Global Financial Stability Report

Risk Taking, Liquidity, and Shadow Banking
Curbing Excess while Promoting Growth

October 2014

International Monetary Fund

Disclaimer: The *Global Financial Stability Report* (GFSR) is a survey by the IMF staff published twice a year, in the spring and fall. The report draws out the financial ramifications of economic issues highlighted in the IMF's *World Economic Outlook* (WEO). The report was prepared by IMF staff and has benefited from comments and suggestions from Executive Directors following their discussion of the report on September 25, 2014. The views expressed in this publication are those of the IMF staff and do not necessarily represent the views of the IMF's Executive Directors or their national authorities.

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ASSUMPTIONS AND CONVENTIONS

The following conventions are used throughout the *Global Financial Stability Report* (GFSR):

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

– between years or months (for example, 2013–14 or January–June) to indicate the years or months covered, including the beginning and ending years or months;

/ between years or months (for example, 2013/14) to indicate a fiscal or financial year.

"Billion" means a thousand million.

"Trillion" means a thousand billion.

"Basis points" refer to hundredths of 1 percentage point (for example, 25 basis points are equivalent to ¼ of 1 percentage point).

If no source is listed on tables and figures, data are based on IMF staff estimates or calculations.

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

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

Further Information and Data

This version of the GFSR is available in full through the IMF eLibrary (www.elibrary.imf.org) and the IMF website (www.imf.org).

The data and analysis appearing in the GFSR are compiled by the IMF staff at the time of publication. Every effort is made to ensure, but not guarantee, their timeliness, accuracy, and completeness. When errors are discovered, there is a concerted effort to correct them as appropriate and feasible. Corrections and revisions made after publication are incorporated into the electronic editions available from the IMF eLibrary (www.elibrary.imf.org) and on the IMF website (www.imf.org). All substantive changes are listed in detail in the online tables of contents.

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PREFACE

The *Global Financial Stability Report* (GFSR) assesses key risks facing the global financial system. In normal times, the report seeks to play a role in preventing crises by highlighting policies that may mitigate systemic risks, thereby contributing to global financial stability and the sustained economic growth of the IMF's member countries. Six years after the start of the crisis, the global economic recovery continues to rely heavily on accommodative monetary policies in advanced economies. Monetary accommodation remains critical in supporting the economy, by encouraging economic risk taking in the form of increased real spending by households and greater willingness to invest and hire by businesses. However, prolonged monetary ease may also encourage excessive financial risk taking.

The current report finds that although economic benefits are becoming more evident in some economies, market and liquidity risks have increased to levels that could compromise financial stability if left unaddressed. The best way to safeguard financial stability and improve the balance between economic and financial risk taking is to put in place policies that enhance the transmission of monetary policy to the real economy—thus promoting economic risk taking—and address financial excesses through well-designed macroprudential measures. The report also examines shadow banking developments around the globe, assessing the role of common drivers behind different forms of shadow banking activities, discussing risks and benefits, and advocating a more encompassing, macroprudential approach to regulate and monitor the sector. Last, the report looks at the contribution of executive compensation and governance—board structure, business culture, and risk management—to risk taking by banks. It endorses financial reforms that align compensation with risk and increase its deferral, and proposes measures to improve bank governance.

The analysis in this report has been coordinated by the Monetary and Capital Markets (MCM) Department under the general direction of José Viñals, Financial Counsellor and Director. The project has been directed by Jan Brockmeijer and Peter Dattels, both Deputy Directors, as well as by Gaston Gelos and Matthew Jones, both Division Chiefs. It has benefited from comments and suggestions from the senior staff in the MCM Department.

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Joe Procopio from the Communications Department led the editorial team and managed production with assistance from Lucy Scott Morales, Sherrie Brown, Gregg Forte, Linda Long, and Maryland Composition with input from Linda Griffin Kean.

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

This GFSR reflects information available as of September 19, 2014. The report benefited from comments and suggestions from staff in other IMF departments, as well as from Executive Directors following their discussion of the *Global Financial Stability Report* on September 25, 2014. However, the analysis and policy considerations are those of the contributing staff and should not be attributed to the IMF, its Executive Directors, or their national authorities.

EXECUTIVE SUMMARY

Six years after the start of the crisis, the global economic recovery continues to rely heavily on accommodative monetary policies in advanced economies to support demand, encourage corporate investment, and facilitate balance sheet repair. Monetary accommodation remains critical in supporting the economy by encouraging *economic risk taking* in advanced economies, in the form of increased real spending by households and greater willingness to invest and hire by businesses. However, prolonged monetary ease may also encourage excessive *financial risk taking,* in the form of increased portfolio allocations to riskier assets and increased willingness to leverage balance sheets. Thus, accommodative monetary policies face a trade-off between the upside economic benefits and the downside financial stability risks. This report finds that although the economic benefits are becoming more evident in some economies, market and liquidity risks have increased to levels that could compromise financial stability if left unaddressed.

The best way to safeguard financial stability and improve the balance between economic and financial risk taking is to put in place policies that enhance the transmission of monetary policy to the real economy—thus promoting economic risk taking—and address financial excesses through well-designed macroprudential measures.

Economic risk taking is advancing but uneven

The October 2014 *World Economic Outlook* (WEO) projects the global recovery to strengthen modestly this year and continue into 2015, supported by accommodative monetary policies in advanced economies and declining headwinds from tighter fiscal policy. However, growth is not yet robust across the globe, and downside risks have risen. Business and consumer confidence remains fragile in many areas, reflecting uncertainties about the recovery of private demand and concerns about incomplete balance sheet repair in banks and corporations. This shortfall in confidence continues to impede greater economic risk taking, making corporations in advanced economies reluctant to ramp up capital investment, despite reasonable

earnings growth and access to funding at very low interest rates. Balance sheet repair and monetary policy are now combining to support greater economic risk taking and a brighter outlook for capital expenditure. But prospects are uneven, reflecting a variety of impediments.

On the brighter side is the United States, where business fixed investment has been picking up, although at a slower pace than in previous recoveries. Capacity utilization is returning to precrisis levels and banks are loosening lending standards, as companies are increasingly focusing on investment rather than equity buybacks. In the euro area, however, growth in business fixed investment remains weak. Capacity utilization is still below precrisis levels, banks have only recently stopped tightening corporate lending, and economic policy uncertainty remains elevated. A number of major emerging market economies are facing weakening export growth and slowing credit expansion. In those countries, capital expenditures in major nonfinancial firms declined across the board in 2013.

The WEO expects the strongest rebound in overall growth in the United States, whereas the brakes on recovery in the euro area will ease only slowly, and growth in Japan will remain modest. For emerging markets, the scope for macroeconomic policies to support growth varies across countries and regions, but space remains limited in several countries with external vulnerabilities.

Easy money continues to increase global financial stability risks

Accommodative policies aimed at supporting the recovery and promoting economic risk taking have facilitated greater financial risk taking. This has resulted in asset price appreciation, spread compression, and record low volatility, in many areas reaching levels that indicate divergence from fundamentals. What is unusual about these developments is their synchronicity: they have occurred simultaneously across broad asset classes and across countries in a way that is unprecedented.

Capital markets have become more significant providers of credit since the crisis, shifting the locus of risks to the shadow banking system. The share of credit instruments held in mutual fund portfolios has been growing, doubling since 2007, and now amounts to 27 percent of global high-yield debt. At the same time, the fund management industry has become more concentrated. The top 10 global asset management firms now account for more than $19 trillion in assets under management. The combination of asset concentration, extended portfolio positions and valuations, flight-prone investors, and vulnerable liquidity structures have increased the sensitivity of key credit markets, increasing market and liquidity risks.

Emerging markets are more vulnerable to shocks from advanced economies, as they now absorb a much larger share of the outward portfolio investment from advanced economies. A consequence of these stronger links is the increased synchronization of asset price movements and volatilities.

These structural changes in credit markets, together with the expected normalization of monetary policy in the United States, have raised market and liquidity risks in ways that could compromise financial stability if left unaddressed. The increased sensitivity of credit markets could make the exit process more volatile, potentially undermining the ability of the financial system to support the recovery.

To illustrate these potential risks to credit markets, this report examines the impact of a rapid market adjustment that causes term premiums in bond markets to revert to historic norms (increasing by 100 basis points) and credit risk premiums to normalize (a repricing of credit risks by 100 basis points). Such a shock could reduce the market value of global bond portfolios by more than 8 percent, or in excess of $3.8 trillion. If losses on this scale were to materialize over a short time horizon, the ensuing portfolio adjustments and market turmoil could trigger significant disruption in global markets.

Managing risks from an ongoing overhaul in bank business models to better support economic risk taking

The policy challenge is to remove impediments to economic risk taking and strengthen the transmission of credit to the real economy. Banks have come a long way since the global financial crisis. Adjustment has proceeded at different stages, with the first stage focus-ing on emergency stabilization measures. In the second phase, banks have strived to adapt to new business and regulatory realities. Since the start of the crisis, banks hold significantly more capital and have accelerated balance sheet repair. But progress has been uneven across banks and many institutions need to do more to achieve a sustainable business model.

Today, low profitability raises concerns about some banks' ability to build and maintain capital buffers and meet credit demand. Reflecting the size and breadth of the challenge, 80 percent of assets of the largest institutions have a return on equity that does not cover the cost of capital required by shareholders. These banks are entering a third phase, in which they will need a more fundamental overhaul of their business models. This will include a combination of repricing existing business lines, reallocating capital across activities, restructuring, or retrenching altogether.

Based on a sample of 300 advanced economy banks, this report finds that many banks have the potential capacity to supply credit, although there is a group of institutions, mostly from the euro area, that would require a high level of repricing to generate sustainable profits and rebuild capital buffers. Such a repricing may not be feasible, especially if done on a stand-alone basis and not followed by other market participants. This could limit these banks' capacity to meet credit demand, particularly in those countries that are in greatest need of a recovery in credit, and create head-winds for the economic recovery.

Strengthening the transmission of credit means, in part, encouraging the prompt and orderly exit of nonviable banks. This would help relieve competitive pressures in a context of excess capacity and allow viable banks to build and maintain capital buffers and meet credit demand. Regulators can further assist that process by encouraging banks to move away from old practices of cross-subsidizing products and adopt more flexible and transparent business models with product pricing that reflects risks and regulatory requirements.

The credit transmission mechanism will also be aided, particularly in Europe, by greater market-based access to credit, including through safe securitization. This will take time, particularly for financial systems that have traditionally been reliant on bank lending. Removing impediments to nonbank participation in credit origination will require solid regulatory frameworks for nonbanks. As discussed further in Chapter 2, policymakers need to closely monitor the risks

that could develop as the financial system evolves in the coming years—with some activities moving from banks to nonbanks—and ensure that these risks are effectively mitigated and managed.

Improving the balance between economic and financial risk taking with policies to safeguard financial stability

Monetary policy should remain committed to achieving the central banks' mandate of price stability and—where relevant—output stability, while macroprudential policies should be the first line of defense against financial excesses that can threaten stability. Improving the monetary policy trade-off and containing the financial stability risks identified in this report require the effective deployment of a suite of micro- and macroprudential policy tools. This will reduce the need to tighten interest rates earlier than warranted by the needs of the economy. It will also make systemic institutions more resilient, help contain procyclical asset price and credit dynamics, and cushion the consequences of liquidity squeezes when volatility returns.

Macroprudential measures depend on three steps. First, policymakers must have the data necessary to *monitor* the build-up of financial stability risks. Second, they must *prepare* to ensure they have the statutory authority and analytical capacity to use the macroprudential policy tools that may be needed. This is particularly important in the nonbanking sector, where the regulatory framework is not yet fully in place and needs to be extended to tackle emerging risks. Third, policymakers must have an explicit mandate to *act* when needed and, equally important, the courage to act, even when measures are highly unpopular. Effective and balanced communication of the measures undertaken will also be needed.

A central concern is the market liquidity risk arising from the mismatch between the liquidity promised to mutual fund owners in good times and the cost of illiquidity when meeting redemptions in times of stress. The policy remedy should seek to address this mismatch, by removing incentives of asset owners to run—by aligning redemption terms of funds with the underlying liquidity in the assets invested—enhancing the accuracy of net asset values, increasing liquidity cash buffers in mutual funds, and improving the liquidity and transparency of secondary markets, specifically for longer-term debt markets. Redemption fees that benefit remaining shareholders are one option;

however, the calibration of such a fee is challenging and to the extent possible, should not be time varying, as this could encourage asset flight. Similarly, gates to limit redemptions appear to solve some incentive problems, but may simply accelerate redemptions ahead of potential imposition and lead to contagion.

Policymakers should also explore contingency measures in cases where illiquidity in markets has the potential for contagion. For advanced economies, bilateral and multilateral swap line arrangements could reduce excess volatility by ensuring access to foreign currency funding in times of stress. For emerging markets, in the event of significant capital outflows, some countries may need to focus on ensuring orderly market functioning. Possible actions include using cash balances, lowering the supply of long-term debt, and conducting switching auctions to temporarily reduce supply on the long end of yield curves. In addition to bilateral and multilateral swap line arrangements to access foreign currency funding in times of stress, multilateral resources such as IMF facilities could provide additional buffers. Keeping emerging market economies resilient calls for an increased focus on domestic vulnerabilities, including weak bank provisioning practices and low loss-absorbing bank buffers in some countries, as discussed in previous reports.

Finally, policymakers need to pursue a vigorous agenda of structural reforms in product and labor markets to increase the return on investment and make the recovery more sustainable.

Growth, risks, and regulatory responses to shadow banking around the world

Chapter 2 shows that in advanced economies, more narrowly defined shadow banking measures indicate stagnation, while broader measures (which include investment funds) generally point to continued growth since the global financial crisis. In emerging market economies, the growth of shadow banking continues to outpace that of the traditional banking system.

Shadow banking varies greatly across and within countries, but empirical results show that some of the key drivers behind its growth are common to all its forms: a tightening of banking regulation, ample liquidity conditions, and demand by institutional investors. Hence, the current financial environment in advanced economies remains conducive to further growth in shadow banking, including the migration of corporate lending from traditional banking to the

nonbank sector. Data limitations prevent a comprehensive assessment, but shadow banking in the United States seems to pose a greater risk to domestic financial stability than shadow banking in the euro area and the United Kingdom.

Policymakers need a more encompassing approach to regulation and supervision that focuses on both shadow banking activities and entities and places a greater emphasis on systemic risk. A critical element of that approach is better data on shadow banking.

Risk taking, governance, and compensation in banks

Chapter 3 empirically investigates the relation of risk taking in banks to banks' ownership structure, governance, and executive pay incentives. The results show that banks with board members who are independent from bank management tend to take less risk, as do banks whose boards have a risk committee and those that have large institutional ownership.

The level of executive compensation in banks is not consistently related to risk taking, but more long-term incentive pay is associated with less risk. As expected,

periods of severe financial stress alter some of these effects, as incentives change when a bank gets closer to default. In particular, when banks are weak, evidence indicates that shareholders (who are protected by limited liability) have an incentive to make risky bets at the expense of creditors—who expect to be bailed out—and society at large.

These results suggest policy measures, including some that have been part of the policy debate but had not previously been empirically validated. These measures include making compensation of bank executives more appropriately risk sensitive (including to the risk exposure of bank creditors), deferring some compensation, and providing for clawbacks. Bank boards should be more independent from management and establish risk committees. In addition, supervisors should ensure that board oversight of risk taking in banks is effective. The potential merits (and possible unintentional consequences) of including representation for debt holders on bank boards should be studied. Finally, transparency is critical to accountability and the effectiveness of market discipline.

IMPROVING THE BALANCE BETWEEN FINANCIAL AND ECONOMIC RISK TAKING

Overall, this report's assessment is that current stability risks call for increased vigilance. According to the World Economic Outlook *(WEO) baseline, the global economic recovery is expected to proceed slowly, supported by ongoing monetary accommodation in advanced economies and less fiscal drag. The extended period of monetary accommodation and the accompanying search for yield are leading to credit mispricing and asset price pressures, increasing the chance that financial stability risks could derail the recovery. Concerns have shifted to the shadow banking system, especially the growing share of illiquid credit in mutual fund portfolios. Should asset markets come under stress, an adverse feedback loop between outflows and asset performance could develop, moving markets from a low- to a high-volatility state, with negative implications for emerging market economies. Such stress might be triggered as part of the exit from unconventional monetary policy or by other sources, including a sharp retrenchment from risk taking due to higher geopolitical risks.*

Relative to the April 2014 *Global Financial Stability Report* (GFSR), the Global Financial Stability Map indicates that the locus of risks has shifted because an increase in *risk appetite* has driven the search for yield and pushed up market and liquidity risks (Figures 1.1 and 1.2). *Credit risks* in the global financial system have declined, reflecting favorable funding conditions and

improved asset quality. Responding partly to regulatory initiatives, the global banking system is now much better capitalized than at the onset of the financial crisis in 2008. However, adapting to the new business realities, including strengthened regulatory requirements, has made profitability a challenge for banks. Although lower profitability partly reflects cyclical factors and lower risk taking, it signals the need for a deeper overhaul in many global banks' business models, which would include a combination of repricing existing business lines, reallocating to higher-risk activities, and retrenching from some products (discussed in the section "Global Banks in Transition: Reprice, Reallocate, or Restructure").

Macroeconomic risks are unchanged, with the global economic recovery proceeding slowly. Reflecting several setbacks, the growth projections have been marked down for 2014, although they remain largely unchanged for 2015, as detailed in the October 2014 *World Economic Outlook*. Moving from liquidity- to growth-driven markets, discussed in the April 2014 GFSR, requires a greater balance between economic and financial risk taking. So far in 2014, economic risk taking has been lagging in most advanced economies. In the United States, a better investment outlook provides more evidence of "green shoots," but recent macroeconomic data for the euro area and other advanced economies have dashed hopes for a quickening of the recovery. In emerging markets, economic risk taking has been rising, but with signs of a continued buildup of leverage and deteriorating credit quality. The imbalances between economic and financial risk taking are examined further in the section "Are Economic and Financial Risk Taking Balanced?"

Monetary and *financial conditions* continue to be accommodative because the recovery is not yet fully self-sustaining, and markets anticipate low interest rates for longer. The market's central expectation of the U.S. policy rate path remains broadly in line with the smooth exit scenario outlined in the April 2014 GFSR. Both market- and survey-based expectations continue pointing to about the middle of 2015 for the first policy rate hike (Figure 1.3, panel 1). The decline

Figure 1.1. Global Financial Stability Map
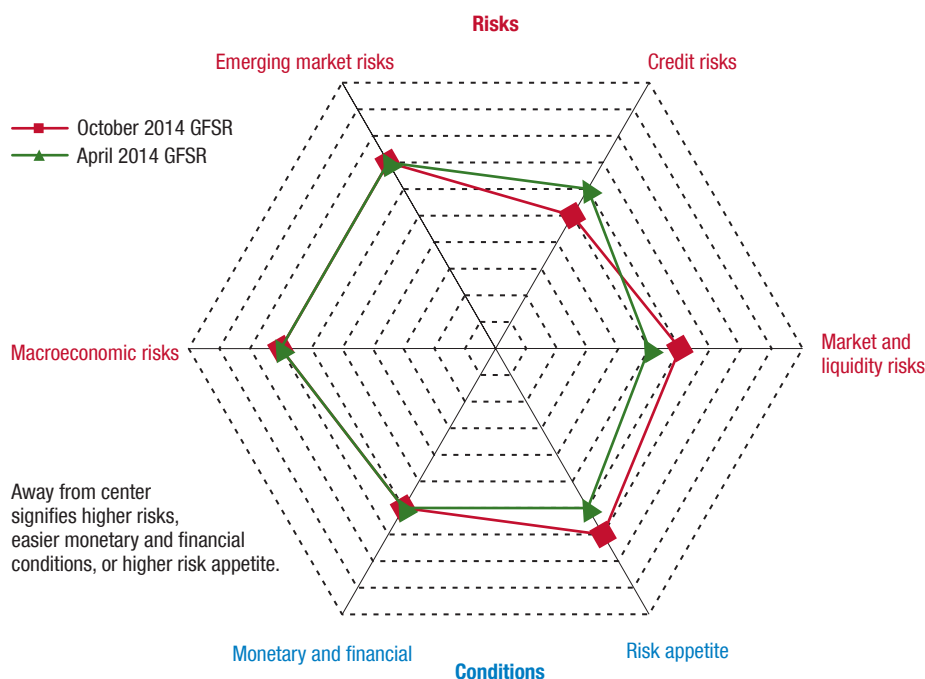
Source: IMF staff estimates.

in the 10-year Treasury rate since April 2014 has been driven equally by a decline in the term premium and a reduction in the expected terminal federal funds rate (Figure 1.3, panels 3–5). The lower term premium may be temporary, given that it remains low relative to historical averages, but the lower terminal rate could be structural, reflecting weaker trend growth expectations. In turn, lower rates for longer extend the search for yield and the buildup of financial stability risks discussed throughout this chapter.

Emerging market risks are unchanged because more favorable external financing conditions are set against a rise in regional geopolitical risks (in particular the increase in tensions surrounding Ukraine and Russia and the heightened tensions in the Middle East, with potential impacts on global financial, trade, and commodity markets), pockets of domestic imbalances, and idiosyncratic factors, such as Argentina's debt litigation proceedings. External imbalances that led to currency and bond sell-offs in 2013 have improved in 2014, although some current accounts are still deeply in deficit (Figure 1.4, panel 1). Recent improvements in inflation expectations for some emerging markets provide welcome monetary policy space, and the decline in global interest rates is reflected in the favor-able performance of emerging market assets this year (Figure 1.4, panel 4). Nevertheless, inflation in several major emerging markets remains elevated and warrants caution. As discussed in the April 2014 GFSR, rising leverage may expose households, banks, and nonfinancial firms to additional strains, especially if rates rise and growth slows.

Market and *liquidity risks* have increased significantly. Financial markets have rallied, despite relatively disappointing performance of the real economy (Figure 1.5), reflecting the ongoing search for yield, which has increased asset prices and compressed spreads. A bird's-eye view provided by the global asset heat map (Figure 1.6, panel 1) shows that across most asset classes, prices have become elevated. Except for emerging market high-yield bonds and equities, asset prices are elevated (and spreads are narrow) relative to their behavior of the past 10 years. Beyond valuations, strong flows into mutual funds have boosted liquidity in credit markets, masking the deterioration of other liquidity measures, such as the depth and breadth of liquidity. Furthermore, structural features of the asset management industry (discussed in the section "Rising Market Liquidity Risks") may amplify the impact of liquidity shocks.

Figure 1.2. Global Financial Stability Map: Risks and Conditions
(Notch changes since the April 2014 GFSR)

Macroeconomic risks remain balanced as the global recovery continues, although weaker than expected.

Emerging market risks are unchanged because subdued growth was offset by supportive policy actions and improved external conditions.

Credit risks have declined, led by improved bank funding conditions and balance sheet repair.

Monetary and financial conditions remain accommodative, with lending conditions and excess liquidity mostly unchanged.

Risk appetite increased on expectations that continued monetary accommodation will support asset prices.

Market and liquidity risks have increased as investors reach for yield in less liquid assets.

Source: IMF staff estimates.
Note: Changes in risks and conditions are based on a range of indicators, complemented with IMF staff judgment (see Annex 1.1. in the April 2010 GFSR and Dattels and others [2010] for a description of the methodology underlying the Global Financial Stability Map). Overall notch changes are the simple average of notch changes in individual indicators. The number next to each legend indicates the number of individual indicators within each subcategory of risks and conditions. For lending conditions, positive values represent slower pace of tightening or faster easing. CB = central bank; QE = quantitative easing.

Figure 1.3. United States: How Far along the Exit Process?

Both market- and survey-based expectations of the liftoff date still center around the middle of 2015...

1. Federal Reserve Policy Rate
(Percent)
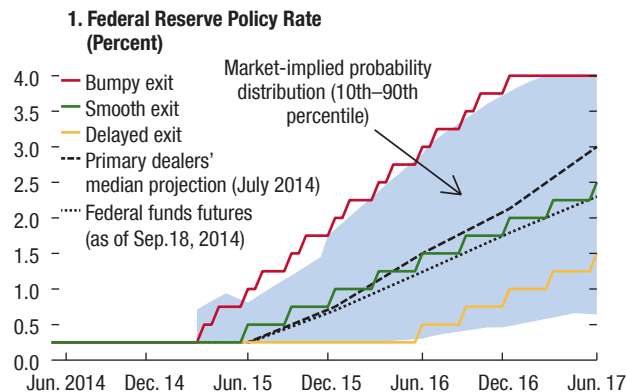
Sources: Bloomberg L.P.; Federal Reserve Bank of New York; and IMF staff calculations.
Note: Market implied probability distribution is derived from eurodollar options as of September 18, 2014.

The 10-year rate has declined in the first half of the year due equally to two factors...

3. Ten-Year Treasury Yield
(Percent)
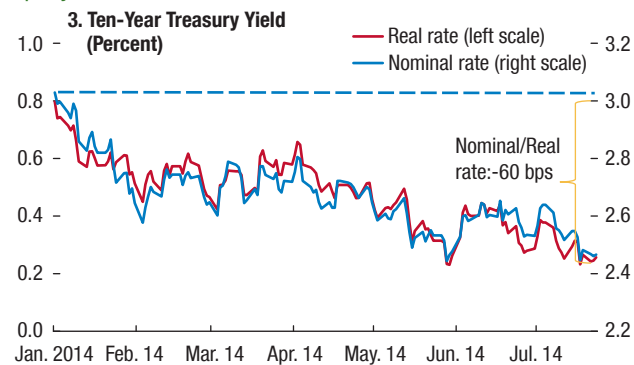
Sources: Bloomberg L.P.

...and a decline in the expected terminal Federal funds rate to about 3.50–3.75 percent.

5. Terminal Federal Funds Rate
(Percent)
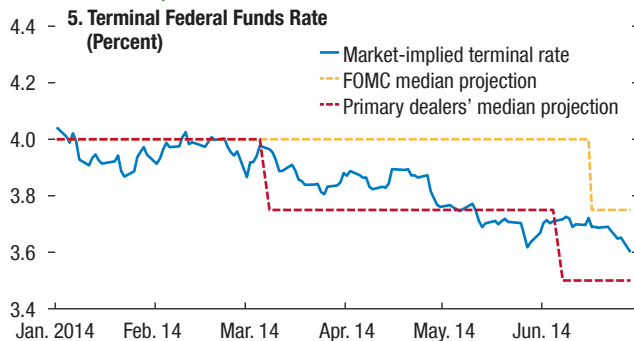
Sources: Bloomberg L.P.; Kim and Wright (K&W) (2005, updated); and IMF staff estimates.
Note: The market-implied terminal rate is derived from the 10-year Treasury rate, the 10-year term premium (Kim and Wright, 2005), and the expected months to liftoff in the federal funds rate. The pace of rate hikes is assumed to be 100 basis points per year until the terminal rate is reached. FOMC = Federal Open Markets Committee.

...while the pace of rate hikes is still expected to be about 300 basis points over a three-year period.

2. Expected Cumulative Changes in the Federal Funds Rate
(Basis points, after June 2015)
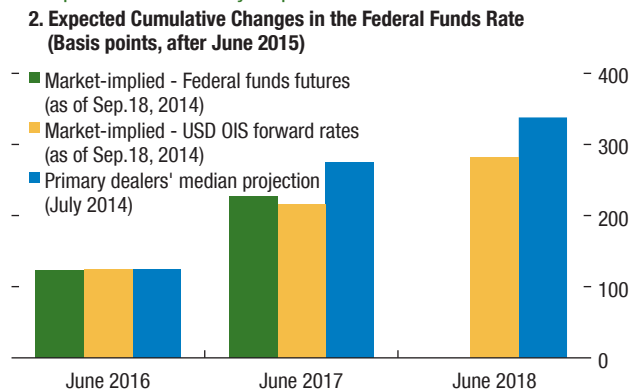
Sources: Bloomberg L.P.; and Federal Reserve Bank of New York.
Note: Federal funds futures are not available beyond July 2017. USD OIS = U.S. dollar overnight indexed swap.

...a decline in the term premium...

4. Ten-Year Term Premium
(Percent)
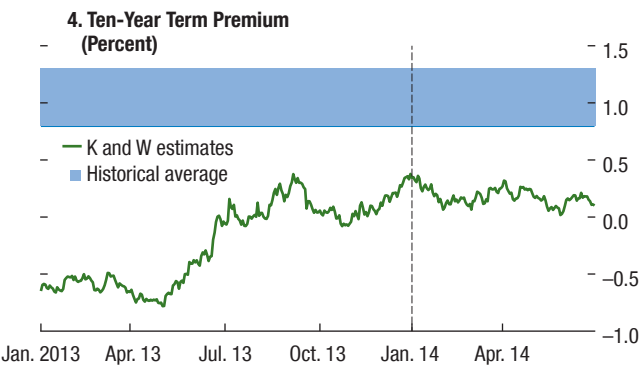
Sources: Kim and Wright (K and W) (2005, updated); and IMF staff estimates.
Note: The upper bound of the blue bar indicates the average K and W term premium from 1990 to 2007, while the lower bound indicates the average term premium from 2000 to 2007.

The second factor could be structural and may depress 10-year rates and prolong the search for yield.

6. Ten-Year Treasury Rate Projection
(Percent; average over next 10 years)
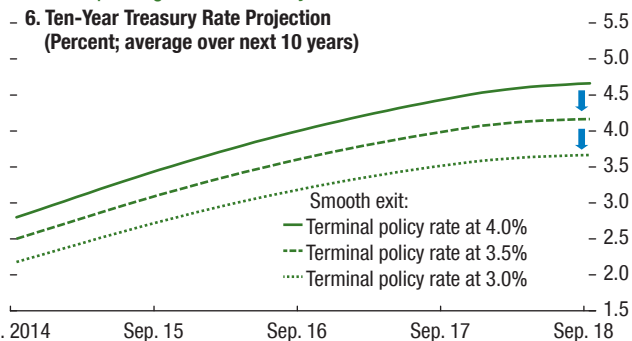
Source: IMF staff projections.

Figure 1.4. Emerging Market Developments

Improvements in external balances...

1. WEO 2014 Forecast Current Account Balance
(Percent of GDP)
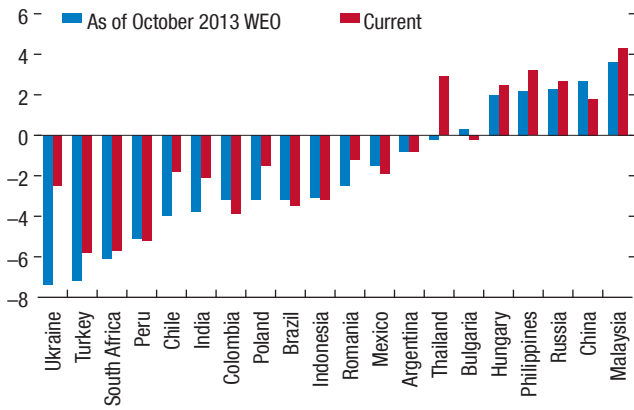
Source: IMF, World Economic Outlook database.

...and, for some, in inflation...

2. WEO 2014 Forecast Headline Inflation Expectations
(Percent, year-over-year)
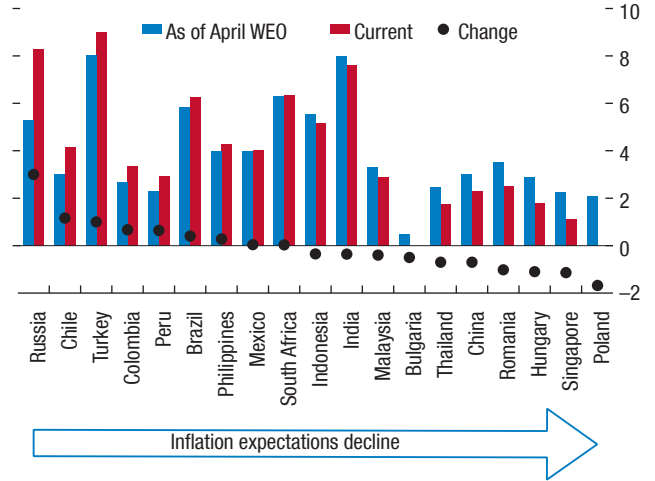
Source: IMF, World Economic Outlook database.

...have allowed the market to reprice the monetary policy space...

3. Expected Policy Rates by end of 2015:Q1
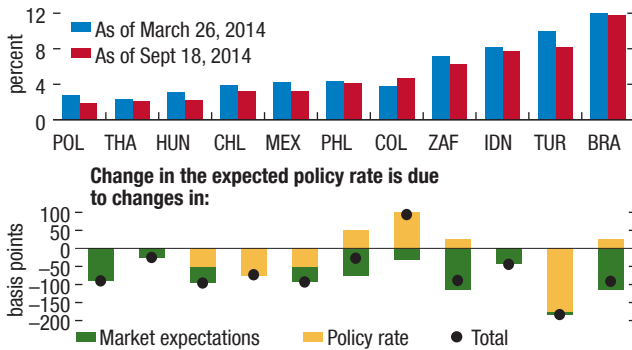
Sources: Haver Analytics; IMF, Economic Data Sharing System database;
and IMF staff calculations.
Note: Data labels use International Organization for Standardization
country codes.

...which has been reflected in asset performance so far in 2014.

4. Major Emerging Market Asset Performance
(Returns; percent)
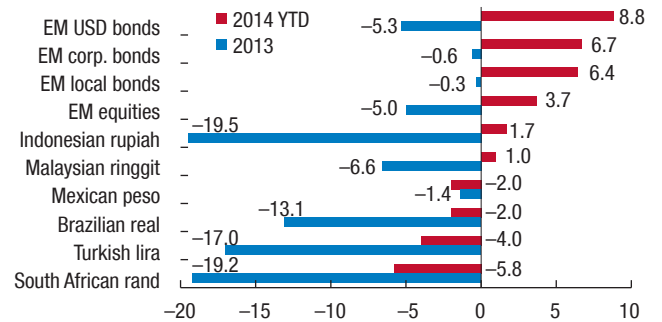
Sources: Bloomberg L.P.; and JPMorgan Chase & Co.
Note: EM = emerging market; USD = U.S. dollar; YTD = year to date.

But corporate leverage and household indebtedness have
continued to rise.

5. Bank Credit and Household Debt Levels
(Percent of GDP)
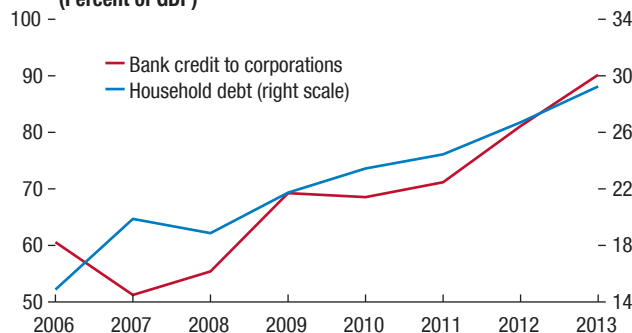
Sources: Bank for International Settlements; CEIC; IMF, Financial
Soundness Indicators database; and IMF staff calculations.

Figure 1.5. Financial Markets Are Buoyant, Despite Economic Disappointments
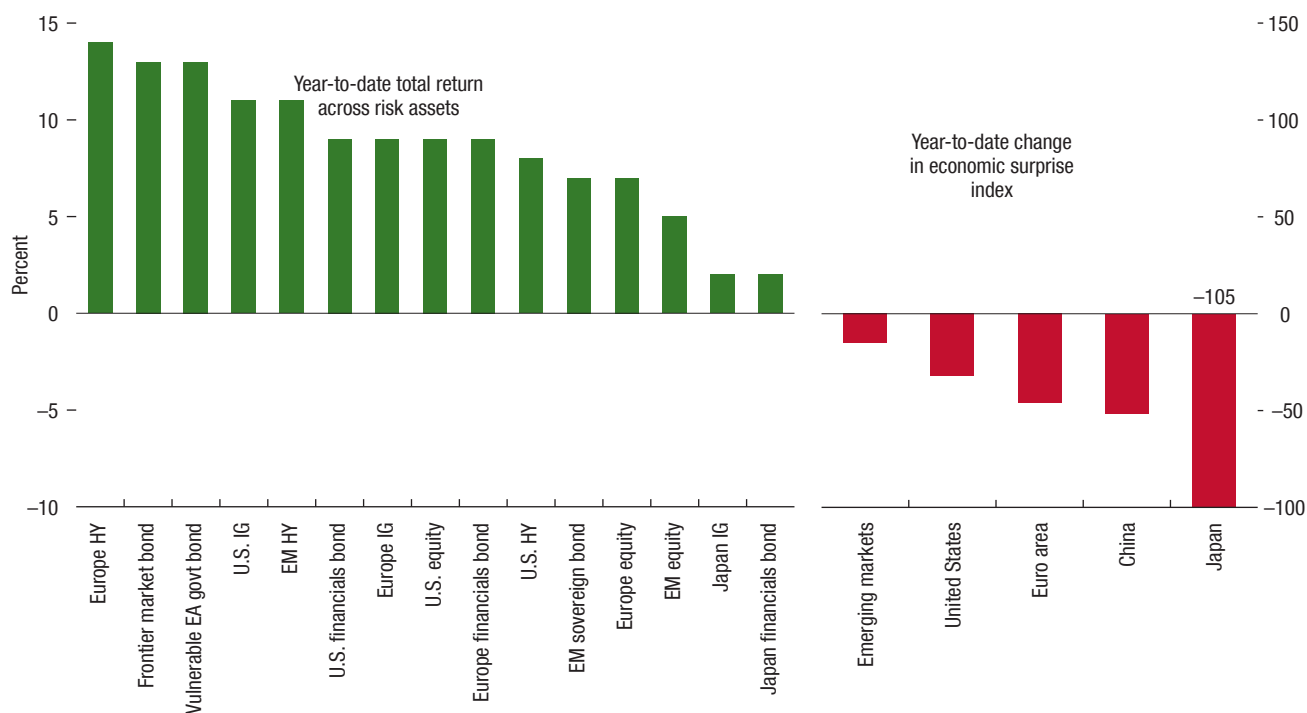
Source: IMF staff calculations.
Note: EM = emerging markets; EA = euro area; HY = high yield; IG = investment grade.

Although there do not appear to be extreme valuations in any single asset class, valuations in virtually all the major asset classes are simultaneously stretched relative to norms, which is historically rare; moreover, volatility has reached record lows across the asset spectrum (Figure 1.6, panel 2). The search for yield, leverage, innovation, and high dependence on common factors across markets all lead to highly correlated mispricing and low volatility across assets last observed in the run-up to the global financial crisis.

- *In almost all fixed income classes, prices are higher than long-term norms and risk premiums are unusually low.* In advanced economy sovereign bonds, term premiums remain low across the board relative to expectations for growth and inflation. They are particularly low for bonds in Germany, Japan, and other advanced economies (Figures 1.27 and 1.28 in Annex 1.1).
- *Sovereign bond spreads in some countries have become compressed by more than predicted by models of fair value.* Annex 1.1 presents different model-based estimates of valuation. Although any modeling exercise of this type faces methodological issues that create

uncertainty around the estimates, it is clear that there is some evidence of overpricing in sovereign bond markets.

- *The high-yield sector, and in particular low-rated corporate credit, is beginning to look worrisome based on valuations.* U.S. high-yield spreads are no longer sufficient to compensate for default (based on an average default cycle). Issuance patterns for bonds are stretched more than average and are becoming increasingly so as the cycle extends. Based on historical experience, the rising share of riskier issues in total credit issuance foreshadows subpar returns. Indeed, high-yield issuance has taken off in both the United States and the rest of the world, and both in absolute terms and as a ratio of total corporate debt issuance, while underwriting standards continue to weaken, with growth in covenant-lite loans and payment-in-kind notes.
- *Equity prices in some advanced economies are stretched relative to historical norms, but not across the board.* Annex 1.1 shows that implied real equity yields are compressed in the United States and in several other advanced economies. At the same time, real equity

Figure 1.6. Global Heat Maps

1. Asset Price Heat Map
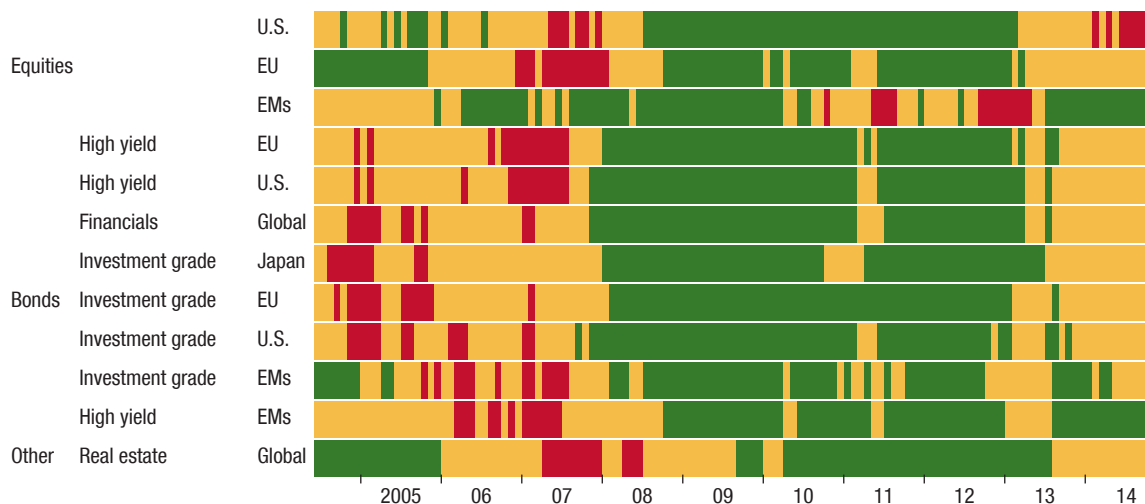
Source: IMF staff calculations.
Note: red = top (bottom) 10 percent of equity prices (bond spreads); green = bottom (top) 50 percent of equity prices (bond spreads); yellow = remainder of the price (spread) distribution over July 2004–September 2014. EM = emerging market; EU = European Union; U.S. = United States.

