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Editor's Note (May 11, 2018)

This online version of the GFSR has been updated to reflect the following changes to the print version:

- On page 6 (Figure 1.4), the data for Germany in panel 3 have been corrected and a note was added.
- On page 31 (Figure 1.17), the data in panel 3 have been corrected.
- On page 37 (Figure 1.21), the x-axis labels in panel 4 have been corrected.
- On page 49 (Figure 1.2.1), the second and third sentences in the note were added.

Outlook for Financial Stability

Despite ongoing monetary policy normalization in some advanced economies and some signs of firming inflation, global financial conditions are still very accommodative relative to historical norms. Although supportive of near-term growth, easy financial conditions also continue to facilitate a buildup of financial fragilities, increasing risks to global financial stability and economic growth over the medium term.

Still-Easy Financial Conditions Continue to Support Economic Growth

With global economic recovery now stronger and more synchronized (as discussed in the April 2018 *World Economic Outlook* [WEO]), monetary policy authorities in advanced economies have started to, or are gearing up to, normalize their monetary policy stance (see “Monetary Policy Normalization in Advanced Economies”). Over the years since the global financial crisis, accommodative monetary policy has been crucial to ensuring a sustainable global economic recovery. But with inflation well below target and buoyant market sentiment, central banks in advanced economies have faced a difficult balancing act of keeping interest rates low to support the economy and addressing financial vulnerabilities that could put growth at risk in the medium term. The recent firming of inflation has provided policymakers with more leeway to address financial vulnerabilities, including by deploying and developing micro- and macroprudential tools.

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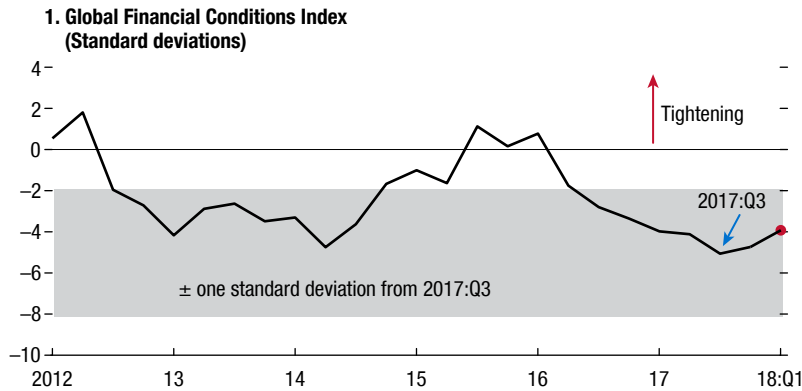
Global financial conditions have tightened somewhat, on balance, since the October 2017 *Global Financial Stability Report* (GFSR), reflecting the spike in equity market volatility in early February and investors’ jitters in late March about a wider escalation of trade tensions (Figure 1.1, panel 1). Nonetheless, even as the US Federal Reserve has continued to normalize monetary policy, global financial conditions remain broadly accommodative relative to historical norms across both advanced and emerging market economies. Figure 1.1 (panels 1 and 2) shows global and regional financial conditions indices (FCIs), as well as their key components.

Although still-easy financial conditions support economic growth in the near term, they may also contribute to a buildup of financial imbalances, excessive risk taking, and mispricing of risks. The growth-at-risk (GaR) approach—which links financial conditions to the distribution of future GDP growth outcomes—provides a framework for assessing the intertemporal trade-off between supporting growth in the near term and putting financial stability and future growth at risk over the medium term.¹ The key steps in this approach are as follows: First, a model of output growth is estimated as a function of current economic and financial conditions. Second, this model is used to forecast conditional distributions of growth for different horizons. Finally, to gauge the impact of financial conditions on growth prospects, changes in the forecasted severely adverse growth outcomes (those that occur with a 5 percent probability, also called the “tail” of the distribution) for different horizons are compared with previous forecasts. Changes in financial conditions that result in a deterioration in severely adverse growth forecasts (that is, a leftward shift in the tail) can be interpreted as financial vulnerabilities potentially increasing toward macrocritical levels. This means that these vulnerabilities could magnify the severity of an eco-

¹See Chapter 3 of the October 2017 GFSR for a description of the growth-at-risk methodology.

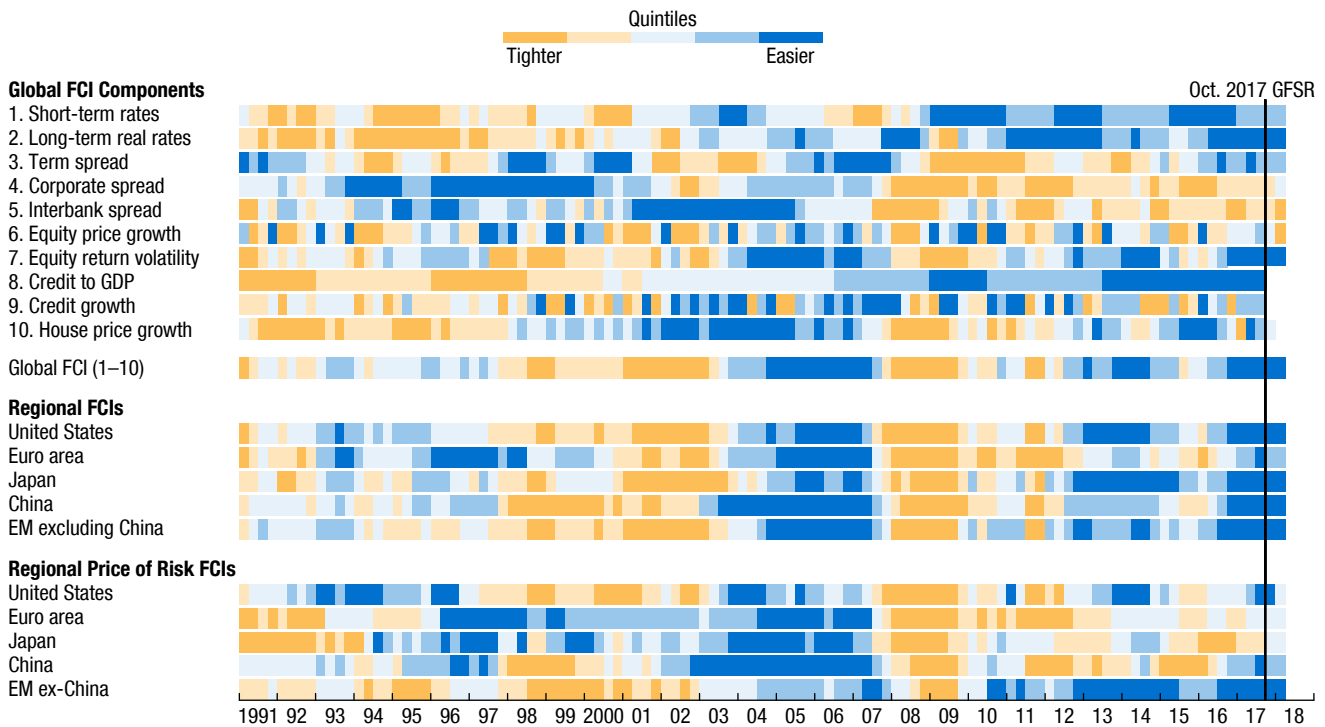
Figure 1.1. Global Financial Conditions

Global financial conditions have tightened somewhat, but remain supportive of growth.



The price of risk is low, markets are buoyant, and leverage is high across both advanced and emerging market economies.

2. Global and Regional FCIs and Their Components



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

Note: Panel 1 shows the Global (Financial Conditions Index) FCI. This was originally presented in GFSR October 2017 (Chapter 3). Higher values of FCIs indicate tighter conditions. The shaded area denotes \pm one standard deviation changes relative to the level of Global FCI at 2017:Q3. Panel 2 shows quintiles of global and regional FCI series and components relative to their own history. Results are compared with a “Price of Risk” FCI, encompassing price-based information only (components 1–7). Easing of conditions is shown in blue and tightening in yellow. For FCI components, the shading is based on their contribution to the FCI index, e.g., a narrowing of credit spreads relative to historical norms would be contributing to the FCI easing, and hence, shown in blue. EM = emerging market; FCI = financial conditions index; GFSR = *Global Financial Stability Report*.

conomic downturn in the future, even without necessarily leading to a systemic financial crisis.

Short-Term Risks Have Increased Somewhat, while Medium-Term Vulnerabilities Remain Elevated

Against the backdrop of slightly tighter financial conditions, short-term financial stability risks have increased somewhat since the previous GFSR. Even so, the current broadly accommodative financial conditions appear to have dampened the near-term risks to growth relative to a few years ago. The GaR model forecasts that, under current financial conditions, the severely adverse outcome is for global growth to fall to about 3 percent or less over the following year (the red dot in Figure 1.2, panel 1). In comparison, in 2015 the predicted range of severely adverse growth outcomes was notably less favorable.²

This assessment, however, does not mean that the global financial system and the real economy are immune to macroeconomic, geopolitical, or policy shocks in the near-term:

- For example, inflation in the United States may rise faster than expected, possibly owing to the recent fiscal expansion. Central banks in response may tighten monetary policy more forcefully than currently anticipated. In such a scenario financial conditions could tighten sharply, generating adverse spillovers to other advanced (see “Monetary Policy Normalization in Advanced Economies” section) and emerging market economies (see “Vulnerabilities in Emerging Markets, Low-Income Countries, and China” section), as well as adversely affecting the internationally active banks that rely on dollar funding (see “Funding Challenges of Internationally Active Banks” section).
- Trade tensions and greater protectionism could affect financial stability via increased uncertainty and lower global growth. As discussed in the April 2018 WEO, a wider escalation of protectionist measures would take a toll on global output and welfare, both directly and indirectly by raising geopolitical tensions. This would shift the distribution of global growth outcomes to the left, with attendant negative implications for global financial stability. But even before any impact on trade, there may be a decline in confidence and a tightening in financial condi-

tions, which could provide a separate and substantial headwind to growth.

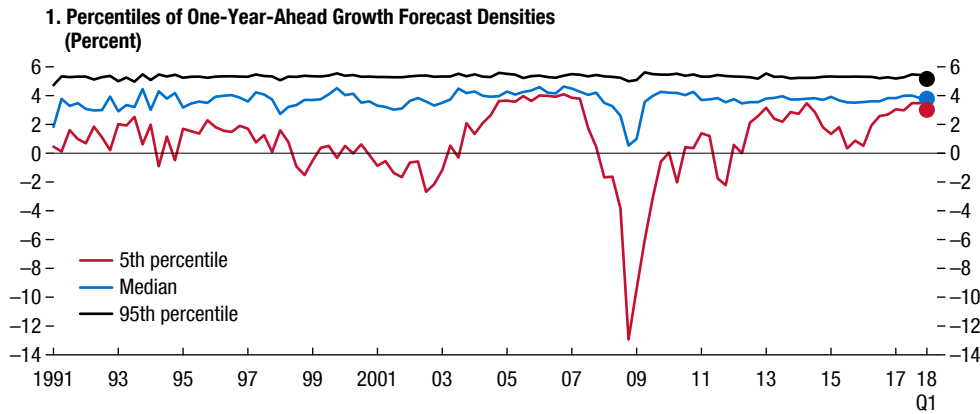
At the same time, easy financial conditions risk fueling financial vulnerabilities that may put medium-term growth at risk. The estimated three-year-ahead growth distribution has a much fatter left tail compared with the one-year-ahead growth distribution (Figure 1.2, panel 2). Given current conditions, the GaR model forecasts that, under the severely adverse scenario, global growth will be negative three years from now. The downward slope of the curve (the dashed red line in Figure 1.2, panel 3) illustrates the intertemporal trade-off between the near-term and the medium-term growth prospects amid easy financial conditions. Continued easing of financial conditions over the past two years has tilted the curve, improving economic prospects in the near term while worsening the medium-term growth outlook. In contrast, the severely adverse medium-term growth forecast at the end of 2016 (the dashed blue line in Figure 1.2, panel 3), for example, was relatively less negative than the current forecast. Finally, a comparison of GaR severely adverse medium-term growth forecasts since the 1990s suggests that risks to medium-term growth stemming from the current easy financial conditions are well above historical norms (Figure 1.2, panel 4).

As central banks continue to normalize monetary policy, financial vulnerabilities foreshadow a bumpy road ahead. High leverage and other balance sheet mismatches tend to amplify the impact of shocks on the financial system and the broader economy. Leverage in the *nonfinancial sector* has been rising in many major economies, as discussed in the October 2017 GFSR, and remains high (Figure 1.1, panel 2, and Figure 1.3, panel 1), implying that aggregate debt-service ratios could deteriorate quickly once financial conditions tighten (see “Reach for Yield or Overreach in Risky Assets?” and “Vulnerabilities in Emerging Markets, Low-Income Countries, and China” sections). In addition, some economies with already-high nonfinancial sector debt are seeing faster growth in house prices (see gray dots in the upper right corner in Figure 1.3, panel 2). In contrast, *banks* have raised their capital and liquidity buffers since the global financial crisis, pointing to increased resilience, though they may still be vulnerable to funding shocks (see “Funding Challenges of Internationally Active Banks” section). At the same time, use of financial leverage *outside the banking sector* is on the rise as the

²As can be seen in Figure 1.1, global financial conditions have eased significantly since 2015–16.

Figure 1.2. Growth-at-Risk

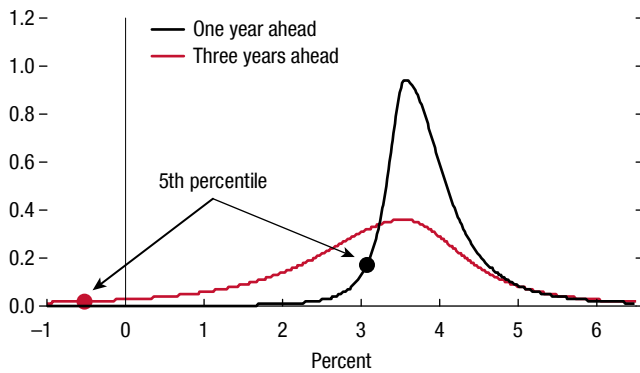
Supportive financial conditions tend to dampen the near-term risks, with growth-at-risk forecasting the severely adverse outcome (for example, with 5 percent probability) for global growth at about 3 percent or less one year ahead.



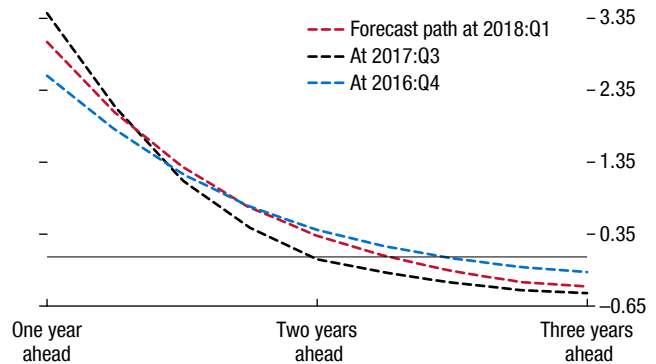
But easy financial conditions also raise the odds of adverse growth outcomes in the medium term—the three-year-ahead growth distribution has a much fatter left tail than the one-year-ahead growth distribution.

Medium-term risks to growth have increased in recent years ...

2. Growth Forecast Densities at 2018:Q1 (Probability)

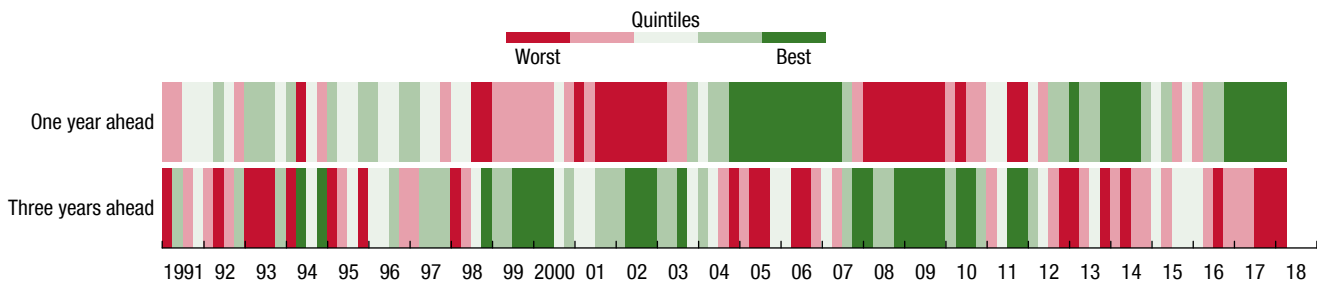


3. Severely Adverse Growth Outcomes (5th Percentile) at Different Future Horizons (Percent)



... and are well above historical norms, given the current financial conditions.

4. GaR Forecasts of Severely Adverse Growth Outcomes: Percentile Ranks



Sources: Bloomberg Finance L.P.; IMF, World Economic Outlook database; and IMF staff estimates.

Note: Growth-at-risk (GaR) refers to the set of outcomes that fall into the 5th percentile of (conditional) forecast densities of global growth. Panel 2 presents forecast densities for growth, one and three years ahead. In panel 4, the color shading depicts the percentile rank for the 5th percentile threshold of densities for one-year- and three-year-ahead growth. Red denotes lower growth outcomes.

prolonged period of low interest rates has fueled search for yield and compressed market risk measures (see “Reach for Yield or Overreach in Risky Assets?” section).

Although the recent bout of volatility in global equity markets (Box 1.1) did not lead to any major dislocations, the episode underscores the need for investors and policymakers to remain attuned to the risks associated with rising interest rates after years of low rates and low volatility.

Monetary Policy Normalization in Advanced Economies

The buildup of financial vulnerabilities over the past few years has left financial markets exposed to the risk of a sharp tightening of financial conditions. In this context, central banks must strike a delicate balance of gradually withdrawing monetary policy accommodation while avoiding disruptive volatility in financial markets. This balancing act highlights the importance of continued clarity in central bank communications.

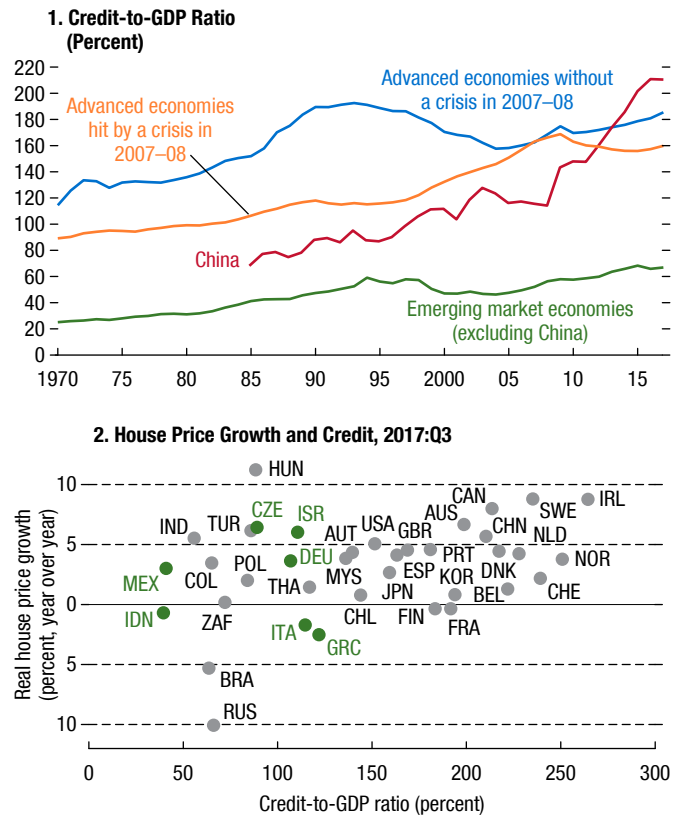
The Global Economy Faces a Critical Transition as Monetary Policy Gradually Normalizes

Financial markets have thus far adjusted relatively smoothly to the gradual pace of monetary policy normalization, benefiting from clear central bank communications and historically large central bank asset holdings (Figure 1.4, panel 1). Indeed, although the expected path of policy interest rates in the United States points to a faster pace of tightening relative to other advanced economies, reflecting differences in the interest-rate-hiking cycle, it remains consistent with gradual removal of accommodation (Figure 1.4, panel 2).

But policymakers may face increasing challenges to ensuring a smooth normalization path. Substantial medium-term financial vulnerabilities have built up during the period of prolonged monetary accommodation. As central banks withdraw accommodation by raising short-term interest rates and shrinking their balance sheets, a decompression of term premiums (the compensation investors demand for holding bonds in excess of risk-free short-term interest rates) may cause an abrupt tightening of financial conditions.³ This

³Significant uncertainty surrounds the magnitude and size of the adjustments, as discussed in the October 2017 GFSR. Indeed, by letting asset holdings mature, central bank balance sheet normalization will increase net supply to the public, a development expected to put upward pressure on term premiums and broader risk premiums.

Figure 1.3. Nonfinancial Private Sector Debt



Sources: Bank for International Settlements (BIS); Haver Analytics; IMF, World Economic Outlook database; and IMF staff calculations.
 Note: In panel 1, advanced economies hit by a crisis are those in the Laeven and Valencia (2012) database with a crisis starting in 2007 or 2008 that are also in the Bank for International Settlements credit database. Panel 2 shows data for 2017:Q3 or latest available figures, if earlier. House price growth is calculated over the past three years (annualized). Data for credit-to-GDP ratios are from the BIS. For some countries, these data include inter- and intra-company loans, which can be significant. Countries with gray dots have a credit-to-GDP ratio above the median historical ratio for advanced or emerging market economies. The median is calculated using annual data from 1970 (or first available date, if later) for a pooled sample of 27 advanced economies and 16 emerging market economies. Green dots are countries with a credit-to-GDP ratio below the median. Data labels in the panel use International Organization for Standardization (ISO) country codes.

potential risk underscores the importance of a smooth process to avoid sudden, sharp volatility and disruptions in financial markets.

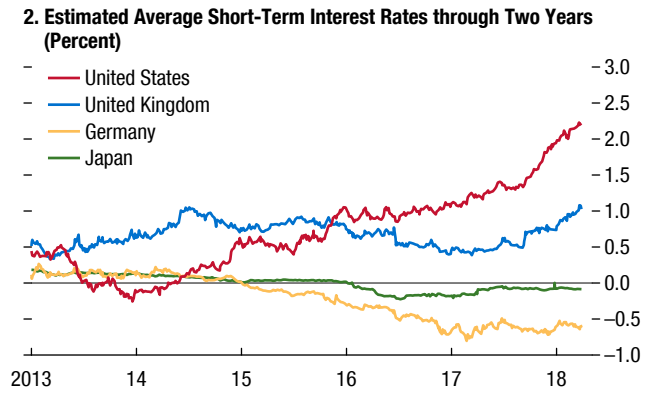
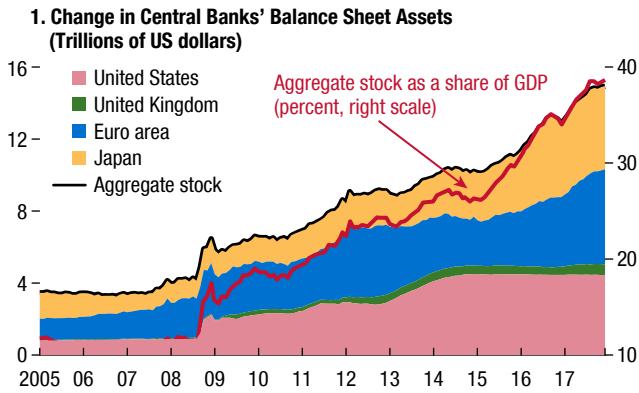
Why Have Term Premiums Remained Low in the United States Even as the Federal Reserve Has Started to Reduce Its Portfolio?

In the United States, the Federal Reserve has increased the federal funds rate six times since December 2015. Yet the term premium remains near historical lows, and financial conditions have continued to ease, in contrast

Figure 1.4. Market Interest Rates, Central Bank Balance Sheets, and US Financial Indicators

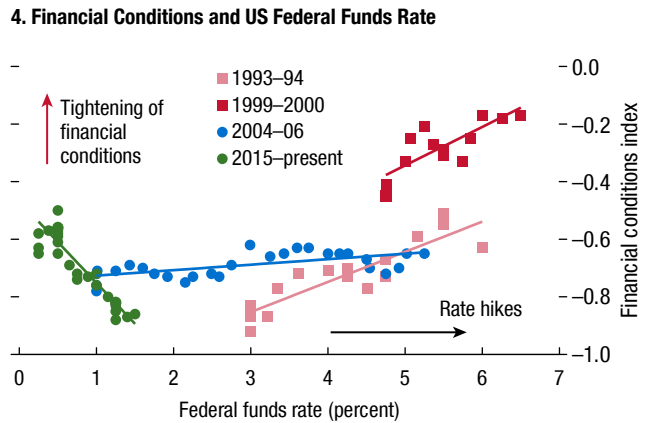
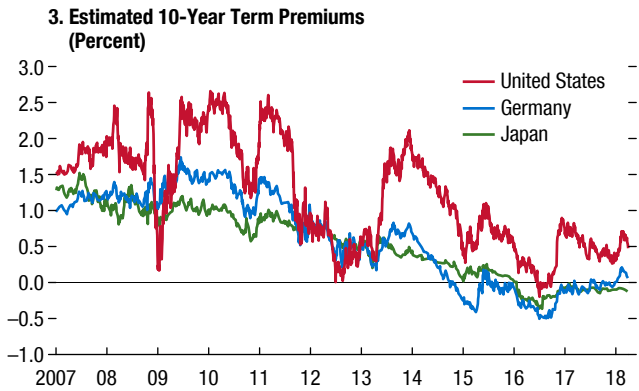
Easy global financial conditions are underpinned by advanced economy central banks' large asset holdings.

Policy rate expectations still point to gradual rate hikes.



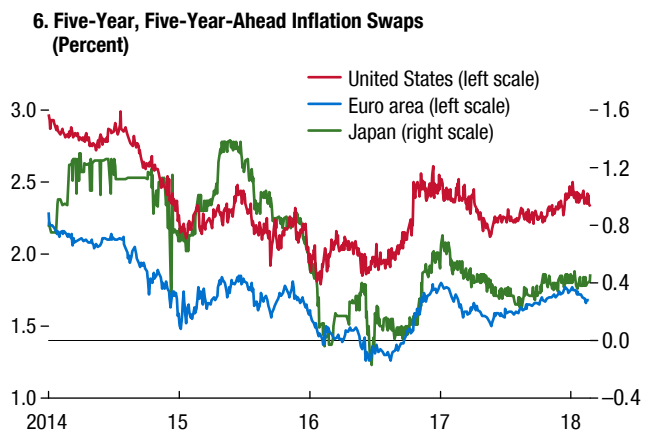
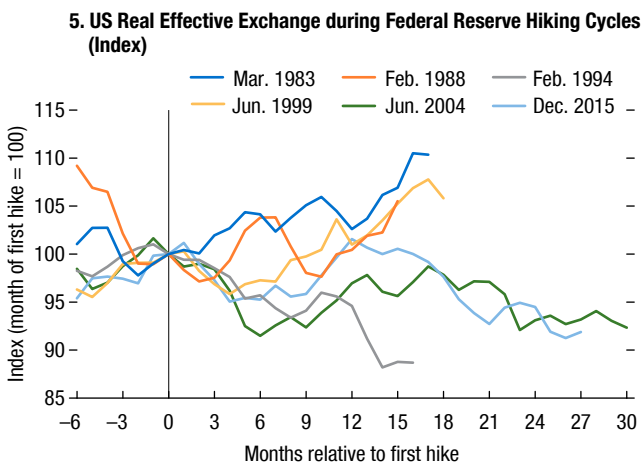
Term premiums have remained compressed in major economies and are near historic lows.

US financial conditions have continued to ease despite policy rate hikes ...



... while the US dollar has weakened ...

... and measures of inflation compensation have remained relatively muted.



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

Note: Panel 3 is based on IMF staff estimates of four-factor term structure models based on the Adrian, Crump and Moench (2013) model, using underlying Bloomberg fitted yield curve series from the early 1990s.

to previous hiking cycles (Figure 1.4, panels 3 and 4). The tightening cycle so far has not offset the broader weakness of the dollar since the beginning of the normalization process in the United States (Figure 1.4, panel 5). Moreover, although measures of inflation compensation have moved a bit higher recently with the firming in inflation, they continue to be relatively low in the United States and other countries (Figure 1.4, panel 6).⁴

Several factors may help explain why the effects of the Federal Reserve's policy actions on term premiums (and thus financial conditions) have been somewhat muted to date, compared with the sizable decline following initial implementation of unconventional balance sheet policies:⁵

- *Liquidity considerations* point to likely asymmetric responses of term premiums to asset purchases, on the one hand, and shrinkage of balance sheets, on the other. For example, many studies find that the Federal Reserve's first asset purchase program had a larger effect than subsequent programs. One possible explanation is that the first rounds may have ameliorated illiquidity and extinguished potential fire sales of assets. By contrast, the initial withdrawal of unconventional accommodation seems unlikely to have had the concomitant and opposite effect of boosting liquidity premiums and therefore yields.
- *Central bank purchase programs* may have "structurally" lowered term premiums, especially in the current environment of lower equilibrium policy rates. Investors likely expect asset purchases to remain in the policy toolkit in the future, whether or not central banks reduce their asset holdings to near precrisis levels.⁶ To commit credibly to abandoning these tools may prove difficult. Moreover, policymakers are presumably more likely than before to pull these levers, given new limits to conventional measures, because equilibrium or terminal policy interest rates (the rate that is consistent with full employment and capacity utilization and stable prices) may be lower today as a result of underlying structural factors in the economy that keep interest rates nearer their nominal lower bound.⁷

⁴Inflation compensation, typically referred to as breakeven inflation rates, is defined as the inflation rates that, if realized, would leave an investor indifferent between holding an inflation-protected Treasury security and a nominal Treasury security.

