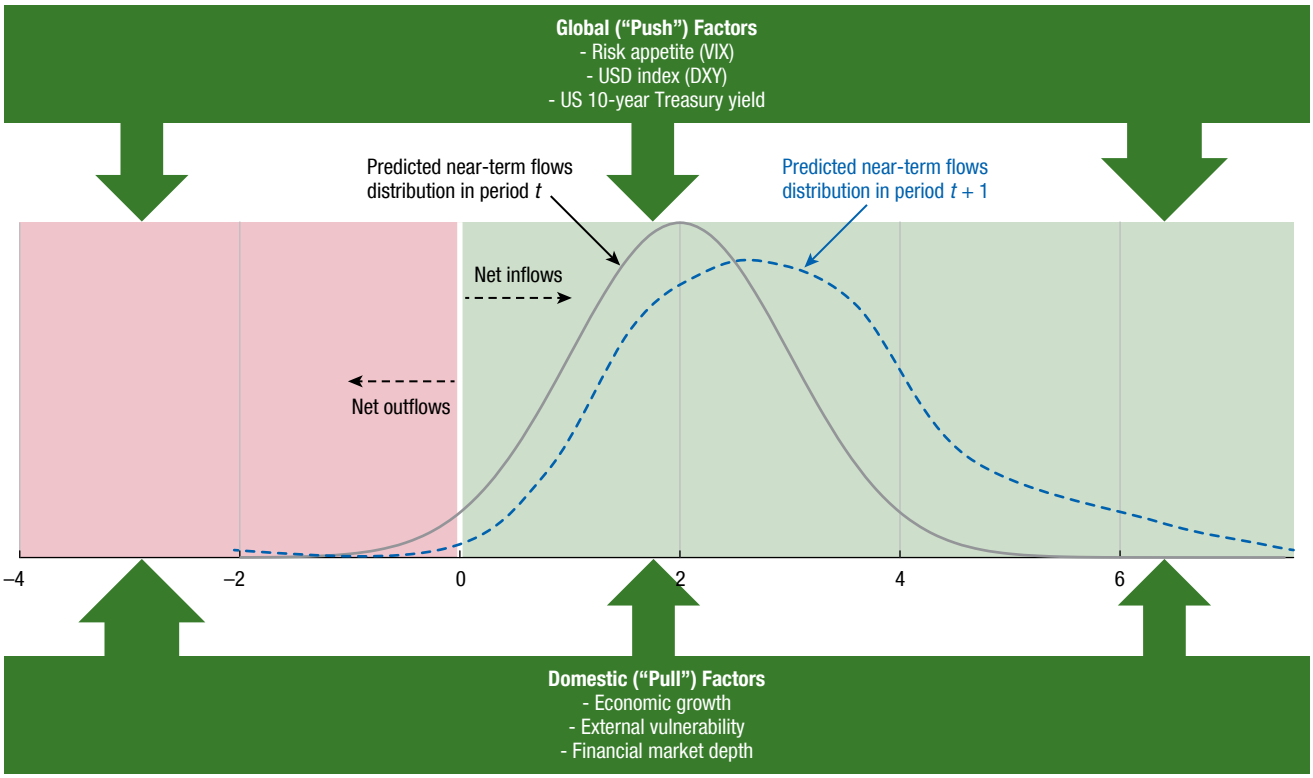
Sources: Bloomberg Finance L.P.; EPFR Global; Institute for International Finance; IMF, World Economic Outlook database; and IMF staff calculations.
Note: Panel 2: China is not included. Panel 3: inflow (outflow) episodes are reset at the first monthly occurrence of outflows (inflows). Panel 4: calculated as rolling sum, data ends February 2020. EM = emerging market; EMEA = Europe, Middle East, and Africa; FX = foreign currency; IG = investment-grade; USD = US dollar; WGBI = World Government Bond Index.

distribution of future flows is a way of quantifying a likelihood of extreme outcomes that could potentially lead to financial instability. From a policy perspective, this could help policymakers prepare for future reversals or surges of portfolio flows.

In this chapter, the capital-flows-at-risk methodology is used to study the impact of global and domestic factors on total debt and equity portfolio flows to emerging markets and on hard currency versus local currency debt flows. The analysis focuses on the predicted distributions of portfolio flows over the near term (the current quarter and the next two quarters) based on global factors in the current period and on domestic factors prevailing in the previous period. Figure 3.4 shows two stylized distributions of portfolio flows—the gray line is the predicted distribution conditional on factors observed at time t, and the dashed blue line is the predicted distribution conditional on factors at time $t + 1$. The figure shows that a change in either global or domestic conditions between t and $t + 1$ contributed to an improved outlook for portfolio flows, including a significantly lower likelihood of outflows and a higher likelihood of strong inflows, conditional on other factors being fixed.

The capital-flows-at-risk approach used in this chapter highlights the differential effects of global

Figure 3.4. Effects of Global and Domestic Factors on the Distribution of Predicted Portfolio Flows



Source: IMF staff.
Note: The gray density function is an example of a predicted density of near-term portfolio flows distribution. The predicted distribution is state-contingent; that is, it depends on the global and domestic factors in a given period. Changes in the domestic or global factors over time induce shifts in the predicted distribution. The blue density function shows a rightward shift of the predicted density of near-term flows, which could be caused, for example, by easing in global funding conditions. This change—all else equal—is associated with a reduced likelihood of net outflows and with a higher likelihood of very large inflows. In addition, the likelihood of very large inflows increases by more than the likelihood of net outflow declines. See Online Annex 3.1 for details. DXY = US Dollar Index; VIX = Chicago Board Options Exchange Volatility Index.

and domestic factors on the likelihood of negative or weak flows in contrast to the likelihood of moderate or strong flows. For example, changes in certain factors can have a larger effect on the likelihood of outflows than on the rest of the expected distribution of portfolio flows. The analysis in this chapter focuses on nonresident flows, referred to as "gross inflows" in the literature. In the baseline specification, the portfolio flows (in percent of GDP) are regressed on the Chicago Board Options Exchange Volatility Index (VIX), US Dollar Index, US 10-year Treasury yield, and lagged domestic drivers (domestic GDP growth, the ratio of short-term foreign exchange debt to international reserves, the depth of domestic financial markets, GDP per capita, and capital account openness). All regressions include country fixed effects and period dummies prior to, during, and following the global financial crisis. When discussing the results of quantile regressions, the interpretation focuses on the directional impact of different factors on the likelihood of observing weak or strong flows, conditional on other factors being fixed.

Based on the literature, tightening in global funding conditions would be expected to worsen the outlook for near-term portfolio flows. Similarly, weaker growth and more shallow domestic financial markets should worsen the outlook for portfolio flows across the board. At the same time, higher levels of external debt could have differential effects on portfolio flows at different percentiles. For example, a higher level of debt today could increase short-term financing needs—and thus future inflows—or it could lead to a decline in flows because of concerns about debt sustainability.

Debt versus Equity Portfolio Flows

For debt portfolio flows, changes in global conditions disproportionately affect the outlook for large inflows. In contrast, changes in domestic fundamentals seem to contribute more to the likelihood of negative or weak inflows than to the likelihood of large inflows. Intuitively, positive global risk sentiment can quickly boost portfolio inflows as investors search for yield, but when risk appetite deteriorates, investors tend to pay more attention to domestic factors, leading to larger pullbacks from countries with weaker fundamentals.[5] The sensitivities to specific factors vary:

- As expected, easier global financial conditions today boost the near-term outlook for debt portfolio flows across the board (that is, the entire distribution of predicted flows in Figure 3.4 moves to the right). This is also the case when considering individual factors that make external borrowing cheaper or change the risk-adjusted returns in favor of emerging markets—lower volatility (VIX), lower US Treasury yields, and a weaker US dollar. But a closer look at the individual global factors reveals important differences (Figure 3.5, panels 1–4). Lower US Treasury bond yields and a weaker US dollar (or equivalently, stronger domestic currencies) increase the likelihood of strong debt portfolio inflows by considerably more than they decrease the likelihood of negative or weak flows. This could be because debt managers often try to take advantage of favorable funding conditions to arrange funding in advance (prefinance). In contrast, risk aversion among global investors—measured by the VIX—affects the outlook for strong and weak flows in roughly equal magnitudes.
- While stronger domestic fundamentals do not necessarily lead to surges in portfolio inflows, they often help reduce the likelihood of outflows. Stronger domestic growth is associated with a smaller likelihood of negative or weak inflows but does not seem by itself to increase the likelihood of very large inflows. Greater external vulnerabilities (measured by a higher level of short-term foreign currency debt relative to international reserves) are linked to a larger likelihood of negative or weak debt inflows in the near term (Figure 3.5, panel 5). When the level of short-term debt is higher today, the likelihood of very strong inflows increases too, but to a lesser extent. This positive impact potentially reflects greater refinancing needs in countries with higher levels of short-term debt, as well as investors' confidence in successful debt redemption. Moreover, deeper domestic financial markets improve the outlook for debt flows across the board (Figure 3.5, panel 6).

The results discussed above also suggest that the COVID-19 shock has considerably weakened the outlook for debt inflows. The downgraded GDP forecasts imply a greater likelihood of weak or negative flows, while tightened global financial conditions reduce the likelihood of large inflows, at least in the near term. The magnitude of the deterioration in the near-term outlook is comparable to the one observed during the global financial crisis, with the strengthening of the US dollar and higher market volatility alone weakening the median predicted quarterly flows by 1 percent of GDP for an average emerging market economy.[6]

Equity portfolio flows are also influenced by global and domestic factors, but in a different way. A similar specification of the quantile regression for equity flows (Figure 3.5, panels 4–6) shows some notable differences[7]:

- Equity flows seem to be less sensitive to global factors than debt flows. Among global factors, the disproportionately larger impact on the likelihood of strong inflows (compared with weak inflows) is present only for debt portfolio flows. In particular, a stronger US dollar weakens the near-term outlook for equity flows across the board, but its impact is an order of magnitude smaller than for debt flows.[8]
- Domestic fundamentals have a similar qualitative impact on both debt and equity flows, but—in line with intuition—stronger domestic growth

[5]For example, as shown by Milesi-Ferretti and Tille (2010), countries with larger external or domestic vulnerabilities also experienced a larger retrenchment in capital flows during the global financial crisis.

[6]During the last quarter of 2008, the US Dollar Index and the VIX increased by about 10.5 points and 33.5 points, respectively. As of mid-March 2020, the US Dollar Index and the VIX were 10.5 points and 43 points higher, respectively, than at the end of 2019.

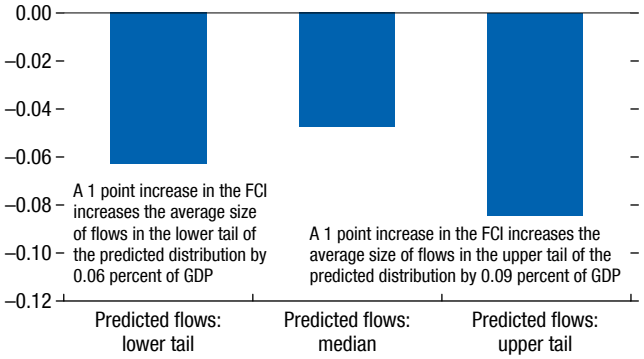
[7]Figures 3.5 and 3.6 show nonstandardized coefficients for different variables. The findings presented in this chapter also hold when comparing standardized coefficients (reported in Online Annex 3.1).

[8]This is in line with Li, de Haan, and Scholtens (2018), which finds that weaker domestic currency provides earnings support to exporters in an economy, thus boosting growth and equity flows.

Figure 3.5. What Drives Debt and Equity Portfolio Flows to Emerging Markets?

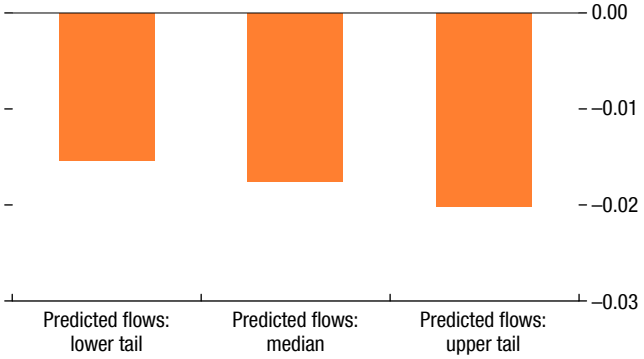
Tighter global financial conditions today decrease near-term debt flows in general.

1. Coefficients on the Global Financial Conditions Index (FCI) from Quantile Regressions of Near-Term Debt Portfolio Flows



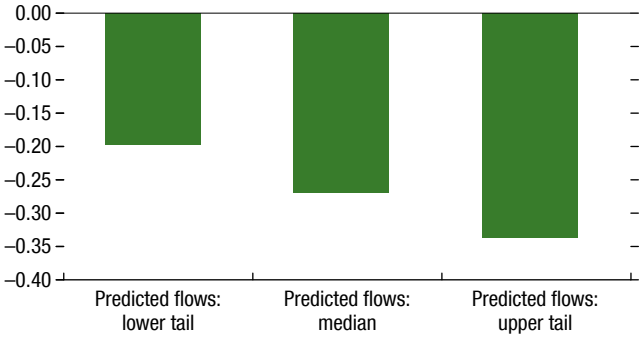
The risk aversion of global investors affects the outlook for debt flows across the board ...

2. Coefficients on the VIX from Quantile Regressions of Near-Term Debt Portfolio Flows



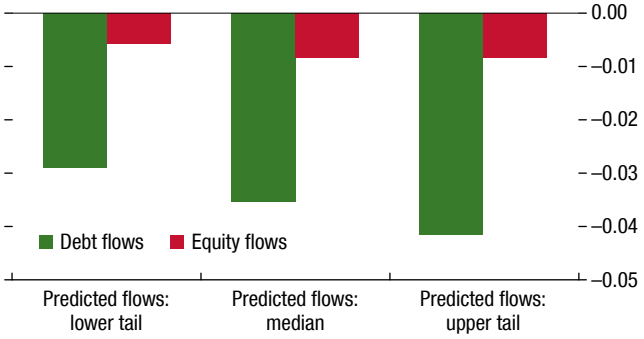
... while higher global interest rates disproportionately limit the likelihood of very large inflows.

3. Coefficients on the US Sovereign 10-Year Yields from Quantile Regressions of Near-Term Debt Portfolio Flows



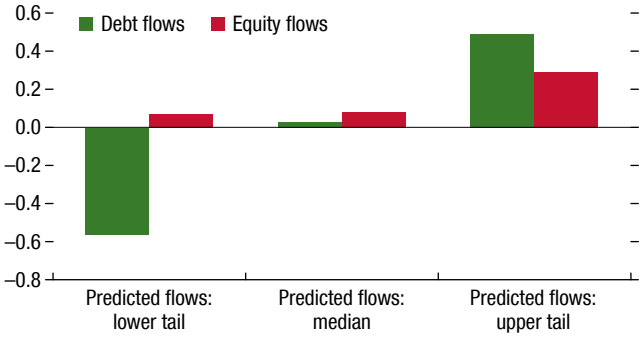
A stronger US dollar reduces the likelihood of strong flows more than it increases the likelihood of weak or negative flows, more so for debt flows than for equity flows.

4. Coefficients on the US Dollar Index from Quantile Regressions of Near-Term Debt and Equity Portfolio Flows



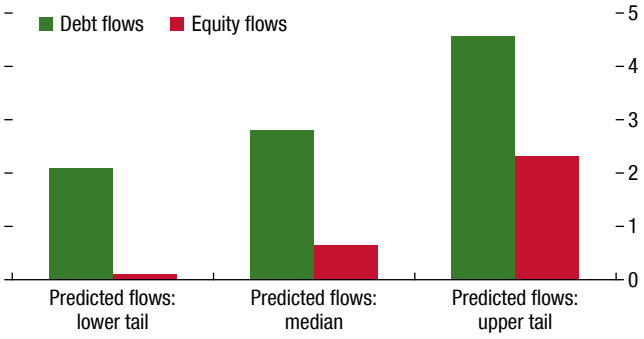
Higher debt vulnerability is negative for debt flows in general, but it increases the likelihood of negative or weak inflows much more than it increases the likelihood of large inflows.

5. Coefficients on the Ratio of Short-Term Foreign Currency Debt to Reserves from Quantile Regressions of Near-Term Debt and Equity Portfolio Flows



Deeper financial markets reduce the likelihood of negative or weak debt inflows and increase the likelihood of large inflows of both types of flows.

6. Coefficients on the Depth of Domestic Financial Markets Index from Quantile Regressions of Near-Term Debt and Equity Portfolio Flows



Sources: IMF, International Financial Statistics, Financial Flows Analytics, and Assessing Reserve Adequacy databases; World Bank; and IMF staff calculations.
Note: The reported coefficients come from quantile regressions of average quarterly debt or equity portfolio inflows in the current and next two quarters (as a percent of GDP) on a range of global and (lagged) domestic factors for a panel of emerging and frontier markets. The lower tail corresponds to average coefficients on explanatory variables from regressions for low percentiles (5th, 10th, 20th, 30th), median flows correspond to average coefficients from regressions for middle percentiles (40th, 50th, 60th), and upper tail corresponds to average coefficients for upper percentiles (70th, 80th, 90th, 95th). See Online Annex 3.1 for details.
FCI = Financial Conditions Index; VIX = Chicago Board Options Exchange Volatility Index.

contributes to an increased likelihood of strong equity inflows more than it improves the likelihood of strong debt inflows, while overall debt sustainability (as proxied by the ratio of short-term foreign currency debt to international reserves) seems to be more relevant for debt flows. In the context of the COVID-19 crisis, weakened growth prospects for emerging markets will worsen the outlook for equity portfolio flows more than for debt portfolio flows. Deeper domestic financial markets do not seem to matter when it comes to reducing the likelihood of negative or weak equity inflows in the same way as they do for debt flows.[9]

Hard Currency versus Local Currency Debt Portfolio Flows

While better domestic fundamentals and economic prospects improve the outlook for both local and hard currency debt portfolio flows, local currency flows are more sensitive to domestic factors than hard currency flows:

- Local currency debt flows appear to be more sensitive to the level of external vulnerabilities than hard currency debt flows. A higher level of short-term debt and weaker reserve adequacy significantly increase the likelihood of negative or weak inflows, especially for local currency flows (Figure 3.6, panel 1).[10] For example, a 1 percentage point rise in the ratio of short-term debt to international reserves could lower the local currency debt flows at risk[11] by 0.4 percent of GDP and hard currency debt flows at risk by 0.2 percent of GDP.[12]
- Local currency debt flows are more sensitive to domestic growth prospects than hard currency debt flows, especially the likelihood of extreme flows. Higher growth boosts expected flows but affects the tails of the portfolio flow distribution twice as much (Figure 3.6, panel 2). This also means that better growth prospects limit the likelihood of weak or negative inflows but also amplify the likelihood of very large inflows. The outlook for local currency flows is almost three times more sensitive to domestic growth than the outlook for hard currency flows.[13]
- Deeper domestic financial markets improve the outlook for both hard currency and local currency flows (Figure 3.6, panel 3) and significantly limit the likelihood of negative or weak flows. The result is in line with previous studies (October 2007 GFSR) and reflects the increased market liquidity (October 2018 GFSR) and decreased volatility (discussed later in this chapter) associated with greater market depth. The probability of significant bond outflows (equivalent to the 5th percentile of historical events) declines from about 35 percent to less than 10 percent when market depth increases by one standard deviation.

Tighter global financial conditions decrease expected portfolio flows and have a disproportionately larger impact on the likelihood of extreme flows.[14] Moreover, hard currency flows are almost twice as sensitive as local currency flows to changes in global financial conditions (Figure 3.6, panel 4). This may in part reflect differences in the investor base—hard currency bonds are typically held by global investors—whereas the local currency bond markets are typically dominated by domestic investors.[15] For example, benchmark-driven investors have a larger presence in hard currency than in local currency sovereign debt markets (April 2019 GFSR). The analysis implies that a much weaker growth outlook for emerging markets due to the COVID-19 outbreak will significantly worsen the outlook for local currency flows, while the outlook for hard currency flows will be relatively more affected by the sharp tightening in global financial conditions.

[9]The literature suggests that financial market depth can mitigate the impact of global shocks on portfolio flows by softening the asset price response to these shocks. For the role of institutional factors in capital flows, see Alfaro, Kalemli-Ozcan, and Volosovych (2008).

[10]An exception is local currency flows during surges, which potentially reflect investor confidence in successful refinancing.

[11]A measure of downside risks to capital flows, equal to the value of flows that will materialize with 5 percent probability.

[12]This is consistent with Anderson, Silva, and Velandia-Rubiano (2010), which finds that prudent public debt management with a focus on containing risks in the debt portfolio was an additional fundamental factor that strengthened emerging markets' resilience during the global financial crisis.

[13]Greater sensitivity of local currency bonds to domestic factors provides diversification for global investors (Miyajima, Mohanty, and Chan 2012).

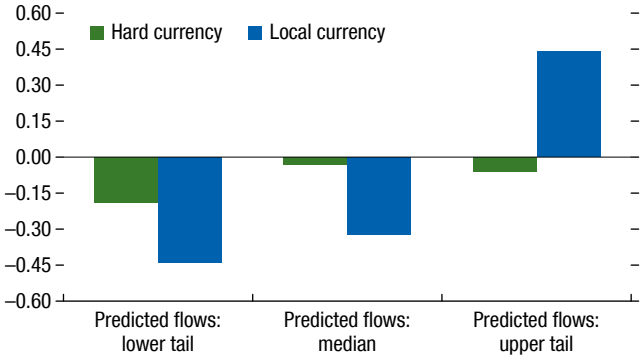
[14]Nier, Sedik, and Mondino (2014) also finds that risk appetite becomes the dominant driver of flows during crises.

[15]Median foreign ownership of emerging market local currency bonds is just about 20 percent, though this level has risen over the past decade.

Figure 3.6. What Drives Local Currency versus Hard Currency Debt Portfolio Flows?

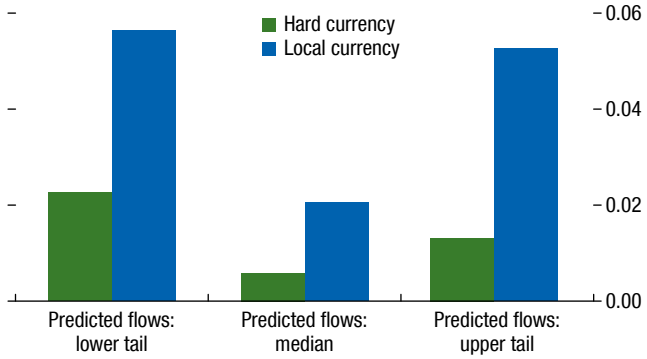
Higher short-term debt relative to reserves reduces the likelihood of negative or weak flows materially—especially for local currency flows.

1. Coefficients of Short-Term Debt/Reserves for Hard Currency and Currency and Local Currency Flows



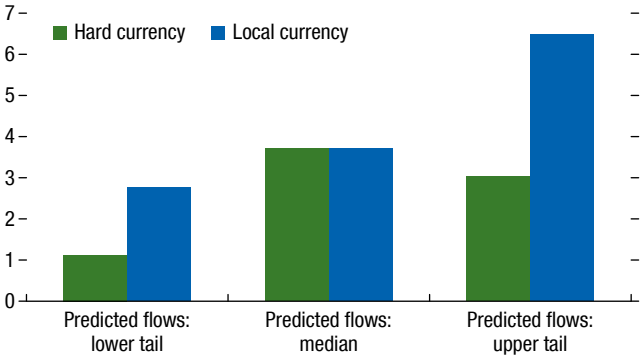
Local currency flows are more sensitive to domestic growth prospects, particularly the likelihood of extreme flows.