2. Volatility Heat Map
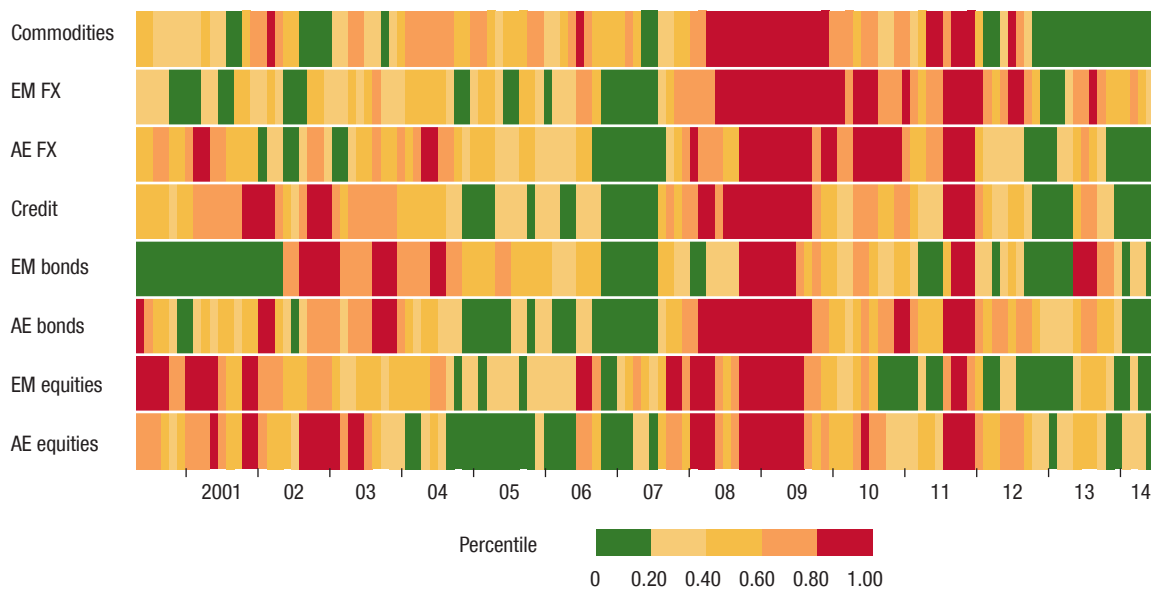
Sources: Bloomberg L.P.; and IMF staff calculations.
Note: Percentiles of three-month realized volatility. AE = advanced economy; EM = emerging markets; FX = foreign exchange. Percentile value of 1 corresponds to the maximum level of asset volatility for the entire period; 0 corresponds to the minimum.

yields are relatively high in other countries, including many emerging markets, indicating that equities in those markets are relatively cheap vis-à-vis historical norms. Overall, except for the United States (see next section), relatively little evidence is to be found of "bubble-like" behavior in nonprice data, such as investor fund flows, issuance patterns, and surveys of expected future returns.

- *Real estate and other assets offer a mixed story, with elevated prices and pockets of overvaluation.* At the global level, real estate imbalances are not as widespread as in the run-up to and the early stages of the global financial crisis; however, country-level vulnerabilities are still evident. After a period of decline in the initial stages of the global financial crisis, the IMF's Global House Price Index has been inching up, with strong rebounds in house prices in many countries. During the past 12 months, house prices have increased in about half of the advanced economies and about two-thirds of the emerging market economies included in the index, and key valuation metrics, such as house price-to-income and house price-to-rent ratios, remain greater than historical averages for many countries (Annex 1.1).
- *Across asset classes, volatility has reached record lows.* Realized volatilities have declined to 15-year lows (Figure 1.6, panel 2), despite a few idiosyncratic risk-off episodes in emerging market economies. Even more striking is that volatility has become highly correlated across most major asset classes, which has coincided with the simultaneous and widespread pattern of prices exceeding historical norms.

Are Economic and Financial Risk Taking Balanced?

Accommodative monetary policies in advanced economies have facilitated balance sheet repair and increased economic risk taking, contributing to a brighter outlook for capital expenditure, especially in Japan, the United Kingdom, and the United States. At the same time, however, accommodative policies may be causing too much financial risk taking, as reflected in compressed credit spreads, low volatility, and asset prices that are both elevated and highly correlated. Corporate leverage in the United States has risen, and default cushions have eroded in lower-rated segments of high-yield corporate bond markets as underwriting standards have weakened. In emerging markets, strong investor risk appetite has fueled corporate borrowing

at low spreads, while bond issuance continues to grow rapidly. Overall, in the absence of a large adverse shock, leverage does not yet appear to be at critical levels across companies in emerging markets, but corporate vulnerabilities are more pronounced in China.

The use of accommodative conventional and unconventional monetary policies involves a trade-off between the upside benefits from support for balance sheet repair and economic risk taking, and the downside stability risks from an extended period of financial risk taking. Too much financial risk taking raises financial stability risks that may undermine growth, while too much economic risk taking can result in overconsumption or overinvestment and increased leverage as households and firms ramp up borrowing. This section assesses this balance, focusing on the corporate sector, balance sheet metrics, and credit and equity markets in advanced and emerging market economies.

Despite improvements, balance sheet repair is incomplete

Monetary policy actions and other remedial steps have supported asset valuations and balance sheet repair in advanced economies since 2008, but progress remains uneven across countries:

- Household balance sheets in the United States and the United Kingdom have improved since the global financial crisis, with a decline in household liabilities coupled with gains in household financial assets from higher equity prices (Figure 1.7, panel 1). The net asset position of Japanese households has also improved noticeably compared with 2007, mainly reflecting a sharp rise in the market value of financial assets, with household debt as a share of GDP little changed. By contrast, the recovery in household net financial assets has lagged in the euro area. Gross financial assets of euro area households have surpassed 2007 levels but so have household liabilities in France, Greece, and Italy, indicating substantially smaller net gains compared with other countries. Household liabilities as a share of GDP are high in Ireland, Portugal, and Spain.
- Corporate leverage has dipped from crisis highs as equity markets have recovered, but leverage generally remains well above recent lows (Figure 1.7, panel 2). Large-scale asset purchases by the Federal Reserve pushed down long-term borrowing costs, and U.S. nonfinancial firms have increased their debt loads, with the result that U.S. corporate leverage remains

Figure 1.7. Indebtedness and Leverage in Selected Advanced Economies

1. **Financial Assets and Liabilities of Households**
   (Percent of GDP)

- Financial assets
- Net financial assets (NFA)
- Financial liabilities (negative)
- NFA, maximum 2000–13
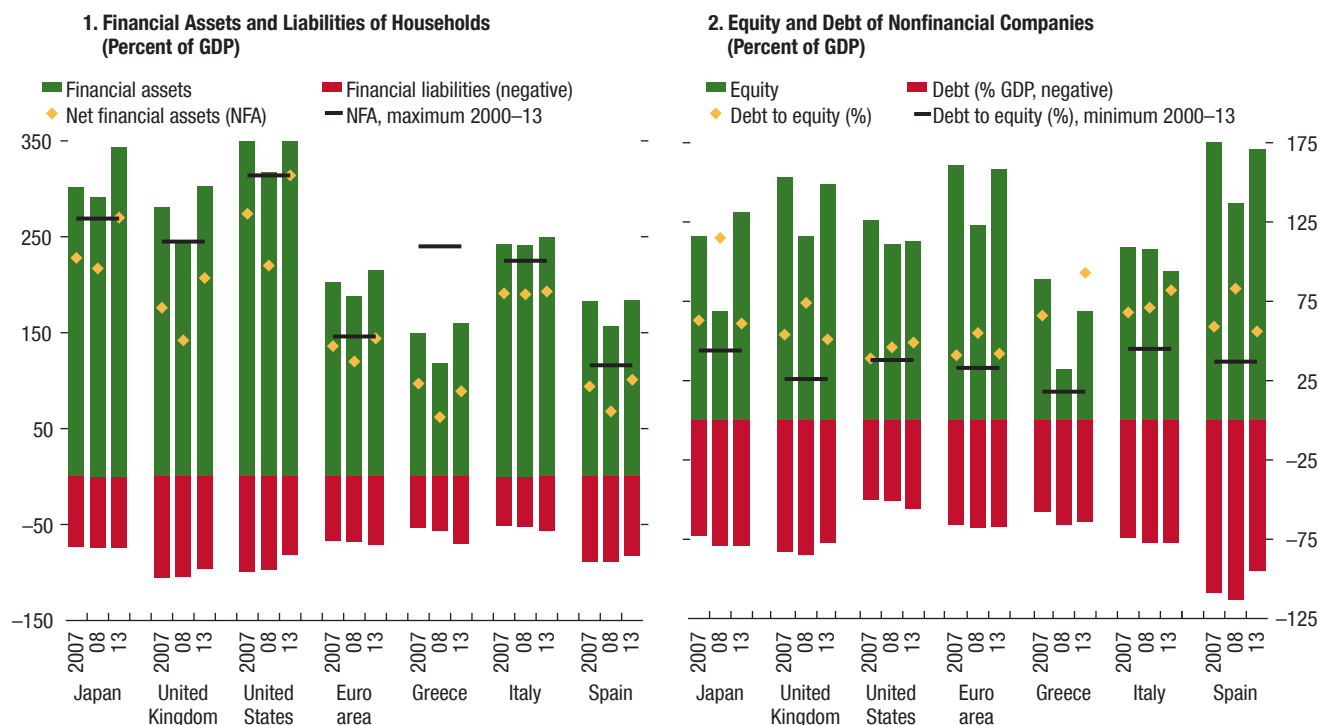
Sources: National statistics; Haver Analytics; IMF World Economic
Outlook database; and IMF staff estimates.
Note: Last quarter scaled by GDP in year.

2. **Equity and Debt of Nonfinancial Companies**
   (Percent of GDP)

- Equity
- Debt to equity (%)
- Debt (% GDP, negative)
- Debt to equity (%), minimum 2000–13

Sources: European Central Bank; national statistics; Haver Analytics;
IMF World Economic Outlook database; and IMF staff estimates.
Note: Debt calculations include an adjusment for estimated intercom-
pany loans, where necessary. Credit market debt over net worth
(market value) for United States.

relatively high compared with the precrisis average.
In Japan, the financial health of the corporate sector
has continued to improve as firms have paid down
debts and rebuilt liquidity buffers (Kang 2014). In a
number of European countries, the corporate sector
remains highly leveraged because countries have been
slow to address corporate debt overhangs although
some recent progress has been made. In these coun-
tries, the benefits of unconventional monetary policy
have been transmitted only very gradually given the
still fragmented state of euro area financial markets.

Economic risk taking is lagging financial risk taking

Low rates have encouraged firms to take on greater lev-
els of debt, but the effect on investment and productive
capacity has been muted. Despite reasonable earnings
growth (in some countries) and access to funding at
very low interest rates, corporations in advanced econo-
mies have, until recently, been reluctant to accelerate
capital investment. This reflects the backdrop of uneven

balance sheet repair, impaired credit transmission, and
weak business confidence and outlook for medium-
term growth, as discussed in the WEO.

A review of past investment cycles across a range of
countries offers some hopeful indications.[1] This analysis
shows that where balance sheet repair and monetary
policy are more supportive, there are better prospects
for economic risk taking and capital expenditure.
Gains in both earnings and stock market valuations
since 2009 augur well for capital investment. So does
the deleveraging that has occurred in some countries
and sectors, given the negative correlation between
existing leverage and investment. But the picture across
different regions is still decidedly mixed.

[1]Employing a broad panel of 1,200 firms in five countries (France,
Germany, Japan, the United Kingdom, the United States) for the past 15
years, analysis of corporate balance sheets shows a persistent, robust rela-
tionship between earnings, expected profits, leverage, and cost of funds on
the one hand, and capital investment on the other. Both current earnings,
in the form of return on assets, and expected future profits, as gauged by
the ratio of a company's stock market value to its book value (sometimes
called "Tobin's q"), are shown to have a positive and statistically significant
relationship to capital investment (see Annex 1.2).

Figure 1.8. United States: Capital Expenditure Developments in Nonfinancial Firms

Investment is picking up as capacity utilization is getting back to precrisis levels...

...and banks are loosening lending standards.

1. Capacity Utilization and Business Fixed Investment (Percent)
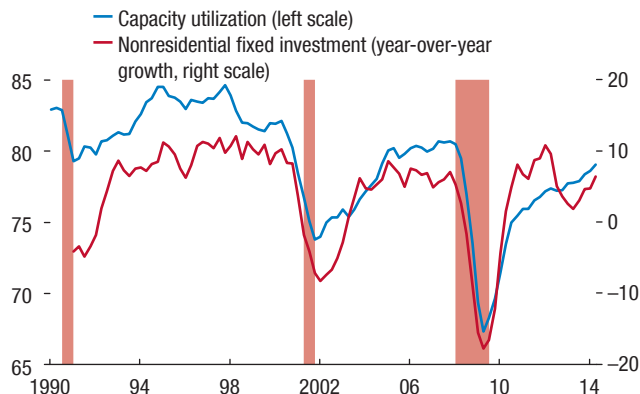
- Capacity utilization (left scale)
- Nonresidential fixed investment (year-over-year growth, right scale)

Sources: Federal Reserve; and IMF staff estimates.
Note: Pink bars indicate National Bureau of Economic Research recession dates.

2. Lending Standards for Corporate Loans and Commercial and Industrial (C&I) Loan Growth (Percent)

- C&I loan growth (year-over-year, left scale)
- Lending standards (small firms, net percentage, right scale, reversed)

Easier standards

Tighter standards
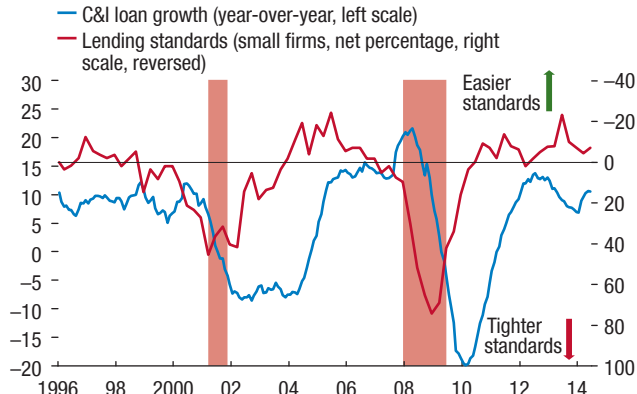
Source: Federal Reserve Senior Loan Officer Survey.
Note: Pink bars indicate National Bureau of Economic Research recession dates.

Economic policy uncertainty is declining...

...while more debt issuance is now getting used for capex.

3. Economic Policy Uncertainty Index (1985–2009=100, 6-month moving average)

Sources: Baker, Bloom, and Davis (2012); Haver Analytics; and IMF staff estimates.
Note: Pink bars indicate National Bureau of Economic Research recession dates.

4. NFCs: Debt Issuance, Capex, and Equity Buybacks (Percent of operating cash flows on a four-quarter trailing basis)

Capital expenditure: Historical average since 1999

- Debt issuance (net)
- Equity buyback (net)
- Capital expenditure (right scale)
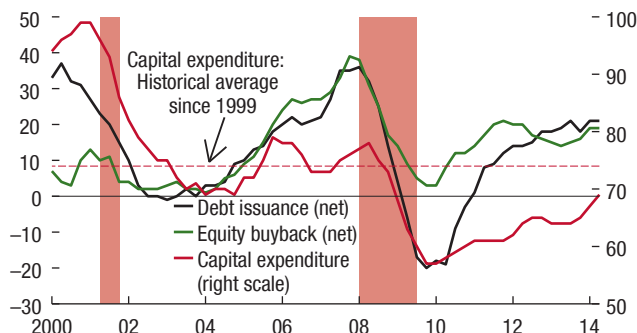
Sources: Federal Reserve; and IMF staff estimates.
Note: Capex = capital expenditure; NFC = nonfinancial corporation. Pink bars indicate National Bureau of Economic Research recession dates.

Most advanced is the United States, where business fixed investment is picking up, although at a more muted rate than in previous recoveries. Capacity utilization is returning to precrisis levels, banks are loosening lending standards on commercial and industrial loans, and economic policy uncertainty is declining (Figure 1.8). As a result, loan growth has accelerated recently, and the Philadelphia Federal Reserve's capital expenditure outlook has turned up, while corporate debt issuance has been increasingly used more for investment (raising future earnings) than equity buybacks (increasing financial leverage). If sustained, these trends could lead to further gains

in capital investment and economic risk taking in the United States in the coming months.

In Japan, business confidence was boosted by the implementation of extraordinary monetary accommodation by the Bank of Japan in 2013 (the monetary "first arrow" of "Abenomics"), leading to a recovery of nonresidential investment. An aging capital stock and high capacity utilization rates have also contributed to the investment recovery, along with stronger corporate earnings and easier financing conditions. Healthy balance sheets have enabled firms to respond to stepped-up growth expectations.

Figure 1.9. Euro Area Nonfinancial Firms: Capital Expenditure Developments

Bank lending remains anemic as...

1. Euro Area Credit Conditions
(Percent)
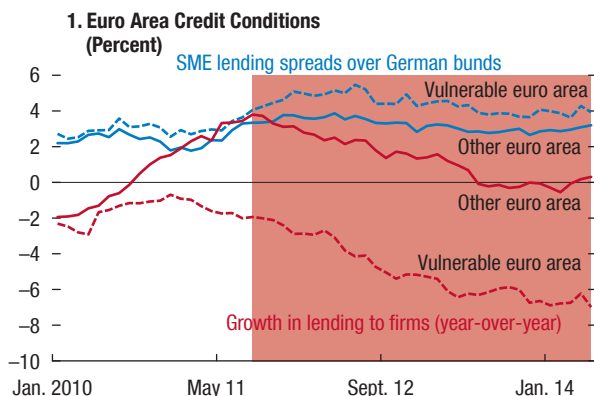
Sources: European Commission; Eurostat; and IMF staff estimates.
Note: Shows spreads of one- to five-year corporate loans of less than €1 million to five-year German bunds. SME = small- and medium-sized enterprises. Vulnerable euro area countries are those that have faced a sharp fall in bank lending. In this chart, the group includes Greece, Ireland, Italy, Portugal, and Spain. Other euro area comprises Austria, Belgium, France, Germany, and Netherlands.

... tight lending standards and elevated economic uncertainty...
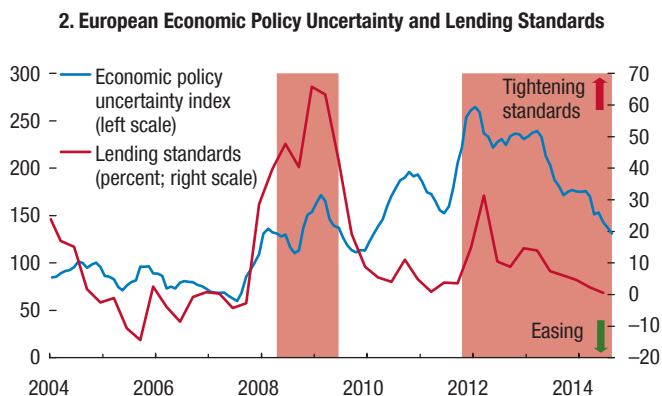
2. European Economic Policy Uncertainty and Lending Standards

Sources: Baker, Bloom, and Davis (2012); Haver Analytics; and IMF staff estimates.
Note: Shows spreads of one- to five-year corporate loans of less than €1 million to five-year German bunds. SME = small- and medium-sized enterprises. Pink bars indicate Center for Economic Policy Research recession dates.

... continue to dampen prospects for capital expenditure, while incoming data do not point to a strong pickup either.

3. Euro Area Companies' Investment and PMI
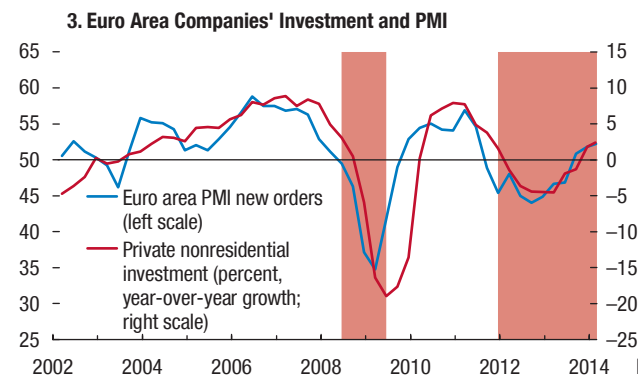
Sources: Haver Analytics; and IMF staff calculations.
Note: PMI = Purchasing Managers' Index. Pink bars indicate Center for Economic Policy Research recession dates.

Capital expenditure remains below its historical average.

4. Euro Area Nonfinancial Firms: Capital Expenditures
(Percent of operating cash flows; four quarter cumulative flows)
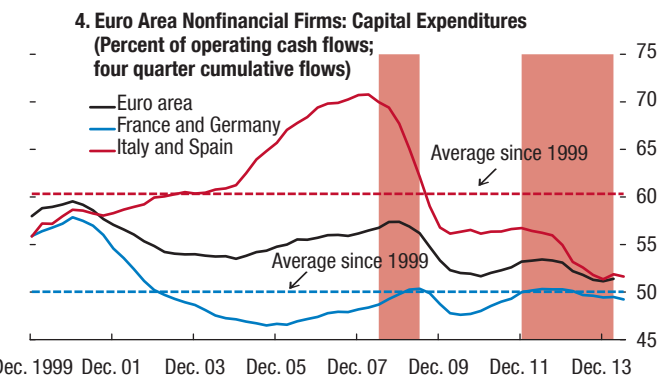
Sources: European Central Bank; Haver Analytics' and IMF staff estimates.
Note: Figures for Germany include both nonfinancial and financial firms.

In contrast, in the euro area, business fixed investment—although trending up—remains weak. Capacity utilization is still below precrisis levels, bank lending standards have been tightening until recently, and economic policy uncertainty remains elevated relative to the precrisis period. As a result, growth in bank lending to euro area firms continues to be anemic. The outlook is also clouded by macroeconomic risks, including weak demand and geopolitical risks, suppressing corporate capital expenditures (Figure 1.9, panels 1–3), as well as the corporate debt overhang in some economies (as discussed in past GFSRs). Overall,

euro area corporate capital expenditures, as a percentage of operating cash flows, remain below their historical average (Figure 1.9, panel 4).

In a number of major emerging market economies capital expenditures by nonfinancial firms have declined across the board in 2013, amid weakening export growth, tightening credit standards, and deteriorating business confidence. As a result, growth in corporate borrowing from banks has decelerated from about 10 percent (precrisis average) to 5 percent, in real terms, and leading indicators do not point to a strong pickup in capital expenditures in the near future.

Figure 1.10. Financial Risk Taking and Volatility

Unconventional policies shift the normal risk-return trade-off of monetary policy.

Low volatility and high asset prices are highly synchronized.

1. Risk-Return Trade-offs under Different Monetary Policies

2. Volatility and Asset Price Percentiles
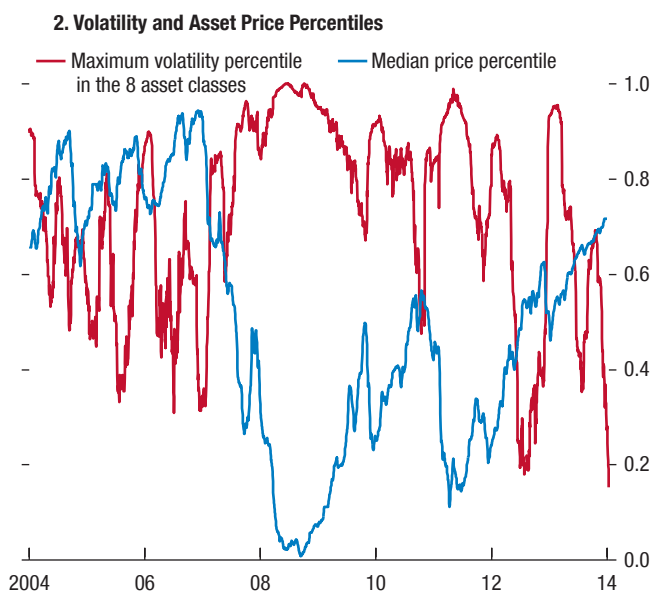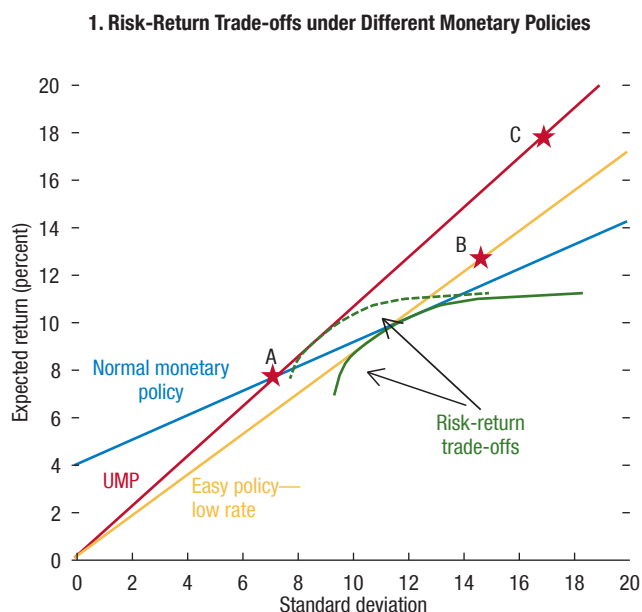
Sources: Bloomberg L.P.; and IMF staff calculations.
Note: A decline in the policy rate shifts the efficient frontier (from blue to orange) and moves the optimal portfolio from A to B. A decline in volatility with UMP shifts the efficient frontier again (from orange to red) and the optimal portfolio moves from B to C. UMP = unconventional monetary policy.

Sources: Bloomberg L.P.; and IMF staff calculations.
Note: The eight asset classes are advanced economy equities; emerging market equities; advanced economy bonds; emerging market bonds; corporate credit; advanced economy foreign exchange rates; emerging market foreign exchange rates; and commodities.

Financial risk taking is on the rise

With the shift to accommodative and unconventional monetary policies, the incentives faced by some investors also shift, and this can lead them to take on greater financial risks. A version of the capital asset pricing model (CAPM) illustrates the channels through which conventional and unconventional monetary policies can promote financial risk taking by some investors—for example, asset managers who have relatively unrestricted capacity to leverage. The consequences of this behavior are most evident in the markets for higher-risk fixed-income assets.

Under normal monetary policy, when the policy rate is significantly higher than zero and asset price volatility is normal, an investor will be able to construct portfolios with normal risk and return combinations (Figure 1.10, panel 1, blue line, point A).[2] As the

"safe" interest rate declines with policy easing under monetary accommodation, the return available from the safe asset falls, but so does the cost of borrowing, changing the available risk-return combinations (from the blue line to the orange line) and inducing investors who have the capacity to do so to increase leverage (from point A to B).[3] As unconventional monetary policy is implemented, financial volatility diminishes, further shifting the risk-return possibilities (to the red line). In addition to holding greater leverage because of lower interest rates, leveraged investors become even more willing to hold risky assets (point C) because the volatility of those assets has declined. In practice, this portfolio rebalancing channel of monetary policy has encouraged some investors to "search for yield" and take on more financial risks. Asset volatility has continued to fall steadily in 2014, with realized

prevailing policy rates. The shift in the risk-return trade-off depicted by the move from the solid to the dashed green curve in Figure 1.10 corresponds to the decline in portfolio volatility in the 2011–13 period.
    [3]An increase in borrowing on the part of some investors must be matched by an increase in lending from other participants in the financial system, such as the banking sector.

    [2]This example assumes an investor with mean-variance utility and the capacity to take on leverage. Relative risk aversion is held constant through the policy changes. Efficient frontiers for the basket of risky assets are calculated based on daily price changes in a basket of 11 different asset classes for the period 2001–13, while "safe" rates are based on

volatilities declining to 15-year lows (Figure 1.10, panel 2), despite a few idiosyncratic risk-off episodes in emerging market economies.[4] Even more strikingly, the declines in volatility toward record low levels have been highly correlated across most major asset classes. Asset prices show a pattern similar to that of volatilities, with a simultaneous and widespread pattern of prices above historical norms, although, as highlighted earlier, there are no extreme valuations in major asset classes.

Corporations also may engage in financial risk taking. With improved debt profiles, high interest rate coverage, and easy refinancing conditions, U.S. nonfinancial firms do not face imminent debt-repayment problems (Figure 1.11, panel 1). However, U.S. corporate leverage—measured by both gross debt and net debt (that is, excluding cash holdings) as a percentage of assets—has risen during the past three years. The ratio of net debt to internal cash flows, which has been a good predictor of credit spreads and turning points in the credit cycle—at least until recently—is now greater. Moreover, as corporate leverage has risen, credit spreads have continued to narrow, diverging from the traditional, more fundamental relationship between leverage and spreads observed during the past 25 years (Figure 1.11, panel 2).

As a result, spread cushions in the lower-rated U.S. corporate bond market have eroded (Figure 1.11, panel 3).[5] For U.S. corporate bonds rated B- and CCC, current credit spreads are no longer sufficient to protect against an average default cycle. Meanwhile, underwriting standards in the leveraged loan market continue to deteriorate, despite supervisory concerns raised by the Federal Reserve, the Office of the Comptroller of the Currency, and the Federal Deposit Insurance Corporation. For instance, about 30 percent of leveraged loan transactions this year had leverage ratios (LRs) more than six times earnings before interest, taxes, depreciation, and amortization (Figure 1.11, panel 4), a level deemed risky by supervisors. Meanwhile, covenant-lite issuance of leveraged loans (often used as an indicator of weaker underwriting standards) continues to grow because origination activity is starting to shift from

banks to nonbanks that are less tightly regulated.[6] A further indication of the uptick in financial risk taking is the acceleration in mergers and acquisitions by U.S. companies, with 2014 trending to be a potentially record year.

Pricing in some equity markets also points to a greater degree of financial risk taking. In the U.S. equity market, valuations are now higher than historical averages by most standard measures (Figure 1.12, panel 1). It is estimated that about half of the rise in U.S. equity prices since end-2012 has come from a decline in the equity risk premium rather than an increase in earnings, in contrast to the euro area and Japan (Figure 1.12, panel 2). Moreover, the quality of earnings is deteriorating. Recent gains in S&P 500 earnings have been driven primarily by rising operating profit margins that are now at peak levels, while sales growth is decelerating (Figure 1.12, panels 3–4). Given the limited potential for further profit margin improvements, especially as the labor market strengthens, earnings growth will have to come increasingly from top-line revenue (sales) growth.

In the euro area the risks associated with financial excesses are more limited. Corporate leverage, measured by both gross debt and net debt, has been on the decline for the region as a whole, suggesting that euro area firms are at a different stage of the credit cycle than their U.S. counterparts, and some face further pressures to deleverage. Reduced reliance on short-term debt funding and rising cash balances relative to short-term debt mean that nonfinancial firms do not face short-term debt-repayment issues. Yet some exuberance is shared with the United States—the pace of European high-yield issuance has exceeded that of U.S. issuance this year, as banks retreat and companies turn increasingly to the bond markets. However, an important distinction is that the credit quality of the European high-yield market is generally better than its U.S. counterpart (that is, with a higher share of bonds rated BB), suggesting that the search for yield has yet to penetrate to the lowest-rated borrowers in the euro area. Meanwhile, trailing and forward-looking price-earnings ratios suggest that equity valuations for the region as a whole are now broadly in line with historical standards, after being depressed for the past three years.

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[4]The CAPM exercise implies that, even as the volatility of individual assets declines, there is an increase in the volatility of portfolios held by investors who can take on leverage. Intuitively, the increase in their portfolio "betas" more than compensates for the decline in asset volatility.

[5]Spread cushions are calculated as the credit spread during a five-year period minus expected losses during the same period. Expected losses are derived from a distribution of cumulative realized default and recovery rates over a rolling five-year cycle since 1985 based on data from Moody's.

[6]A recent study by Moody's (2014) shows that covenant-lite loans can defer defaults, but over time, these loans have default rates similar to those of other loans.

Figure 1.11. United States: Nonfinancial Corporations' Credit Fundamentals

U.S. firms do not face imminent debt repayment problems...
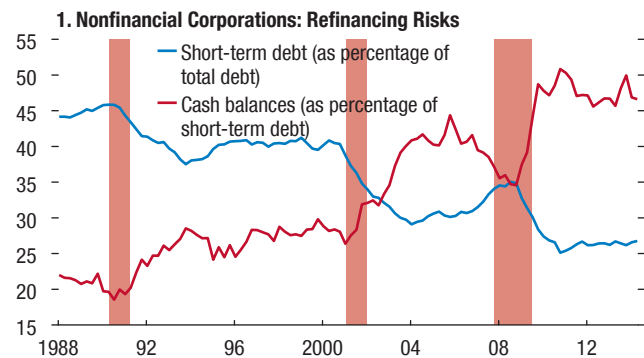
1. Nonfinancial Corporations: Refinancing Risks

- Short-term debt (as percentage of total debt)
- Cash balances (as percentage of short-term debt)

Sources: Federal Reserve; and IMF staff estimates.
Note: Pink bars indicate National Bureau of Economic Research recession dates.

...but corporate leverage has risen and credit spreads no longer follow leverage.

2. Nonfinancial Corporations: Leverage and Spreads

- High-yield corporate bond spread (percent; left scale)
- Net debt to internal cash flows (times; right scale)
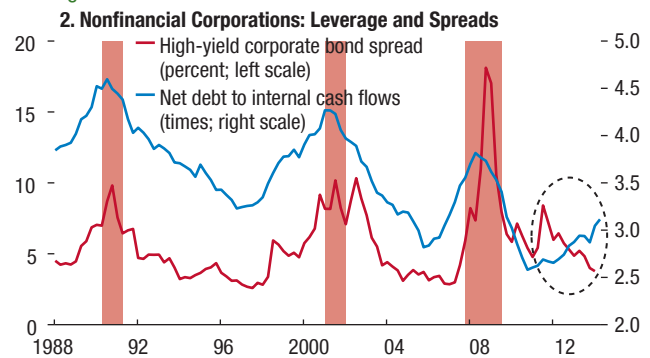
Sources: Bank of America Merrill Lynch; Federal Reserve; and IMF staff estimates.
Note: Pink bars indicate National Bureau of Economic Research recession dates.

Default cushions have eroded in lower-rated segments of high-yield corporate bonds...

3. B-Rated Corporate Bond Spreads (Basis points)

- Current spread
- Breakeven spread in average default cycle
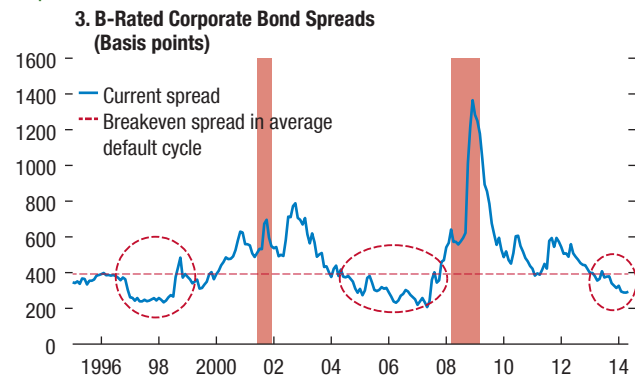
Sources: Bank of America Merrill Lynch; Moody's; and IMF staff estimates.
Note: Pink bars indicate National Bureau of Economic Research recession dates.

...while underwriting standards continue to weaken, despite supervisory concerns.

4. Leveraged Loan Transactions Greater than Six Times Earnings (Percent of sample)

- Percentage of deals
- Percentage of face value

Insufficient data for this period
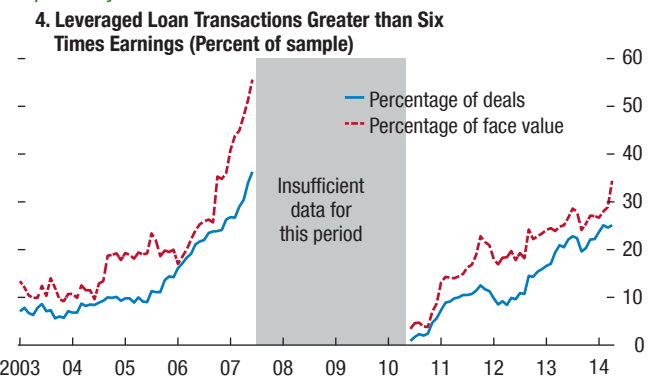
Sources: Deutsche Bank; and IMF staff estimates.

Corporate bond and leveraged loan indicators show deterioration.

5. Search-for-Yield Heat Map

		2007	2008	2009	2010	2011	2012	2013	2014
Spreads	High yield								
	Leveraged loans								
Quantity of issuance	High yield								
	Leveraged loans								
Quality of issuance	High yield								
	Leveraged loans								
Retail investor base	Corporate bonds								
	Syndicated loans								
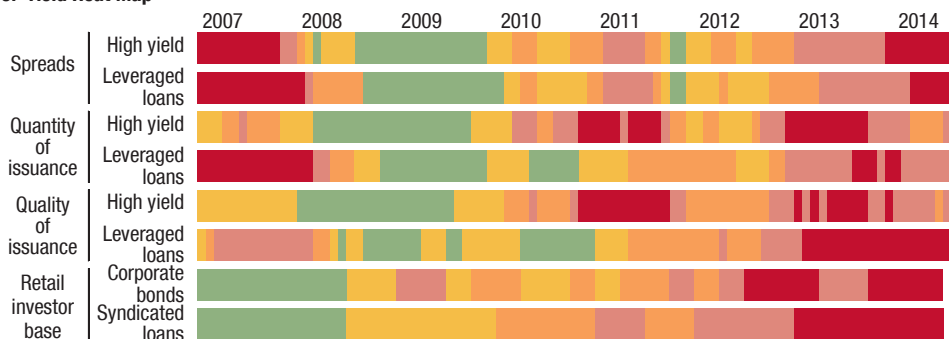
Sources: Bank of America Merrill Lynch; Bloomberg L.P.; Haver Analytics; JPMorgan Chase & Co.; Securities Industry and Financial Markets Association; and IMF staff calculations.
Note: High-yield spread is from Bank of America Merrill Lynch U.S. high-yield master II index (H0A0). Leveraged loan spread is from JPMorgan Chase & Co. leveraged loan index. Quantity of issuance measures the 12-month trailing gross issuance as a share of outstanding amount. Quality of issuance measures the share of high-yield corporate bonds in total corporate bond issuance, and the share of second-lien and cov-lite loans in total leveraged loan issuance (both on a 12-month trailing gross issuance basis). Investor base measures the share of holdings by households, mutual funds, and exchange-traded funds. All observations are measured as a percentile over the period from January 2007 to August 2014. Color coding is based on the percentile, with red (green) indicating lower (higher) spreads, higher (lower) quantity of issuance, lower (higher) quality of issuance, and higher (lower) retail investor base.

Figure 1.12. United States: Equity Market Fundamentals

U.S. equity valuations are rising beyond historical averages.

1. S&P 500 Price-to-Earnings Ratio

— Shiller P/E — 1-year trailing P/E — 1-year forward P/E
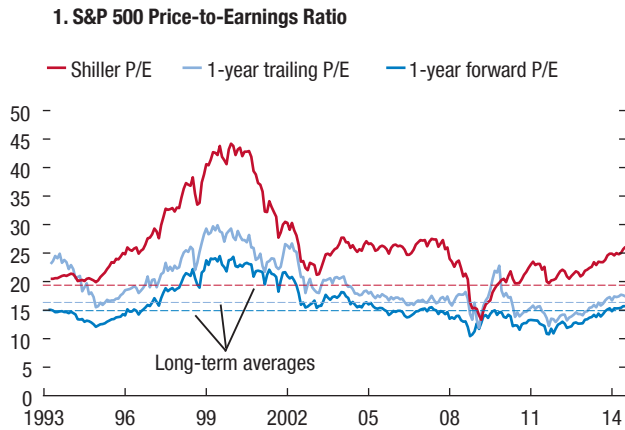
Long-term averages

Sources: Haver Analytics; I/B/E/S; IMF staff calculations.
Note: Long-term averages are from 1954 for Shiller and 1-year trailing P/E,
and from 1985 for 1-year forward P/E. P/E = price-to-earnings.

Growth in earnings accounts for only about half of the rise in U.S. equity prices.

2. Decomposition of Equity Performance
(Percent contribution from December 2012 through July 2014)

■ Risk-free rate ■ Equity risk premium
■ Earnings (current and projected) ◆ Total return

United States   Euro area   Japan   Emerging markets
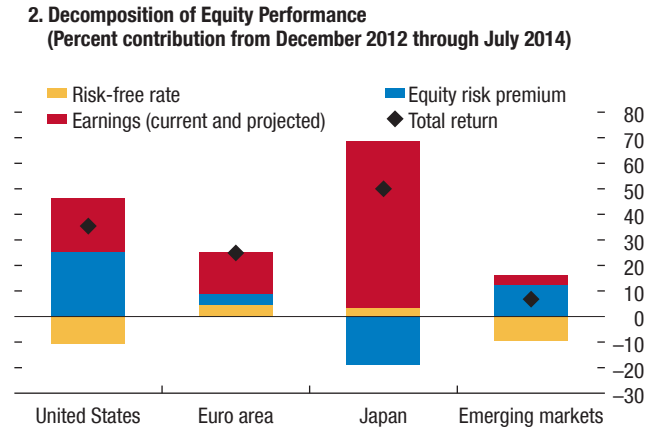
Sources: Haver Analytics; I/B/E/S; J.P. Morgan Chase & Co.; and IMF staff
estimates.
Note: Based on a standard three-stage dividend discount model.