⁵As such, careful studies of the effects of unconventional policy measures (including Gagnon and others 2010) may be less relevant, if not somewhat misleading, to understanding the reversal of these measures.

⁶In addition, a possible sustained dearth of global risk-free assets could also durably lower the level of the term premium.

⁷These factors include demographic effects and changes in productivity, among others. See Chapter 2 of the April 2017 GFSR.

- *The signaling channel of balance sheet reduction* may be muted, especially compared with the significant signaling effects associated with implementation of asset purchases. This is because the Federal Reserve has mapped out the unwinding of its balance sheet into the future, with a "high hurdle" for revision. At least in the United States so far, the unwinding of balance sheet measures is less data dependent than the purchase program. Guidance around the initial balance sheet reduction contains much less information about the future path of the traditional tool compared with possible signaling effects of asset purchases. Indeed, at the nominal lower bound, unconventional policy tools supplement traditional levers. But when removing accommodation, policy rates have no upper bound.

Are Term Premiums Too Low Given Economic Variables and Other Fundamentals?

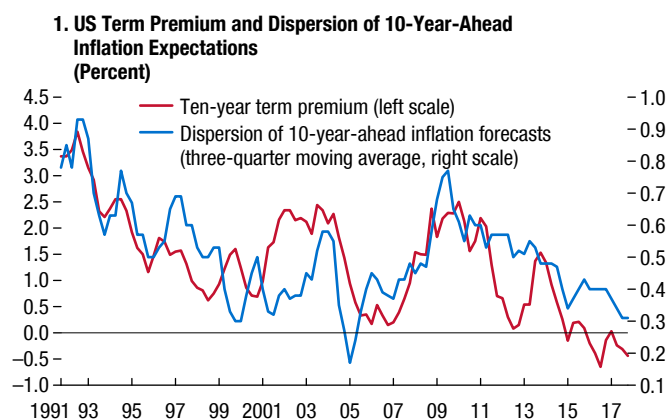
Term premiums remain very low by historical standards. But are they "too low" relative to economic fundamentals? The answer to this question is central to determining the implications of the prolonged period of monetary policy accommodation for global financial markets. Even though a variety of shocks could push term premiums higher, the impact of these shocks on financial markets could be sudden and more pronounced if term premiums are too low given the stage of the economic cycle.

Model estimates suggest that term premiums are not too low. Analysis finds that term premiums are broadly in line with investors' expectations for growth, inflation, and the current stance of monetary policy. As shown in Box 1.2, the estimated term premium has remained near the lower bound of fitted model values over the past few years, in line with the large-scale monetary accommodation needed to support the economic recovery.⁸ In addition, the gap between the estimated and the model-based weighted-average estimated term premiums has been closing recently, suggesting that term premiums are largely in line with investors' expectations for economic fundamentals. However, the model also suggests that term premiums are significantly vulnerable to any revisions in those expectations, particularly with

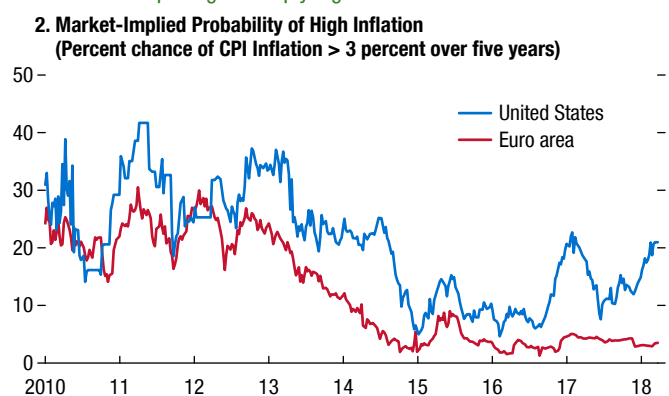
⁸Figure 1.2.1 in Box 1.2 shows the average and range of 900 model-fitted values for the Adrian, Crump, and Moench (2013) term premium estimate, conditional on various economic and financial factors, for the United States and Germany.

Figure 1.5. US Inflation Expectations and Term Premium

Term premiums have moved lower, and uncertainty about future inflation has declined.



Markets are not pricing in sharply higher inflation.



Sources: Bloomberg Finance L.P.; Federal Reserve Bank of Minneapolis; and IMF staff estimates.

Note: In panel 2, euro area options are illiquid. CPI = consumer price index.

respect to uncertainty about the future path of inflation and growth, or the path for monetary policy.

Financial Markets Remain Vulnerable to an Inflation Surprise

Although the expected path of policy rates has recently increased somewhat in some countries, markets continue to price in a gradual pace of monetary tightening. Uncertainty about future inflation outcomes has diminished in tandem with declining term premiums (Figure 1.5, panel 1). In addition, market participants are not currently pricing in a risk of sharply higher inflation over the next few years (Figure 1.5, panel 2).

An upside surprise to inflation could pose a challenge to investors and policymakers. For example, inflation in the United States may increase faster than expected,

possibly as a result of the recent fiscal expansion at a late stage of the credit cycle. In response to the revision in the inflation outlook, the Federal Reserve may withdraw monetary policy accommodation at a faster pace than currently anticipated. In this scenario, term premiums could suddenly decompress, risk premiums could rise, and global financial conditions could tighten sharply, with possible adverse consequences for the global economy.

Emerging markets are vulnerable to spillovers from an abrupt tightening in global financial conditions. Gradual and well-telegraphed normalization of monetary policy in advanced economies has provided a period of favorable external conditions, and investor sentiment toward emerging markets has remained constructive. The favorable conditions have allowed weaker issuers to access markets, and the creditor base now includes investors more inclined to turn over their portfolios. If the tightening cycle is accompanied by a rise in investor risk aversion, portfolio flows to emerging markets could fall by at least one-quarter under realistic assumptions (see “Vulnerabilities in Emerging Markets, Low-Income Countries, and China” section). This drop would increase rollover risks and the cost of funding in these countries. Low-income, small, non-investment-grade borrowers are particularly exposed to such risks because they have seen a sharp rise in debt vulnerabilities over the past few years.

Correlations among Global Term Premiums (and Expected Rates) Underscore Risks of International Spillovers

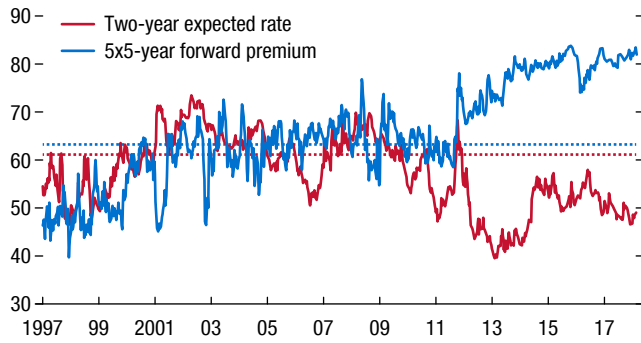
Rapid decompression of term premiums could quickly spill over to global financial markets. Key questions are the extent to which movements in term premiums are correlated across countries today, and thus primed for contagion, and the direction and intensity of such spillovers. Some evidence indicates that sovereign term premiums among major economies (Canada, Germany, Japan, United Kingdom, United States) move very closely together, even as investors’ expectations for policy rate paths in these countries have diverged. This trend seems to have preceded the Federal Reserve’s lift-off from the nominal lower bound in December 2015, and is in line with the view that asset purchases may be a stronger driver of spillovers than standard monetary policy via short interest rates (Figure 1.6, panel 1).

Moreover, model estimates indicate the impact of spillovers between G4 (Germany, Japan, United King-

Figure 1.6. Term Premium Correlations, Spillovers, and Exchange Rate Relationships

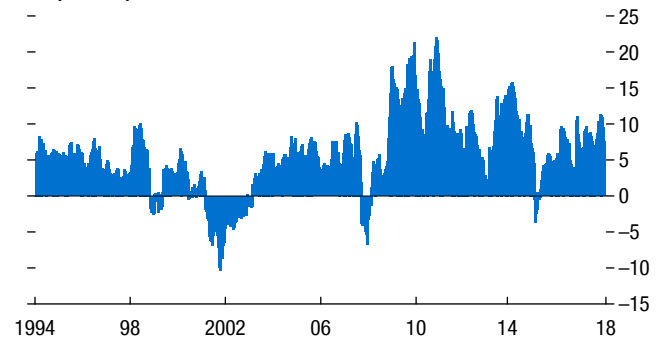
Term premiums in major advanced economies move very closely together even as market expectations of policy rate paths diverge.

**1. Term Premiums and Expected Rate Correlations
(Percent explained by first principal component)**



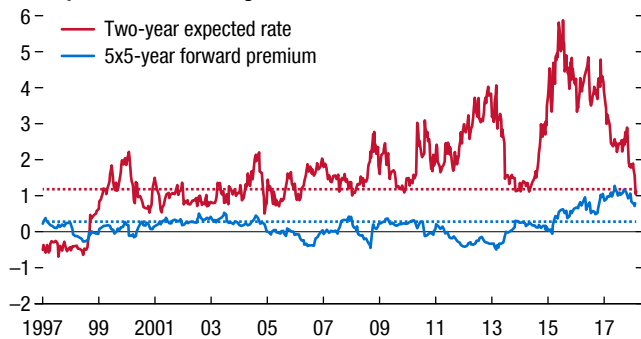
Spillovers between G4 term premiums are elevated, with the United States dominating the direction.

**2. Net Pairwise Spillovers between the US Term Premium and German, Japanese, and UK Premiums
(Percent)**



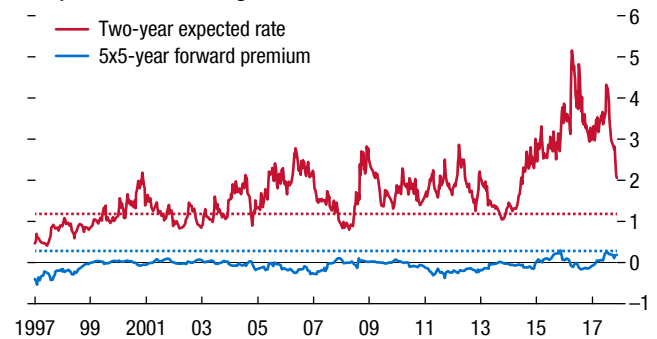
Short rates dominate movements in exchange rates between the euro-US dollar ...

3. Spot US Dollar Exchange Rate Betas: Euro



... and the sterling-US dollar cross rates.

4. Spot US Dollar Exchange Rate Betas: British Pound



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

Note: The dotted horizontal lines denote unconditional sample estimates. In panel 2, a positive (negative) value indicates that the US term premium is a shock transmitter (receiver) to German, Japanese, and UK term premiums. G4 = Group of Four (Germany, Japan, United Kingdom, United States).

dom, United States) term premiums is elevated, with spillovers from the United States to the other countries mainly dominating (Figure 1.6, panel 2).⁹ Although the net impact of such spillovers appears notably lower than at the height of the crisis, alongside higher correlations of term premiums this suggests considerable scope for a rapid rise in interest rates to be transmitted to global markets.

⁹The methodology, by Diebold and Yilmaz (2012), obtains a time-varying spillover index using rolling generalized forecast error variance decompositions in a generalized vector autoregression model. The framework measures directional spillovers by using the normalized elements of the variance decomposition matrix. The net pairwise spillovers are then calculated by taking the difference between the total spillovers transmitted from market *i* to all markets *j* and the spillovers transmitted from all markets *j* to market *i*.

In this environment, spillovers from a faster withdrawal of US Federal Reserve monetary policy accommodation in the wake of an inflation surprise and associated repricing of inflation risk and term premiums could rapidly tighten US and global financial conditions. This could challenge major central banks, such as the European Central Bank, that are not as far along in the normalization process, perhaps forcing them to respond through additional accommodation.

Although term premiums may be more correlated at present, perhaps because of global factors, central banks' strategies regarding conventional policy tools remain critical for communicating the stance of monetary policy. For example, term premium differentials do not appear to have dominated the transmission of monetary policy through exchange rates, at least

among the G4.¹⁰ In fact, the sensitivity of currencies to expected short rate differentials has remained elevated in recent years (Figure 1.6, panels 3 and 4). This finding holds both on average over the past 20 years and for estimates for the latest sensitivity.

Continued Clear Monetary Policy Communication Is Essential to Avoid Market Disruptions

Gradual removal of monetary accommodation and clear communications will help anchor market expectations and prevent undue volatility. To support the recovery and ensure inflation objectives are met, monetary authorities should maintain accommodation, as needed. When normalizing policy, central banks should do so in a gradual and well-communicated manner. They should also provide guidance on prospective changes to policy frameworks if such changes are warranted. Gradualism and clear communications are crucial given the confluence of still relatively low inflation, easy global financial conditions, and rising financial vulnerabilities. To address the buildup in financial vulnerabilities and avoid putting growth at risk, policymakers should also deploy and develop appropriate micro- and macroprudential tools.

Reach for Yield or Overreach in Risky Assets?

Against a backdrop of mounting vulnerabilities, risky asset valuations appear overstretched, albeit to varying degrees across markets, ranging from global equities and credit markets, including leveraged loans, to rapidly expanding crypto assets (discussed in the next section). Moreover, the increasing use of financial leverage to boost returns and the growing influence of some passive investment vehicles, particularly exchange-traded funds (ETFs) in less liquid underlying markets, could amplify the impact of asset price moves on the financial system.

Financial Vulnerabilities Continue to Build amid Easy Financial Conditions

The unconventional monetary policies implemented since the global financial crisis, including both asset purchases and forward guidance, clearly and by design encouraged investors to reach for yield. But today's policy environment differs. Rather than encourage

¹⁰Based on estimated dynamic correlations following Cappiello, Engle, and Shephard (2006).

investors to take additional risk, some central banks around the globe have either been raising policy rates or preparing investors for an eventually less accommodative stance. And although the share of assets with negative yields remains sizable globally, this fraction has ticked down in recent months. So, rather than a reach for yield prompted by central bank accommodation, there may be outright speculative overreach in some risky assets.¹¹

The key questions are the extent to which financial vulnerabilities have increased since the previous GFSR, how the constellation of current accommodative financial conditions and vulnerabilities compares with past episodes of financial stress, and whether asset valuations appear stretched, given current cyclical conditions. This final determination matters. If asset valuations are not judged to be significantly out of line with fundamentals, policymakers can continue to normalize monetary policy gradually and to implement macroprudential and other regulatory measures aimed at lessening financial stability risks. In contrast, if asset misalignments are significant and may put growth at risk in the future, a more forceful policy response may be needed.

To shed some light on rising financial vulnerabilities, this section focuses on *asset price valuations* in equity, corporate bond, and leveraged loan markets; on *financial leverage*, including that embedded in derivative products; and on *liquidity mismatches* related to the proliferation of certain types of investment funds and strategies (for example, exchange-traded funds).

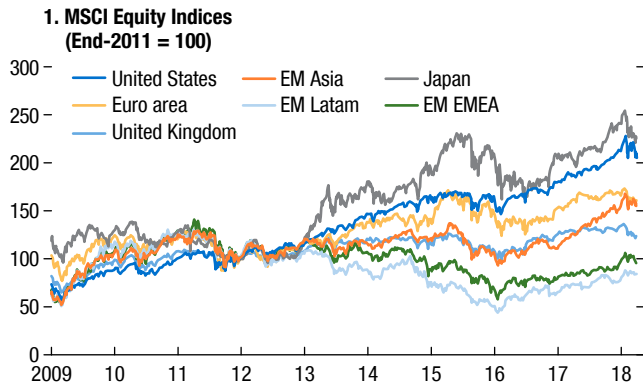
Equity Valuations Remain Expensive

The ongoing global economic recovery, strong corporate performance, and still-low interest rates have supported equity prices, on balance, since the previous GFSR (Figure 1.7, panel 1). In the United States, and through the spate of volatility beginning in early February, equity market capitalization has risen from 95 percent of GDP in 2011 to 155 percent of GDP in March 2018. Rising global equity prices have sup-

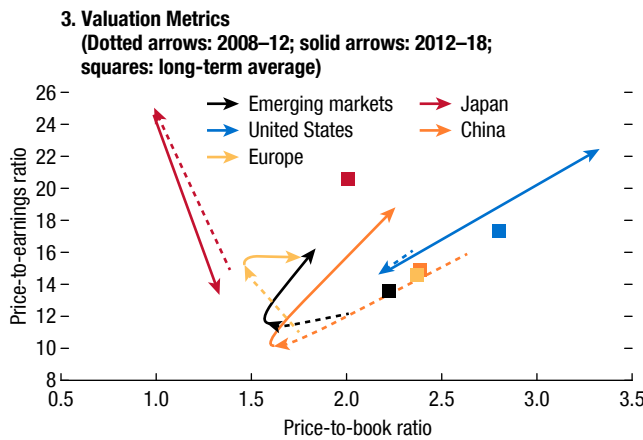
¹¹“Reach for yield” may be a dated description of current investor behavior and financial asset price developments. Following Hanson and Stein (2015), the effects are transitory, and the lengths of these episodes depend on the capacity of so-called return-oriented arbitrageurs to take offsetting positions. Insofar as financial conditions are very accommodative (for example, the ability and willingness to take on leverage), any reach for yield should not have persisted.

Figure 1.7. Valuations of Global Equities

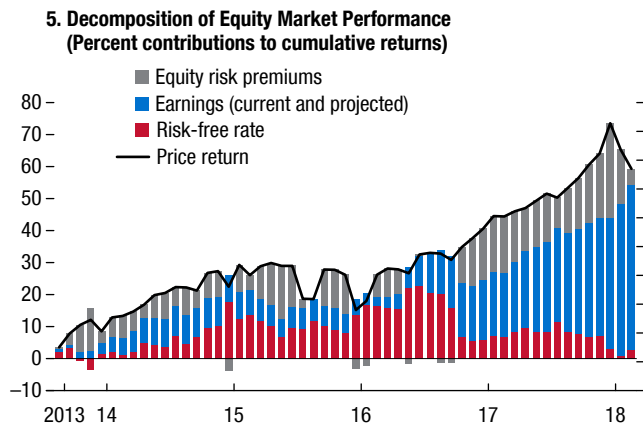
Global equities have extended their rally in recent months, on balance, since October ...



In the United States, valuations are high relative to their historical averages and pre-GFC peak, and to other countries.

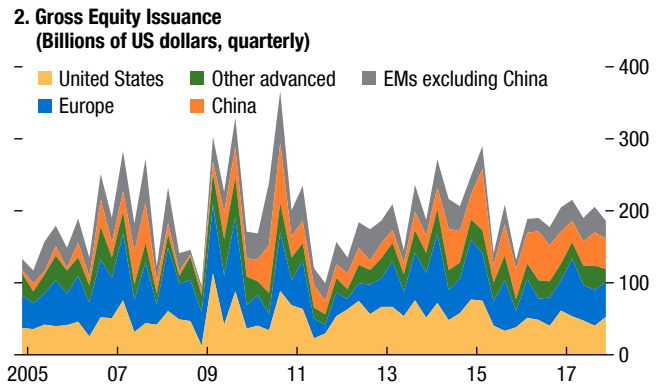


Equity valuations have been supported by historically low interest rates and robust earnings expectations.

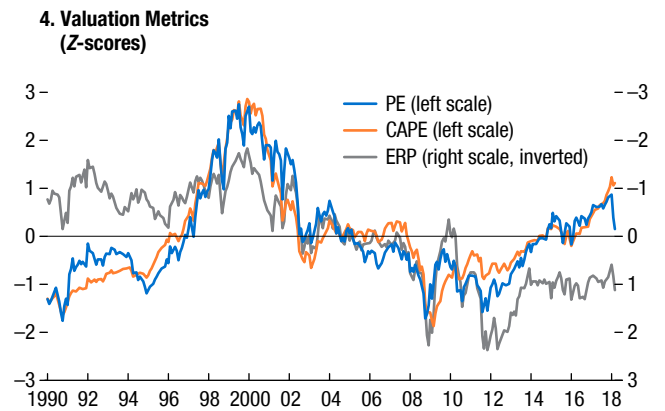


Sources: Bloomberg Finance L.P.; Citigroup Index LLC; ICE Bank of America Merrill Lynch; JPMorgan Chase & Co; IMF, World Economic Outlook (WEO) database; Morgan Stanley Capital International (MSCI); Standard & Poor's; Thomson Reuters IBES; and IMF staff calculations.
 Note: bps = basis points; CAPE = cyclically adjusted price-to-earnings ratio; EM = emerging market; EMEA = Europe, Middle East, Africa; EPS = earnings per share; ERP = equity risk premium; GFC = global financial crisis; Latam = Latin America; PE = price-to-earnings ratio.

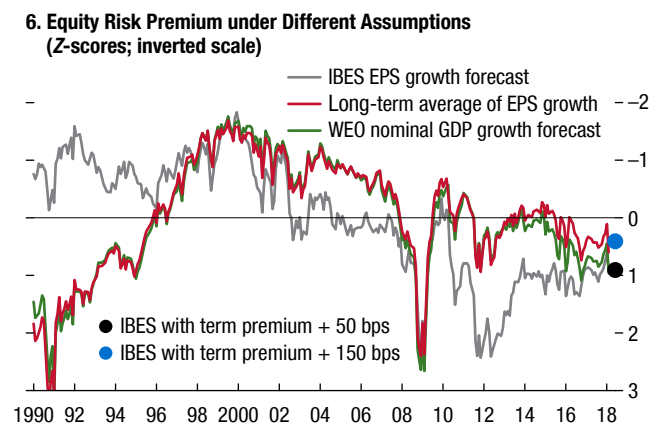
... supporting a rebound in equity issuance, especially in emerging markets.



However, US equity valuations appear low relative to US Treasuries.



The relative equity valuations are closer to their historical averages if more sustainable earnings are assumed.



ported a moderate rebound in new issuance, especially in emerging markets (Figure 1.7, panel 2).

These developments raise questions about valuations and potential investor excesses. Standard price-to-earnings and price-to-book valuation metrics remain elevated in most regions (Figure 1.7, panel 3). For the United States, these measures remain relatively high compared to both historical levels and current valuations in other countries. Indicators that incorporate longer-term averages of realized earnings to capture expectations, such as cyclically adjusted price-to-earnings, continue to support this assessment, even after the volatility spike in February and the slide in equity prices in March on concerns about trade tensions (Figure 1.7, panel 4).

Some measures of the US equity risk premium, in which equity valuations are conditional on the level of interest rates, suggest that shares have been closer to fair value. Indeed, strong near-term earnings expectations, as well as historically low interest rates, sustain comparatively wide equity risk premiums (Figure 1.7, panel 5). However, this approach is highly sensitive to profit forecasts as well as to different assumptions about the discount factor. Equity valuations deteriorate under alternative, less sanguine proxies for earnings, such as longer-term averages or nominal GDP growth. Also, higher projected paths for interest rates similarly narrow the equity premium and imply richer valuations (Figure 1.7, panel 6).

Corporate Bond Valuations Are Stretched and Credit Quality Is Deteriorating in Risky Segments

With central banks in advanced economies continuing to lift policy rates from the nominal lower bound or signaling a not-too-distant commencement of the normalization process, the share of negative-yielding global bonds has dipped lower since the October 2017 GFSR. This ratio, however, remains significant (Figure 1.8, panel 1). Against a backdrop of low default rates, corporate spreads remain at very low levels, even in the riskiest segments (Figure 1.8, panel 2). Favorable financial conditions have boosted corporate bond issuances. Issuance of riskier bonds has surged, and the share of lower-grade bonds (BBB-rated) in the investment-grade universe has been rising (Figure 1.8, panel 3).

Strong economic growth and corporate restructuring efforts, particularly in the energy sector, have supported corporate profitability; and debt ratios—while

still high—have edged lower, especially in China and other emerging markets (Figure 1.8, panel 4). Effective interest rates paid by the corporate sector moved higher, particularly outside the United States. As a result, interest coverage ratios have dipped everywhere except China and the United States (Figure 1.8, panel 5).

Recent US tax reform will have important implications for the corporate sector. As discussed in the April 2017 GFSR, most US companies will gain from the reform. However, historical experience in the United States in the 1980s and with the repatriation tax holiday in 2004 suggests that financial risk taking often follows tax policy changes, as evidenced by heightened purchases of financial assets, mergers and acquisitions, dividends, and share buybacks. The cap on the tax deductibility of interest expense will reduce incentives for debt financing, which tends to affect highly leveraged companies disproportionately (Figure 1.8, panel 6). These firms may face funding pressures because of higher interest expenses, more volatile earnings, and a more compressed schedule for adapting their funding structure to the new tax code.

Signs of Overheating Are Evident in the Leveraged Loan Market

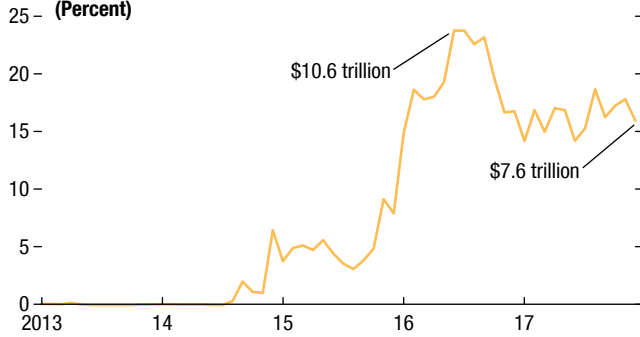
The leveraged loan market, consisting of commercial loans extended to borrowers who are non-investment grade or already have significant amounts of debt, is seen by market participants as a barometer for broader risk taking. Global credit markets have grown massively in recent years. Global leveraged loan issuance hit a record high in 2017 of \$788 billion, surpassing the precrisis high of \$762 billion in 2007. Most issuance occurred in the United States, amounting to \$564 billion (Figure 1.9, panel 1). Since 2007, US institutional leveraged loans outstanding have doubled to almost \$1 trillion, compared with \$1.3 trillion in US high-yield bonds outstanding.¹² While refinancing volumes have been significant given the low-interest-rate environment, borrowing to fund mergers and acquisitions, leveraged buyouts, dividends, and share buybacks still accounts for half of total issuance amid improving global growth (Figure 1.9, panel 2).

¹²Institutional leveraged loans include term loans structured specifically for institutional investors, such as loan funds, collateralized loan obligations, real money investors, and hedge funds, though there are some banks that buy institutional term loans. These tranches include first- and second-lien loans.

Figure 1.8. Valuations of Corporate Bonds

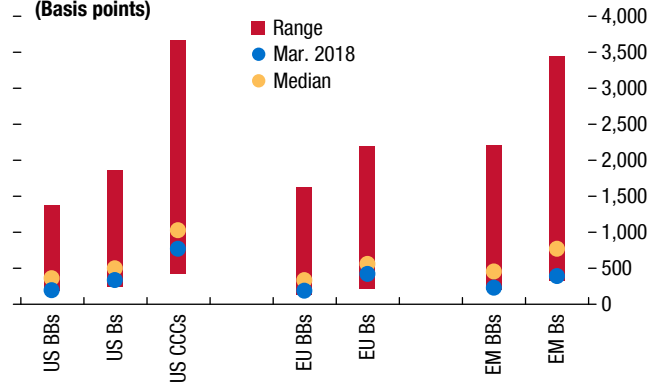
A still-high share of negative-yield assets ...

1. Share of Negative Yielding Global Bonds (Percent)



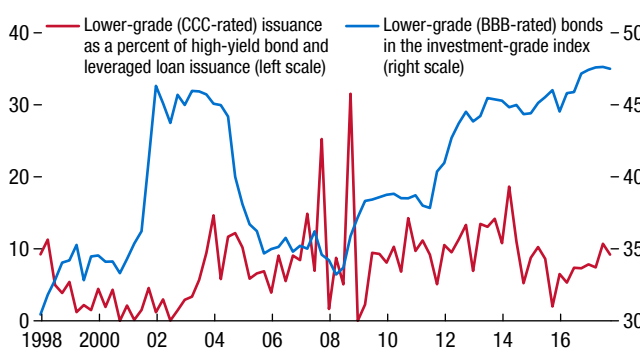
... has supported demand for risky assets and compressed credit spreads.

2. Credit Spreads per Rating Bucket, 1999–2018 (Basis points)



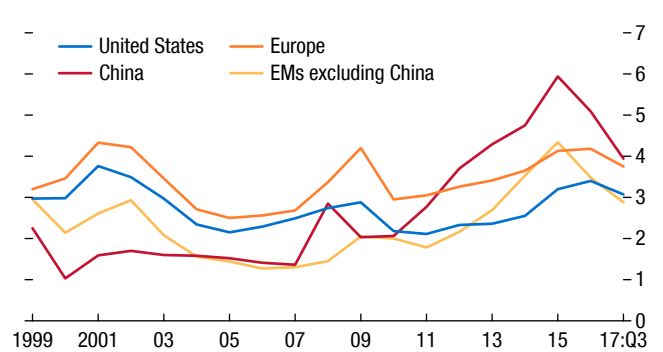
This has spurred the new issuance of risky bonds in lower-credit-quality buckets.

3. Share of the Lowest Credit Bucket (Percent)



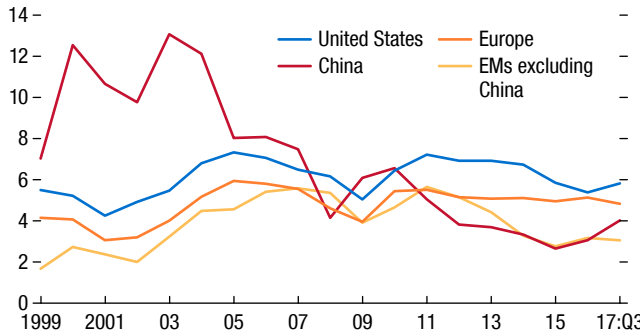
Profitability has helped reduce debt ratios.