2. Coefficients of Domestic Growth for Hard Currency and Local Currency Flows



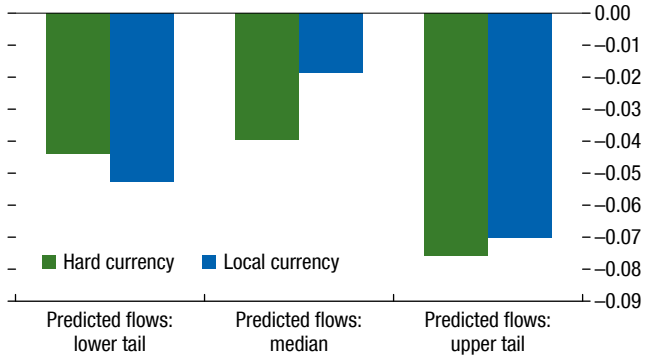
Greater market depth significantly improves the outlook for both hard currency and local currency portfolio flows.

3. Coefficients for Market Depth for Hard Currency and Local Currency Flows



Tighter global financial conditions have negative effects on both local currency and hard currency flows, with a somewhat larger impact on hard currency flows.

4. Coefficients for Global Financial Conditions Index for Hard Currency and Local Currency Flows



Sources: Bloomberg Finance L.P.; Haver Analytics; JPMorgan Chase & Co; Institute of International Finance; IMF, International Financial Statistics, Financial Flows Analytics, and Assessing Reserve Adequacy databases; World Bank; and IMF staff calculations.
Note: The reported coefficients come from quantile regressions of average quarterly debt portfolio inflows in the current and next two quarters (as a percent of GDP) on a range of global and (lagged) domestic factors for a panel of emerging and frontier markets. The lower tail corresponds to average coefficients on explanatory variables from regressions for low percentiles (5th, 10th, 20th, 30th), median flows correspond to average coefficients from regressions for middle percentiles (40th, 50th, 60th), and the upper tail corresponds to average coefficients for upper percentiles (70th, 80th, 90th, 95th). See Online Annex 3.1 for details. In panel 4, the larger sensitivity of hard currency flows to global factors may reflect the attendant exchange rate volatility and its impact on the issuer's repayment capacity in the presence of foreign exchange mismatches.

Impact of Portfolio Flows on the Level and Volatility of Funding Costs

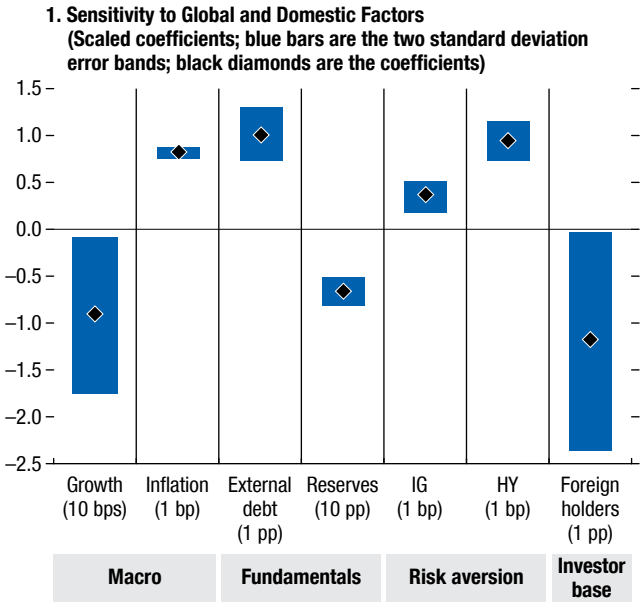
The pricing of sovereign debt securities is linked to country-specific fundamentals (Edwards 1985) but is also influenced by global investors' risk appetite (Eichengreen and Mody 2000). Strong domestic fundamentals help lower funding costs (Baldacci and Kumar 2010), while tight global financial conditions can widen spreads (Ebner 2009; Peiris 2010). Global risk appetite becomes especially relevant during periods of stress (González-Rozada and Levy-Yeyati 2008) because it can interact with domestic vulnerabilities to amplify the impact on borrowers, especially those with weaker fundamentals (Nickel, Rother, and Rülke 2009).

Foreign participation in local currency bond markets can be a mixed blessing:

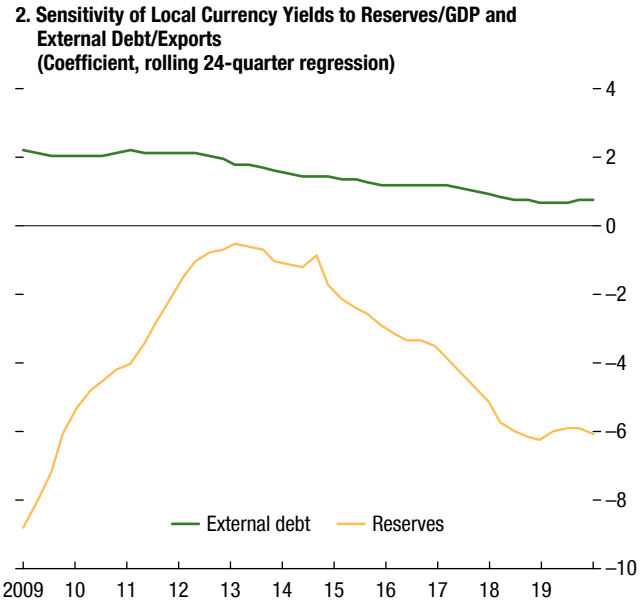
- Nonresident holdings of bonds can reduce borrowing costs, currency mismatches, and rollover risks associated with external borrowing. In addition, by

Figure 3.7. Emerging Market Local Currency Bond Yields

Funding cost is lowered by stronger domestic fundamentals and higher foreign participation.



Local currency bond yields have become more sensitive to reserve adequacy and less sensitive to the level of external debt.



Sources: Bloomberg Finance L.P.; Haver Analytics; Institute of International Finance; JPMorgan Chase & Co; and IMF staff calculations.
Note: Panels 1 and 2 report the unconditional effect of domestic and global factors on the local currency bond yields. In panel 1, variable coefficients are scaled by a given metric; for example, for every 10 basis point increase in growth, yields change by –0.9 basis points as per the panel. For every 1 percentage point increase in external debt (to exports), yields change by 1 percentage point. bp = basis point; HY = high yield; IG = investment grade; pp = percentage point.

diversifying the investor base, issuers can increase their flexibility and boost the potential size of the market beyond the absorption capacity of their domestic investor base.

- At the same time, investment decisions by foreign investors can strengthen the link between exchange rate fluctuations and domestic financial conditions. Foreign investors can create or reinforce exchange rate pressures, and a reduction in their positions can create domestic debt rollover risks. Local currency bond outflows can also increase term premiums and increase long-term interest rates, which in turn can affect domestic activity (Carstens 2019). Ebeke and Kyobe (2015) suggests that foreign holdings transmit global financial shocks to local currency sovereign bond markets by increasing yield volatility and, beyond a certain threshold, amplifying spillovers from global shocks.

Depth of domestic financial markets can help countries mobilize savings, promote information sharing, and diversify risk. Deep financial systems can also support financial stability by helping buffer the economy against external shocks and by dampening the volatility of asset prices (Sahay and others 2015).[16]

Level of Funding Costs

Stronger domestic fundamentals are associated with lower funding costs (Figure 3.7, panel 1).[17] High inflation increases local currency bond yields, while better growth prospects contribute to lower yields. Elevated vulnerabilities and lower buffers tend to increase the cost of funding: higher levels of external debt and lower levels of foreign exchange reserves are associated with higher local currency yields. IMF staff analysis suggests that the sensitivity of local currency bond yields to the level of foreign exchange reserves has increased in recent years, while sensitivity to external debt appears to have declined somewhat

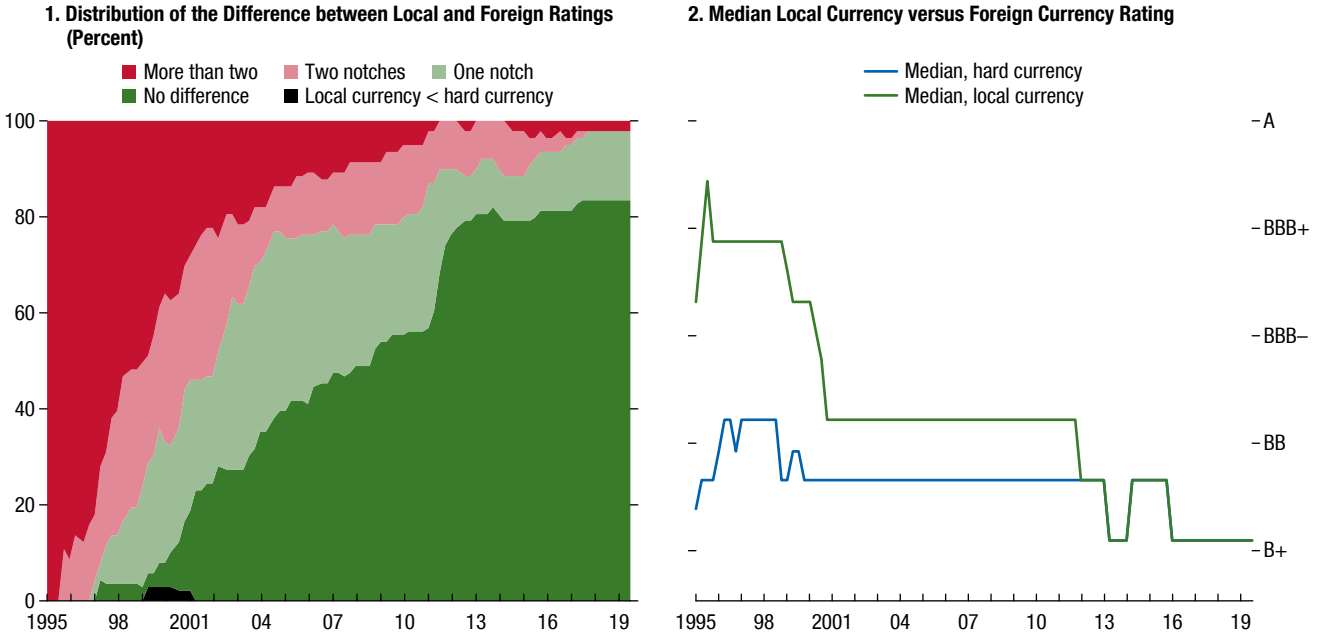
[16]Sahay and others (2015) also points out a potentially dark side of financial deepening in terms of financial stability; that is, a "too much finance effect."

[17]See Baldacci and Kumar (2010), Jaramillo and Weber (2013), and Piljak (2013).

Figure 3.8. Local Currency versus Hard Currency Sovereign Ratings

The local currency ratings advantage has narrowed significantly over time ...

... driven by an overall worsening of ratings.



Sources: Bloomberg Finance L.P.; and S&P Capital IQ.
Note: Panels reflect S&P sovereign credit ratings.

as the search for yield has intensified (Figure 3.7, panel 2).[18]

Lower-rated bond issuers are found to be more vulnerable to swings in global investor risk sentiment than higher-rated issuers,[19] as suggested by analysis of yield sensitivity to global risk-aversion shocks (Figure 3.7, panel 1). For example, a 100 basis point increase in US BBB-rated corporate spreads could widen yields of high-yield emerging market bonds by almost 100 basis points, compared with only 40 basis points for investment-grade issuers.

Greater foreign participation also helps reduce local currency yields (as in Ebeke and Lu 2015), which reflects the investor confidence channel as well as the role of foreign investors in the development of local bond markets (Peiris 2010).

Credit ratings also play an important role in determining funding costs (Jaramillo and Tejada 2011), even after accounting for fundamentals, as they alter investor behavior and eligibility. Local currency debt has been deemed safer by sovereign debt managers (Amstad, Packer, and Shek 2018), and this has aided the push toward greater local currency borrowing.[20] However, the ratings gap between local and foreign currency debt has narrowed significantly over time as the local currency rating advantage has withered away. For 80 percent of the countries in the sample, there is currently no difference between the local and foreign currency rating, compared with 50 percent at the time of the global financial crisis and 20 percent during the Asian financial crisis (Figure 3.8, panels 1 and 2). This convergence has been driven by a worsening of local currency ratings.[21]

[18]This might also reflect the lengthening of maturities by investors.

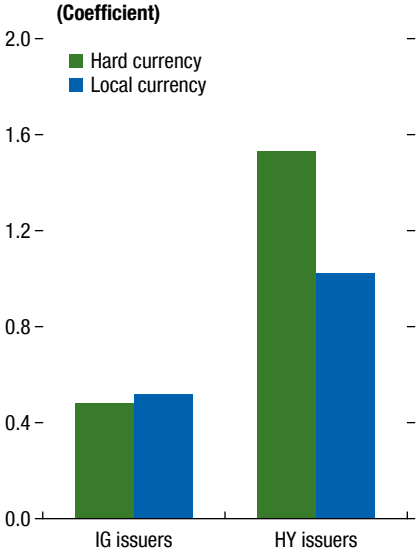
[19]The results are consistent with the hard currency spread analysis conducted in the October 2019 GFSR.

[20]Led by China's domestic bond market boom (Dehn 2019), local currency bonds now account for almost 90 percent of the marketable emerging market fixed-income universe compared with 75 percent in 2008.

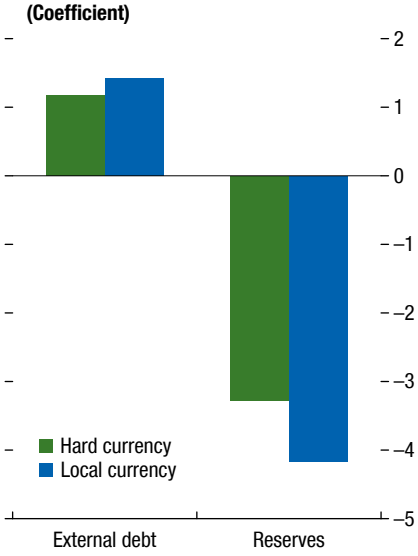
[21]This reflects country-level downgrades (Brazil, South Africa, Turkey) and increased recognition that sovereigns do default in local currency (Reinhart and Rogoff 2009), as well as more local currency ratings, possibly for the lower-rated countries (Amstad, Packer, and Shek 2018).

Figure 3.9. Drivers of Hard Currency versus Local Currency Spreads

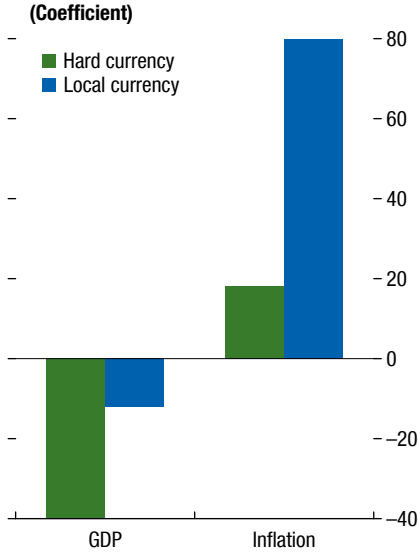
External spreads are more affected by shocks in global risk aversion.



Local currency spreads are more affected by domestic vulnerabilities and buffers.



GDP growth has a greater impact on hard currency bond spreads.



Sources: Bloomberg Finance L.P.; Haver Analytics; Institute of International Finance; JPMorgan Chase & Co; and IMF staff calculations.
Note: Spreads on local currency bonds are proxied by subtracting the five-year US Treasury yield from the local currency yields. The specification for local currency spreads is the same as discussed for local currency yields in the previous section and described in Online Annex 3.1. The model for the hard currency spreads is the same as introduced in the October 2019 *Global Financial Stability Report*. HY = high yield; IG = investment grade.

There are also notable differences between hard and local currency debt in terms of drivers of their valuations.[22] Hard currency bond spreads, especially for high-yield issuers, are affected about 60 percent more by global risk aversion shocks (Figure 3.9, panel 1). Local currency spreads are more sensitive to domestic vulnerabilities, including external debt and reserve adequacy (Figure 3.9, panel 2).[23] Economic fundamentals have a mixed effect, with domestic inflation disproportionately increasing local currency spreads (Figure 3.9, panel 3). Every percentage point rise in inflation increases local currency bond spreads by more than 70 basis points, but by only 20 basis points for hard currency bond spreads, and GDP growth has a greater impact on hard currency bond spreads.

Volatility of Funding Costs

IMF staff analysis finds evidence that greater foreign participation in local currency bond markets increases the volatility of yields after it reaches a certain threshold, while further domestic financial deepening helps reduce the volatility of yields. In particular, conditional on domestic factors, when the size of foreign investor bond holdings exceeds about 40 percent of the country's international reserves, the volatility of yields is found to increase by about 15 percent (see Table 3.1 and Online Annex 3.1). Controlling for the same factors and the threshold effect for foreign participation, the analysis finds that domestic financial market deepening decreases volatility significantly.[24] On average, domestic financial market deepening helped emerging market economies dampen volatility by 39 percent during 2004–17.

[22]These spreads capture only part of the funding costs. The level of local currency yields can also be affected by monetary policy.

[23]Du and Schreger (2013) also finds that local currency bond spreads are less sensitive to global factors than hard currency bond spreads.

[24]The variable used for financial market deepening does not capture all aspects of market depth—for example, the amount of foreign exchange liquidity, which could also act as a mitigating factor (as in Mexico and South Africa), is not accounted for.

Table 3.1. Contribution of Financial Market Depth and Foreign Participation to the Volatility of Yields

Estimates show that financial market depth increases volatility when foreign participation rises beyond a 40 percent threshold.

Variable Threshold (Percent)	Financial Market Depth	Dummy: Foreign Participation
37	–1.051***	0.009
38	–1.029***	0.060
39	–1.015***	0.090
40	–0.980***	0.147**
41	–0.969***	0.163**
42	–0.967***	0.205***
43	–0.980***	0.188**

Source: IMF staff calculations.

Note: The sample is based on quarterly data from 18 emerging market economies during 2004–17. The number of observations is 741. Country and quarter fixed effects are included. The dependent variable is volatility of yield. The dummy is defined using the ratio of different thresholds of foreign participation in local currency bond markets to reserves. Control variables include the current account balance, external debt, government debt, reserves as shares of GDP, growth rate of GDP, inflation, exchange rate against the US dollar, and turnover in the foreign exchange market. Results are robust to dropping these control variables and are not driven by any of the countries in the sample. Results are very similar for the depth of financial institutions (see Online Annex 3.1).

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

Foreign Investor Participation in Frontier Markets and Debt Rollover Risks

Strong investor interest in frontier market economies in 2017–19 led to a notable increase in nonresident exposures in the foreign exchange and local currency bond markets. Local currency bond markets in Egypt and Nigeria have consistently had some of the largest overweight exposures in investor surveys, with most of the foreign holdings concentrated in their high-yielding short-term debt market segments. As a result, the share of foreign holdings of local currency debt in several frontier markets reached levels similar to those prevalent in emerging markets, despite the relatively weaker fundamentals and policy frameworks in frontier market economies (Figure 3.10, panel 1). Evidence so far from the COVID-19–induced market turbulence suggests that economies with greater nonresident investor participation in domestic bond markets experienced larger yield increases (Hofmann, Shim, and Shin 2020) and higher exchange rate volatility. Frontier markets underperformed, experiencing large outflows[25] and acute exchange rate pressure, with 12-month nondeliverable forwards depreciating by more than 20 percent in some cases (Figure 3.10, panel 2).

Frontier market economies often lack financial depth and have a relatively shallow domestic investor base.[26] Many of them rank well below the emerging market median in terms of overall financial development and the depth of local financial markets (Figure 3.10, panel 3). The lack of financial depth is also reflected in more challenging local market liquidity conditions, with bid-offer spreads and the price impact of trades typically being much larger than in other emerging markets (Figure 3.10, panel 4). Limited market liquidity tends to compound market pressures in times of stress, due to reduced capacity of market makers to intermediate flows, and may also impair monetary policy transmission, especially in countries where foreigners are concentrated in short-term instruments.

Emerging signs of financing strains, combined with a greater need for debt issuance to support COVID-19–related fiscal spending and a difficult external demand outlook (most notably, for oil and tourism revenues), pose significant risks for frontier market economies. Short-term relief from debt payments to official creditors announced by the IMF, the World Bank, and the Group of Twenty (G20) in April 2020 provides vulnerable economies with some breathing room to handle the health emergency. But over the near term, many frontier market economies may need to rethink the currency composition of their debt issuance, the extent of reliance on official versus private creditors, and the extent of foreign investor participation in their local markets.

Over the long term, beyond the COVID-19 pandemic, frontier market economies should seek to develop their local financial markets where feasible. The empirical estimates based on the analysis in this chapter suggest that a further deepening of domestic financial markets and institutions to the emerging market average level could help an average frontier market economy lower the volatility of

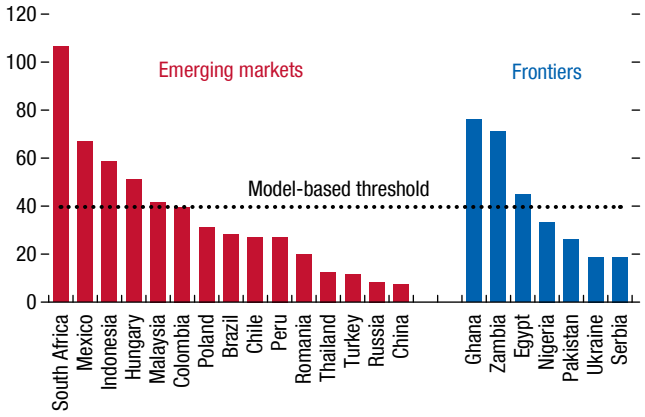
[25]For example, there were reports of large outflows in local currency debt and/or reserves declines in Egypt and Nigeria.

[26]In addition, none of the countries in the frontier market sample are yet included in any of the major global index or emerging market bond indices. In comparison, several emerging market local currency bond markets are part of both global and emerging market types of indices (for example, Malaysia, Mexico, Poland, South Africa), which can help them attract more buy-and-hold foreign investors.

Figure 3.10. Local Currency Debt Markets

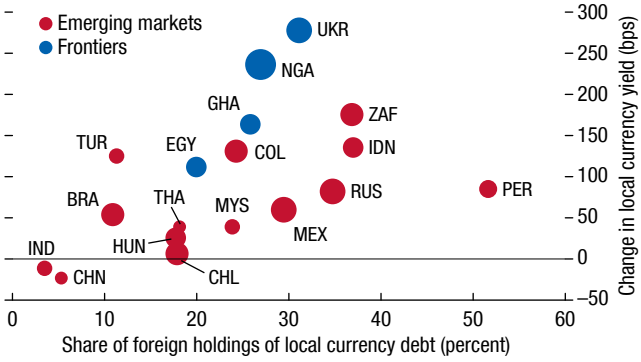
Foreign participation in local currency bond markets is comparable between emerging and frontier market economies.

1. Foreign Holdings of Local Debt (Percent of reserves)



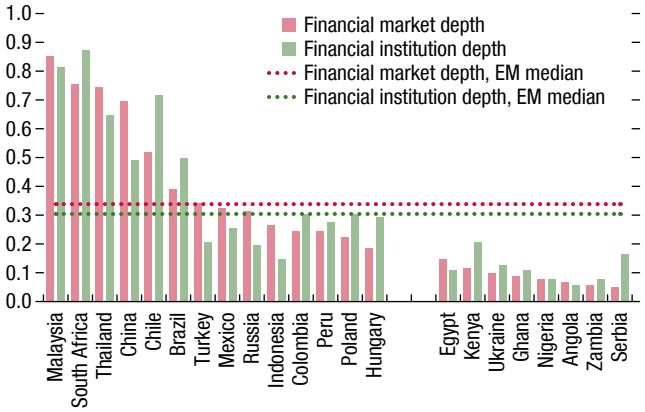
Generally, countries with a larger share of nonresident investors in their local markets saw a larger increase in their bond yields.