Earnings have been boosted by rising profit margins...

3. Decomposition of S&P 500 Earnings per Share Growth
(Percent, on a 12-month trailing basis)

■ Profit margin
■ Sales per share
—●— Earnings per share

2006:Q2   08:Q2   10:Q2   12:Q2   14:Q2

Sources: Standard & Poor's; and IMF staff calculations.

...which are at peak levels, but sales growth is anemic.

4. S&P 500 Sales per Share Growth and Profit Margin
(Percent, on a 12-month trailing basis)

— Sales per share growth (left scale)
--- Operating profit margin (right scale)

1996   99   2002   05   08   11   14
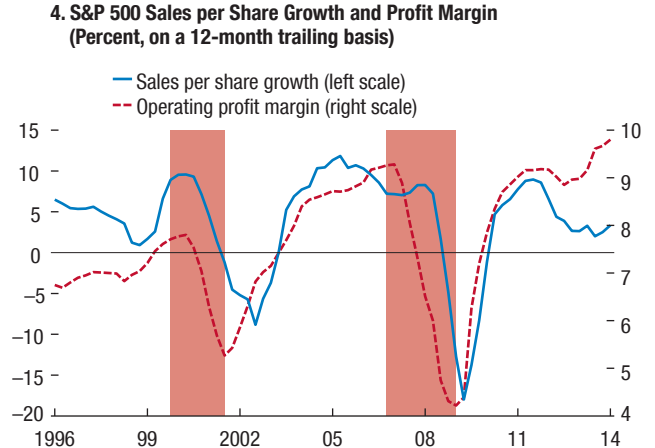
Sources: Standard & Poor's; and IMF staff calculations.
Note: Pink bars indicate National Bureau of Economic Research recession dates.

Corporates are turning to M&A activity to boost sales and earnings, while capital expenditures growth has been modest.

5. M&A and Capital Expenditures by U.S. Companies

■ M&A volume (left scale)
— Capital expenditures (right scale)

Trillions of U.S. dollars

Percent of operating cash flows

1996   99   2002   05   08   11   14

Sources: Dealogic; Federal Reserve; and IMF staff calculations.
Note: Capital expenditures as of 2014:Q2. M&A volume for 2014 annualized as
of 2014:Q2. M&A = mergers and acquisitions.

Corporations have to increase sales further to meet earnings expectations.

6. S&P 500 Earning per Share and Sales per Share Growth
(Percent, on a 12-month trailing basis)

Projections

— Earnings per share
— Sales per share

Dec. 2011   Dec. 12   Dec. 13   Dec. 14   Dec. 15
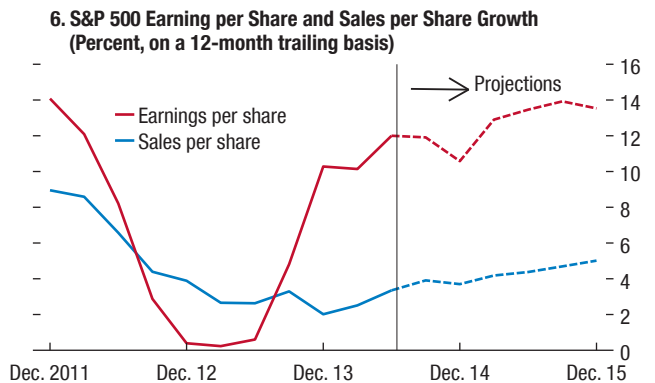
Sources: Standard & Poor's Blue Chip Survey; and IMF staff estimates.
Note: Projected earnings per share growth is based on market expectations
compiled by S&P. Projected sales per share growth is derived from expected
GDP growth from Blue Chip Survey.

Emerging markets: Waning economic risk taking in some, rising financial risks in many

As in many advanced economies, financial risk taking is increasing in emerging market economies. Strong risk appetite continues to fuel corporate borrowing at low spreads, with bond issuance growing 23 percent on an annualized basis in the first half of 2014, close to the five-year annual average growth rate of 28 percent (Figure 1.13, panel 1). The April 2014 GFSR found that firms have become more sensitive to external financing conditions as a result of higher debt loads. This report updates and deepens that analysis, with a particular emphasis on China.

Overall, leverage does not yet appear to be at critical levels (Table 1.1), but some countries and sectors have high and rising debt levels that may complicate the adjustment when financial conditions eventually tighten. Boosted by persistently low interest rates, debt-service capacity has improved in some countries (Chile, Mexico, Indonesia, Thailand, and the Philippines) even as it has declined in others (Argentina, Brazil, China, India, Poland, and Turkey). At the same time, however, the recent slowdown in many economies has eroded profitability, and weak firms—highlighted as a vulnerability in previous GFSRs—continue to post material losses (Figure 1.13, panel 3). Earnings have deteriorated across most sectors (Figure 1.13, panel 4), pushing down interest coverage ratios (Figure 1.13, panel 5). As a consequence, in 2013, the share of total debt-at-risk owed by weak firms in Europe, the Middle East, and Africa (EMEA) and in Latin America has continued to rise, whereas in Asia it stabilized at relatively high levels (Figure 1.13, panel 6).[7] In China, corporate debt-service capacity and profitability have weakened in tandem with slowing growth.

Corporate vulnerabilities in China are rising

Corporate vulnerabilities are rising in China, in large part due to the rapid increase in corporate debt from less than 100 percent of GDP in 2008 to 141 percent in the second quarter of 2014.[8] These vulner-

abilities reflect not only the level but also the distributions of debt and leverage, which are now concentrated in certain segments, including a weak tail in the real estate and construction sectors and among state-owned enterprises (IMF 2014b). Furthermore, deteriorating returns on assets and weaker cash flows have affected debt-servicing capacity across several sectors (Figure 1.14, panels 1 and 2).

Notwithstanding these developments, only one small issuer has defaulted in the history of China's corporate bond market, well below the long-term global default rate of 1.5 percent, and bond spreads have been declining (Standard & Poor's Credit Research 2014). Nonperforming loan ratios have also remained remarkably low at slightly more than 1 percent, within the bottom tenth of a sample of 89 countries. To assess whether corporate vulnerabilities are indeed rising, default probabilities for individual firms that have either listed public equity or issued bonds were estimated using contingent claims analysis. The sample covers about 4,500 firms including state-owned enterprises, private firms, and local-government-financing vehicles (LGFVs). This method uses option pricing theory, equity market prices, and firms' balance sheets to estimate the probability that the value of a firm's assets will drop below a specified distress barrier—defined as short-term liabilities plus 50 percent of long-term liabilities—during the next 12 months.[9]

Default probabilities currently appear to be low with a median for the full sample of firms of well below 1 percent, in part reflecting record-low equity price volatility in common with other global markets. To test robustness, a stress scenario of a fall in equity prices and a rise in volatility calibrated to the 90th percentile from each firm's default probability history (events that, in practice, are clustered around the

---

[7]Debt-at-risk is defined as debts of weak firms with interest coverage ratios (the ratio of earnings before interest, taxation, depreciation and amortization to interest expense) of less than two.

[8]Including bank loans to firms, trust loans, and nonfinancial corporate bonds outstanding. Also includes borrowing by local-government financing vehicles (LGFV) for which debt stands at an estimated 30 percent of GDP. The status of LGFV liabilities, includ-

ing whether they should be considered as public or corporate debt, remains the subject of discussion (IMF 2014b).

[9]Based on the methodology described in Jobst and Gray (2013) and Gray (2009). The results presented are actual one-year default probabilities. The distributions for asset values were estimated using a jump diffusion model to account for skew and kurtosis and fitted on the empirical distribution of changes in equity markets with an additional adjustment suggested by Gray (2009) to better reflect expected default frequencies. This method does not consider the impact that state ownership or implicit guarantees from third parties may have on actual default probabilities. Total liabilities were adjusted to reflect majority stakes and consolidated accounting by non-listed state-owned enterprise parents that have issued bonds. For firms that have only issued bonds, the analysis used the equity prices of a listed counterpart that was matched based on similarities in terms of industry classification, asset size, and leverage.

Figure 1.13. Emerging Market Corporate Debt and Fundamentals

Strong investors' appetite continues to fuel corporate bond issuance...

1. Nonfinancial Corporate Bond Issuance in Hard Currencies
(Billions of U.S. dollars)
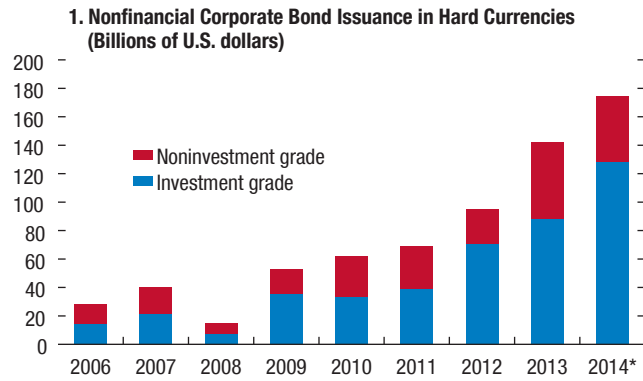
Source: Bond Radar.
Note: Includes bond issuance from Argentina, Brazil, Bulgaria, Chile, China, Colombia, India, Indonesia, Malaysia, Mexico, Philippines, Poland, Romania, Russia, South Africa, Thailand, Turkey, Ukraine, and Vietnam.
*As at end-June 2014, annualized.

...prompting leverage to rise further.

2. Total Debt, 2011 and 2013
(Percent of total equity)

Source: Capital IQ.
Note: Based on sample median.

Weak firms are still earning negative returns...

3. Return on Assets
(Percent)

- Median of weak firms (five-year average)   Median of weak firms (2013)
- Median of sample (five-year average)   Median of sample (2013)
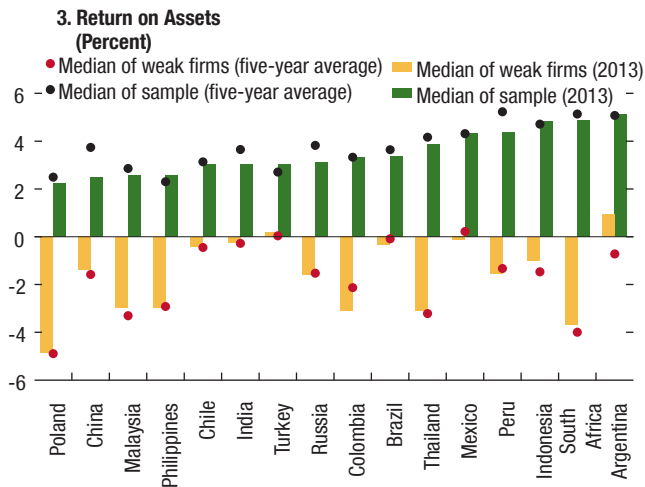
Source: Capital IQ.
Note: Weak firms refer to those with interest coverage ratios (earnings before interest, taxes, depreciation, and amortization divided by interest expense) below 2.

...with earnings falling across sectors.

4. Return on Assets, 2011 and 2013
(Percent)

Weakest firms   Strongest firms   Median
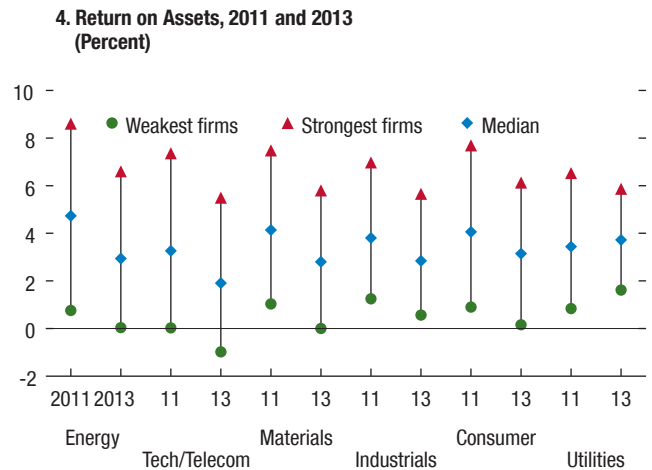
Source: Capital IQ.
Note: Weakest firms are based on the 25th percentile, strongest firms are 75th percentile.

Debt servicing capacity has weakened...

5. Interest Coverage Ratio by Sector, 2011 and 2013

Weakest firms   Strongest firms   Median
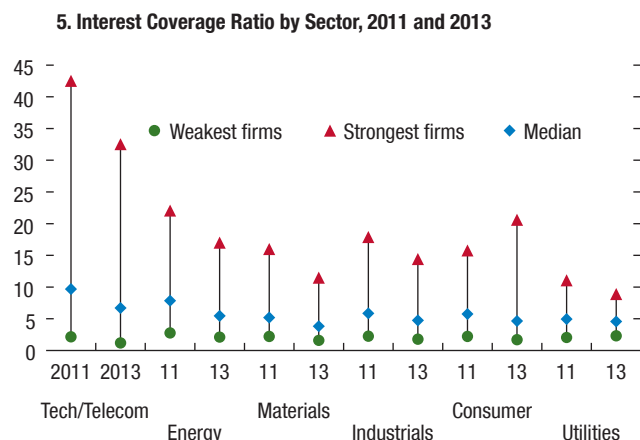
Source: Capital IQ.

...and debt-at-risk is still high or rising.

6. Share of Debt from Firms with Interest Coverage below 2
(Percent of total debt)
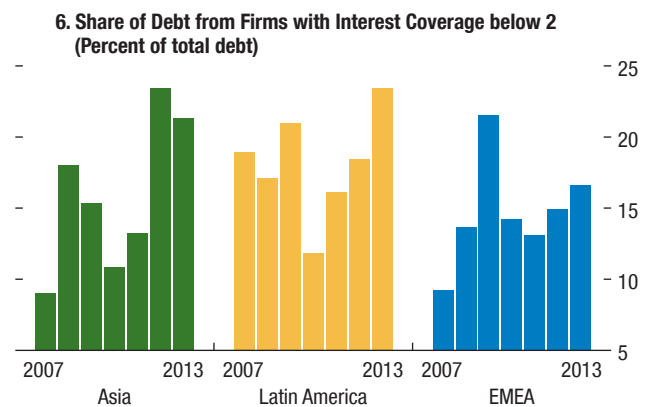
Source: Capital IQ.
Note: EMEA = Europe, Middle East, and Africa.

Table 1.1. Corporate and Banking Sector Fundamentals

	Latin America				Asia						Europe, Middle East, and Africa			
	Argentina	Brazil	Chile	Mexico	China	India	Indonesia	Malaysia	Philippines	Thailand	Poland	Russia	South Africa	Turkey
Change in corporate credit spreads (basis points)[1]	−282	−29	−24	−19	−3	−82	−81	−57	−28	−20	−12	35	−78	−109
Real GDP growth, 2014	−1.7	0.3	2.0	2.4	7.4	5.6	5.2	5.9	6.2	1.0	3.2	0.2	1.4	3.0
Corporate sector[2]														
Leverage: Total debt-to-total equity	64	79	54	54	29	66	52	24	22	34	25	56	33	57
Profitability: Return on assets	5.1	3.4	3.0	4.3	2.5	3.0	4.8	2.6	2.6	3.9	2.2	3.1	4.9	3.0
Debt service capacity: EBITDA-to-interest expense	2.4	3.1	6.2	6.5	6.6	2.8	6.1	7.4	7.9	9.6	6.0	6.4	7.3	2.7
Banking sector														
Assets:														
Asset quality: Gross NPL ratio	1.7	2.9	2.1	3.2	1.0	4.0	1.7	1.8	2.9	2.3	8.6	6.0	3.6	2.6
Profitability: Return on assets	5.0	1.4	1.5	2.1	1.3	0.7	3.1	1.5	1.6	1.4	1.1	1.9	1.5	2.0
Funding:														
Reliance on noncustomer deposit funding[3]	5	23	49	47	22	18	8	16	33	27	26	44	52	29
Liquidity buffers: Total loan-to-total deposit	68	99	115	113	57	78	96	80	55	110	115	148	106	119
Buffers:														
Loss-absorbing buffers[4]	12.6	13.9	9.8	14.5	10.0	7.4	17.4	11.8	16.0	13.5	11.8	9.5	10.6	12.9
Provision coverage[5]	148	161	109	148	283	47	51	30	119	170	68	71	45	76

Sources: Bloomberg L.P.; Capital IQ; Haver Analytics; JPMorgan Chase & Co.; national authorities; IMF, Financial Soundness Indicators; and IMF staff estimates.

Note: Definitions of capital (for example, Basel II vs. Basel III), provisioning, and NPL vary across countries; therefore, caution is recommended when comparing these data across countries. EBITDA = earnings before interest, taxes, depreciation, and amortization; NPL = nonperforming loans. Indicators are based on 2013 financial statements. Red denotes deterioration relative to five-year average (2009–13); green indicates improvement relative to the five-year average, except for "Change in Corporate Credit Spreads" for which deterioration or improvement is for 2014:H1.

[1]Change in JPMorgan's Corporate Emerging Markets Bond Index (CEMBI) spreads for 2014:H1.

[2]Sample median.

[3]Total Liabilities *minus* Tier 1 Capital *minus* Customer Deposits, all *divided* by Total Liabilities *minus* Tier 1 Capital.

[4]Tier 1 Capital *plus* Loan Loss Reserves *minus* NPL, all *divided* by Risk-Weighted Assets.

[5]Refers to the ratio of specific provisions to NPL, as defined by the Financial Soundness Indicators.

Figure 1.14. China Corporate Indicators

Leverage appears not to have increased significantly...

1. Debt-to-Equity Ratios

- ▲ 75th percentile
- ■ 50th percentile
- ● 25th percentile
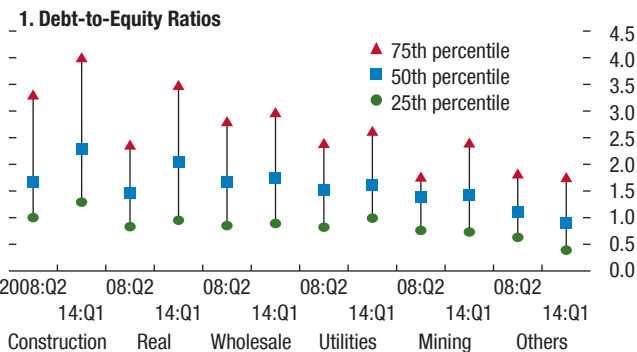
Sources: WIND; and IMF staff calculations.
Note: Sample of firms with available debt and equity data that were listed on a stock exchange or had issued bonds by 2008:Q2 (about 2,412 firms) and 2014:Q1 (about 3,412 firms).

...but debt-servicing capacity is worse, particularly in property-related sectors...

2. Debt-to-12-Month EBIT Ratios

- ▲ 75th percentile
- ■ 50th percentile
- ● 25th percentile
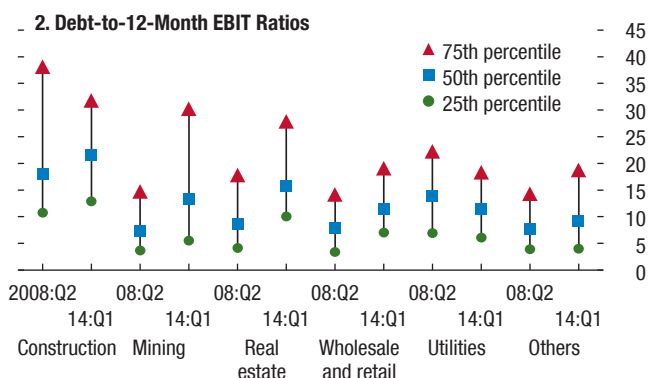
Sources: WIND; and IMF staff calculations.
Note: Sample of firms with available debt and EBIT data that were listed on a stock exchange or had issued bonds by 2008:Q2 (about 2,172 firms) and 2014:Q1 (about 3,161 firms). EBIT = earnings before interest and taxes.

...increasing risk of default.

3. Corporate Sector Default Probabilities after Stress (Percent)

- ▲ 75th percentile
- ■ 50th percentile
- ● 25th percentile
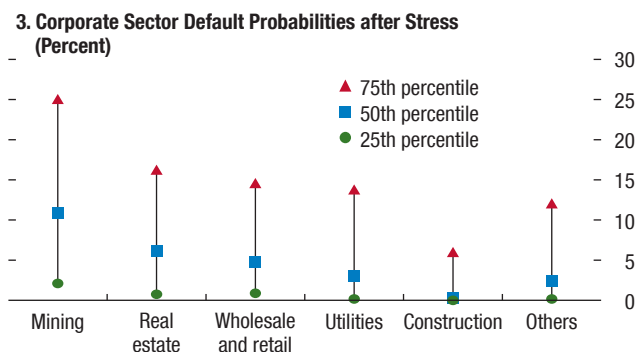
Sources: WIND; and IMF staff calculations.

third and fourth quarters of 2008) was applied. This combination is equivalent to a rise in asset volatility of about 10 percentage points and a 15 percent drop in equity prices for the firm in the upper quartile of default probabilities. In this scenario, default probabilities would rise sharply in some vulnerable sectors. Mining and real estate would see the largest increases, with default probabilities for the upper quartile firms (the weak tail) rising by 24 and 16 percentage points, respectively (Figure 1.14, panel 3). The results are broadly similar when the 581 LGFVs with recent balance sheet data are excluded from the sample. However, for some sectors the default probability for the weak tail rises even further, especially for real estate, which increases by 23 percentage points.

This stress scenario would trigger a substantial increase in the proportion of debt owed by vulnerable firms. For example, the total value of liabilities owed by firms with a default probability of 25 percent or more—equivalent to a highly speculative credit rating for which issuers are considered vulnerable and dependent on favorable conditions to meet their financial obligations—would rise from very low levels to about 21 percent of total liabilities among sample firms (25 percent excluding LGFVs). Overall, a shock to asset values and volatility similar to the one experienced in 2008 would now have a more adverse impact on the corporate sector's credit profile, mainly due to higher leverage in some segments.

These illustrative estimates are based on an extreme (although historical) scenario and do not consider the substantial state backing that many firms would receive in the event of financial distress. At the same time, such explicit and implicit guarantees, by encouraging the flow of credit to more leveraged sectors, are themselves contributing to rising corporate sector vulnerability. For example, during the past 18 months, as medium- and long-term onshore corporate bond yields have increased, bond issuance has been increasingly dominated by LGFVs. A sustainable reduction in corporate vulnerabilities will require more efficient risk pricing, which, in turn, will depend on a gradual rolling back of guarantees, defaults by nonviable firms, and a rebalancing of credit allocation toward more productive areas of the economy.

Risks of default are concentrated in the nonbank sector

Progress has been made in China during 2014 to address some potential vulnerabilities, particularly with

Figure 1.15. China's Shadow Banking and Real Estate Markets

Recent measures to curtail interbank funding of shadow banks have slowed credit growth...

...contributing to the slowdown in real estate activity.

1. Interbank Claims and Trust Loans
(Annual percent change)

Interbank claims (left scale)
Trust loans (right scale)

2. Listed Property Developer Cash Flows
(Billions of yuan)

Cash flow from operations
Cash flow from financing
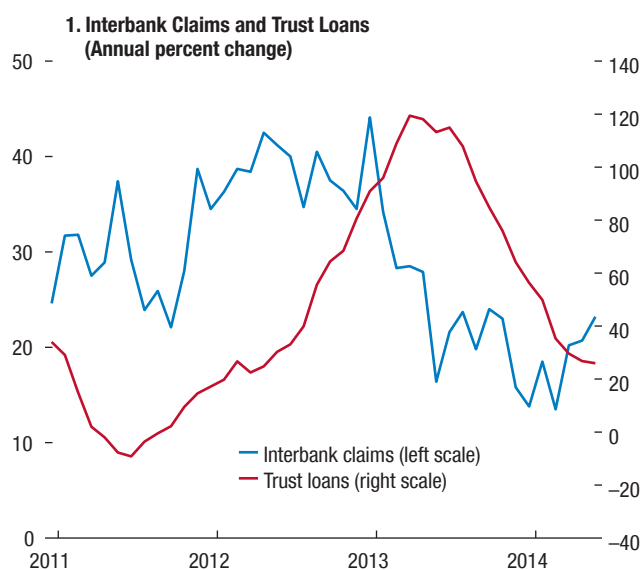
Sources: CEIC; WIND; and IMF staff calculations
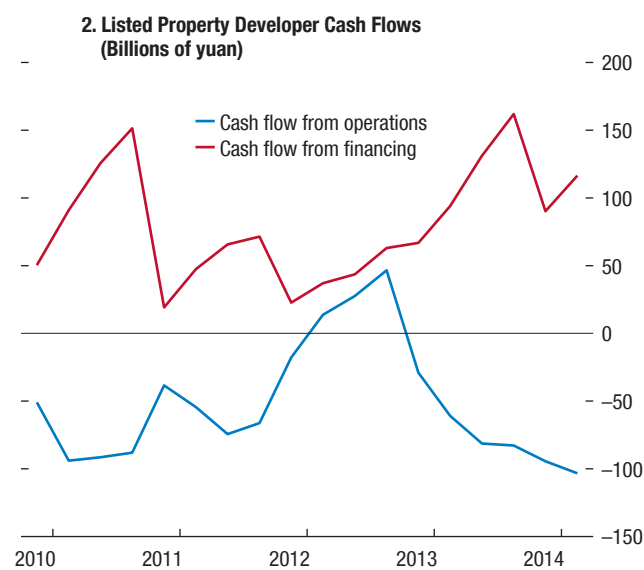
regard to credit provided through shadow banking. Measures aimed at restoring the interbank loan market as a tool for short-term liquidity management (instead of a source of cheap funding) appear to have been effective (Figure 1.15). Anticipating tighter rules, banks began to curtail the interbank funding of nonbank credit, slowing down the growth in trust loans. This slowdown has contributed to a welcome cooling off in property market activity, which has come to rely heavily on nonbank funding. Nonetheless, weaknesses in China's property market remain a key risk. At the same time, some parts of the shadow banking sector, including firm-to-firm entrusted loans and funding from wealth management products, continue to expand quickly.

Although banks appear to be prepared for some pickup in corporate defaults, the nonbank (shadow banking) sector is more directly exposed because of a combination of higher-risk lending (especially to the real estate sector) and thin capital cushions. As described in the April 2014 GFSR, nonbanks often lend to borrowers cut off from bank credit because regulators consider them too risky. For example, trust exposures, mainly loans, to property and infrastructure (typically LGFV borrowers with revenues linked to land sales) account for 4 trillion yuan ($647 billion), or more than one-third of total trust assets. Firms

in other sectors also lend to and invest in real estate through entrusted loans which are expanding at 40 percent in annual terms.[10] The capacity for nonbanks to absorb losses is limited—for example, the ratio of assets under management to equity for the trust sector has now risen to 41—which suggests that third-party bailouts, including by banks that sponsored or distributed nonbank products, would be needed if investors are to continue to avoid large-scale losses.

Cross-border spillover risks are on the rise

The risk of direct spillovers to advanced economies from elevated stress in China's financial system continues to rise with the growth in cross-border bank lending. Claims by foreign banks on all sectors in China, including offshore borrowers, have more than tripled in three years to $1.3 trillion, of which one-third is to the nonbank sector. Potential spillovers may also propagate through the bond market given that mainland Chinese firms issued a net $164 billion of international bonds in the four quarters through the

---

[10]This rapidly growing form of credit now accounts for 16 percent of GDP, and recent studies suggest that up to 20 percent may be exposed to real estate.

second quarter of 2014, bringing the outstanding stock to about $335 billion.

Global Banks in Transition: Reprice, Reallocate, or Restructure

The ability of financial institutions to provide credit to the economy is essential for channeling financial risk taking into economic risk taking. Much-needed regulatory initiatives have contributed to a strengthening of the banking system, which is now much better capitalized than before the financial crisis. Some global banks, however, are also struggling to adapt to new business realities, with low profitability raising concerns about their ability to build capital buffers and meet credit demand. These banks will require a fundamental overhaul of their business models, including a combination of repricing existing business lines, reallocating capital across activities, or retrenching altogether. More limited bank balance sheet capacity could create headwinds for the economic recovery in some countries, and it will take time for nonbank entities to fill the gap, particularly for financial systems that have traditionally been reliant on bank lending. Policymakers need to ensure that they are fully cognizant of the risks that could develop as the financial system evolves and that these risks are effectively mitigated and managed.

Regulatory reforms have strengthened the global banking system

The global financial crisis uncovered major fault lines in the financial regulatory landscape. Large banks with overleveraged and complex balance sheets, financed by short-term wholesale funding, were at the heart of the problem. Adjustment proceeded in different stages, with the first stage focusing on stabilization through emergency measures, including bank recapitalization and central bank liquidity provision.

In the second phase, regulators all over the world have worked hard to address these vulnerabilities, developing stronger regulatory standards and inducing banks to adjust strategies and accelerate balance sheet repair. Today, banks hold significantly more capital than at the height of the global financial crisis and are also much less leveraged than before the crisis (Figure 1.16, panels 1 and 2).[11]

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[11]Although Basel III (common equity) Tier 1 capital is becoming the key capital benchmark, this chapter focuses on Tier 1 common capital reported by banks because of data limitations.

Progress has been uneven across banks, with some banks still focusing on derisking their balance sheets, whereas others, particularly North American and some European banks, are further along in the balance sheet cleanup and deleveraging process and are in a position to again rerisk their balance sheets (Figure 1.16, panels 3 and 4).

Regulatory reforms have also sought to increase bank resilience by reducing risks associated with wholesale funding and proprietary trading. This has helped strengthen the banking system. Higher capital requirements for market risk, structural restrictions on certain trading activities, and measures increasing the transparency of over-the-counter derivatives markets will undoubtedly strengthen the system. But these reforms have also had the unintended consequence of contributing to subduing market-making and repo activities, reflected in reduced trading activity (Figure 1.17, panels 1 and 2). These developments have also reduced the role of banks as providers of liquidity at times of stress, with potentially important financial stability implications, as discussed in the section entitled "Rising Market Liquidity Risks." Bank resilience to liquidity shocks has been strengthened by a more than doubling in holdings of liquid assets since 2006 (Figure 1.17, panel 1). In some cases, these reforms have led banks to hold more domestic government bonds, maintaining the bank-sovereign link and potentially crowding out private credit. Key recent regulatory reforms are summarized in Annex 1.3.

Banks are struggling to adapt to new realities

Now large banks are entering the third phase—they have become stronger and are emerging from postcrisis balance sheet repair, but need to adjust their business models to new economic realities. Overall, their much-strengthened balance sheets carry higher costs. Bank return-on-equity has fallen to a historically low level, excluding the peak of the financial crisis, because underlying profitability (return on assets) has declined and the capital base has increased (Figure 1.17, panels 3 and 4). Low profitability is partly the price of moving to lower-risk, lower-return activities. It also reflects cyclical factors—a sluggish economy, the burden of nonperforming loans, litigation costs from past misdeeds and low interest margins from near-zero policy rates—structural market changes resulting from

Figure 1.16. Bank Capitalization

Bank core Tier 1 ratios have improved substantially since the global financial crisis...

1. Tier 1 Common Capital Ratio, December 2008
(Percent of sample assets)

2. Tier 1 Common Capital Ratio, June 2014
(Percent of sample assets)
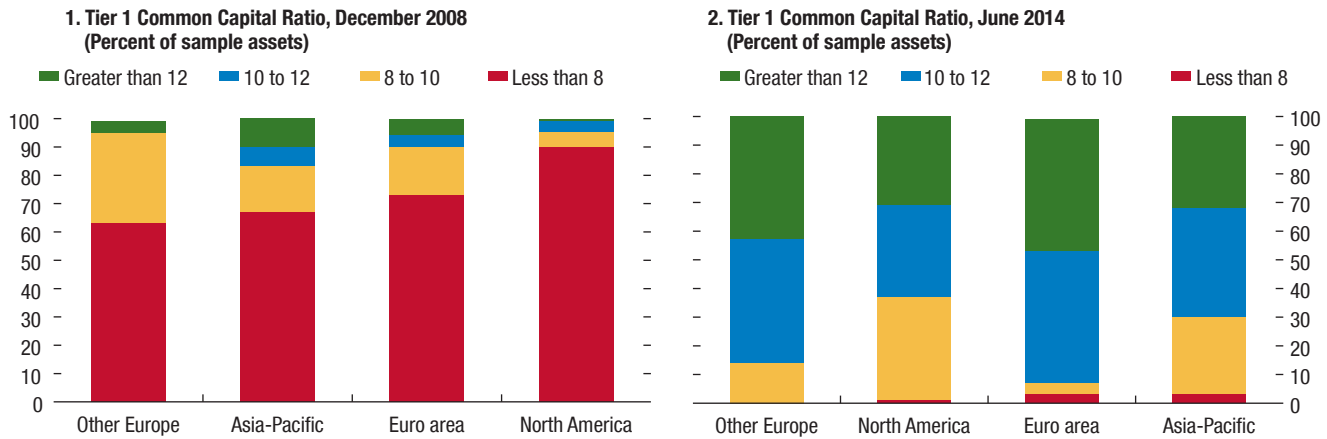
...driven in large part by recapitalization...

...but progress has been uneven.

3. Change in Tier 1 Capital Ratio, 2008–14
(Percent of risk-weighted assets)

4. Change in Bank Leverage and Average Risk Weight, 2008–14
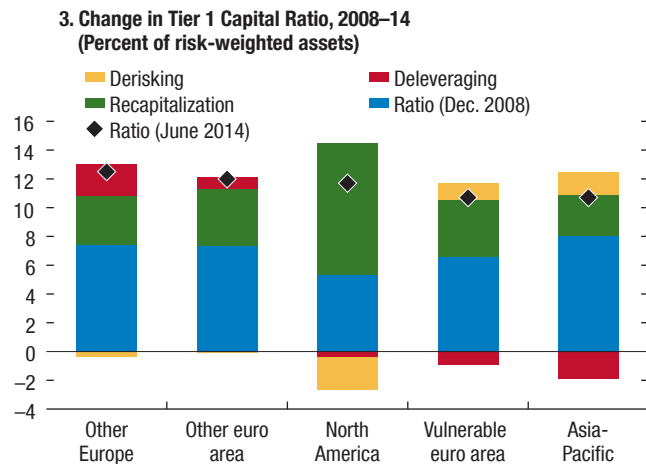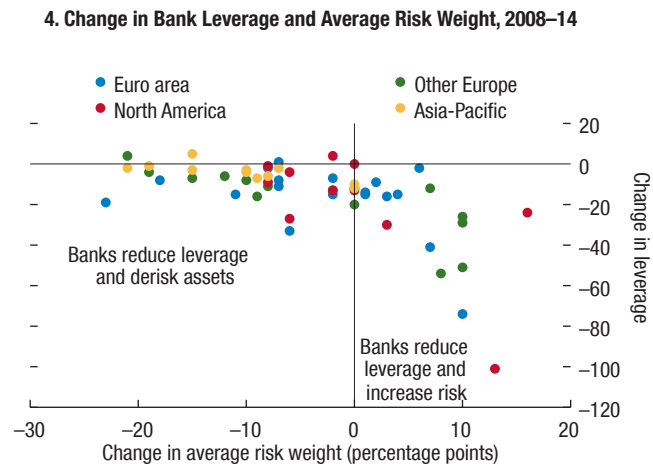
Sources: SNL Financial; and IMF staff calculations.
Note: Panels 1–3 are based on a sample of more than 1,500 advanced economy banks. Panel 4 is based on a sample of about 90 large banks. 2014 data are for 2014:Q2 or latest available. Vulnerable euro area countries are those that have faced a sharp fall in bank lending. In this figure, vulnerable euro area = Cyprus, Greece, Portugal, Ireland, Italy, Slovenia, and Spain. Other euro area = Austria, Belgium, Finland, France, Germany, Luxembourg, Malta, Netherlands, and Slovak Republic. Other Europe = Denmark, Sweden, Switzerland, and United Kingdom. Asia-Pacific = Australia, Japan, and Singapore. North America = Canada and United States.

regulatory reforms, and acute competition in the context of excess capacity.[12]

At the same time, investors demand high returns from banks, with the cost of equity having risen since

before the crisis.[13] According to Bloomberg estimates, after a spike in 2010, the cost of equity of 300 large banks has been slowly trending downward to 13 percent but is still 5 percentage points higher than its 2000–05 historical average as of end-March 2014

[12]In Europe, the ongoing European Central Bank (ECB) Comprehensive Assessment and related European Banking Authority stress test exercise will help address part of the backlog of nonperforming assets, particularly in the vulnerable euro area, but more needs to be done, including strengthening the bankruptcy and insolvency procedures for firms and accelerating the resolution of nonviable banks, as discussed in the April 2014 GFSR.

[13]The cost of equity represents the rate of return required by shareholders to compensate for the underlying risk of their investment. It can be estimated with the capital asset pricing model as the risk-free rate plus the correlation between the risk premium of the equity in question and that of the overall market (beta) multiplied by the market risk premium.

Figure 1.17. Bank Balance Sheets and Profitability

Bank balance sheets have moved in the same direction...

1. Bank Assets, 2006 and 2013
(Percent of total assets)
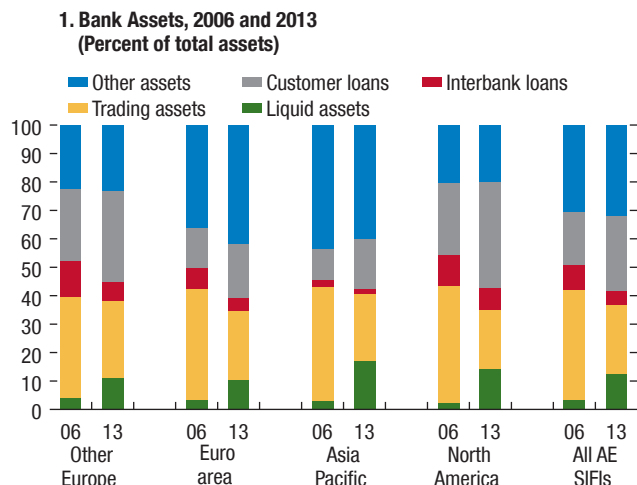
Sources: Bankscope; and IMF estimates.
Note: Other assets include nongovernment securities in the banking book, reverse repo, and fixed assets. Based on 90 large banks. AE SIFI = advanced economy systemically important financial institution. See note to Figure 1.16 for the countries in each region.

Return on equity is generally lower...

3. Bank Return on Equity by Region
(Percent)
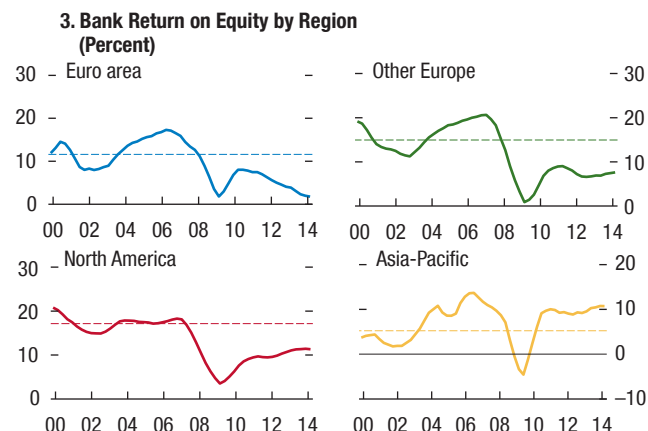
Sources: Bloomberg L.P.; and IMF staff estimates.
Note: Shows four-quarter asset-weighted averages. Based on a sample of about 300 large banks. Dotted line shows the 2000–05 average. See note to Figure 1.16 for the countries in each region.

...while trading books have declined since the crisis.

2. Bank Trading Portfolios
(Trillions of U.S. dollars)

Sources: SNL Financial; and IMF staff estimates.
Note: Figure drawn for 27 advanced economy banks identified by the Bank for International Settlements as systemically important.

...against a high cost of capital...

4. Return on Equity and Cost of Equity
(Percent)
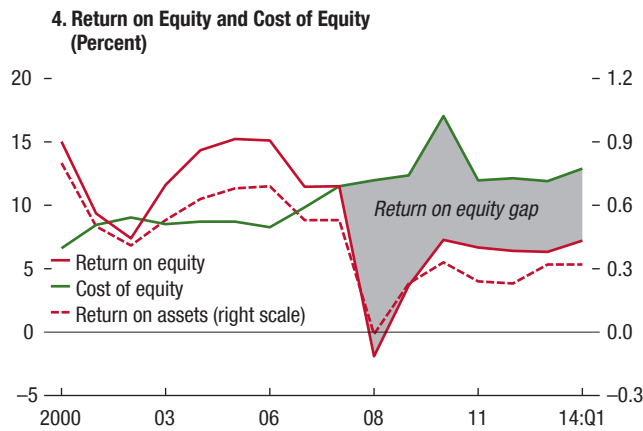
Sources: Bloomberg L.P.; and IMF staff calculations.
Note: Cost of equity derived from the capital asset pricing model, with the risk-free rate plus the market risk premium multiplied by the nondiversifiable risk (beta). Shows asset-weighted averages. Based on a sample of about 300 large banks.