4. Debt Ratios (Net debt to EBITDA, percent)



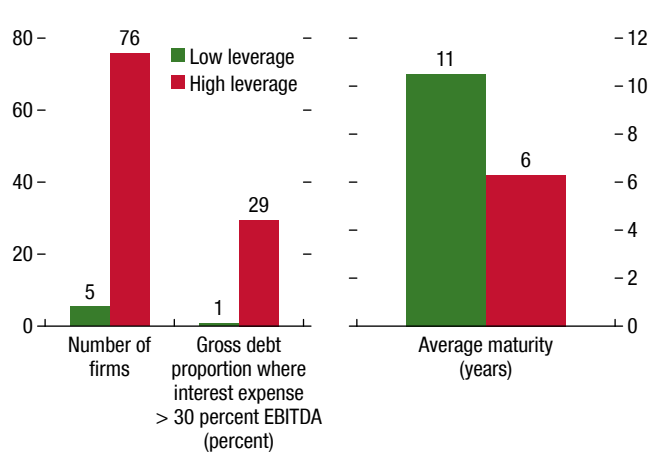
As a result, interest coverage ratios have dipped, except for the United States and China.

5. Interest Coverage Ratios (EBIT to interest expense)



Highly levered firms are more likely to be impacted by the US corporate tax reform.

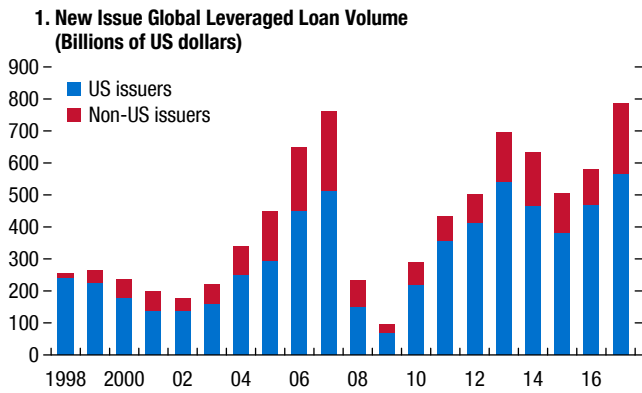
6. Comparison among High- and Low-Leveraged US Firms



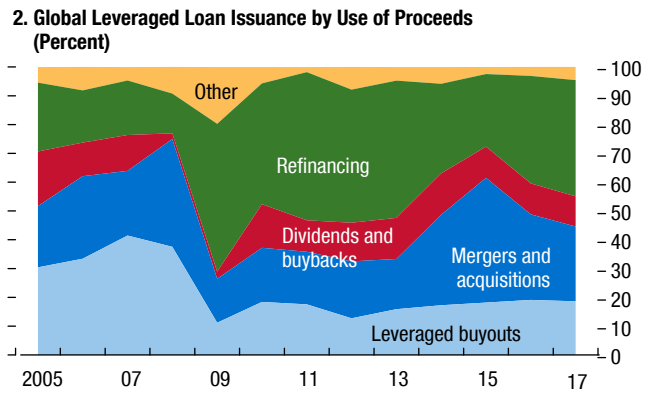
Sources: Bloomberg Finance L.P.; ICE Bank of America Merrill Lynch; JPMorgan Chase & Co; Standard & Poor's; and IMF staff calculations. Note: In panel 2, the full sample is from 1999 to 2018. In panels 4 and 5, the full sample from 1999 to 2005 from the source is limited. In panel 6, high leveraged is defined as firms with net debt divided by EBITDA > four times. Real estate and utilities sectors are not included. EBIT = earnings before interest and taxes; EBITDA = earnings before interest, taxes, depreciation, and amortization; EM = emerging market.

Figure 1.9. Leveraged Loan Issuance, Quality, and Developments after Regulatory Guidance

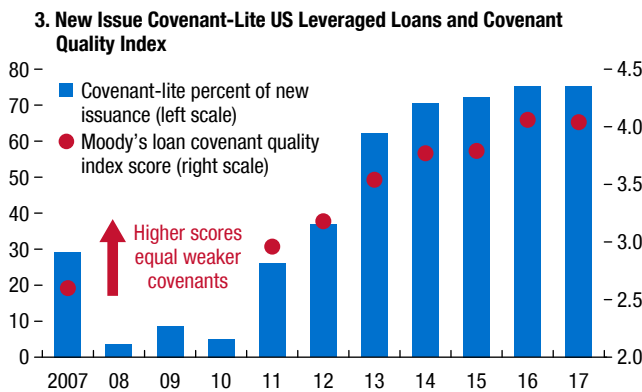
Loan issuance reached record highs in 2017 ...



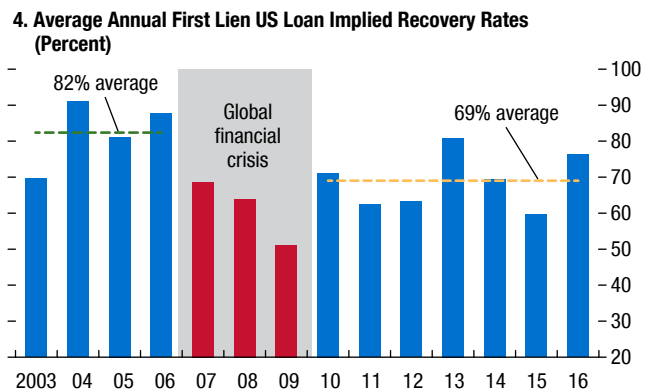
... with the share of proceeds used to fund acquisitions and shareholder enhancements still large.



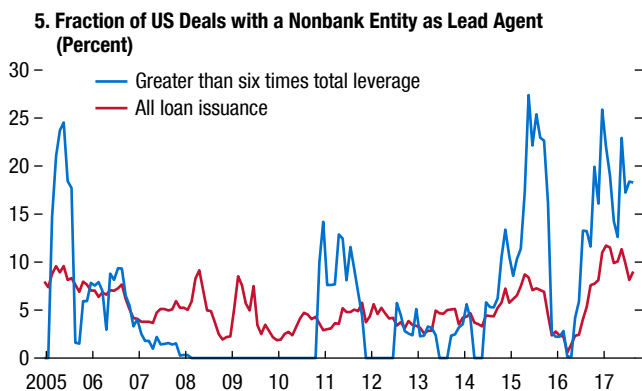
Covenant protections have weakened over time ...



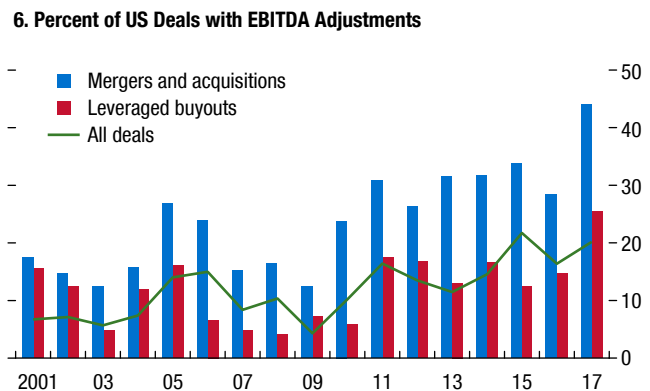
... leading to potentially lower recovery rates in the next default cycle.



Highly leveraged loan deals have increasingly been arranged by nonbank lenders ...



... while adjustments to earnings expectations have led to less conservative leverage calculations.



Sources: Barclay's; Moody's Default and Recovery database; Standard & Poor's Leveraged Commentary and Data; and IMF staff calculations.
 Note: In panel 3, the Moody's Loan Covenant Quality Index score is a yearly average; data are unavailable from 2008 to 2010 due to lack of rated leveraged loan issuance. A higher Covenant Quality Index score represents weaker covenant protections. In panel 4, implied recovery rates are based on loan prices one month after default. EBITDA = earnings before interest, taxes, depreciation, and amortization.

The global leveraged loan market now offers an interesting example of the extent to which reach for yield has supported issuance and adversely affected price and nonprice terms, as well as credit quality, despite efforts by regulators to rein in risk taking.¹³ Strong issuance and lofty valuations, including a weakening of nonprice terms such as investor protections, could exacerbate the next default cycle. A sharp rise in defaults following a tightening of financial conditions, or a shutdown of the market at the extreme, could have large negative implications for the real economy given the growing size of the loan market to date and the role it plays in channeling funding to corporations.

Signs of late credit cycle dynamics are already emerging in the leveraged loan market and, in some cases, are reminiscent of past episodes of investor excesses. Lower-quality companies continue to enjoy ample access to credit. Yet at the same time, ratings have deteriorated. In the United States, the percentage of new loan issuance rated single-B or lower increased from about 25 percent in 2007 to 65 percent in 2017, although this trend could partly reflect some changes in rating agencies since the crisis.¹⁴ Meanwhile, new deals include fewer investor protections, such as looser covenants and thinner subordination in the capital structure. For example, covenant-lite loans have evolved from a specialty structured debt instrument before the financial crisis to the largest market segment today. Covenant-lite loans made up 75 percent of new institutional loan issuance in 2017. In addition, the quality of loan covenants has continued to deteriorate (Figure 1.9, panel 3).

To be fair, weaker covenants may reflect the loan market's changing investor base as loans mature into a widely accepted asset class in investors' portfolios. But looser provisions inherently provide fewer warning signals about a potential default and may thereby result in lower recovery rates. For example, in the recent past banks typically demanded a first-lien claim on collateral as well as sufficient loss-absorption capacity

(usually in the form of corporate bonds) to protect loans in the event of a default. But the average debt cushion of first-lien covenant-lite loans is now only 15 percent, down from about 33 percent before the financial crisis. Although the number of defaults so far in this cycle has been limited, weakening investor protections and eroding debt cushions have coincided with lower average recovery rates for defaulted loans (69 percent), compared with the precrisis average of 82 percent (Figure 1.9, panel 4).

Regulators in the United States and Europe have taken actions aimed at curbing market excesses.¹⁵ One unintended consequence of these actions appears to be a migration of activity away from banks toward institutional investors, such as collateralized loan obligations, bank loan mutual funds, private equity firms, and other private funds (Kim, Plosser, and Santos 2017). (See Box 1.3 for a discussion of the changing investor base in the US leveraged loan market.) As noted, institutional leveraged loans outstanding have grown rapidly in recent years, with institutional investors increasingly playing an important role in highly leveraged loan deals (Figure 1.9, panel 5). In addition, nonprice terms, which are more difficult to monitor, have been loosening. Weaker covenants have reportedly allowed borrowers to inflate projections of earnings before interest expenses, taxes, depreciation, and amortization (EBITDA) and to borrow more after the closing of the deal. New loans with EBITDA add-backs or adjustments that conceal deteriorated leverage metrics have reached new highs (Figure 1.9, panel 6).¹⁶

¹³There is no universal definition for leveraged loans, but the term usually refers to a speculative-grade loan for which the obligor's postfinancing leverage (as measured by debt-to-assets ratio, debt-to-equity ratio, cash-flow-to-total-debt ratio, or other such standards unique to particular industries) significantly exceeds industry norms. Leveraged borrowers typically have diminished ability to adjust to unexpected events and changes in business conditions because of their higher ratio of total liabilities to capital.

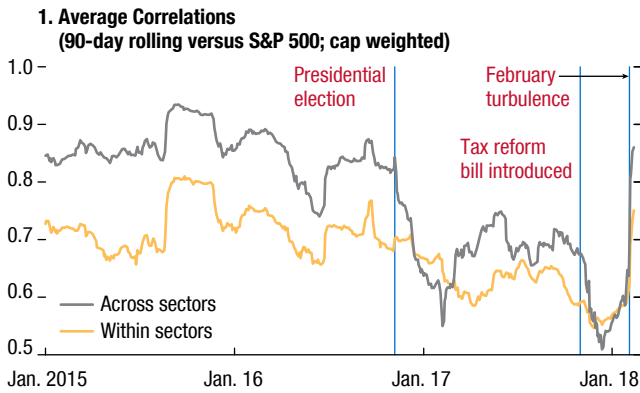
¹⁴Cohen and Manuszak (2013) find that increased competition among credit rating agencies from 2002 to 2007 led to lower subordination levels and less stringent ratings.

¹⁵For example, in March 2013 US federal banking agencies issued guidance to reduce risk in the leveraged loan market, both for loans retained on banks' balance sheets and for those repackaged for sale to other parties. More recently, in May 2017 the ECB issued supervisory guidance concerning expectations around leveraged transactions in Europe and the ongoing monitoring of the fundamental credit quality of leveraged exposures. In particular, US and European supervisors recommended that banks follow heightened risk management when a borrower's debt exceeds six times its earnings before interest expense, taxes, depreciation, and amortization.

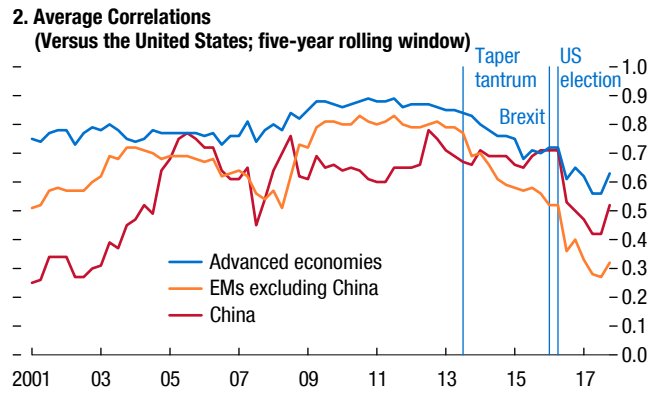
¹⁶EBITDA add-backs generally consist of pro forma fees and expenses (expected to be eliminated following an acquisition deal) that increase the pro forma EBITDA during the loan syndication process. For additional debt after deal closing, most structures include a debt incurrence clause that allows the borrower to add debt subject to the satisfaction of certain financial ratios along with fixed-dollar debt baskets that generally permit the borrower to incur debt without reference to a maintenance covenant or other financial ratio.

Figure 1.10. Correlations and Interconnectedness

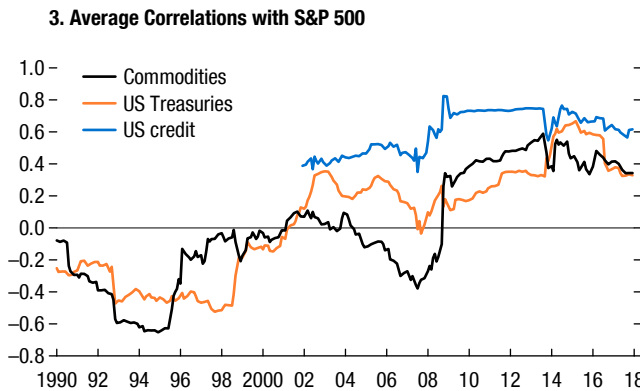
In the United States, correlations between individual stocks and across sectors have picked up.



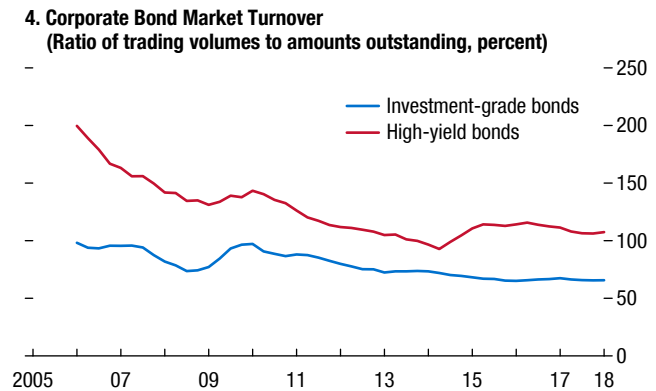
Within the global equity market, cross-country correlations have rebounded somewhat.



The average correlations across major asset classes have remained relatively high ...



... while market turnover has been relatively low.



Sources: Bloomberg Finance L.P.; Haver Analytics; Market Axess; and IMF staff estimates.
Note: In panel 4, data are as of end-February 2018. EM = emerging market. S&P = Standard & Poor's.

The Price of Volatility Remains Low

Another critical issue is how much risk investors perceive around asset valuations. Indeed, valuations for options, on the one hand, and underlying securities, on the other, are distinct, strictly speaking. During the turmoil in global equity markets in early February, implied volatilities derived from equity options, which reflect information not only about investors' expectations for volatility but also the premium they require to bear volatility risk, spiked sharply from subdued levels. The VIX term structure, based on short- to longer-dated option expiration dates, not only shifted higher but also inverted briefly (see Online Annex 1.1 on implied volatility pricing).¹⁷

¹⁷See Online Annex 1.1 at www.imf.org/en/Publications/GFSR for more details.

But realized volatility and underlying forecasts of future volatility also increased. Both near- and longer-term equity options now appear close to, if not below, levels consistent with volatility forecasts. Therefore, the premium investors require to compensate for volatility risks was little changed, on net, which is ultimately consistent with persistently accommodative financial conditions, as well as a renewed willingness on the part of investors to sell volatility. A broadly similar picture arises across other asset classes, including US dollar swaptions.

Correlations within and across asset classes are also important indicators of financial conditions. Indeed, correlations among even typically unrelated assets tend to increase sharply during financial crises, making diversification difficult as investors' overall portfolio risk increases. Correlation measures have rebounded of late,

albeit from subdued levels relative to historical norms. Within the US stock market, correlations between individual stocks and across sectors picked up somewhat after the completion of major tax legislation and increased further after the spike in volatility in February 2018 (Figure 1.10, panel 1). Global equity market correlations also rebounded in recent months, even before the drop in global share prices (Figure 1.10, panel 2). Finally, broader correlations across asset classes have increased, which suggests that global diversification has become somewhat more difficult (Figure 1.10, panel 3).

It should be noted, however, that trends in realized statistical correlations may understate the prospects of contagion risk. Indeed, both correlations and volatility tend to increase at precisely the most inopportune and unforeseeable times; namely, when prices of risky assets swoon. In addition, market turnover has been relatively low, especially for high-yield bonds, which may compound price discovery distortions and illiquidity in the future (Figure 1.10, panel 4).

Beyond asset price correlations and volatility, the ongoing structural changes in the investment management industry affect interconnectedness and the potential for spillovers across markets. For example, broker dealers' intermediation role has declined in recent years, leading to a greater role for the non-bank sector. Institutional investors include both firms dedicated to high-frequency trading across markets, which have become more prominent, and also other market participants, such as insurance companies and pension funds, which may be using less procyclical investment strategies. In any case, these new market structures have not been tested during a significant market downturn.

Increasing Use of Financial Leverage May Amplify Risks

As the financial crisis illustrates, leverage can amplify negative shocks through pernicious feedback loops. Sharp price declines can lead to investor runs and fire sales of liquid and safe assets to cover redemptions and margin requirements.

There have been some noteworthy developments since the crisis. For example, lower volumes of *repurchase agreements (repos)*, at least relative to market capitalization, may be reflective of less financial leverage. In the years before the global financial crisis, investors widely used repos and leverage to boost returns. But stricter regulations, as well as changes in bank business models, have significantly reduced repo activity.

However, other forms of financial leverage appear to be on the rise:

- *Synthetic collateralized debt obligations (CDOs)*: Analysts estimate synthetic CDO issuance to have surged to between \$80 billion and \$100 billion in 2017—well below precrisis levels but up from about \$20 billion a year in 2014–15 (Figure 1.11, panel 1). Some market participants also speculate that institutional investors are actively increasing leverage to boost yields using total return swaps and asset swaps, although little evidence is available at this point.
- *Margin debt*: The margin debt from stock borrowing stands at a record \$580 billion in the United States, about 2 percent of overall market capitalization as of the end of 2017 (Figure 1.11, panel 2).¹⁸ Although this share is below the peak in 2008, it is still quite elevated. Also worrisome, the current net exposure¹⁹ of investors involved in stock margin borrowing is at record negative highs relative to overall market capitalization compared with the past 25 years (Figure 1.11, panel 3).
- *Use of financial leverage by investment funds*: Meanwhile, assets under management of large regulated bond investment funds that actively use derivatives have increased to more than \$1.5 trillion, about 17 percent of the world's bond fund sector (Figure 1.11, panel 4). The use of embedded leverage through derivatives is increasing as fund managers seek to enhance low yields. The lack of sufficient data collection and oversight by regulators compounds the risks.²⁰ Gross notional exposure of bond funds to derivatives is worrisome. The average derivatives leverage (defined as gross notional exposure) of an asset-weighted sample of more than 200 US- and European-domiciled bond funds has risen from 215 percent to 268 percent of assets over the past four years (Figure 1.11, panel 5). The level of deriv-

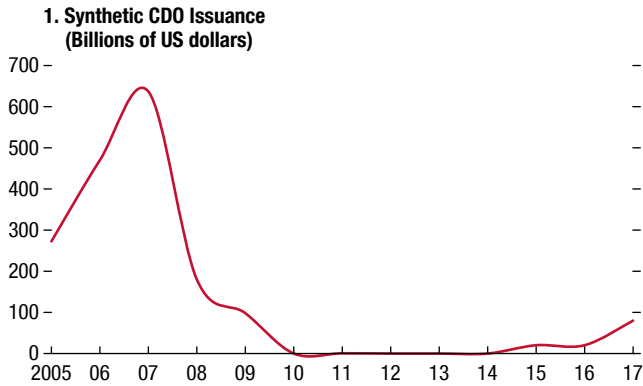
¹⁸Stock margin borrowing data can also include fixed-income securities, but most transactions are related to stocks. The data include both retail and institutional investor transactions.

¹⁹Defined as the difference between debit balances and free credit balances in customers' security margin and cash accounts.

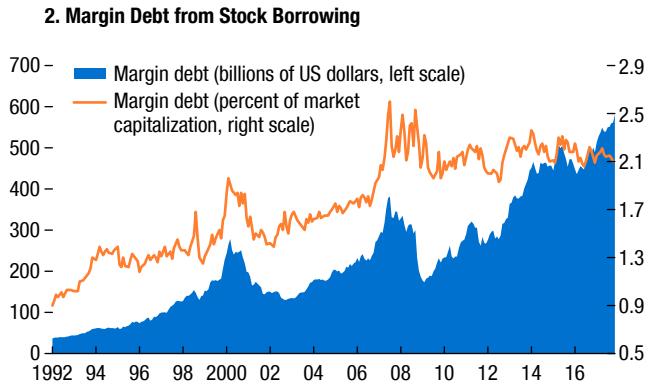
²⁰No disclosure requirements for detailed leverage information for regulated investment funds are in place in the United States, and requirements are in place only on a selected basis in some European countries. Implementing comprehensive and globally consistent reporting standards across the asset management industry would give regulators better data with which to locate leverage risks. For example, reporting standards should include enough information on derivatives to show funds' sensitivity to large moves in underlying rate and credit markets.

Figure 1.11. Measures of Leverage and Investment Funds with Derivatives-Embedded Leverage

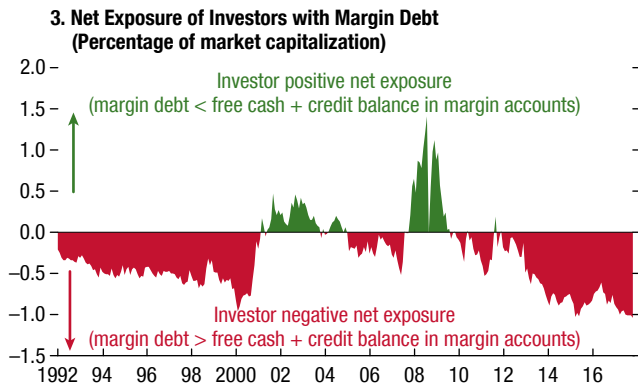
Although well below precrisis levels, synthetic CDO issuance is coming back ...



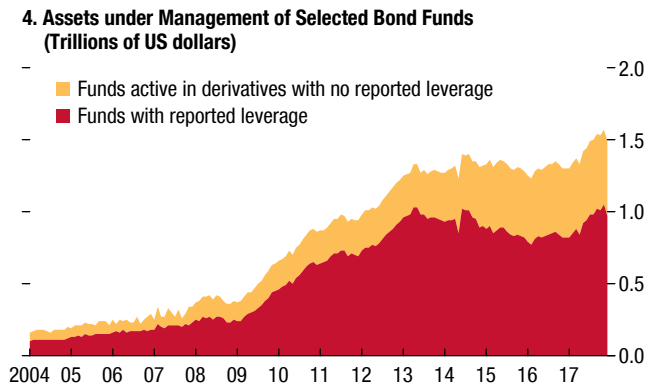
... with elevated stock borrowing by margin indicating greater leverage risk in US equity markets ...



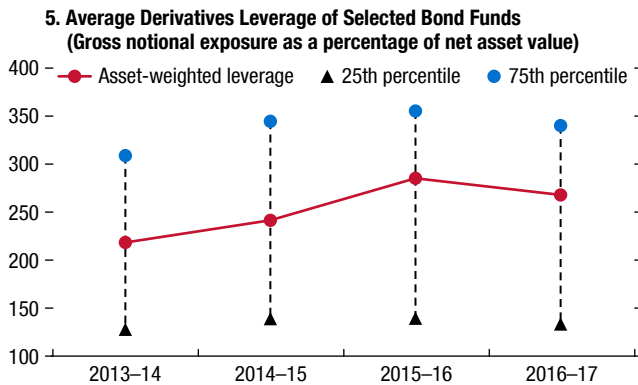
... and net exposures in margin accounting for stock borrowing reaching record negative levels.



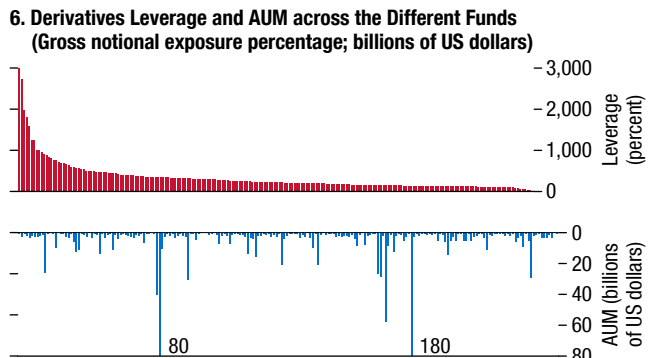
There is strong growth in the AUM of selected large regulated bond funds that use derivatives ...



... with rising gross notional exposures ...



... that can exceed multiples of fund net asset values.



Sources: Annual reports of selected regulated investment funds; Bloomberg Finance L.P.; Federal Reserve; Financial Industry Regulatory Authority; ICE Bank of America Merrill Lynch; and IMF staff estimates.

Note: Selected EU-domiciled investment funds report a gross notional exposure of their derivative positions in their annual report. Funds with reported leverage in derivatives positions in the sample account for over \$1 trillion of these assets, including the assets of the US-domiciled version of the same EU-domiciled funds that report leverage. Although these funds are separate investment vehicles, they share the same mandate and portfolio manager and therefore have closely matched portfolios, exhibiting a high correlation of returns. The remaining \$500 billion of assets correspond to a group of selected funds that do not report leverage in derivatives positions but are known to be active in derivatives (the funds' latest annual reports list at least 15 derivatives positions). In panels 2 and 3, margin debt data may also include nonequity securities such as bonds. In panel 6, the data are as of the latest annual reports. AUM = assets under management; CDO = collateralized debt obligation.

atives notional exposure in the sample ranges quite significantly: the bottom 25th percentile of funds has embedded derivatives leverage in the 100 to 150 percent range. But the top 25th percentile shows funds with average leverage between 300 and 2,800 percent (Figure 1.11, panel 6).²¹ Some investors may enter derivatives contracts to hedge unwanted risk. However, others may do so to boost returns, which, in turn, can amplify shocks during periods of stress.²²

Growth in Less Liquid Bond ETFs May Raise Financial Stability Concerns

The assets under management of ETFs invested in less liquid assets—bank loans and high-yield and emerging market bonds—have risen rapidly to more than \$140 billion (Figure 1.12, panel 1). Although the share of high-yield bond and emerging market bond ETF assets is still small (less than 5 percent of the total market value of underlying bond markets), it more than tripled from 2010 to 2017 (Figure 1.12, panel 2).²³

ETFs offer several benefits to investors: they enhance price discovery, provide an alternative source of liquidity through exchange trading, facilitate hedging and diversification, and charge lower fees than other investment funds.²⁴ Indeed, ETFs can provide additional liquidity to less liquid bond markets: only about one-fifth of transactions in high-yield and emerging market bond ETFs prompt a corresponding transaction in the underlying market as a result of outflows from ETFs; that is, a destruction of ETF shares (Figure 1.12, panel 3).

However, the extension of ETFs to less liquid bond markets may pose risks related to liquidity mismatches between ETFs and underlying assets. Although there

is no conclusive evidence about the broader impact of large outflows from less liquid bond ETFs on underlying markets,²⁵ the fast growth of these ETFs is worth monitoring, given their potential for increasing contagion risks:

- *Frequent trading:* Investors in ETFs appear to trade more actively than market participants in the underlying asset class, which may increase contagion risk. To start, unlike flows into retail mutual funds, ETF flows are very volatile (Figure 1.12, panel 4). Less liquid bond markets, such as high-yield bonds, lack the depth and breadth to accommodate large and frequent transactions.²⁶ Even during the financial crisis, outflows from high-yield bond investment funds were limited, with a maximum monthly outflow of 2.5 percent (of assets) in October 2008. Monthly ETF outflows now often exceed 3 percent (of assets), which may become more of a concern as the market share of ETFs rises.
- *Sensitivity to changes in risky asset prices:* As evidenced during the February episode of volatility in equity markets, the sensitivity of high-yield and emerging market bond ETFs to S&P 500 returns is higher than the sensitivity of their underlying indices to S&P 500 returns. This suggests that the rise in ETFs, particularly those investing in relatively illiquid assets, may increase contagion risk and possibly amplify price moves across asset markets during periods of stress. Greater investment in passive investment strategies, such as ETFs, may be related to the rise in cross-asset correlations during periods of stress, one of the main attributes of contagion. Benchmark-focused investors are more likely to be driven by common shocks than by the idiosyncratic fundamentals of assets they invest in.²⁷

²¹While US and European regulated investment funds are subject to explicit leverage limits, derivatives exposures may mask implicit leverage since there is less explicit regulation on leverage, particularly in the United States. See Chapter 1 of the April 2015 GFSR for more detail.