2. Local Currency Yields, Exchange Rate Volatility, and Foreign Holdings of Local Currency Debt (Bubble size is three-month realized exchange rate volatility)



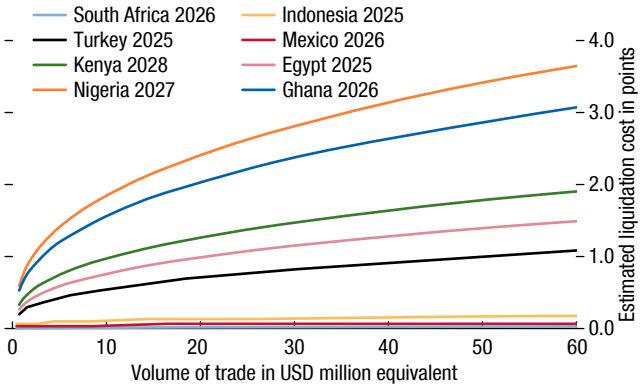
A shallower domestic investor base and lower financial depth have the potential to create higher volatility ...

3. Financial Market and Institutions Depth Score (Index)



... and limited liquidity can augment market volatility.

4. Estimates of Price Impact of Trade for Selected Bonds (Percentage points; millions of US dollars)



Sources: JP Morgan Chase & Co.; and IMF staff calculations.
Note: Panel 1 and 2 holdings data are latest available as of the end of February 2020. Reserve data are end-2019 estimates as of the end of 2019. For Nigeria and Egypt, only Treasury bill holdings are considered. Panel 2 exchange rate volatility for frontiers is calculated using nondeliverable forwards. The panel 3 index is calculated based on latest available data as of 2017. Panel 4 estimates use the liquidity assessment function in Bloomberg as of January 2019. In panel 2, data labels use International Organization for Standardization (ISO) country codes. bps = basis points; EM = emerging market; USD = US dollar.

its local currency bond yield by almost 30 percent. The capital-flows-at-risk analysis also suggests that if frontier market economies were to increase their financial depth to the emerging market average level, their portfolio debt flow outlook could improve by 1.2 percent of GDP, on average, and the probability of net nonresident outflows could decline by 15 percentage points.

Policy Priorities

The analysis presented in this chapter focuses on the cost-risk considerations related to different types of portfolio flows that have a bearing on sovereign debt management, capital flow management, exchange rate, and macroprudential policies. These policies can play an important role in containing external pressures and help cushion

the corresponding macroeconomic and financial impacts that emerging markets are facing during the COVID-19 crisis.

What Should Policymakers Do Now?

The specific policy responses to external pressures will depend on the nature of the shock (for example, liquidity versus solvency crisis), fiscal and monetary policy space, depth of financial markets, and balance sheet vulnerabilities, among others (see Chapter 1 for a broader discussion of policy priorities). However, there are some common principles that can help guide policy choices:

Foreign Currency Interventions

- For countries with flexible exchange rates, credible monetary frameworks, low inflation, deep financial markets, and the absence of large currency mismatches, the exchange rate should be a key shock absorber.
- For countries with adequate reserves, exchange rate intervention can lean against market illiquidity and thus play a role in muting excessive volatility. However, interventions should not prevent necessary adjustments of the exchange rate. Interventions should be based on the expectation that the pressures arising from the current crisis could last several months or longer.
- Countries with fixed or tightly managed currency regimes, including some major oil exporters and frontier markets, have more difficult trade-offs to consider. If reserves are adequate, maintaining the currency regime may be the best course of action in the short term. Exchange rate intervention, however, may need to be supported by monetary policy tightening and possibly capital flow management measures. These policies should also be based on the expectation that outflow pressures could last several months or longer, which may put current currency regimes under severe strain.

Capital Flow Management Measures

- In the face of an imminent crisis, introducing capital outflow management measures could be part of a broad policy package, but these measures cannot substitute for, or avoid, warranted macroeconomic adjustment. If nonresident outflows are a significant driver of overall outflows, minimum holding periods, caps, and other limits on nonresidents' transfers abroad could be considered with due consideration for the country's international obligations. Such measures should be implemented in a transparent manner, temporary, and lifted once crisis conditions abate.

Sovereign Debt Management Strategy

- Sovereign debt managers should prepare for long-term external funding disruptions. Countries that still enjoy market access at reasonable rates should actively decrease rollover risks as part of their debt management strategy. From the perspective of the trade-off between cost and risk, lowering rollover risks should take priority over concerns about containing costs when there are large downside risks stemming from potential loss of market access. Given the considerable sensitivity of the private sector and some state-owned enterprises to commodity prices, sovereign debt managers should consider the interactions between the government's financing strategy and other domestic issuers in times of stress to ensure that debt management activities of the government do not exacerbate risks (IMF 2014).

Macroprudential Policy

- If there are macroprudential buffers available, a relaxation of these tools can reduce the impact of the current shock on market conditions as well as on the economy in general. For example, foreign currency reserve requirements can be relaxed to mitigate foreign exchange funding pressures. Furthermore, countries that have introduced additional liquidity coverage ratio requirements in foreign currency can allow banks to use the buffer or relax the requirement.

Looking Beyond the Current Crisis

For frontier market economies with less-developed financial systems, *local capital market development* and the promotion of a stable and diversified local investor base should be a priority. This would require coordination among public stakeholders and proper sequencing of reforms (IMF 2020). Specific measures include (1) developing efficient money markets, (2) strengthening primary market practices to enhance transparency and predictability of issuance, (3) bolstering market liquidity, (4) developing a robust market infrastructure,

and (5) establishing a sound legal and regulatory framework for securities.

During periods of strong investor appetite, *macroprudential tools* may be put in place or tightened preemptively—before an inflow surge occurs—and maintained over the long term or permanently to build resilience and/or contain the buildup of systemic financial risk. Policymakers should weigh all evidence about encouraging the participation of foreign investors beyond a level considered prudent after taking into account the capacity of their local markets to absorb external shocks without excessive volatility. In particular, when local markets are at an early stage of development and there is limited room to adjust macroeconomic policies, authorities should proceed with caution when it comes to liberalizing portfolio inflows. Countries with portfolio flow restrictions that intend to liberalize might consider a gradual approach by moving toward either quantitative limits or price-based restrictions (for example, taxes, reserve requirements) that could mitigate the risk of excessive inflows.

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CHAPTER 4

BANKING SECTOR

LOW RATES, LOW PROFITS?

Chapter 4 at a Glance

- Over the past decade, very low interest rates have been associated with compressed bank net interest margins in several advanced economies, and this should continue over the medium term.
- The support to earnings provided by falling rates in recent years—stemming from gains on securities holdings and lower provisions—will fade in the medium term, putting sustained pressure on banks' profits.
- Cost cutting and higher fee income should help, but these mitigating factors are unlikely to fully lessen pressures on banks' profitability.
- Looking ahead, there is a danger that profitability challenges could induce banks to take on excessive risks once the economy fully recovers.
- Once the COVID-19 emergency is resolved, a combination of structural and financial policies could help mitigate future vulnerabilities and ensure an adequate supply of credit to the economy.

Profitability has been a persistent challenge for banks in several advanced economies since the global financial crisis. While monetary policy accommodation has helped sustain economic growth during this period and has provided some support for bank profits, very low interest rates have compressed banks' net interest margins (the difference between interest earned on assets and interest paid on liabilities). Looking beyond the immediate challenges faced by banks as a result of the coronavirus (COVID-19) outbreak, a persistent period of low interest rates is likely to put further pressure on bank profitability over the medium term. A simulation exercise conducted for a group of nine advanced economies indicates that a large fraction of their banking sectors, by assets, may fail to generate profits above their cost of equity in 2025. Once immediate challenges recede, banks could take steps to mitigate pressures on profits, including by increasing fee income or cutting costs, but it may be challenging to fully mitigate profitability pressures. Over the medium term, banks may seek to recoup lost profits by taking excessive risks. If so, vulnerabilities could build in the banking system, sowing the seeds of future problems. Authorities can implement a number of policies to help mitigate vulnerabilities arising from excessive risk taking and ensure an adequate flow of credit to the economy, including the removal of structural impediments to bank consolidation, the incorporation of a low-interest-rate-environment scenario on banks' risk assessments and supervision, and the use of macroprudential policies to tame banks' incentives for excessive risk taking.

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Banks Have Faced Persistent Profitability Challenges

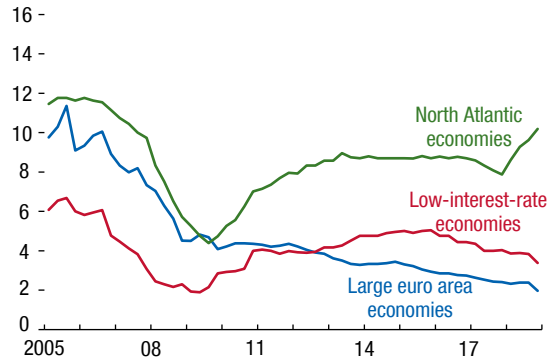
Banks globally have more and better-quality capital, hold more liquid assets, and borrow less from short-term markets than they did before the global financial crisis. This means that, on aggregate, the banking sector is better prepared to confront losses and liquidity stresses. The resilience of banks, however, may be tested in some countries in the face of the sharp slowdown in economic activity resulting from the COVID-19 pandemic and the associated, necessary containment measures, especially if the downturn turns out to be more severe and lengthier than currently anticipated.

Rather than looking at the immediate challenges facing banks, which are discussed in Chapter 1, this chapter focuses on bank profitability over the next few years in an environment of persistent low interest rates and flat yield curves. The analysis is based on a large sample of banks in nine advanced economies—the Group of Seven economies plus two other advanced economies that currently have, or have experienced, negative policy rates. These countries are divided into

Figure 4.1. Large Advanced Economy Bank Profitability and Cost of Equity

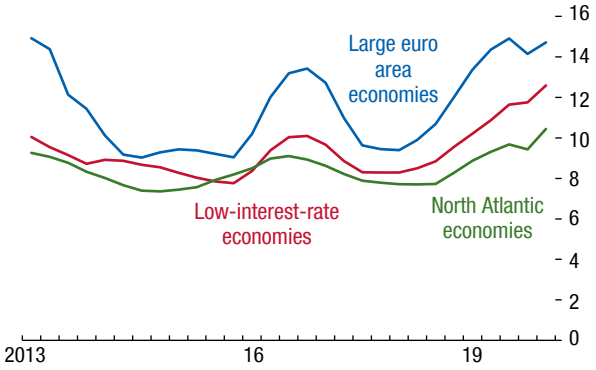
Profitability continues to be a challenge for some banks ...

1. Median Bank Return on Equity
(Percent)



... particularly when return on equity is below the cost of equity required by investors.

2. Median Market Implied Bank Cost of Equity
(Percent, four-quarter moving average)



Sources: Bloomberg Finance L.P.; S&P Market Intelligence; SNL Financial; and IMF staff calculations.
Note: The figure is based on a sample of more than 5,000 banks in nine advanced economies. Large euro area economies = France, Germany, Italy; low-interest-rate economies = Japan, Sweden, Switzerland; North Atlantic economies = Canada, United Kingdom, United States.

the North Atlantic economies (Canada, United Kingdom, United States), the large euro area economies (France, Germany, Italy), and the low-interest-rate economies (Japan, Sweden, Switzerland). The chapter presents an econometric analysis of the drivers of bank profitability and a novel forward-looking simulation of profitability to illustrate the challenges banks could face in a scenario consistent with the latest medium-term projections of economic activity in the April 2020 *World Economic Outlook* and market expectations of interest rates.[1]

Bank profitability challenges came to the fore during the global financial crisis, which delivered a devastating blow to bank profits in these advanced economies (Figure 4.1, panel 1). Over time, profitability has recovered in North Atlantic banks (particularly in Canada and the United States), where interest rates have been higher. However, there has been less improvement among banks in large euro area countries beset with the sovereign debt crisis; low economic growth; and a number of structural challenges, such as high operational costs and debt overhang (as discussed in the April 2017 *Global Financial Stability Report* [GFSR]). Profits in the low-interest-rate economies—especially Japan—have been weak for years, and this trend has been deepening as policy rates have been cut further.

Profitability is a concern because it affects bank resilience. While a very high level of profitability could indicate excessive risk taking, low profits mean that it takes longer for banks to build capital against unexpected losses. Slower capital accumulation also constrains banks' provision of credit to support the economy and their ability to absorb shocks, such as mark-to-market losses on their investments or credit losses on loans extended to households and firms. Consistently weak profitability—where the ex post return on equity is below the ex ante cost of equity capital (the return that shareholders require)—also makes it more difficult for banks to raise new capital from the market.

This last factor provides a useful benchmark for profitability. Banks with a return on equity below the cost of equity can be said to have an insufficient level of profitability. In this chapter, the cost of equity is measured as the ratio of a bank's return on equity to the price-to-book ratio (this formulation is based on the Gordon growth model; see Online Annex 4.1).[2]

[1]The number of banks included varies across the exercise because of their different data requirements. While the econometric exercise relies on a sample of about 12,000 banks, the estimation of the effective maturity profiles that are fed into the forward-looking simulation and the actual simulation rely on 1,000 banks. The details of the sample composition are reported in Online Annex 4.1 (all annexes are available at www.imf.org/en/Publications/GFSR). Consolidated data for individual banks are used for these analyses.

[2]According to the Gordon growth model, the share price of a firm can be written as the ratio of its dividend per share to the difference between its cost of equity and long-term growth of earnings. Under the usual assumption that earnings remain stable in the long

While this market-implied cost of equity varies over time, the median for each region has ranged from 8 percent to 14 percent since 2013 (Figure 4.1, panel 2).

A decline in interest rates can affect bank profitability through four main channels.[3]

- *Changes in net interest margins:* The replacement of maturing loans by new ones issued at lower interest rates, along with a repricing of bank deposits and other funding instruments, affects banks' net interest margins.[4] Between 2013—the year immediately after the euro area debt crisis—and 2015, interest rates on deposits fell at a faster rate, on average, than rates on loans, helping cushion the impact on net interest margins (phase 1 in Figure 4.2, panel 1). After 2015, however, deposit rates flattened out while interest rates on loans continued to fall (phase 2 in Figure 4.2, panel 1). This dynamic led to a fall in net interest margins in many countries (Figure 4.2, panel 2).
- *Declines in loan loss provisions:* Low interest rates can stimulate economic activity (Box 4.1 discusses this in more detail). Continued accommodative monetary policy—including asset purchase programs, forward guidance, and negative policy rates—has been crucial in supporting the global economic recovery over the past decade and is playing a key role in responding to the COVID-19–related challenges currently faced by the global economy. A more dynamic economy benefits households and firms by increasing their incomes and profits while, at the same time, lower rates reduce their interest burdens. These two factors tend to reduce borrowers' probability of default, enabling banks to lower their provisions against expected loan losses.
- *Higher credit growth:* Low interest rates and higher economic activity stimulate credit growth, resulting in higher revenues for a given level of net interest margins. However, this would not mechanically result in higher return on assets, unless the expansion takes place through a shift to customer loans from lower yielding securities and interbank assets. Higher credit growth, nevertheless, could lead to an increase in return on equity if the expansion in assets is accompanied by an increase in leverage.
- *Higher noninterest income:* A more dynamic economy could also result in higher noninterest income (for example, through fees) if some activities, such as mergers and acquisitions, become more prevalent. Another source of banks' noninterest income—gains on their securities portfolios—could also increase when rates decline, as the latter would lead to a rise in asset prices (Figure 4.2, panel 3).

The change in the median bank's profitability as a result of these various channels is shown in Figure 4.2, panel 4, for 2013–18. While the compression in net interest margins has contributed importantly to lower median net interest income in most countries, this has been partly offset by lower provisioning and, in a few cases, higher noninterest income. Banks have also sought to offset lower revenues by cutting operating expenses. The overall result has been mixed so far, with median return on assets actually rising in three of the economies, falling in four others, and remaining stable in the other two. This result is consistent with a strand of the literature that estimates that low rates have had little impact on bank profitability so far but expresses concern that further cuts or prolonged low rates will depress future profitability (see, for example, IMF 2017).

An econometric exercise for the nine banking systems considered in this chapter reveals how much of the fall in net interest margins between 2013 and 2018 has been due to lower rates and flatter yield curves. This analysis relates bank net interest margins to bank characteristics, the economic environment, short-term interest rates, and the term spread between long- and short-term interest rates (see Online Annex 4.1 for

term, the formula described above can be easily derived (see Online Annex 4.1). Alternative methods can be used to estimate the cost of equity. For example, Kovner and van Tassel (2019), using the capital asset pricing model, estimates US banks' cost of equity at 10.5 percent. Surveys of banks, conducted by the European Banking Authority (2018), find that two out of three banks estimate that their cost of equity was between 8 percent and 10 percent.

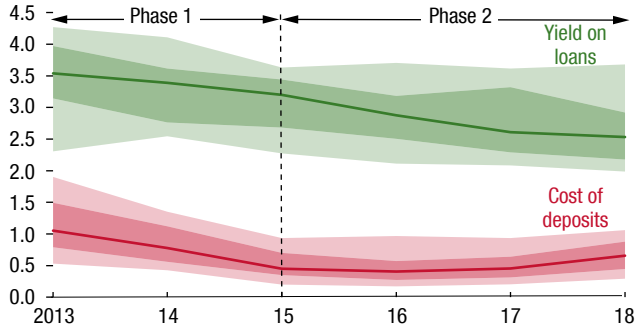
[3]These four channels are always present, but the overall direction of variables, such as provisions or credit, will depend on whether the decline in interest rates takes place in response to other shocks. For instance, adverse macroeconomic shocks, such as the recent COVID-19 shock, can induce policymakers to cut short-term policy rates and, at the same time, trigger adverse movements in all four of the channels that affect bank profitability described above, and this could lead to a situation where low rates coincide with higher credit losses and lower credit growth.

[4]This repricing effect depends on the whole term structure of interest rates—the rates prevailing at different maturities, their past trajectory, the prevalence of fixed and floating rate loans, and the use of interest rate derivatives, for example for hedging purposes.

Figure 4.2. Interest Rates and Bank Profits

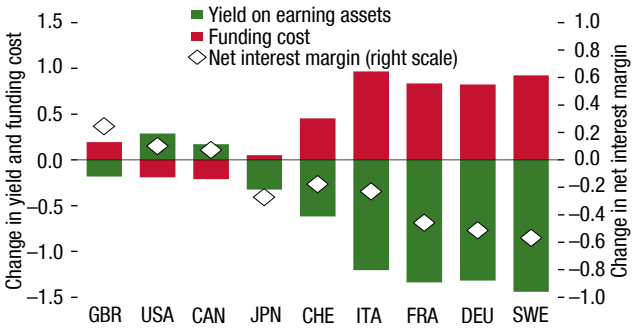
Bank deposit rates fell quickly but have stabilized near zero, while bank lending rates have continued to fall ...

1. Bank Interest Rates across Economies
(Percent)



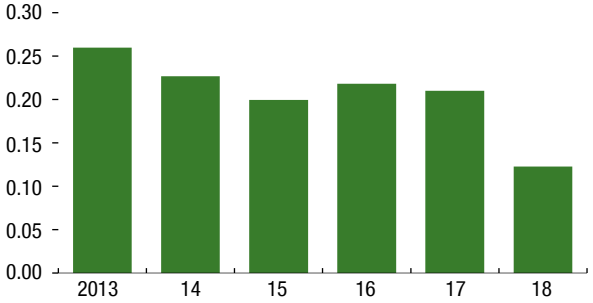
... which has squeezed bank net interest margins.

2. Changes in Bank Yields and Funding Costs, 2013–18
(Percentage points)



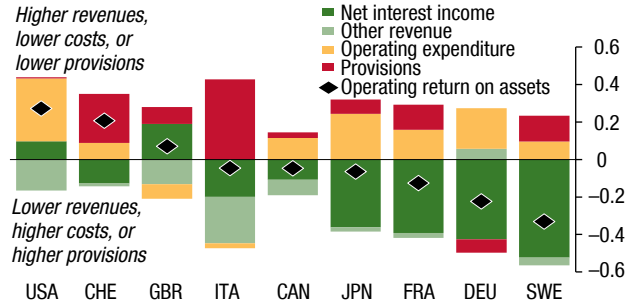
Gains from securities have been shrinking, and this trajectory may continue.

3. Banks' Net Gain on Securities
(Percent of assets)



Lower net interest income has been partly offset by a cutback in provisioning and lower operating expenses.

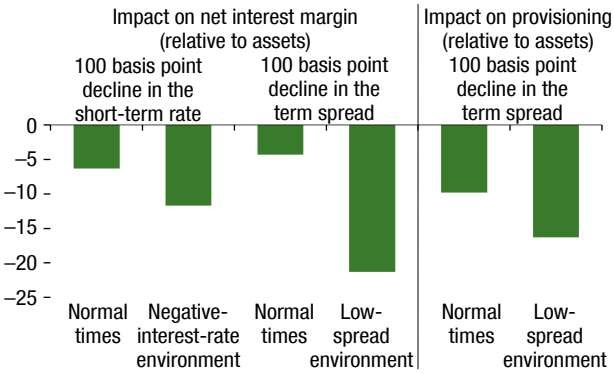
4. Change in Median Bank's Return on Assets, 2013–18
(Percentage points)



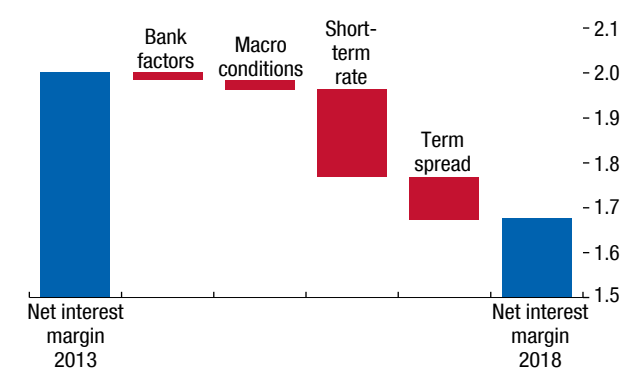
These results are supported by an econometric analysis ...

... which can be used to illustrate the main drivers of the fall in net interest margins.

5. Impact of a Decline in Rates and Term Spreads on Bank Net Interest Margins and Provisions
(Basis points)



6. Contributions to the Change in Net Interest Margins: Large Euro Area and Low-Interest-Rate Economies
(Percentage points)



Sources: Bloomberg Finance L.P; European Central Bank; Fitch Connect; Haver Analytics; S&P Market Intelligence; SNL Financial; and IMF staff calculations.
Note: The figure is based on a sample of banks from nine large advanced economies. In panel 1, the shaded areas show the 10th–90th percentiles of the interest rates across the nine economies, while the dark shading shows the 25th–75th percentiles, and the line shows the median. Panels 5 and 6 are based on the econometric exercise described in Online Annex 4.1. In panels 2 and 4, data labels use International Organization for Standardization (ISO) country codes.

an explanation of the methodology).[5] The analysis—summarized in Figure 4.2, panel 5—indicates that a 100 basis point decline in short-term interest rates reduces net interest margins (relative to assets) for the average bank in the sample by about 6 basis points in normal times (when short-term interest rates are positive); this effect, however, is larger—12 basis points—when short-term interest rates are negative, indicating a nonlinear relationship. Similarly, a 100 basis point fall in the term spread leads to a decline in net interest margins (relative to assets), on average, and this effect is much larger—at nearly 21 basis points—in a period of low spreads (when the spread between the 10-year and 3-month rates is below 1 percent).[6]

The same exercise also confirms the offsetting impact that lower interest rates can have on bank profitability through lower provisioning (Figure 4.2, panel 5). A 100 basis point decline in the term spread is estimated to lead to a 15 basis point fall in provisions (relative to assets) in a low-spread environment. In addition, a 1 percent increase in economic growth is associated with a 1.2 basis point reduction in the ratio of loan loss provisions to assets.

The results from this econometric exercise can also be used to decompose the relative importance of the interest rate environment and other factors in driving changes in net interest margins (Figure 4.2, panel 6). Such a decomposition reveals that, for the average bank in the large euro area and low-interest-rate economies included in the sample, lower short-term rates and a tightening in term spreads can account for a sizable part of the fall in net interest margins over 2013–18.[7] The role of the interest rate environment is relatively lower in North Atlantic economies over this period.