(Figure 1.17 continues)

(Figure 1.17, panel 4). This higher cost reflects market concerns about the outlook for bank earnings, including from weak and opaque balance sheets, possible litigation costs, and the uncertain impact of regulatory reforms.[14] As a result, banks accounting for 80 percent of total assets of the largest institutions currently have a so-called return-on-equity gap, in which their return on equity is lower than the cost of capital demanded by shareholders (Figure 1.17, panel 5).[15]

[14]For example, the top four U.S. banks incurred about $80 billion in legal costs in 2013, while the top 25 European banks spent $37 billion during the same period (Credit Suisse 2014). These costs have pertained largely to sales of mortgage-backed bonds, practices around the fixing of interest rate benchmarks, and mis-selling of payment protection insurance.

[15]There is a close relationship between banks with a large return-on-equity gap and those with a low price-to-book ratio (that is,

Figure 1.17. Bank Balance Sheets and Profitability *(continued)*

...leading many banks to miss return expectations.

Regulatory reforms are changing banks' incentives.

5. Banks with Return on Equity Lower than the Cost of Equity
(Percent of sample assets)

6. Impact of Leverage Ratio on Holding a Corporate Loan
(Basis points)
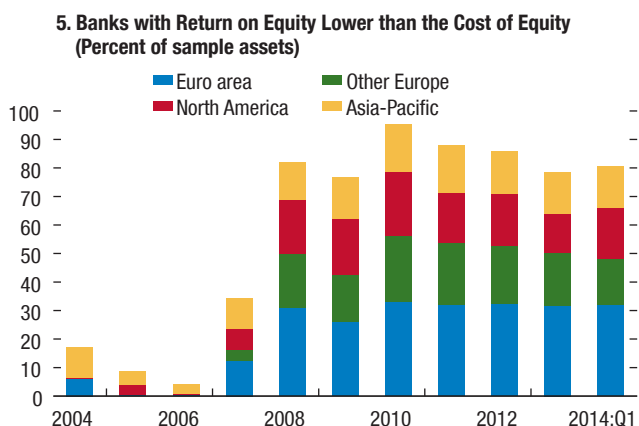
Sources: Bloomberg L.P.; and IMF staff calculations.
Note: Based on a sample of about 300 large banks. See note to Figure 1.16 for the countries in each region.

Sources: Bloomberg L.P.; European Central Bank; and IMF staff calculations.
Note: The blue bars measure the minimum return over U.S. dollar Libor (London Interbank Offered Rate) necessary to cover the Basel III capital costs associated with a U.S. corporate loan for a representative large bank under the Internal Ratings Based model. In this stylized example, the capital cost for an A-rated loan is about 33 basis points (bps) (assuming a 35 percent risk weight × 9.5 percent Tier 1 ratio × 10 percent return on equity target). The red bars measure the additional spread (over U.S. dollar Libor) to cover the Supplementary Leverage Ratio (SLR) capital costs. The 50 bps floor is equal to 100 percent leverage exposure × 5 percent SLR × 10 percent return on equity target. The diamonds represent the current loan margin proxied by a representative U.S. corporate bond index spread (over U.S. dollar Libor). The difference between the loan margin (diamonds) and the bars must be sufficient to cover operating expenses, other regulatory costs, and expected losses.

Until now, banks have focused primarily on raising capital and derisking their balance sheets to meet risk-based requirements. Their focus, however, has now broadened to include other elements of the Basel III regime, often ahead of the mandated schedule (see Table 1.7 in Annex 1.3). For example, the LR and the supplementary leverage ratio in the United States (both mandatory beginning January 2018), which penalize size, will make it more costly for banks to hold lower-risk assets. New liquidity requirements, such as the liquidity coverage ratio and the net stable funding ratio will induce banks to hold more liquid (low-risk) assets and to rely more on stable funding sources. And the recent stress test exercises (for example, the Comprehensive Capital Analysis and Review in the United States and the ECB Comprehensive Assessment in the euro area), which emphasize "stressed capital," are inducing banks to ask for more high-quality collateralization of loans to help absorb losses under stress

scenarios, potentially tightening nonprice lending conditions. These new regulations have increased the strength and resilience of national banking systems, and this report does not advocate backing away from these reforms. But there is merit in analyzing how the adjustment to a safer system will affect the provision of financial services as bank business models change.

In this new paradigm—in which banks are facing a combination of low profitability and new regulatory requirements—banks need to change the way they operate to ensure that they can build and maintain capital buffers without taking excessive risk and still meet credit demand. During the past few years, banks have undertaken a number of measures to address these challenges. They have raised capital. They have also worked in other areas, including running off portfolios, selling noncore businesses, and cutting operating costs. But there may be only limited room left for further gains in these areas and more needs to be done.[16] Additional steps are likely

where equity market valuation is close to or below book valuation) across both time and type of bank.

[16]Substantial cost-cutting efforts have taken place, with the average cost-to-income ratio of 300 large banks having fallen by 7 per-

to entail a combination of repricing current business lines, reallocating capital away from low-risk assets, and—in some cases—selective retrenchment or even restructuring.

As banks adjust to the new environment, they will reallocate capital across activities. Banks with low risk-weights are likely to shift to higher-risk activities until regulatory capital constraints are hit. For example, some banks, particularly in the euro area, exhibit very low risk-weights and will see their ratio of risk-weighted assets to total assets naturally rise as they shift from zero-risk-weighted public bonds to higher-risk-weighted loans (Figure 1.16, panel 4). Other banks, such as U.S. banks, have already strengthened and rerisked their balance sheets to precrisis levels, including by expanding their loan portfolios. These banks may be able to shift to higher-risk activities, although doing so will require increasingly higher capital as they move up along the risk scale.

New regulatory requirements may induce banks to retrench from some activities if they are unable to reprice. For example, when binding, the leverage ratio could make it uneconomical to hold or acquire lower-risk assets.[17] This is shown in Figure 1.17, panel 6, in which the supplementary leverage ratio, which is applicable to large U.S. banks, introduces a spread floor of 50 basis points (red bars) on top of the standard risk-based capital charges (blue bars) needed to meet a 10 percent target return on equity. In this example, it becomes uneconomical to hold U.S. corporate loans rated AAA and AA in the absence of repricing. Activities most affected by this type of constraint include Treasuries and other fixed-income trading, general collateral repo markets, and hedging and arbitrage activities, with a possibly adverse impact on the corporate sector, which may no longer be able to access critical services, such as financial commitments or derivative instruments to hedge their long-term investments.

Banks have already increased loan margins significantly since the onset of the global financial crisis, but some banks will need to do more to regain profitability and be in a position to lend. Repricing is likely to be easier with bank-dependent borrowers, such as in small and medium-

sized enterprises and consumer credit. With regard to products, the cost of mortgage loans and other lower-risk longer-term loans, such as infrastructure finance, are likely to rise as banks adjust to the leverage ratio, the net stable funding ratio, and the higher regulatory cost of holding long-dated derivatives used for hedging purposes. In contrast, repricing will be more difficult in investment grade corporate segments, in which margins are tight and borrowers have access to capital market funding.

Banks' ability to reprice will also depend on their market power. For example, they may not be able to reprice much if they are surrounded by stronger competitors that do not need to reprice or by weaker banks that underprice risk to maintain market share. Promptly restructuring weak banks when necessary and resolving unviable ones will help remove competitive distortions and allow remaining banks to move to sustainable business models. This process can be further supported by supervisory pressure to move toward a more transparent product-based transfer-pricing mechanism that aligns the price of an activity to its underlying risks and away from the more traditional product cross-subsidization approach, whereby revenues are computed at the product level but a significant part of the costs is spread across the wider firm.[18] A more transparent transfer-pricing mechanism would help regulators identify loss-making activities, assess the banks that do not offer sustainable risk-based pricing, and facilitate the balance sheet restructuring of weak banks and the exit of unviable banks.

Global banks have already begun their transition to new business models (Table 1.2). First, many global banks are shrinking or exiting from capital market activities, especially in fixed income, currencies, and commodities. Only a few large investment banks are expected to maintain a strong presence in these activities. Second, most global banks are also rebalancing their business models away from capital-intensive activities to more fee-based activities, such as mergers and acquisitions and securities-underwriting activities, as well as asset management and private wealth management. Third, a large number of global banks are retrenching selectively from international markets and refocusing on commercial banking activities in home markets and regional markets where they enjoy a leading presence. A

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centage points to 66 percent since 2008, in line with the 1995–2005 historical average of 65 percent.

[17]The regulatory leverage ratio is binding for some large banks. At end-December 2013, based on a conservative "fully loaded" capital definition, 11 percent of 227 surveyed banks were not meeting the 3 percent Basel III Tier 1 leverage ratio (BCBS 2014). But the pricing and capital allocation decisions of all banks are likely to be affected, as banks strive to achieve or maintain the leverage ratio requirement.

[18]Banks have typically maximized their returns on a client (rather than product) basis, so that low-margin, loss-making products (such as current accounts or mortgages) are offered as part of a suite of products, which, on aggregate, compensate for losses on some activities.

Table 1.2. Changes in Business Models and Strategic Direction (Stylized Heat Map)

Legend: Exit | Selectively shrinking | Expanding | No or little change | No critical business

	Commercial bank			Investment bank			Asset management and private wealth
	Retail and small and medium-sized enterprises	Corporate	Infrastructure finance	Fixed income, currencies, and commodities	Equities (market making and proprietary trading)	M&A and securities underwriting	Asset management and private wealth
European banks							
Barclays	U.K. focus (selectively Africa), exit retail Europe	Greater U.K. focus		Exit from bespoke derivatives. Going forward, standardized centrally cleared products only		U.K. and U.S. focus	
BNP Paribas	Growth focus on Asia	Reallocating portfolio, except growth in Asia and United States	Selectively reduced, except growth in Asia	Selectively expanding	Growing in Europe and Asia	France and U.K. focus	Growth in Asia
Credit Agricole	Focus on France			Selective with securitization focus		Bond focus	France focus
Credit Suisse	Heavily Swiss focused	Heavily Swiss focused		Selective, focus on securitization (U.S.), emerging market & global credit (U.K.), and introducing capital light fixed income agency model	Cash equities (U.K.)	Europe focused	Slow growth with wealth focus
Deutsche Bank	Heavily German focused	Reallocating portfolio, except growth in Asia	Selectively reduced	Selective reductions (structured credit, large foreign exposures, derivatives book), but still broad based (U.K., U.S.). Top-three player in securitization	Large offering (U.K., U.S.)	Top three in bonds	Growth with asset management focus
RBS	U.K. leader in SME; second in retail	U.K. leader in corporates	Exited 2009	Selective; continuous derisking and deleveraging		Bond focus	U.K. focus
Standard Chartered	Expand multi-local trade finance leadership		Selectively active	Selective, expanding in commodities	Selective, expanding in commodities	Bond focus (for example, number 1 in renminbi bonds)	Asia and Middle East focus
UBS	Heavily Swiss focus	Heavily Swiss focus		Exited 2012	Broad offering (Europe, U.S.), strong distribution	Equity and Europe focus	Strong growth with wealth focus
U.S. banks							
Goldman Sachs				Selectively shrinking	Rebalancing balance sheet use from financial instruments toward direct investments	Expand global leadership (number 1 in equity; Number 2 in bonds)	Growth with wealth focus
JPMorgan	U.S. focus, market leader by total assets		Maintain global leadership (for example, in syndicated loans)	Maintain global leadership in G-10 rates and securitization, selective capital use by clients and products	Selective international growth; equity derivative focus	Expand global leadership in corporate bonds (number 1) and growing in equity (number 2)	Growth with focus on institutional and retail asset management
Morgan Stanley				Selectively shrinking; move toward hybrid principal and agency model		Maintain leadership in equity and M&A (top three)	Growth with wealth focus; taking advantage of large broker sales force

Sources: Annual reports; company presentations; and IMF staff.
Note: M&A = mergers and acquisitions. Indicative rankings as of end-2013.

notable exception is infrastructure finance, where many global banks are reducing their presence or exiting.

Retrenchment and repricing could add headwinds to the recovery

The transition to new business models could have important implications for the capacity and willingness of banks to supply credit to the real economy, potentially creating a headwind against the recovery in some countries. This transition is likely to be uneven across banks and those with a greater return-on-equity gap, which includes some of the largest banks, will have a greater transition to make (Figure 1.18, panel 1). The impact of this transition for credit recovery is likely to be particularly relevant where banks with significant transitioning needs are large providers of credit.

These transition challenges are illustrated through a balance sheet simulation. The simulation, which is based on more than 300 advanced economy banks (representing about two-thirds of the banking sector assets of the sample countries), explores the extent to which banks have made progress in their transition to new business models.[19] The simulation has two stages. In the first stage, the potential size and profitability of balance sheets is estimated at end-2015, not to estimate how much balance sheets are expected to grow, but to assess the capacity of banks to adapt balance sheets, generate earnings, and supply credit.[20] The second stage assesses how much interest margins would need to rise to close any remaining return-on-equity gaps in 2015.[21] The idea here is not to predict how much margins will actually rise, but to use the required increase in margins as a gauge of how far banks still have to go in their transition to new business models.

The simulation offers several key insights into the transition of bank business models. It first suggests

that many banks have the capacity to supply more credit, given their increased levels of capitalization. But there are a significant number of institutions for which this potential capacity is somewhat limited by their available capital buffers and expected profitability. For example, about 35 percent of the sample, by assets, cannot deliver more than 5 percent annual credit growth (Figure 1.18, panel 2). Some of these banks are not able to expand their balance sheets because they are constrained by low capital buffers. Also, a few small institutions may need to deleverage—or shrink balance sheets and cut back lending—to meet the capital targets. It is important for banks to have adequate capital buffers to meet credit demand when the economy recovers.

A second insight is that many banks will need to increase lending margins, or use alternative measures, to close their return-on-equity gaps and generate sustainable profits.[22] But for a number of banks in the simulation, the repricing needed is very large and may not be realistic, particularly if done on a stand-alone basis and not followed by other market participants. For example, banks with a required increase in margins of more than 50 basis points on their entire loan books—in addition to the repricing already envisaged in analysts' profit forecasts—account for about 20 percent of assets in the sample (Figure 1.18, panel 3).

The results are confirmed at the country level, where the largest transition needs are concentrated in some euro area countries and, to a lesser extent, in the United Kingdom and Japan (Figure 1.18, panel 5). Transition needs are not concentrated in any particular type of bank but affect both global and large domestic institutions (Figure 1.18, panel 6).

A further insight is that even among the banks that have the capacity to supply more credit, a group of institutions have high repricing needs (Figure 1.18, panel 4). Because these repricing needs may be unrealistic for individual institutions to implement, these banks may not be willing to expand lending, and therefore may not be able to generate retained earnings and build capital buffers to support future credit. Many of these banks are from the euro area and have been slower to adjust, weighed down by cyclically poor asset quality and profitability, as well as a wholesale-based funding model (see also Chapter 1 of the April 2014 GFSR).

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[19]The sample includes the largest banks in each of the sample countries. The reported sample size relative to total banking sector assets is an approximation, given the lack of consistent cross-country data on banking system assets on a consolidated basis.

[20]The simulation is based on banks' meeting a Tier 1 common capital ratio of 7 percent, plus a 1.0–3.5 percentage point buffer for global systemically important banks and a 0.5 percentage point buffer for large domestic banks, as well as a 3 percent unweighted leverage capital ratio (for U.S. banks a 1 percentage point buffer is added). The expected return on equity in 2015 is based on analysts' forecasts.

[21]For the sake of presentation, the simulation assumes a uniform cost of equity of 10 percent. To test the sensitivity of the results to this assumption, the simulation was replicated using bank-specific cost of equity estimates (from Bloomberg and IMF staff).

[22]Further cost cutting would also help banks reduce their return-on-equity gaps, although room for maneuver may be limited given cost cuts achieved in recent years and already factored into financial plans for the coming years.

Figure 1.18. Where Are Banks in Their Transition to New Business Models?

Transition needs are large.

1. Bank Return-on-Equity Gap, 2014:Q2
(Percentage points)

Banks with a return-on-equity gap need more progress on business models

Banks with a return-on-equity surplus need less progress on business models

Bubble size = tangible assets
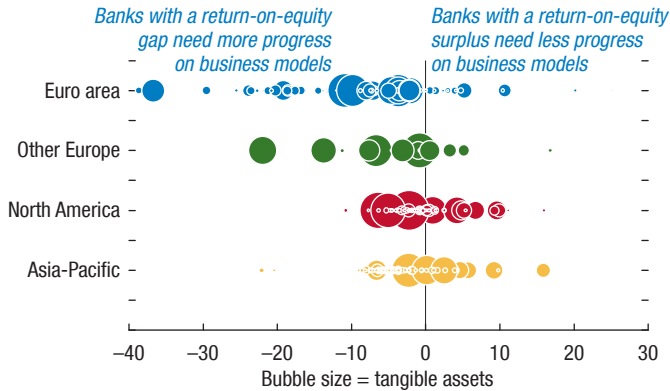
While lending capacity varies...

2. Potential Credit Supply Expansion, by Cumulated Assets

Proportion of sample that cannot deliver credit growth of more than 5 percent

(Percent)	Assets	Proportion of Banks
Asia-Pacific	27	46
North America	16	6
Other Europe	28	7
Euro area	59	46
Total	36	25
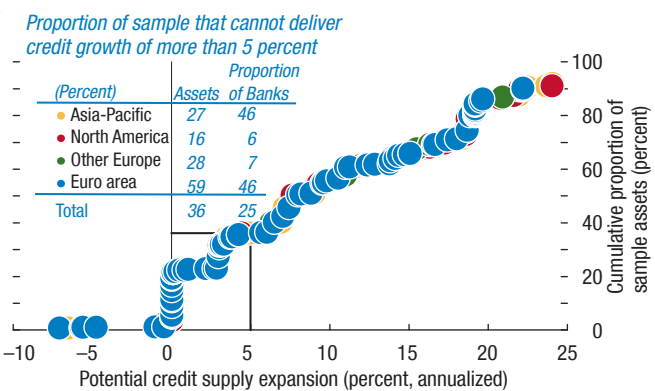
...some banks have unrealistic repricing needs ...

3. Required Repricing of Loans, by Cumulated Assets

Proportion of sample with repricing needs greater than 50 basis points

(Percent)	Assets	Proportion of Banks
Asia-Pacific	1	6
North America	2	7
Other Europe	28	7
Euro area	41	40
Total	21	19
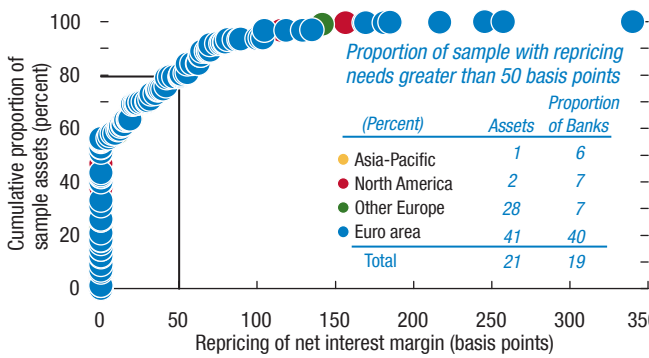
...raising a question about credit supply.

4. Required Repricing and Potential Credit Supply Expansion

Resolution or recapitalization needed (4%)

Business model change needed (38%)

Better positioned to support recovery (58%)
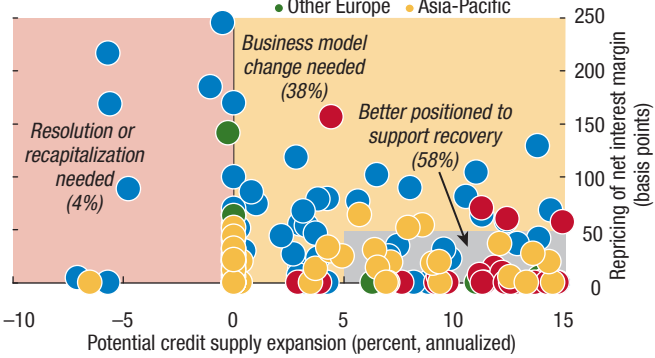
Transition needs differ across countries...

5. Required Repricing, by Country

Greater need to change business models

Lesser need to change business models
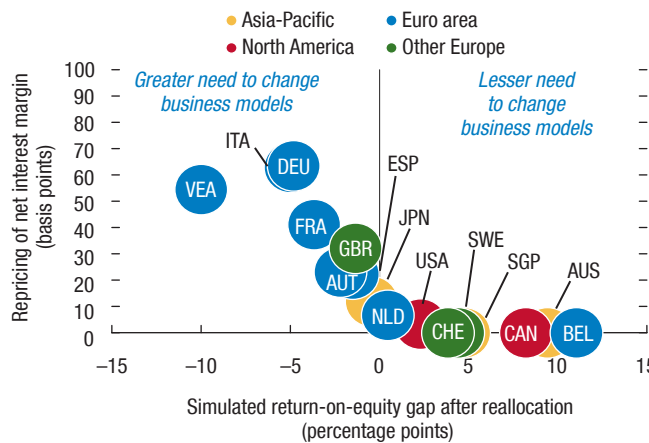
...and by type of banks.

6. Required Repricing, by Type of Bank

Greater need to change business models

Lesser need to change business models
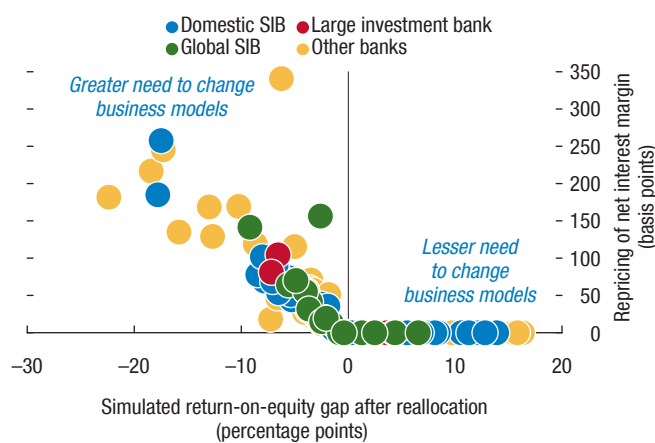
Sources: Bloomberg L.P.; SNL Financial; and IMF staff estimates.
Note: Based on a sample of more than 300 advanced economy banks. The return-on-equity (RoE) gap is RoE less a cost of capital of 10 percent. Panel 1 shows 2014:Q2 or latest available data. The other panels are based on simulations. See note to Figure 1.16 for the countries in each region. Panel 5 uses International Organization for Standardization country codes, except for VEA, which is vulnerable euro area countries (in this case Cyprus, Greece, Ireland, Portugal, Slovenia). In panel 6, SIB = systemically important banks. There are 21 global SIBs (average tangible assets of $1,691 billion), 7 large investment banks ($1,494 billion), 68 domestic SIBs ($320 billion), and 213 other banks ($45 billion).

Figure 1.19. Bank Lending and Nonbank Sources of Credit

Bank lending remains lackluster in Europe.
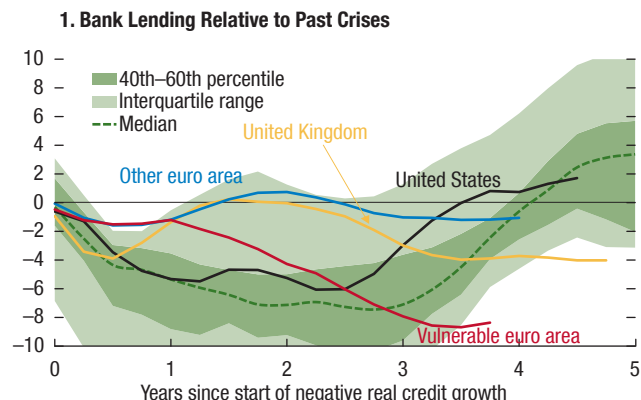
1. Bank Lending Relative to Past Crises

Sources: Haver Analytics; IMF, World Economic Outlook database; and IMF staff calculations.
Note: Green shaded area is for past crisis periods in advanced and emerging economies from the late 1980s to the period before the global financial crisis. Vulnerable euro area countries are those that have faced a sharp fall in bank lending. In this chart, the group includes Greece, Ireland, Italy, Portugal, and Spain. Other euro area comprises Austria, Belgium, Finland, France, Germany, Luxembourg, and Netherlands.

Large firms turn to nonbank credit...

2. Corporate Borrowing (Percent of total borrowing)
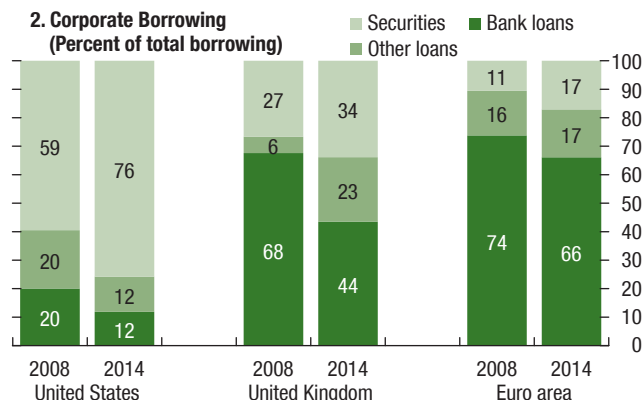
Sources: National central banks; and IMF staff estimates.
Note: Excludes estimated value of intercompany loans. Rest of World bank loans are included in bank loans in the United States and United Kingdom but are included in other loans in the euro area.

...but this is not enough to offset the fall in bank lending.

3. Euro Area Corporate Credit (Billions of euro)

Sources: National central banks; and IMF staff estimates.
Note: Shows a four-quarter sum of changes in levels. Vulnerable euro area countries are those that have faced a sharp fall in bank lending. In this chart, the group includes Ireland, Italy, Portugal and Spain. Other euro area comprises Austria, Belgium, France, Germany and Netherlands.

Nonbanks can help diversify the provision of credit, including through securitization.

4. Securitization Issuance (Billions of U.S. dollars)
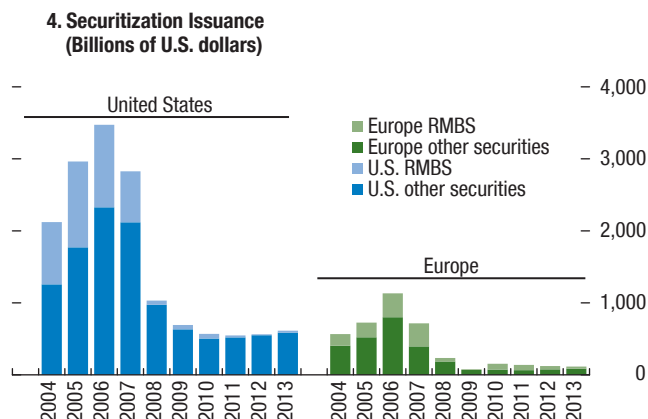
Sources: Association for Financial Markets in Europe; Commercial Research Finance Council; Inside Mortgage Finance; JPMorgan Chase & Co.; Federal Reserve; and IMF staff calculations.
Note: All data are issuance volumes, except for asset-backed commercial paper, which are end-period outstanding. RMBS = residential mortgage-backed securities.

The ECB's Comprehensive Assessment and introduction of the Single Supervisory Mechanism provide a golden opportunity to clean up balance sheets, restructure weak institutions, and resolve nonviable banks—where necessary—to produce a strong cross-border banking system.

The simulation exercise, therefore, suggests that although many banks have the capacity to supply more credit, challenges lie ahead for bank lending, particularly in economies that most need a recovery in credit. Indeed, real credit growth is already lagging behind the average recovery path in past banking crises in the euro area and the United Kingdom (Figure 1.19, panel 1). Although bank credit growth should accelerate over time, the recovery of credit, which also depends on the demand for lending, could be modest in some economies and continue to be a headwind for the economic recovery.

Nonbank sources of credit cannot fully compensate for sluggish bank credit

Nonbanks see strong opportunities to compete with banks and are increasing their market share in credit intermediation. A wide and rapidly growing range of nonbank entities are providing lending services. These entities include large asset managers (such as pension funds, credit mutual funds), business development companies, private equity firms, and traditional brokerage firms.[23] Levered private debt funds are investing in loan portfolios and are providing cofinancing. Balance sheet constrained banks are partnering with nonbanks—such as insurance companies and pension funds, asset managers, and private equity and credit funds—in new intermediation models that allow banks to provide their origination capacity and credit-related expertise, and nonbanks to provide the capital needed to warehouse credit risk. As developed in Chapter 2, shifting toward greater nonbank financial intermediation will help support the provision of financial services but also requires the strengthening of the regulatory framework for nonbanks. Supervisors must be in a position to adequately monitor credit developments, assess the buildup of risks, and have the authority and the tools to address the attendant risks.

Yet, it is not clear whether nonbanks can provide sufficient financing to compensate for the retrenchment by banks. Although bank loans account for only 12 percent of corporate credit in the United States, they represent more than 40 percent of corporate borrowing in the United Kingdom and more than 60 percent in the euro area (Figure 1.19, panel 2). In the euro area, the steady rise in securities issued by nonfinancial companies since 2008, partly as a result of the falling cost of issuing bonds relative to bank loans, has not been sufficient to offset the steep decline in bank lending, particularly in some euro area economies (Figure 1.19, panel 3).

Furthermore, the substitution of nonbank credit for bank credit will take time. So far, only banks have financed greenfield projects given their complex construction-period risks, and refinancing by nonbanks has been slow, including because of insurers' risk policies and solvency requirements. Nonbank appetite for lending to small and medium enterprises is mixed

because of unfamiliarity with the risks (even when central bank data on these enterprises are made available), and joint ventures between banks and insurers are only developing slowly.

Regulatory frameworks explain some of the regional differences in the use of nonbank credit. In the United States and in Japan, insurance companies and pension funds are directly lending to borrowers, as reflected by their large commercial real estate loan portfolios, whereas insurers in some European countries are prevented from extending credit to the corporate sector. Likewise, mutual funds can purchase loans in the United States (so-called loan funds[24]), which is not allowed in Europe by the Undertakings for the Collective Investment in Transferable Securities directive.[25] In Europe, lending by nonbanks is mostly provided by private equity firms, which focus primarily on real estate. As a result, there is a greater risk in Europe that nonbanks may not be able to compensate for the retrenchment of bank credit, particularly for customers without alternative funding sources.

Filling the credit gap left by banks' more limited balance sheets requires efforts to increase the use of securitization or other forms of fee-based originate-to-distribute models but on a safer basis. Since the global financial crisis, securitization issuance has been declining sharply in Europe—to about one-eighth of the issuance in 2008—in contrast to the fairly stable volumes in the United States (Figure 1.19, panel 4). Kick-starting safe securitization could help diversify funding sources for the real economy and help reinvigorate credit supply. Trade finance, for example, as a short-dated and low-risk asset, may be well suited to this shift toward an originate-to-distribute model.

The expansion of securitization markets, however, faces a number of challenges. Structural market factors (for example, high cost of issuance, heterogeneity of

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[23]These partnerships are likely to strengthen links between banking and shadow banking activities, as will the reported refocusing of global banks on asset management activities.

[24]In the United States, mutual funds can invest up to 15 percent of their assets in illiquid securities.

[25]In Europe, funds that are not sold to retail investors are not subject to authorization under the Collective Investment in Transferable Securities Directive but are subject to a number of requirements under the less stringent Alternative Investment Funds Management Directive. They may also be subject to additional national regulation by individual EU member states. The volume of funds investing in loans is still small, and there is debate about their use as loan originators in view of the limited capacity of policymakers to identify and address a potential buildup of risks arising from such funds (see, for example, Central Bank of Ireland 2014). The Central Bank of Ireland has, for example, in September 2014 introduced additional national rules that seek to address those particular loan origination risks.

loan portfolios across countries), adverse cyclical factors (for example, sluggish economic recovery), and impediments to effective debt restructuring reduce the incentives for issuance. Regulatory requirements in Basel III (for banks) and Solvency II (for insurance companies) should not provide negative incentives for these institutions to buy high-quality securitization instruments.[26] In this context, the recent announcement by the ECB that it will purchase asset-backed securities and covered bonds is a welcome step in the right direction, and providing targeted fiscal support (guarantees by pan-European agencies) would further encourage this type of market-based funding.

Rising Market Liquidity Risks

Capital markets are now more important providers of credit than in the past, with a growing share of credit instruments held by mutual funds. Inflows into mutual funds have provided an illusion of liquidity in underlying credit markets, but structural changes in the industry may exacerbate illiquidity in times of stress. More investors are now following benchmarks, and retail investors are playing a greater role in credit markets. The asset management industry is also highly concentrated, with features that may amplify liquidity risks. At the same time, emerging markets have grown in importance as a destination for investors from advanced economies. Together, these trends will likely magnify market shocks and liquidity risks and provide additional challenges to the execution of a smooth exit for monetary policy.

Credit is increasingly being provided outside the banking system through funds

Accommodative monetary policies have induced greater risk taking by market participants, as reflected in rising asset flows into mutual funds and exchange-traded funds (ETFs) focused on less liquid, high-yield global fixed-income assets (Figure 1.20, panels 1 and 2). The nonbank sector,[27] particularly mutual funds and ETFs, has become an increasingly important supplier of credit,

as many banks continue to have limited balance sheet space to support private sector credit. Since 2007, mutual funds, ETFs, and households have become the largest owners of U.S. corporate and foreign bonds, accounting for 30 percent of total holdings.

Credit intermediation provided by asset managers is heavily reliant on market liquidity

Inflows into mutual funds have enhanced flow liquidity, or the capacity to trade assets cheaply, as measured by narrower bid-ask spreads (Figure 1.20, panel 3).[28] Indeed, in the U.S. high-yield bond market there is a statistically significant relationship between net inflows into mutual funds and measures of the bid-ask spread.[29]

Although steady inflows have boosted one dimension of liquidity, other more structural market liquidity measures, such as its depth and breadth, have deteriorated. This is reflected in lower trading volumes, smaller trading size, a smaller share of large trades, and less frequent trading of many securities in less liquid fixed-income markets such as corporate bonds (Figure 1.20, panels 4–6). This deterioration in underlying structural liquidity may only become apparent when inflow liquidity disappears at times of stress, and thus inflows could be providing a false sense of comfort to investors about underlying liquidity in several fixed-income markets.

Structural features of the asset management industry amplify liquidity risks[30]

In the postcrisis financial landscape—in which the banking and insurance sectors have been more constrained by regulation—investment funds have been

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[26]For example, Basel III imposes higher capital charges for securitized assets relative to loans or corporate bonds of similar risk and limits their eligibility for liquidity purposes. See Bank of England and European Central Bank (2014), IMF (2014a), and Segoviano and others (forthcoming) for a comprehensive discussion on regulatory impediments for securitization in Europe.

[27]See Chapter 2 for a detailed analysis of and conceptual framework for shadow banking around the world.

[28]An asset is said to be liquid if (1) it can be cheaply traded (also called "flow liquidity"); (2) it can be transacted in any amount without having a significant price impact (often referred to as "depth" or "resiliency"); (3) it can be traded in a short time ("immediacy of execution"); and (4) it is more easily traded than other assets with a similar risk profile ("breadth").

[29]Flow liquidity is represented here by the Liquidity Cost Score (LCS) from Barclays Capital, capturing the loss incurred by simultaneously buying and selling the same bond. $\Delta LCS_T = \alpha + \beta_1 \times \Delta NF_{T-1} + \beta_2 \times \Delta VIX_T + \varepsilon$; in which NF = net inflows/assets under management and VIX = average monthly value of the VIX index. $\Delta LCS = 0.03 + (-7.55) \times \Delta NF + (0.07) \times \Delta NS + \varepsilon$, with both factors statistically significant at the 95 percent level and an adjusted $R^2 = 0.623$.

[30]This section is based on the work of Brown, Dattels, and Frieda (forthcoming).

Figure 1.20. Market Liquidity: Rising Flow but Deteriorating Depth

Households, mutual funds, and ETFs are owning a rising share of risky assets...

1. Ownership of Corporate and Foreign Bonds
(Percent, total corporate and foreign bonds held by all sectors)
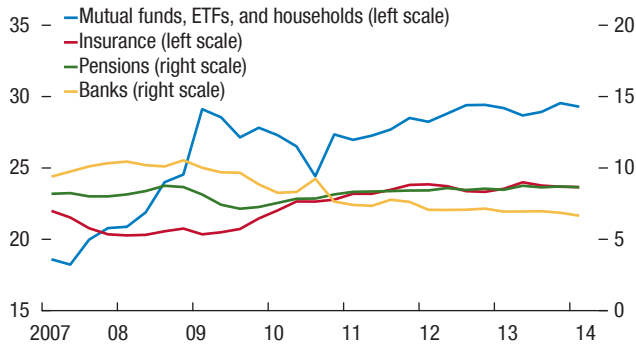
Sources: Federal Reserve; and IMF staff calculations.
Note: ETF = exchange-traded fund.

...predominantly in less liquid credit and emerging market fixed-income markets.

2. Assets under Management of Mutual Funds and ETFs
(Trillions of U.S. dollars)
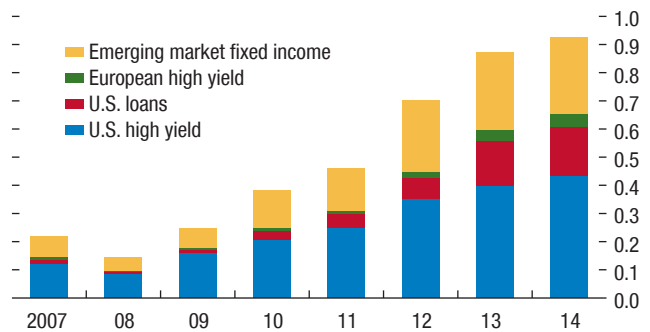
Source: EPFR Global.
Note: ETF = exchange-traded fund.

Flow liquidity has improved with large flows into high-yield mutual funds...

3. Assets under Management versus "Flow Liquidity"
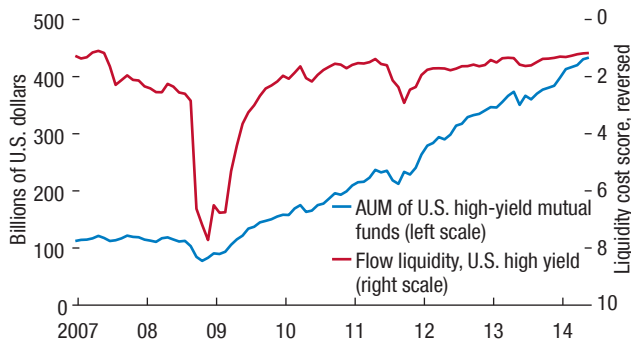
Sources: Barclays; and EPFR Global.
Note: AUM = assets under management.

...but lower trading volumes...

4. Turnover: Trading Volumes versus Outstanding
(Ratio)
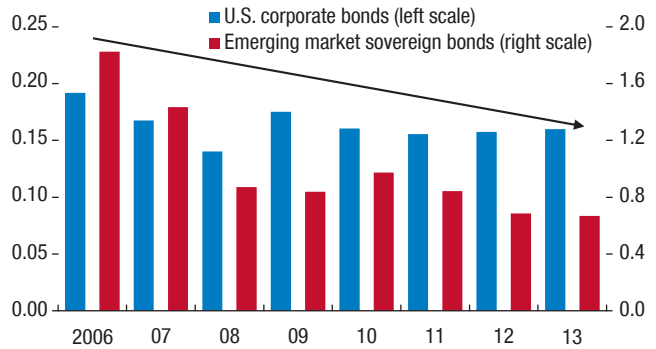
Sources: EMTA; JPMorgan Chase & Co.; Securities Industry and Financial Markets Association; TRACE; and IMF staff calculations.
Note: Quarterly average turnover per year.

...lower trading size...

5. Six-Month Average Size of TRACE IG/HY Trades of more than $5 Million
(Millions of U.S. dollars)
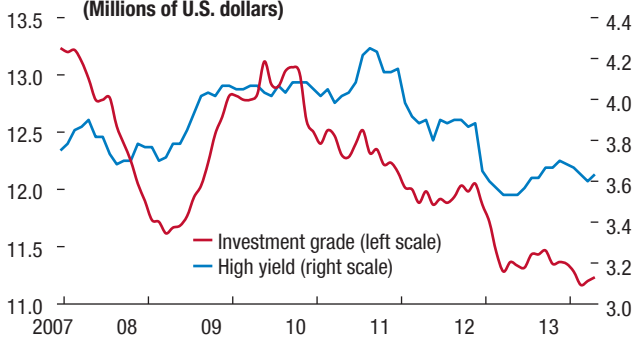
Source: TRACE.
Note: HY = high-yield; IG = investment grade.

...and infrequent trading suggest less market depth.

6. Percent of Trading Days per Quartile: Barclays High-Yield Index Constituents
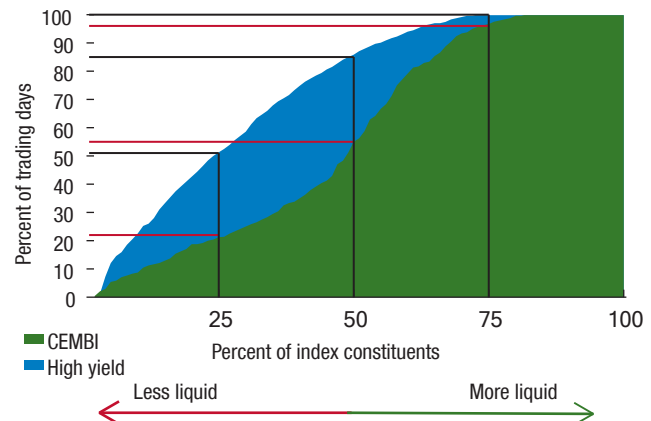
Source: Barclays.
Note: CEMBI = Corporate Emerging Markets Bond Index.

the main sector accumulating issuance by nonfinancial companies. From a financial stability perspective, credit intermediation through asset managers and markets has advantages over that through banks.[31] For example, the investment risk is borne largely by investors in the fund, not the asset manager because there are no public guarantees like those the banking system has for deposits. Liquidity is provided mostly by markets, and not from bank holdings of liquid assets backed by central bank facilities. Finally, funds generally do not raise liabilities to fund assets and are therefore less leveraged than banks.