²²There are 14 funds in the sample (with about \$25 billion in assets under management) that report both the gross notional exposure of their derivatives and a leverage exposure, adjusted for discretionary hedging and netting. About two-thirds of their gross derivatives notional exposure is not dedicated to hedging and netting, but to boosting returns and additional risk.

²³Data on the share of the loan market are not included owing to lack of data availability.

²⁴ETFs are generally index-tracking funds that are traded on exchanges and allow investors to gain exposure to several asset classes on a real-time basis at a relatively low cost compared with higher-fee regulated investment funds that do not offer intraday liquidity. ETFs thereby enhance price discovery and offer liquid and transparent investment and hedging alternatives.

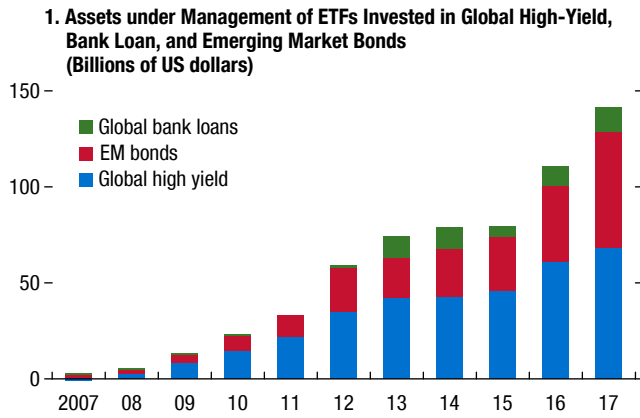
²⁵There is some evidence that the largest holdings of high-yield bond ETFs are increasingly and more systematically underperforming the broader market during days of large outflows. During these days (top 5th percentile of daily shares destroyed), the largest 10 bond holdings of US high-yield bond ETFs showed significantly greater underperformance to the market in the 2015–17 period as compared with the 2010–11 period, when their ownership of the underlying market was less than a quarter of what it is today. There is no evidence, however, of large redemptions from these ETFs having a significant impact on the pricing of the broader underlying market. This is not at all surprising given that their share of the underlying high-yield and emerging market bond markets is still less than 5 percent.

²⁶This limitation is reflected in the lower trading volumes, smaller trading size, smaller share of large trades, and less frequent trading of the less liquid fixed-income markets. Some high-yield bonds do not even transact on a daily basis. See Chapter 1 of the October 2014 GFSR.

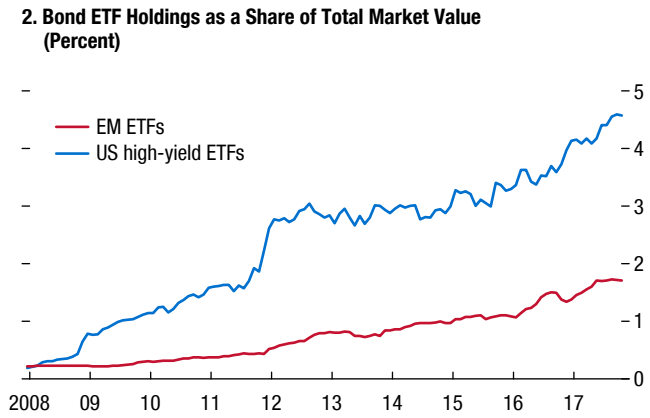
²⁷See Chapter 1 of the April 2015 GFSR.

Figure 1.12. Strong Inflows into Exchange-Traded Funds Pose Challenges for the Less Liquid Fixed-Income Markets

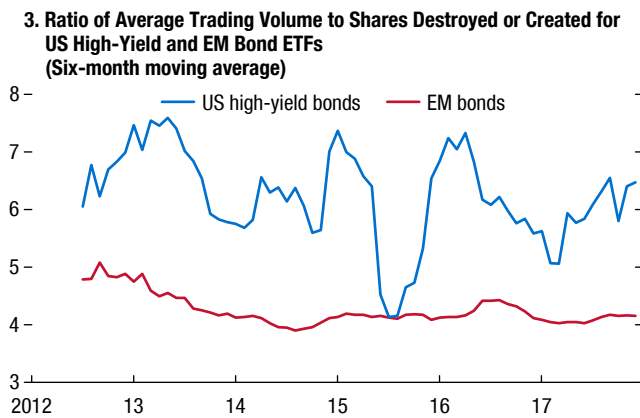
ETFs invested in less liquid bond markets are receiving strong inflows ...



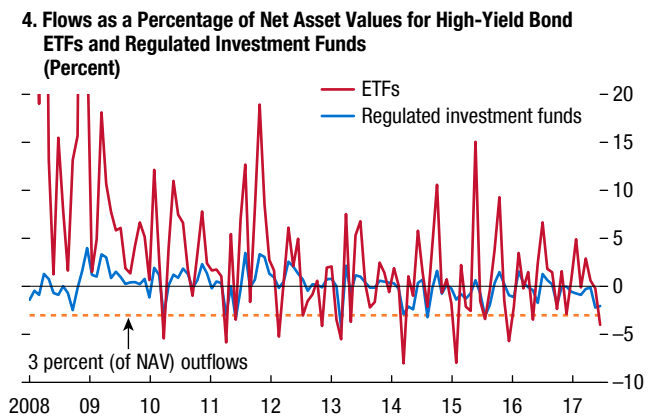
... and ETFs are owning a growing share of the underlying markets.



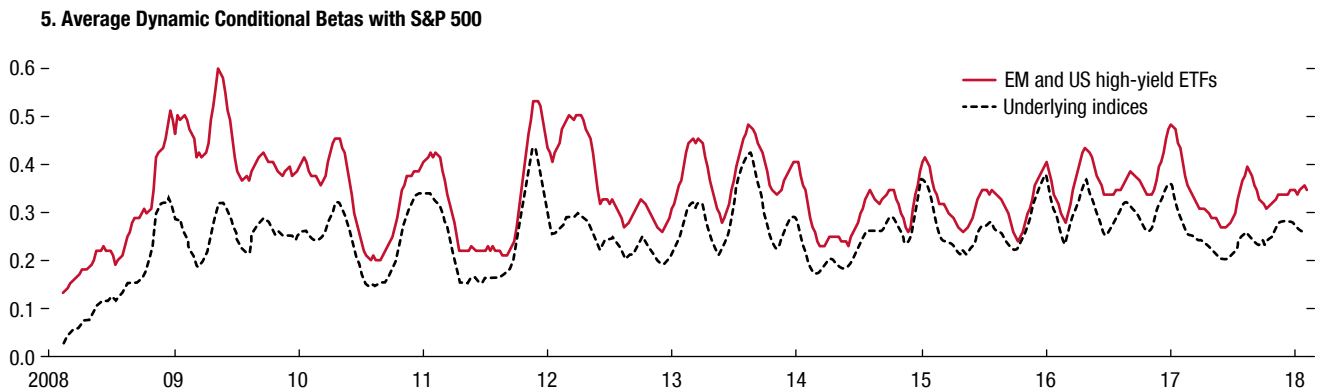
Although ETFs can provide additional liquidity to the less liquid bond markets ...



... their investor base is significantly more flight prone ...



... and their greater sensitivity to major liquid markets increases contagion risks.



Sources: Bloomberg Finance L.P.; EPFR Global; Haver Analytics; ICE Bank of America Merrill Lynch; and IMF staff estimates.
 Note: The market value of underlying bonds in panel 2 is calculated using ICE Bank of America Merrill Lynch indices. EM = emerging market; ETF = exchange-traded fund; NAV = net asset value. S&P = Standard & Poor's.

Risks Arising from the Buildup of Financial Vulnerabilities Should Be Managed

Regulators and financial market participants should avoid complacency and be mindful of the risk of sudden bouts of extreme volatility. Although financial markets functioned well during the turbulence in early February, the episode was largely confined to global equity markets. Asset valuations remain stretched, and rising interest rates may be accompanied by a repricing of risky assets and further spikes in volatility. Regulators should, therefore, ensure that financial institutions maintain robust risk management standards, including through the close monitoring and assessment of exposures to asset classes deemed to be overvalued. Financial market participants should remain attuned to the risks associated with rising interest rates and monetary policy normalization.

Given signs of late-stage credit cycle dynamics, policymakers should use the macroprudential tools at their disposal more actively. In addition to deploying standard capital- and borrower-based macroprudential instruments, regulators should improve credit risk monitoring, also focusing on deterioration of nonprice terms and investor protection. Regulators should also be mindful of the unintended consequences of regulatory measures, including migration of activity toward more opaque segments of the financial system.

Finally, the macroprudential toolkit needs to be expanded to address risks in the nonbank financial sector. For example, regulators should do the following:

- *Endorse a clear and common definition of financial leverage in investment funds:* This definition would improve transparency, particularly for derivatives positions. Lack of progress on regulation covering the use of derivatives is also a concern that should be addressed.
- *Continue to strengthen supervisory frameworks for liquidity risk management in investment funds:* Although the International Organization of Securities Commissions' latest report on liquidity risk management for collective investment funds (IOSCO 2018) provides welcome guidance on this front, there is scope for the country authorities to monitor further the effectiveness of existing liquidity risk management tools used by fund managers. More broadly, it is important that the authorities across different jurisdictions agree on a harmonized and coherent macroprudential approach to the financial stability risks stemming from investment fund activities, including the possibility of conducting stress test exercises.

Crypto Assets: New Coin on the Block, Reach for Yield, or Asset Price Bubble?

Amid stretched valuations in many risky asset classes, crypto assets have erupted onto the financial landscape and their prices have skyrocketed. Some of the technological advances behind them have the potential to increase the efficiency of payment systems and the financial infrastructure. There has been a notable proliferation of crypto assets in recent years and major US exchanges have launched futures contracts. However, crypto assets have also been afflicted by notorious cases of fraud, security breaches, and operational failures and have been associated with illicit activities. At present, crypto assets do not appear to pose macrocritical financial stability risks. Policymakers, however, will need to be nimble, innovative, and cooperative to tackle potential financial stability challenges should crypto assets be used more widely.

Crypto Assets: A New Asset Class and Means of Payment?

Crypto assets have the potential to combine the benefits of traditional currencies and commodities.²⁸ Like fiat money, they can potentially be exchanged for other currencies, be used for payments, and store value.²⁹ As investment products, they may offer portfolio diversification, although their ability to do so is still limited by their short track record, regulatory uncertainty, and primitive market infrastructure.

The technology underlying crypto assets—distributed ledger technology (DLT)—could also lead to more efficient market infrastructure (IMF 2016a and CPMI 2017). This technology differs from traditional payment systems, which require a clearing entity, such as a central bank, that settles transactions and distributes funds between participants. DLT, in contrast, uses multiple copies of the central ledger, which are kept by individual entities. Blocks of transactions are subsequently validated and recorded, forming a historical chain—hence the name blockchain. New units of the major crypto assets are supplied by “miners” who solve a cryptographic puzzle as part of the validation process and receive a new coin in return. This procedure, however, is costly

²⁸The term “crypto asset” is used here to refer to digital currencies that rely on encryption techniques to regulate the generation of units and verification of transfers. Digital currencies are often referred to as “cryptocurrencies” in the popular press. Although tokens and initial coin offerings (ICOs) are discussed at times in the section, the main focus is on crypto assets. ICOs are issuances of digital currencies sold via auction or investor subscription in return for crypto assets.

²⁹Some jurisdictions, however, have forbidden the use of crypto assets as a medium of exchange for payments.

in terms of both energy and time. The supply process differs somewhat across crypto assets and allows for some flexibility. For example, there is an upper limit on the eventual outstanding amount of Bitcoins. But crypto assets can be designed without such an upper limit, thus mimicking more closely the money supply dynamics in traditional fiat money systems.

Crypto assets have been touted as a new form of money. However, they are still far from fulfilling the three basic functions of money. While they may serve as a store of value, their use as a medium of exchange has been limited, and their elevated volatility has prevented them from becoming a reliable unit of account. These shortcomings could change with wider adoption and technological improvements, and some crypto assets may be able to perform the functions of money better, thus putting competitive pressure on fiat currencies (Box 1.4).

Even after accounting for recent price corrections, crypto assets have experienced spectacular appreciation over the past year, spurred by the global reach for yield. Nonetheless, they represent only a small share of the global financial system. Their total market value is less than 3 percent of the combined G4 central bank balance sheets (Figure 1.13, panel 1). Bitcoin alone accounts for 47 percent of crypto assets' market value, while the next two largest crypto assets, Ethereum and Ripple, account for 15 percent and 8 percent, respectively. As such, crypto assets currently pose limited challenges to fiat currencies or to the conduct of monetary policy. The dramatic growth in the sector, however, may pose risks to financial stability in the future and thus warrants vigilance by regulators.

Much attention has been devoted to the skyrocketing prices of crypto assets in 2017, which has invited comparisons with past speculative bubbles (Figure 1.13, panel 2). However, after accounting for price volatility, risk-adjusted returns have not dramatically exceeded those of mainstream assets over the medium term, though they have in the most recent year (Figure 1.13, panel 3).³⁰ For example, the Sharpe ratio of crypto assets was relatively close to the risk-reward ratio of the S&P 500 over the past three years, and it was below what investing in so-called FANG stocks (Facebook, Amazon, Netflix, Google) would yield (Figure 1.13, panel 4). However, crypto assets have not

³⁰Admittedly, some of the volatility in crypto assets followed the consideration of regulatory measures in various countries.

been correlated with other assets, and therefore could provide diversification benefits to investors, on balance.

The unconditional correlation between Bitcoin and other asset classes was close to zero between September 2015 and March 2018 (Bank of America Merrill Lynch 2017; Burniske and White 2017) (Table 1.1, panel 1).³¹ Even during the most recent bout of volatility, the correlation of Bitcoin with most mainstream assets did not appear to change significantly. Pairwise correlations between different crypto assets are comparatively subdued, again despite tremendous variance in returns (Table 1.1, panel 2). Although these correlations are positive, they are somewhat lower than correlations with G4 sovereign yields and equities.³² However, it is important to note that these correlations may change over time. So while some investors are beginning to investigate whether crypto assets could be an asset class in their own right, it is too early to draw clear conclusions.

Dedicated crypto-asset exchanges (CEs) provide liquidity, leverage, and custodial services. More than 180 CEs are transacting in thousands of different coins across jurisdictions, adding up to an average daily volume of \$30 billion. Still, liquidity tends to be highly concentrated in a select few coins and exchanges. The top 14 CEs account for more than 80 percent of reported volume (Figure 1.14, panel 1), and the top 10 crypto assets account for 82 percent of the total reported volume (Figure 1.14, panel 2). Among currency pairs with fiat currency on one side, the US dollar dominates with 71 percent of volume, followed by the yen and the euro with about 14 percent and 11 percent, respectively (Figure 1.14, panel 3).

In December 2017, the Chicago Mercantile Exchange (CME) and Chicago Board Options Exchange (CBOE) introduced Bitcoin futures contracts. For now, however, futures volumes represent a small fraction of overall trading activity on the CME and CBOE and only 2.3 percent of reported trading in the Bitcoin cash market on CEs (Figure 1.14, panel 4).

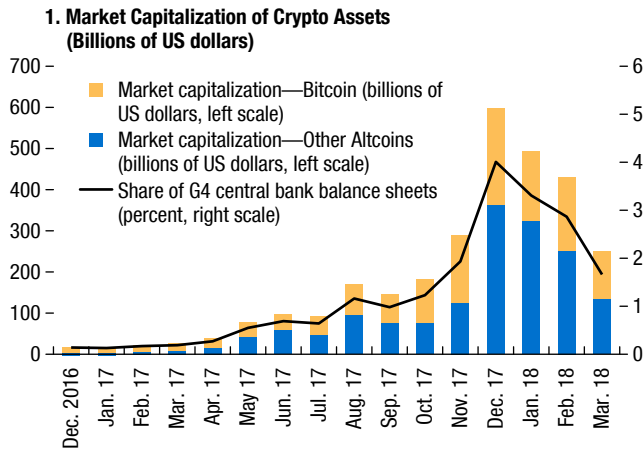
However, CEs are a major source of risk for investors, given their opaque and often unregulated nature. Security breaches and exchange failures have led to periods—albeit short-lived—of high volatility and

³¹September 2015 is used as the starting point of the sample because of data availability limitations before then.

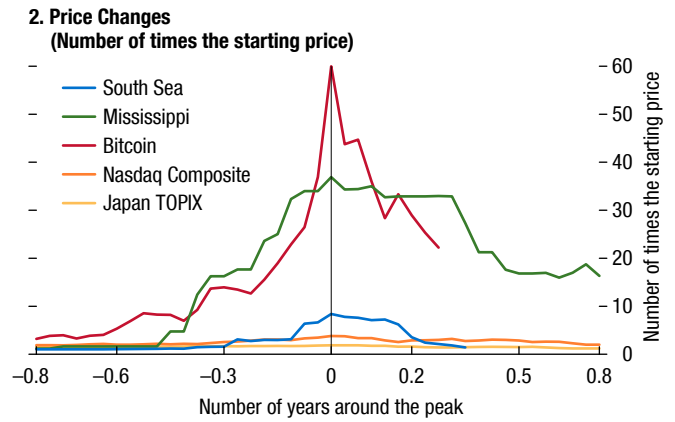
³²To assess conditional correlations, another multivariate GARCH (asymmetric, generalized autoregressive conditional heteroscedasticity) model was estimated, which found no clear trend during the recent period of sharp crypto-asset appreciation.

Figure 1.13. Crypto Assets: Size, Price Appreciation, Realized Volatility, and Sharpe Ratio

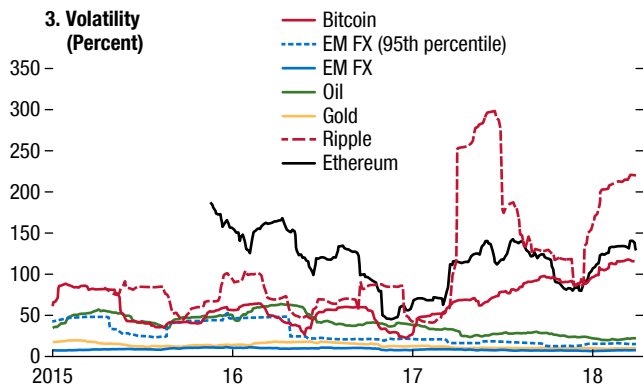
Crypto assets account for a small fraction of G4 central bank balance sheets.



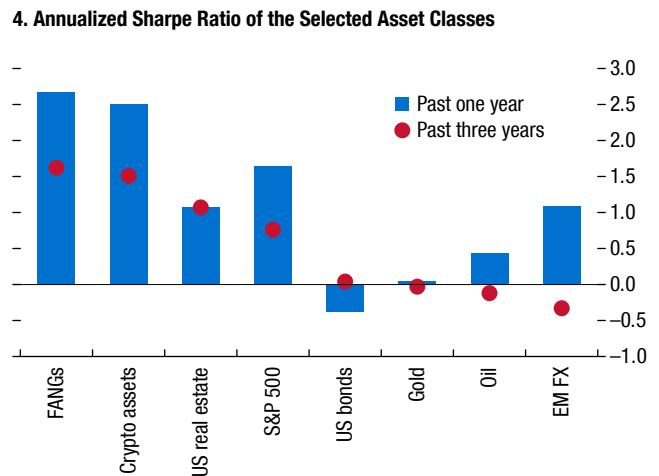
Comparison with historical bubbles.



Bitcoin's realized volatility is much higher than that of other asset classes.



Risk-adjusted returns of crypto assets have not dramatically exceeded those of other mainstream assets.



Sources: Bloomberg Finance L.P.; CoinDance; CoinMetrics; European Central Bank; Haver Analytics; national central banks; Yale International Center for Finance; and IMF staff estimates.

Note: Panel 3 is based on 90-day realized volatility. In panel 4, crypto assets is an average across Bitcoin, Ethereum, Litecoin, and Ripple. The Sharpe ratio is the average return earned in excess of the risk-free rate per unit of total risk. EM = emerging market; FANGs = equal-weighted index of highly traded stocks of technology and tech-enabled companies such as Facebook, Amazon, Netflix, and Alphabet's Google; FX = foreign exchange; G4 = Group of Four (euro area, Japan, United Kingdom, United States); TOPIX = Tokyo Stock Price Index.

Table 1.1. Correlation of Bitcoin with Key Asset Classes and within Crypto Assets

The unconditional correlation between Bitcoin and other asset classes has been close to zero.

1. Unconditional Covariance Matrix of Daily Returns within Selected Asset Classes

	Bitcoin	S&P 500	Long US Treasury ETF	Euro	Chinese Renminbi	Gold
Bitcoin	1.00	0.02	0.02	-0.04	0.04	0.03
Standard & Poor's 500	0.02	1.00	-0.32	-0.05	-0.09	-0.14
Long US Treasury ETF	0.02	-0.32	1.00	0.11	-0.07	0.39
Euro	-0.04	-0.05	0.11	1.00	-0.37	0.42
Chinese renminbi	0.04	-0.09	-0.07	-0.37	1.00	-0.28
Gold	0.03	-0.14	0.39	0.42	-0.28	1.00

Pairwise correlations among the various crypto-asset pairs remain low.

2. Unconditional Covariance Matrix of Daily Returns within Selected Crypto Assets

	Bitcoin	Monero	Ethereum	Ripple	Litecoin
Bitcoin	1.00	0.36	0.35	0.28	0.49
Monero	0.36	1.00	0.40	0.23	0.29
Ethereum	0.35	0.40	1.00	0.22	0.30
Ripple	0.28	0.23	0.22	1.00	0.33
Litecoin	0.49	0.29	0.30	0.33	1.00

Sources: Bloomberg L.P.; and IMF staff estimates

Note: Correlations are calculated over September 2015–March 2018. ETF = exchange-traded fund.

severe losses. Data on trading volumes can be unreliable, especially since CEs operate under heterogeneous rules with different fee structures, investor bases, and levels of regulatory oversight.

Financial Stability Risk Assessment

It is impossible to know the extent to which crypto assets may transform the financial infrastructure and whether most new crypto assets are likely to disappear as in past episodes of technological innovation (as many tech companies did during the boom of the late 1990s, for example). Before they can transform financial activity in a meaningful and lasting manner, crypto assets will first need to earn the confidence and support of consumers and financial authorities. The initial step in this process will involve coming to a consensus within the global regulatory community about what crypto assets are—for example, a security or a currency—and the role they can play in the financial system. Although Bitcoin was indeed created to circumvent a lack of trust among trading parties (Nakamoto 2008), a series of notorious fraud cases has undermined this goal, suggesting increased prudential regulation may be needed. At present, crypto assets do not appear to pose risks to financial stability. However, regulators should be vigilant to the potential for financial stability challenges that could arise should crypto assets be used more widely. A few aspects that deserve monitoring are highlighted below.

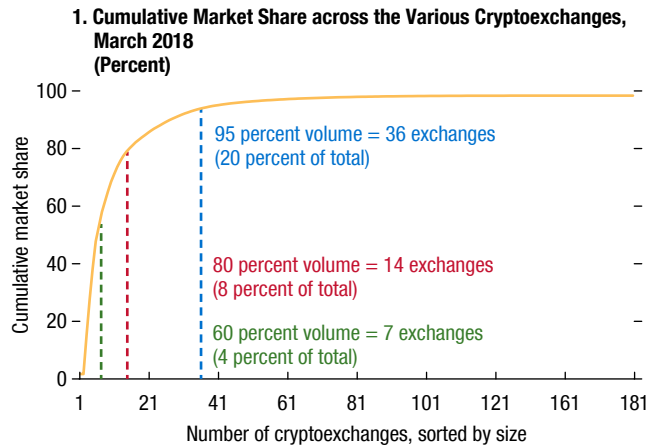
- *Leveraged trading:* CEs have set generous limits on leveraged positions, in some cases reportedly 15 times, 25 times, and even 100 times (Deutsche Bank 2017).³³ As in any exchange, sudden depreciations prompt margin calls and amplify price moves. Separately, concerns have also been raised about futures contracts traded on the CME and CBOE, given that clearing members in these exchanges bear the risk associated with these contracts through their obligation to the guarantee fund, even if they do not participate directly in the market.³⁴ Still, the combination of low asset return correlations discussed previously and crypto assets' small footprint within the financial system suggests that the risk of spillovers from idiosyncratic price moves in crypto assets to the wider market may be limited at this point.
- *Integration into mainstream financial products:* The proliferation of crypto-asset-related investment funds, ETFs, and futures contracts increases the opportu-

³³Leverage limits have been reported at 15 times an investor's cash deposits in Japan's bitFlyer exchange ("Bitcoin feeding frenzy fuelled by 15 times leverage, says exchange," <https://www.ft.com/content/7f02cdba-dbd6-11e7-a039-c64b1c09b482>). Other exchanges offer even more extreme leverage opportunities of up to 100 times (see www.bitmex.com). In practice, however, industry contacts indicate that actual average leverage tends to be between 3 and 8 times.

³⁴"Open letter to CFTC chairman Giancarlo regarding the listing of crypto-asset derivatives," from the US Futures Industry Association to the Commodity Futures Trading Commission regarding the introduction of futures contracts on crypto assets (<https://fia.org/articles/open-letter-cftc-chairman-giancarlo-regarding-listing-crypto-asset-derivatives>).

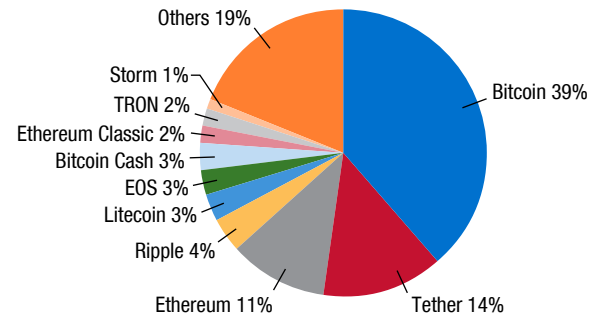
Figure 1.14. Share of Trading Volumes across Exchanges, Crypto Assets, and Fiat Currencies

Trading volume is highly concentrated, with 80 percent of volume traded on just 14 exchanges.

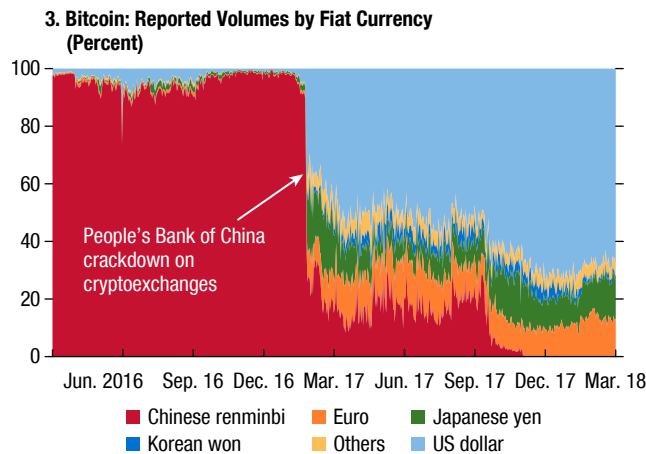


Volume share across crypto assets is led by Bitcoin, Ethereum, Ripple, and Tether.

2. Reported Volumes by Cryptocurrency, March 2018 (Percent)

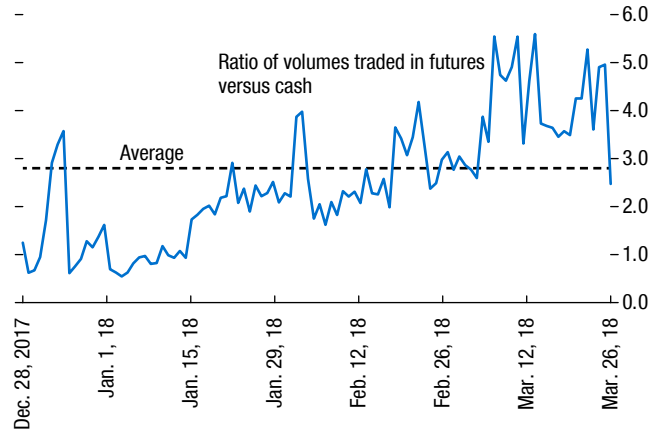


Composition of reported volumes has shifted away from the Chinese exchanges.



Bitcoin futures volumes remain low.

4. Bitcoin Futures as a Proportion of Cash Volume (Percent)



Sources: Bitcoinity; Bloomberg Finance L.P.; CoinMarketCap; and IMF staff estimates.

nities for mainstream investors to incorporate these assets into their portfolios. However, this broadening of the investor base could result in increased correlation between crypto assets and traditional assets over time, increasing the potential for transmission of shocks, especially during episodes of risk aversion.

- *Partial disintermediation of the banking system:* A large shift away from fiat money toward crypto assets could add challenges to banks' business models. Such a shift, if on a broad scale, would result in a more decentralized financial system in which banks would play a smaller role in traditional lending business and in payment systems. In such a decentralized system,

financial stability risks may become more prominent because the critical prudential and safety-net functions of existing banking systems (for example, consumer protection, resolution regulations, and systemic liquidity management by the central bank) would safeguard a smaller segment of the financial system, and the ability of central banks to function as a lender of last resort may also be curtailed.

- *Cross-border considerations:* The lack of transparency in the markets and the rapid pace of growth could cause market disruptions. Those disruptions could be transmitted across national boundaries given the borderless nature of the underlying transaction mechanisms, a

development that could be further facilitated by the differing national regulatory approaches.