Bank Profits are Likely to Come under Further Pressure

The bank profitability outlook for the near-term (2020–21) is likely to be adversely affected by sharply rising credit costs due to the economic downturn resulting from the COVID-19 outbreak (see Chapter 1). As discussed, banks in most of the countries considered in this chapter had already displayed significant margin pressure before this shock materialized. That margin compression is likely to persist and intensify as longer-term rates have declined sharply as a result of more accommodative monetary policy (while deposit rates have already stabilized to levels close to zero). Furthermore, two key earnings tailwinds—falling loan-loss provisions and investment and trading gains linked to falling interest rates—had been largely exhausted by the end of 2018, and are increasingly unlikely to remediate margin pressure going forward. Thus, underlying profitability pressures are likely to persist over the medium- and longer-term even once the global economy begins to recover from the current shock.

This chapter quantifies these pressures by simulating bank profitability over the next five years for the nine economies covered in this chapter.[8] The simulation uses market expectations of benchmark interest rates and the baseline IMF economic growth and inflation forecasts.[9] Investors expect short-term interest rates to remain at very low levels for a while and term spreads

[5]Bank characteristics include lagged values of the deposit-to-liabilities ratio, capital ratio, and the ratio of securities to assets; the economic environment includes the contemporaneous growth rate of real GDP and inflation, and the current forecasts of these variables for the upcoming year; the short-term rate corresponds to the 3-month benchmark rate for each country; and the term spread corresponds to that between the 10-year and 3-month benchmark rates. The short-term rate is also interacted with a dummy that takes the value 1 when the rate is negative, and the term spread is interacted with a dummy that takes the value 1 when the spread is below 1 percent (the 10th empirical percentile). Each of these dummies is also included in the specification. Furthermore, dummies for the years of the global financial crisis and the European sovereign crisis are included (see Online Annex 4.1 for a detailed discussion and presentation of the econometric results). This specification closely follows those previously used in the literature, such as Borio, Gambacorta, and Hofmann (2017) and Claessens, Coleman, and Donnelly (2018).

[6]Other studies (Borio, Gambacorta, and Hofmann 2017; Claessens, Coleman, and Donnelly 2018; Eggertsson and others 2019) are consistent with these observations: net interest margins decline with falling rates and declining term spreads (flattening yield curves); these effects are nonlinear as short-term rates approach zero and they are particularly nonlinear when policy rates fall below zero.

[7]An alternative specification of this econometric analysis, where there is a full set of time fixed effects, assigns the biggest role to macro factors—which include these fixed effects—than presented here, followed by the short-term rate and the term spread.

[8]For data availability reasons, the simulation uses December 2018 as the starting point. The simulated values for 2019 use the realized growth rates and interest rate data. For the rest of the simulation period, growth forecasts correspond to those of the April 2020 *World Economic Outlook*. Interest rates correspond to effective rates until the first quarter of 2020 and to forward market rates for the 1-month, 3-month, and 10-year benchmark bonds of each of the sample countries prevailing at April 6, 2020.

[9]The simulation was also conducted using consensus forecasts for growth, inflation, and interest rates released April 9–14, 2020, obtaining similar results to those described below.

to recover gradually over the next few years, albeit to levels below historical norms and with different trajectories across countries (Figure 4.3, panel 1).

In the baseline IMF scenario, growth is expected to experience a sharp contraction in 2020 and start recovering in 2021. However, because of the unprecedented nature of the shock affecting the global economy, there is considerable uncertainty about the intensity and duration of the economic contraction, and risks to the outlook are on the downside, as discussed in the April 2020 *World Economic Outlook*. Moreover, although the forecasts should account, at least to some extent, for the support provided by the recent monetary, fiscal, and financial policy actions, the simulation does not consider the direct implications of measures directly targeting the banking sector or providing relief to borrowers, among others.

The simulation incorporates the four channels through which the future interest rate and growth trajectories affect bank profitability, as previously discussed: (1) changes in net interest margins resulting from the repricing of maturing loans and deposits, (2) changes in loan-loss provisions resulting from the interest rate and economic environment, (3) changes in credit growth associated with economic growth, and (4) noninterest income.

The repricing of loans and deposits depends on the "effective repricing maturity" of the stock of loans and deposits, which is sensitive to the prevalence of floating rates and the use of interest rate derivatives. These effective maturities are estimated using a model of bank interest income dynamics over 2005–18 (see Online Annex 4.1), which suggests that loans are repriced every three to six years and deposits every two to three years, on average, across the nine economies.[10] These estimated maturities, along with forecasts of interest rates, are used to simulate the evolution of yields on loans and the cost of funding—the main two components of net interest margins—for the average bank in each economy. In doing so, it is assumed that deposit rates have a floor at zero because negative rates have so far been applied only to part of banks' deposit bases.[11] While the model of interest income dynamics cannot be separately estimated for global systemically important banks because of data availability issues, the simulation incorporates a lower sensitivity of net income to interest rate movements for these banks. This observation is in line with other econometric evidence indicating that net interest margins of global systemically important banks are less sensitive to declines in interest rates than other banks.[12]

The evolution of loan-loss provisions and the fee income component of noninterest income are modeled as a function of economic growth, short-term interest rates, and the term spread, based on econometric results. These models capture the historical relationships between these variables and, as such, they may not fully incorporate the impact of the unprecedented COVID-19 shock and the implications of recent bold and sizable policy measures, adding uncertainty to the estimates.[13] For example, as noted in Chapter 1, bank resilience may not be as severely impacted in the current episode as in the past, given that the historical relationship between economic growth and credit losses may be weaker in light of the large amounts of fiscal and other support measures being provided.

[10]Effective maturities are estimated by looking at the historical relationship between average yields (on bank assets and liabilities), short-term rates, and the slope of the yield curve. Effective maturities are estimated at the country level and are assumed to be constant for all banks domiciled in that country (see Online Annex 4.1 for more details). These effective maturities implicitly account for the amount of fixed and floating rate assets and liabilities, as well as the degree of hedging against interest rate risk. Effective maturities of deposits are longer than contractual maturities as they incorporate the stickiness of deposits (particularly those in checking or sight accounts with overnight contractual maturities) with respect to changes in interest rates.

[11]Relaxing this assumption and allowing the deposit rate to fall to a minimum of –50 basis points does not significantly change the results.

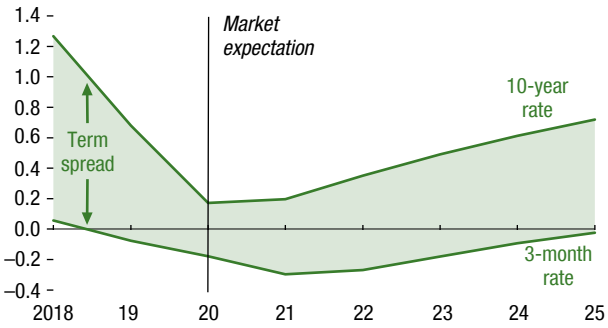
[12]See Online Annex 4.1. This is likely because these more sophisticated banks, with deeper treasury and balance sheet management capacities, may use interest rate swaps to hedge against changes in interest rates.

[13]In principle, the near-term consequences for provision expenses may be ambiguous as the magnitude of the shock may lead to greater provisioning while the flexibility provided by the regulatory and accounting response may allow banks to smooth them through the cycle. In addition, fiscal measures aimed at supporting households and firms that would otherwise default may alter historical patterns. Furthermore, government loan guarantees may reduce the need for provisioning for years to come as some of these guarantees covers a relatively long horizon. Fresh estimates of provision expenses released by major US banks for 2020 suggest that, on balance, provision expenses may be larger in the near term than those modeled from historical patterns. An important part of these increases in provisions is related to credit cards, which may in turn reflect uncertainty and record high unemployment in recent weeks. However, some banks have also reported increases in non-fee income associated with the expanded trading activity in light of the sharp rise in volatility seen in recent months.

Figure 4.3. Bank Profitability Simulation Results

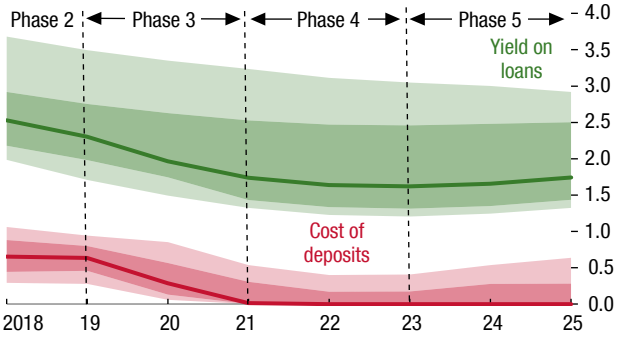
In the simulation, interest rates and term spreads are assumed to remain at low levels ...

1. Median Interest Rate Assumptions across Economies (Percent)



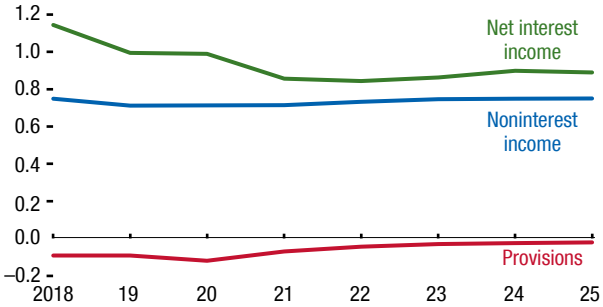
... and this passes through to interest rates on bank loans and deposits.

2. Simulated Path of Bank Interest Rates (Percent)



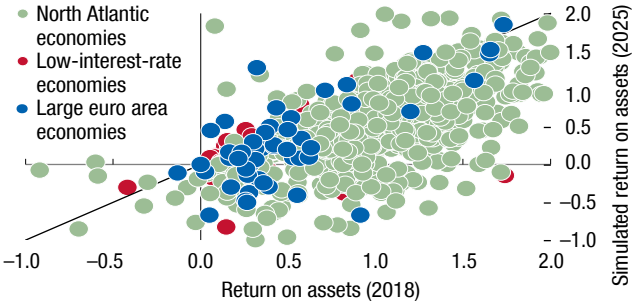
Lower net interest income is partly offset by lower provisions ...

3. Simulated Median Profitability across Economies (Percent of assets)



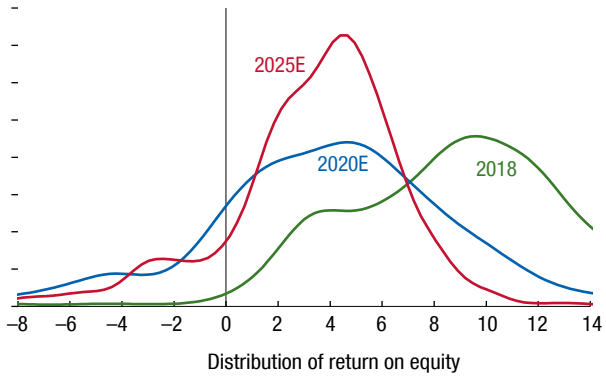
... but overall profitability falls in most of the banks in the sample.

4. Return on Assets, 2018 and Scenario Estimates for 2015 (Percent)



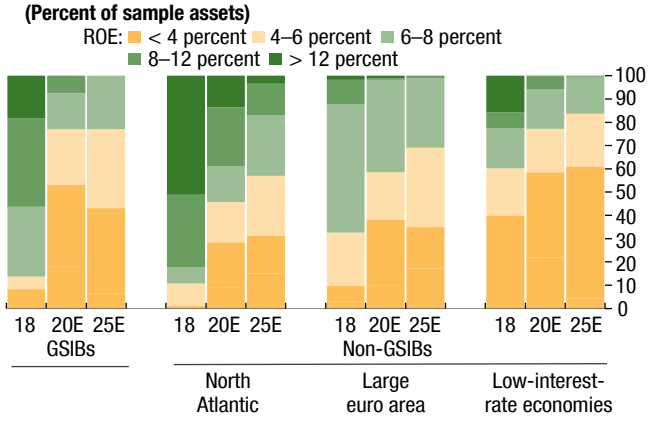
Return on equity falls materially across the banks in the sample ...

5. Return on Equity Distibutions (Percent)



... though profits are weakest in the large euro area and low-interest-rate economies.

6. Simulated Return on Equity, by Region (Percent of sample assets)



Sources: Bloomberg Finance L.P.; Fitch Connect; S&P Market Intelligence; SNL Financial; and IMF staff calculations.
Note: Results are based on the nine advanced economies covered in this chapter. In panel 2, the shaded areas show the 10th–90th percentiles of the interest rates across the nine economies, while the dark shading shows the 25th–75th percentiles, and the line shows the median. E = estimated; GSIBs = global systematically important banks; large euro area economies = France, Germany, Italy; low-interest-rate economies = Japan, Sweden, Switzerland; North Atlantic economies = Canada, United Kingdom, United States; ROE = return on equity.

Credit growth is derived from a Bayesian vector autoregression model used to estimate effective repricing maturities, ensuring consistency between the estimates. This model captures the downside pressure on credit growth resulting from the deterioration in the near-term economic outlook and the compensating effect of declining interest rates, but does not explicitly (other than what is incorporated in market interest rates) account for the consequences of other recent policy actions aimed at supporting flow of credit to the economy.

Potential gains on securities investments (the other main component of noninterest income) are kept constant relative to assets because of lack of data on banks' securities portfolios. The near-term impact of this omission is difficult to assess but, in the medium term, is likely to overstate simulated profits because, as rates remain at low levels in the simulation and eventually move up, there are likely to be few gains on securities. As is usual in simulation exercises, the composition of bank balance sheets is assumed to remain unchanged. This rules out endogenous changes in asset and liability composition, which would require a fully-fledged model of bank behavior.

The simulated path of interest rates is shown in Figure 4.3, panel 2. At the start of the simulation, new loans are issued at lower rates than those of maturing loans, while funding costs remain relatively unchanged, resulting in a continued reduction in net interest margins (this is a continuation of phase 2 previously discussed). Then, in phase 3, deposit rates fall further until they hit the zero lower bound, reflecting easing of monetary policy.[14] In phase 4, there is another round of net interest margin compression as interest rates on loans continue to fall, while deposit rates remain around zero. Finally, in the last phase, interest rates on loans start to increase gradually, as do deposit rates in some countries.

Based on historical relationships, the sharp economic contraction in 2020 will lead to higher provision expenses (Figure 4.3, panel 3). As discussed above, the actual change in provisions in the current conjuncture may differ importantly from historical patterns, adding uncertainty to this trajectory.[15] Over the rest of the simulation, provisioning declines as economic growth recovers. Nonetheless, the important message from the simulation is that the medium-term dynamics of profitability are dominated by further compression in net interest income.

Overall, these simulations suggest that bank profitability will likely remain under pressure over the next five years. Across country groups, even after the contraction in profitability in 2020–21 fades, most banks in the simulation see a reduction in return on assets by 2025 relative to their recent, already-low levels (Figure 4.3, panel 4). While the low-interest-rate environment puts pressure on net interest margins across all regions, banks in low-interest-rate economies tend to benefit less from the future economic recovery than others because provisioning and net interest margins are already very low by historical standards and rates are not expected to rise by much. In the large euro area economies, the simulation foresees a cutback in provisions and a small increase in noninterest income in the medium term that enables a fraction of banks (by assets) to increase profits relative to 2018 levels. Nonetheless, return on assets in 2025 remains below current levels for most banks in the region. Banks in the North Atlantic economies are also not immune from profitability pressures, largely driven by net interest margin compression.

Declining profits compromise the ability of banks to generate a return on equity commensurate with estimates of the cost of equity. The simulated distribution of return on equity in 2025 is markedly to the left of the one observed in 2018 and not very different from the distribution simulated for 2020, indicating that profitability pressures persist well beyond the immediate impact of the deterioration in the economic outlook (Figure 4.3, panel 5). In addition, a large fraction of banks in the sample generate a return on equity below 8 percent—the lower end of the current estimates for the cost of equity previously discussed. Profitability challenges at global systemically important banks are set to continue beyond the near term, with simulated return on equity in 2025 somewhat better than in 2020, but still deteriorating relative to 2018

[14]As discussed above, this simulation does not explicitly incorporate the consequences of the direct measures aimed at the banking sector that may result in lower cost of funding in the near term, but the quick decline in the cost of deposits obtained from the model is consistent with this mechanism.

[15]For instance, loan loss guarantees would have a dampening effect on provisions in the near term and flatten the decline in provision expenses in the medium term. The use of regulatory flexibility could have a similar effect. At the same time, earnings management by banks may have the opposite effect on the trajectory of provisions.

(Figure 4.3, panel 6). A similar pattern is observed outside of the group of global systemically important banks, where most of the banks still have weak return on equity in 2025, especially in large euro area and low-interest-rate economies.

Substantial Action Will Be Needed to Fill the Earnings Shortfall

The sharp economic downturn resulting from COVID-19 will likely hurt bank earnings through mark-to-market and credit losses (see Chapter 1). However, banks' earnings challenges emerged prior to the recent COVID-19 episode and will extend to at least 2025, well beyond the immediate effects of the current situation. Banks' capacity to mitigate these continuing, structural profitability pressures from low interest rates will therefore depend on their ability to further increase noninterest income or cut operating costs in an environment of increasing competition from fintech and nonbank financial intermediaries.

Noninterest income includes two broad components: fees and gains on securities. As discussed, gains on securities holdings will likely decline further when interest rates stabilize, so an improvement of noninterest income must derive largely from generating more fee income. However, fees appear to offer little additional potential upside to profitability. From 2013 to 2018, fee income (relative to assets) was fairly flat across advanced economy banks, on aggregate (Figure 4.4, panel 1). There were, however, some differences across economies. While fee income fell in Canada, Germany, Sweden, the United Kingdom, and the United States over 2016–18, it rose (albeit to different degrees) in France, Italy, and Japan (blue bars in Figure 4.4, panel 2). In addition, significant fee income pools appear structurally mature (capital markets sales and trading revenue have shrunk steadily over the past decade) or subject to technology-based market erosion (payments and transaction banking). Analysts are therefore forecasting falling fee income relative to assets (red bars in Figure 4.4, panel 2).

Banks can, in principle, support profits by cutting operating expenses, for example through more efficient technology. From 2013 to 2018, cost savings have delivered about a 15 basis point improvement to median return on assets (Figure 4.4, panel 3). Analysts expect cost-to-assets ratios to continue to decline in some countries, generally in the order of another 5–25 basis points of assets by 2021 (Figure 4.4, panel 4).[16]

Given that fee income and cost improvement are the two major levers banks can use to mitigate downward pressure on bank return on equity, the crucial question is: are they likely to be sufficient? Assuming profits evolve as projected in the simulation presented earlier, what combinations of cost reduction and additional fee income improvement would be required for banks in each country to generate a return on equity in line with the cost of equity? To address this question, Figure 4.5, panel 1, compares noninterest income and operating costs (both relative to assets) for a sample of banks across the three country groups against the combinations of cost and fee income that would be required for an "average" bank in that group to deliver return on equity of 8 percent (Figure 4.5). In the North Atlantic economies, a fair proportion of banks is expected to generate adequate returns by 2025 and, for the rest, there is a range of feasible cost and revenue improvements that would generate them. However, the improvements that would be required for banks in large euro area countries and low-interest-rate economies are particularly challenging. In the former, virtually all banks would need to improve both cost and noninterest income, sometimes significantly. For instance, for some banks, cutting costs to zero would not suffice in absence of an increase in noninterest income. In low-interest-rate economies, many banks show little scope for further cost improvement—costs are already quite low—and would require noninterest income rising from very low current levels.

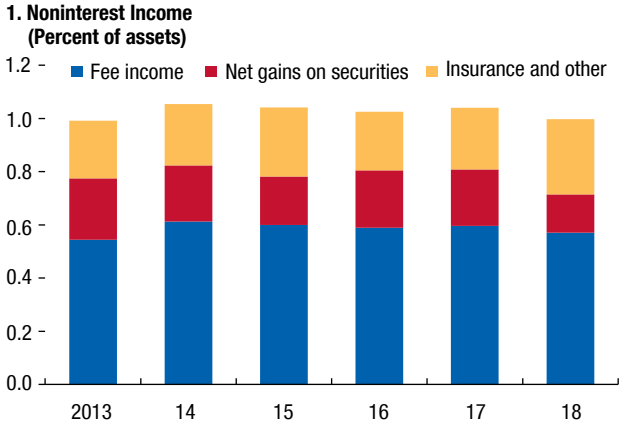
Banks may also mitigate margin pressures by hedging against declining rates, typically using interest rate swaps. The much larger overall swap books of the largest banks (relative to total assets) suggests that they are more heavily engaged in hedging (Figure 4.6, panel 1).[17] Moreover, available data for the United States suggests that smaller banks are more sensitive to a decline in rates than larger banks (Figure 4.6, panel 2). The econometric analysis discussed above corroborates this finding, and this is consistent with other studies

[16]This resembles a discussion of European banks' profitability outlook in the April 2017 GFSR, though this section deploys a more nuanced, dynamic model of the responses of net interest margin responses to changes in the policy rate environment.

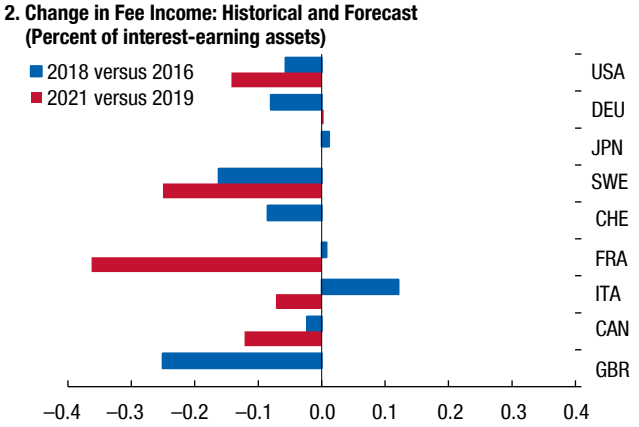
[17]Available data only reveal aggregate interest rate swap contracts in notional terms. Disclosures do not provide sufficient data to reveal the specific interest rate positioning or the degree of hedging against specific interest rate risk scenarios.

Figure 4.4. Key Mitigants of Declining Profitability: Noninterest Earnings Levers

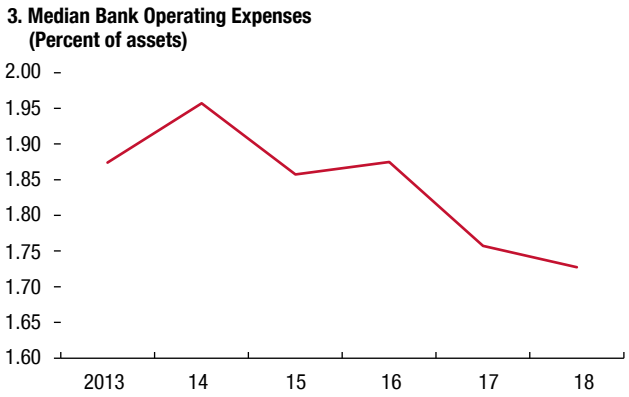
Fee income has remained roughly stable, relative to assets, but gains on securities have fallen.



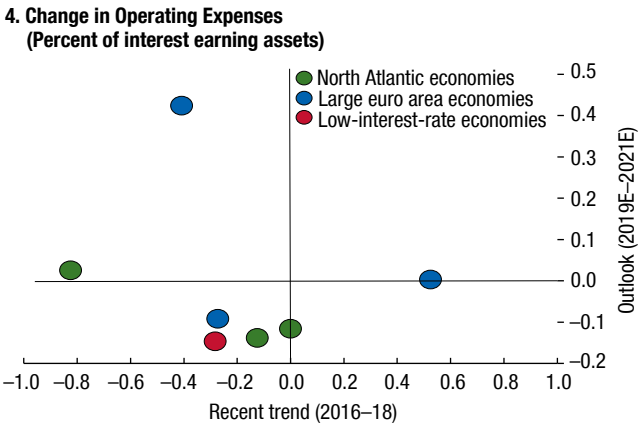
Analysts see limited potential for a significant improvement in fee income.