Despite these advantages, funds investing in credit instruments have a number of features that could result in elevated financial stability risks.

- First is a mismatch in liquidity offered by investment funds with redemption terms that may be inconsistent with the liquidity of underlying assets. Many credit funds hold illiquid credit instruments that trade infrequently in thin secondary markets.
- Second is the large amount of assets concentrated in the hands of a few managers. This concentration can result in "brand risk," given that end-investor allocation decisions are increasingly driven by the perceived brand quality of the asset management firm. Sharp drawdowns in one fund of an asset manager could propagate redemptions across funds for that particular asset manager if its brand reputation is damaged, for example through illiquidity or large losses.
- Third is the concentration of decision making across funds of an individual fund manager, which can reduce diversification benefits, increase brand risk, or both.
- Fourth is the concentrated holdings of individual issuers, which can exacerbate price adjustments.
- Fifth is the rise in retail participation, which can increase the tendency to follow the herd.

These features could exacerbate the feedback loop between negative fund performance and outflows from the sector, leading to further pressure on prices and the risk of runs on funds (Figure 1.21). These risks could become more prominent in the coming year as the monetary policy tightening cycle begins to gain traction.

Figure 1.21. Feedback Loop between Performance, Flow, and Illiquidity
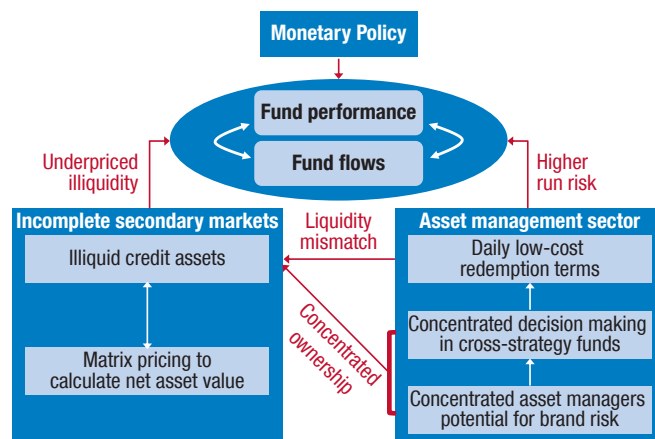
Source: IMF staff calculations.

Within many fixed-income markets, a large proportion of the market trades infrequently, providing an illusion of price stability and presenting challenges to the calculation of a net asset value (NAV) for funds that provide daily liquidity (Figure 1.20, panel 6). The computation of a daily NAV from a portfolio consisting of infrequently traded securities often relies on third-party "matrix pricing" services that use algorithms and assumptions to generate estimates of fair value. In stable markets, this approach may reinforce correlations between similar assets. In more volatile markets, prices may be subject to discrete jumps as traded prices diverge from assumptions or pricing providers incorporate new information and methodologies into estimates. For end-investors unaware of the limited liquidity of underlying instruments, large price drops may encourage further redemptions, potentially exacerbating selling pressures during periods of market stress.

Asset management holdings are now concentrated in a small number of large managers, resulting in increased "brand risk." The top 10 asset managers account for $19 trillion in assets under management globally.[32] These trends toward increased concentration could lead to brand risk and price distortions in the event of sharp drawdowns in a particular fund. For ETFs, whose primary value to end-investors is liquid-

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[31]However, both asset managers and banks share the same tendency toward procyclicality. One reason for their procyclical behavior is that asset managers are subjected to trading restrictions based on measures of risks similar to those used by banks.

[32]See Haldane (2014), who shows this represented almost 30 percent of the total assets under management of the whole industry, as of the end of 2012.

Figure 1.22. Asset Management Industry Impact on Liquidity

Corporate holdings are concentrated in a few asset managers in high-yield...

...and in emerging market corporate debt.

1. **Fund Family Ownership of High-Yield External Debt**
   (Percent of total debt issuance)

2. **Fund Family Ownership of Emerging Market External Debt**
   (Percent of total debt issuance)
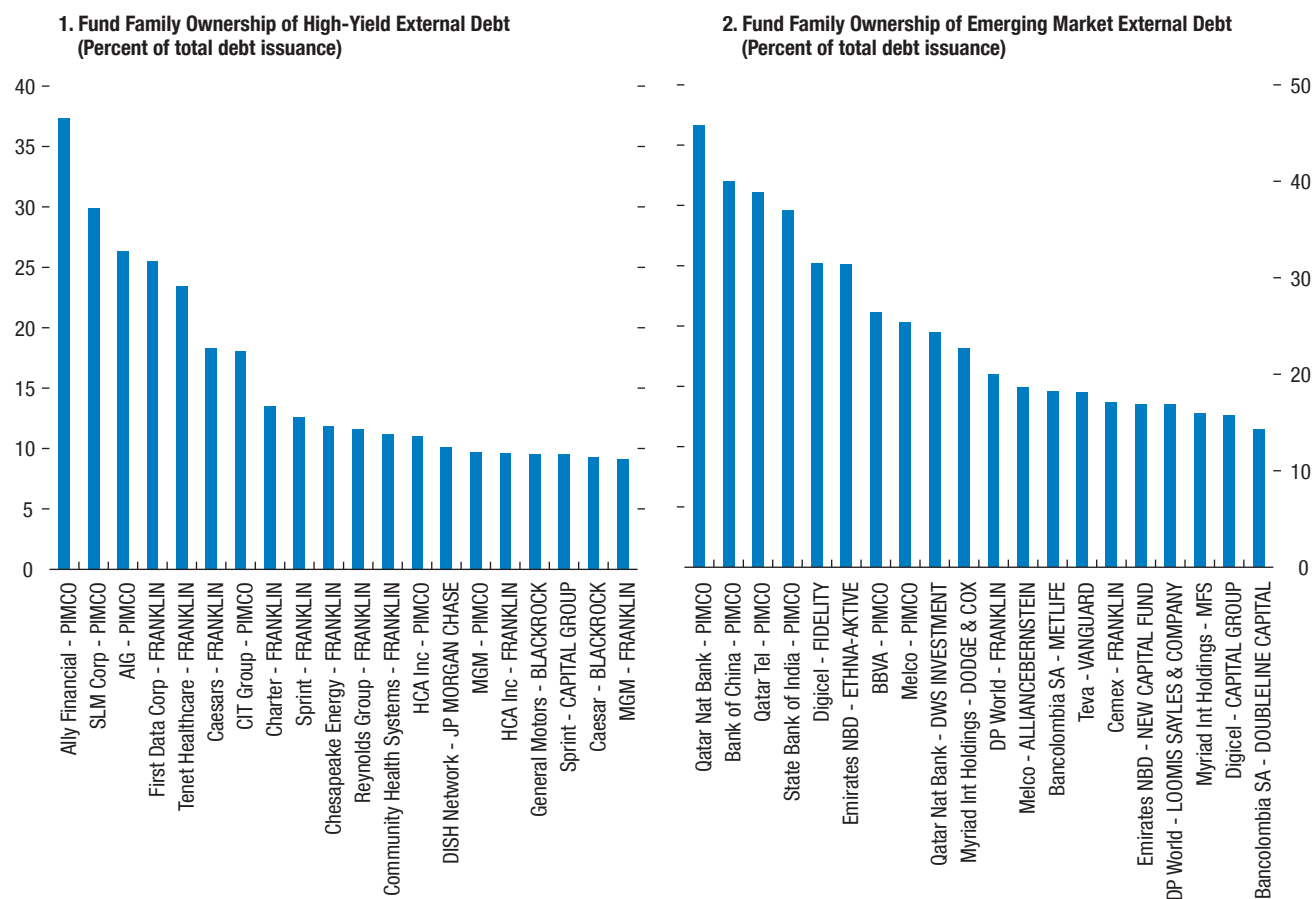
Sources: Bloomberg L.P.; Moore Capital; and IMF staff calculations.

ity, market dislocations that limit redeemability could also undermine product appeal and brand reputation.

Another trend in the asset management industry is the high degree of concentrated holdings in individual securities issues. A reduced number of asset managers hold a significant amount of the debt of large corporate issuers across advanced and emerging market economies (Figure 1.22, panels 1 and 2). For example, 50 percent or more of all debt issued by a number of large nonresource firms in the JPMorgan Corporate Emerging Markets Bond Index is held by the top five fund families. From the asset manager's perspective, concentrated holdings in a single issue may not be troublesome alongside a large amount of commingled assets. However, the concentration of asset holdings can pose difficulties for the ultimate borrowers should

redemptions from a small number of funds result in the closure of market access in times of stress. A high concentration of asset holdings leads to a high degree of dependence by corporate and emerging market sovereign issuers on a small number of asset managers for their market funding.

The concentration of decision making within some of the largest asset management firms can also lead to increased risks and reduced diversification benefit across funds. To the extent that asset managers centralize portfolio management decisions across different funds and deploy similar strategies, common holdings across a family of funds can lead to more highly correlated returns. Large-scale redemptions in one sector may precipitate losses in unrelated asset classes and indeed across multiple funds of a single asset manager,

increasing and magnifying selling pressures across markets.

The risk of a run may be intensified by the increased holdings of mutual funds. Qi and others (2010) find that funds held mostly by large institutional investors are less likely to exhibit run risk than funds held mostly by retail investors.[33] During the past five years, however, the share of credit instruments held by mutual funds, ETFs, and households has increased substantially, and now represents more than a third of total credit holdings, which may also increase the risk of contagion across asset classes. Manconi, Massa, and Yasuda (2012) find that when securitized bonds became problematic in August 2007, mutual funds with liquidity needs increasingly retained these securities and sold other assets, such as corporate bonds, to raise liquidity, which played a role in creating contagion from securitized assets to corporate bonds.

Less liquidity is available from traditional liquidity providers

In contrast to banks, this new class of retail and ETF investors is more benchmark-centric (that is, they are highly sensitive to the direction of the market) and thus are less likely to provide liquidity in times of stress (Figure 1.23, panel 1). Even though a majority of mutual funds are not leveraged, the impulse of benchmark-centric investors may be further amplified by the reported increase in leverage by large mutual funds through their use of derivatives (Figure 1.23, panel 2).[34] At the same time, regulatory pressures on banks and market pressures on institutional investors and hedge funds have reduced their roles as liquidity providers.

- Banks have less capacity to absorb liquidity shocks. Changes in their business models in the wake of the crisis, and regulatory developments (for example, higher capital charges under Basel 2.5 and regulatory restrictions on proprietary trading),[35] have

reduced their market-making activities and dealer inventories. The resulting increase in liquidity mismatches is reflected in the increasing number of days it would take for an asset manager to liquidate a credit fund (Figure 1.23, panel 3) for a given daily turnover.

- Hedge funds are also increasingly behaving in a more benchmark-centric manner,[36] as reflected by their higher sensitivity to market direction (Figure 1.23, panel 4). Since the global financial crisis, hedge fund managers have become less willing to warehouse losses by buying assets when prices fall in return for gains when the market turns. This reluctance is due to a number of factors, including restricted access to leverage from the prime brokerage units of banks,[37] investors demanding tighter risk management and greater transparency, and lower arbitrage trading opportunities because of record-low volatility across many asset classes.
- Pension funds and insurance companies may be playing less of a countercyclical role in financial markets, making it more difficult to provide liquidity in times of stress (Bank of England and the Procyclicality Working Group 2014).[38]

The mutual fund industry is highly interconnected with the rest of the financial system

Mutual funds and ETFs have become key players in credit intermediation, particularly in high-yield debt markets, and have become highly interconnected with the rest of the financial system. Between January 2008 and March 2014, the percentage contributions of fixed-income mutual funds to the vulnerability of the banking sector has more than doubled, particularly

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[33]For evidence that retail-oriented mutual funds can be more sensitive to global financial shocks, see Chapter 2 of the April 2014 GFSR.

[34]This derivative exposure is often achieved by the regular use of credit default swaps (CDS), with academic research reporting that, among large mutual funds, the use of CDS has increased significantly during the past decade (see, for example, Guettler and Adam 2010). Interest rate futures, swaps, and options, which can carry large notional leverage, are also regularly deployed by these funds, a process that can enhance returns to manage their exposures given the difficulty of transacting in large sizes in the secondary bond markets.

[35]Authorities have made banks safer by raising liquidity requirements and strengthening capital standards. However, by drawing starker and more severe limits on banks' ability to take risks, these

regulations have also diminished banks' capacity to provide liquidity to markets during times of stress. Dealers have reduced inventories and are less willing to make markets when volatility increases, particularly in less liquid markets with higher regulatory capital expenses, such as high-yield credit and emerging market bonds.

[36]For further discussion on this issue, see Jones (forthcoming).

[37]Leverage restrictions for banks are transferred to hedge funds in the form of higher costs and less availability of leverage.

[38]Also, increased regulatory emphasis on asset-liability matching can make institutional investors more procyclical. If these investors are minimizing the liability shortfall, they may become increasingly risk averse during periods of stress as their liability gap increases in down markets. Capital requirements for insurance companies and pension funds should therefore feature countercyclical measures while promoting adequate matching of long-term liabilities. Solvency II, as an example, embeds such measures with the matching adjustment, volatility adjustment, and countercyclical capital charges for equity risk, depending on the level of share prices.

Figure 1.23. Liquidity Risk Amplifiers

The benchmark-centric nature of mutual funds and ETFs fuels high correlations...

1. Correlation of Returns: Top 10 Global High-Yield Mutual Funds and ETFs versus the Global High-Yield Index
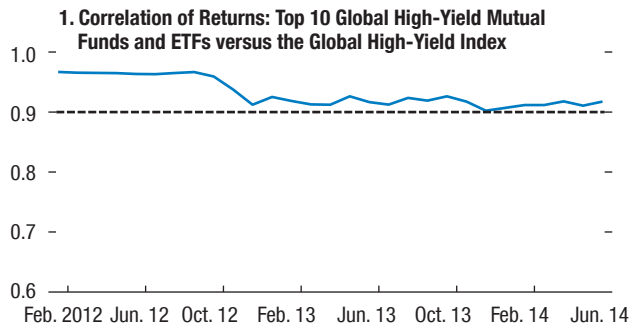
Sources: Bank of America Merrill Lynch; Bloomberg L.P.; EPFR Global; and IMF staff calculations.
Note: Twelve-month rolling correlation of the returns of the top 10 global high-yield mutual funds as measured by assets under management. ETF = exchange-traded fund. Dashed line shows a correlation of 0.9.

Liquidity mismatches are rising, as redemption-prone vehicles invest in less liquid assets...

3. Number of Days for the Full Liquidation of U.S. Credit Mutual Funds and ETFs
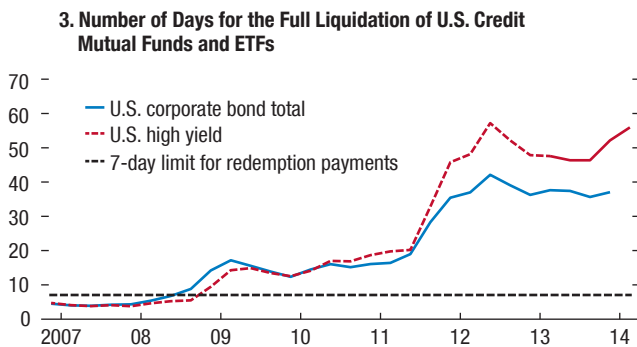
Sources: EPFR Global; Federal Reserve; and IMF staff calculations.
Note: The number of days to liquidate is the ratio of assets of mutual funds and ETFs (exchange-traded funds) per daily dealer inventories. Under the Investment Company Act of 1940, Section 22(e), U.S. open-end mutual funds may not postpone the payment of redemption proceeds for more than seven days following receipt of a redemption request. Because there are no data for U.S. high-yield bond dealer inventories before April 2013, the dashed red line assumes a constant ratio of this amount to total corporate bonds before this date.

Bond mutual funds are now more highly interconnected with the banking system...

5. Contribution to Vulnerability of Distress in the Banking Sector

Source: Segoviano and others (forthcoming).

...which are amplified by the reported rise in synthetic leverage by large crossover mutual funds.

2. Assets under Management to Large Crossover Fixed-Income Funds (Billions of U.S. dollars)

Sources: Bloomberg L.P.; EPFR Global; and IMF staff calculations.
Note: Sample of mutual funds with unconstrained mandates across fixed-income sectors and with assets under management exceeding $5 billion.

...with hedge funds less likely to take short positions and provide liquidity during stressed markets.

4. Correlation and Alpha of Hedge Fund Returns

Sources: Bloomberg L.P.; Hedge Fund Research; and Morgan Stanley Capital International.
Note: Monthly returns measured over a rolling five-year observation window. Hedge fund returns are based on the Hedge Fund Research Fund-Weighted Composite Index.

...and with the insurance sector.

6. Contribution to Vulnerability of Distress in the Insurance Sector
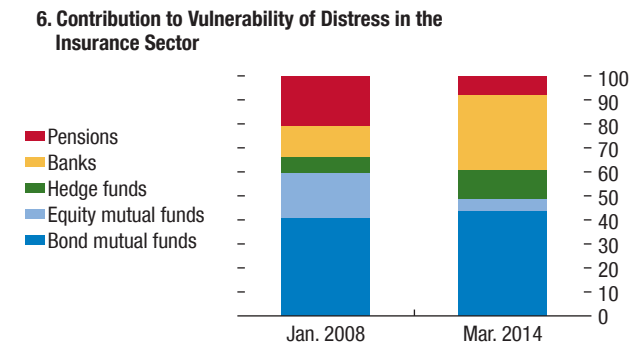
Source: Segoviano and others (forthcoming).

in high-yield credit markets (Figure 1.23, panels 5 and 6).[39] Furthermore, market and liquidity pressures in segments in which mutual funds and ETFs are active may negatively affect the banking and insurance sectors both through direct balance sheet exposures and indirectly through common mark-to-market exposures.

Emerging market economies are more vulnerable to shocks from advanced economies

While some emerging market economies have greater buffers, they now absorb a much larger share of the outward portfolio investment from advanced economies than before the financial crisis (Figure 1.24, panels 1 and 2). Equity portfolio allocations to emerging market economies from advanced economies have increased substantially, from 7 percent of the total stock of advanced economy portfolio investment in 2002 to almost 20 percent in 2012 (latest available survey results). Similarly, fixed-income allocations of advanced economies to emerging market economies grew from 4 percent of the total stock of outward portfolio investment from advanced economy markets in 2002 to almost 10 percent in 2012.[40]

These portfolio allocations to emerging market economies are highly concentrated in a few destination countries (Figure 1.24, panels 4 and 6). Of the $2.4 trillion stock of portfolio allocations to emerging market equities in 2012, about 80 percent was invested in only 12 of the 190 emerging market economies. China was the destination for $980 billion of that stock—more than to any other emerging market economy. Concentration patterns are similar in fixed-income markets, with 12 emerging market economies absorbing $1.2 trillion of the $1.6 trillion stock of advanced economy bond allocations.

Furthermore, the concentration among the advanced economies as the source of portfolio investment is even more striking (see Figure 1.24, panels 3 and 5). As of 2012, four of the world's most financially integrated

countries, Hong Kong SAR, Singapore, the United Kingdom, and the United States, sourced at least half of all equity portfolio investment to the major emerging market economies, and at least a third of the total advanced economy fixed-income portfolio investment. Portfolio allocations from U.S. residents alone account for more than a third of equity portfolio investment in most major emerging market economies. Given the degree of concentration for portfolio allocations, the prospects for tighter monetary policies in the United Kingdom and the United States could have a significant impact on portfolio flows to the largest emerging market economies.

An unintended consequence of these stronger financial links between advanced and emerging market economies in recent years is the increased synchronization of asset price movements and volatilities. Shocks emanating from advanced economies can now more quickly propagate to emerging market economies via the portfolio investment channel and changes in underlying market liquidity. The increasing correlation in recent years between asset prices of emerging market and advanced economies (in both equities and bonds) is consistent with this increased synchronization (Figure 1.25, panel 1). This synchronization is also found in volatility; global low volatility, particularly for emerging market fixed-income assets, can be linked to low volatility in U.S. fixed-income markets, a by-product of unconventional monetary policies. Conversely, when volatility in U.S. Treasuries switches to a higher level, the knock-on impact on the volatility of other asset classes is also very rapid, as shown in the May 2013 risk-off episode (see Annex 1.4).

Normalization of monetary policy could trigger a significant disruption in global markets

A wide variety of possible events could trigger a sharp reversal of risk appetite and increase volatility in credit markets. Such events include major geopolitical flare-ups or sudden shocks to large, systemically important emerging market economies. Perhaps the most plausible trigger for a broad-based market repricing is the expected reduction in monetary accommodation in the United States.

If monetary normalization and interest rate adjustment proceeds smoothly, the impact on asset market volatility may be well contained, leading to a smooth adjustment of asset allocations over time. However, the change in U.S. policy could have repercussions

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[39]Estimates are based on Segoviano and others (forthcoming) and capture how sectoral interlinkages affect the vulnerability of a particular sector to distress in other sectors (distress dependence). The same framework is used in Chapter 2 to estimate the contribution of shadow banking to systemic risk.

[40]This stock of fixed-income allocations from advanced economies was $275 billion, or 4 percent of aggregate emerging market economy nominal GDP in 2002, and grew to $1.65 trillion in 2012, or 6 percent of emerging market GDP. The share of fixed-income allocations has likely increased even more in 2013 and 2014, based on higher-frequency surveys of portfolio flows.

Figure 1.24. Evolution and Concentration of Asset Allocation to Emerging Markets

Portfolio allocations from developed markets to
emerging market bonds have risen...
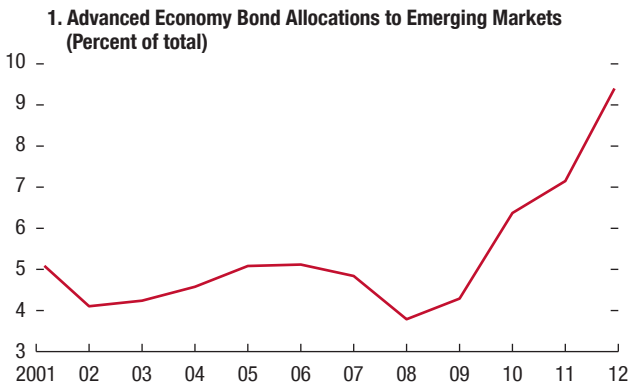
...as have allocations to emerging market equities.

1. Advanced Economy Bond Allocations to Emerging Markets
(Percent of total)

2. Advanced Economy Equity Allocations to Emerging Markets
(Percent of total)

3. Equity Allocations of Advanced Economies to Emerging Market
Economies by Source Advanced Economy, 2012
(Billions of U.S. dollars)

4. Equity Allocations of Advanced Economies to Emerging Market
Economies by Receiving Emerging Market Economy, 2012
(Billions of U.S. dollars)

5. Bond Allocations of Advanced Economies to Emerging Market
Economies by Source Advanced Economy, 2012
(Billions of U.S. dollars)

6. Bond Allocations of Advanced Economies to Emerging Market
Economies by Receiving Emerging Market Economy, 2012
(Billions of U.S. dollars)

Sources: IMF, Coordinated Portfolio Investment Survey; and IMF staff calculations.
Note: In 2012, advanced economies held $2.4 trillion of emerging market equities and $1.6 trillion of emerging market bonds. Portfolio stocks include revaluation effects.

Figure 1.25. Volatility Developments

Advanced economy and emerging market asset prices are increasingly synchronized.

1. Portion of Total Variation Explained by the First Principal Component of Levels of Emerging Market and Advanced Economy Bonds and Equities (Six-month moving window)
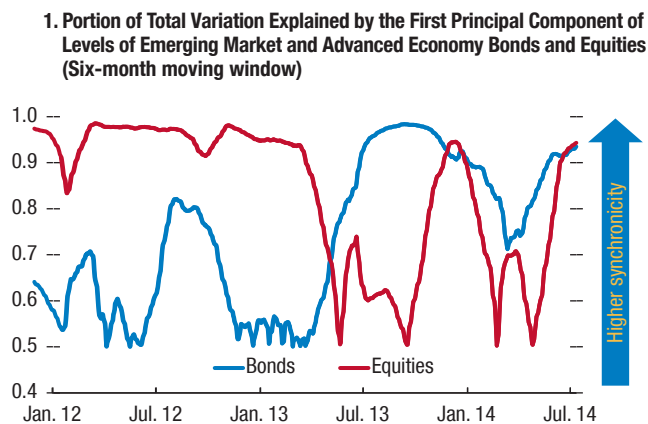
Sources: Bloomberg L.P.; JPMorgan Chase & Co.; and IMF staff calculations.

Volatility has become more sensitive to price declines for sovereign bond and credit markets ...

2. News Impact on Asset Volatility
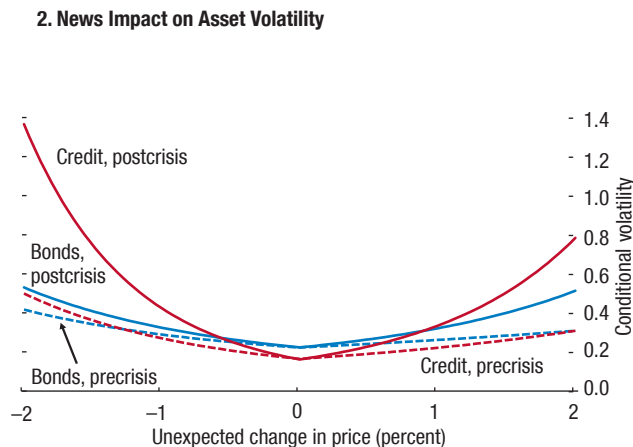
Source: IMF staff calculations.
Note: See Annex 1.4 for more information.

... and volatility increases a lot more for emerging market than for advanced economy assets during periods of high risk aversion.

3. Increase in Volatility between Low and High Volatility Regimes (Multiples)
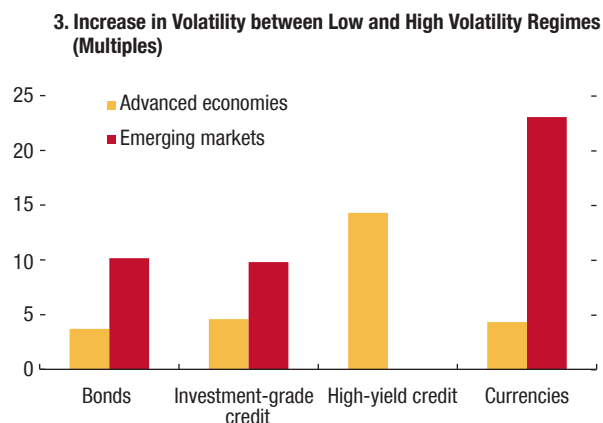
Source: IMF staff calculations.
Note: See Annex 1.4 for more information.

Longer-term implied volatility remains very low.

4. S&P 500 Implied Volatility Term Structure (Daily average)
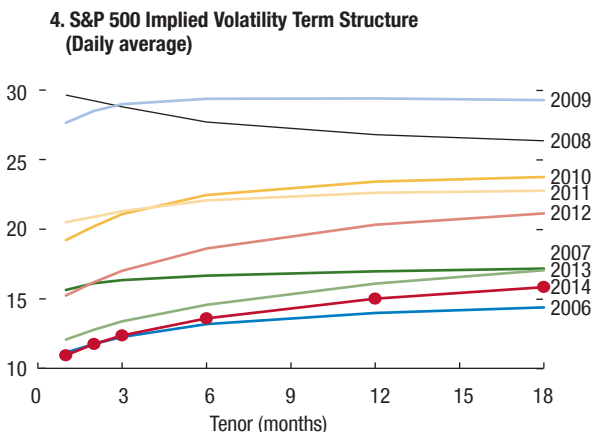
Sources: Bloomberg L.P.; and IMF staff calculations.

extending to all major markets, radiating out from global bond and credit markets. As shown in Annex 1.4, shifts in volatility in U.S. Treasury markets to a high level tend to rapidly drive up volatility in other asset classes to a correspondingly high level. Given the increased role of redemption-prone investors in rate-sensitive credit markets, and the numerous amplifying factors described in this report that could reduce liquidity during times of stress, the monetary policy exit process may be accompanied by significant bouts of increased volatility. Reflecting these developments,

the sensitivity of volatility to price shocks has already increased since the crisis (Figure 1.25, panel 2), especially for credit products, which can lead to faster sell-offs.[41] The increased sensitivity of volatility to negative

[41]For most assets, volatility tends to react differently to positive and negative price shocks, a phenomenon known as the "news impact" effect (Engle and Ng 1993). Assets that generally appreciate during periods of low risk aversion (for example, equities, corporate bonds, emerging market currencies, and commodities) usually have larger volatility shocks from a price decline than from a price increase. This sensitivity is now greater than before the crisis. Annex 1.4 shows the impact of unexpected price shocks on the volatility of

news is also true for emerging market and advanced economy equities (see Annex 1.4).

Under these circumstances, the situation could be pushed to the "bumpy exit" scenario described in the April 2014 GFSR, with global repercussions. The observed increase in volatility between periods of low and high volatility since the crisis began is greater for more leveraged asset classes, namely, emerging market sovereign and corporate bonds, high-yield corporate credit, and emerging market currencies (Figure 1.25, panel 3). Although markets are expecting volatility to rise in the future in several key asset classes (such as bonds, foreign exchange, and equities), the long end of volatility curves remains relatively low in absolute terms. For instance, the volatility term structure for the S&P 500 equity index is now at its lowest level since 2006 (Figure 1.25, panel 4), suggesting that markets may be underpricing the risk of higher volatility in the future.

The result of a rapid switch to a high-volatility scenario would likely be a faster rise in term premiums, widening credit spreads, and a rise in financial volatility that spills over to global markets. For example, an unexpected 100 bps increase in the 10-year term premium, coupled with a 100 bps rise in credit spreads, could rapidly push up U.S. Treasury and speculative-grade bond yields (Figure 1.26, panel 1). This occurrence would bring the term premium closer to historical averages and credit spreads to levels that would be consistent with expected losses under an average default cycle.

A normalization of monetary policy could trigger instability in the fund sector if it results in sustained losses for investors. Monetary policy tightening has been a key trigger for losses in fixed-income markets in the past, resulting in highly persistent outflows as policy normalizes (Figure 1.26, panel 2, shows that three-quarters of losses were during tightening cycles). This reflects a well-known phenomenon that fund flows follow performance (Feroli, Schoenholtz, and Shin 2014). With interest rates low and credit spreads having narrowed as the search for yield intensified, credit market performance is likely to be more driven by changes in the risk-free rate than by underlying fundamental credit developments. Indeed, relative to previous policy cycles, current yields in many sectors of fixed-income markets are unlikely to offset principal losses from a return to more normal interest rates over a short horizon. Thus,

the probability of losses to fixed-income portfolios has increased substantially in the event of a normalization of volatility and a rise in rates (Figure 1.26, panel 3).

To illustrate these potential risks to credit markets, Table 1.3 shows the impact of a rapid market adjustment that causes term premiums in bond markets to revert to historical norms (increasing by 100 bps) and credit risk premiums to normalize (a repricing of credit risk by 100 bps). Such a shock could reduce the market value of global bond portfolios by more than 8 percent, or in excess of $3.8 trillion.[42] If losses on this scale were to materialize over a short time horizon, the ensuing portfolio adjustments and market turmoil could trigger significant disruption in global markets. A 100 bps increase in the yield would lead to a loss of 6.1 percent in the global bond aggregate index and a loss of 6.6 percent in the index for U.S. investment-grade corporate bonds (Table 1.3).

Emerging market economy local-currency bond yields are also sensitive to such increases in U.S. rates and volatility. Panel 4 of Figure 1.26 shows the effect on emerging market local currency government bond yields from a 100 bps increase in the yield of the 10-year U.S. Treasury note, 65 point increase in interest rate volatility, and a switch of the local bond yield volatility state to high from its current low state (see Annex 1.4). For many emerging market economies the yield increase is more than 200 bps, and for most the bulk of the increase comes from the volatility shock. Outflows from redemption-prone investors under this high-volatility scenario could be significant, if previous tightening cycles are any indication.

Table 1.3 shows the potential increase in volatility if markets switch to such a high-volatility state (which would be consistent with a bumpy exit), suggesting that such a scenario could entail significant spikes in volatility for high-yield corporate debt markets and emerging market debt. This analysis suggests that the structural changes in market liquidity, investor behavior, and volatility could provide significant additional challenges to engineering a smooth exit for monetary policy. These challenges would substantially compromise the ability of the financial system to support the recovery.

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[42]The October 2013 GFSR referenced a $2.3 trillion loss from a 100 bps increase in the Barclays Global Bond Aggregate index. Currently the loss from a 100 bps increase in the same index would amount to $2.8 trillion, stemming from the higher interest rate sensitivity (duration has increased from 6.2 to 6.4) and larger market value of the index (increased from $42 trillion to $45 trillion).

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different assets for the periods before and after the global financial crisis, using a standard econometric volatility model.

Figure 1.26. Monetary Policy Normalization

The impact of an accelerated monetary policy normalization on yields can be significant.

1. Impact on U.S. 10-Year Treasury and Speculative-Grade Bond Yields under Shock Scenarios
(Percent)
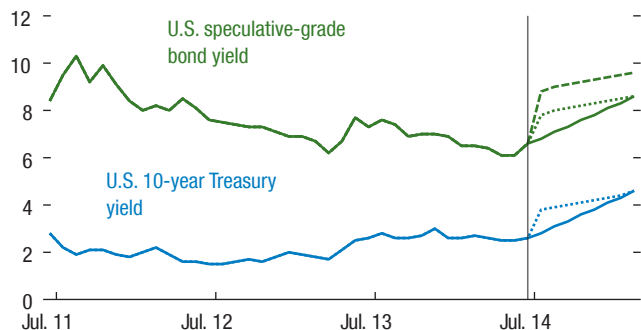
Sources: Federal Reserve; Bloomberg L.P.; and IMF staff calculations.
Note: The dotted lines show a term premium shock. The dashed line shows an additional credit premium shock.

...and the risk of market losses is high.

3. Probability of Quarterly Loss
(Percent)
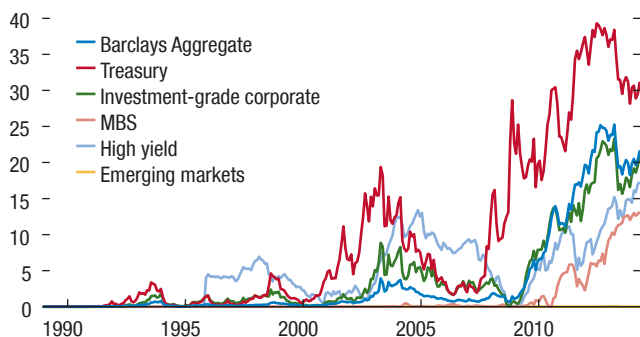
Sources: Barclays; and IMF staff calculations.
Note: MBS = mortgage-backed securities.

Monetary normalization could trigger outflows...

2. Barclays Aggregate Six-Month Flows versus Return
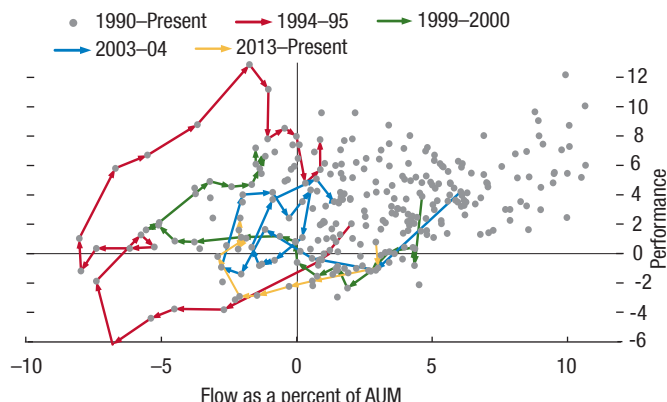
Source: Barclays.
Note: AUM = assets under management.

Sensitivity of emerging market bond yields to volatility is generally higher than rates.

4. Estimated Impact on Increase in Volatility and U.S. Rates on Emerging Market Local-Currency Government Bond Yields (Basis points)
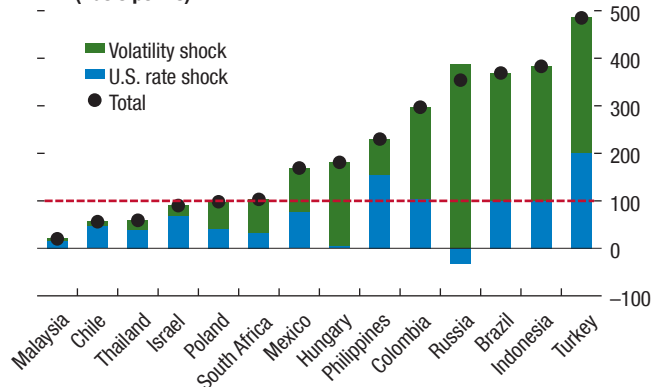
Source: IMF staff calculations.
Note: The figure shows the increase in yield of several emerging market 10-year local currency government bonds (10-year cross-currency swap for Turkey and Russia, 10-year TIIE [Tasa de Interés Interbancaria de Equilibrio] 130x1 swap for Mexico, and five-year DI [depositos interfinanceiros] futures for Brazil) with respect to an increase in the yield of the 10-year U.S. Treasury note by 100 basis points, an increase of the MOVE (Merrill Option Volatility Estimate) index to 125, corresponding to its June 2013 level, and a switch of each country's yield volatility state to high (see Annex 1.4 for more information).

Improving the Balance between Financial and Economic Risk Taking

Monetary accommodation remains critical to support the recovery by encouraging economic risk taking, but prolonged monetary ease is leading to some financial

excesses. Continued financial risk taking and structural changes in credit markets have shifted the locus of financial concerns from the banking system to the shadow banking system—particularly to asset managers—thereby increasing market and liquidity risks. The banking system has been strengthened substantially,

Table 1.3. Major Bond Index Sensitivities

	Global bond aggregate	Advanced economy government bonds	U.S. bond aggregate	U.S. corporate IG	U.S. corporate HY	Agency MBS	Municipal	Global IG	Global HY	Emerging market hard currency	Emerging market local currency[1]	Emerging market corporate
Duration (years)												
Average for last three tightening cycles[2]	5.0	5.4	4.8	5.8	4.7	4.0	7.2	...	4.4	4.0	...	...
August 2014	6.4	7.3	5.6	7.2	4.1	4.8	6.8	6.2	4.1	5.9	5.0	5.2
Breakeven yield change (August 2014; basis points)[3]	45	31	55	57	165	76	65	62	162	91	105	98
Total market value ($ billions)												
Average for last three tightening cycles[2]	13,319	6,705	5,833	1,155	474	1,960	814	...	592	265	...	...
August 2014	45,059	22,196	17,303	4,053	1,336	4,981	1,314	7,699	2,182	1,459	1,890	918
Present-level losses from (percent of total market value)												
100 bps increase	–6.1	–6.7	–5.6	–6.7	–4.1	–5.7	–7.7	–5.9	–4.1	–5.6	–4.7	–5.0
200 bps increase	–11.7	–12.4	–11.2	–12.4	–8.4	–13.2	–17.0	–11.0	–8.3	–10.5	–8.9	–9.4
Present-level market value loss from ($ billions)												
100 bps increase	–2,766	–1,492	–970	–271	–55	–285	–101	–451	–90	–82	–89	–46
200 bps increase	–5,267	–2,750	–1,938	–501	–113	–659	–224	–843	–180	–154	–169	–86
Losses from shock scenario to term (100 bps) and credit risk (additional 100 bps) premiums ($3.8 trillion)	...	–1,492	...	...	...	–659	–224	–843	–180	–154	–169	–86
Increase in volatility from low to high state[4] (multiples)	...	...	2.8	5.3	11.4	...	...	...	...	7.2	13.1	...

Sources: Barclays Capital; Bloomberg L.P.; and IMF staff calculations.

[1]Data are unavailable before July 2008.

[2]Cycles include 1994–95, 1999–2000, 2004–06. For municipal, U.S. corporate HY, and emerging market hard currency, only the latter two cycles are used.

[3]The breakeven yield change is the maximum increase in the bond index yield before the portfolio has more losses than the annualized coupon.

[4]See Annex 1.4 for more information.

Note: bps = basis points; HY = high yield; IG = investment grade; MBS = mortgage-backed security.

as capital buffers have increased and regulation has reduced leverage. But markets are now more significant providers of credit, and their responses to shocks are likely to be more synchronized and rapid across advanced and emerging market economies, against a backdrop of structurally weaker underlying market liquidity. Policy recommendations must rely on two pillars: (1) strengthening the credit transmission channels by improving the monetary policy trade-off between financial and economic risk; and (2) using macroprudential policies to contain new and evolving financial stability risks, including growing market and liquidity risks emerging from the shadow banking system.[43]

Is easy money increasing financial stability risks?

This chapter has focused on the trade-off between the benefits of monetary accommodation in support of economic activity and balance sheet repair, and the downside risks associated with financial excesses that could, if they become systemic, pose risks to the real economy. The chapter asks, is easy money growth increasing financial stability risks?

The answer is different in each economic region, owing to differences in the stage of economic recovery, the buildup of financial excesses, and the structure of the financial system (which determines the vulnerability to an unwinding of those excesses).