Investor Protection and Anti-Money-Laundering Aspects

Crypto assets also present concerns for investor and consumer protection, as highlighted by the International Organization of Securities Commissions and in related forums. In this regard, securities regulators have drawn attention to the risks around ICOs, mostly on the back of the increasing targeting of ICOs to retail investors by parties located outside the investor's home jurisdiction, thus escaping the purview of the relevant securities regulator. Risks around ICOs include the heightened potential for fraud, cross-border distribution risks relating to heterogeneous regulatory regimes, information asymmetries, technological flaws, and liquidity risks partly caused by the lack of reliable market makers and opaque trading practices.³⁵

By design, crypto-asset transactions entail a high degree of anonymity. This results in a potentially major new vehicle for money laundering and the financing of terrorism. Therefore, regulators and supervisors will have to be particularly vigilant regarding money laundering and the financing of terrorism when it comes to designing the appropriate environment for crypto assets (IMF 2016a). Preventive measures such as reporting requirements, customer due diligence, and transaction monitoring could be employed to ensure that crypto assets provide similar safeguards to traditional money against money laundering and the financing of terrorism.

Policy Response

Ultimately, regulators need to decide what role crypto assets could play in the financial system. So far, views have varied widely, often within the same jurisdiction (see FATF 2015). In the United States, the Commodity Futures Trading Commission sees crypto assets as a commodity, whereas the Internal Revenue Service considers them property, and the Securities and Exchange Commission (SEC) has acted on a case-by-case basis, including by halting some ICOs.³⁶ Discrepancies also appear across countries. After hosting a large share of recent ICOs, the Swiss authorities

³⁵For details, see IOSCO (2017).

³⁶For example, the SEC ruled last year that tokens issued by a virtual organization known as "The DAO" were securities, hence subject to federal regulation. More recently, the SEC halted some ICOs and launched a probe into several crypto assets. The SEC's chairman has promised increased scrutiny to prevent fraud in this area.

have issued guidelines with the intent to regulate ICOs based on economic function and the purpose for which the token is issued, its tradability, and its transferability. In contrast, China, and Korea have cracked down on some trading activities.

Future policymaking will need to be nimble, innovative, and cooperative. The IMF can help advance the agenda on regulation of crypto assets by offering advice and by serving as a forum for discussion and international collaboration. National authorities and international standard setters are encouraged to intensify cooperation on the monitoring of crypto assets and on the consistency of the regulatory approach. Immediate action is needed to close data gaps that inhibit effective monitoring of potential risks and their links to the core financial system; support systemic risk assessment and timely policy responses; and underpin measures to protect consumers, investors, and market integrity. And given the borderless nature of crypto assets and risks of regulatory arbitrage, drawing out common elements of effective regulatory approaches to facilitate consistent international cooperation is essential. Such common elements could include good practices and regulatory requirements to promote the transparency and integrity of ICOs and to strengthen the risk management and robustness of crypto-asset exchanges.

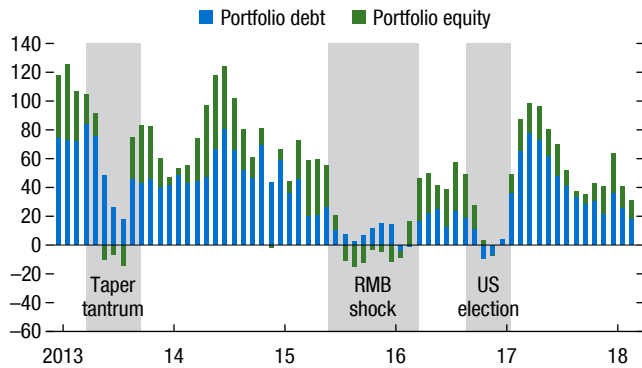
Vulnerabilities in Emerging Markets, Low-Income Countries, and China

A number of emerging market economies have taken advantage of benign external financial conditions to address imbalances and build buffers; in others, however, vulnerabilities have continued to build. Monetary policy normalization in advanced economies could result in a tightening of global financial conditions and a reduction in capital flows, increasing rollover risk and adversely affecting productive investment. With weaker issuers increasingly able to access capital markets and with fickle investors playing a larger role in recent years, stress amplifiers have risen. In addition, a considerable number of low-income countries and other small non-investment-grade issuers have experienced a sharp deterioration in debt sustainability. Meanwhile, the creditor composition in these countries has become more complex, posing policy challenges for ongoing and prospective debt restructuring. In China, regulators have taken a number of steps to reduce risks in the financial system. Despite these efforts, however, vulnerabilities remain elevated. The use of leverage and liquidity transfor-

Figure 1.15. Improving Fundamentals, Increased Foreign Currency Issuance

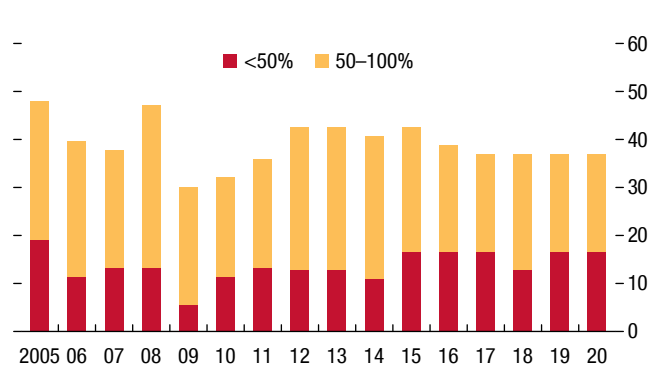
Portfolio flows have been robust.

1. Nonresident Portfolio Flows to EMs
(Three-month rolling sum in billions of US dollars)



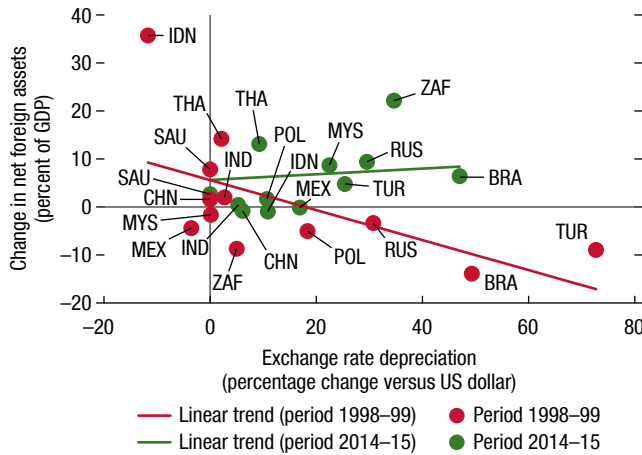
Reserve coverage has improved, but a tail of weak countries remains.

2. Reserves as a Share of External Financing Needs
(Percent of countries)



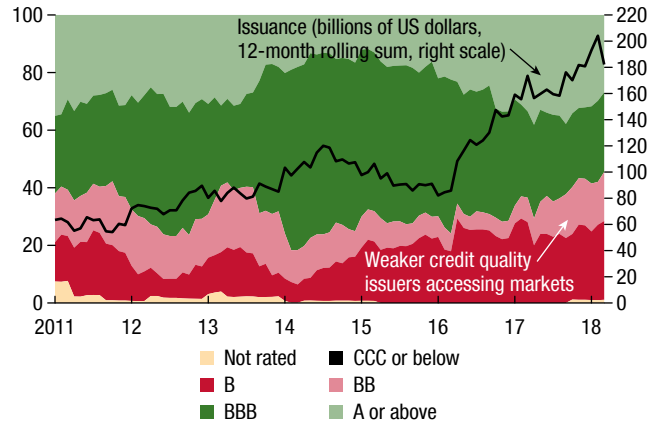
EMs were less vulnerable to dollar appreciation during 2014–15 than in the late 1990s.

3. Change in Emerging Markets' Net Foreign Assets during Periods of Dollar Appreciation



Sovereign issuers had a record year in 2017, and the share of non-investment-grade issuers is on the rise.

4. Sovereign Issuance of International Bonds by Rating
(Percent of total)



Sources: Bloomberg Finance L.P.; Bond Radar; Lane and Milesi-Ferretti (2007); Institute of International Finance; IMF, World Economic Outlook database; and IMF staff estimates.

Note: Panel 2 sample includes 54 EM economies that are part of an external debt sovereign benchmark index. Data labels in panel 3 use International Organization for Standardization (ISO) country codes. EM = emerging market; RMB = renminbi.

mation in risky investment products remains widespread, with risks residing in opaque corners of the financial system.

Has the Prolonged Search for Yield Made Emerging Market Economies More Vulnerable?

Investor sentiment toward emerging markets has remained favorable since the previous GFSR, underpinned by improving growth prospects and robust portfolio flows. Real GDP growth in emerging market economies is projected to reach 4.9 percent in 2018, the fastest pace since 2013 (see the April 2018 WEO).

Nonresident portfolio flows to emerging market economies rose to an estimated \$240 billion during 2017—twice the pace observed in the previous two years (Figure 1.15, panel 1). Although market interest rates in advanced economies have risen notably over the past six months, emerging market assets have generally performed well over the same period, even after accounting for the episode of volatility in global equity markets in early February.

The gradual and well-telegraphed normalization of monetary policy in advanced economies has pro-

vided a window of opportunity for emerging market economies. Current account deficits have generally narrowed since 2013 but remain large in a number of emerging markets and are projected to widen, especially for commodity-importing countries (see the April 2018 WEO). Strong capital inflows have enabled some countries to strengthen reserve buffers, leaving a smaller tail of countries with low reserve adequacy (Figure 1.15, panel 2). Corporate fundamentals have also been improving (see “Reach for Yield or Overreach in Risky Assets?” section and Figure 1.8, panels 4 and 5). A strong recovery in earnings has improved interest coverage, and corporate debt levels have fallen somewhat recently but remain elevated in several countries (see October 2017 GFSR).

A sharp appreciation of the US dollar could pose challenges to some countries, even as external balance sheets at an aggregate level have become less vulnerable to exchange rate depreciations. Against the backdrop of an increase in foreign currency sovereign and corporate issuance, a stronger US dollar could put pressure on emerging markets. Borrowers that obtained credit in foreign currency would see the domestic currency value of their liabilities rise, making it more challenging to service and repay debt. A sudden episode of risk aversion could be accompanied by capital outflows, reduce productive investment, and put growth at risk in some emerging markets. However, many emerging market economies have continued to improve their net foreign currency positions, thus reducing their exposures to currency depreciations. Indeed, when the dollar appreciated in 2014–15, net foreign asset positions improved in most emerging markets, a reflection of increased foreign currency assets and higher reliance on both equity liabilities and domestic currency borrowing (Figure 1.15, panel 3; also see IMF 2016b).

Aggregate measures of net external balances may, however, mask vulnerabilities arising from offsetting gross positions and imbalances at a sectoral level. Indeed, gross issuance of foreign currency corporate and sovereign debt securities rose to new highs in 2017, allowing even weaker issuers to access markets (Figure 1.15, panel 4). The share of non-investment-grade issuance has risen to more than 40 percent over the past 12 months, boosted by the return to bond markets of issuers such as Egypt and smaller issuers in sub-Saharan Africa.

Furthermore, exposure to less committed, potentially “flighty,” investors is growing, which makes

countries more susceptible to a reversal in capital flows. The growing role of fickle investors is evidenced by an upward trend in the “investor base risk index” based on Arslanalp and Tsuda (2012) (Figure 1.16, panel 1).³⁷ Foreign investor participation helps deepen capital markets, but high shares of foreign ownership can also increase vulnerability to interest rate and rollover risks; for example, in the event of a risk aversion episode. Foreign ownership of sovereign bonds remains high among several emerging market economies (Figure 1.16, panel 2). Among nonbank investors, mutual funds and ETFs stand out as potential sources of volatility because they are associated with increased sensitivity of flows to global financial conditions (for example, Cerutti, Claessens, and Puy 2015; Converse, Levy-Yeyati, and Williams 2018). These investment funds now own nearly one-sixth of fixed-income assets included in emerging market benchmark indices, and more than a third in some countries (Figure 1.16, panel 3).

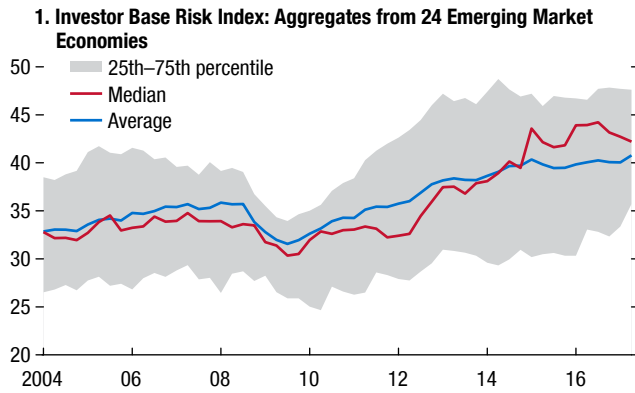
The reduction in portfolio flows to emerging markets expected to result from monetary policy normalization in the United States in the coming years could put countries with weak fundamentals at risk. Assuming the Federal Reserve’s balance sheet normalization proceeds as announced and the federal funds rate is raised to 3.6 percent by early 2020, as projected in the April 2018 WEO, portfolio flows to emerging markets are estimated to be reduced by an average of \$40 billion a year in 2018–19.³⁸ This estimate assumes a smooth normalization process in which there is no increase in investor risk aversion. If, instead, the policy tightening process were accompanied by a rise in risk aversion on the order of magnitude observed after the renminbi devaluation of August 2015, portfolio flows could be reduced by a total of \$60 billion a year over the same period, equivalent to one-quarter of annual inflows

³⁷The investor base risk index aims to capture the likelihood of sudden outflows, given the different types of investors that hold sovereign debt (Arslanalp and Tsuda 2012). The measure is calculated based on the historical relationship between changes in investor holdings of sovereign debt and sovereign bond yields. The index ranges from 0 to 100. The higher the score, the greater the likelihood of a sudden investor outflow. According to this measure, the most fickle investor type is foreign nonbanks, followed by foreign banks, foreign central banks, domestic nonbanks, domestic banks, and the domestic central bank.

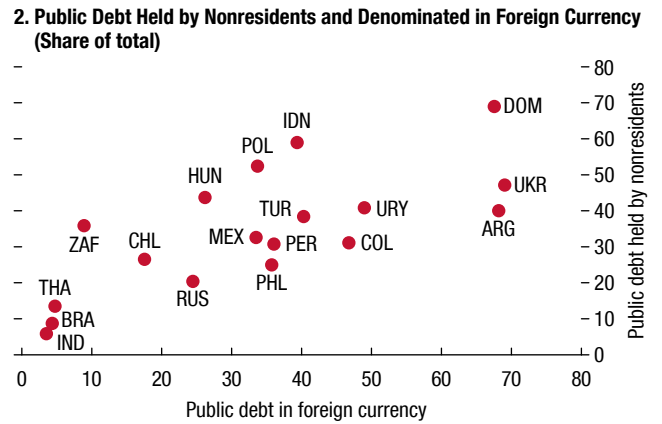
³⁸Estimates are based on an econometric model discussed in the October 2017 GFSR.

Figure 1.16. Creditor Base and External Financing Vulnerabilities

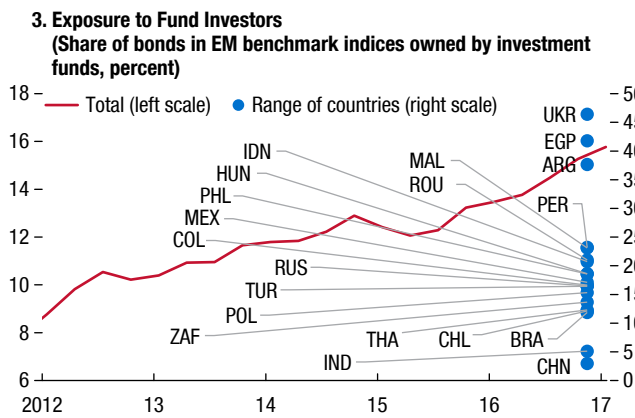
The investor base for EM sovereign debt has become more fickle in recent years.



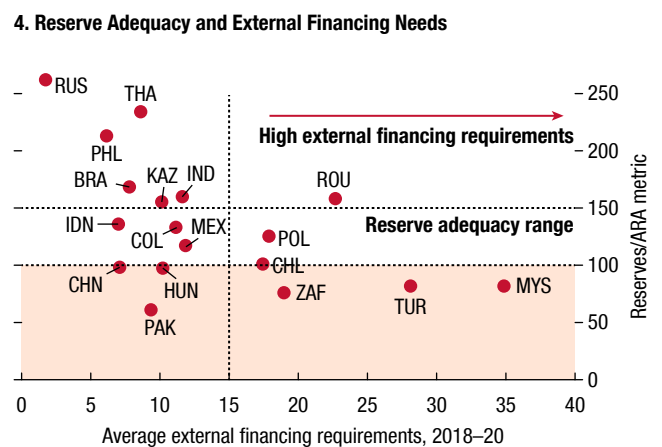
Vulnerabilities in public debt structure remain high for several countries.



Fund investors account for a growing share of EM portfolio asset holdings.



Countries with high financing needs could be vulnerable to a tightening of global financing conditions.



Sources: EPFR Global; JPMorgan Chase & Co.; and IMF staff estimates.

Note: Panel 1 uses the data set from Arslanalp and Tsuda (2012 updated). Panel 2 uses 2017 data or latest available. In panel 3, exposures to fund investors are measured as assets under management at investment funds (based on EPFR data) divided by the amount outstanding of bonds in EM local currency and hard currency benchmark indices (based on JPMorgan data). Panel 4 uses the IMF's Assessing Reserve Adequacy (ARA) metric estimates for 2017, not adjusted for capital controls. Data labels in the figure use International Organization for Standardization (ISO) country codes. EM = emerging market.

in 2010–17.³⁹ Countries that have not addressed vulnerabilities (such as low reserve adequacy) during the favorable period could be particularly at risk of a reversal in capital flows from rapid tightening of global financial conditions (Figure 1.16, panel 4). Moreover, countries with fixed exchange rates at different stages of the economic cycle face the risk

that rising interest rates could weigh on growth and aggravate financial stability risks. Commodity producers could be further affected if monetary tightening is accompanied by weakening commodity prices (Husain and others 2015).

Countries Should Prepare for Tighter Financial Conditions by Pursuing Adequate Policies

Policymakers in emerging markets should use current favorable conditions to prepare for a potential retrench-

³⁹Specifically, a 100-basis-point increase in the spread on US BBB-rated corporate bonds was assumed, which is on par with the increase observed from July 2015 to February 2016.

ment in capital flows that may be accelerated by monetary policy normalization in advanced economies and associated tightening in financial conditions. Vulnerable countries could be disproportionately affected and should strengthen fundamentals in preparation for less benign external financial conditions (Sahay and others 2014; Chen, Mancini-Griffoli, and Sahay 2014). To build resilience and reduce the likelihood of outflows, countries should maintain sound macroeconomic, structural, financial, and macroprudential policies, taking into account their cyclical position, balance sheet vulnerabilities, and macroeconomic policy space. Because capital outflow pressures can be driven by external rather than domestic factors, it is also necessary to build appropriate buffers that can be used during stress, possibly by taking advantage of low interest rates to borrow long term. Buffers include building international reserves to support exchange rate regimes in periods of stress or taking steps toward making the exchange rate regime more flexible where appropriate. Monitoring firms' foreign exchange exposures and ensuring their capacity to absorb exchange rate risks would also help emerging market economies cope with a reduction in capital inflows.

If external financial conditions deteriorate sharply, a rapid and appropriate macroeconomic and financial policy response to capital outflow pressures is particularly important (IMF 2012, 2015, 2016c). Exchange rates often serve as a critical shock absorber, but in countries with sufficient reserve buffers, foreign exchange intervention can be useful for preventing disorderly market conditions and allowing the economy to gradually adjust to a new equilibrium. In the context of outflow pressures, capital flow management measures should only be implemented in crisis situations or when a crisis is considered imminent, and should not substitute for any needed macroeconomic adjustment. When warranted, such measures should be transparent, temporary, and nondiscriminatory and should be lifted once crisis conditions abate.

Rising Public Debt Vulnerabilities in Low-Income Countries and Small Non-Investment-Grade Sovereigns

Debt burdens have increased and affordability has deteriorated over the past few years among low-income borrowers and other small non-investment-grade issuers. Public and external debt burdens for many borrowers decreased from 2007 to 2014, especially in countries that benefited from debt relief efforts.

In recent years, however, public debt vulnerabilities have increased because of revenue declines for commodity-exporting countries, exchange rate depreciations, consolidation of previously unaccounted for state-owned enterprise debt, and rising interest rate costs attributable to higher shares of nonconcessional debt.⁴⁰ More than 45 percent of low-income countries were at high risk of, or already in, debt distress as measured by debt sustainability ratings in 2017 (Figure 1.17, panel 1),⁴¹ while several countries have debt-to-GDP levels close to what they were when debt relief was granted (see April 2018 *Fiscal Monitor*). In addition, vulnerabilities are on the rise not just in the current set of low-income countries but also in a wider set of small non-investment-grade issuers, which includes countries that have “graduated” from low-income country status (Figure 1.17, panel 2).

The increase in private and non-Paris Club creditors has led to a substantial change in creditor composition over the past decade. Among countries recently surveyed by the IMF, the combined share of external financing provided by commercial creditors increased from 7.5 percent to 15 percent (Figure 1.17, panel 3) between 2007 and 2016, and financing from non-Paris Club creditors has risen from 18.5 to 37 percent. Among non-Paris Club creditors, China has taken a key role in providing external financing. Since 2010, China has provided commitments of more than \$100 billion a year, on average, in financing to emerging market economies,⁴² over \$30 billion of which has been to low-income countries. This change in debt composition has been more pronounced in several heavily indebted poor countries (HIPCs) that have received debt relief and are now in debt difficulty (Figure 1.17, panel 4).⁴³

The shift to a more diverse composition of creditors can facilitate faster accumulation of debt and can also make debt resolution more complex. The involvement of new non-Paris Club official, as well as private, creditors remains relatively untested. There is less experience

⁴⁰See IMF (2018) for some stylized facts on debt accumulation in recent years.

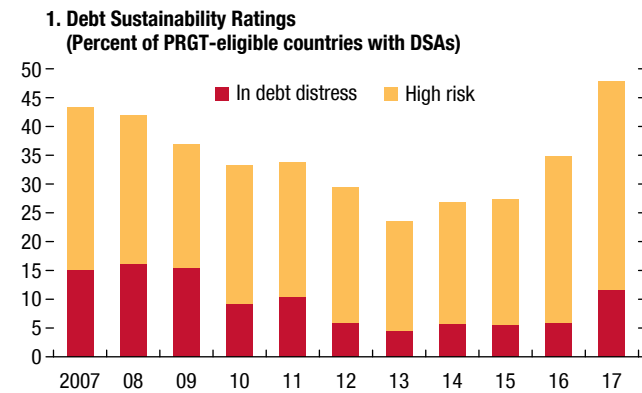
⁴¹The group of low-income countries refers to countries eligible for concessional financing through the Poverty Reduction Growth Trust. For a definition of low-income developing countries, see IMF 2018.

⁴²According to estimates using data from AidData at the College of William & Mary (<http://aiddata.org/data/chinese-global-official-finance-dataset>).

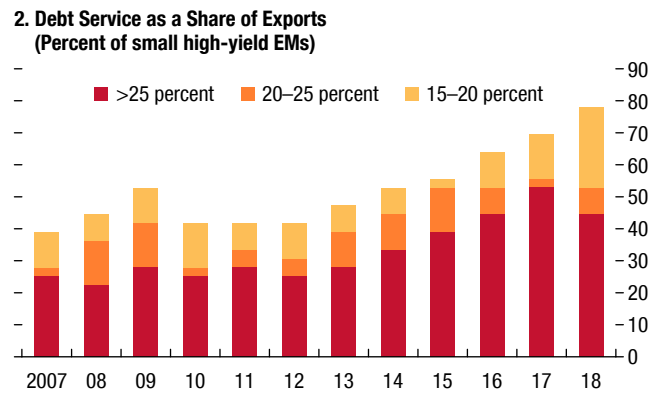
⁴³To date, 36 countries have received the full amount of debt relief for which they were eligible through the HIPC initiative and the Multilateral Debt Relief Initiative.

Figure 1.17. Rising Vulnerabilities and More Complex Creditor Composition

More than 45 percent of LICs are at high risk or in debt distress.

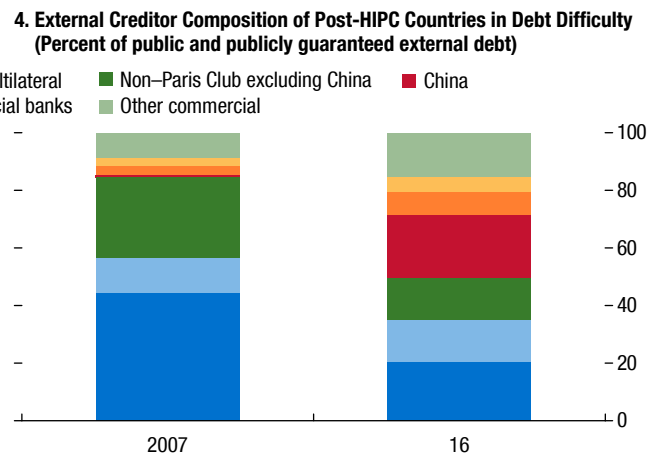
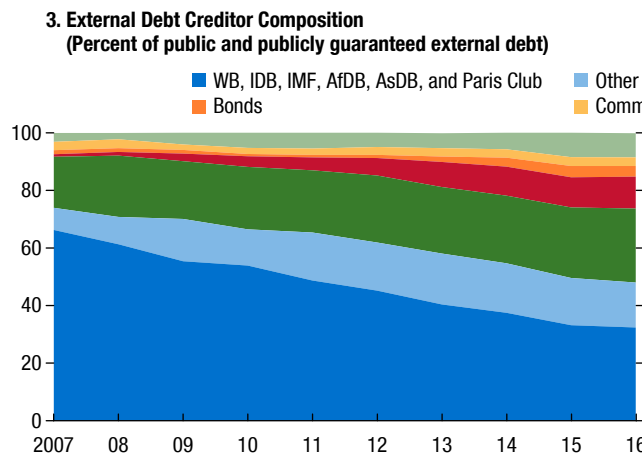


Debt-servicing costs have risen across small non-investment-grade EM issuers.



Composition of creditors of public debt has changed substantially ...

... particularly in several post-HIPC countries.



Sources: Bank for International Settlements; IMF-Organisation for Economic Co-operation and Development-WB Joint External Debt Statistics; 2017 survey of IMF country desks; World Bank International Debt Statistics; IMF, International Financial Statistics database; and various IMF staff reports.
 Note: Panel 1 debt sustainability assessment ratings for LICs are based on the Debt Sustainability Framework for Low-Income Countries. Panel 2 sample includes 35 non-investment-grade relatively small issuers that are part of JP Morgan’s EMBIG index. Each has a weight of less than 2 percent of the index. Panel 3 is based on 37 LIDCs where continuous data are available from 2007 to 2016. Panel 4 countries included are Cameroon, Chad, Republic of Congo, Ethiopia, Ghana, Mauritania, Mozambique, and Zambia. Figures are in simple averages and may be overly influenced by the experience of countries with very high levels of debt. Other commercial creditors include oil traders. AfDB = African Development Bank; AsDB = Asian Development Bank; DSA = Debt Sustainability Analysis; EM = emerging market; EMBIG = JPMorgan’s Emerging Market Bond Index Global; HIPC = highly indebted poor country; IDB = Inter-American Development Bank; LIC = low-income country; LIDC = low-income developing country; PRGT = Poverty Reduction and Growth Trust; WB = World Bank.

with their engagement before and during debt distress than with traditional official lenders. Many of them have not been part of debt resolution in the past, but they could be called on to provide support in such cases.

The use of collateralized debt can further complicate debt resolution and lower recovery rates for creditors with unsecured claims. Some commodity-producing countries offer their exports as collateral; for example, by issuing senior loans through state-owned enterprises or by pledging commodity shipments that can be used

to pay debt in lieu of cash. Both commercial and bilateral lenders have resorted to collateralized lending, as highlighted in recent debt distress cases (for example, Chad, Republic of Congo, Venezuela) that are yet to be resolved.⁴⁴ Apart from such cases, however, details on collateralized deals remain scant.⁴⁵ Given that sover-

⁴⁴For details on recent debt distress cases in low-income developing countries, see IMF (2018).

⁴⁵Bräutigam, Gallagher, and Hwang (2016) find that one-third of Chinese loans to Africa are secured by commodity exports,

eigns have significant protections from seizure of assets, most creditors are reliant on good faith negotiations to secure recovery in distress.⁴⁶ The direct claim on an asset or a revenue stream, however, can grant holders of collateralized debt favorable treatment. Thus, collateralized claims could impair the ability of the sovereign to offer more generous terms in a renegotiation of its unsecured debt, and require a more significant haircut on remaining debt to ensure debt sustainability.

The higher share of private sector creditors could make low-income countries and other vulnerable emerging market borrowers more sensitive to a tightening of global financial conditions. The increase in the share of Eurobonds and commercial loans with shorter maturities can expose issuers to higher rollover and interest rate risk. These new avenues of financing are untested, and it is unclear whether they will remain available if financial conditions tighten significantly, particularly for first-time and low-rated issuers. Part of this new debt is held by investors who do not specialize in this sector and may choose to allocate their funds elsewhere if higher-yielding opportunities become more abundant in more traditional hard currency assets (for example, US high yield). In addition, the anticipation of complex debt resolutions and potentially lower recovery rates could trigger more rapid market repricing at the first sign of sovereign stress.

Policies Should Address Rising Debt Vulnerabilities

To ensure a sustainable debt burden, policymakers should reduce vulnerabilities related to the structure of their debt and attract a stable investor base, including through local bond market development. Debt managers should minimize risks emanating from rollovers, potential foreign exchange mismatches, and collateralization. Countries should explore state contingent debt instruments that may offer some protection against unforeseen shocks such as natural disasters, assuming these instruments are priced at reasonable cost for the issuer by investors (IMF 2017b).

and Bräutigam and Gallagher (2014) find that roughly half of the \$132 billion in Chinese financing to Latin America and Africa is commodity backed.