Banks have been cutting back costs ...



... and analysts expect this to continue.



Sources: S&P Market Intelligence; SNL Financial; and IMF staff calculations.
Note: The figure is based on the nine advanced economies covered in this chapter. In panel 2, 2021 estimates for Swiss and Japanese banks, and 2021 fee income estimates for UK banks, are unavailable. In panel 4, data for 2019E to 2021E are estimated. Data labels use International Organization for Standardization (ISO) country codes.

that find small banks to be less resistant than larger domestic peers to margin and earnings compression in a negative interest rate environment (Nucera and others 2017; Molyneux, Reghezza, and Xie 2019). Finally, US banks' net interest income has become more sensitive to changes in policy rates in recent years, with risk increasingly skewed to the downside, perhaps reflecting the increasing difficulty of mitigating net interest margin pressures as deposit rates approach zero (Figure 4.6, panel 3).

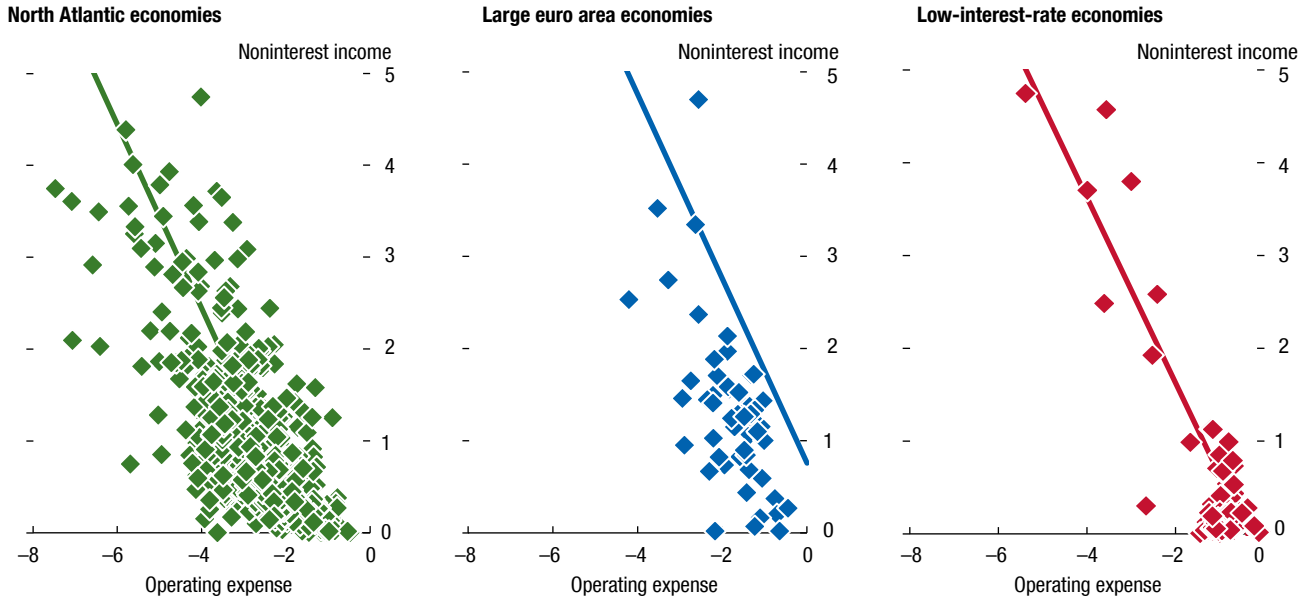
Banks May Take Excessive Risk in the Medium-Term once the Economy Begins to Recover

Recent policy measures taken by monetary and financial authorities aim to help banks use their risk-bearing capacity to mitigate the economic consequences of the COVID-19 outbreak, maintaining the flow of credit to borrowers and supporting economic growth. However, once the current crisis recedes, medium-term profitability pressures may induce banks to increase credit, maturity, liquidity, or trading risks aggressively enough to sow the seeds of future problems.

Figure 4.5. Changes to Costs and Noninterest Income to Restore Profitability

Large increases in noninterest income and substantial cuts to costs may be needed.

Cost and Noninterest Income: Bank Actual Positions and Combinations Needed to Generate 8 Percent Return on Equity (Percent of assets, 2025)



Sources: S&P Global Market Intelligence; SNL Financial; and IMF staff estimates.
Note: The lines represent combinations of operating expenses and noninterest income relative to assets required to generate 8 percent return on equity, assuming that all other earnings drivers (interest income, loan-loss provisions, tax rate, and so on), relative to assets and capital structure (equity relative to assets) are at industry-average levels. Other combinations are possible, but any significant deviation from this assumption requires even more challenging performance improvement on one or the other earnings driver.

There is some evidence that, before the onset of the COVID-19 pandemic, banks had taken more risk in response to a prolonged period of very low interest rates. First, banks in some countries had modestly shifted their exposures from short-term instruments and marketable securities toward less liquid loans, driving up loans as a percentage of total assets and taking additional liquidity risk (Demiralp, Eisenschmidt, and Vlassopoulos 2019). Second, banks had looked to increase the maturity risk of their loans to increase yields. From 2013 to 2018, estimated average loan maturity across reporting banks lengthened, particularly in countries where low interest rates exacerbated pressures on net interest margins (Figure 4.6, panel 4).[18]

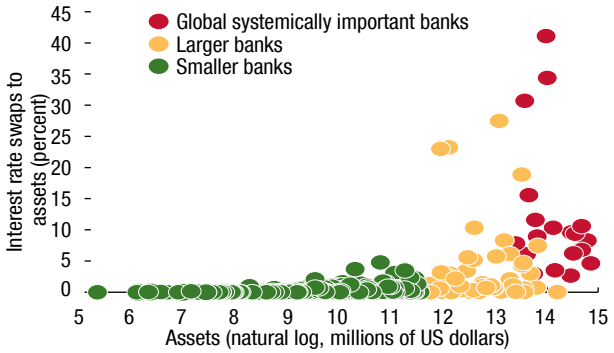
[18]Some banks report loans by maturity interval (less than 3 months, 3–12 months, and so forth). Average maturity is estimated based on the midpoint of each interval and an estimate of average maturity of the final bucket (typically, greater than 5 years).

The econometric analysis discussed earlier confirms that banks operating in a negative rate environment have tended to increase the maturity of their loans, in contrast to their behavior in normal times (Figure 4.6, panel 5). This is consistent with findings in the literature documenting banks expanding their mortgage loan portfolio (Basten and Mariathasan 2018). Finally, though difficult to discern from bank disclosure, studies of credit registers and syndicated loan data suggest that banks may respond to low interest rates by shifting the composition of their loan portfolios toward riskier borrowers (Bottero and others 2019b; Heider, Saidi, and Schepens 2019). However, others have found that the increased origination of riskier syndicated loans by banks is rapidly ceded to nonbank financial intermediaries, thus passing on credit risk to other parts of the financial system (as discussed in Chapter 2 and by Aramonte, Lee, and Stebunovs 2019).

Figure 4.6. Bank Hedging and Risk Taking

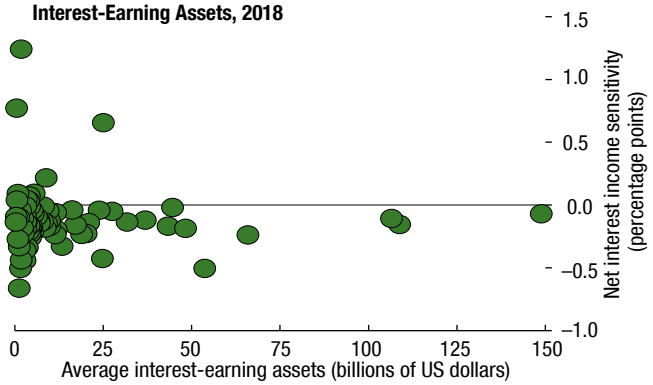
Large banks tend to take larger interest rate swap positions ...

1. Interest Rate Swaps Notional Value Outstanding and Total Assets (End-2018)



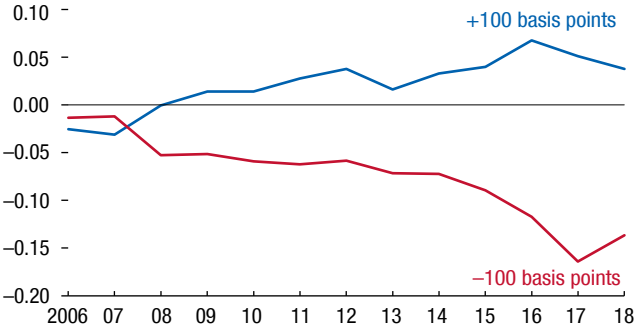
... which probably underlies their lower interest rate risk.

2. United States: Net Interest Income Sensitivity and Average Interest-Earning Assets, 2018



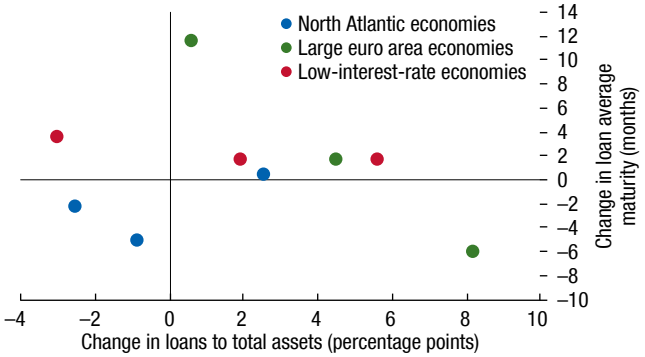
Banks' net interest margins have become more sensitive to changes in policy rates, with risks skewed downward.

3. United States: Median Net Interest Margin Sensitivity to a Change in the Base Rate (Percent)



Banks in most systems have responded by shifting toward loans and, in some cases, increasing loan maturities ...

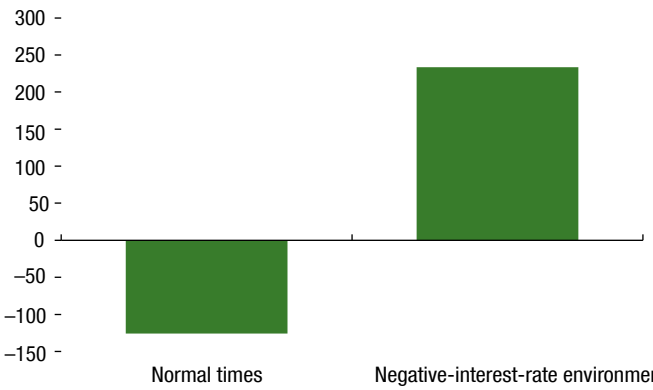
4. Changes in Loans to Assets and in Estimated Average Loan Maturity (2013–18 average)



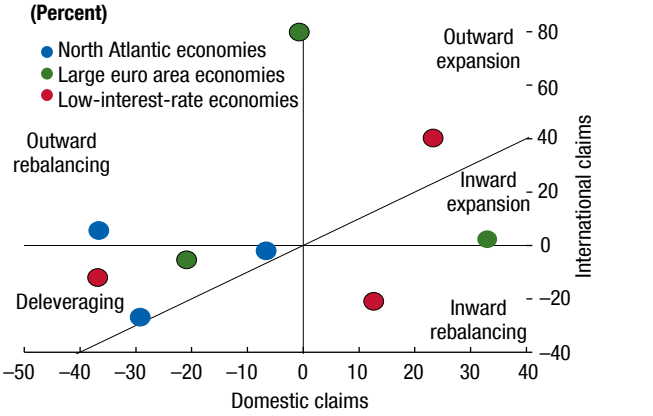
... in contrast to their behavior in more normal positive-rate environments.

Banks have also adjusted their domestic and international loans.

5. Impact of a 100 Basis Point Decline in the Short-Term Rate on the Maturity of Bank Loans (Basis points)



6. Change in Banking Systems' Domestic and International Claims, 2013:Q4–2019:Q4 (Percent)



Sources: Bank for International Settlements; Bloomberg Finance L.P; Fitch Connect; Haver Analytics; S&P Market Intelligence; SNL Financial; and IMF staff calculations.

Note: In panel 1, smaller banks are those with less than $100 billion of total assets. In panels 2 and 3, reported interest rate shocks vary in size. The analysis linearly interpolates net interest income effects to a 100 basis point shock. In panel 4, portfolio maturity is estimated from bank financial reports. This is distinct from the "effective maturity" measure employed in this chapter to gauge banks' net interest margin response to changes in "front-book" rates. Panel 5 shows the impact on the ratio of long-term bank loans to short-term loans for the nine advanced economy banking systems covered in this chapter. In panel 6, domestic claims have been adjusted for movements in local exchange rates against the dollar.

Third, some banks have increased their overseas exposures, potentially raising their currency and liquidity risks.[19] This is most evident in Canada and Japan, though some other banking systems have rebalanced their claims toward foreign lending (Figure 4.6, panel 6). Data from Japan, where individual banks publicly report their overseas exposures, suggest that this tactic is available only to large banks with extensive international subsidiary and branch footprints.

Policy Discussion

The sharp downturn in economic activity resulting from the COVID-19 outbreak will put significant pressure on bank profitability in the near term, as already reflected in banks' equity prices and discussed in Chapter 1. The high levels of capital and liquidity buffers built since the global financial crisis, together with the decisive policy actions taken by policymakers to maintain the flow of credit to households and firms and to sustain the economy, will certainly help banks navigate these challenging times. However, this episode will test banks' resilience. It is thus crucial that policymakers rapidly employ a combination of policies that maintain the balance between preserving financial stability, maintaining the soundness of financial institutions, and supporting economic activity. These include an adequate provision of liquidity by central banks and clear supervisory guidance on the prudent renegotiation of loan terms, the use of the flexibility embedded in existing regulatory frameworks to account for expected credit losses, and the use of existing buffers to absorb costs (see Chapter 1 for a detailed discussion).

Beyond the near term, the findings of this chapter highlight the medium-term profitability challenges that banks will likely face in an environment of persistently low interest rates for years to come. While such difficulties are anticipated to be compounded by increasing competition from fintech and other nonbank financial intermediaries, there are steps that authorities can take to address medium-term bank profitability concerns and ensure an adequate flow of credit to the economy.

Financial sector authorities should incorporate in their decisions and risk assessments the potential impact of the low-interest-rate environment on banks. Supervisory capital planning and stress testing should include lower-for-longer scenarios, and the strength of business models in such an environment should be evaluated. Supervisors should also remain vigilant to prevent an excessive buildup of risks through the arbitrage of existing regulations that could reduce the resilience of the banking sector.

If banks do start taking excessive risks once the current COVID-19 emergency is resolved, macroprudential policy tools should be deployed to address emerging vulnerabilities. For instance, the countercyclical capital buffer could be used in time to enhance the resilience of the banking system as systemic risk builds up during a period of loose financial conditions. Borrower-based measures could also be used to limit rapid growth of mortgage portfolios should banks aggressively shift to these types of loans to sustain margins. For banking systems that expand their foreign operations to enhance profitability, macroprudential authorities could ensure that foreign exposures remain adequately diversified and monitor liquidity mismatches in banks' foreign currency balance sheets (see Chapter 3 of the October 2019 GFSR).

Monetary policy, which has supported economic growth since the onset of the global financial crisis and has been the first line of defense during the COVID-19 pandemic, should remain data dependent and be set to meet central banks' macroeconomic targets. Policy tools helping to offset some of adverse effects of negative interest rates, such as tiering schemes aimed at limiting the application of negative rates to a portion of the banks' reserves held with the central bank, should stay in place while policy rates are negative (see Box 4.2).

In an environment of difficult policy trade-offs and constraints, authorities should also explore actions aimed at removing structural impediments still present in banking systems to support resilient institutions that can provide an adequate flow of credit to the economy. For example, authorities should assess the benefits of domestic and cross-border bank consolidation while also taking steps to ensure adequate competition and addressing potential too-big-to-fail issues. Policymakers at all levels should encourage banks to take a broad range of measures to improve operating efficiencies, including branch reduction where warranted, upgrades of information technology systems, and process outsourcing.

These cost reduction efforts need to be balanced against other important policy concerns, especially in the current environment of heightened uncertainty about the economic outlook. For instance, authorities should ensure broad access to financial services and financial inclusion for households and small- and medium-sized enterprises, technology upgrades should guarantee adequate data protection and privacy, efforts to expand non-fee income should ensure financial consumers are adequately informed and protected, and the potential consequences for local communities and employment should be properly assessed.

[19]For a comprehensive discussion of the link between foreign lending and liquidity risks in foreign currency, see Chapter 5 of the October 2019 GFSR.

Box 4.1. The Experience with Negative Interest Rate Policies

Since 2014 several central banks, mostly in Europe, have set their policy rates below zero for extended periods. Policymakers turned to negative interest rate policies when the room to deliver monetary stimulus by conventional means had been exhausted. In the euro area, Japan, Sweden, and Switzerland, short-term interest rates were already at, or close to, zero. Cyclical headwinds, and, in Switzerland, an overvalued currency, meant that monetary stimulus was needed to support demand and inflation.[1] With persistently low neutral interest rates, central banks had less room to maneuver in positive interest rate territory than in previous cycles.

As with conventional monetary policy, negative rates can be expected to be transmitted to the broader economy through various channels. Lower rates reduce the cost of capital for businesses, raise the attractiveness of current consumption over saving, and strengthen demand for domestically produced goods by weakening the exchange rate. They may also support credit growth by relaxing balance sheet constraints for both borrowers and lenders. These channels remain active when rates fall into mildly negative territory, although their strength may change.

The impact of negative interest rate policies has been most visible in money market rates. Across jurisdictions, they have tracked policy rates closely as the latter moved below zero (Eisenschmidt and Smets 2019). Longer-term yields have fallen too, especially following the initial rounds of cuts that took rates below zero, likely reflecting coincident changes in asset purchase programs and forward guidance (public communication by the central bank about the likely future path of monetary policy and its objectives and intentions).

Deposit rates and lending rates have also fallen. In jurisdictions where central banks have cut interest rates multiple times into negative territory—the euro area and Sweden—these rates have slowly fallen following each round of easing (Figure 4.1.1).[2] The fall in deposit rates has been more pronounced for corporate deposits, which is in line with the notion that, compared to retail depositors, it is costlier for corporate depositors to switch into cash (Committee on the Global Financial System 2019). There is also evidence that these cuts have helped to lower lending rates in the euro area and Switzerland, even if it is difficult to measure their effect because of many confounding factors (for example, the simultaneous announcement of Targeted Longer-Term Refinancing Operations).[3]

The evidence to date on the macroeconomic effects of negative interest rate policies remains sparse. This is partly because it is challenging to separate the effects of negative interest rate policies from those of other concurrent unconventional monetary policy measures. Still, for the euro area, negative interest rate policies seem to have had small but positive effects in inflation and growth (Rostagno and others 2019). In addition, negative interest rate policies may have supported the Japanese economy through the exchange rate channel (Honda and Inoue 2019).

Taken as a whole, the available evidence indicates that negative rates have lowered market rates, supported asset values and credit provision, reduced deposit and lending rates, and therefore likely provided support for growth and inflation. However, there is a limit to how negative rates can go—the effective lower bound. Were rates to become deeply negative, investors could make a wholesale move into cash, bank profits could decline, and the positive impacts observed on bank lending could be reversed (Brunnermeier and Koby 2018).

The author of this box is Roland Meeks.

[1]Denmark operates a currency peg with the euro and introduced negative rates to mitigate upward pressure on the krone.

[2]Deposit rates also adjust sluggishly to changes in policy rates when rates were positive (Andries and Billon 2016).

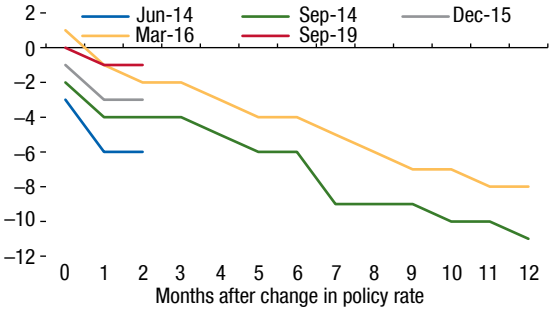
[3]For example, negative interest rate policies have lowered loan rates and gave a boost to lending by Italian and Swiss banks (Bottero and others 2019a, and Basten and Mariathasan 2018, respectively).

Box 4.1 *(continued)*

Figure 4.1.1. Euro Area and Sweden: Change in Bank Interest Rates

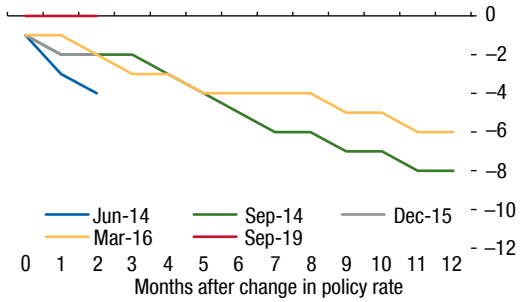
After policy rate cuts, euro area corporate deposit rates have fallen, but pass-through has diminished over time.

1. Euro Area: Change in New Deposit Rates for NFCs (Basis points, following a 10 basis point cut in deposit facility rate)



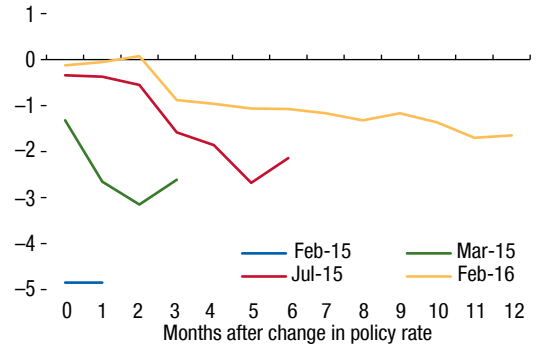
Euro area retail deposit rates have also fallen, but less so.

2. Euro Area: Change in New Deposit Rates for Households (Basis points, following a 10 basis point cut in deposit facility rate)



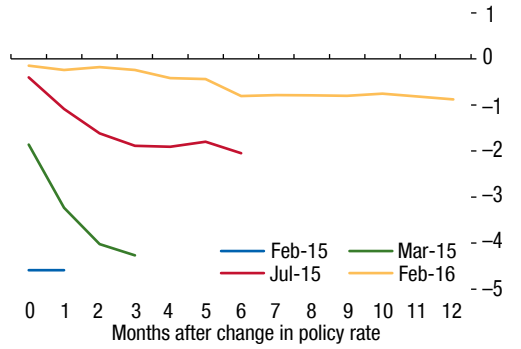
In Sweden, corporate deposit rates have also fallen, with diminishing pass-through ...

3. Sweden: Change in New Deposit Rates for NFCs (Basis points, scaled to a 10 basis point cut in repo rate)



... and Swedish retail deposit rates show the same behavior.

4. Sweden: Change in New Deposit Rates for Households (Basis points, scaled to a 10 basis point cut in repo rate)



Sources: European Central Bank; and IMF staff calculations.
Note: The figure shows the change in new short-term deposit rates for households and corporations up to 12 months following each of the 10 basis point cuts that the European Central Bank has made in its main deposit rate since June 2014 (panels 1 and 2) and the three rate cuts made by the Swedish Riksbank since February 2015 (panels 3 and 4). Shorter lines reflect shorter periods between rate cuts. NFC = nonfinancial corporation; repo = repurchase agreement.

Box 4.2. Experiences with Tiering of Reserve Remuneration

Several central banks have introduced tiered reserve systems to help counter the negative effects of low rates on banks' profitability.[1] Jurisdictions with some form of tiering system include Denmark, the euro area, Japan, Norway, Sweden, and Switzerland (Table 4.2.1).