The United States and the United Kingdom are approaching economic liftoff as confidence in the recovery has progressed, and these economies are closest to exiting monetary accommodation. Growing signs of financial excesses are emerging in the United States, as asset price appreciation, spread compression, and low volatility have reached levels that diverge from fundamentals, potentially complicating the timing of exit and posing risks for a bumpy exit. The broad-based shift of portfolios into fixed-income assets and an extension of duration well above historical norms could magnify the impact of these financial excesses, with ramifications for global asset markets.

Particular focus in this report has been on the high-yield segment. Some argue that the market is too small to be systemic—not unlike commentary in 2007 surrounding the U.S. subprime mortgage segment. We argue that the high-yield segment is systemic for several reasons. First, high-yield and

other illiquid asset holdings in fixed-income mutual funds that may be prone to run risks are growing. Second, liquidity risks are being underpriced, owing to the prolonged search for yield and structural and regulatory changes. Third, the risk of a volatile repricing and portfolio rebalancing is heightened by credit spreads that are overly compressed and do not compensate adequately for duration or default risk. Finally, financial links between advanced and emerging market economies are now stronger, exposing emerging market economies to shocks emanating from advanced economies.

In the euro area and Japan, in contrast, the need for monetary accommodation to support growth is much higher, while the risks associated with financial excesses are lower. In the euro area, the high-yield market is small and credit intermediation is largely bank based, so systemic risks are lower. Indeed, current economic data argue for more not less monetary accommodation. In Japan, the Bank of Japan correctly remains on the path of monetary accommodation.

What policies can improve the balance between financial and economic risk taking?

The policy challenge is to remove impediments to economic risk taking and strengthen monetary and credit transmission to the real economy. Efforts in this direction must go hand in hand with structural reforms in product and labor markets to increase the return on capital and support a sustainable recovery.

In Europe, Japan, and the United States, the strengthening of bank balance sheets, as discussed in previous GFSRs, now needs to be reinforced by moving to new business models that strengthen the transmission of monetary policy and encourage the efficient allocation of credit. Ensuring that nonviable banks exit in an orderly way would help relieve competitive pressures in a context of excess capacity and allow viable banks to establish sustainable business models by repricing and reallocating their activities. In this process, regulators can encourage banks to abandon old practices of cross-subsidizing products and move to a more transparent pricing mechanism in which products are priced along product lines and reflect the underlying economic risks and regulatory requirements.

Looking ahead, authorities need to gain a comprehensive view of the interplay of the different regulations and potential implications for the provision of credit

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[43]A more granular discussion of overall IMF policy advice is provided in the Managing Director's *Global Policy Agenda*.

and financial stability. Banks must operate in an environment in which they can adjust their business models, regain profitability without taking excessive risk, and support the economy through lending, and in which a new balance between bank and capital market financing can be found. Realization of this new environment may require recalibrating some regulations, supporting and monitoring the development of safe nonbank activities, and putting in place safety nets to deal with potential adverse macrofinancial developments.

Furthermore, more efforts, particularly in Europe, will be needed to encourage greater market-based access, including through safe securitization. In this context, the recent announcement by the ECB to purchase asset-backed securities and covered bonds is a welcome step in the right direction, and providing targeted fiscal support (such as guarantees by pan-European agencies) would further encourage this type of market-based funding. Removing impediments to nonbank participation in credit origination will require solid regulatory frameworks for nonbanks. Strengthening the recovery and bankruptcy frameworks will help address heavy debt burdens in the corporate sector, as discussed in previous GFSRs.

Macroprudential policies to safeguard financial stability

Against this backdrop, and in addition to having in place adequate microprudential regulations, it is important to deploy a suite of macroprudential tools (MPTs) aimed at mitigating the financial stability risks identified in this chapter. These tools may be targeted at particular sectors in which financial excesses are apparent, such as the asset management segments, and are equally relevant for advanced and emerging market economies.

Timely deployment of well-designed MPTs will not just reduce the need to tighten interest rates earlier than warranted by the needs of the real economy but will also make systemic institutions more resilient, help contain procyclical asset price and credit dynamics, and cushion the consequences of liquidity squeezes when volatility returns. The conduct of macroprudential policy is far from easy. Implementation is still in its infancy, and its effectiveness is not yet necessarily well understood. But in a world in which financial stability risks are likely to continue to build if left unaddressed, MPTs should prove to be invaluable complements to conventional policy tools in building the resilience of the financial system.

The effective deployment of MPTs entails three steps to monitor, prepare, and act against the buildup of vulnerabilities:

- Policymakers need the information flow and data to adequately *monitor* and assess where financial stability risks are building.
- Policymakers need to *prepare* the suite of MPTs that may need to be deployed on the basis of the information obtained from the monitoring step. This preparation may entail building internal expertise in assessing credit, collateral, and liquidity risks across a number of markets, and having the legal and regulatory powers to implement and use MPTs. Where these tools are associated with bank capital, liquidity, and credit risk requirements, bank regulators are likely to already have such powers, but may need statutory authority to use them purely for macroprudential purposes. In the case of MPTs for nonbanks, however, the regulatory framework may need to be put in place or extended to tackle the emerging risks. Greater coordination between the macroprudential authorities and market and securities regulators may be needed to ensure a systemic orientation in prudential supervision. An adequate governance mechanism should give macroprudential authorities the ability to override objections from securities regulators that macroprudential measures are not warranted on microprudential grounds. But however carefully designed and skillfully deployed, it is unrealistic to expect macroprudential policy to address underlying mispricing that arises from significant policy distortions elsewhere.[44]
- Policymakers need the courage to *act*. Use of MPTs is often highly unpopular with practitioners (for limiting market growth and activity), customers (for raising the cost of credit or limiting its availability), and politicians (for dampening asset values or economic growth). Effective and balanced communication of the measures undertaken will also be needed. Macroprudential policymakers therefore need to have not only instrument independence but also an explicit mandate and requirement to act when needed, in close dialogue with monetary policymakers. Similarly, courage will be needed on the downswing when MPTs may need to be relaxed for

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[44]For instance, tax advantages given to mortgages and property ownership in many countries or a structural shortage of housing supply in others will contribute to elevated house prices. If such distortions are not addressed at their source, MPTs will not easily or sensibly achieve their objectives.

countercyclical purposes even if backward-looking headline indicators of risks may appear to be rising.

Following this monitor, prepare, and act framework, Table 1.4 summarizes key macroprudential policy recommendations to address the risks identified in this chapter and offers recent country examples for each broad category of policy objectives. See also Chapter 2 for policy recommendations to address risks emerging from shadow banking developments.

Macroprudential policies can improve the trade-off between financial and economic risk taking and indeed are a first line of defense. However, they cannot eliminate the trade-off. Macroprudential policy cannot be fully relied on to prevent systemwide financial excesses, and prolonged use could lead to circumvention. In this context, monetary policy may need to adjust to address a systemic buildup of financial risks, especially when countries' cyclical positions improve. Adjusting correctly, however, is a complex exercise that requires careful analysis and must take into account country-specific realities.

Improving the resilience of market structures

This report discusses potential vulnerabilities in the asset management sector to liquidity shocks with wider ramifications for credit markets. A central concern is the liquidity risk arising from the mismatch between the liquidity promised to fund owners in good times and the cost of illiquidity when meeting redemptions in times of stress. The policy remedy should seek to address this mismatch, by removing incentives of asset owners to run, enhancing the accuracy of NAVs, and improving the liquidity and transparency of secondary markets, specifically for longer-term debt markets.

Regulators should consider a granular approach in judging the relative liquidity of specific asset classes compared with the redemption terms offered by funds. For example, in markets with frequently observed transactions and substantial depth, such as advanced economy money markets and sovereign debt, the current practice of striking a daily NAV and redemption terms may be appropriate. In less frequently traded markets in which bid-ask spreads are large, lower frequency redemption terms are more appropriate.

Redemption fees that benefit remaining shareholders are another option, but the calibration of such fees is challenging and, to the extent possible, should be time invariant to discourage asset flight. Similarly, gates to limit redemptions appear to solve some incentive prob-

lems, but may simply accelerate redemptions ahead of potential imposition.

Improving the accuracy of NAV calculations should also reduce stability risks associated with commingled investment vehicles. Initiatives to improve transparency, such as expanding trade reporting initiatives to all global fixed-income sectors, should help alleviate the opacity of secondary markets. If transactions are infrequent, the shift to less frequent redemption terms and NAV pricing should reduce the reliance on interpolated prices of similar securities. Regulators and industry bodies should codify best practices globally to ensure that pricing standards are uniform across jurisdictions.

Finally, reviewing liquidity and investment policy requirements for mutual funds invested in less liquid assets would help mitigate liquidity mismatches. This requirement may include limits on investments in illiquid assets, minimum liquidity buffers, and greater scrutiny of the use of derivatives and the embedded leverage they carry. Increased liquidity-risk-management requirements, such as those proposed by the International Organization of Securities Commissions for money market funds, may be helpful to improve the resilience of funds to liquidity volatility. Moreover, greater emphasis should be placed on asset managers' communication with investors about the risks inherent in mutual funds invested in certain markets that may be subject to greater liquidity risks and volatility, particularly during stress periods.

Given the complexity of these issues, it is crucial that regulators pursue a harmonized effort to examine the universe of mutual funds when considering prudential policies and develop best practices for addressing redemption risks as well as the supervision of liquidity and pricing of illiquid securities.

Managing market liquidity risks and vulnerabilities in advanced economies...

Policymakers and markets need to prepare for structural higher market volatility. Doing so requires strengthening the system's ability to absorb sudden portfolio adjustments, as well as addressing structural liquidity weaknesses and vulnerabilities.

Advanced economies with financial markets at risk for runs and fire sales may need to put in place mechanisms to unwind funds should they come under substantial pressure that threatens wider financial stability. As discussed in the October 2013 GFSR, in the event of adverse shocks, contingency backstops may be

Table 1.4. Key Macroprudential Policy Recommendations and Recent Country Examples

Objectives	Monitor	Prepare	Act	Recent country examples
Contain risks in nonbank institutions arising from market illiquidity	• Strengthen capacity to assess and monitor credit developments at the sectoral and systemwide level. • Monitor holdings of mutual funds and exchange-traded funds and their linkages with the rest of the financial system. • Strengthen the monitoring capacity of policymakers by improving the accuracy of net asset value (NAV) fund valuations and improve pricing transparency of secondary markets. • Introduce mandatory stress tests on cash and liquidity buffers held by funds, particularly high-yield and less liquid funds. • Monitor the rise in embedded leverage in nonbank institutions through securities lending and the use of derivatives.	• Ensure effective powers to designate large asset management companies as systemically important and explore the need to extend designation powers to cover products that may be a source of systemic risk. • Ensure effective governance and inter-agency coordination arrangements to identify and address possible risk shifting from banks to nonbanks. • Strengthen communication to investors about the underlying risk of instruments, including in stress periods.	• Introduce liquidity requirements on money market funds, including minimum liquidity buffers, investment concentration limits, leverage ratios, margin requirements on securities lending and derivative transactions, and tougher liquidity risk management guidelines (for example, euro area, United Kingdom, United States). • Apply redemption fees or liquidity gates, either at all times or set based on triggers or regulatory intervention, recognizing that trigger-based instruments can lead to pre-emptive runs.	**Canada:** Introduced rules to reduce counterparty credit risks for financial institutions dealing in derivatives (effective January 2014). **European Union:** Proposed new rules to make money market funds more resilient, including a 3 percent cash buffer for constant NAV money market funds (September 2013). **United States:** Imposed floating NAV requirement for institutional prime money market funds and introduced the ability for funds to impose new fees and "gates" to mitigate runs on a fund (July 2014), effective after a two-year transitional period.
Strengthen the resilience of the system to the eventual normalization of interest rates and contain excessive leverage in the household, corporate, and banking sectors	• Monitor and contain high household and corporate leverage (particularly in the euro area and emerging market economies), including vulnerability to foreign exchange (FX), maturity, and duration risks. • Conduct annual macroprudential stress tests to assess banks' shock-absorption capacity for identified risks. • Monitor and identify unsustainably high credit intermediation growth, including in the shadow banking system (for example, China).	*To strengthen the resilience of the system to corporate defaults:* • Ensure effective corporate insolvency regimes. • Provide ability to tighten risk weights, provisions, and capital requirements on banks' sectoral exposures. *To strengthen the resilience of the system to excessive household indebtedness:* • Put in place ability to tighten loan-to-value (LTV) and debt-to-income (DTI) requirements. *To strengthen the resilience of banks to shocks:* • Ensure strict capital and provisioning requirements, rapid loan loss recognition, and risk-based loan pricing. • Ensure adequate public backstops to restructure weak banks and resolve unviable banks.	• Finish bank balance sheet cleanup, especially in the euro area, and promote orderly exit of banks with nonviable business models. • Where there are concerns about excessive mortgage debt, increase resilience of borrowers to shocks by ensuring that LTV and DTI requirements are sufficiently stringent (for example, Netherlands, Sweden, Switzerland, United Kingdom) and remove policy distortions (for example, tax incentives, structural housing supply shortages). • Hold large banks to capital requirements above the regulatory minimums, including under stress scenarios (similar to the European Central Bank Comprehensive Assessment and the U.S. Comprehensive Capital Analysis and Review [CCAR] and Dodd-Frank Act stress testing). • In China, contain high domestic credit growth, partly intermediated by the large shadow banking sector.	**China:** Raised bank provisioning requirements and risk weights on local-government-financing vehicles, tightened regulation of nonstandard credit products, and restricted off-balance-sheet funding. **Euro Area:** Introduced the Comprehensive Assessment exercise (asset quality review and supervisory stress test) aimed at increasing transparency of bank balance sheets (November 2013–October 2014). **Indonesia:** Imposed lower LTV ratio on second and third mortgages to curb loan growth and property speculation (September 2013). **Netherlands:** Imposed 1 percentage point annual reduction in LTV ratio cap on new mortgage loans to 100 percent by 2018 (2013), introduced systemic capital buffer requirement (1 to 3 percent of risk-weighted assets) on four largest banks to be phased in between 2016 and 2019 (April 2014). **Russia:** To increase bank loss-absorbing buffers, raised risk weights for consumer loans and provisioning requirements for uncollateralized retail loans (September 2013). **Sweden:** Raised risk weight floors on mortgage assets to 25 percent from 15 percent (effective fall 2014), proposed countercyclical buffer for all banks, and introduced additional capital buffers for four largest banks (3 percent common equity Tier 1 systemic capital buffer and a 2 percent Pillar 2 capital buffer). **Turkey:** To contain growth of household indebtedness, introduced credit card and installment limits, increased provisioning rates and risk weights for consumer loans after 2011. **United States:** Introduced regular CCAR and Dodd-Frank Act stress testing (2011–14) and supplementary leverage ratio for the largest U.S. banks (2014).

Table 1.4. Key Macroprudential Policy Recommendations and Recent Country Examples (continued)

Objectives	Monitor	Prepare	Act	Recent country examples
Strengthen the resilience to asset price shocks and contain excessive credit mispricing	• Monitor financial cycles, assess asset price developments, and identify deterioration in credit underwriting standards. • Collect more comprehensive data on flows, including through over-the-counter markets	• Put in place counter-cyclical buffers and the power to activate them effectively when needed. • Ensure that banks apply risk-based pricing to their products and assess benefits and costs of moving to product-based transfer pricing mechanisms for greater transparency in pricing products.	• Where housing dynamics are strong, contain unsustainable increases in household debt (for example, Sweden), ensure that LTV and DTI requirements are sufficiently stringent (for example, Switzerland, United Kingdom), and remove policy distortions, such as tax incentives (for example, Switzerland) and structural housing supply shortages. • Take measures to increase household resilience to interest rate shocks, such as by introducing heightened DTI requirements on interest-only loans (for example, Hong Kong SAR, Israel). • Encourage safe securitization and remove other roadblocks that prevent provision of sustainable credit by adequately supervised and regulated nonbanks.	**Belgium:** 5 percentage point rise in risk weight floors on residential mortgages for internal ratings model banks (December 2013). **Canada:** Imposed 25-year cap on amortization period for insured mortgages with high LTV loans, 5 percent minimum down payment for new mortgages and 20 percent down payment for non-owner-occupied properties and mortgage refinancing, and a 44 percent cap on total debt service ratios; tightened LTV ratios on refinancing loans and loans to non-owner-occupied homes; and withdrew government insurance backing on home-secured lines of credit (2008–13). **Hong Kong SAR:** To mitigate real estate overheating, applied a 10 percentage point lower maximum LTV on all mortgages; required stressed debt service ratio calculation based on a 10 percentage point lower LTV for real estate properties and a 300 basis point higher mortgage rate, and introduced a 15 percent risk-weight floor on new residential mortgages secured on Hong Kong properties (February 2013). **Israel:** Tightened mortgage capital and provisioning requirements; imposed a cap on repayment period (30 years), floating component of mortgages (two-thirds of loan), and DSI ratio on new loans (50 percent); added capital surcharges on mortgages with DSI ratio between 40 and 50 percent (August 2013). **Korea:** Ongoing adjustments of LTV limits (including recent relaxation in July 2014) and DTI ratios. **New Zealand:** Imposed 10 percent cap on share of new housing loans with LTV ratio above 80 percent (October 2013). **Singapore:** Tightened LTV ratios depending on the number of existing loans, the tenor of the loan, and the age of the borrower and adjusted DTI limits on bank mortgages. **Switzerland:** Activated and subsequently increased countercyclical capital buffer targeting residential property mortgages (2013–14). **United Kingdom:** Recommended that supervisors (1) apply a 15 percent cap for each lender on the share of new residential mortgages with a loan-to-income ratio at or greater than 4.5; and (2) ensure mortgage lenders include a 300 basis point stress test when assessing affordability (June 2014). **United States:** Enhanced monitoring of leveraged loan exposures and updated supervisory guidance on leveraged lending (2013–14).
Strengthen resilience of financial systems to global wholesale funding shocks and exposures to exchange rate shocks	• Monitor the share of noncore funding (short-term, FX, wholesale) in total liabilities. • Ensure adequate reporting and monitor private sector exposures and funding mismatches in foreign currencies. • Close data gaps in bank and nonbank financial flows.	• Intensify supervisory scrutiny and step up communication to inform of potential risks. • Tighten capital requirements for banks on exposures of households and corporations, particularly when leveraged in foreign currency. • Encourage banks to set up committed borrowing and swap lines with other major domestic and foreign banks to increase their liquidity-shock-absorption capacity.	• Bolster defenses against sudden reversal of foreign capital flows in context of U.S. monetary policy exit (for example, maturity lengthening of bank-based FX funding, including through net-stable-funding-ratio (NSFR)–type measures, as in New Zealand, or levies, as in Korea). • Maintain bilateral and multilateral swap line arrangements to ensure access to foreign currency funding in times of stress. • For emerging markets, be ready to access multilateral resources such as IMF facilities in case of need.	**Hungary:** A ban was imposed on FX mortgage lending in August 2010, which was lifted in mid-2011. **Korea:** To contain short-term FX funding, implemented a levy on noncore FX liabilities. **New Zealand:** To contain bank reliance on wholesale funding, tightened by 10 percentage points to 75 percent the core funding ratio (similar to a Basel-type NSFR measure) introduced in 2010. **Serbia:** A higher risk weight was applied to FX loans to unhedged borrowers in 2008 (125 percent compared with 50 percent to local-currency mortgage loans). **Sweden:** Implemented a Basel-based liquidity coverage ratio requirement for the largest credit institutions and financial groups (January 2013).

Sources: IMF staff based on Article IV reports, Financial System Stability Assessments, and information from country authorities.

needed to address the risk of fire sales in some market segments and to manage orderly unwinding or liquidation. In a severe crisis scenario, a mechanism (such as a resolution authority) that can manage an orderly and appropriately timed unwinding or liquidation of funds and assets may be warranted. Bilateral and multilateral swap line arrangements could reduce excess volatility by ensuring access to foreign currency funding in times of stress, and multilateral resources such as IMF facilities could provide additional buffers.

…and in emerging market economies

In the event of a bumpy exit from unconventional monetary policy and its normalization, the principal volatility transmission channel is likely to be through liquidity strains on sovereigns and financial institutions associated with capital outflows. In light of the recent slowdown in economic activity in many emerging market economies, policymakers should take preemptive measures to safeguard financial stability in the event of a further deterioration in the corporate sector, including by strengthening provisioning practices and loss-absorbing buffers in banks and enforcing proper and timely reporting of hidden corporate liabilities and funding mismatches in foreign currencies. Banks with excessive reliance on wholesale funding or on potentially volatile large corporate deposits must remain vigilant in mitigating pressures associated with liquidity risks, including through net-stable-funding-ratio-type

measures, higher reserve requirements, or levies on volatile short-term funding.

In the event of significant capital outflows, some countries may need to focus on ensuring orderly market functioning. Possible actions include using cash balances, lowering the supply of long-term debt, and conducting switching auctions to temporarily reduce supply on the long end of yield curves. Bilateral and multilateral swap line agreements could reduce excess volatility by ensuring access to foreign currency funding in times of stress, and close networking with foreign investors and ongoing communication with markets (for example, on government action plans) could help maintain investor confidence and encourage inflows. Multilateral resources such as IMF facilities could provide additional buffers. Keeping emerging market economies resilient calls for an increased focus on domestic vulnerabilities, as discussed in previous GFSRs.

In China, policymakers should carefully monitor and contain the rapid growth of corporate leverage, particularly in the real estate and construction sectors and in state-owned enterprises. Rebalancing credit allocation toward more productive areas of the economy requires moving to more efficient risk pricing, a gradual rolling back of guarantees, and the default of nonviable firms. Building on current policy efforts to contain financial stability risks in the nonbank financial system is a top priority, as noted in the April 2014 GFSR.

Annex 1.1. Asset Valuations and Sovereign Spreads[45]

An in-depth look at sovereign spreads

To further examine the considerable compression in sovereign bond spreads, econometric models were estimated using sovereign spreads for France, Italy, and Spain. The models aim to identify how far the spreads are from plausible medium-term equilibrium relationships ("fair values"). Previous related work, including the October 2013 GFSR, suggests that equilibrium sovereign spreads are driven by (1) the economy's fiscal position, captured by the debt-to-GDP ratio (Poghosyan 2012); (2) price-to-book ratios or Moody's expected default frequencies (Sun, Munves, and Hamilton 2012) in the banking sector (see also Zoli [2013] and the October 2013 GFSR); (3) the state of the business cycle, which influences the path of fiscal revenues, approximated by the industrial production index (log changes); (4) inflation, which, given its persistence, influences expectations of inflation and the path of debt (ease of deleveraging; see also IMF [2014a]); and (5) a measure of external imbalances (TARGET2 or real effective exchange rates), which became focal points of attention during the crisis. In addition, money market rates, a proxy for global market risk and liquidity (the VIX index), and a measure for flight to quality enter the model exogenously (see the October 2013 GFSR).

Methodology

Autoregressive specifications, namely vector error correction models (VECMs), were estimated on monthly data since 2001 for France, Italy, and Spain (130–140 observations). The VECM specification rationalizes spreads as driven by the adjustment toward equilibrium, determined by the factors listed above.[46] In this configuration, each cointegrated variable has a corresponding autoregressive equation, and each variable is treated symmetrically as endogenous. Hence, the first two equations of the six-equation baseline VECM

[45]The authors of this annex are Martin Čihák and Vladimir Pillonca.

[46]Following the Johansen methodology, trace and maximum eigenvalue tests were performed alongside diagnostic testing; the specification search was general to specific. Reduced-form models aim to capture the dynamics of the data-generating process; parameter values have no deep causal or structural interpretation.

system for economy j, corresponding to the spread and debt dynamics, can be written as follows:

$$
\begin{aligned}
s10^j_t = \; & \alpha^j_{11}[s10^j_{t-1} - \beta_1 \, \Delta \, Dbty^j_{t-1} - \beta_2 \, pbk^j_{t-1} \\
& - \beta_3 \, \Delta ip^j_{t-1} - \beta_4 \, \mathrm{infl}^j_{t-1} - \beta_5 \, reer^j_{t-1} - \upsilon^j_{11}] \\
& + \gamma_{11}\Delta \, s10^j_{t-1} + \gamma_{12}\Delta_2 Dbty^j_{t-1} + \gamma_{13}\Delta pbk^j_{t-1} \\
& + \gamma_{14}\Delta_2 \, ip^j_{t-1} + \gamma_{15}\Delta \mathrm{infl}^j_{t-1} + \gamma_{16}\Delta reer^j_{t-1} \\
& + \chi_{11}\sigma_{t-i} + \varepsilon_1 \qquad\qquad\qquad (1.1)
\end{aligned}
$$

$$
\begin{aligned}
\Delta Dbty^j_{t-1} = \; & \alpha^j_{11}[s10^j_{t-1} - \beta_1 \, \Delta \, Dbty^j_{t-1} - \beta_2 \, pbk^j_{t-1} \\
& - \beta_3 \, \Delta ip^j_{t-1} - \beta_4 \, \mathrm{infl}^j_{t-1} - \beta_5 \, reer^j_{t-1} \\
& - \upsilon^j_{11}] + \gamma_{21}\Delta \, s10^j_{t-1} + \gamma_{22}\Delta_2 Dbty^j_{t-1} \\
& + \gamma_{23}\Delta pbk^j_{t-1} + \gamma_{24}\Delta_2 \, ip^j_{t-1} + \gamma_{25}\Delta \mathrm{infl}^j_{t-1} \\
& + \gamma_{26}\Delta reer^j_{t-1} + \chi_{21}\sigma_{t-i} + \varepsilon_2 \qquad (1.2)
\end{aligned}
$$

in which $s10^j_t$ is the 10-year sovereign yield spread against the German bund; $\Delta Dbty_{t-1}$ denotes changes in the debt-to-GDP ratio; pbk^j_{t-1} are price-to-book ratios in the banking sector; Δip^j_{t-1} captures the business cycle, as approximated by (log) changes in the industrial production index; infl^j_{t-1} is the annual rate of inflation; and $reer^j_{t-1}$ is the real effective exchange rate.

The common cointegrating vector shared by the system's six equations is given by equation (1.3):

$$
\begin{aligned}
s10^j_t = \; & \upsilon^j_{11} + \beta_1 \, \Delta \, Dbty^j_{t-1} + \beta_2 \, pbk^j_{t-1} + \beta_3 \, \Delta ip^j_{t-1} \\
& + \beta_4 \, \mathrm{infl}^j_{t-1} + \beta_5 \, reer^j_{t-1} + \xi_{t-1}, \qquad (1.3)
\end{aligned}
$$

so that when $\xi_{t-1} = 0$, spreads are at their equilibrium level, captured by the horizontal axis in the panels on the left side of Figure 1.29. Because the focus of the exercise is the behavior of sovereign spreads, equation 1.1 is the most relevant. The beta coefficients associated with the model's cointegrating relationship are the same for each equation in the system because all the endogenous variables share the same cointegrating equilibrium. The speed of adjustment toward equilibrium is captured by the model's factor loadings, denoted α_{ij}. In addition, the model incorporates lagged rates of change for each endogenous variable. The constants υ_{ij} and the error terms ε_i complete the specification. The vector σ_{t-i} includes exogenous variables such as money market rates and Germany's asset swap spread (a proxy for flight-to-quality episodes).

The cointegrating equilibrium level is used as the indicator of fair value. The overvaluation ranges shown in Figure 1.29 reflect variation arising from the use of alternative specifications (such as the specification using Moody's expected default frequencies rather than price-to-book ratios). The cointegrating equilibrium spread was filtered using the asymmetric Christiano-Fitzgerald

Figure 1.27. Stretched Valuations across Asset Classes (z–scores)

1. Sovereign Bonds: Market–Implied Term Premiums

Sources: Consensus Economics; and IMF staff calculations.
Note: The z-scores for the implied bond term premium across 15 advanced economies and 9 emerging markets. The implied ("Wicksellian") bond term premium is the 5-year-5-year sovereign bond yield in local currency terms, minus the 5-year-5-year surveybased expectation of real GDP growth and inflation. See Jones (2014).

2. Investment-Grade and High-Yield Credit Spreads

Source: IMF staff calculations.
Note: Z-scores relative to the historical distribution of the respective option-adjusted spreads. EU = European Union.

3. Equities: Market–Implied Required Return
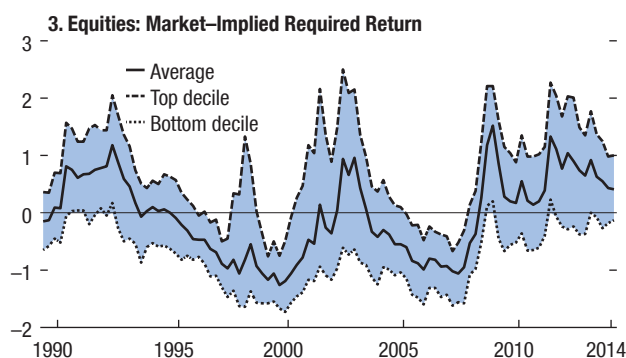
Sources: Consensus Economics; and IMF staff calculations.
Note: The z-scores for the implied required return on equity across 15 advanced economies and 10 emerging markets. The implied equity discount rate is the average of three model estimates backed out of current prices (a running yield based on cyclically-adjusted earnings, a single-stage dividend discount model, and a multi-stage dividend discount model). See Jones (forthcoming).

4. House Prices: Ratio to Rents
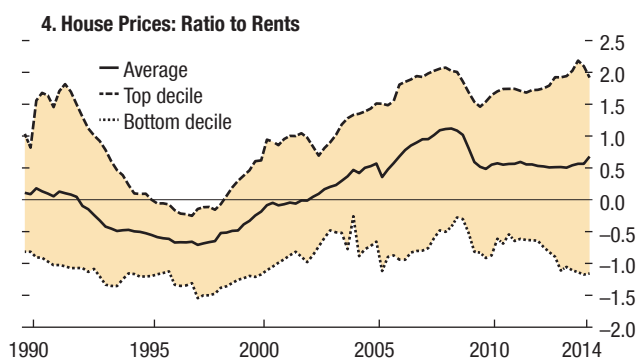
Sources: Haver Analytics; Organisation for Economic Co-operation and Development data; and IMF staff calculations based on Global Property Guide.
Note: Z-scores calculated over the respective historical distribution of the house price-to-rent ratio for each jurisdiction using data going back to 1970

band pass (Christiano and Fitzgerald 2003) to smooth the trajectory, reduce its volatility, and control for outliers (a moving average yields similar results).

Results

It is possible that progress in fiscal frameworks at the European level has offset the prolonged deterioration in public finances, and that the EU Bank Recovery and Resolution Directive has helped reassure investors about the destabilizing nexus between contingent liabilities in the financial sector and government finances. The European Central Bank's (ECB's) forthcoming Asset Quality Review may raise confidence about

banks' progress toward balance sheet transparency and capital adequacy. Nonetheless, there is no hard evidence that market participants have revised downward their medium-term forecasts of public debt ratios in view of lower future contingent liabilities. According to the IMF's October 2014 *Fiscal Monitor* projections, general government debt ratios in the three countries are poised to increase further in 2014 and remain high thereafter. Despite some improvements, imbalances, such as TARGET2 levels and real exchange rates, remain at elevated levels and still exert upward pressure on fair value spreads.

The estimated valuation paths appear historically plausible and consistent with other approaches (such

Figure 1.28. Cross-Country Distribution

1. Sovereign Bonds: Market-Implied Term Premiums
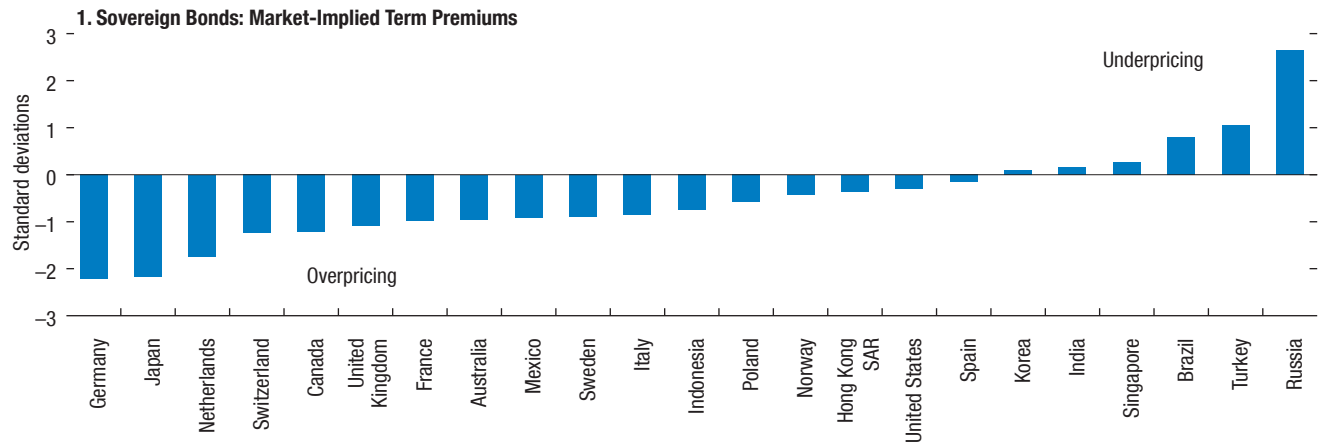
Source: IMF staff calculations.
Note: The implied bond term premium is defined as 5-year-5-year rates (local currency terms) minus five-year-five-year survey-based expectations for real GDP growth and inflation. It is expressed as the number of standard deviations from the country-specific long-term average. Data start in 1989 (1953 for the United States). See Jones (forthcoming).

2. Equities: Market-Implied Required Return
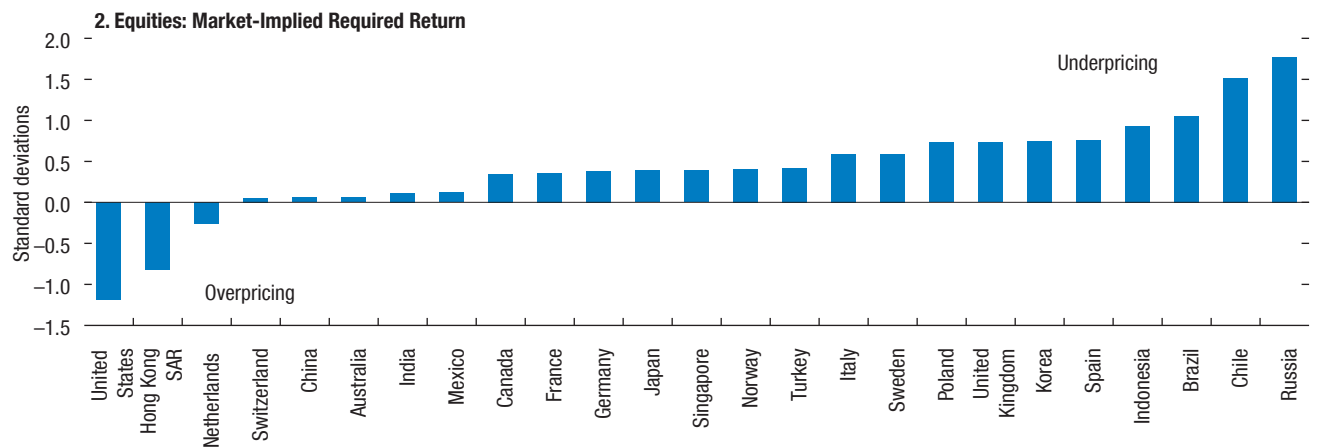
Source: IMF staff calculations.
Note: The implied real equity yield is the cost of capital for equities (or the required return to hold stocks), expressed as the number of standard deviations from the country-specific long-term average. Data start in 1989 (1953 for the United States). See Jones (2014).

3. House Price Fundamentals
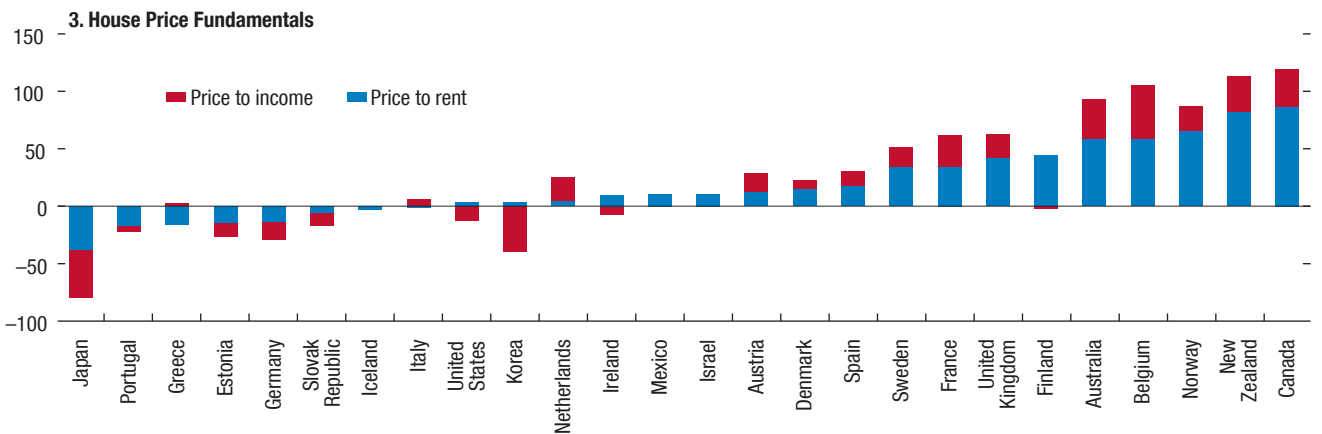
Source: IMF staff calculations based on Organisation for Economic Co-operation and Development data.
Note: Figure shows 2014:Q1, or latest, deviation from historical average, in percent.

Figure 1.29. Analysis of Selected European Spreads
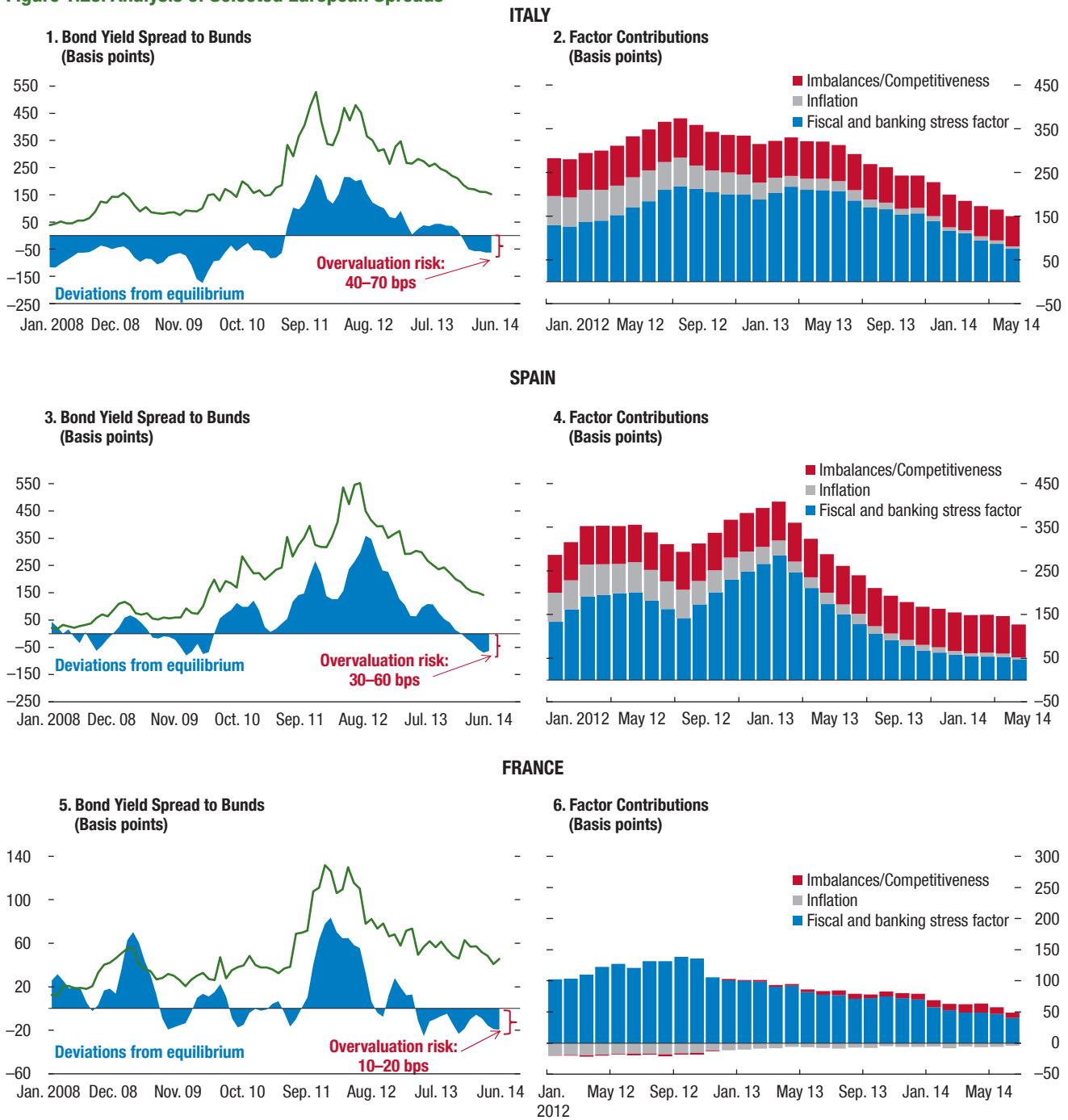
Source: IMF staff calculations.
Note: bps = basis points.

as seemingly unrelated regressions), despite the large shocks during the sovereign and banking crises. As illustrated in Figure 1.29, spreads ultimately revert toward this notion of fair value.[47] It is clear that the unwinding of the overvaluation of some sovereigns

may affect banks and their funding costs. This effect, possibly combined with uncertainties about the pending results of the ECB's Comprehensive Assessment of banks, could lead to increased volatility in some banks' funding costs.