⁴⁶Sovereign states are typically granted immunity for noncommercial activities in international courts. The two jurisdictions most commonly used for international debt issuance formalize this immunity under the Foreign Sovereign Immunities Act (United States) and under the State Immunity Act (United Kingdom).

Official creditors, when needed, should emphasize timely resolution of debt distress cases to avoid potential spillovers and to minimize the costs for both the issuer and creditors. Transparent and broad creditor coordination should be encouraged, especially when the set of lenders is diverse. New official creditors should consider the benefits of adopting sustainable lending rules, such as those endorsed by the Group of 20. Finally, borrowers and official creditors should ensure transparency of the contractual terms for new debt, including debt that is issued by entities related to the sovereign.

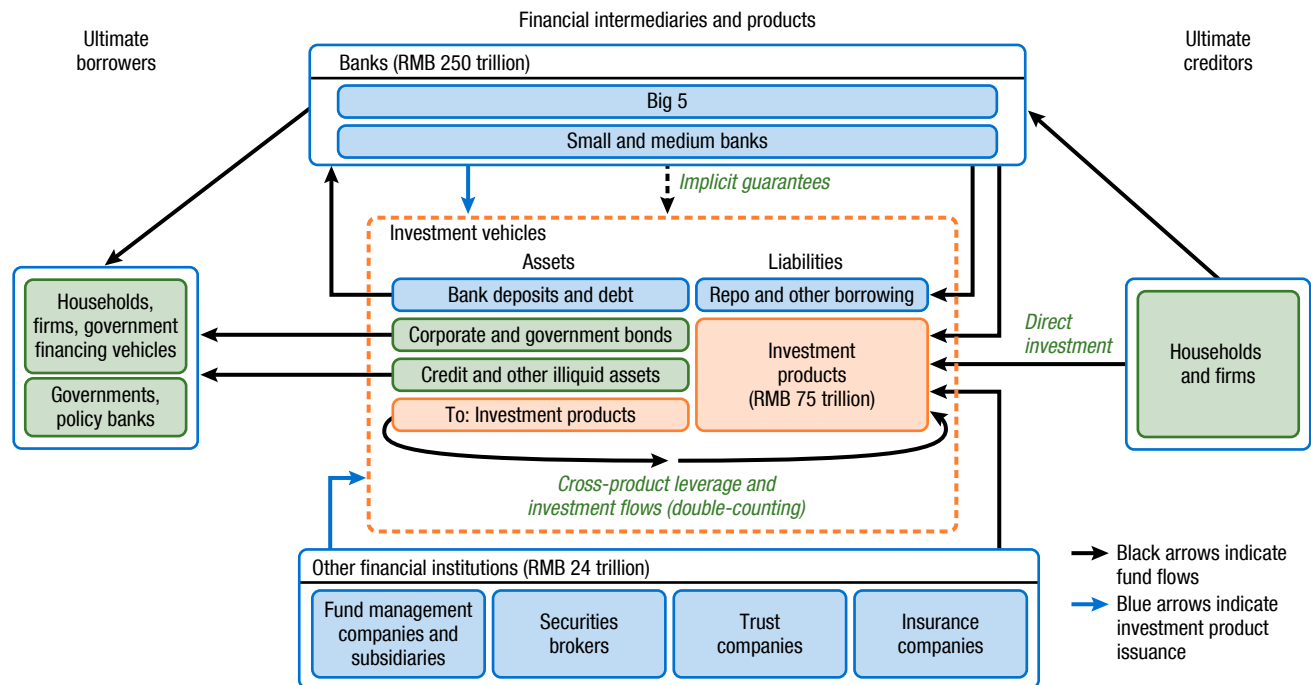
Shadow Banking Reform and Risk in China

The large-scale and opaque interconnections of the Chinese financial system continue to pose stability risks (Figure 1.18). China's RMB 250 trillion (300 percent of GDP) banking system is tightly linked to the shadow banking sector through its exposure to off-balance-sheet investment vehicles. These vehicles are largely funded through the issuance of investment products (RMB 75 trillion), with roughly half sold to multiple investors as high-yielding alternatives to bank deposits and half held by single investors, including banks.⁴⁷ They invest in various assets, such as bonds, bank deposits, and nonstandard credit assets, as well as in other investment products. Insurance companies also have considerable exposure to these vehicles because they invest in their products and use them as a source of funding. These little-regulated vehicles have played a critical role in facilitating China's historic credit boom and have helped create a complex web of exposure between financial institutions.

Banks are exposed to investment vehicles along many dimensions—as investors, creditors, borrowers, guarantors, and managers. These vehicles rely on banks' short-term financing to use leverage and manage their maturity mismatches. Banks, in turn, receive significant flows from these vehicles in the

⁴⁷Bank-issued non-principal-guaranteed wealth management products account for the majority of products sold to multiple investors. As used herein, investment products include asset management products issued by securities brokers, fund companies and their subsidiaries, trust companies, and insurers. Money market funds and other public mutual funds are more strictly regulated and not included. Other forms of nonbank credit activities also carry risks but are not considered in this section; for instance, money market funds, other public mutual funds, and exposures between firms.

Figure 1.18. Stylized Map of Linkages within China's Financial System



Sources: Asset Management Association of China; CEIC; ChinaBond; People's Bank of China; and IMF staff estimates.

Note: Investment products include non-principal-guaranteed bank-issued wealth management products and asset management products issued by other financial institutions depicted. Numbers shown are total on-balance-sheet assets for banks and financial institutions, and total investment products outstanding as of end-2017 or latest available reporting period. Numbers for other financial institutions do not include fund management companies and their subsidiaries due to lack of data. See also Ehlers, Kong, and Zhu (2018). RMB = renminbi.

form of deposits and bond investments. Banks and other financial institutions are also direct investors in investment products. Small and medium-sized banking institutions and insurance companies are particularly exposed, with investment products accounting for one-fifth and one-third of their assets, respectively. About one-quarter of investment vehicle assets, in turn, are invested in other vehicles, leading to opaque cross-holding and leverage structures that are difficult for regulators and investors to monitor. Banks in particular are seen as implicitly guaranteeing the RMB 25 trillion in investment products they manage, which allows them to package high-risk credit investments as low-risk retail savings products. Investment vehicles managed by nonbank financial institutions are perceived to be higher risk, but in most cases banks still bear some risk as creditor, end investor, or guarantor.

The authorities have substantially tightened the regulatory framework to reduce risks related to invest-

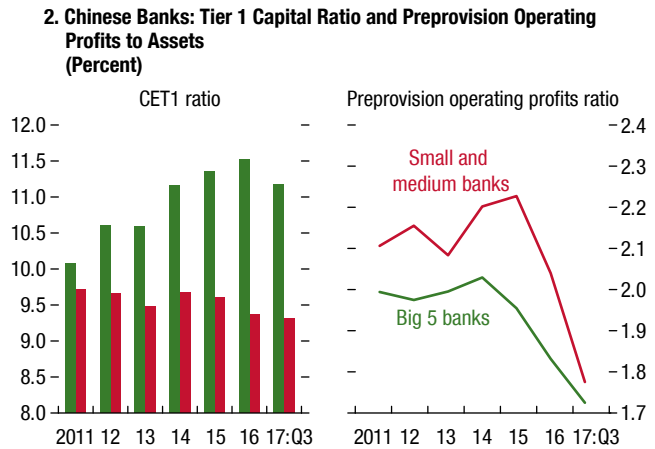
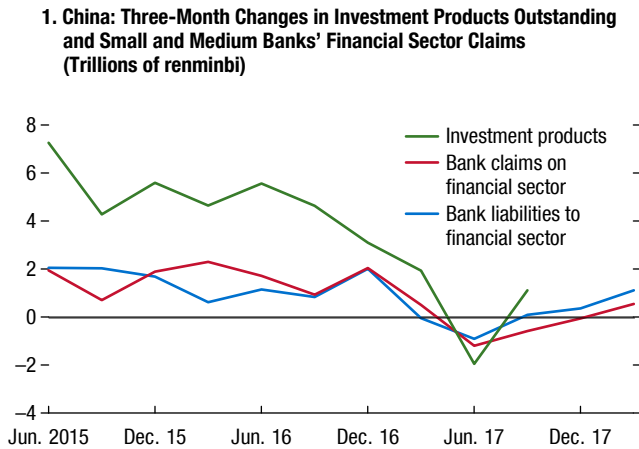
ment vehicles and other borrowing between financial institutions. Since the summer of 2016, regulators have incorporated bank-sponsored investment vehicles in the macroprudential framework and have taken other steps to curb financial sector leverage and interconnectedness.⁴⁸ Proposed asset management rules would also overhaul the investment product market beginning in 2018. In addition to limits on investment vehicle leverage and complexity, banks would be gradually restricted from investing in these vehicles or providing them with financial support. This restriction would limit their ability to implicitly guarantee investment products' fixed-yield returns, effectively converting roughly half of the market from deposit-like products into mutual funds. In addition, the insurance regulator has clamped down on the sale of short-term investment products by life insurers.

⁴⁸For more details on China's financial system stability assessment and associated policy recommendations, please refer to IMF (2017a).

Figure 1.19. Chinese Banking System and Financial Market Developments and Liabilities

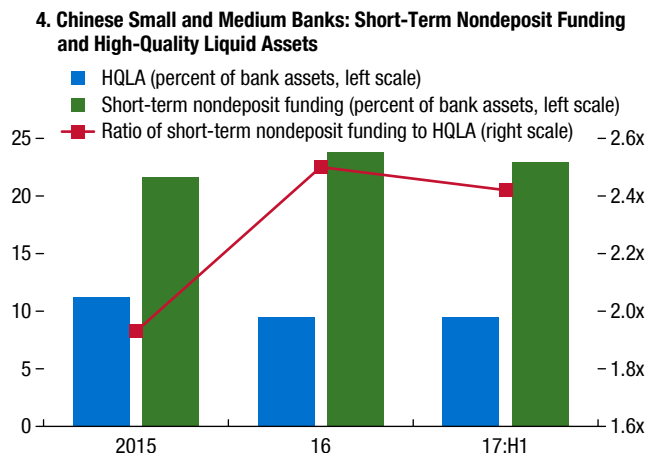
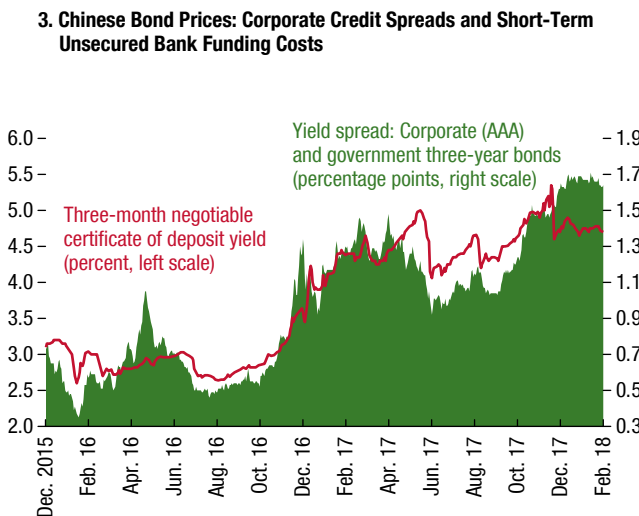
Regulatory tightening has stifled growth in financial sector leverage and in risky investment products ...

... but capital positions are becoming more stretched and underlying profitability continues to fall.



Bank vulnerabilities remain elevated as funding costs rise ...

... and liquidity remains stretched.



Sources: Asset Management Association of China; Bloomberg Finance L.P.; CEIC; People's Bank of China; S&P Global Market Intelligence; and IMF staff calculations. Note: Panel 4 is based on a sample of 10 banks that disclose HQLA and contractual maturities. Short-term is less than three-month contractual maturity or on demand. China's HQLA definition disallows required reserves held at the People's Bank of China. CET1 = common equity Tier 1; HQLA = high-quality liquid assets.

Chinese Banks Have Made Progress in Deleveraging, but Risks Remain Elevated

Tighter regulations have lowered growth in banks' use of risky short-term funding and in investment products, slowing the buildup of bank vulnerabilities. Lending by small and medium-sized banks through investment vehicles has slowed, as has their use of wholesale short-term financing and the overall volume of investment products outstanding (Figure 1.19, panel 1). Notably, growth of banks' exposure to other financial institutions fell from about 80 percent on an

annual basis in 2016 to less than 20 percent at the end of 2017, and banks' holdings of investment products issued by other banks has also declined sharply.

Financial stability risks nonetheless remain high, and smaller banks are particularly vulnerable. Bank buffers continue to thin at many of the country's commercial banks. In addition to still-elevated investment vehicle exposures, core Tier 1 capital ratios are declining and remain near minimum levels for many small and medium-sized banks, while preprovision profitability also continues to weaken (Figure 1.19, panel 2).

Following tighter regulatory constraints, money market rates have risen sharply, leading to wider corporate bond spreads, particularly for weaker borrowers (Figure 1.19, panel 3). Highlighting liquidity risks faced by small and medium-sized banks, reliance on short-term nondeposit funding remains high, and short-term wholesale liabilities are still more than double the available liquidity buffers at smaller banks (Figure 1.19, panel 4).

Reforming China's Investment Product Market—An Important Conduit for Shadow Credit—Poses Challenges to Financial Stability

A key challenge for the reform agenda will be phasing out implicit guarantees for investment vehicles. Because they primarily hold illiquid and long-term assets, such as corporate bonds and nonstandard credit assets, these vehicles rely on guarantees to borrow and to meet maturing short-term liabilities to product holders. As a result, investment vehicles are now the largest net borrower in China's repurchase market, driving overall market activity, often with relatively illiquid collateral (Figure 1.20, panel 1). Furthermore, direct lending by large banks to their sponsored vehicles amounts to about 10 percent of their investment product liabilities, on average.⁴⁹

Without such financial support, investment vehicles would need to hold safer, more liquid asset portfolios to avoid rollover and refinancing risks. Yet allocations to such assets have recently decreased among bank-sponsored investment vehicles, falling to one-third in 2017, from about half in 2015 (Figure 1.20, panel 2). Rising use of illiquid assets and borrowing suggests dependence on implicit guarantees is still trending up, underscoring the difficulty of progress in this critical area.

Reducing risks in the investment product market will require further slowing credit growth in the near term, which is necessary to ensure financial stability and sustainable growth in the medium term. Investment vehicles have bought nearly all the net increase in corporate and financial bond issuance in the past three years and hold 70 percent of such bonds outstanding

⁴⁹Eight banks (including four of the Big Five lenders) disclose active direct lending to their investment vehicles, which account for nearly half of the bank-managed investment product market (more than RMB 10 trillion in non-principal-guaranteed wealth management products). This lending was equivalent to 15 percent of these banks' core Tier 1 capital as of mid-2017.

(Figure 1.20, panel 3). Without bank-guaranteed fixed yields on investment products, the generally risk-averse retail investor base is likely to shift toward less risky instruments, a development that would reduce net demand for already illiquid corporate bonds.⁵⁰ Banks will also need to gradually recognize some portion of the corporate credit exposure held through investment vehicles as loans or bonds, requiring capital and provisioning costs that will cut into loan growth capacity. For small and medium-sized banks, even absorbing half of these exposures over two years would reduce net new loan growth from 17 percent to 6 percent, unless banks raise new capital (Figure 1.20, panel 4) (see also the October 2017 GFSR).

China's Insurance Sector Has Grown Rapidly, Increased Its Risk Profile, and Become Closely Linked with Other Parts of the Financial System

Chinese life insurers have grown rapidly, and their share prices have been volatile. Insurers' assets have more than tripled in size over the past seven years, growing in line with the rest of the Chinese financial system (Figure 1.21, panel 1). Growth has been fueled by "universal life insurance," flexible savings products (in 2015 and 2016), and more traditional life policies (in 2017) (Figure 1.21, panel 2). At the same time, insurers' share prices have risen sharply, accompanied by an increase in volatility reflecting perceived elevated risks (Figure 1.21, panel 3). Recently, the regulator took control of a large insurance group that had financed a rapid expansion into other business areas with short-term high-guarantee investment products.

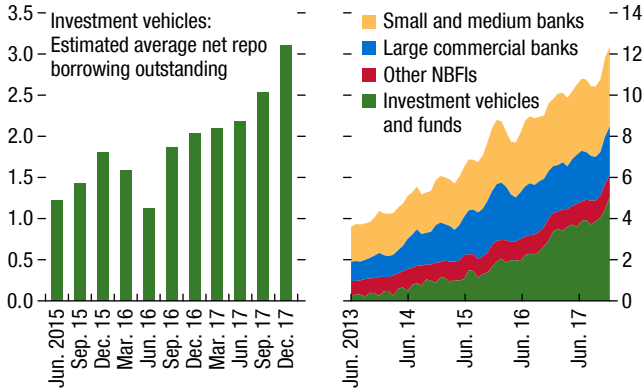
The shift into riskier investments entails vulnerabilities for insurers and the system at large. To attain the high guaranteed returns of their long-term policies (4 percent, in many cases) amid the relatively small and illiquid corporate bond market, insurers have shifted their investments from bonds and deposits to equity, funds, and "other assets" (Figure 1.21, panel 4). These other assets include asset and wealth management products, debt and equity products, and participations in joint ventures (Figure 1.21, panel 5). These large investments in infrastructure, real estate, and loan portfolios concentrate credit risks, including for insurers with limited expertise in credit assessment.

⁵⁰More than 80 percent of outstanding wealth management products are billed as low risk, rated as 1 or 2 on an industry group-defined scale to 5 (with 5 being riskiest).

Figure 1.20. Risks and Adjustment Challenges in Chinese Investment Products

Investment vehicles are borrowing more ...

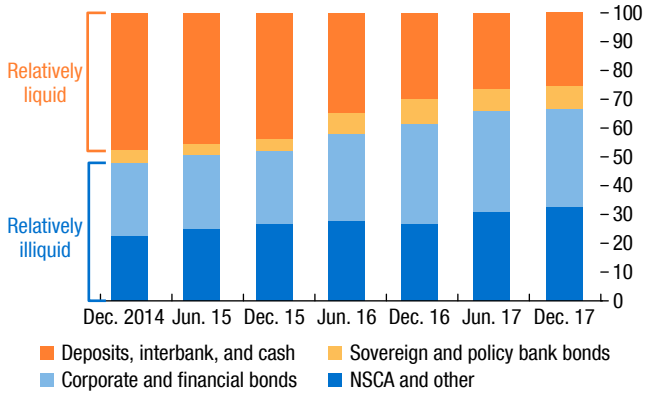
1. Estimated Investment Vehicle Net Repo Borrowing and Interbank Gross Repo Position, by Institution Type (Trillions of renminbi)



Sources: CEIC; China Central Clearing & Depository Corporation; National Interbank Funding Center; People’s Bank of China; Shanghai Clearing House; WIND; and IMF staff calculations.
 Note: Gross repo position includes the sum of outstanding month-end cash borrowing and lending positions. “Investment vehicles and funds” includes repo positions by mutual funds (which are net lenders) and other NBFIs not captured in the “Other NBFIs” category. Estimated average repo borrowing outstanding is the People’s Bank of China—reported quarterly net repo borrowing volume for all funds, divided by the ratio of nonbank repo volume to month-end position, minus the reported net repo position of public mutual funds and other NBFIs. NBFIs = nonbank financial institution.

... and holding more illiquid assets.

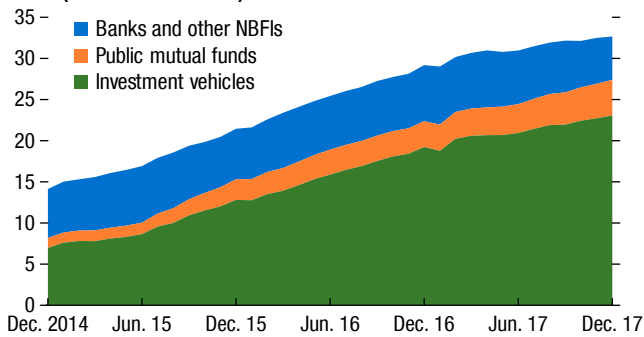
2. Chinese Investment Vehicles: Bank-Issued Product Portfolio Allocation (Percent)



Sources: Bank Wealth Management Registration and Trusteeship Center; and IMF staff calculations.
 Note: Due to the lack of available data, data for June 2015 are the interpolation of December 2014 and December 2015 data. “NCSA and other” includes mostly illiquid credit assets but also has derivatives and investment fund shares. NCSA = nonstandard credit asset.

Reforming investment products will further slow credit growth by weakening demand for corporate and financial bond issuance ...

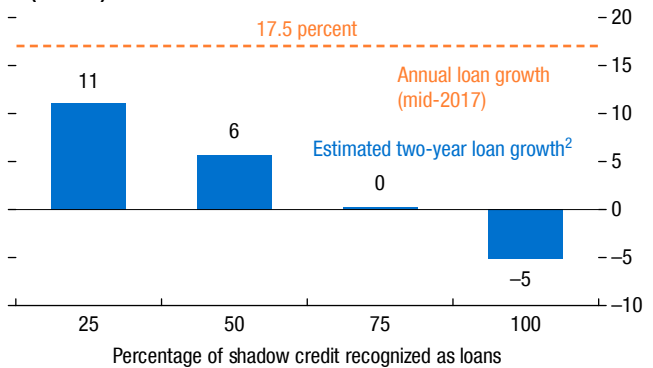
3. China Bond Market: Corporate and Non-Policy-Bank Financial Bonds Outstanding, by Holder (Trillions of renminbi)



Sources: China Clearing and Depository Corporation; National Interbank Funding Center; People’s Bank of China; Shanghai Clearing House; WIND; and IMF staff calculations.
 Note: Public mutual fund holdings shown are interpolated semi-annual data. NBFIs = nonbank financial institution.

... and limiting small banks’ ability to increase lending without fresh capital.

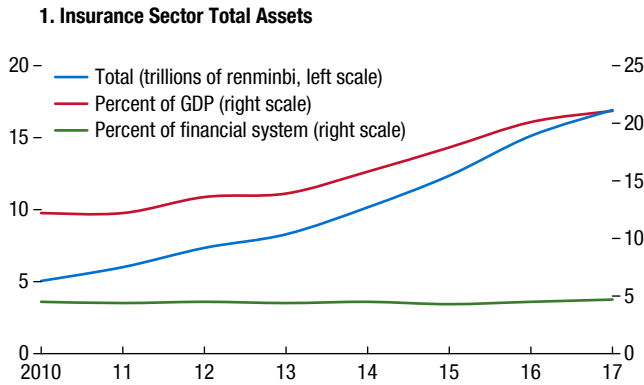
4. Chinese Small and Medium Banks: Two-Year Estimated Loan Growth Capacity Given Shadow Credit Recognition Assumption¹ (Percent)



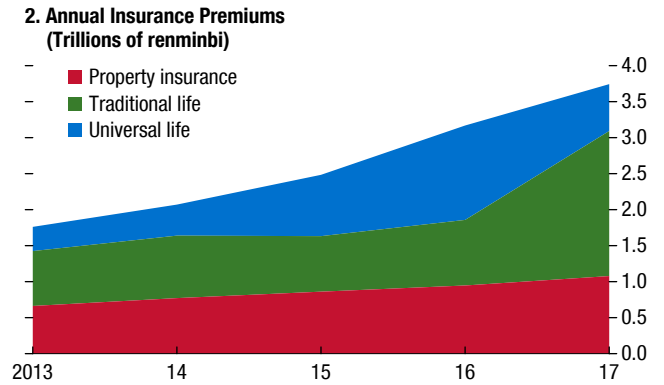
Sources: Bank financial reports; S&P Global Market Intelligence; and IMF staff calculations.
¹Shadow credit is defined as 100 percent of banks’ investments in third-party unconsolidated structured products and 20 percent of their sponsored non-principal-guaranteed wealth management products. Based on a sample of 25 listed banks with available disclosures. Assumes banks receive no external capital and maintain static capital and profitability ratios. Shadow credit recognition entails raising risk weightings for selected assets to 100 percent from initial weightings of 25 and 0 percent for structured products and wealth management products, respectively.
²Growth rates shown are annualized. Negative number indicates loan book would need to shrink to initially accommodate existing shadow credit. Loan growth shown is net of loans converted from existing shadow credit.

Figure 1.21. Chinese Insurers

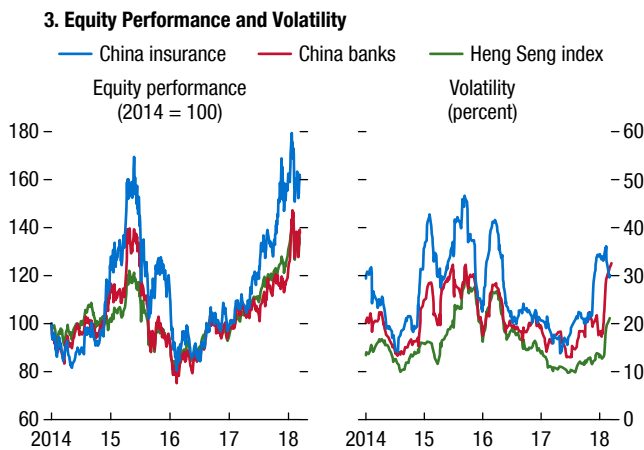
Chinese insurers have grown rapidly ...



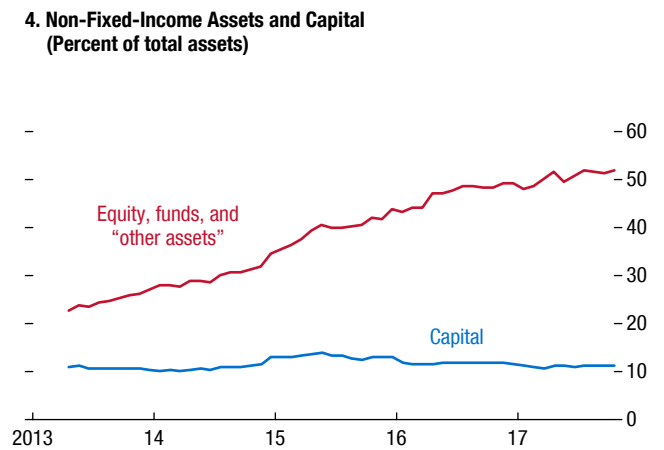
... fueled by life insurance sales.



Insurers' shares have risen sharply, accompanied by high volatility.

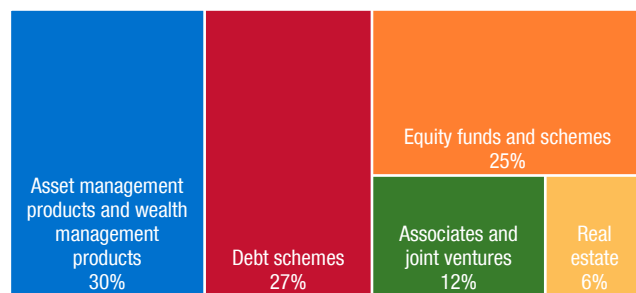


Increased revenues have been invested in higher-risk assets but capital has not been raised.



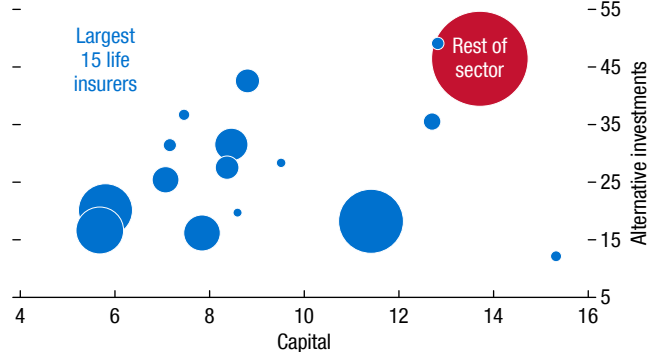
Other assets are mainly portfolios of infrastructure projects, real estate, and loans provided by asset managers.

5. Decomposition of "Other Assets," 2016 (Percent of other assets)



Variation of alternative investments and capital buffers within the sector is large.

6. Capital and Alternative Investments, 2016 (Percent of assets)



Sources: Annual reports; Bloomberg Finance L.P.; China Insurance Regulatory Commission; Morgan Stanley Capital International; and IMF staff calculations. Note: In panel 3, volatility is calculated as the annualized standard deviation of the relative price change for the 60 most recent trading days' closing price. In panel 5, an associate is an entity in which the company/group has a long-term interest of generally not less than 20 percent of the equity voting rights and over which it is in a position to exercise significant influence. Panels 5 and 6 are based on annual reports of the 15 largest life insurers. These companies cover two-thirds of the total assets of the Chinese insurance sector. In panel 6, the size of the bubbles denotes total assets.

Furthermore, the uncertain and volatile returns on these assets may not match the minimum yields promised to policyholders. Increased illiquid assets covered by deposit-like insurance products raise exposure to redemptions at short notice.⁵¹ When faced with net cash outflows, insurers may need to sell off their illiquid assets, potentially adding to market volatility. In addition, insurers are in some instances part of financial conglomerates encompassing several sectors.⁵² While these links give insurers the ability to sell their products within their own networks, they bring risks of spillovers across sectors.

Whether all insurers have sufficient resilience against these vulnerabilities is uncertain. Current regulations require relatively low capital charges for infrastructure investments, joint ventures, and real estate compared with, for instance, corporate bonds. Moreover, capital requirements for investments in funds are fixed and not based on the risks of the underlying assets.⁵³ Despite the elevated risks, capital levels have remained unchanged (Figure 1.21, panel 4). Medium-sized and smaller insurers have invested more heavily in alternative assets and have weaker capability to manage related risks (Figure 1.21, panel 6). In addition, risk assessments are clouded by complex and opaque company structures and uncertainty about the exact nature and credit quality of the underlying investments, including implicit guarantees.