Tiering delivers two benefits to banks. First, banks are exempted from paying interest (or receiving a less negative rate) on a portion of the reserves they maintain at the central bank. Second, banks have scope to arbitrage the difference between the negative rate and the exempted rate by trading liquidity (possibly across countries).[2]

The introduction of the two-tier system by the European Central Bank at the end of 2019 is estimated to generate total savings for euro area banks of about €4.7 billion per year relative to a counterfactual scenario where tiering is not introduced (Table 4.2.2). In Switzerland, savings from the recent change in tiering introduced in November 2019 are estimated at about $0.7 billion per year. While this helps banks, these savings, equivalent to a few basis points of return on assets, are unlikely to fully offset the impact of low interest rates on profitability.

The author of this box is Juan Solé.

[1]Although deposit tiering is present is various jurisdictions, not all central banks introduced the tiering policy to alleviate the impact of negative rates on bank profitability. For instance, deposit tiering was part of central banks' monetary policy frameworks in Denmark and Norway before the introduction of negative policy rates (Jobst and Lin 2016).

[2]For example, a German bank with excess reserves that is charged the deposit facility rate of –0.50 percent could find an Italian bank with few reserves and offer to pay, say, –0.30 percent to the Italian lender for holding such liquidity. Both lenders would gain: the German by lowering the cost of its deposits, and the Italian by accruing a positive return. The benefits from such activities are estimated to be smaller than those from the introduction of tiering schemes.

Table 4.2.1. Selected Central Bank Deposit Tiering Schemes

Economy	Description	Exemption Threshold	Interest Rate Applied to Nonexempt Reserves (percent)	Date Tiering Implemented	Date Negative Rates Implemented
Euro Area	Bank deposits below the exemption threshold pay no interest. Reserves above the threshold pay the deposit rate.	Six times the minimum reserve requirement.	–0.50	Nov. 2019	Jun. 2014
Japan	Three-tier system at 0.1 percent rate for the basic balance, 0.0 percent rate for the macro add-on balance, and -0.1 percent rate for the policy rate balance.	Amount of reserves charged at the policy rate varies in line with the Bank of Japan's monetary base target.	–0.10	Feb. 2016	Jan. 2016
Switzerland	Negative interest is charged on the portion of banks' sight deposits at the central bank exceeding the exemption threshold.	Twenty-five times the minimum reserve requirement (revised up from 20 times exemption in Nov. 2019).	–0.75	Jan. 2015	Dec. 2014

Sources: National central banks; and IMF staff estimates.

Table 4.2.2. European Central Bank Tiering Scheme: End of 2019

Economy	Minimum Reserve Requirement (MRR)	Bank Deposits with Eurosystem	Exempted Reserves (MRR * Multiple)	Cost Savings for Banks	Impact on Banks' Return on Assets (percentage points)
	(Billions of euro)				
Euro Area	135	1,818	807	**4.0**	0.01
Germany	37	562	224	**1.1**	0.01
France	27	526	160	**0.8**	0.01
Italy	18	102	110	**0.4**	0.01

Sources: European Central Bank; national central banks; and IMF staff estimates.

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CHAPTER 5

CLIMATE CHANGE

PHYSICAL RISK AND EQUITY PRICES

Chapter 5 at a Glance

- The impact of large climatic disasters on equity prices has been modest in the past.
- Climate change physical risk does not appear to be reflected in global equity valuations.
- Beyond climate change mitigation and adaptation, sovereign financial strength and higher insurance penetration help to preserve financial stability.
- Stress testing and climate risk disclosure are essential to better assess physical risk.

The projected increase in the frequency and severity of disasters due to climate change is a potential threat to financial stability. Equity markets are a key segment of the global financial system, provide a data-rich environment, and are sensitive to long-term risks, making them fertile ground for investigating how projected future physical risk affects financial markets and institutions. Looking back over the past 50 years shows a generally modest impact of large disasters on equity markets, bank stocks, and non–life insurance stocks, although country characteristics matter. Higher insurance penetration and greater sovereign financial strength have helped dampen the adverse effects of large disasters on equity markets and financial institutions. While projections of climatic variables and their economic impact are subject to a high degree of uncertainty, aggregate equity valuations as of 2019 do not appear to reflect the predicted changes in physical risk under various climate change scenarios. This suggests that equity investors may not be paying sufficient attention to climate change risks. Beyond policy measures to mitigate and adapt to climate change, actions to enhance insurance penetration and strengthen sovereign financial health will be instrumental in reducing the adverse effects of climatic disasters on financial stability. Moreover, better measurement and disclosure of exposures to climatic disasters are needed to facilitate the pricing of climate-change-related physical risks.

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Introduction

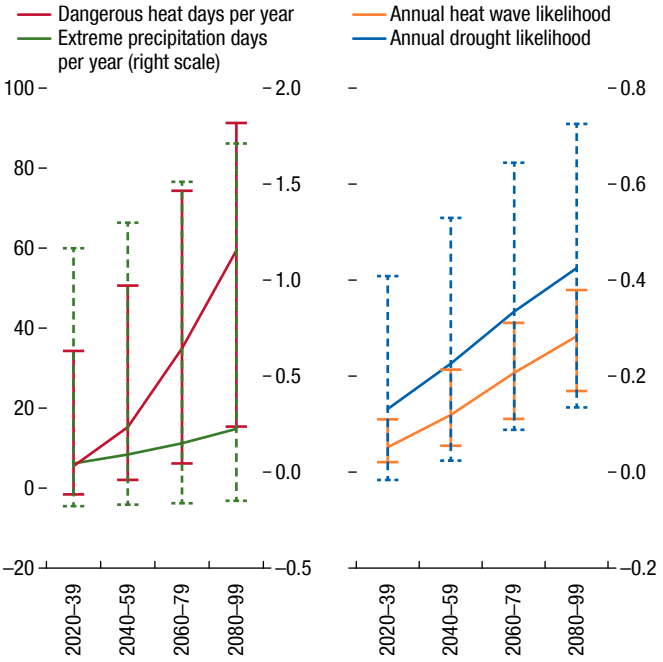
Global temperatures have increased by 1.1 degrees Celsius relative to preindustrial levels, and climate scientists have almost unanimously attributed this change to man-made (anthropogenic) greenhouse gas emissions. The path of global temperatures over the next several decades will depend in large part on mitigation actions that help reduce the amount of emissions. Based on currently stated mitigation policies, future anthropogenic greenhouse gas emissions are predicted to lead to warming of about 3 degrees Celsius by the end of the century (IPCC 2018). Climate change induced by this level of warming is, in turn, expected to adversely impact the world's stock of natural assets, lead to a significant rise in sea level, and increase the frequency and severity of extreme weather events (IPCC 2014 and Online Annex Table 5.1.3). The impact is subject to a significant degree of model uncertainty (Figure 5.1), is likely to vary considerably across economies, and may be nonlinear as a result of thresholds in the climate system beyond which the effects accelerate or become irreversible (DeFries and others 2019).

Extreme weather events—or climatic hazards—can turn into disasters that cause loss of life and capital stock, as well as disruptions to economic activity. As a result, they are a source of so-called physical risk for economic agents. Some climatic hazards have wrecked cities and even entire economies. New Orleans was devastated by Hurricane Katrina in 2005, while Dominica suffered damage amounting to more than twice its GDP when Hurricane Maria struck in 2017. As the frequency and severity of climatic hazards rise,

Figure 5.1. Projected Changes in Climatic Hazards

The size of the future increase in climatic hazard occurrence is large and uncertain.

Sample Economies: Latest Projected Changes in Extreme Weather Events, Relative to 1985–2005
(Various horizons)



Sources: World Bank Group, Climate Change Knowledge Portal; and IMF staff calculations.
Note: The figure shows the equal-weighted average across all sample countries of the median projection—from up to 35 models included in the fifth phase of the Coupled Model Intercomparison Project (CMIP5)—of four climate variables, defined as anomalies relative to historical simulations over the period 1986–2005. The extremities of the vertical bars show the equal-weighted average of the 90th and the 10th percentiles of the projections. Projections are based on the high-emissions scenario Representative Concentration Pathway (RCP) 8.5. See Online Annex 5.1 for the list of sample economies, as well as a definition of the RCP scenarios and the future climate variables.

the resultant socioeconomic losses could be significantly higher than in recent history.

The magnitude of the change in physical risk will depend not only on how future emissions (and therefore mitigation policies) translate into global warming, and on how this warming, in turn, translates into more frequent and more severe climatic hazards, but also on nonclimatic factors—that is, the reactions of economic agents (including governments) to these changes, in particular through adaptation.[1] For example, a study of predicted flood losses in the world's 136 largest coastal cities concluded that global annual average losses would exceed $1 trillion in 2050 in a scenario without adaptation versus only $60 billion in a scenario with adaptation investments that maintain constant flood probabilities despite a higher sea level (Hallegatte and others 2013).

Given the climatic trends, financial stability authorities have become concerned that the financial system may be underprepared to cope with this potentially large increase in physical risk, as well as with the so-called transition risk resulting from policy, technology, legal, and market changes that occur during the move to a low-carbon economy. Transition risks include assets becoming stranded, reputational damage, and financial distress of polluters. The Network for Greening the Financial System, a group of central banks and financial supervisors, has expressed concern that financial risks related to climate change are not fully reflected in asset valuations and has called for integrating these risks into financial stability monitoring (NGFS 2019). In its Financial Sector Assessment Program, the IMF is paying increasing attention to financial stability risks related to climate change and aims to push forward efforts around climate change stress testing across economies (see Box 5.1).

From the perspective of physical risk, climate change can affect financial stability through two main channels (Figure 5.2). First, a climatic hazard can turn into a disaster if it happens in an area where the exposure is large and vulnerability is high.[2] Such a disaster affects households, nonfinancial firms, and the government sector through the loss of physical and human capital, thereby causing economic disruptions that can possibly be significant. Financial sector firms are exposed to these shocks through their underwriting activity (insurers), lending activity (mostly banks), and the portfolio holdings of affected securities (all financial firms). Financial institutions could also be exposed to operational risk (such as in cases in which their structures, systems, and personnel are directly affected by an event) or to liquidity risk (such as if a disaster triggers sizable withdrawal of customer deposits). Insurers play a special role in absorbing shocks. The provision

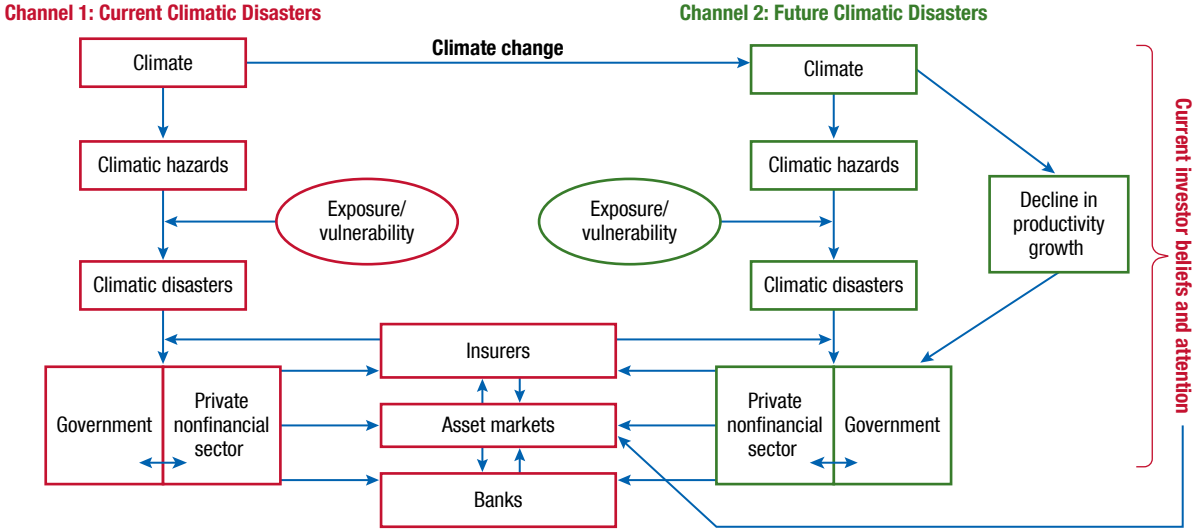
[1]Mitigation addresses the causes of climate change, whereas adaptation addresses the impacts of climate change.

[2]This chapter uses the same terminology as climate change research: exposure is defined as "the presence of people; livelihoods; environmental services and resources; infrastructure; or economic, social, or cultural assets in places that could be adversely affected." Vulnerability is defined as "the propensity or predisposition to be adversely affected" (IPCC 2012). Resilience is the opposite of vulnerability.

Figure 5.2. Climate Change Physical Risk and Financial Stability

The financial sector is exposed to climatic disasters through two channels. First, current climatic disasters affect credit, underwriting, market, operational, and liquidity risks.

Second, the shifts in expectations and attention about future climatic disasters can affect asset values today.



Source: IMF staff.

of insurance concentrates the impact of the shock on the insurance sector and reduces the impact on other economic agents.[3] Governments also generally play an important cushioning role by providing some forms of insurance, as well as relief and support in the aftermath of a disaster. The strain on government balance sheets after a disaster could potentially have financial stability implications given the strong sovereign-bank nexus in many economies.

Second, investors form beliefs about physical risk—the result of a combination of climatic hazards, exposures, and vulnerabilities—as well as insurance coverage (and risk sharing more broadly, including through the government) at various time horizons in the future. Standard asset pricing theory suggests that investors should demand a premium for holding assets exposed to a future increase in physical risk induced by climate change. In other words, these assets should have a lower price compared with assets with similar characteristics but not exposed to this change in physical risk. However, because the nature of the risk is long term, and depends on complex interactions between climate variables and socioeconomic developments that are difficult to model, markets may not price future physical risk correctly, potentially leading to capital misallocation and economic inefficiency. Perhaps more important from a financial stability perspective, a sudden shift in investors' perception of this future risk could lead to a drop in asset values, generating a ripple effect on investor portfolios and financial institutions' balance sheets.[4]

Against this backdrop, this chapter analyzes the financial stability implications of the anticipated increase in the frequency and severity of climatic hazards over the next several decades.[5] To do so, it

[3]Insurers can transfer portions of their risk portfolios to reinsurers. Yet anecdotal evidence suggests that some large disasters had a sizable impact on insurers' solvency. For example, Hurricane Andrew led to the failure of at least 16 US insurers in 1992–93 (III 2020).

[4]As shown in Figure 5.2, the climate economics literature suggests that climate change could lead to a decline in productivity growth, which may also not be reflected adequately in asset prices. Under a scenario of no further mitigation action on climate change, most estimates suggest a loss of global economic output of less than 5 percent in 2050 and 10 percent in 2100 (Kahn and others 2019). While this implies that the average productivity growth decline due to climate change would be small, the historical relationship between temperature and GDP growth may not be an accurate guide to the future in the presence of tipping points in the climate system.

[5]An in-depth exploration of the impact of transition risk is left for future issues of the *Global Financial Stability Report*. For a comprehensive discussion of financial stability risks related to climate change, including transition risk, see Carney (2015); Bank of England Prudential Regulatory Authority (2018); European Central Bank (2019); and NGFS (2019), among others. Chapter 6 of the October 2019 *Global Financial Stability Report* also discusses these risks as part of a broad analysis of sustainable finance.

focuses on equity markets, which play a central role in the financial system and provide a useful avenue to explore the two channels described. This is so because, relative to other financial markets, equity markets provide readily available high-frequency information on investors' perception of the impact of a shock on the future performance of a broad range of financial and nonfinancial firms. Equity markets are thus well suited for an event-study type of analysis to investigate the first channel. Moreover, because equities are perpetual claims on firms' cash flows, their price should reflect the long-term risks facing firms, including those associated with changes in physical risk, allowing an investigation of the second channel.

The chapter focuses on 68 economies with available aggregate stock market data[6] and asks the following key questions: (1) What has been the trend in frequency and severity of climatic disasters in these economies? (2) How have aggregate equity prices, bank equity prices, and insurance equity prices reacted to large climatic disasters in the past? (3) Can better insurance coverage and sovereign financial strength enhance the resilience of equity markets and financial institutions? (4) Acknowledging the informational challenges faced by investors, are climate change risks reflected in equity prices—that is, do equity valuations as of 2019 correlate negatively with the predicted changes in physical risk? (5) Are equity investors paying attention to temperature, a climate variable that—in contrast to future climatic hazards—is not predicted or model-dependent but can actually be observed at high frequency? The sample used in the analysis comprises 34 advanced and 34 emerging market and developing economies and covers the past 50 years. The data sources and econometric methodologies, as well as robustness tests of the key findings, are described in the online annexes.

The chapter's main findings are as follows: Climate change is a source of financial risk for investors that could lead to adverse consequences for financial stability. However, over the past several decades, the reactions of aggregate equity prices, bank equity prices, and insurance equity prices to large climatic disasters have generally been modest, in particular in economies with high rates of insurance penetration and sovereign financial strength. Pricing future climate risks is extremely challenging, given the large uncertainties around climate science projections and the economic cost of predicted hazards. However, current economy-level equity valuations as of 2019 are generally not statistically significantly associated with the currently available proxies of future changes in physical risk. Furthermore, equity investors do not seem to have paid full attention to temperature, which could suggest that they do not pay full attention to climate change either. The analysis implies that, in the current baseline scenario, in which climate change mitigation policies are projected to remain weak globally, domestic financial stability will be best protected if governments preserve or enhance their financial strength, reduce barriers to non–life insurance penetration while ensuring adequate capital in the insurance sector, and encourage adaptation. Soberingly, preserving or enhancing financial strength appears challenging as public debt ratios continue to increase (see Chapter 1). In addition, better measurement and increased disclosure of exposure and vulnerability to climatic hazards would help reduce investors' informational challenges and facilitate risk pricing.

Climatic Disasters—Some Stylized Facts

Climatic hazards range from acute (storms, floods, heat waves, cold waves, wildfires, landslides) to chronic (droughts). Hazards that result in large-scale damage to human life, physical assets, and economic activity are defined as disasters.[7] The transformation of a climatic hazard into a disaster depends not only on the physical magnitude of the hazard (for example, the wind speed during a storm event), but also on the economic exposure of the region where it strikes (especially the value of assets and the population size) and its vulnerability (for example, the quality of buildings and infrastructure and disaster preparedness). Given that disasters are more economically meaningful than hazards, the focus here

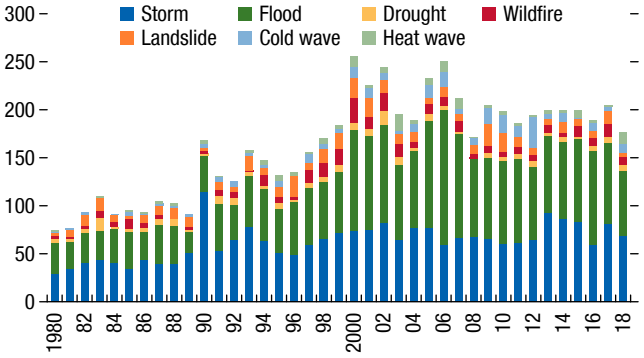
[6]All economies for which aggregate stock market data are available have been included in the sample. These represent about 95 percent of world GDP in 2018. See Online Annex 5.1 for the list of economies. All online annexes and online boxes are available at www.imf.org/en/Publications/GFSR.

[7]Disaster data are sourced from the Emergency Events Database (EM-DAT). Disasters conform to at least one of the following three criteria: 10 or more deaths; 100 or more people affected; the declaration of a state of emergency and/or a call for international assistance. Reported damages from disasters are measured imperfectly and generally cover only direct costs from damages to physical assets, crops, and livestock.

Figure 5.3. Climatic Disasters and Related Damage

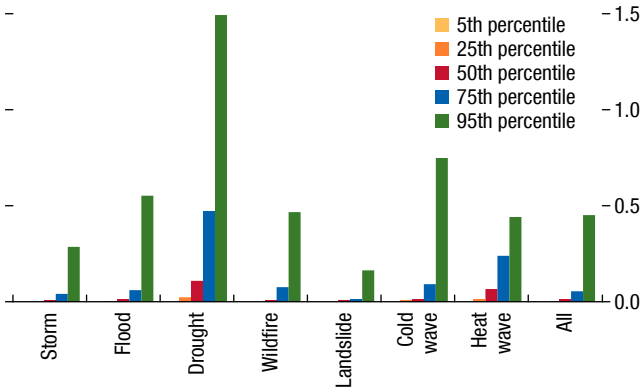
After rising until 2000 the number of climatic disasters has been stable over the past 20 years, with storms and floods accounting for most occurrences.

1. Sample Economies: Annual Number of Climatic Disasters, 1980–2018



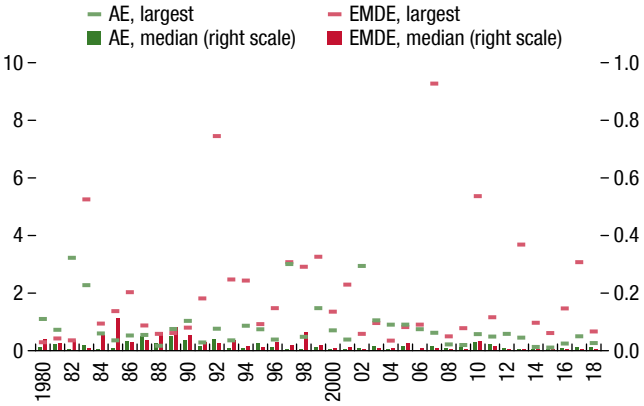
Only large disasters cause sizable damages relative to domestic GDP.

2. Sample Economies: Damages-to-GDP Ratio, by Disaster Type and Percentile of the Distribution, 1980–2018 (Percent)



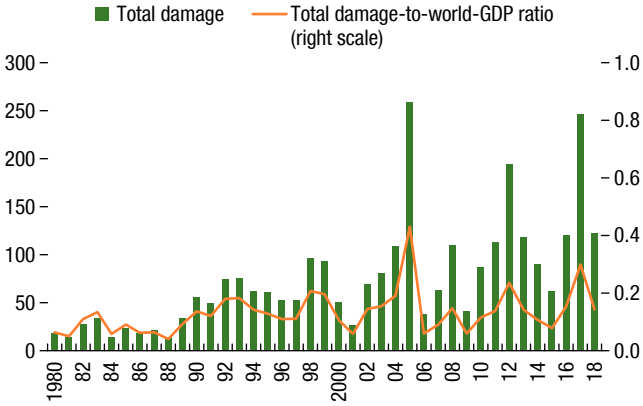
The damage from disasters has been stable over the past 30 years ...

3. Sample Economies: Median and Largest Annual Damage-to-GDP Ratio, 1980–2018 (Percent)



... as have total damages relative to the world GDP.

4. Sample Economies: Total Annual Damages and Total Annual Damages-to-World-GDP Ratio, 1980–2018 (Left scale = 2018 billion US dollars; right scale = percent)



Sources: Emergency Events Database (EM-DAT); IMF, World Economic Outlook database; and IMF staff calculations.
Note: In panels 2–4, ratios are calculated based on nominal GDP in the starting year of the disaster. In panel 4, conversion to 2018 US dollars is based on the US GDP deflator. AE = advanced economy; EMDE = emerging market and developing economy.

is on disasters, especially on large disasters.[8] The sample includes more than 6,000 disasters, about 60 percent of which have occurred in emerging market and developing economies. The annual number of disasters has increased considerably in the past few decades, from slightly more than 50 in the early 1980s to about 200 since 2000, though it has remained stable over the past 20 years (Figure 5.3, panel 1). Floods and storms have been the most frequent climatic disasters, constituting about 80 percent of the sample. While part of the rise in the frequency of disasters may be related to better reporting over time, a large part of it is also due to increased frequency of the occurrence of hazards and increased exposure of assets and people to hazards (IPCC 2012).