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[47]The speed of adjustment is measured using the factor loadings of the error correction vector. The cointegration-based estimates of

fair values for sovereign spreads are within the ranges provided by Di Cesare and others (2012).

Annex 1.2. Corporate Conditions and Investment[48]

Complementing and deepening the work of Chapter 1 on the connection between financial and economic risk taking, a detailed econometric analysis was performed using corporate balance sheet data to identify the main determinants of investment from a company perspective. The analysis focused on factors that, for financial or economic reasons, are generally considered to affect firms' investment capacity and incentives. These factors include existing levels of debt (leverage), current profitability (return on assets), the anticipated future profitability of current investment (Tobin's q), and cost of funds (the interest rate at which the firm borrows).

A panel fixed effects strategy was used, drawing on corporate balance sheet data in five major advanced economies: France, Germany, Japan, the United Kingdom, and the United States. Data are quarterly, corresponding to the frequency of firms' financial statements, and cover the period 1999:Q1 to 2014:Q2. The sample consists of 895 firms, comprising members of the major equity indices in each country. All data are obtained from the S&P Capital IQ database.

Individual variables are derived as follows: Investment is captured as capital expenditure normalized by total assets. Return on assets (ROA) is calculated as operating income divided by total assets. Cost of funds is measured as interest payments divided by total debt. Leverage is defined as the stock of debt divided by the book value of equity. Leverage is a stock variable, but it is also useful to gauge the effect of debt flows on capital expenditure. Accordingly, the change in debt is defined as the increase (decrease) in debt from the previous quarter, normalized by total assets.

The baseline investment model is given by equation (1.4):

$$I_{ict} = \beta_1 \times r_{i,c,t} + \beta_2 \times ROA_{i,c,t} + \beta_3 \times Leverage_{i,c,t-1}$$
$$+ \beta_4 \times \Delta Debt_{i,c,t} + Firm\ FE + Time\ FE$$
$$+ Country\ FE + \varepsilon_{i,c,t}, \qquad (1.4)$$

in which I is investment for firm i in country c at time t, r is the cost of funds, and $\Delta Debt$ is the change in debt stock from the previous quarter. Beta coefficients are estimated by linear panel regression with firm fixed effects over shorter and longer periods.

[48]The authors of this annex are Chris Walker, Atsuko Izumi, Shaun Roache, and Daniel Law.

It is expected that the coefficient on ROA will be positive and the coefficient on the cost of funds will be negative. Debt stocks and debt flows are expected to have opposite effects in the investment equations. The flow of debt in the period preceding investment would normally be positively related to capital expenditure, given that a major reason for issuing debt is to fund investment projects. However, existing high debt levels are likely to slow investment flows because of the higher risk premiums and resulting higher cost of financing they normally entail. Although the cost of funds should capture some of the negative effects of risk premiums on investment, the company-specific measure used corresponds more closely to the average than to the marginal cost of funds. The latter, however, is more relevant for funding decisions, and it is expected that the leverage level would catch some of the gap between the marginal and average cost of funds, as well as any unobserved unwillingness of creditors to provide funds to highly leveraged firms.

As shown in models 1 and 2 of Table 1.5, all four coefficients turn out to be statistically significant at the 1 percent level and have the expected signs for both sample period specifications.

Tobin's q is incorporated in models 3 and 4 to capture the effect of expected investment returns on firm investment decisions. Inclusion of Tobin's q does not change either the sign of the coefficients or their statistical significance level. Consistent with the theory, which holds that firms invest when the expected marginal return on additional capital is higher than its cost, the coefficient of Tobin's q is significantly positive in the estimation. Because the marginal return on investment is not observed directly, the ratio of market value to the book value of firm assets is used as a proxy for marginal Tobin's q. The estimation results are consistent with theoretical implications and findings in previous empirical studies (Fazzari, Hubbard, and Petersen 1988; Kaplan and Zingales 1997).

The panel regressions provide robust evidence that firms increase capital expenditure with profitability and expected capital productivity, and reduce it with higher costs of funds and leverage. An important implication is that, on the whole, firms in advanced economies are currently in favorable conditions to ramp up investment with recent improvement in profitability, appreciation in stock price, and low cost of funds. However, one source of concern, as indicated in the main text of Chapter 1, is the uncertainty associated with the future path of U.S. interest rates.

Table 1.5. Capital Investment Regressions

Dependent variable = Investment	Model 1 2004:Q1–2014:Q1	Model 2 1999:Q1–2014:Q1	Model 3 2004:Q1–2014:Q1	Model 4 1999:Q1–2014:Q1
ROA	0.04731***	0.07948***	0.02304**	0.05565***
	(0.01066)	(0.00972)	(0.01118)	(0.00930)
Lagged leverage	−0.00065***	−0.00067***	−0.00064***	−0.00065***
	(0.00015)	(0.00014)	(0.00014)	(0.00013)
Change in debt	0.02222***	0.01851***	0.02137***	0.01758***
	(0.00416)	(0.00353)	(0.00417)	(0.00352)
Cost of funds	−0.02269***	−0.02320**	−0.02321***	−0.02377***
	(0.00809)	(0.00827)	(0.00820)	(0.00832)
Tobin's Q			0.00198***	0.00150***
			(0.00034)	(0.00023)
Constant	0.00314***	0.00311***	0.00284***	0.00281***
	(0.00006)	(0.00005)	(0.00008)	(0.00007)
Observations	23,232	32,081	23,232	32,081
R^2	0.01574	0.02129	0.02567	0.03440
Number of companies	794	803	794	803
Time FE	YES	YES	YES	YES
Country FE	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES

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

Note: FE = fixed effects; ROA = return on assets. All variables are Winsorized at the 1st and 99th percentiles. Firm-clustered standard errors are in parentheses.

*, **, and *** indicate significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Estimating default probabilities for China's corporate sector

The contingent claims analysis in Chapter 1 is based on the standard Merton (1974) structural model of credit risk as described by Jobst and Gray (2013). Equity prices and balance sheet fundamentals are used to calculate the probability that the market value of a firm's assets V will fall below some prespecified distress barrier DB. Using the methodology outlined by Zhou (1997), V is assumed to follow a jump diffusion process to allow for the possibility of sudden large changes in asset values and "unexpected" defaults. The risk-neutral probability of default denoted PD (or the probability that V/DB ≤ ξ) over some horizon T (12 months in this case) is calculated from equation (1.5):

$$PD = \sum_{i=0}^{\infty} \frac{e^{-\lambda T}(\lambda T)^i}{i!}$$

$$\times N\left(\frac{\ln(\xi) - \ln\left(\frac{V}{DB}\right) - \left(r - \frac{\sigma^2}{2} - \lambda\upsilon\right)T - i\mu_\pi}{\sqrt{\sigma^2 T + i\sigma_\pi^2}}\right),$$
(1.5)

in which i denotes the total number of jumps over T, σ is the estimated volatility of asset value, λ is the jump intensity, μ_π is the jump size, and υ is the expected jump size. Two adjustments are made to provide a more accurate estimate of actual default probabilities as described in Gray (2009). First, to better approximate Moody's KMV expected default frequencies—which incorporate evidence from actual default histories—the asset volatility in equation (1.5) was calculated as a positive linear function of the fitted volatility σ. Second, to convert risk-neutral to actual default probabilities, the risk-free rate r in equation (1.5) was replaced by a linear function of the fitted asset drift μ and an estimated time-varying price of risk.

Data

The sample comprised 4,483 nonfinancial firms, including 2,441 firms with listed public equity and 2,042 nonlisted firms, for the period 2006:Q1–2014:Q1. The listed firms are those traded on China's onshore equity market, and the nonlisted firms cover all bond issuers available in the WIND database that are not listed on an equity exchange. In the absence of equity prices, nonlisted firms were matched to a listed peer firm based on subindustry classification and a minimum distance procedure incorporating asset size and debt-to-equity ratios. The jump diffusion parameters for these nonlisted firms were then taken from the fitted distribution of the listed peer firm.

The total liabilities of firms in the sample accounted for about 70 percent of total bank loans, or 48 percent of the estimated stock of total social financing as of the end of 2014:Q1; the sample size dropped to 61 percent and 42 percent of loans and total social financing, respectively, in the stress scenario because of difficulties in estimating *PD* for some firms. The data set is an unbalanced panel because of different listing dates for listed firms and some missing quarterly numbers for nonlisted firms. Balance sheet variables are taken from the WIND database (see Table 1.6 for the data as of 2014:Q1 and the 2008 crisis period). Total liabilities of each firm consist of current liabilities and noncurrent liabilities.

Following Moody's KMV and previous studies, balance sheet variables with a one-quarter lag are used in the estimation, and the distress barrier *DB* is set to be current liabilities plus half of noncurrent liabilities. Estimated asset volatility is based on the rolling four-quarter standard deviation of equity price returns and the jump diffusion parameters, which were estimated from an iterative maximum likelihood procedure. Daily market capitalizations of listed firms are extracted from Bloomberg and are used as initial values to fit the jump diffusion process. To adjust for cross-ownership and possible double counting of debt, the total liabilities of listed state-owned firms are reduced by the share of their parent's holding (as proxied by the largest shareholding) when the parent is included in the database.

Table 1.6. Summary of Capital Structure of Sample Firms

	2014:Q1		2008 crisis[1]	
	Median	Std. Dev.	Median	Std. Dev.
Listed nonfinancial firms				
Total assets (RMB billion)	2.83	68.97	2.05	40.35
Total liabilities (RMB billion)	1.16	38.82	1.06	18.27
Current liabilities (RMB billion)	0.92	28.03	0.83	12.82
Noncurrent liabilities (RMB billion)	0.11	13.57	0.09	5.98
Market cap (RMB billion)	3.85	32.93	1.86	70.33
Number of firms	2,411		1,390	
Nonlisted nonfinancial firms				
Total assets (RMB billion)	7.55	185.07	9.32	120.48
Total liabilities (RMB billion)	4.34	111.56	5.00	56.68
Current liabilities (RMB billion)	2.37	47.35	3.17	30.90
Noncurrent liabilities (RMB billion)	1.07	75.68	1.53	29.60
Number of firms	1,586		675	

Sources: WIND Info; and IMF staff calculations.

Note: RMB = renminbi; Std. Dev. = standard deviation.

[1]2008:Q3 for listed firms and 2008:Q4 for nonlisted firms.

Annex 1.3. Regulatory Reform Agenda: State of Play ahead of the G20 Summit in Brisbane, Australia[49]

Work on the Group of Twenty (G20) regulatory reform agenda has focused on addressing the shortcomings revealed by the global crisis, paving the way for more effective regulation and supervision. The agenda is ambitious and much has been achieved to date, but progress remains uneven. In particular, political commitment is needed to advance reforms on resolution of global systemically important financial institutions and harmonization of cross-border application of over-the-counter derivatives rules.

The main elements of the Basel III framework—capital, liquidity, and leverage—have largely moved from agreement to implementation. A recent major step is the new standard on large exposures, which was published in April and is to be implemented by 2019. The new standard establishes the first international definition and benchmark for large exposure limits and aims at protecting banks from losses caused by the sudden default of an individual counterparty or a group of connected counterparties. In addition, a new standard for calculating regulatory capital for banks' exposures to central counterparties (CCPs) will take effect on January 1, 2017. This standard introduces a single approach for calculating capped capital requirements for a bank's exposure that arises from its contributions to the mutualized default fund of a qualifying CCP.

To help restore trust in banking and Basel capital standards, the Basel Committee on Banking Supervision (BCBS) is working to address the high variability across risk-weighted assets reported across banks. Although actual difference in risk is an important driver of differences in risk weights used by banks, the BCBS is considering policy alternatives to limit variability—such as introducing floors and benchmarks and constraining modeling practices—as well as providing additional guidance and reviewing Pillar 3 disclosure requirements to enhance comparability across banks.

Addressing the issue of "too big to fail" remains a key challenge. Notwithstanding progress since 2011, many jurisdictions have yet to fully align their resolution regimes with international best practices. Further efforts are needed to (1) make progress on living wills

[49]The authors of this annex are Jennifer Elliott, Michaela Erbenova, Mamoru Yanase, Fabiana Melo, Cristina Cuervo, Oliver Weunsch, and Nobuyasu Sugimoto.

and identify and remove barriers to firms' resolvability; (2) firm up agreement on banks' total loss-absorbing capacity, providing clarity on the nature, quantity, and location of eligible liabilities; (3) address obstacles to cross-border cooperation and recognition of resolution measures; and (4) advance the agenda on recovery and resolution of nonbanks, including CCPs.

Uneven progress has been made by the International Accounting Standards Board on key accounting reforms. Two new standards—International Financial Reporting Standard (IFRS) 9 on financial reporting for financial instruments and IFRS 15 on revenue from contracts with customers—were published this year, with two remaining reforms (on insurance contracts and leases) still in progress. IFRS 9 introduces a forward-looking credit loss recognition model, which is expected to facilitate international convergence on recognition of impairment losses. This approach to loss recognition will help enhance investor confidence in bank balance sheets and improve capital market transparency and integrity.

Progress on the nonbank side of the global reform agenda has been made but measures, in most part, have not yet been implemented. The International Association of Insurance Supervisors is aiming to finalize, in time for the G20 summit, a groupwide basic capital requirement for global systemically important insurers. The Financial Stability Board has carried on its work on draft methodologies for identifying nonbank and noninsurer global systemically important financial institutions. A second public consultation is expected around end-2014. National regulators are also making efforts to implement agreed-on standards on shadow banking, and important progress has been made by the U.S. Securities and Exchange Commission on money market fund reform, including adopting mandatory floating net asset value or liquidity fees (or both) for nongovernment nonretail money market funds. The Financial Stability Board is now working to finalize minimum haircut requirements on securities lending and repurchase agreements.

Work continues toward improving the regulatory framework for securitization. Two consultative documents have been published, aiming at reducing mechanistic reliance on external ratings, enhancing the framework's risk sensitivity, and reducing cliff effects. A new joint BCBS–International Organization of Securities Commissions Task Force on Securitization Markets will assess the development and functioning of securitization markets and define criteria to assist in the identification and development of simple and transparent securitizations.

Application of new OTC derivatives rules across borders remains challenging pending regulatory decisions on equivalence. Increased central clearing volumes emphasize the need for policy decisions on possible emergency liquidity assistance to CCPs and their recovery and resolution. Trade reporting requirements have been adopted in key countries, but legal barriers to reporting and to foreign authorities' access to data held by trade repositories remain a problem. Progress on trading standardized contracts on exchanges and electronic trading platforms continues to lag the original timetable.

Table 1.7. Major Recent Regulatory Measures and Potential Impacts on Select Bank Business Lines

Legend:
- Restricted or directly affected
- Indirectly affected and may make some operations uneconomical
- Indirectly affected but may become uneconomical in certain circumstances
- Limited or no impact

	Regulatory Measures (entry into force)	Commercial Banking (Bank lending)					Investment Banking (Market-related business)		Asset Management and Private Wealth
		Trade Finance	Retail and SME Lending	Corporate Lending	Residential Mortgages	Long-Term Infrastructure Finance	Fixed-Income, Currencies, and Commodities (FICC)	Equities (market making and proprietary trading)	
Basel III	Basel 2.5 (2011)						Significantly higher capital charge on trading book, particularly driven by stressed value at risk		
	Capital (including G-SIB surcharge) (2013)	Higher capital charge for G-SIBs across lending products, particularly affecting higher-risk-weighted assets (such as retail and SME lending, on average)				Higher capital charge on long-dated noncleared hedge instruments	Higher risk charges (credit valuation adjustment for counterparty risks; asset value correlation multiplier for large bank exposures)		
	Leverage ratio and U.S. Supplementary Leverage Ratio (2018)			Higher capital charge for low-risk-weighted exposures and unsecured commitment lines	Higher capital charge for low-risk-weighted exposures	Higher capital charge for low-risk-weighted exposures	Significantly higher capital charge for high-quality assets, derivatives, off-balance-sheet items, and securities financing (for example, repos)	Significantly higher capital charge for derivatives and off-balance-sheet items	
	Liquidity Coverage Ratio (2015)						Increased liquidity requirements for short term liabilities (for example, repos, commercial paper)		
	Net Stable Funding Ratio (2018) Consultation issued as of April 2014		85 percent required stable funding (RSF) for average quality loans not maturing within one year		65 percent RSF for fully secured mortgages not maturing within one year	85 percent RSF for loans not maturing within one year	50 percent RSF for repos involving nonbanks		
	OTC derivatives reforms					Higher capital charge on long-tenure hedging derivatives	Increased margin and transparency requirements		
	Structural measures (U.S. Volcker Rule Final, 2014)							Restrictions on proprietary trading and ownership of hedge funds	Restriction on ownership of hedge funds
	U.S. foreign banking organization rule U.K. and EU structural measures	Higher cost of maintaining capital and liquidity, pressuring banks toward lower balance sheet size, fewer activities, or retreat							
	Conduct rules (anti–money laundering and combating the financing of terrorism, know your clients); Litigation	Increase in operational risks							

Source: IMF staff.

Note: EU = European Union; G-SIB = global systemically important bank; OTC = over the counter; repos = repurchase agreements; RSF = required stable funding; SME = small- and medium-sized enterprise.

Annex 1.4. Volatility[50]

This annex elaborates on the volatility modeling results presented in the main text of Chapter 1.

Realized volatility

The daily annualized realized volatility σ_t of an asset with price P_t on day t is expressed as

$$\sigma_t = \sqrt{\sum_{i=1}^{n} (\log(P_{t-i+1}/P_{t-i}))^2 \ 252/n}, \tag{1.6}$$

in which n is the number of days in the volatility tenor and log is the natural logarithm (that is, $\log e = 1$). The volatility heat map in Figure 1.6, panel 2, is a visual representation of how low the three-month realized volatility of equities, bonds, credit, and commodities was in 2014:Q3. The aggregate realized volatility indices for the advanced and emerging market equities, bonds, and currency asset classes were constructed from the first principal component of the three-month realized volatilities of the following sets:

- *Advanced economy equities and bonds:* Austria, Canada, France, Germany, Italy, Japan, Norway, Spain, Sweden, Switzerland, United Kingdom, and United States.
- *Emerging market equities:* Argentina, Brazil, Chile, China, Colombia, Hungary, India, Indonesia, Malaysia, Mexico, Peru, Philippines, Poland, Romania, Russia, South Africa, Thailand, Turkey, and Ukraine.
- *Emerging market bonds:* Total returns of the JP Morgan EMBI Global Diversified (U.S. dollar–denominated sovereign bonds) and the JP Morgan GBI-EM (local-currency-denominated government bonds) indices.
- *Advanced economy currencies (all against the U.S. dollar):* Australian dollar, Canadian dollar, euro, Norwegian krone, U.K. pound sterling, Swedish krona, Swiss franc, and Japanese yen.
- *Emerging market currencies (all against the U.S. dollar):* Argentine peso, Brazilian *real*, Chilean peso, Chinese yuan, Colombian peso, Hungarian forint, Indian rupee, Indonesian rupiah, Malaysian ringgit, Mexican peso, Peruvian sol, Philippine peso, Polish zloty, Romanian leu, Russian ruble, South African rand, Thai baht, Turkish lira, and Ukrainian hryvnia.

[50]The author of this annex is Evan Papageorgiou.

Modeling volatility

This report borrows from the rich literature on volatility. A common feature among volatility time series is that they tend to exhibit clustering through time, in that instances of low volatility are more likely to be followed by more low volatility, and vice versa. Furthermore, volatility time series are usually mean-reverting over long periods. These behaviors were incorporated in early applications of volatility modeling in the works of Engle (1982) and Bollerslev (1986), with the autoregressive conditional heteroscedasticity (ARCH) and generalized ARCH (GARCH) models.

A modeling approach building on these common features is the switching ARCH (SWARCH) methodology developed by Hamilton (1989) and Hamilton and Susmel (1994). In a simple SWARCH framework, volatility is modeled as an ARCH model, but with the ability to provide different specifications for different *states of volatility*. As a result, SWARCH models are able to capture structural shifts in the drivers of volatility, with the added benefit of providing statistical identification of these shifts. Given that increases in volatility tend to be sudden and distinctly recognized, the ability to identify these switches and measure their effect on volatility is particularly relevant for the current environment of low volatility ahead of expected monetary policy normalization.

The SWARCH model used here has two volatility states and order-one conditional volatility autoregression (also called SWARCH(2,1) model), and is given by

$$r_t = a_0 + a_1 r_{t-1} + \varepsilon_t; \tag{1.7}$$

$$\varepsilon_t = \sqrt{\gamma_{s_t}} u_t; \tag{1.8}$$

$$u_t = h_t v_t; \tag{1.9}$$

$$h_t^2 = \alpha_0 + \alpha_1 u_{t-1}^2, \tag{1.10}$$

in which $\alpha_0 \geq 0$, $\alpha_1 \geq 0$; $r_t = \log(P_t/P_{t-1})$ for prices, or $r_t = y_t - y_{t-1}$ for yields; s_t takes value 1 when volatility is in the low state and 2 when it is in the high state; and γ_{s_t} is the volatility scale parameter at state s_t. The error terms $(v_t)_{t=1,2,\ldots}$ are assumed to be independent and identically normally distributed with mean 0 and variance 1. The state of volatility evolves according to a two-state Markov chain, independent of the process r, so that

$$\mathbb{P}\{s_t = j | s_{t-1} = i, s_{t-2} = k, \ldots, r_t, r_{t-1}, \ldots\}$$

$$= \mathbb{P}\{s_t = j | s_{t-1} = i\}, \text{ for } i, j, k \text{ in } \{1,2\}. \tag{1.11}$$

Figure 1.30. Volatility Multiples between High and Low States (γ factors of SWARCH model)
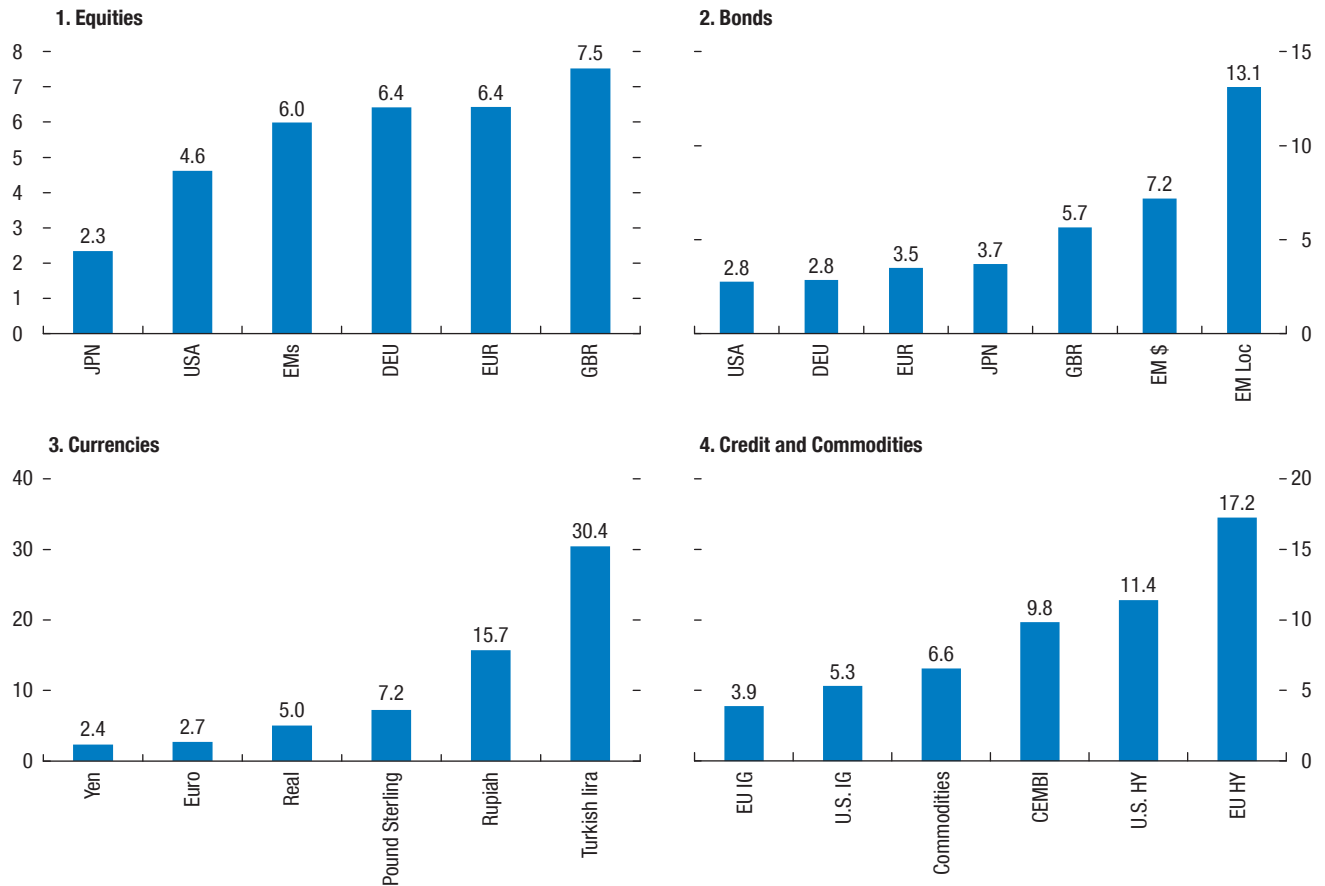
Source: IMF staff calculations.
Note: CEMBI = JPMorgan Corporate Emerging Markets Bond Index; EM = emerging market; EM Loc = emerging market local currency government bonds; EM $ = JPMorgan EMBI Global index; HY = high yield; IG = investment grade.

Process *u* is known as an ARCH(1) process. The parameter γ scales the entire ARCH process between the states, but otherwise *u* is identical between the low and high volatility states.

Disruptions arising from monetary policy normalization in the United States are likely to be more pronounced in emerging markets and other leveraged asset classes. Indeed, the magnitude of the volatility increase between the high and low volatility states for emerging market bonds and currencies and high-yield credit is much greater compared with advanced economy bonds, currencies, and investment-grade credit as shown in Figure 1.30. For example, panel 2 shows that during the past 15 years the instantaneous (weekly) volatility in the high state of U.S. Treasuries is, on average, 2.8 times larger than in the low state, but within local-currency-denominated emerging market government bonds volatility at the high state is, on average, 13 times larger than in the low state. There-

fore, although high-volatility episodes for emerging market assets and high-yield credit are short lived, they tend to be much stronger.

Quantifying the effect of negative surprises on volatility and prices

For most assets, volatility tends to react differently to positive and negative price shocks, a phenomenon known as the *news impact* effect (Engle and Ng 1993).[51] Assets that generally appreciate during periods of low risk aversion tend to have larger volatility shocks from a price decline than from a price increase. Safe haven assets such as U.S. Treasuries and other advanced economy government bonds tend to have the opposite behavior.

[51]This is also known as the leverage effect in econometric volatility modeling.

Table 1.8. Results of Tests for Independence between Assets' Volatility and the Volatility of the U.S. Treasury Total Return Index when the Latter Acts as an Originator of Shocks

	S&P 500	European equities (EURO STOXX)	Emerging market equities (MSCI Emerging Markets)	U.S. IG credit	GBI-EM (local currency emerging market bonds)
Log-likelihood, independent model	–2,186	–2,365	–2,420	–874	–438
Log-likelihood, fully specified SWARCH model	–2,231	–2,396	–2,438	–924	–446
Full SWARCH likelihood ratio (*p* value)	91(< 0.001)	61(< 0.001)	35(< 0.001)	100(< 0.001)	17 (0.028)

Source: IMF staff calculations.
Note: GBI-EM = JPMorgan Government Bond Index–Emerging Markets; IG = investment grade; SWARCH = switching autoregressive conditional heteroscedasticity. See Edwards and Susmel (2001) for more information.

In the aftermath of the global financial crisis, it appears that the changing nature of risk and monetary policy has affected the news impact of volatility. Based on an exponential GARCH(1,1) model, which allows for asymmetric news impact on volatility, the sensitivity of volatility with respect to price shocks appears to have increased for most assets in the post-global-financial-crisis period. The steepness of the news impact curve for U.S. Treasuries in this period has also risen and has become more symmetric for negative and positive price shocks (less flight-to-safety-like), consistent with the Federal Reserve's asset purchase programs, which have tempered the directional impact of price shocks on bond volatility.

There is strong evidence that the Federal Reserve's policies have suppressed volatility in the equity market via reduction in bond market volatility. Table 1.8 presents the results of the tests of the null hypothesis that the evolution of the assets' realized volatility is independent of the volatility process for the 10-year U.S. Treasury note. The null hypothesis is strongly rejected for all asset classes considered here, lending support to the view that unconventional monetary policies have suppressed volatility in other major asset classes.

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SHADOW BANKING AROUND THE GLOBE: HOW LARGE, AND HOW RISKY?

Summary

This chapter describes the growth and risks of and regulatory responses to shadow banking—financial intermediaries or activities involved in credit intermediation outside the regular banking system, and therefore lacking a formal safety net.

The largest shadow banking systems are found in advanced economies, where more narrowly defined shadow banking measures indicate stagnation, while broader measures (which include investment funds) generally show continued growth since the global financial crisis. In emerging market economies, the growth of shadow banking has been strong, outpacing that of the traditional banking system.

Although shadow banking takes vastly different forms across and within countries, some of the key drivers behind its growth are common to all: a tightening of banking regulation and ample liquidity conditions, as well as demand from institutional investors, tend to foster nonbanking activities. The current financial environment in advanced economies remains conducive to further growth in shadow banking. Many indications there point to the migration of some activities—such as lending to firms—from traditional banks to the nonbank sector.

Shadow banking can play a beneficial role as a complement to traditional banking by expanding access to credit or by supporting market liquidity, maturity transformation, and risk sharing. It often, however, comes with banklike risks, as seen during the 2007–08 global financial crisis. Although data limitations prevent a comprehensive assessment, the U.S. shadow banking system appears to contribute most to domestic systemic risk; its contribution is much less pronounced in the euro area and the United Kingdom.

The challenge for policymakers is to maximize the benefits of shadow banking while minimizing systemic risks. This chapter encourages policymakers to address the continued expansion of finance outside the regulatory perimeter through a more encompassing approach to regulation and supervision that focuses both on activities and on entities and places greater emphasis on systemic risk. To begin with, however, important data gaps need to be addressed because even aggregate information about many activities remains scarce in most countries.

INTRODUCTION

Shadow banking, broadly defined as credit intermediation outside the conventional banking system, constitutes about one-fourth of total financial intermediation worldwide. The official financial community has (through the Financial Stability Board [FSB], of which the IMF is a member) been engaged since 2011 in a global project to monitor and measure shadow banking, and to adapt the regulatory framework to better address shadow banking risks. The United States, the euro area, and the United Kingdom have the largest shadow banking systems according to FSB data (Figure 2.1). In the United Kingdom, shadow banking assets as a share of GDP are more than twice those in any other area, and only in the United States do shadow banking assets exceed those of the conventional banking system. Shadow banking has been growing rapidly in emerging market economies.

Shadow banking can complement traditional banking by expanding access to credit or by supporting market liquidity, maturity transformation, and risk sharing. For example, in developing economies, finance companies and microcredit lenders often provide credit and investments to underbanked communities, subprime customers, and low-rated firms (Ghosh, Gonzalez del Mazo, and Ötker-Robe 2012). In advanced economies, various types of funds have been stepping in (often as intermediaries for insurance companies and pension funds) to provide long-term credit to the private sector while banks have been repairing their

balance sheets and retrenching from certain activities (see the April 2014 *Global Financial Stability Report* [GFSR]). In fact, lending by shadow banking entities contributes significantly to total lending in the United States and is rising in many countries, including in the euro area (Figure 2.2). Finally, shadow banks often enhance the efficiency of the financial sector by enabling better risk sharing and maturity transformation and by deepening market liquidity (Claessens and others 2012). For example, securitization mobilizes illiquid assets, and structured finance techniques can be used to tailor risk and return distributions to better fit the needs of ultimate investors.

However, the global financial crisis revealed that, absent adequate regulation, shadow banking can put the stability of the financial system at risk in several ways. In advanced economies, some shadow intermediaries (such as money market mutual funds [MMFs] and securitization vehicles) were highly leveraged or had large holdings of illiquid assets during the crisis, and were vulnerable to runs when investors withdrew large quantities of funds at short notice. This led to fire sales of assets, which intensified the financial turmoil by reducing asset values and helped spread the stress to traditional banks. Since then, global regulatory reforms coordinated by the FSB have called for greater disclosure of asset valuations, improved governance, ownership reforms, and stricter oversight and regulation of shadow banks (FSB 2013a, 2013b).

Since the crisis, the ongoing tightening of bank regulations may be encouraging a shift of traditional

Figure 2.1. Broad Shadow Banking Measures
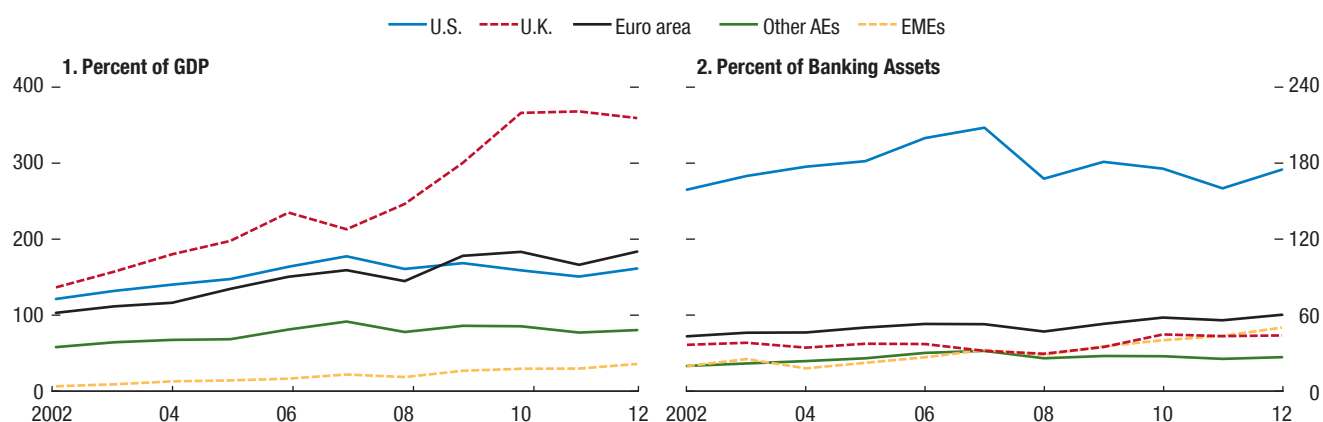
Sources: Financial Stability Board; IMF, World Economic Outlook database; and IMF staff estimates.
Note: AE = advanced economy; EME = emerging market economy. For sample coverage, see Table 2.3.

Figure 2.2. Lending by Shadow Banks
(Percent of bank and shadow bank lending)
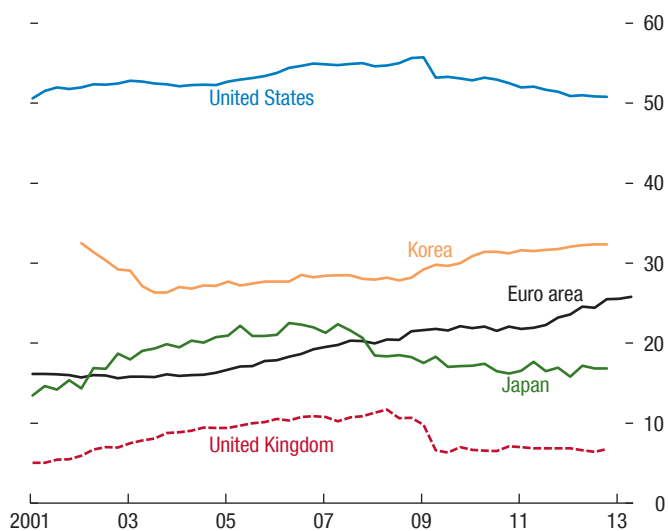
Sources: Haver Analytics; national central banks; and IMF staff estimates.

banking activities into the shadows. The interplay of different regulations (capital, liquidity, activity restrictions, and governance) and increased compliance costs and legal risks may be affecting banks' willingness to support certain activities (for example, lending to smaller enterprises, leveraged loans, project finance, and hedging). Increased scrutiny of the shadow banking system is only beginning to reveal the patterns of these shifts, and their implications for systemic risk are not yet well understood.

This chapter aims to provide a conceptual framework for understanding different types of shadow banking around the world by answering the following questions:

- How has shadow banking evolved since the early 2000s in advanced and emerging market economies?
- What drives the growth of shadow banking? Are there common underlying factors across advanced and emerging market economies?
- When does shadow banking activity become a risk to financial stability?
- What can regulation and supervision do to contain shadow banking risks without unduly stifling financial intermediation?

The chapter highlights key commonalities across vastly differing forms of shadow banking. First, it identifies the different dimensions of risk associated with diverse

shadow banking activities and entities. Second, it compares various measures of shadow banking, including a new one introduced here. Third, it provides a statistical analysis of factors driving the growth of shadow banking, illustrates the findings with country examples, and highlights key similarities. Fourth, it offers a risk scoring of various shadow banking segments and presents a new assessment of the contribution of shadow banking to systemic risk in some major advanced economies. Fifth, it describes various recent shadow banking developments around the world. Finally, it relates the findings to the ongoing regulatory reform agenda and provides new, specific, and generally applicable proposals for further steps.

These are the main findings:

- Although shadow banking takes different forms around the world, the drivers of shadow banking growth are fundamentally very similar: shadow banking tends to flourish when tight bank regulations combine with ample liquidity and when it serves to facilitate the development of the rest of the financial system. The current financial environment in advanced economies remains conducive to further growth in shadow banking activities.
- Most broad estimates point to a recent pickup in shadow banking activity in the euro area, the United States, and the United Kingdom, while narrower estimates point to stagnation. Whereas activities such as securitization have seen a decline, traditionally less risky entities such as investment funds have been expanding strongly.
- In emerging market economies, shadow banking continues to grow strongly, outstripping banking sector growth. To some extent, this is a natural by-product of the deepening of financial markets, with a concomitant rise in pension, sovereign wealth, and insurance funds.
- So far, the (imperfectly) measurable contribution of shadow banking to systemic risk in the financial system is substantial in the United States but remains modest in the United Kingdom and the euro area. In the United States, the risk contributions of shadow banking activities have been rising, but remain slightly below precrisis levels. Our evidence also suggests the presence of significant cross-border effects of shadow banking in advanced economies. In emerging market economies, the growth of shadow banking in China stands out.
- In general, however, assessing risks associated with recent developments in shadow banking remains

difficult, largely because of a lack of detailed data. It is not clear whether the shift of some activities (such as lending to firms) from traditional banking to the nonbank sector will lead to a rise or reduction in overall systemic risk. There are, however, indications that, as a result, market and liquidity risks have risen in advanced economies (see also Chapter 1).

- Overall, the continued expansion of finance outside the regulatory perimeter calls for a more encompassing approach to regulation and supervision that combines a focus on both activities and entities and places greater emphasis on systemic risk and improved transparency. A number of regulatory reforms currently under development try to address some of these concerns (see Annex 2.4). This chapter advocates a macroprudential approach and lays out a concrete framework for collaboration and task sharing among microprudential, macroprudential, and business conduct regulators.

What Is Shadow Banking, and How Should It Be Measured?

Most studies define shadow banking by the nature of the entity that carries it out: it is usually less regulated than traditional banks and lacks a formal safety net (for example, Claessens and Ratnovski 2014). Other definitions focus instead on instruments (McCulley 2007; Mehrling and others 2013) or markets (Gorton and Metrick 2012). The FSB has described it as "credit intermediation involving entities and activities outside the regular banking system" (FSB 2013a—see Annex 2.1 for an overview of definitions used in the literature). This chapter introduces a new definition of shadow banking based on nontraditional (noncore) funding—in this "activity" concept, financing of banks and nonbank financial institutions through noncore liabilities constitutes shadow banking, regardless of the entity that carries it out. For example, according to this definition, securitization is shadow banking; whether it is conducted directly on balance sheet by a bank or indirectly through a special purpose vehicle (SPV) ultimately does not matter under the activity view.

An ideal definition would be precise and all-encompassing—which is difficult given the large differences in shadow banking activities across countries. In advanced economies, shadow banking typically involves a network of financial entities and activities that decompose the process of credit intermediation between lenders and borrowers into a sequence of discrete operations (see the inner quadrant in Figure

2.3 for a simplified schematic representation; for a more comprehensive description, see Pozsar and others 2013). In developing economies, these chains are usually absent, with shadow banking taking a more straightforward intermediation role between ultimate lenders and ultimate borrowers.