Authorities Should Continue to Reform the Investment Product Market and Enhance the Insurance Supervisory Regime

Addressing remaining financial risks is key to promoting financial stability in China. The proposed asset management reforms are a promising blueprint for gradually taming risks within the investment product sector. Regulators should, however, further limit leverage for lower-risk products and eventually require that implicitly guaranteed off-balance-sheet business carry the same capital and liquidity buffers as on-balance-sheet business. Careful sequencing of reforms is also critical.

⁵¹About one-fifth of life insurers' liabilities are deposits and policyholders' investments, which are presumed to be more easily withdrawn by policyholders than traditional life insurance products.

⁵²One-third of the consolidated balance sheets of the five largest insurance groups consists of banking, asset management, or other activities.

⁵³The risk factor applied to infrastructure equity plans is 12 percent, to real estate it is 8 to 12 percent, and for 10-year AA-rated corporate bonds it is 15 percent. The risk factor applied to bond funds is 6 percent.

As recommended by the IMF's recent Financial Sector Stability Assessment (IMF 2017a), authorities should prioritize strengthening policy frameworks and financial institutions' liquidity and capital buffers to prevent the dismantling of implicit guarantees from inadvertently bringing forward stability risks. Equally important, authorities must address the wide range of nonregulatory factors that have driven the proliferation of risky investment products and excessive demand for credit more broadly; for instance, GDP growth targets.⁵⁴

The insurance supervisory regime should continue to evolve toward a transparent, market- and risk-based regime that includes close cooperation with other authorities. The authorities have strengthened oversight of insurers by curtailing the sale of "universal life" policies and addressing duration mismatches. The introduction of a stronger prudential standard in the China Risk-Oriented Solvency System in 2016 was another important step. Nevertheless, the increase in insurers' "other assets" suggests further work is needed. Additional transparency on the nature, credit quality, and valuation of these investments, as well as a thorough review of prudential treatment to adequately reflect the risks of the underlying assets, are needed. The profile of liabilities—including duration and surrenders—should be closely monitored, and further action to curb unusual liquidity risks should be considered. Finally, the size, complexity, and interconnectedness of the largest life insurers require enhanced group supervision, strong cross-sector coordination, and a framework for recovery and resolution should one of them fail. The recently announced merger of the China Insurance Regulatory Commission and the China Banking Regulatory Commission should facilitate closer cooperation with respect to insurance and banking supervision.

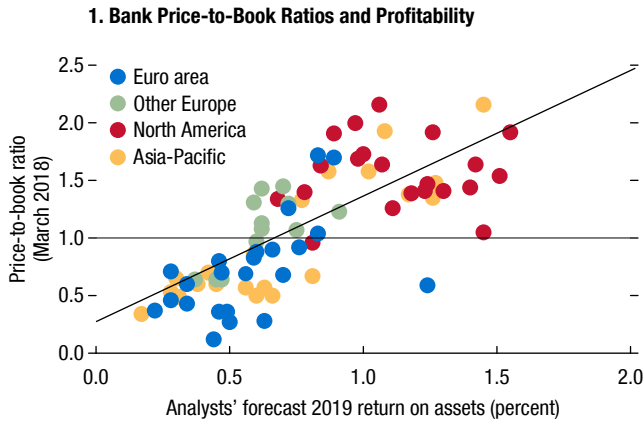
Funding Challenges of Internationally Active Banks

Although banks have strengthened their consolidated balance sheets over the past decade, dollar balance sheet liquidity remains a source of vulnerability. International dollar lending continues to increase, dominated by non-US banks operating through international branch networks. Most rely heavily on short-term wholesale dollar funding and, at the margin, on volatile foreign

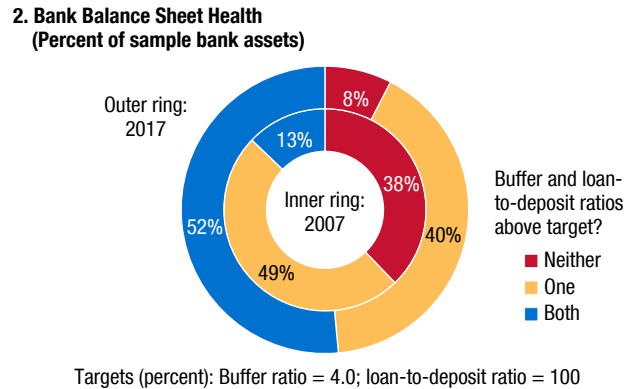
⁵⁴For example, budget constraints at state-owned enterprises and local governments should be tightened, and the system's vulnerability to slower credit growth should be reduced via improvements to insolvency and debtor workout regimes.

Figure 1.22. Advanced Economy Bank Health

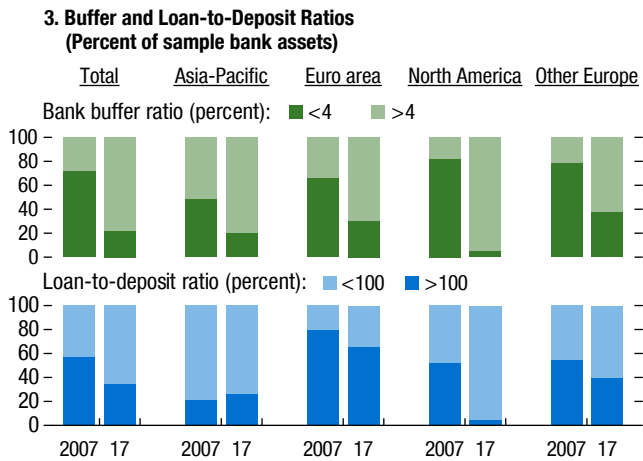
Equity market signals are mixed.



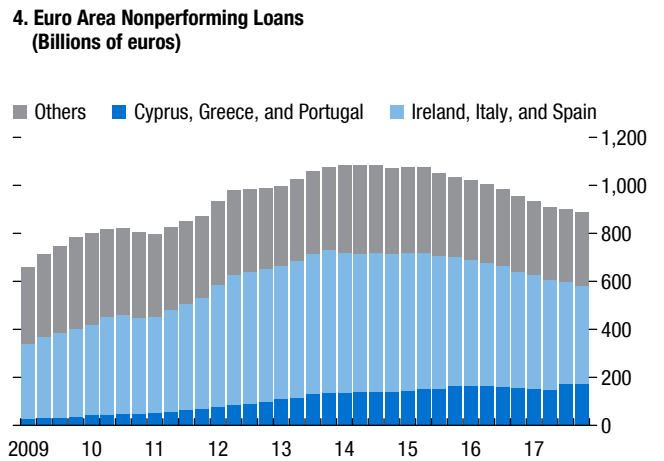
Bank balance sheet metrics have improved ...



... including capital buffers and funding profiles.



But work to fortify balance sheets should continue.



Sources: Bloomberg Finance L.P.; IMF, Financial Soundness Indicators database; S&P Global Market Intelligence; and IMF staff calculations. Note: In panel 1, US bank assets have been adjusted for derivatives netting. Panels 2 and 3 are based on a sample of 691 banks headquartered in advanced economies. In panels 2 to 4, where 2017 data are unavailable, the latest published figures are used. Asia-Pacific = Australia, Japan, Korea, New Zealand, and Singapore; North America = Canada and the United States; Other Europe = Denmark, Iceland, Norway, Sweden, Switzerland, and the United Kingdom; Bank buffers = Tier 1 common capital plus loan loss provisions less 60 percent of nonperforming loans as a percentage of tangible assets (adjusted for derivatives netting at US banks). The 60 percent figure is an assumption used for this analysis and not a regulatory requirement.

exchange swap markets. A sharp tightening of financial conditions could expose structurally vulnerable liquidity positions and trigger forced asset sales or even defaults, amplifying and transmitting market turbulence.

Banks Have Bolstered Their Balance Sheets, but These Efforts Need to Continue, Especially at Weaker Institutions

Markets are providing mixed signals about the health of the banking sector. Equity market price-to-book ratios vary across banks, likely reflecting investor concerns about the sustainability of

some banks' business models, as discussed in previous GFSRs (Figure 1.22, panel 1).

But balance sheet metrics suggest that banks' consolidated financial positions have been fortified over the past decade.⁵⁵ In 2007 almost 40 percent of the sample, by assets, had weak buffers and high loan-to-deposit ratios, but this proportion is now less than 10 percent (Figure 1.22, panel 2). This improve-

⁵⁵The October 2017 GFSR looked at global banks, but this analysis is based on a sample of almost 700 advanced economy banks. Also see BIS (2018) for a discussion on the enhanced resilience of banks.

ment has been achieved by increasing capital and liquidity, raising provisions, and improving funding profiles in response to enhanced prudential standards, stricter supervision, better risk management practices at banks, and pressure from investors.

Although bank buffers have increased in aggregate (Figure 1.22, panel 3), there is a tail of weaker banks, representing about 20 percent of sample assets, with lower levels of capital and provisions against non-performing loans (NPLs).⁵⁶ These banks are mainly concentrated in Europe (inside and outside the euro area) and would be more susceptible to shocks such as a sudden bout of market turmoil or an unexpected economic downturn. The combination of a pickup in economic growth, actions taken to reduce these NPLs, and policy measures by the European authorities have contributed to a decline in the stock of NPLs in recent quarters (Figure 1.22, panel 4), but NPL levels remain high at some banks.⁵⁷ So while the economic recovery will certainly help reduce NPLs, a comprehensive strategy—involving strict supervision, ambitious NPL reduction targets, modernizing insolvency and foreclosure frameworks, and further developing distressed debt markets—needs to be fully implemented to address the NPL problem at its root.

Banks have also improved their funding profiles; nonetheless, more could be done to bolster resilience against liquidity risks in some institutions.⁵⁸ About one-third of sample banks, by assets, still have loan-to-deposit ratios in excess of 100 percent (Figure 1.22, panel 3). This does not necessarily mean that these banks will fail to meet regulatory measures, such as the liquidity coverage ratio.⁵⁹ But these results do suggest that attention should continue to be paid to liquidity risks, particularly with respect to the dollar-funding profiles of banks operating internationally.

⁵⁶The buffer ratio is Tier 1 common capital and provisions minus 60 percent of NPLs as a percentage of tangible assets (adjusted for derivatives netting at US banks). The 60 percent figure is an assumption used for this analysis rather than a regulatory requirement.

⁵⁷In March, the European Commission and European Central Bank proposed new measures targeting NPLs.

⁵⁸See also Chapter 3 of the October 2013 GFSR for a discussion of changes in bank funding structures over time.

⁵⁹Data for the liquidity coverage ratio are not available over time for the full sample of banks.

The International Dollar Banking System Faces a Structural Liquidity Mismatch

Demand for US dollar-denominated assets from outside the United States continues to grow rapidly. Demand remains robust, since the US dollar is often the default currency for commodities, energy, trade credit, and corporate borrowers (especially in emerging market economies). Banks and other institutional investors in low-interest-rate advanced economies also seek dollar assets to enhance yields. Although dollar bonds outstanding have increased rapidly, loans remain the largest form of credit (Figure 1.23, panel 1). Banks are central to this system through both lending and derivatives market activities.

Non-US banks occupy a dominant position in the provision of US dollar credit (Figure 1.23, panel 2). Banks intermediate dollars internationally through branches in the United States and elsewhere; these branches are relatively free to transfer funds across borders. Non-US banks' branches in the United States have been dollar borrowers from overseas, on net, since 2011, but the gross flows in each direction remain considerable (Figure 1.23, panel 3). By contrast, US subsidiaries of foreign banks gather retail dollar deposits but are limited in their flexibility to transfer funds intragroup across borders or legal entities, so they play little role in the international dollar system (Figure 1.23, panel 4) (McCauley, McGuire, and von Peter 2010; McCauley and von Peter 2012).

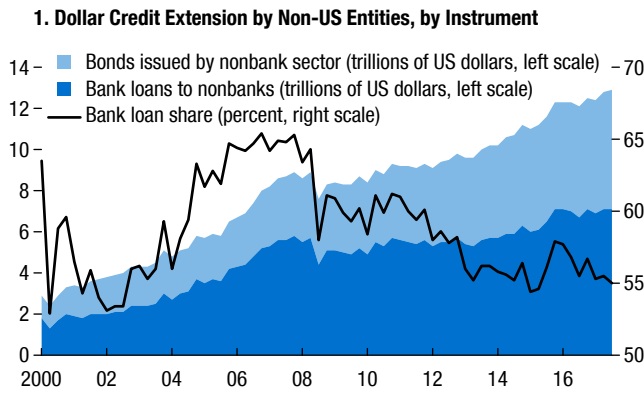
This section, therefore, assesses funding and liquidity across non-US banks' *international US dollar balance sheets*, defined to include non-US banks' dollar positions outside the United States plus their US branches, but excluding their US subsidiaries. The discussion focuses on country banking systems, and is based on top-down country aggregate balance sheet information combined with a bottom-up aggregate of non-US banks' branches in the United States (see Online Annex 1.2).⁶⁰

Overall, non-US banks' international US dollar balance sheets rely more on short-term or wholesale dollar funding than do their consolidated balance sheets (Figure 1.24, panel 1). These short-term wholesale instruments—interbank deposits, commercial paper, and certificates of deposit—along with relatively unstable (corporate, nontransactional, and uninsured)

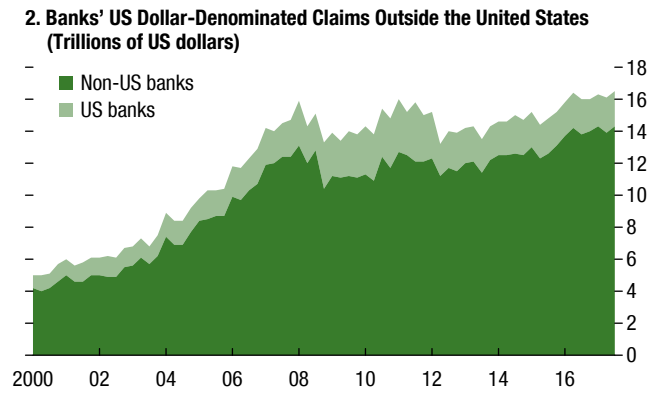
⁶⁰See Online Annex 1.2 at www.imf.org/en/Publications/GFSR for more details.

Figure 1.23. US Dollar Credit Aggregates and Bank Intragroup Funding Structures

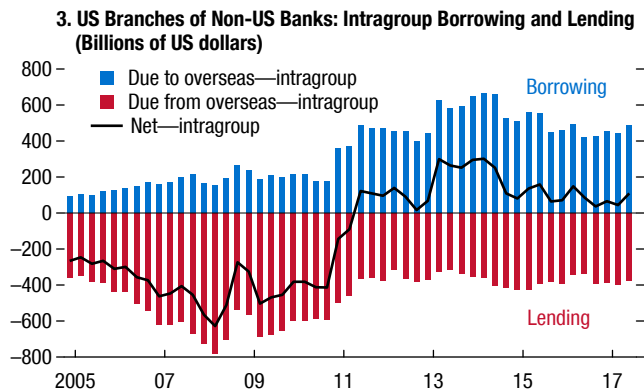
While dollar bonds outstanding have increased rapidly, loans remain the largest form of credit ...



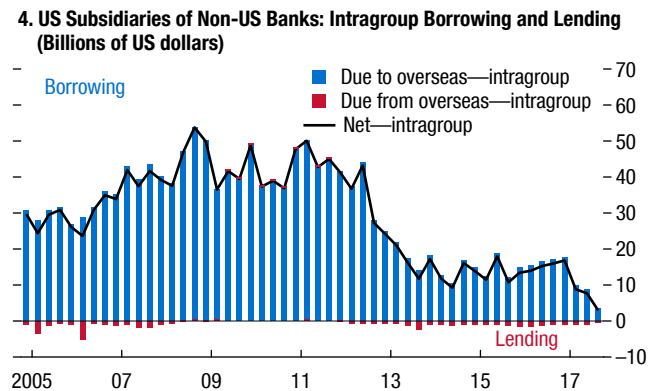
... dominated by non-US banks operating through international branch networks.



Non-US banks' international branches are key dollar intermediation channels ...



... while subsidiaries play a very limited role.



Sources: Bank for International Settlements; Federal Financial Institutions Examination Council; Federal Reserve call reports; and IMF staff calculations.

deposits are prone to outflows and can generate refinancing risk under stressed conditions.

This use of short-term funding makes international US dollar balance sheets structurally vulnerable to liquidity risks. This vulnerability can be assessed using two indicators—a liquidity ratio⁶¹ that approximates the Basel Liquidity Coverage Ratio (LCR) and a stable

funding ratio.⁶² The aggregate stable funding ratio is lower for US dollar international balance sheets than for consolidated (aggregate position in all currencies) balance sheets, and the international US dollar liquidity ratio is lower than the reported LCRs for banks' consolidated positions (Figure 1.24, panel 2).⁶³ US dollar liquidity ratios vary widely between banking

⁶¹The liquidity ratio is estimated high-quality liquid assets divided by estimated funding outflows over a short stress period (see Online Annex 1.2 for more details). This mimics the Basel framework's liquidity coverage ratio but relies on more limited disclosure of assets (to measure high-quality liquid assets) and liabilities (to measure one-month stress outflow). Analysis of the sensitivity of the liquidity ratio to changes in the underlying assumptions (in Online Annex 1.2) suggests that the estimates shown here may be somewhat overstated; that is, dollar liquidity ratios as measured by the Bank for International Settlements Liquidity Coverage Ratio would probably be somewhat lower than shown here.

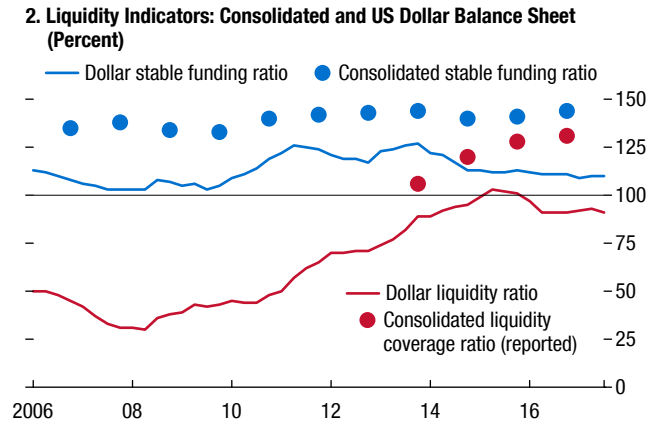
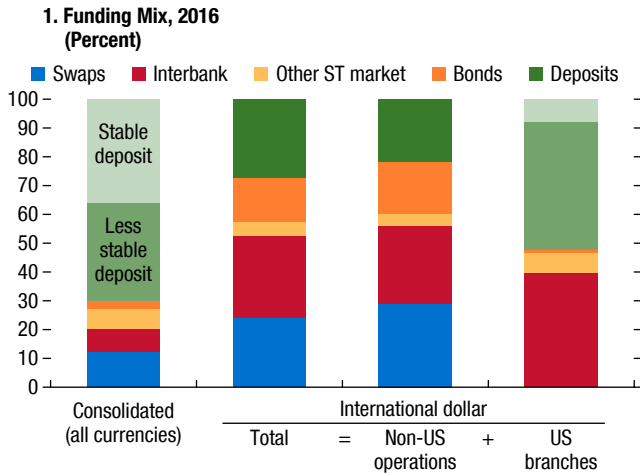
⁶²The stable funding ratio is stable funding (total deposits plus long-term securities and swap funding) divided by loans (see Online Annex 1.2 for more details). This is intended to be broadly analogous to the Basel framework's net stable funding ratio but probably generates higher estimates since it does not apply available stable funding haircuts to wholesale deposits. For Japan, 70 percent of swap funding is greater than one year in duration and is therefore treated as stable, based on Bank of Japan data; for other countries, 50 percent of swap funding is included in stable funding.

⁶³Global systemically important banks now meet the consolidated, Basel LCR.

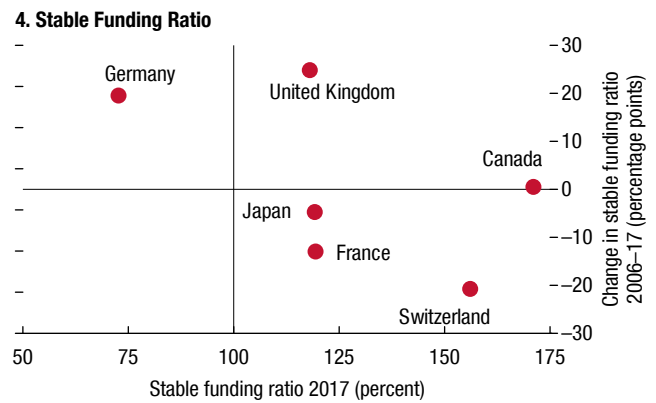
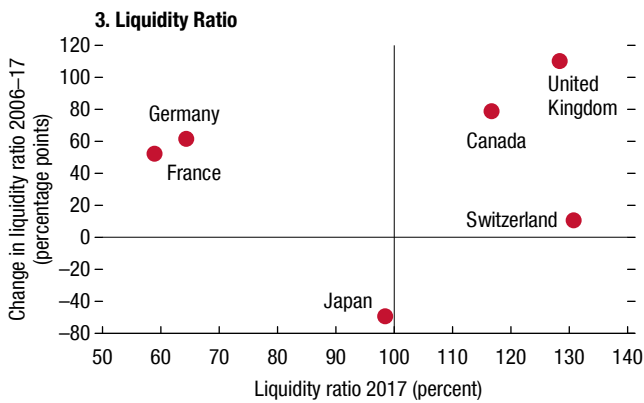
Figure 1.24. Non-US Banks' International Dollar Balance Sheets

Non-US banks tend to rely on short-term or wholesale US dollar funding.

Their US dollar liquidity is usually weaker than their overall positions.



And US dollar funding ratios vary significantly between banking systems.



Sources: Bank for International Settlements; bank financial statements; Bank of Japan; Federal Financial Institutions Examination Council; S&P Global Market Intelligence; and IMF staff estimates and analysis.

Note: Measurement of the liquidity ratio and stable funding ratio is explained in the text and in more detail in Online Annex 1.2. International dollar = dollar claims/liabilities in non-US offices and in US branches of non-US banks. ST = short-term.

systems—the French and German aggregate liquidity ratios are somewhat lower than their peers’, though they have been rising over the past few years, and the German banking system’s stable funding ratio is below the levels in some other countries (Figure 1.24, panels 3 and 4).

Overall, US dollar liquidity ratios have improved since the global financial crisis. This improvement has largely been driven by large increases in High Quality Liquid Assets (HQLA, reserves at central banks and holdings of official sector bonds), probably in response to intensifying regulatory scrutiny of short-term liquidity positions (Figure 1.25, panel 1).

Only the Japanese banking system’s liquidity ratio declined over the same period, although it currently stands at about 100 percent (Figure 1.25, panel 3). This decline reflects a rise in interbank liabilities used to fund an increase in loans and securities (Figure 1.25, panel 5).

Aggregate US dollar stable funding ratios, however, are largely unchanged over 2006–17 (Figure 1.25, panel 2). Individual banking systems have shown little progress in strengthening stable funding ratios, and in some the ratio has actually fallen (Figure 1.25, panel 4). These declines reflect rapid growth in dollar loans—particularly in the Canadian, French, and Japa-

nese banking systems—that has exceeded banks’ ability or willingness to source deposits (Figure 1.25, panel 6). This situation is perhaps due to a reach for yield in banks looking to boost profitability by expanding lending across borders through an increased maturity mismatch. Systems whose stable funding ratios have improved (UK and German banking systems) accomplished this only by shrinking dollar loans (Figure 1.25, panel 6).

Banks Use Foreign Exchange Swaps to Meet Short-Term Currency Funding Mismatches, but This Market May Not Be a Reliable Backstop in Periods of Stress

Non-US banks use foreign exchange swap markets to meet short-term currency needs. While some banks have lengthened the tenor of their swap positions, banks still plan to tap swap markets when liquidity is tight. Non-US banks’ dependence on cross-currency swaps varies, but two facts stand out: their use has increased overall over the past decade, and Japanese banks rely relatively heavily on these instruments (Figure 1.26, panel 1). These developments are concerning, because cross-currency basis swap spreads have moved sharply in the past (Figure 1.26, panel 2) and because swap markets have been more volatile than other short-term funding sources such as repo and interbank markets (Figure 1.26, panel 3). This suggests that swap markets may not be a reliable backstop in periods of stress.

Furthermore, the yen-dollar market—a crucial source of bank funding—may have become more procyclical because of changes in market structure. As sovereign yields have fallen below policy guaranteed return targets, Asian life insurers have sought yield in dollar-denominated securities. The need to hedge currency risk has driven a surge in demand for swaps (Figure 1.26, panel 4). US banks’ dollar swap supply has not kept up with this growing demand.⁶⁴ Non-traditional lenders, such as hedge funds and sovereign wealth funds, have stepped in to meet this demand and now account for about 70 percent of the supply of foreign currency derivatives to Japanese financial institutions (Figure 1.26, panel 5). But their appe-

tite to supply dollars may be more procyclical than banks’. Because these new players place the yen they receive in swap transactions in Japanese government bills, their ability to provide dollar funding in the yen-dollar market may also be constrained by the scarcity of high-quality yen assets in the market; about 85 percent of short-term Japanese government bills are now held by non-Japanese investors and the Bank of Japan.

Several Forces Are Tightening Dollar Funding Conditions

US dollar funding markets have begun to tighten. Market participants have pointed to a number of factors behind this, including an expected rise in Treasury bill issuance, US companies changing their investment patterns ahead of repatriating offshore assets, and continued central bank normalization. This tightening can be illustrated by the widening of the dollar LIBOR-OIS spread (the difference between the London interbank offered rate and the overnight indexed swap rate) in recent months (Figure 1.26, panel 6).

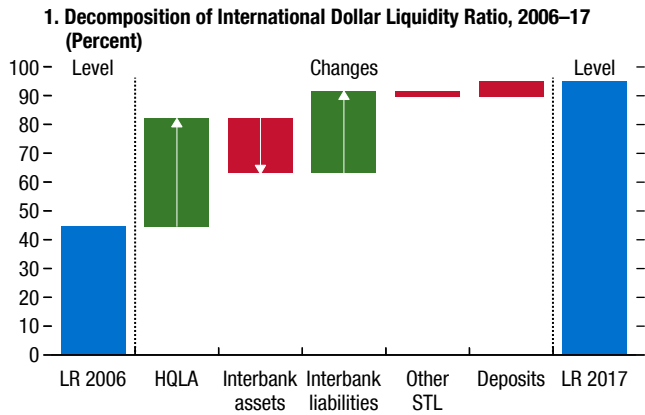
Moreover, country-specific liquidity regulations, while helping to strengthen national financial systems, may inadvertently introduce frictions in international funding markets. Some regulators have increased restrictions on or surveillance of cross-border intra-group liquidity flows in recent years and are extending the perimeter of their liquidity requirements to foreign banks operating in their country (Buch and Goldberg 2015; Gambacorta, van Rixtel, and Schiaffi 2017; Goldberg and Gupta 2013; Reinhart and Riddiough 2014).

The combination of balance sheet vulnerabilities and market tightening could trigger funding problems in the event of market strains. Market turbulence may make it more difficult for banks to manage currency gaps in volatile swap markets, possibly rendering some banks unable to roll over short-term dollar funding. Banks could then act as an amplifier of market strains if funding pressures were to compel banks to sell assets in a turbulent market to pay their liabilities that are due. Funding pressure could also induce banks to shrink dollar lending to non-US borrowers, thus reducing credit availability. Ultimately, there is a risk that banks could default on their dollar obligations.

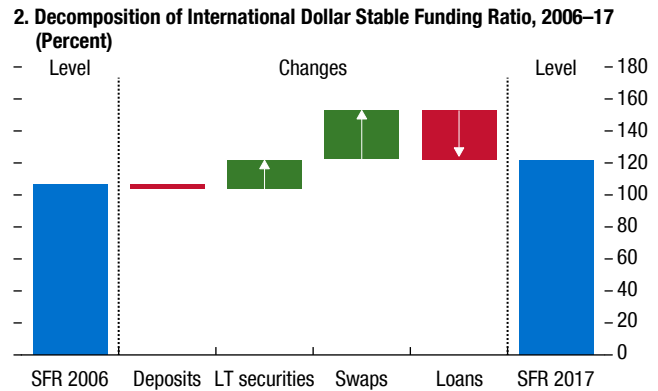
⁶⁴The size of US banks’ short-tenor dollar swap supply is estimated by their holdings of claims on the Japanese official sector, as non-Japanese investors receiving yen in swap transactions typically invest the yen in short-term Japanese government bills.

Figure 1.25. Non-US Banks' International US Dollar Liquidity Ratios

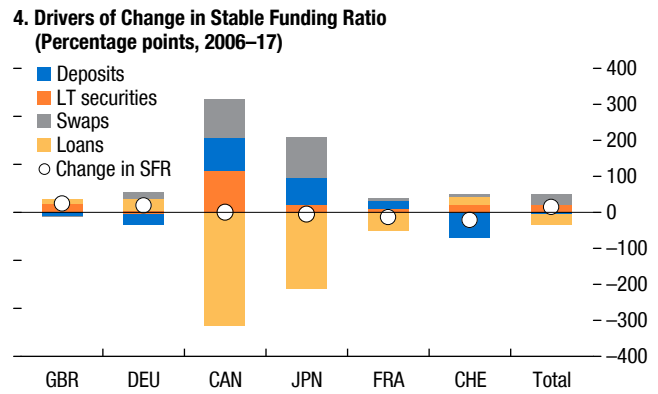
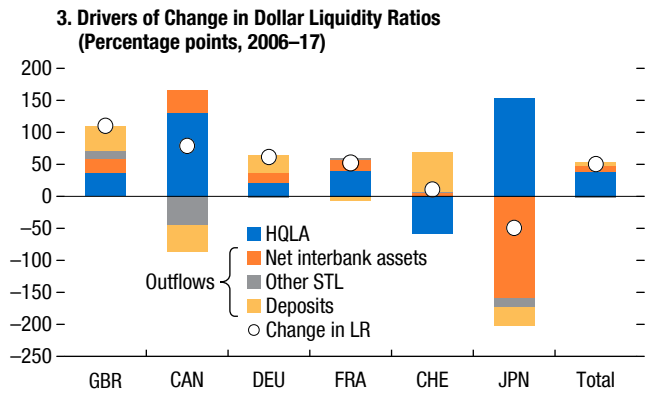
The aggregate liquidity ratio has improved ...