In general, emerging market and developing economies have been hit much harder by climatic disasters

[8]The chapter defines a disaster as "large" if the rate of affected population is greater than 0.5 percent or the damage is greater than 0.05 percent of GDP.

than advanced economies, suffering almost twice as much average damage relative to the size of their economies (0.13 percent of GDP compared with 0.07 percent of GDP). The difference is even starker when looking at the 10 largest disasters over 1970–2018: emerging market and developing economies incurred damages in the range of 2.9 percent of GDP to 10.1 percent of GDP versus 1.0 percent of GDP to 3.2 percent of GDP in advanced economies (Online Annex Table 5.1.4). Moreover, the number of people affected by climatic disasters in emerging market and developing economies also tends to be much higher than in advanced economies.

The distribution of the damage-to-GDP ratio is asymmetric and strongly positively skewed (Figure 5.3, panel 2). While the median disaster damage amounts to only a small fraction of GDP (0.01 percent), the largest disasters tend to be costly, with the 95th percentile of the distribution corresponding to damage of about 0.5 percent of GDP.[9] Despite an increase in hazard strength and exposure, the average damage from disasters (including from the largest disasters) in terms of GDP has not increased much over time (Figure 5.3, panel 3). This is consistent with a concomitant reduction in vulnerabilities.[10]

In absolute terms, the total annual average damage from climatic disasters (measured in constant 2018 US dollars) has been increasing in the sample of economies considered here—rising nearly sixfold and surpassing $120 billion in 2010–18 compared with $22 billion in 1980–89. As a share of world GDP, however, it has remained broadly constant at about 0.2 percent over the past 30 years (Figure 5.3, panel 4).

Large Climatic Disasters and Equity Returns

The reported damages reflect the loss of physical capital stock and do not capture the disasters' full impact on economic activity. Overall, large climatic disasters can significantly adversely impact GDP for several quarters, especially in low-income countries, as discussed in the recent literature (Felbermayr and Gröschl 2014).

The adverse impact of large climatic disasters on economic growth prompts the question: Do such events trigger a response in equity markets that could lead to financial stability concerns? The impact on equity prices can inform financial stability assessments for at least two reasons. First, large disasters could expose financial institutions to market risk if they lead to a large drop in equity prices because of widespread destruction of firms' assets and productive capacity or a drop in demand for their products. To this end, the analysis focuses on aggregate stock market indices to capture the systemic impact of disasters on equity prices.[11] Second, the reaction of the stock prices of financial institutions provides a summary measure of the extent to which these institutions are affected by disasters. For banks, for example, disasters are a source of credit risk, market risk, operational risk, and liquidity risk. For insurers, disasters are a source of underwriting risk, market risk, credit risk, and operational risk. (They may also be an opportunity to increase underwriting volumes and premiums, as the demand for insurance is likely to rise following a disaster.)

The analysis indicates that, on average, there has been only a modest response of stock prices to large climatic disasters. The cumulative average abnormal returns (defined as the actual returns minus the returns predicted by a pricing model with a global stock market factor, averaged over disasters) are about −1 percent from 21 trading days before the disaster (to incorporate possible anticipation effects) to 40 trading days after the disaster (Figure 5.4, panel 1). Results, however, vary considerably across disasters. For example, Hurricane Katrina, which resulted in the largest damage in the sample in absolute constant US dollar terms

[9]Some of the largest disasters in the sample have unfolded over a relatively long period of time. An example is the drought in Australia—the costliest disaster in an advanced economy—that started in 1981 and lasted two years. However, most other disasters have been acute and have unfolded over a period of a month or less. In the subsequent analysis, the costs of a disaster are attributed to the year of onset.

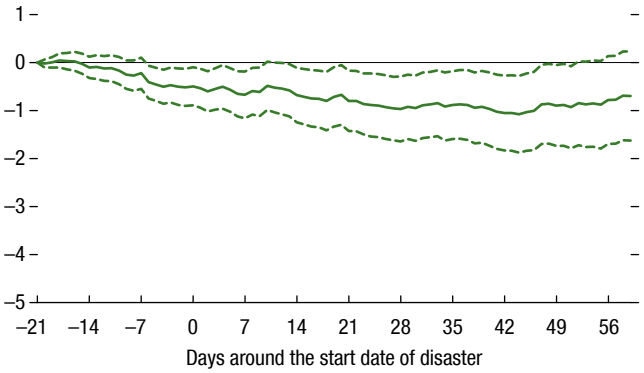
[10]Controlling for hazard size and exposure, the number of deaths from disasters decreases with GDP per capita and institutional quality (Kahn 2005). Some studies find that hurricane damages in the United States have not increased in line with exposure (Estrada, Botzen, and Tol 2015).

[11]Clearly the impact of disasters is highly firm-specific, as it depends on whether a firm's production facilities, suppliers' production facilities, or customers are significantly hit by the disaster (see Barrot and Sauvagnat 2016). Thus, a disaster may have significant consequences for firms listed in an economy where the disaster did not hit. It is also possible that some firms might benefit from the disaster, such as firms in the construction sector. Evidence that climatic events affect individual firms' equity returns has been provided in the literature (see, for example, Griffin, Lont, and Lubberink 2019).

Figure 5.4. Equity Market Returns Immediately before and after Large Climatic Disasters

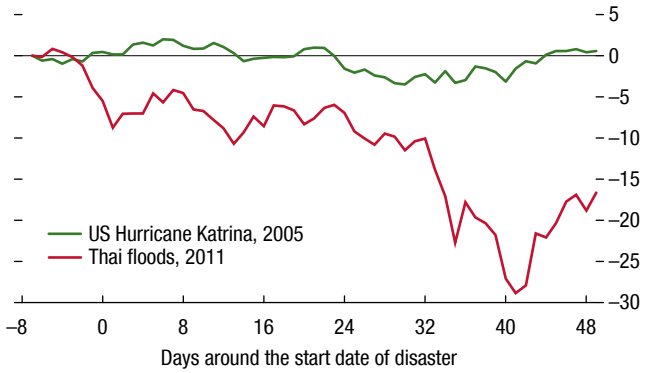
The impact of large climatic disasters on aggregate stock prices has been modest ...

1. Sample Economies: Cumulative Average Abnormal Market Returns around Large Disasters, 90 Percent Confidence Interval (Percent)



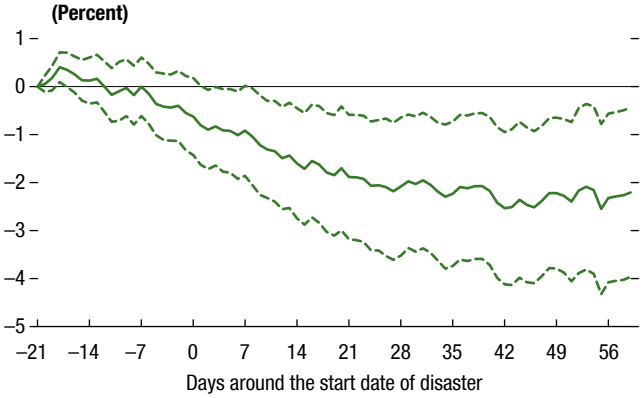
... but varied.

2. Cumulative Market Returns in the United States around Hurricane Katrina (2005) and in Thailand around the 2011 Thai Floods (Percent)



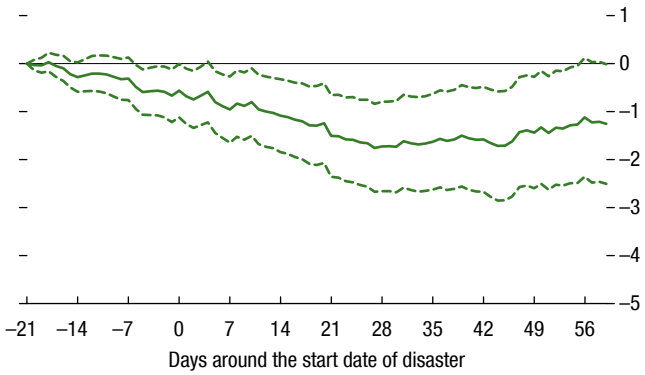
Following a disaster, stock prices of non–life insurers in advanced economies drop modestly ...

3. Sample Advanced Economies, Non–Life Insurance Sector: Cumulative Average Abnormal Returns around Large Disasters, 90 Percent Confidence Interval (Percent)



... as do stock prices of banks in both advanced economies and emerging market and developing economies.

4. Sample Economies, Banking Sector: Cumulative Average Abnormal Returns around Large Disasters, 90 Percent Confidence Interval (Percent)



Sources: Emergency Events Database (EM-DAT); Refinitiv Datastream; and IMF staff calculations.
Note: In panels 1, 3, and 4, all large disasters with a precise start date are included in the analysis. The *x*-axis represents trading days surrounding the events. Time 0 is the start day of the events. Cumulative average abnormal returns are relative to 21 trading days before the start day to incorporate any potential anticipation effects of disasters. Dashed lines represent the 90 percent confidence intervals. Abnormal returns are computed based on estimates from a one-factor model (global factor) using daily returns of one year before the disaster. Panel 2 plots the cumulative returns of the aggregate stock market for the United States during the days before and after Hurricane Katrina in 2005 and for the floods in Thailand in 2011.

(about 1 percent of US GDP, nearly 2,000 lives lost, and half a million people affected), triggered only a modest stock market reaction, with no discernible drop in the US stock market index (Figure 5.4, panel 2). By contrast, the 2011 floods in Thailand, which resulted in the largest damage in the sample relative to the size of the economy (amounting to 10.1 percent of GDP, 813 deaths, and 9.5 million affected people), resulted in a drop in the Thai stock market index of more than 8 percent soon after the onset of the disaster and a cumulative drop of about 30 percent after 40 trading days (Figure 5.4, panel 2).[12]

Among financial sector firms, large disasters have a statistically significant effect on the returns of non–life

[12]It is worth noting that the floods in Thailand caused repercussions not only for firms listed in Thailand, but also for foreign firms with supply chains depending on businesses located in the affected areas.

insurers in advanced economies: the cumulative average abnormal returns trend down for about 50 trading days after a large disaster and reach a trough of about −2 percent (Figure 5.4, panel 3). In emerging market and developing economies, however, there is no significant reaction of insurers' stock prices. What can explain these different outcomes? Such a difference could arise for several potential reasons, such as if a large share of insurance in emerging market and developing economies is provided by subsidiaries of insurers listed abroad; if insurers listed domestically do not or barely cover climatic disasters; or if insurers reinsure a large share of their exposures to climatic disasters. In fact, the stocks of global reinsurance companies react negatively to disasters happening in both advanced economies and emerging market and developing economies (Online Annex 5.2). For banks in both groups of economies, there is a small negative contemporaneous stock market reaction. Cumulative average abnormal returns of banks reach a trough of about −1.5 percent 25 trading days after the onset of a disaster (Figure 5.4, panel 4).[13,14]

The Role of Insurance Penetration and Sovereign Financial Strength in Cushioning the Equity Market Effects of Climatic Disasters

The United Nations Sendai Framework for Disaster Risk Reduction emphasizes several economy-wide characteristics that matter for resilience in the face of disasters (UNDRR 2015).[15] The academic literature also finds that economy-level institutional strength and financial development level can help mitigate the impact of disasters on GDP growth (Melecky and Raddatz 2011; Felbermayr and Gröschl 2014; Hsiang and Jina 2014).

This chapter focuses on the effect of two key economy-wide characteristics that can increase resilience: insurance penetration and sovereign financial strength. Risk-sharing mechanisms offered by financial markets, such as insurance, weather derivatives, and catastrophe bonds, reduce the losses incurred by nonfinancial sector firms (as well as some financial firms) in times of disasters and thus can be expected to limit the impact on equity prices (see Online Box 5.1 for a discussion of catastrophe bonds).[16] Yet economies vary widely in insurance penetration, measured by the ratio of non–life insurance premiums to GDP, with the ratio ranging from 0 to 5 (Figure 5.5, panel 1). The variation in protection gap (share of uninsured losses) with respect to climatic disasters is also large, as shown in Figure 5.5, panel 2. Even in advanced economies, only two-thirds of losses related to climate disasters are covered by insurance. A sovereign's financial strength is also likely to matter because it affects both the ability of the government to respond to disasters through financial relief and reconstruction efforts and its capacity to offer some forms of explicit insurance programs.

Consistent with such expectations, econometric analysis confirms that a higher rate of insurance penetration and greater sovereign financial strength (proxied by sovereign credit rating) dampen the impact of a large disaster on equity returns. Specifically, focusing on the impact of these two characteristics on cumulative abnormal returns 40 trading days after disaster onset for the aggregate stock market, as well as for the banking, non–life insurance, and industrial sectors, the results show a generally statistically significant association between greater insurance penetration and higher returns in the immediate aftermath of a disaster. Perhaps unsurprisingly, the effects are quantitatively larger and statistically stronger when looking at the left tail of the equity return distribution—that is, on disasters with the largest negative impact on returns.[17] A 1 percentage point increase in non–life insurance penetration improves banking and industrial sector returns by about 1.5 percentage points on average. In the left tail—that is, when returns are particularly low—the improvement is about 3–4 percentage points (Figure 5.6, panel 1). Similarly, sovereign

[13]Klomp (2014) finds that disasters have an adverse impact on bank soundness in emerging market economies.

[14]US banks reported only $1.3 billion in loan impairment charges due to Hurricane Katrina and Hurricane Rita (Bauerlein 2005), while insured losses amounted to more than $50 billion.

[15]The framework emphasizes (1) understanding disaster risk; (2) strengthening disaster risk governance to manage disaster risk; (3) investing in disaster risk reduction for resilience; and (4) enhancing disaster preparedness for effective response and to "build back better" in recovery, rehabilitation, and reconstruction. https://www.undrr.org/implementing-sendai-framework/what-sf.

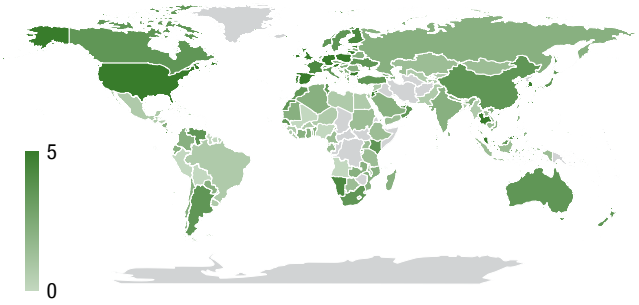
[16]Financial risk-sharing solutions have evolved in reaction to the occurrence of large disasters. For example, catastrophe bonds were created and first used in the aftermath of Hurricane Andrew in the mid-1990s. Hurricane Andrew also revealed that Florida's vulnerability to hurricanes had been seriously underestimated, leading to large changes in the US property insurance market and US insurers' risk-management practices (McChristian 2012). Looking ahead, further financial developments along these lines could help contain the macro-financial impact of disasters.

[17]The analysis controls for the damage-to-GDP ratio.

Figure 5.5. Insurance Penetration and the Protection Gap

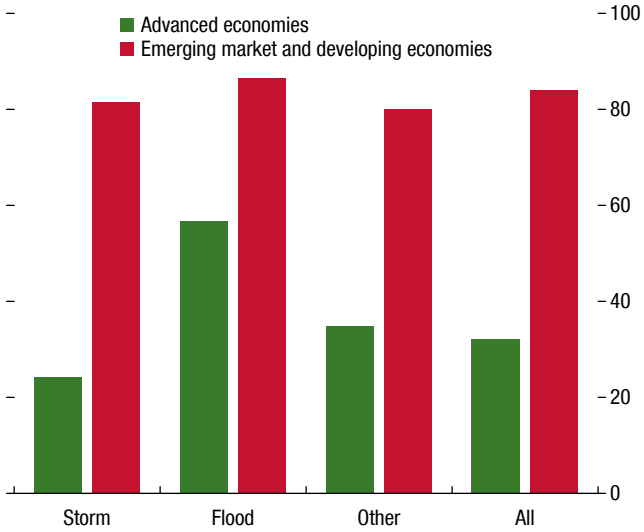
Non–life insurance penetration varies considerably across economies ...

1. Insurance Penetration
(Non–life insurance premium, percent of GDP, 2017)



... and the protection gap for climatic disasters is large, particularly in emerging market and developing economies.

2. Protection Gap, 2009–18 Average
(Percent)



Sources: Emergency Events Database (EM-DAT); World Bank; and IMF staff calculations.
Note: Insurance penetration is defined as the ratio of the non–life insurance premium volume to GDP. Protection gap is defined as the share of uninsured losses from disasters.

financial strength has a positive and generally statistically significant impact on returns. A one-notch improvement in sovereign rating (on a scale of 1 to 21) boosts aggregate market returns by 0.2 percentage point, and banking and industrial sector returns by 0.3 percentage point on average. When returns are low, the improvement is about 0.6–1.0 percentage point for the aggregate market and these two sectors, and 1.6 percentage points for the non–life insurance sector (Figure 5.6, panel 2).[18] These effects are large relative to the size of cumulative average abnormal returns around disasters (between 1 percent and 2 percent, as discussed above).

As mentioned in the introduction, climate scientists have warned that some climatic hazards will become more frequent and severe in the future (IPCC 2014). Even though much progress has been made toward a better understanding of these hazards, substantial uncertainties remain, especially over long time horizons. The results presented in this section indicate that regardless of the size of future climatic shocks, insurance coverage and sovereign financial strength will be key factors in maintaining financial stability.[19]

Equity Pricing of Future Climate Change Physical Risk

With climate change predicted to increase physical risk, financial market participants appear to have started to place a greater focus on physical risk as a potential source of financial vulnerability (BlackRock 2019; IIF 2019; McKinsey 2020; Moody's Analytics 2019). Still, only a very small proportion of global stocks are held by sustainable funds (Figure 5.7), which are likely to pay greater attention to climate risk and tend to have a more long-term view.[20] A 2018 survey of institutional investors found that beliefs in

[18]The correlation between insurance penetration and sovereign financial strength is high. When the two characteristics are considered jointly in the analysis, the effect of sovereign financial strength appears more robust.

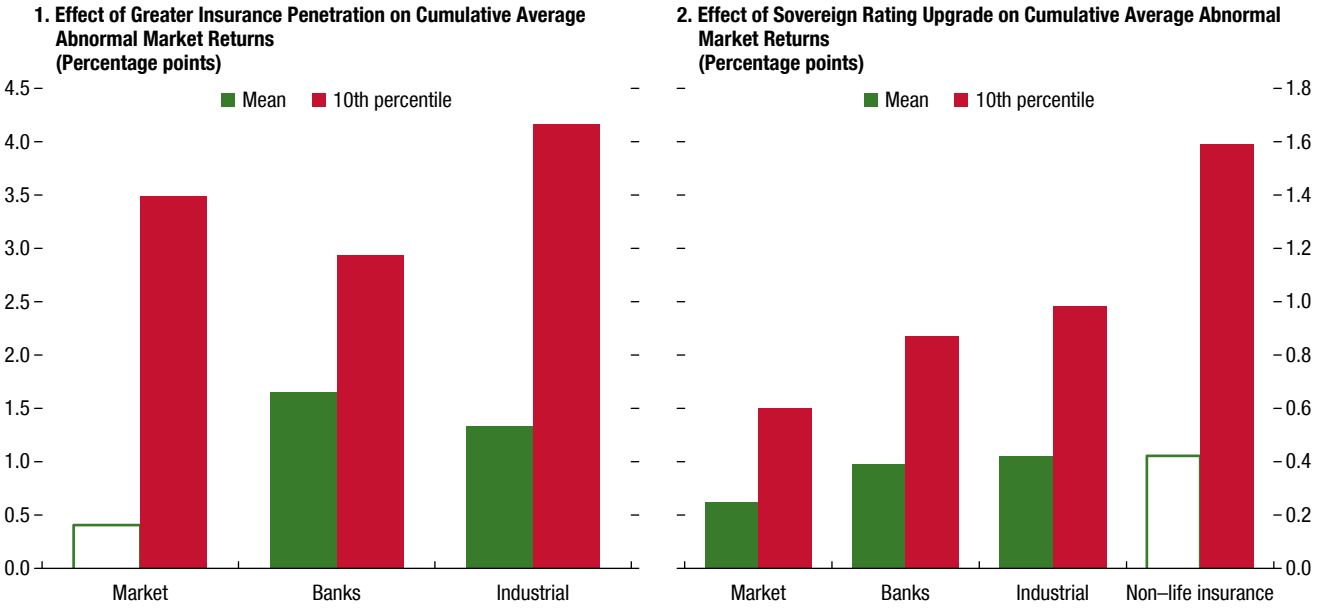
[19]The effectiveness of insurance as a mechanism to share risk in the financial system may be reduced if future climatic disasters become increasingly pervasive and correlated.

[20]There is no single definition of what constitutes a sustainable fund. This chapter relies on the Morningstar classification of sustainable funds.

Figure 5.6. The Effect of Insurance Penetration and Sovereign Financial Strength on Equity Market Performance Immediately before and after Large Disasters

Greater insurance penetration cushions the negative impact of large disasters on equities and banks, especially when the impact is large ...

... as does greater sovereign financial strength.



Sources: Emergency Events Database (EM-DAT); Refinitiv Datastream; World Bank; and IMF staff estimates.
Note: Panel 1 shows the impact of increasing the non–life insurance premium-to-GDP ratio by 1 percent on the cumulative average abnormal returns (CAAR) (mean and 10th percentile of the distribution) 40 trading days after large climatic disasters relative to 20 trading days before disasters. Panel 2 shows the impact of increasing the sovereign rating by one notch (on a scale of 1 to 21) on the cumulative abnormal returns (mean and 10th percentile) 40 trading days after large climatic disasters relative to 20 trading days before disasters. CAARs are computed at the sector level based on a single global factor model using daily returns in the year preceding each disaster. In both panels, solid bars indicate significance at the 10 percent level or less.

the lack of financial materiality of physical risk were more pronounced among short- and medium-term investors, while investors with a larger share of sustainable funds ranked climate risk higher in terms of its overall relevance for performance (Krueger, Sautner, and Starks 2019).

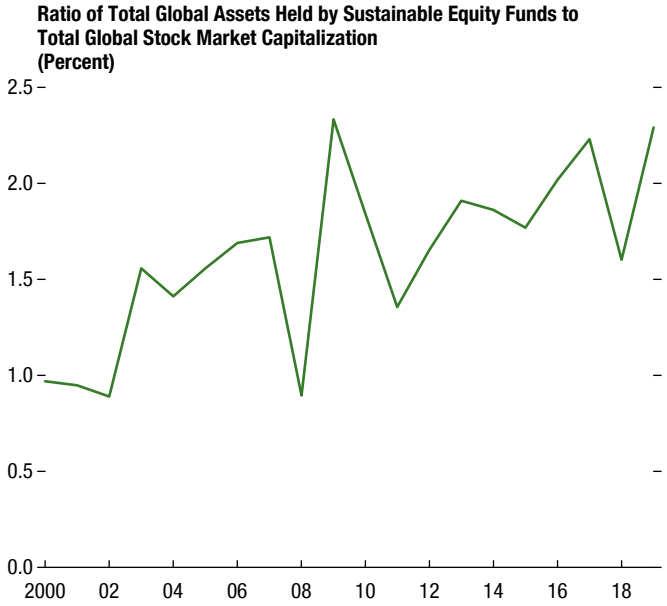
Equity investors face a daunting informational challenge in pricing the anticipated increase in physical risk into equity portfolios. Based on climate science, expected climate change mitigation policies, and adaptation actions, they need to form views on the likelihood of various climate scenarios and their implications for physical risk across the world.[21] For each firm, they then need to form a granular view on the future location of its production sites, supply chain and suppliers' location, and geographic distribution of customers under these climate risk scenarios. In addition, even if investors had the ability to correctly price the change in physical risk, the time horizon over which this change is likely to unfold may be longer than the investment horizon of most investors, including institutional investors.

To test whether climate change is a risk factor priced into equities, the standard empirical asset pricing approach would require a time-varying measure of future physical risk. Given the difficulties in precisely measuring future physical risk—after all, even insurance companies rarely offer contracts over multiple years, and catastrophe bonds have a maximum maturity of only five years—and the scarcity of firm disclosures regarding their exposure to physical risk (both present and future), it is hardly surprising that empirical evidence on whether the valuation of equities (or other types of financial assets) today reflects future physical risk is scant.

[21]Barnett, Brock, and Hansen (2020) distinguish among three forms of uncertainty: (1) risk—what probabilities does a specific model assign to events in the future? (2) ambiguity—how much confidence is placed in each model? and (3) misspecification—how are models that are not perfect used?

Figure 5.7. Growth in the Sustainable Equity Fund Market

The share of assets under management by sustainable equity funds relative to the overall market capitalization has been increasing but remains small.



Sources: Morningstar; Refinitiv Datastream; and IMF staff calculations.
Note: The figure shows global assets under management by sustainable funds as classified by Morningstar.

An alternative, albeit more complicated, approach would be to develop a comprehensive asset pricing model that takes into account the projected impact of climate change on each economy and to compare the model-implied equity risk premium—defined as the financial compensation above the risk-free rate an equity investor should require to hold equity risk—with the market-implied equity risk premium.[22] A stylized version of such a model is presented in Online Box 5.2. It suggests that market-implied equity risk premiums as observed in 2019 are in line with those obtained in a scenario with no further warming (possibly implying that climate risk is not being factored in). Moreover, it shows that the premiums in a no-further-warming scenario are significantly smaller than those obtained under a high-warming scenario, suggesting that equity valuations should be lower if the high-warming scenario were to materialize.

[22]Asset pricing models that incorporate climate-related disasters imply risk premiums that are positive and increasing over time due to climate change (Bansal, Kiku, and Ochoa 2019; Karydas and Xepapadeas 2019).

In the absence of granular firm-level information and time-varying measures of future physical risk, the approach here is to use simple cross-country econometric analysis to determine whether aggregate equity valuations as of 2019—captured by the price-to-earnings ratio of the stock market index—are sensitive to current proxies for future changes in physical risk under various climate change scenarios.[23] All else equal, economies where these changes are predicted to be smaller would be expected to have higher valuations if future physical risk were financially material and markets were pricing it correctly.[24]

To conduct the analysis, economy-specific projections of hazard occurrence from the World Bank Climate Change Knowledge Portal are used. These projections, each corresponding to the changes between 1986–2005 and 2020–39, cover the number of extreme heat days, drought likelihood, heat wave likelihood, and the number of extreme precipitation days. Each projection is available for the four emission scenarios presented by the Intergovernmental Panel on Climate Change (labeled RCP 2.6, RCP 4.5, RCP 6.0, and RCP 8.5, in which a higher number is associated with higher emissions over multiple time horizons). In addition, measures of projected sea level rise by 2100, and a Climate Change Hazard Index capturing several climate hazards, both current and future (under RCP 8.5), are used.[25]

Overall, there is no evidence to suggest that equity valuations in 2019 were negatively associated with these projected changes in hazard occurrence.[26] This can be seen in a simple scatter plot of the composite Climate Change Hazard Index and price-to-earnings ratios (Figure 5.8, panel 1) as well as the association between predicted changes in hazard occurrence and price-to-earnings ratios based on econometric analysis. The association is in fact

[23]Findings are similar when equity valuations are measured by price-to-book ratios or dividend yields.

[24]The econometric analysis always controls for three financial variables: mean annual growth rate of earnings per share, standard deviation of annual growth of earnings per share, and the three-month Treasury bill rate.

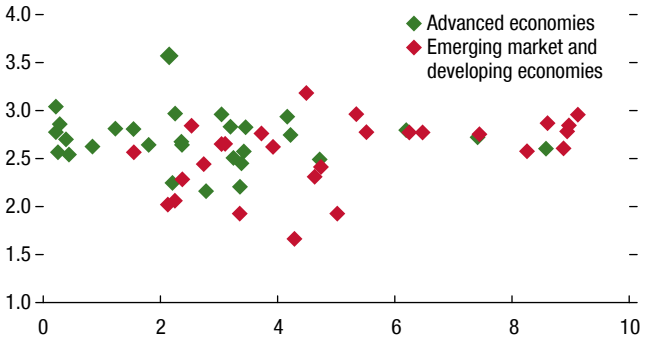
[25]The Climate Change Hazard Index assesses the degree to which economies are exposed to the physical impacts of climate extremes and future changes in climate over the subsequent three decades. The Climate Change Physical Risk Index captures not only hazard risk but also exposure and vulnerability.

[26]See Online Annex 5.3 for a description of the econometric methodology and additional robustness tests.

Figure 5.8. Climate Change Physical Risk and Equity Valuations

There is no association between measures of predicted changes in climatic hazard occurrence and equity valuations ...

1. Price-to-Earnings Ratio (in logs; *y*-axis) and Climate Change Hazard Index (*x*-axis)



... even when controlling for fundamentals.

2. Sign of Coefficients from Regressions of Price-to-Earnings Ratio on Indicators of Predicted Changes in Climatic Hazard Occurrence (Various climate change scenarios)

Sign consistent with the pricing of climate change physical risk, but the coefficient is not statistically significant

	RCP 2.6	RCP 4.5	RCP 6.0	RCP 8.5
Δ Extreme heat exposure	+	+	+	+
Δ Extreme precipitation	+	+	+	+
Δ Drought likelihood	–	–	–	–
Δ Heat wave likelihood	+	+	+	+
Sea level rise index				+
Climate change hazard index				+

A greater projected increase in hazard risk combined with a greater sensitivity to climate change is not associated with lower valuations ...

3. Sign of Coefficients from Regressions of Price-to-Earnings Ratio on the Interaction Term between Predicted Changes in Climatic Hazard Occurrence and Climate Change Sensitivity Index (Various climate change scenarios)

Sign consistent with the pricing of climate change physical risk, but the coefficient is not statistically significant

	RCP 2.6	RCP 4.5	RCP 6.0	RCP 8.5
Δ Extreme heat exposure × climate change sensitivity	–	–	–	+
Δ Extreme precipitation × climate change sensitivity	+	–	–	–
Δ Drought likelihood × climate change sensitivity	+	+	–	+
Δ Heat wave likelihood × climate change sensitivity	+	+	+	+
Sea level rise index × climate change sensitivity				–
Climate change hazard index × climate change sensitivity				+

... neither is a greater projected increase in hazard risk combined with a lower capacity to adapt to climate change.

4. Sign of Coefficients from Regressions of Price-to-Earnings Ratio on the Interaction Term between Predicted Changes in Climatic Hazard Occurrence and Climate Change Adaptive Capacity Index (Various climate change scenarios)

Sign consistent with the pricing of climate change physical risk, but the coefficient is not statistically significant

	RCP 2.6	RCP 4.5	RCP 6.0	RCP 8.5
Δ Extreme heat exposure × adaptive capacity	+	–	–	–
Δ Extreme precipitation × adaptive capacity	–	–	+	–
Δ Drought likelihood × adaptive capacity	+	–	–	+
Δ Heat wave likelihood × adaptive capacity	–	–	–	–
Sea level rise index × adaptive capacity				+
Climate change hazard index × adaptive capacity				–

Sources: Refinitiv Datastream; Verisk Maplecroft; World Bank Group, Climate Change Knowledge Portal; and IMF staff calculations.
Note: In panel 1, the index ranges from 0 to 10. Panels 2–4 show the coefficients from cross-sectional regressions of the price-to-earnings ratio on climate change physical risk indicators. Each regression controls for expected future earnings, the equity risk premium, and interest rates. Representative Concentration Pathway (RCP) 2.6, RCP 4.5, RCP 6.0, and RCP 8.5 are International Panel on Climate Change (IPCC) emission scenarios, in which a higher number is associated with a higher level of emissions. Extreme heat exposure, extreme precipitation, drought likelihood, and heat wave likelihood are projections for the horizon 2020–39. The sea level rise index is based on projections for the year 2100 under RCP 8.5. The Climate Change Hazard Index is based on projections up to 2050 under RCP 8.5. None of the coefficients in panels 2–4 is significant and has a sign consistent with pricing of climate change physical risk.

positive—the opposite of what would be expected were hazards priced into equity valuations—across five of the six types of hazard measures, regardless of the climate change scenario considered (Figure 5.8, panel 2). The association is negative only for the change in drought likelihood but is not statistically significant.

However, looking simply at predicted changes in hazard occurrence may be misleading. As explained, physical risk is the result of an interaction among climatic hazard, exposure, and vulnerability. To proxy for the combination of exposure and vulnerability, the analysis relies on two readily available indicators: a Climate Change Sensitivity Index and a Climate Change

Adaptive Capacity Index.[27] A higher value of the Sensitivity Index would be expected to amplify the adverse effects of climatic hazards, resulting in greater physical risk, while a higher value of the Adaptive Capacity Index would be expected to dampen them, resulting in lower physical risk. If equity valuations were responsive to predicted changes in physical risk, one would expect to find a negative association between valuations and the interaction between hazards and the Sensitivity Index, and a positive association between valuations and the interaction between hazards and the Adaptive Capacity Index. No such associations are found when conducting a similar econometric exercise as above—reinforcing the earlier results that climate change physical risk is not being factored into equity valuations. For the Sensitivity Index, the association is generally positive and is not statistically significant when it is negative (Figure 5.8, panel 3). The opposite is true for the Adaptive Capacity Index, regardless of the climate change scenario envisaged (Figure 5.8, panel 4).

There is a further twist. The preceding analysis of the reaction of equity prices to large climatic disasters concludes that insurance penetration and sovereign financial strength cushion equity markets from the adverse effects of disasters. This suggests that the analysis of equity valuations as of 2019 should consider these two characteristics. Yet results are equally inconclusive when the exercise is augmented with an interaction between proxies of changes in physical risks and any of the two characteristics.

Overall, notwithstanding data and measurement limitations, the evidence in this section does not indicate that equity investors are pricing climate change physical risk.[28] By contrast, there is some evidence for the pricing of climate change physical risk in other asset classes. In the United States, counties projected to be adversely affected by rising sea level face higher costs when issuing long-term municipal bonds (Painter 2020). Similarly, Online Box 5.3 documents that sovereigns facing a greater projected change in physical risk—at least for some available proxies—pay higher spreads for long-term bonds relative to short-term bonds, all else equal.[29] One reason for this apparent difference in pricing of climate change risk between equity and bond investors might be that there is a closer geographic match between the climatic disasters and issuers' assets and sources of income in the case of sovereigns than in the case of listed firms, reducing the informational challenge that investors face.[30] Investors' investment horizon may play a role as well. Another reason could be that equity investors expect governments to bear a greater share of the costs of future climatic disasters than listed firms. In addition, it remains a possibility that long-term government bond investors discount less and pay more attention to long-term risks than equity investors.

Equity Investors' Attention to the Effect of Temperature on Pricing

Another, more indirect way to assess whether equity investors have been paying attention to climate change is to focus the analysis on temperature, a climate variable that is observable at high frequency and does not suffer from the same measurement challenges as climate change variables. This section builds on Kumar, Xin, and Zhang (2019), which documents a temperature-related pricing anomaly by showing that returns of a portfolio of US firms with a high sensitivity to temperature underperform relative to other stocks, after controlling for standard equity pricing factors. The discussion here extends that study's analysis to a sample of 27 economies over 1998–2017.[31] A firm's temperature sensitivity is defined as the absolute value of the "temperature beta," which captures how firms' stock return

[27]The Climate Change Sensitivity Index assesses the human population's susceptibility to the impacts of extreme climate-related events and projected climate change. The Climate Change Adaptive Capacity Index assesses the current ability of a country's institutions, economy, and society to adjust to, or take advantage of, existing or anticipated stresses resulting from climate change. See Online Annex 5.1 for details.

[28]It may be that climate change physical risk is heavily discounted by equity investors because of its long-term nature. Bolton and Kacperczyk (2019) provide evidence that equity investors demand a premium for transition risk, elements of which are arguably easier to model, and which could materialize at a shorter horizon than physical risk.

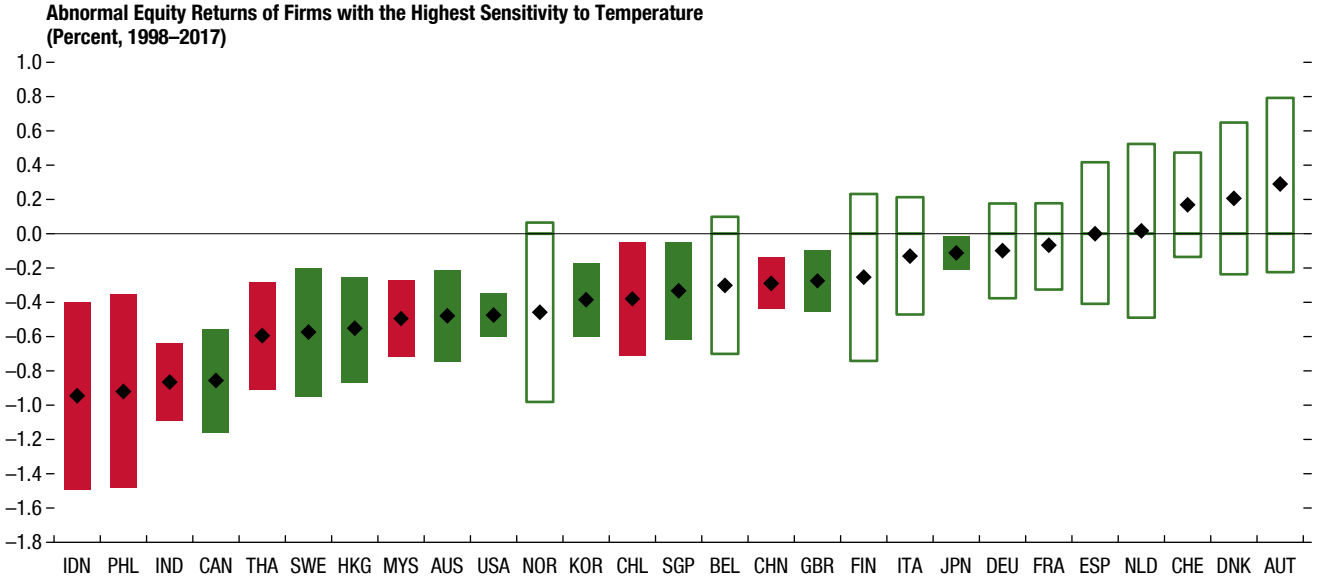
[29]There is no consensus in the literature as to whether real estate markets price climate change physical risk. Bernstein, Gustafson, and Lewis (2019) and Baldauf, Garlappi, and Yannelis (2020) find that coastal homes vulnerable to sea level rise are priced at a discount relative to similar homes at higher elevations, but Murfin and Spiegel (2020) find no such effect.

[30]Firms' location of listing, production facilities, customers, and supply chains can be in multiple economies.

[31]The multifactor equity pricing model is known as the Fama-French three-factor model. See Online Annex 5.4 for methodological details.

Figure 5.9. Equities' Temperature Sensitivity

In many countries, stocks with the highest sensitivity to temperature earn lower returns than the others, after controlling for standard risk factors, suggesting mispricing, and lack of attention to temperature-related variables.



Sources: Refinitiv Datastream; and IMF staff calculations.
Note: Black diamonds show the difference in stock return performance between firms with high temperature sensitivity (top quintile) and all other firms. Red (emerging market and developing economies) and green (advanced economies) bars show the 90 percent confidence intervals of the differences. Solid bars indicate significance at the 10 percent level or less. Data labels use International Organization for Standardization (ISO) country codes. See Online Annex 5.4 for a definition of temperature sensitivity.

comoves with temperature extremes.[32] A finding that these risk-adjusted returns are different from zero—in other words that a portfolio of firms with high temperature sensitivities would generate returns that cannot be explained by a standard asset pricing model—can be interpreted as a violation of the efficient market hypothesis.

The analysis not only confirms the findings in Kumar, Xin, and Zhang (2019) for the United States, but also documents a similar temperature-related pricing anomaly in more than half of the economies considered (Figure 5.9). In 10 of the economies, a portfolio composed of the top 20 percent of stocks most sensitive to temperature underperformed by at least 0.5 percent a month, on average, over the sample period, controlling for standard risk factors. The presence of such a pricing anomaly indicates that equity investors in most economies have not paid enough attention to climate variables and suggests that they may not be paying sufficient attention to climate change risk either.[33]

Conclusion and Policy Recommendations

Climate change is a source of physical and transition risks for the financial sector and could have significant implications for financial stability. Pricing the impact of future climatic hazards into asset prices is a challenging task because it requires an understanding of the future behavior of climatic and nonclimatic variables, which are both subject to a large degree of uncertainty. Focusing on climate change physical risk, the analysis and evidence provided in this chapter suggest that the aggregate equity valuations as of 2019 did not reflect this risk; thus, equity investors may be paying insufficient attention to climate variables.

[32]More specifically, the analysis measures the comovement with the so-called temperature anomaly, defined as the difference between the temperature in a given month and the average temperature over the preceding 30 years in the same month. By taking the absolute value, the pricing of firms with both high and low sensitivities is considered. The sensitivity is measured over rolling windows of 60 months.

[33]The chapter's finding echoes that of Hong, Li, and Xu (2019), which documents global stock markets' underpricing of drought risk in the food sector. Bansal, Kiku, and Ochoa (2019), however argues that there is a pricing factor related to temperature that is priced.

The chapter documents that the reaction of equity prices to large climatic disasters has been modest over the past 50 years. However, country characteristics matter. Insurance penetration and sovereign financial strength can lessen the impact of climatic disasters on equity prices, including of the financial sector. These findings imply that, regardless of the magnitude of future climatic hazards, financial stability will be better preserved in economies that score well along these dimensions[34]:

- Non–life insurance is a source of financial resilience because it increases economies' ability to recover from disasters. Yet the protection gap (the share of uninsured losses) remains significant, especially in emerging market and developing economies. For private insurance markets to thrive, a sound legal and regulatory system is essential. Policymakers may also consider mandating coverage for climatic disaster risks for some assets (such as those used as loan collateral), subsidizing climatic disaster insurance, or enabling insurer-of-last-resort solutions where economic agents have difficulty obtaining insurance. Awareness of the benefits of insurance could be encouraged by increasing financial and risk literacy. Other protection gap challenges related to lack of information and expertise in modeling underinsured areas or types of risk can be addressed through the establishment of risk-sharing arrangements between the public and private sectors, such as Protection Gap Entities.[35]
- A sovereign's financial strength allows it to respond forcefully to disasters and reduce the economic and financial impact of the shock. Building fiscal buffers, establishing contingent lines of credit, and developing a sound public financial management system are important in this regard. State contingent debt instruments can also be useful to allow for greater policy flexibility in bad times (IMF 2017).

To help the public, including market participants, better understand future physical risk, policymakers should consider strengthening climate change literacy by enhancing the visibility of relevant findings in climate science, climate economics, and climate finance.

Granular, firm-specific information on current and future exposure and vulnerability to climate change physical risk would help lenders, insurers, and investors better grasp these risks. An increasing number of firms have begun to voluntarily disclose climate change risk information, in line with the recommendations set out by the Taskforce on Climate-related Financial Disclosures (TCFD). However, going further by developing global mandatory disclosures on material climate change risks would be an important step to sustain financial stability. In the short term, mandatory climate change risk disclosure could be based on globally agreed principles. In the longer term, climate change risk disclosure standards could be incorporated into financial statements compliant with International Financial Reporting Standards.

It would be useful for these standards and disclosures to be anchored in proper measurement of financial exposure to climate risk and to be based on adequate taxonomies. For financial firms, climate change stress testing, and scenario analysis more broadly, can play a potentially important role in providing a better sense of the size of the exposures at a highly granular level.

Although not explicitly analyzed in the chapter, adaptation and risk reduction measures that decrease (or at least limit) the exposures and vulnerabilities of economies to climate hazards are highly desirable. These include the enhancement of early warning systems and the management of population density in areas at risk, as well as the implementation of regulation (such as land-use regulation) and investment in infrastructure that helps boost physical resilience, such as through "build back better" programs.[36]

Of course, strong policy actions to mitigate climate change would reduce greenhouse gas emissions and future physical risk in the first place, conferring benefits to mankind that extend well beyond the realm of financial stability. Yet, from a financial stability perspective, this transition to a lower-carbon economy needs to be carefully managed to avoid abrupt and unanticipated repricing of portfolios and economic dislocation.[37] These issues will be explored further in future issues of the *Global Financial Stability Report*.

[34]These findings are consistent with those of IMF (2019), which discusses physical and financial resilience in developing economies vulnerable to large natural disasters.

[35]See the discussion in Jarzabkowski and others (2019).

[36]A recent report finds that a global $1.8 trillion investment in adaptation measures over the next decade could generate $7.1 trillion in total net benefits (Global Commission on Adaptation 2019).

[37]The benefits of gradual but ambitious, clear, and predictable mitigation policies for the transition path are discussed in the October 2019 *Fiscal Monitor.* Krogstrup and Oman (2019) provides an overview of available policy tools.

Box 5.1. Stress Testing for Physical Risk in the Financial Sector Assessment Program

The IMF pioneered the use of stress tests for assessing financial stability in the Financial Sector Assessment Program (FSAP) 20 years ago. Every year, under the FSAP, the IMF carries out in-depth financial stability assessments for 12–14 economies. Stress testing using confidential supervisory data is a cornerstone of the FSAP's risk analysis. The tests capture physical risks related to climatic disasters, such as storms, floods, and droughts, whenever relevant. Over the past decade, one in five FSAPs contained an examination of such risks. Most related to small island states and other economies prone to climatic disasters with economy-wide impacts, but FSAPs for advanced economies with systemically important financial sectors (such as France, Sweden, and the United States) also covered physical risks in insurance stress testing.

The 2019 FSAP for The Bahamas provides an example of a stress test that incorporates a climatic disaster. The country was hit by 11 hurricanes with average costs of 4.3 percent of GDP in the 20 years before the FSAP. The analysis examined the effects of hurricanes on tourism, employment, and financial sector assets, showing how more frequent and more severe hurricanes amplify risks to economic growth. Domestic banks typically required catastrophic risk insurance, and domestic insurance companies reinsured abroad—so growth and employment were the main channels of hurricanes' impact on the financial system. Banks' direct credit exposures to tourism were small, mitigating the risk of large business loan losses, though hotel and infrastructure damage could lead to unemployment and bank losses on mortgages and consumer loans. A key finding was that the financial stability effects of hurricanes were nonlinear and dependent on the broader macroeconomic context: a US recession combined with a hurricane would significantly amplify macro-financial losses. Three months after the FSAP concluded, The Bahamas was hit by Hurricane Dorian, the worst climatic disaster in the country's history. The financial sector appears to have weathered the hurricane well, thanks to limited exposures to uninsured assets and adequate reinsurance of domestic insurance companies abroad. At the same time, insurance penetration, especially in the residential segment, remains low, leaving many homeowners in dire straits. The IMF therefore suggested new approaches to extend insurance coverage as part of a broader disaster risk management strategy.

Stress tests for climate-related risks are evolving. The FSAP has already been moving from narrow exercises concentrating on non–life insurance to stress tests that incorporate broader macro-financial feedback effects. While the focus so far has been on "acute" manifestations of physical risk, future assessments may also consider stability implications of slow-moving consequences of climate change, such as migrations due to water shortages and crop failures. Forthcoming FSAPs that are expected to consider physical risk are, for example, those for the Philippines and South Africa.

Ongoing assessments, such as the FSAP for Norway, have started, on a pilot basis, examining consequences of changes in public policy and technology related to the transition to a low-carbon economy. These transition risks are potentially relevant for all economies, with many country authorities recognizing that the transition may not be smooth, and that changes in policies and technology may lead to abrupt changes in asset valuations. Leverage and interconnectedness in the financial system could exacerbate these shocks.

The IMF staff has engaged with the World Bank, central banks, and other stakeholders on these issues. In emerging market and developing economies, the IMF carries out FSAP assessments jointly with the World Bank. The joint work provides an opportunity to leverage the World Bank's expertise in financial sector development, catastrophe risk modeling, and sustainable finance.

This box was prepared by Martin Čihák.

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