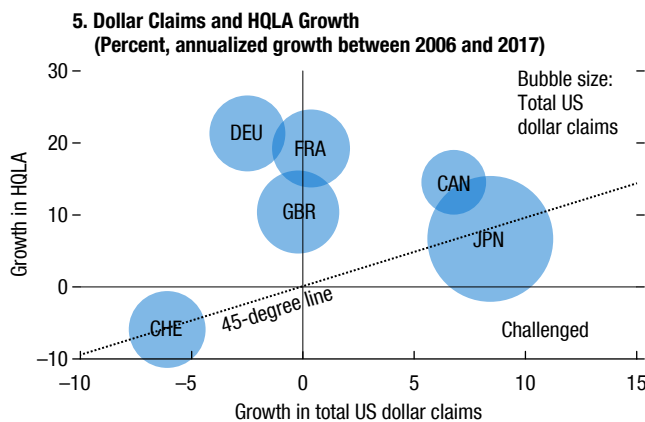
... but the stable funding ratio is little changed.



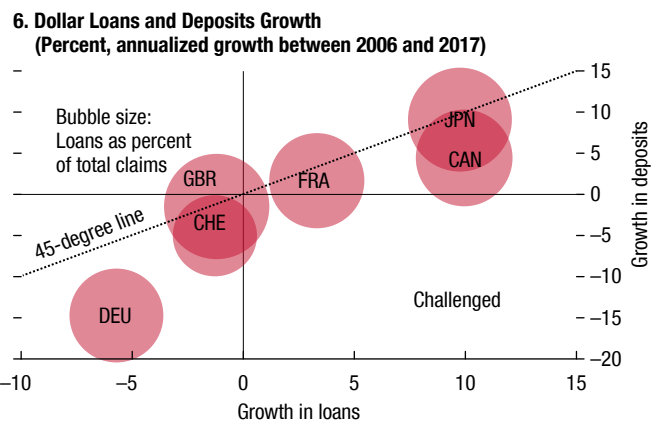
The drivers of changes in these ratios vary across banking systems.



Rapid growth of dollar claims is a key challenge ...



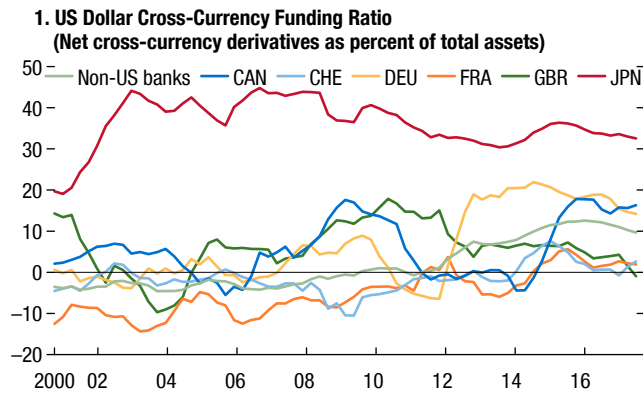
... as is rapid loan growth.



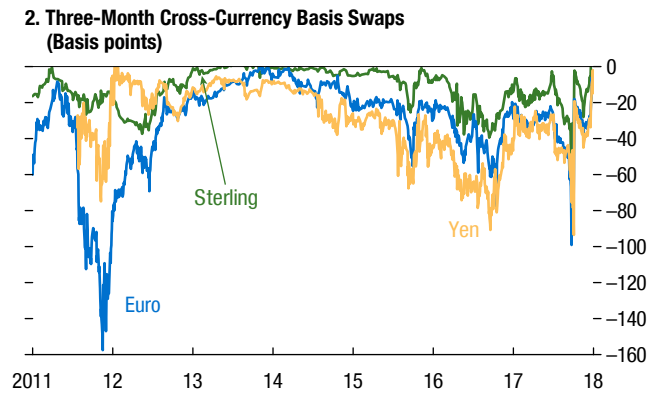
Sources: Bank financial statements; Bank for International Settlements; Bank of Japan; Federal Financial Institutions Examination Council; S&P Global Market Intelligence; and IMF staff estimates and analysis.
 Note: Dollar claims are loans and securities denominated in dollars. Data labels in the figure use International Organization for Standardization (ISO) country codes. HQLA = high-quality liquid assets; LR = liquidity ratio; LT = long-term; SFR = stable funding ratio; STL = short-term liabilities.

Figure 1.26. Foreign Exchange Swap and Short-Term Bank Funding Markets

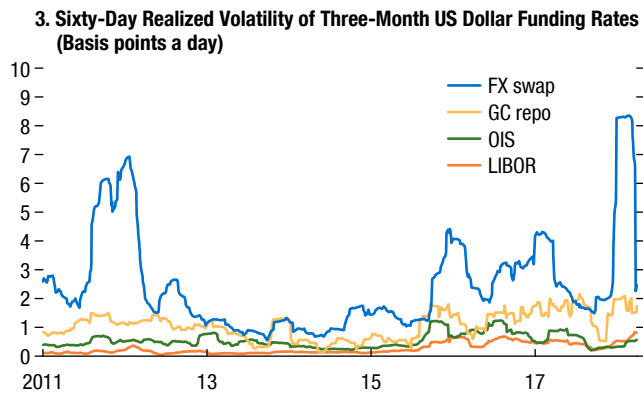
Some non-US banks are reliant on cross-currency funding via swaps.



Cross-currency basis swap spreads have widened sharply in the past ...



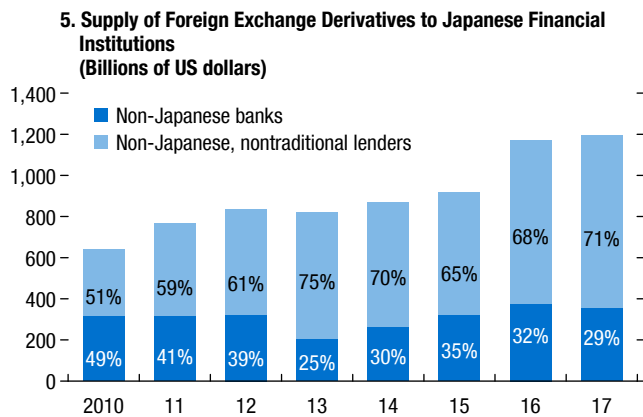
... and foreign exchange swaps are more volatile than other short-term funding sources.



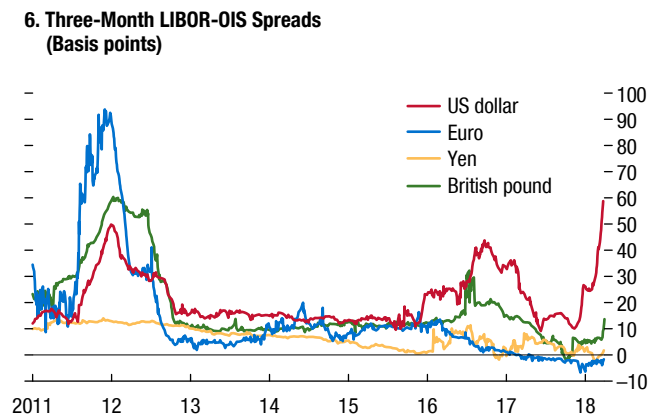
Demand to hedge foreign currencies by Asian financial institutions is increasing ...



... while the supply is shifting from banks to nontraditional financial institutions.



US dollar LIBOR-OIS spreads have widened recently.



Sources: Annual reports; Bank for International Settlements; Bank of Japan; Bloomberg Finance L.P.; Financial Supervisory Commission (Taiwan Province of China); the Korean Life Insurance Association; and IMF staff estimates.

Note: In panels 4 and 5, the latest data are as of September 2017. In panel 4, data for Korea life insurers and the National Pension Service are estimated assuming 100 percent hedging of their foreign investments. For Taiwan Province of China life insurers, the assumption is a 50 percent hedging of their foreign investments. Data labels in panel 1 use International Organization for Standardization (ISO) country codes. FX swap = foreign exchange swap (average of euro-dollar and yen-dollar); GC repo = general collateral repurchase agreement; LIBOR = London interbank offered rate; OIS = overnight indexed swaps.

Funding Market Risks Call for Disclosure as Well as Gradual and Coordinated Implementation of Regulations

The Basel liquidity framework, centered on the LCR, has significantly improved banks' consolidated balance sheet resilience against short-term funding shocks, and both capital and liquidity regulations have driven considerable improvement in banks' longer-term funding stability. But there is still a need to address risks from foreign currency liquidity mismatches.

- Banks should ensure that currency-specific mismatches within individual entities in their banking groups continue to be managed effectively to reduce the risk of funding strains.
- Consideration should be given to enhancing disclosure of foreign currency funding risks.⁶⁵ This would

⁶⁵The Basel Committee's 2008 Principles for Sound Liquidity Risk Management and Supervision contained guidance on managing liquidity risk, including in different currencies. This guidance included a principle on the public disclosure of information on liquidity risk.

help investors and analysts better assess international liquidity and maturity mismatches.

- Regulators should develop or maintain currency-specific liquidity risk frameworks, including stress tests, emergency funding strategies, and resolution planning. Coordination and sharing of information among regulators are crucial to reduce any unintended cross-border spillovers from jurisdiction-specific liquidity requirements.
- Central bank swap lines should be retained to provide foreign exchange liquidity in periods of systemic stress. This should help prevent foreign currency funding difficulties from spilling over to other parts of the financial system.

Finally, while implementation of the Basel III package of reforms has helped strengthen the banking sector, there is still some ground to be covered, and completing the postcrisis reform agenda is vital (Box 1.5). Ensuring the independence of supervision will be crucial in this effort, as will be addressing the new challenges posed by technology.

Box 1.1. The VIX Tantrum

Global equity markets experienced a bout of renewed volatility on February 5–6, 2018 (Figure 1.1.1). Equity losses were heavy, with a 7 percent cumulative drop in the S&P 500 over the first seven trading days of February. The Chicago Board Options Exchange Volatility Index (VIX) of implied equity volatility surged, jumping from below 15 at the open on February 5 to an intraday peak of 50 on February 6, the highest level since August 2015, when China devalued its currency.

Market participants indicated that technical factors in options products and short-volatility strategies amplified market moves. For example, the implied volatility spike forced VIX-related exchange-traded products to buy large volumes of VIX futures to cover short VIX positions, creating a feedback loop that exacerbated the rise in the VIX. Some of these exchange-traded products closed with very heavy losses. In addition, the evidence to date is inconclusive, but debate persists among market participants

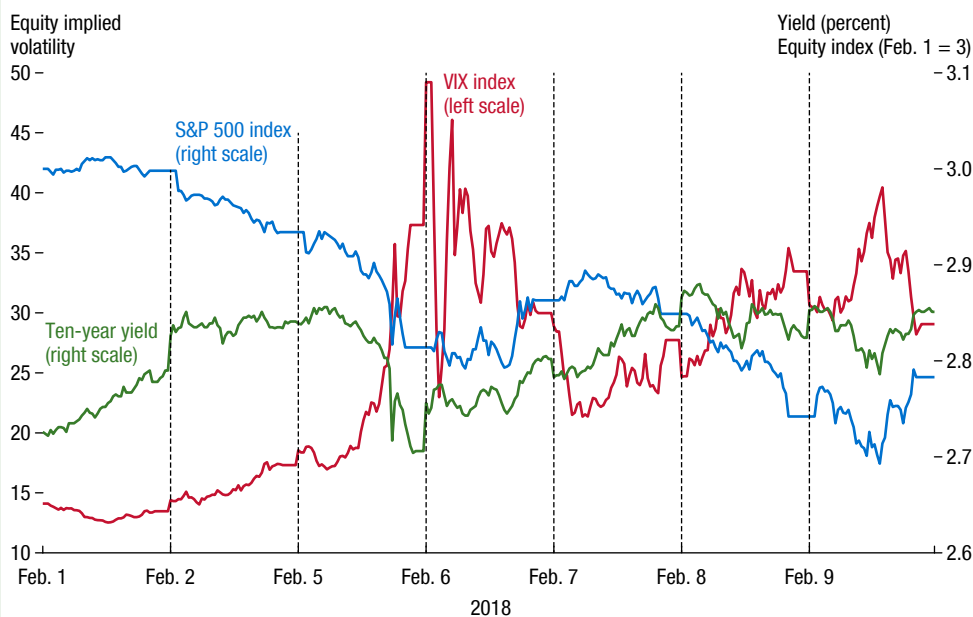
about whether other investment strategies, based on momentum, risk parity, volatility targeting, or artificial intelligence, may have also exacerbated the initial volatility spike. But by the end of the episode, the VIX, which should reflect investors' expectations and attitudes toward equity risk, was about in line with forecasts of underlying stock market volatility (see Online Annex 1.1).¹

Although technical factors may have exacerbated volatility at times, they do not seem to have triggered the initial shock. Mounting fears about higher inflation in preceding days reportedly soured investor sentiment. However, observed moves in market-based measures of inflation compensation, term premiums, and implied volatility derived from interest rate swaptions do not appear to be consistent with any concurrent, meaningful revision in inflation expectations or related risks precisely during the equity market swoon.

This box was prepared by J. Benson Durham and Will Kerry.

¹See Online Annex 1.1 at www.imf.org/en/Publications/GFSR for more details.

Figure 1.1.1. US Asset Prices



Source: Bloomberg Finance L.P.

Note: VIX = Chicago Board Options Exchange Volatility Index.

Box 1.1 (continued)

The fall in US equities spilled over to other equity markets, which fell by about 5–9 percent during February 1–9. Despite the large price moves, equity markets functioned well, with very high trading volumes; liquidity conditions were reportedly reasonable other than in futures markets; and there was no apparent disorderly portfolio unwinding. Declines in other risky assets were more modest than the fall in equities.

In the aftermath of the VIX tantrum, and after years of prolonged low interest rates, investors and central bankers are faced with increasing maturity and

liquidity mismatches as well as rising leverage that may amplify market turbulence down the road. The extent of institutional investors' exposure to short volatility positions remains unclear. Yet estimates of the price of risk, based on volatility projections, are now very close to the levels observed before the episode, which broadly implies that investors' willingness to sell volatility remains robust today despite the tremors in early February. Moreover, valuations remained stretched, amid a sustained increase in correlations across asset classes since the episode (as discussed in "Reach for Yield or Overreach in Risky Assets?" section).

Box 1.2. An Econometric Lens on What Drives Term Premiums

The term premium on a zero-coupon government bond is the extra compensation investors demand for holding government bonds in excess of risk-free short-term interest rates. Specifically, it is the difference between its yield and the average expected risk-free short rate over the maturity of the bond. Like equity risk premiums, term premiums are unobservable and must be estimated. Policymakers and investors routinely decompose bond yields into expected rates and term premiums to better understand the information embedded in the yield curve.

To determine what affects term premiums, researchers commonly estimate the econometric relationship between these estimates and observable macroeconomic and financial “factors” (Wright 2011; Li and Wei 2013). The return on a government bond should conceivably correlate with any variable that captures some component of either the quantity or the price of risk around the path of risk-free rates. Relevant factors include forecasts of economic growth and inflation, as well as measures of uncertainty around those projections; budget deficit forecasts and supply factors related to “special demand” for safe assets; estimates of the volatility of bond returns; estimated covariance of bond and stock returns, to assess hedging value; and broad measures of financial market stress, including the VIX (Chicago Board Options Exchange Volatility Index) or equity market volatility, to capture so-called flight-to-quality episodes.¹

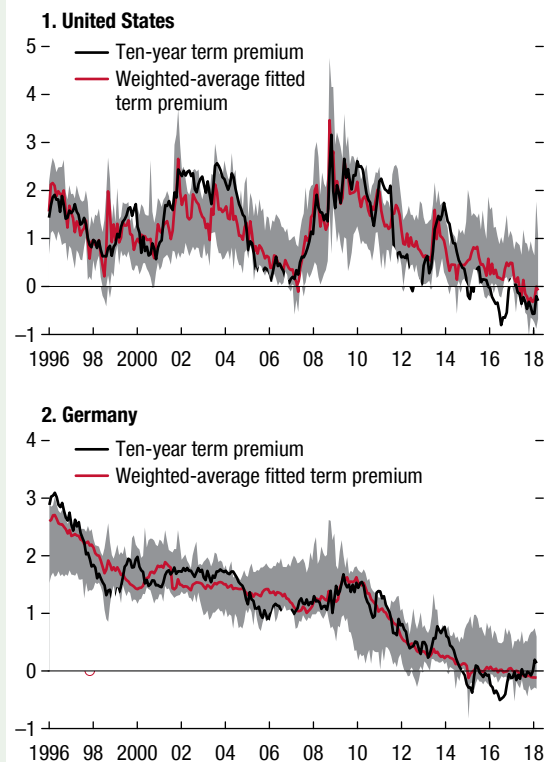
Rather than report the result from a single model and risk false precision, the estimates that follow average over hundreds of monthly regression models, based on alternative proxies for the underlying factors, to enhance robustness. In addition, the approach emphasizes weighted averages (based on the overall fit of the models) and ranges rather than a single point estimate of the fair value of term premiums; that is, the required returns statistically commensurate with underlying macroeconomic and financial variables. This method not only conveys warranted uncertainty around the estimates but also provides a sharper sense of which factors affect required returns, all else equal.

Importantly, the models generally track estimated 10-year term premiums for Canada, France, Germany, Japan, the United Kingdom, and the United States reasonably well over the sample from February 1996

This box was prepared by J. Benson Durham.

¹For a broader discussion of default risk premiums, see the April 2018 *Fiscal Monitor*.

Figure 1.2.1. Estimated Term Premiums



Sources: Bloomberg Finance L.P.; and IMF staff estimates.
Note: Ten-year term premium estimates follow the Adrian, Crump, and Moench (2013) model. The estimates for the US term premium follow a five-factor specification using underlying fitted yield data from June 1961 (for example, ACMTP10 Index). The estimates for Germany follow a four-factor specification using fitted yields from Bloomberg from October 1991. The weighted-average fair value estimate is the average of all estimated conditional term premium models. The shaded area denotes the range of fitted values from these models.

through March 2018. For example, for the United States, the models largely capture the so-called conundrum period during the mid-2000s. Finally, considering the current environment, as referenced in the main text, the weighted-average estimate of the fair value of the 10-year term premium from these hundreds of monthly regression models was about –10 basis points, near its sample low, compared with the actual term premium estimate of –30 basis points. After closing a meaningful gap over the past year or so, the reported estimated term premium is largely within the range of all 900 models, and the latest reading is small by historical comparison (Figure 1.2.1, panel 1).

Box 1.2 (continued)

Outside the United States, estimated term premiums on 10-year German bunds are close to historical lows. The latest fitted value, about -15 basis points, is less than the observed estimate, about 15 basis points, which strictly speaking suggests that required returns more than compensate for the current constellation of risks (Figure 1.2.1, panel 2). Finally, estimated term premiums are similarly close to their fitted values across Canada, France, Japan, and the United Kingdom.

Considering the coefficients of the models, as well as the current levels of the underlying factors, the most recent low fitted values of term premiums are owing to low survey-based uncertainty about near-term GDP growth and inflation, subdued volatility of US Treasury returns, and a persistently lower correlation between Treasury and risky asset returns. Notably, however, the

models say nothing about the future direction of any of these underlying factors. Indeed, the estimates imply significant increases in term premiums should, say, investors become more uncertain about the outlooks for inflation, growth, and the path for monetary policy. Also, naturally this formal time-series approach has shortcomings. Other key variables are hard to capture with formal statistics, including some of the phenomena discussed in the main text and other regulatory restrictions that affect investors' demand for government paper or debt-management considerations.

Nonetheless, these statistical results are consistent with the view that the overall level of longer-dated yields is appropriate given the stance of monetary policy, which, in turn, should remain largely accommodative to support growth and to bring inflation closer to central banks' targets.

Box 1.3. The Changing Investor Base in the US Leveraged Loan Market

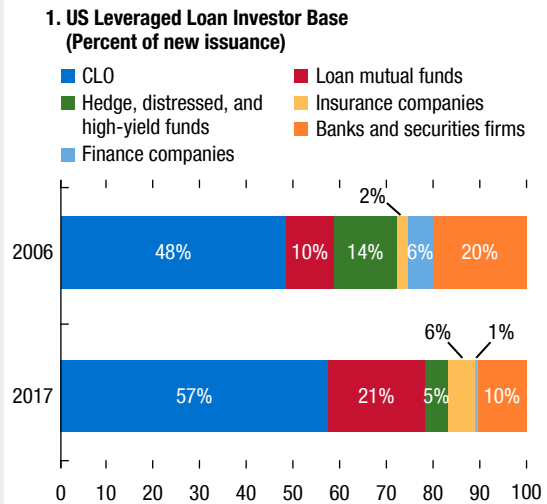
With the US leveraged loan market experiencing impressive growth over the past several years, the buyer base has shifted further toward institutional investors (Figure 1.3.1, panel 1). Similar to the precrisis period, structured financial products, such as collateralized loan obligations (CLOs), are an important source of demand for low-quality credit. Since 2014, CLOs have purchased more than half of total issuance of leveraged loans. US CLOs accounted for 57 percent of leveraged loans outstanding in 2017, with \$495 billion in assets under management. CLO issuance (sale of CLO tranches to outside investors to fund purchases of loans) reached \$118 billion in 2017, above precrisis levels. Loan mutual funds (including exchange-traded funds) are another important institutional investor class. They have grown from roughly \$20 billion in 2007 to \$170 billion in assets in 2017, and now account for more than 20 percent of the institutional loan market (Figure 1.3.1, panel 2).

Increased holdings of leveraged loans by institutional investors such as loan mutual funds and CLOs at the expense of banks may affect market dynamics during times of stress. The migration of loan assets to open-end loan mutual funds offering daily liquidity may exacerbate price moves in the event of large investor redemptions under distress (Braithwaite and others 2014). Furthermore, market participants cite an increase in demand for CLO tranches by asset managers, insurance companies, and pension funds, which now account for 45 percent of AAA CLO market share. In the years leading up to the financial crisis, AAA CLO tranches were routinely funded in the repurchase agreement (repo) market and through other means, essentially using financial leverage to boost meager AAA spreads. The unwinding of such leveraged positions reportedly amplified loan price moves when investors became uncertain about the safety and liquidity of higher-rated structured products. At this point, the use of financial leverage to fund CLO positions appears to be limited. Similarly, investors do not seem to be widely using total return swaps as a vehicle for gaining leveraged exposure to the loan market (another common instrument employed in 2006–07).

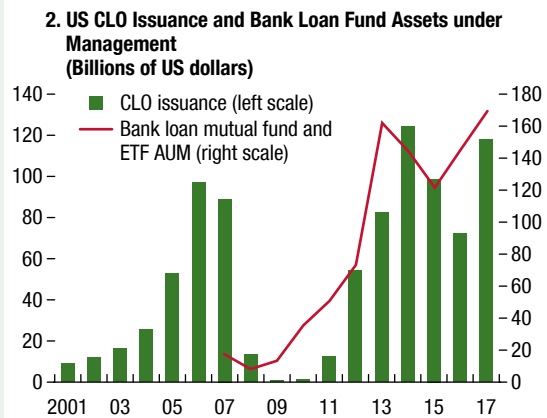
This box was prepared by Tom Piontek.

Figure 1.3.1. Nonbanks Have Increased Their Credit Exposure in the US Leveraged Loan Market

The US leveraged loan investor base has shifted further toward CLOs and asset managers.



CLO formation and loan fund growth remain robust.



Sources: EPFR Global; S&P Leveraged Commentary and Data; and IMF staff calculations.
 Note: AUM = assets under management; CLO = collateralized loan obligation; ETF = exchange-traded fund.

Box 1.4. Central Bank Digital Currencies

Crypto assets provide challenges and opportunities to central banks. As argued earlier, they are still far from fulfilling the three basic functions of money, and their underlying technology still has to develop further before it unequivocally offers the benefits it promises. Nonetheless, central banks can learn from the properties of cryptocurrencies and underlying technologies to make the use of fiat currencies more attractive. As a medium of exchange, cryptocurrencies have certain properties that central bank money in its current forms (cash and commercial bank reserves) does not have. Unlike reserve transfers, cryptocurrency transactions can be cleared and settled instantaneously without an intermediary, and transacting parties can enjoy anonymity; unlike with cash, transacting parties do not need to be in the same place, and the technology offers more flexibility in designing the denomination structure of the cryptocurrency. These properties make cryptocurrencies attractive for cross-border payments and micro payments in the new sharing, service-based digital economy.

Building on these developments, central banks such as the Bank of Canada, the People's Bank of China, the Monetary Authority of Singapore, and the Swedish Riksbank have started to explore a new form of central bank money: central bank digital currency (CBDC). Although approaches vary by institution, and a single definition is lacking, a CBDC could be defined as a digital form of central bank money that can be exchanged, peer to peer, in a decentralized manner. A CBDC would be a token representation of, or in addition to, cash in physical form (banknotes and coins) and/or electronic deposits. It could be issued by the central bank directly to commercial banks and other payment services providers or to individuals, and would be exchanged at par with the central bank's other monetary liabilities.

Payment system efficiency and stability seem to be important objectives in considering CBDCs. CBDCs could be used to counter the monopoly power that strong network externalities might confer on private

payment networks or to address the inability to ensure the full stability and safety of private cryptocurrencies.

From a retail point of view, gradually replacing notes and coins with a CBDC could yield savings to the state for the costs of maintaining and replacing notes and coins. It may also reduce transaction costs for individuals and small enterprises that have little or costly access to banking services in some countries or regions, and it may facilitate financial inclusion. Central banks would also be able to tailor the level of anonymity of a CBDC, ensuring cash-like anonymity for small-value payments, yet allowing for more tailored regulatory compliance for larger-value payments.

From a monetary policy perspective, CBDCs could help maintain the demand for central bank money in the digital age. Central bank seigniorage would continue with CBDCs. This, in turn, would allow central banks to continue to finance their operations and distribute profits to government. CBDCs, along with the abolition of cash, might also allow central banks to overcome the zero lower bound, facilitating truly negative interest rates when necessary, though the benefit of enhanced monetary policy effectiveness may need to be traded off against a potential cost to financial stability. Making the CBDC a potential competitor to commercial bank deposits could, for instance, lead to volatility in fund flows between commercial banks and the central bank, potentially resulting in bank runs toward CBDCs and thereby hampering financial stability.

In summary, some central banks have expressed interest in exploring the idea of a CBDC.¹ Given the uncertainties described above, a gradual and cautious approach that builds on experience and takes into account evolving and maturing financial technologies seems warranted. Risks to financial stability could potentially be reduced if the design of the CBDC is such that it respects the current two-tier banking system (that is, the separation of commercial banking from central banking) and merely creates a digital form of cash.

This box was prepared by Dong He and Ashraf Khan.

¹See CPMI (2018).

Box 1.5. Regulatory Reform—Tying Up the Loose Ends

The postcrisis regulatory reform agenda has been successful in enhancing the resilience of the major banks. This resilience has been achieved primarily through implementation of the Basel III package. However, the excessive variation in the output of internal models used by banks to compute regulatory capital led to concerns that these models were being gamed to reduce regulatory requirements without a corresponding reduction in risk exposures.

To address these concerns, the Basel Committee on Banking Supervision proposed a package of enhancements to Basel III in 2014, which was finally agreed to in December 2017, bringing closure to a critical piece of the regulatory reform agenda. These measures limit risk-weighted assets, based on the internal-ratings-based approach, to a minimum of 72.5 percent of the amount calculated using the simpler standardized approach.

These measures also aim to achieve a better balance between simplicity, risk sensitivity, and comparability. In this vein, the agreed-on implementation of the Fundamental Review of the Trading Book has been postponed to 2022, in response to practical challenges reported by countries, and the standardized approach to credit risk has been revised to make it more risk sensitive (for example, varying risk weights for real estate exposures using loan-to-value ratios).

Agreement on the Basel III enhancements has come at the cost of: a less conservative risk-weighted assets floor, from the 80 percent proposed initially; further extending the implementation timeline for these reforms to 2022–27, 20 years since the start of the crisis; an annual cap on any increase in risk-weighted assets resulting from the measures; and lowering some minimum risk weights in the standardized approach.

Despite these adjustments, the outcome has brought certainty to market participants. The focus of the

international efforts can now move to full, timely, and consistent implementation, which has already been delayed and is lagging in important areas such as cross-border resolution frameworks for banks.

A major challenge for effective implementation is shortcomings in the operational independence of supervisors from political and market influence. IMF Financial Sector Assessment Programs have found that only a handful of the nearly 40 countries that have been assessed since the global financial crisis are in full compliance with the Basel Core Principles on independence and accountability. Policymakers must ensure that supervisors have the resources and power to take timely, preemptive, and corrective actions to address emerging threats.

What else remains on the agenda? The Financial Stability Board recommendations to transform shadow banking into resilient market-based finance are now being translated into operational guidance to facilitate consistent national implementation. Resolution efforts for nonbanks, including central counterparties, remain a work in progress, while the reform agenda for insurers has not kept pace with planned timelines. The issue of tackling incentives for excessive risk taking has moved away from regulating remuneration to reforming governance, addressing misconduct, seeking to reinforce individual accountability, and creating a supportive institutional culture. The difficult decision on better incorporating sovereign risks into the regulatory framework has been shelved for the time being.

All in all, even though much has been achieved through the regulatory reforms, there is still some ground to be covered. Given the backdrop of calls for rolling back the reforms, it is vital that the postcrisis agenda be completed and implemented to allow supervisors to focus on emerging challenges, including those from rapid developments in financial technology and the threats posed by cyberattacks.

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