The usefulness of a definition also depends on the extent to which it covers relevant risk dimensions. These include the specific risks of each business model and its potential for spillovers (see Annex 2.2 and the section "Balance Sheet Risk Measures" in this chapter). These are the specific risks:[1]

- *Run risk:* Since shadow banks perform credit intermediation, they are subject to a number of bank-like sources of risk, including run risk, stemming from credit exposures on the asset side combined with high leverage on the liability side, and liquidity and maturity mismatches between assets and liabilities. However, these risks are usually greater at shadow banks because they have no formal official sector liquidity backstops and are not subject to bank-like prudential standards and supervision (see Adrian 2014 for a review).
- *Agency problems:* The separation of financial intermediation activities across multiple institutions in the more complex shadow banking systems tends to aggravate underlying agency problems (Adrian, Ashcraft, and Cetorelli 2013).[2]
- *Opacity and complexity:* These constitute vulnerabilities, since during periods of stress, investors tend to retrench and flee to quality and transparency (Caballero and Simsek 2009).
- *Leverage and procyclicality:* When asset prices are buoyant and margins on secured financing are low, shadow banking facilitates high leverage. In periods of stress, the value of collateral securities falls and margins increase, leading potentially to abrupt deleveraging and margin spirals (FSB 2013b; Brunnermeier and Pedersen 2009).
- *Spillovers:* Stress in the shadow banking system may be transmitted to the rest of the financial system through ownership linkages, a flight to quality, and fire sales in the event of runs (see Box 2.1 and the section "Systemic Risk and Distress Dependence"). In good times,

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[1]Shadow banking does not only entail risk: it may contribute to financial stability because some entities (such as private equity funds) may be able to lend at very long maturities without facing the risk of a run.

[2]Ashcraft and Schuermann (2008) describe informational frictions in the securitization of subprime mortgage credit before the financial crisis.

Figure 2.3. Traditional versus Shadow Banking Intermediation
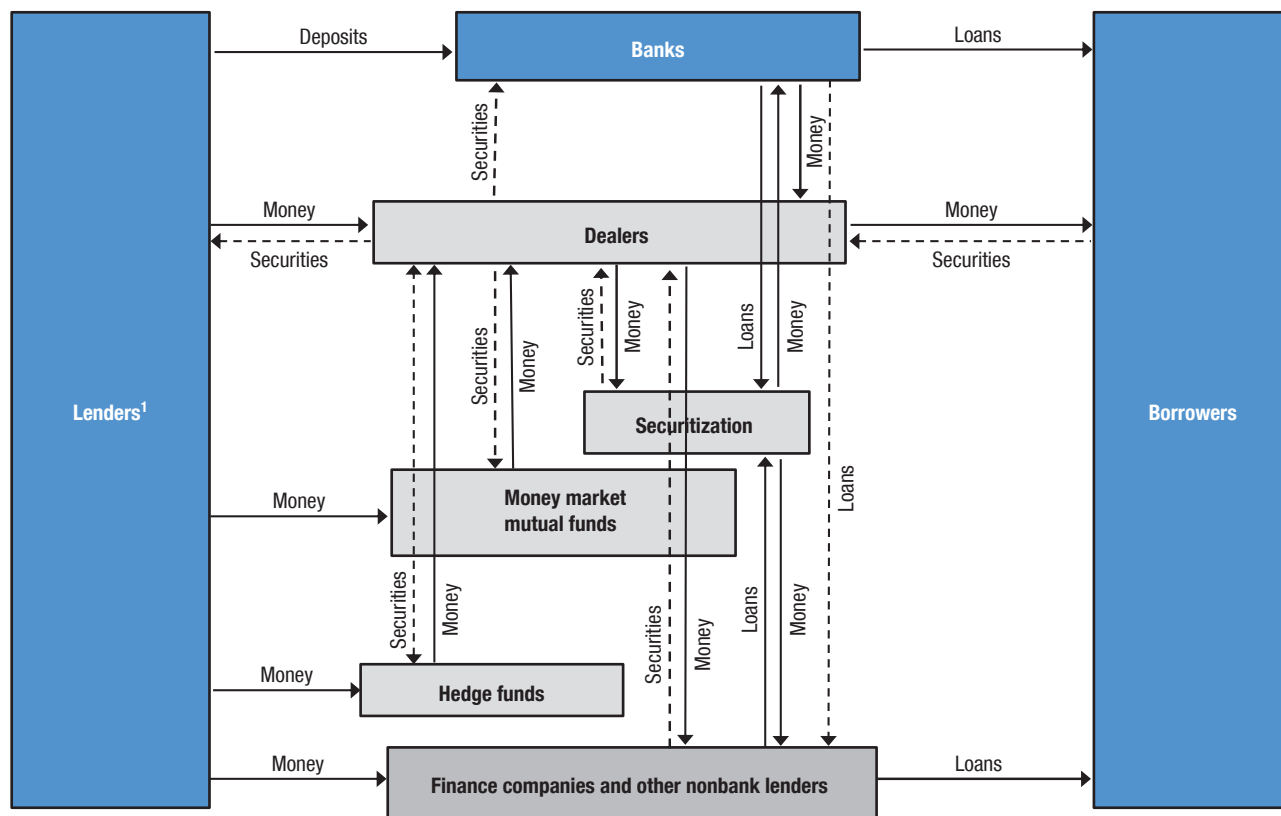
Source: IMF staff illustration.
Note: This simplified representation of the financial sector shows the flow of funds from lenders to borrowers. It does not show the reverse flows, such as bank deposit withdrawals and money market mutual fund redemptions. The blue boxes represent the components of a bank-based economy, with the rest representing the shadow banking sector. The boxes on the outside characterize a simple shadow banking system as might be found in a less developed economy. The lighter colored boxes in the middle reflect the kinds of shadow banking activities and entities usually associated with more advanced economies, with dealers as the hub of most activity. This activity comprises issuing securities on behalf of borrowers (including securitization vehicles, finance companies, and other nonbank lenders), providing prime broker services to hedge funds, and conducting repurchase agreements and securities lending. Securitization vehicles do not generally involve borrowers directly. Securitized assets generally come from banks and nonbank lenders, and securities from dealers. See Annex 2.2 for details on the role of securitization.
[1]The lenders category includes institutional investors (such as insurance companies and pension funds) and official sector institutions (such as central banks and sovereign wealth funds).

shadow banks also may contribute substantially to asset price bubbles because, as less regulated entities, they are more able to engage in highly leveraged or otherwise risky financial activities (Pozsar and others 2013).

Recognizing the variation in these risks across countries, entities, and activities, the FSB deliberately starts by casting the net wide, but also offers a narrower definition that focuses on a subset of nonbank credit intermediation in which (1) systemic risk is increasing (in particular, through maturity and liquidity transformation, imperfect credit risk transfer, and leverage) and (2) regulatory arbitrage is undermining the benefits of financial regulation.

However, risk characteristics can differ even across similar activities, depending on the context in which they are conducted. Risk scores may differ by country or regulatory context and may change over time (see the section "Balance Sheet Risk Measures"). For example, risks surrounding repurchase agreements (repos) and securities lending depend on whether there are limits on the reuse of collateral. Similarly, the public in one country may regard shares in fixed-income mutual funds as bank-like deposits (possibly because of perceptions of implicit guarantees by governments or associated banks), but this perception may be different elsewhere and may also change over time. Therefore, risks need to be evaluated in light of country-specific conditions, regulations, and public perceptions.

Box 2.1. The Run on the Shadow Banking System and Bank Losses during the Financial Crisis

This box analyzes risk transmission in the shadow banking system as a chain of interlinked, risk-adjusted balance sheets. It shows that risks of shadow banks' reliance on short-term funding caused adverse spillovers to banks and guarantors, which had provided liquidity backstops and debt guarantees to these shadow entities.

Until 2007, shadow banking activities in the United States and Europe had grown very rapidly, but many of them collapsed during the financial crisis. Over time, the U.S. and European financial systems had come to rely increasingly on repo and securitization financing, through conduits and structured finance vehicles, while money market mutual funds (MMFs) and other funds benefited from inflows due to ample global liquidity (Figure 2.6). Eventually, rapidly rising defaults in the U.S. housing market in 2007 led to a liquidity crisis in the markets for private-label securitization and asset-backed commercial paper (ABCP) as investors refused to roll over their holdings (Acharya, Schnabl, and Suarez 2013). MMFs experienced a run in September

2008 after the default of Lehman Brothers, and MMF sponsors were unable to absorb the losses.[1]

Contingent claims analysis (CCA) can be used to model banks' relationships with the U.S. shadow banking system. In essence, CCA models the financial system as a chain of interlinked, contingent claims (that is, risk-adjusted balance sheets). The claims include cross-holdings of risky prime and subprime debt. They also include residential mortgage-backed security tranches held in asset-backed commercial paper conduits and structured investment vehicles (SIVs) financed by short-term funds (Figure 2.1.1). Banks provided explicit liquidity and credit guarantees to ABCP conduits and SIVs and short-term loans to nonbank mortgage originators. "Monoline" insurers provided insurance against losses on ABCP and SIV borrowing.

In each risk-adjusted CCA balance sheet, assets equal equity and risky debt. An entity's equity can be modeled as an implicit call option on its assets. Risky debt equals the default-free value of debt minus

The author of this box is Dale Gray.

[1]For a review of the causes of the crisis in the United States, including the evolution of shadow banking, see FCIC (2011).

Figure 2.1.1. U.S. Shadow Banking System
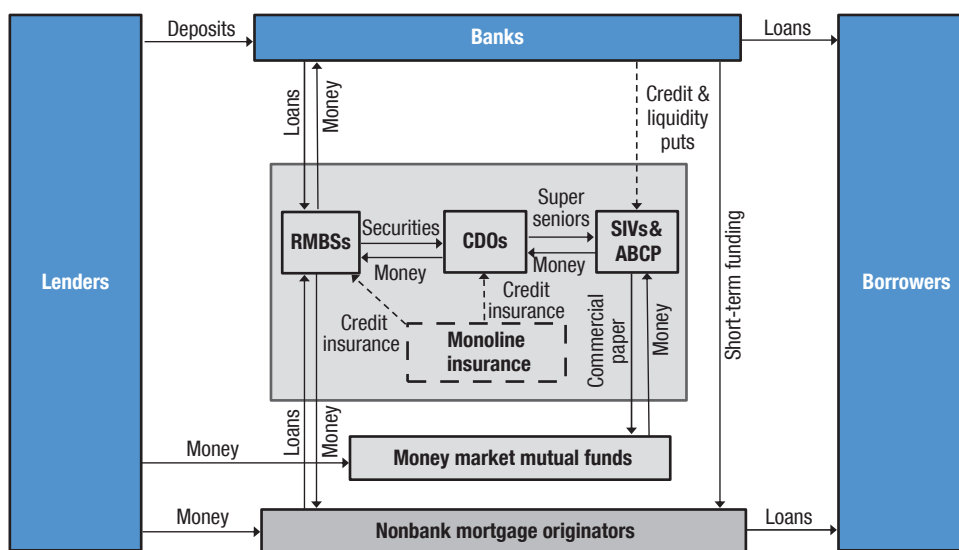
Source: IMF staff.
Note: This is a simplified schematic of the precrisis U.S. financial sector showing the flow of funds from lenders to borrowers and the interlinkages between them and shadow banks. Securitization vehicles include asset-backed commercial paper (ABCP) conduits, collateralized debt obligations (CDOs), residential mortgage-backed securities (RMBSs), and structured investment vehicles (SIVs). See notes to Figure 2.3 for further explanations.

Box 2.1 *(continued)*

the expected loss due to possible default and can be modeled as an implicit put option. If a third party (say, a bank or a monoline insurer) is providing a debt guarantee, the value of this guarantee can also be modeled as an implicit put option. For example, if commercial paper lenders provide short-term funds to an SIV with credit puts from a bank, the commercial paper provider is "long" the default-free value of the short-term debt, but the bank is "short" the implicit put option—that is, it provides a guarantee.[2]

The CCA model of major U.S. and European banks captures a significant increase in expected losses as the crisis unfolded (Figure 2.1.2). From August 2007 to March 2009, bank liabilities rose by 32 percent (in part because they brought SIVs onto their balance sheets), and total market capitalization fell by 74 percent. Expected losses embedded in their liabilities (that is, implicit put options with three-year horizons) peaked at $550 billion in March 2009 and averaged $395 billion between September 2008 and August 2009. The activa-

tion of bank credit puts (guarantees) provided to ABCP and securitization vehicles contributed to this severe negative financial shock to the banks. Moreover, as housing prices began to fall in 2007, widespread mortgage refinancing led to a "refinancing ratchet effect" because higher interest rates applied to the refinancing, which dramatically increased mortgage defaults. Banks suffered directly from losses on residential mortgages because of a severe underestimation of the correlation between house prices and mortgage default (Khandani, Lo, and Merton 2013). This increased potential residential mortgage losses to $1.7 trillion (inferred from implicit put options on mortgage debt) from June 2006 to December 2008.

This analysis highlights the ability of CCA analysis to provide timely information on the severity of bank losses as the crisis developed, unlike financial statements, which become available only with considerable lags. In this case, it also demonstrates how rapidly risk can increase for banks when they guarantee their off-balance-sheet vehicles when the latter engage in a search for yield that relies on short-term funding and funding backstops from parent banks.

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[2]For more details on the CCA approach, see Gray, Merton, and Bodie (2008).

Figure 2.1.2. Contingent Claims Analysis Simulations of Implicit Shadow Banking Puts

1. Bank Liabilities, Market Capitalization, and Expected Losses
(Billions of U.S. dollars)

2. Bank Assets, Default Barrier, and Expected Losses
(Billions of U.S. dollars)
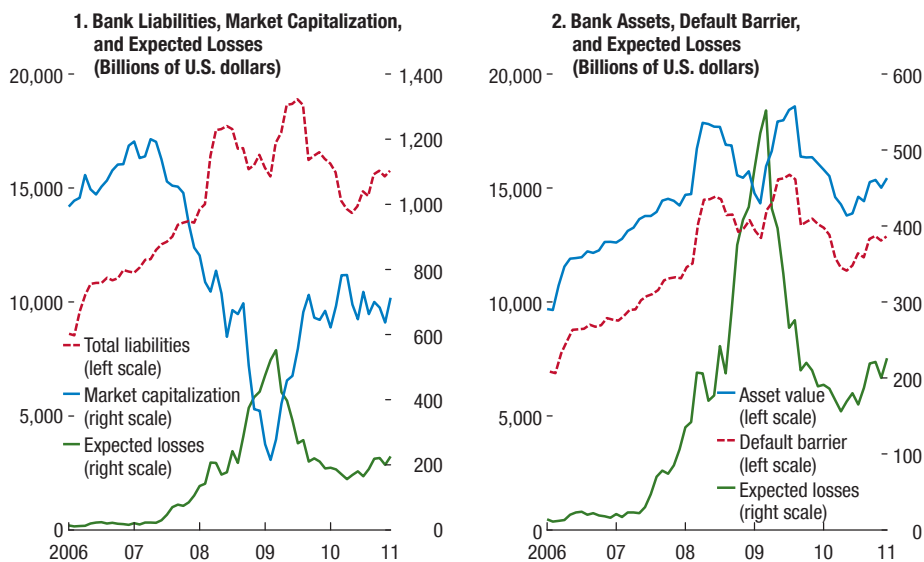
Sources: Moody's CreditEdge; and IMF staff estimates.
Note: Data represent aggregates for Citibank, JPMorgan Chase & Co., Bank of America, Deutsche Bank, Credit Suisse, UBS, Barclays, and Royal Bank of Scotland. Total liabilities comprise debt and deposits. Expected losses are the sum of the implicit puts. Asset value equals equity and risky debt, which is measured as the default-free value of debt minus the expected loss from possible default. Default barrier is the default-free value of debt and deposits, estimated to be short term, plus one-half of long-term debt in the Moody's framework.

Given these difficulties, no single definition or measure of shadow banking is likely to suffice for all purposes, and as a starting point, this chapter uses three different approaches to measure shadow banking. The first two measures are entity based; the third is activity based and derived from the noncore-financing definition of shadow banking.

- *Flow of funds measure:* Data from flow of funds accounts capture the financial assets of other financial intermediaries (OFIs). OFIs consist of (1) all non-bank financial corporations and quasi corporations engaged mainly in financial intermediation and (2) entities providing primarily long-term financing.

- *FSB measure:* Using flow of funds and sectoral accounts, the FSB constructs a broad measure of shadow banking activity based on nonbank financial intermediaries (NBFIs) engaged in credit intermediation activities, and a narrow measure, excluding NBFIs that do not provide credit intermediation directly—such as equity investment funds—and NBFIs that are prudentially consolidated into banking groups.[3]

- *The size of noncore liabilities:* This is a new measure, based on the funding definition of shadow banking presented earlier. It includes noncore liabilities both from banks and from "other financial corporations."[4,5] A *narrow* measure of noncore liabilities excludes those confined to the financial sector; it is thus a proxy for the intermediation between ultimate lenders and ultimate borrowers—that is, between the financial sector and the real economy. The difference between the broad and narrow measures represents an estimate of the amount of credit intermediation conducted *within* the shadow banking sector (Annex 2.1).[6,7]

[3]Our proxy for the narrow FSB measure excludes only equity funds.

[4]For example, securitization can be seen as a way for intermediaries to tap nondeposit funding by creating securities that can be pledged as collateral (Shin 2010).

[5]See Harutyunyan and others (forthcoming). The measure is based on IMF member countries' reporting of monetary data through the Standardized Report Form (SRF). However, only 36 of 142 SRF reporting countries provide data on other financial corporations. See also Annex 2.1, which discusses the reason for excluding insurance and pension funds and non-money-market investment funds from both the banking and shadow banking sectors.

[6]Noncore liabilities of the U.S. financial system are sometimes also used as proxies for global liquidity (IMF 2014b).

[7]The financial stability implications of the reliance by financial institutions on noncore liabilities depend on the degree to which these occur within group structures, such as conglomerates (especially if they span national borders).

These measures are conceptually somewhat different and can be expected to yield different size estimates.[8] Each measure has its own merits and can be used to capture specific issues of interest (Table 2.1). For various analyses in this chapter, the chapter also examines specific shadow banking activities and entities in more detail, depending on data availability.

Whereas the flow of funds and the noncore measures exclude non-MMF funds, the FSB measure includes them. Both approaches have their merits. On the one hand, fund asset managers manage assets on behalf of clients. As opposed to bank deposit holders, clients bear gains and losses directly, rather than asset management firms. Therefore, as opposed to banks (which accept deposits with a liability of redemption at par and on demand [OFR 2013]), funds have typically not faced capital requirements; and studies have often excluded them from shadow banking measures (Bakk-Simon and others 2012; Adrian and Ashcraft 2012). However, more recently, concerns have been expressed that many of these funds can pose bank-like risks. For example, they can issue money-like liabilities; they can be vulnerable to runs in the event of an investor confidence crisis, particularly if they hold illiquid assets; and they often are subject to easy redemptions (OFR 2013; Feroli and others 2014). Runs can be transmitted through the rest of the financial system through fire sales, especially in the presence of leverage, and in the presence of high concentration in the industry. Herding into certain asset classes can magnify market volatility (Chapter 1). This chapter therefore considers both approaches.

How Much Is It Growing?

Main Facts

FSB estimates point to a recent pickup in shadow banking activity in the euro area, the United Kingdom, and the United States, while narrower gauges of shadow banking suggest stagnation. The different measures share a similar growth trend until 2007, when their paths markedly diverge (Figure 2.4). After a mild drop around 2008, the FSB measures show varying degrees of recovery in the United States, the euro area, and the United Kingdom. In contrast, the flow of funds and noncore liabilities measures remain broadly constant, which reflects two opposing forces: the decline in the

[8]The broad FSB measure is based on both disaggregated sectoral data and flow of funds statistics and hence may differ from the flow of funds measure.

Table 2.1. Comparison of Shadow Banking Measures

	Flow of funds	Financial Stability Board	Noncore liabilities
Coverage	Nonbank financial institutions • Engaged in financial intermediation • Providing long-term financing Excludes non-MMF investment funds Advanced economies Former emerging market economies	Nonbank financial institutions • Engaged in financial intermediation • Providing long-term financing Includes non-MMF investment funds Advanced economies Emerging market economies	Banks Nonbank financial institutions MMFs Excludes non-MMF investment funds Advanced economies Few emerging markets
Source	Flow of funds statistics Quarterly, long history, starting 1980s	Flow of funds and sector data, FSB Annual, short history, starting 2002	IFS Quarterly, short history, starting 2001
Entities/ Activities	Money market mutual funds Financial leasing corporations Securitization vehicles Broker/dealers Country-specific entities • Financial holding corporations • Development capital companies • Other entities Venture capital corporations	Money market mutual funds Finance companies Securitization vehicles Broker/dealers Investment funds (bonds, equity, mixed) Hedge funds Country-specific entities • Financial holding corporations • Private development banks • Other entities Other (not specified)	Narrow measure includes: • Restricted and nonresident deposits • Securities • Loans • MMF shares/units Broad measure consists of narrow plus the following intra-financial-sector positions: • Securities • MMF shares/units
Features	Entity based (narrower entity set) Entity breakdown not always available Balance sheet breakdowns available Somewhat more country specific	Entity based (broader entity set) Broad and narrow measures No balance sheet breakdowns More cross-country consistency Not publicly available Data more subject to valuation effects (due to importance of investment funds)	Entity and activity based Broad and narrow measures No balance sheet breakdowns Somewhat country specific Relates to financial fragility literature Captures shadowy banking activities

Source: IMF staff.
Note: FSB = Financial Stability Board; MMF = money market mutual fund; IFS = IMF, International Financial Statistics database.

role of certain activities after the crisis, such as securitization and lending via repos and securities (Box 2.1), and a concomitant rise in other activities, including those of country-specific entities. The pickup in the FSB measures can be partly explained by positive valuation effects from the growth in the investment fund industry. The large difference between broad and narrow noncore funding measures in the United States (more than $6 trillion in 2013) and in Japan and the euro area (about $4 trillion in both cases) reflects significant activity within the financial system that is not fully captured by other shadow banking measures.[9]

In advanced economies, shadow banking seems to be shifting to less-well-monitored activities. Only investment funds, especially bond funds, country-specific entities, and "other" entities continued to grow after 2008 (Figure 2.5). The growth of the "other" entities could imply a shift in financial stability risk

toward activities that are not as well understood. Box 2.2 suggests that these may comprise new forms of direct lending and over-the-counter derivatives trading.

In emerging market economies, overall shadow banking continues to grow strongly. Shadow banking assets as a proportion of GDP expanded from 6 percent to 35 percent between 2002 and 2012 (see Figure 2.1), while banking sector assets grew from 30 percent to 70 percent of GDP over the same period.[10] To some extent, an increase in shadow banking activities is a natural part of domestic financial deepening in these economies (April 2014 GFSR). The expansion of shadow banking was significantly driven by the growth of broker-dealer activities and finance companies as well as the growth of entities similar to MMFs (Figures 2.5 and 2.6). In some countries, including Brazil and South Africa, mutual funds have also been growing strongly; in others, including Mexico and Turkey, real estate investment trusts have expanded especially

[9]The difference is small for the United Kingdom, but this is mainly related to a lack of disaggregated data. The large differential for Japan is attributable to the significance of noncore liabilities issued by public financial institutions.

[10]This growth is broad-based across emerging markets (FSB 2013c).

Figure 2.4. Alternative Measures of Shadow Banking Size
(Trillions of U.S. dollars)

Figure 2.5. Shadow Banking Subsectors
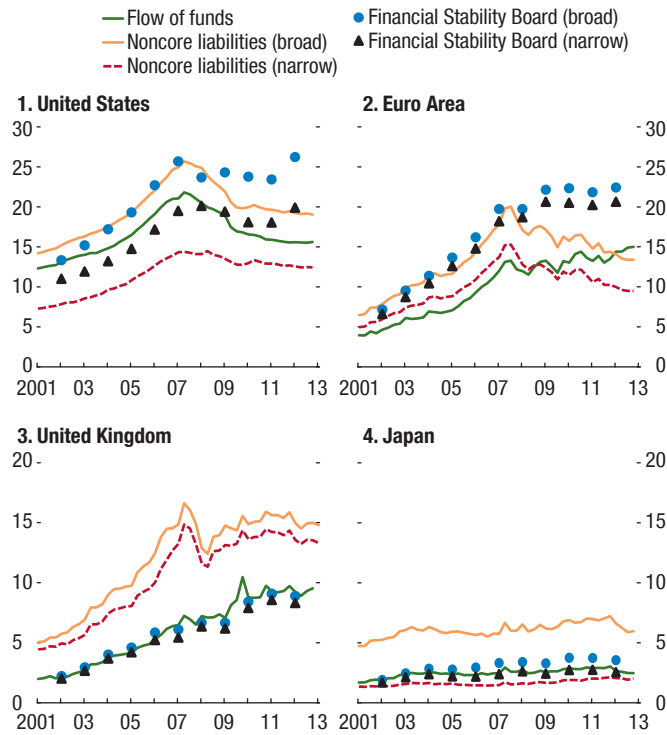
Sources: European Central Bank; Financial Stability Board (FSB); Haver Analytics; IMF, International Financial Statistics database; and IMF staff estimates.
Note: FOF = flow of funds. The FSB broad measure includes all nonbank financial intermediaries; this figure's proxy for the narrow FSB measure excludes equity funds, but not entities prudentially consolidated with banks (for example, structured investment vehicles and retained securitization). The broad (narrow) noncore liabilities measure includes (excludes) intra-financial-sector liabilities. For the definition of U.S. flow of funds shadow bank entities, see Adrian and Ashcraft (2012). For the definition of euro area FOF shadow bank entities, see Bakk-Simon and others (2012). Euro area noncore liabilities cover liabilities of banks and, within the nonbank financial sector, only liabilities of financial vehicle companies, which explains the decline after 2008.

Sources: Financial Stability Board; European Central Bank; Hedge Fund Research (HFR); People's Bank of China; and IMF staff estimates.
Note: AE = advanced economy; CAGR = compound annual growth rate; Country spec/Specific = country-specific shadow entities, such as U.S. holding corporations, Dutch special financial institutions, and Swiss mortgage bond institutions; EME = emerging market economy; Finance Co = finance companies; MMF = money market mutual fund; Other = residual category. Investment funds in Figure 2.5 include bond, equity, and mixed funds. FSB data have been supplemented with hedge fund data from HFR, and some subsector trends have been extrapolated to produce this figure. An estimate of China's shadow banking sector was inferred from various issues of the China Financial Stability Report and WIND Info, and includes data on wealth management products, finance companies, trust loans and entrusted loans, securities investment funds, and bank acceptances. Growth rates are scaled by the subsectors' financial assets in 2012. For emerging market economies, CAGR in the first subperiod is for 2004–08 instead of 2002–08. For sample coverage, see Table 2.3.

fast (albeit from a low base). In dollar terms, China's shadow banking sector became the fifth largest among FSB jurisdictions in 2012 (see Boxes 2.2 and 2.3).

What Contributes to Shadow Banking Growth?

This section identifies key drivers of the growth patterns just discussed, stressing commonalities across advanced and emerging market economies. Both quantitative analyses and concrete country examples are presented.

The literature suggests that a search for yield, regulatory arbitrage, and complementarities with the rest of the financial system play a role in the growth of shadow banking. First, when government bond yields are low

and investors are looking for higher-yielding assets, it is the shadow banking system that often supplies those assets—the search-for-yield effect.[11] Some have stressed

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[11]See Jackson (2013); Caballero (2010); Goda, Lysandrou, and Stewart (2013); Goda and Lysandrou (2014); and Lysandrou (2009, 2012).

Figure 2.6. Size of the Shadow Banking Markets
(Trillions of U.S. dollars)

1. U.S. and European Private-Label Securitization Issuance

- Europe (retained by issuers)
- Europe (placed with investors)
- United States (placed with investors)

2. U.S. and European Repo Markets

- Europe
- United States (tri-party)
- United States (bilateral)

3. MMFs and Investment Fund Assets in Emerging Market Economies

- Investment funds
- MMFs

4. Broker/Dealers and Finance Companies in Emerging Market Economies

- Broker/dealers
- Finance companies

Sources: Association for Financial Markets in Europe; Board of Governors of the Federal Reserve System; Federal Reserve Bank of New York; CRE Finance Council; Financial Stability Board; Inside Mortgage Finance; International Capital Markets Association; JPMorgan Chase & Co.; and IMF staff estimates.
Note: MMF = money market mutual fund. For U.S. tri-party repurchase agreements (repos), data between 2002 and 2005 were interpolated.

the international dimension of the effect, pointing to the role of shadow banks in intermediating capital flows (Shin 2010; Mehrling and others 2013). Second, tighter bank regulation encourages institutions to circumvent it through nonbank intermediation.[12] This phenomenon has long been recognized in the literature on financial repression in developing economies (Vittas 1992). Third, growth of shadow banking can be complementary to the rest of the financial system. In emerging markets, the growth of pension funds and insurance companies has often come along with the growth of investment funds and other nonbank intermediaries

[12]See Kanatas and Greenbaum (1982); Bernanke and Lown (1991); Udell and Berger (1994); and Duca (1992, 2014).

(April 2014 GFSR). In the United States, argues Pozsar (2011), shadow banking grew from the demands of so-called institutional cash pools for alternatives to insured deposits and safe assets.[13] However, to some extent, this, too, can be regarded as a special case of a reaction to regulations (that is, limits on deposit insurance) in an environment of ample liquidity. No comprehensive empirical assessment of the drivers of shadow banking appears to have been conducted yet.

Econometric evidence

Econometric analysis supports the role of these factors in explaining shadow banking growth. Given its broader coverage and higher frequency, this chapter uses the flow of funds measure (in national currency) as a proxy for the shadow banking system.[14] Although many of the findings are consistent with causal interpretations as discussed above, the chapter does not claim to overcome potential endogeneity problems, and the results should be interpreted primarily as correlations. The main findings of the econometric assessment are that higher growth of shadow banking is associated with the following factors (Figure 2.7, Table 2.2, Annex 2.3):[15]

- *Bank regulation:* More stringent capital requirements, for example, are associated with stronger growth of shadow banking. This is consistent with the notion that banks have an incentive to shift activities to the nonbank sector in response to certain regulatory changes.

[13]Institutional cash pools include the liquidity tranche of foreign exchange reserves, corporate cash pools, institutional investors, and securities lenders' cash collateral reinvestment accounts.
[14]This sample largely comprises advanced economies, but given the significant time coverage, it also includes a number of countries considered emerging market economies in earlier years of the sample. The FSB measure (covering fewer countries, a shorter time span, and at a lower frequency, but comprising more emerging market economies) is also used in a robustness check (Annex 2.3). A separate estimation for emerging market economies was not possible due to lack of data. Estimations with the noncore liabilities measure yielded broadly similar results. For flow of funds estimations, all variables are measured in national currencies; hence, results are not affected by currency fluctuations. FSB data are measured in U.S. dollars; however, controlling for exchange-rate movements did not affect any of the findings reported here.
[15]Panel regressions were conducted to assess the potential role of these factors over the period 1990–2013. The level of real interest rates and the term spread were used to measure financial conditions, a variety of regulatory variables (from World Bank surveys on bank regulation and supervision) to measure the impact of regulation, and the growth of banking and insurance companies' and pension funds' assets to measure complementarities. To control for valuation effects, stock market returns were included in the model, but this did not affect the significance of any of the factors under examination.

Box 2.2. New Shadow Banking Developments

In advanced economies, nonbank lending is rapidly growing as banks are apparently withdrawing from certain activities in response to strengthened regulations.

- *Direct corporate lending in Europe and the United States:* New lenders comprise a wide and growing range of nonbank entities, including pension funds and insurers. Moreover, U.S. entities (such as private equity and distressed debt funds) are increasingly providing European firms with long-term funding. In the United States, according to market sources, the

nonbank share of leveraged lending rose from about 20 percent in 2000 to 80 percent in 2013, and loan funds expanded from $80 billion to $160 billion between 2010 and 2013 (Figure 2.2.1, panel 1).[1]

- *Peer-to-peer online lending platforms:* Although this market is currently small—about $6.5 billion outstanding at the end of March 2014—its potential for growth is large (Kirby and Worner 2014). So far, most activity is taking place in the United States and the United Kingdom and is focused on loans to

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[1]This is in line with the substitution effect found between investment funds and traditional banks in the preceding section.

Figure 2.2.1. New Shadow Banking Developments and Risks

1. Mutual Fund Loans in the United States and Euro Area[1]
(Billions of U.S. dollars)
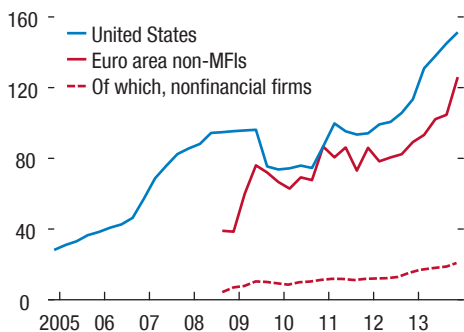
2. China: Wealth Management Products
(Trillions of yuan)
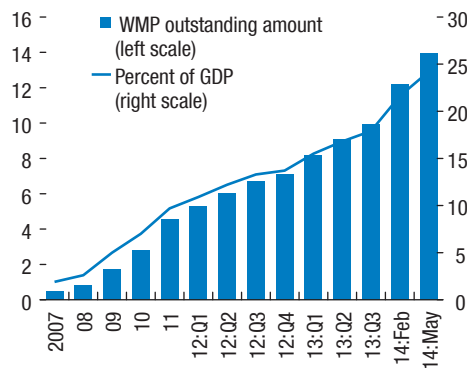
3. Risk Scoring in Advanced Economies
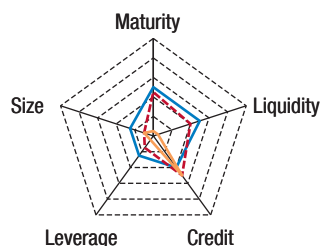
4. Risk Scoring in Emerging Market Economies
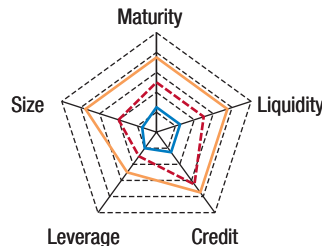
Sources: CEIC Data; China Banking Regulatory Commission; Haver Analytics; local media; and IMF staff calculations.
[1]In Europe, mutual funds are typically limited to participations.
Note: DPC = derivative product company; MFI = monetary financial institution; REIT = real estate investment trust; SE = southeast; WMP = wealth management product. Panels 3 and 4 depict qualitative risk scoring of new shadow banking activities from low (toward the center) to high (on the edges of the figures), based on discussions with market participants, policymakers, and IMF staff, and on various research reports.

Box 2.2 *(continued)*

households and small businesses, although various institutions are seeking to securitize these loans, expand toward riskier borrowers, and form partnerships with banks (McCrum 2014; S&P 2014).

- *Mortgage servicing rights (MSRs):* MSRs are rights to receive a portion of mortgage interest and fees collected from borrowers in return for administering loans. In the United States, banks have been selling MSRs to lightly regulated nonbank specialty servicing firms because of increased capital risk weights. Nonbank servicers accounted for $1.8 trillion remaining principal balance on U.S. mortgages at the end of March 2014 versus nearly none at the end of 2010 (Kroll 2014). MSRs carry significant short-term risks in terms of compliance and operational factors (such as interruption of servicing or delays in transfers).

- *Derivative product companies (DPCs):* DPCs are special-purpose companies set up by banks, jointly with private equity firms and hedge funds, to trade with non-affiliated counterparties in non–centrally cleared derivatives to avoid higher capital charges on the latter (Whittall 2014). Since DPCs may be rated higher than parent banks, they may attract business from rating-constrained counterparties and also help banks reduce their required liquidity buffers. So far, only a few DPCs have been newly established.

Among recent developments in emerging market economies, growth in shadow banking in China stands out.

- *Rapidly growing and varied shadow banking in China:* As of March 2014, shadow banking social financing had risen to 35 percent of GDP and is expanding at twice the rate of bank credit.[2] Entrusted loans and trust loans, originated outside the highly regulated banking system, account for a large share of shadow banking social financing.[3]

Banks have also been issuing wealth management products (WMPs), which share some of the characteristics of structured investment vehicles and collateral debt obligations used by U.S. banks before 2008 to keep loans off their balance sheets.[4] WMPs offer higher yields than bank deposit rates and are promoted as a low-risk instrument (see Box 2.3). In early 2014, WMPs accounted for 25 percent of GDP, growing by 50 percent since early 2013, and threefold since early 2011 (Figure 2.2.1, panel 2). Furthermore, retail payment platforms recently instituted a method of sweeping cash balances into money market mutual funds that in turn may (partly) invest in short-term commercial paper issued by local government financing vehicles. The growth of the latter form of shadow banking has been exponential, and it is subject to run risk because the money can be instantly redeemed, which would require the money market mutual fund to sell assets.

- *Real estate investment trusts (REITs) in Mexico:* With $12 billion in assets, the industry is small relative to the financial sector (around 2.4 percent of banking assets). However, its importance is increasing rapidly. In 2013, REITs accounted for more than one-third of the funds raised by Mexican companies in the domestic equity market. Risks seem contained at this point; bank loan financing is low, and the authorities recently established limits on leverage and interest coverage ratios.

- *Lending by nonbanks in Southeast Asia:* In Malaysia, this activity accounted for roughly one-quarter of the increase in household debt since 2008, and in Thailand for nearly 30 percent of the increase since 2007.[5] Because it has focused on lower- to middle-income households, it may be more risky than bank lending, although the authorities have taken mitigating action. Another trend in this region is the financing of large (cross-border) infrastructure projects through finance companies, funded by long-term institutional investors.

[2]Total social financing (TSF) is a broad measure of credit from the financial sector to the real economy computed by the People's Bank of China. Shadow banking social financing is defined as TSF minus bank loans, equity-like items, and bond issuance.

[3]Entrusted loans are loans between firms with banks or finance companies as payment agents. Trust loans are loans by trust companies that in turn structure these loans into trust schemes or wealth management products and sell them to investors.

[4]Off-balance-sheet bank WMPs package various underlying assets, such as bonds, loans, or discounted bills that are sold to investors. WMPs by securities firms package fixed-income securities, equity, or loans.

[5]Household debt as a proportion of GDP rose in Malaysia from 60 percent in 2008 to 87 percent in 2013, and in Thailand from 55 percent in 2007 to 82 percent in 2013.

Box 2.3. China: Bank Characteristics and Wealth Management Product Issuance

The growth of wealth management products (WMPs) is related to the size of Chinese banks (Figure 2.3.1, panel 1), implying that they may generate potentially higher financial stability risks for large banks. The majority of new WMPs are offered by banks, and larger banks tend to issue proportionally more. Because WMP yields are much higher than bank deposit rates or repo rates, and a significant number of them have guaranteed returns,

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WMPs may entail a shift away from bank deposits and affect bank funding patterns and costs.

However, several mitigating factors are in place. For larger banks, higher issuance of WMPs is associated with lower leverage, suggesting that these banks have larger capital buffers to absorb deposit drains. For smaller banks, there is no apparent relationship between WMP issuance and leverage. Furthermore, larger banks tend to have WMPs with a longer tenor, which reduces liquidity and rollover risk. Moreover, on the asset side, many of the underlying loans are granted to public sector companies, which enjoy some form of implicit state guarantee.

Figure 2.3.1. Wealth Management Products in China
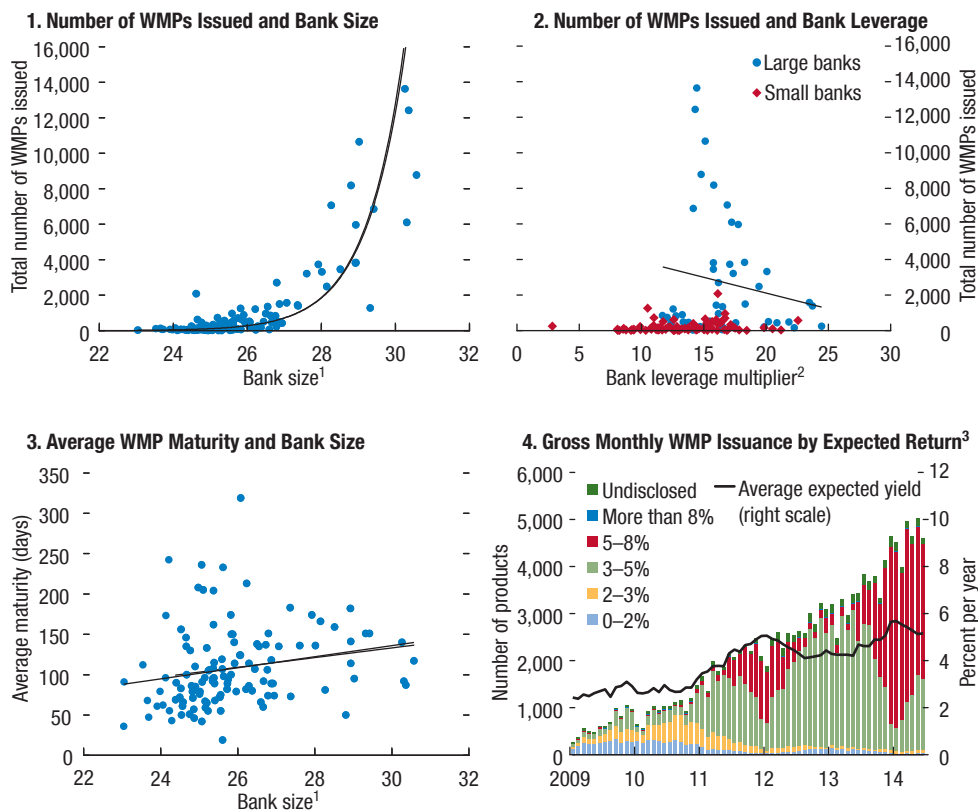
Sources: RESSET Data Tech Co., Ltd.; WIND Info; and IMF staff calculations.
Note: WMP = wealth management product.
[1]Log of total assets for 2013.
[2]Assets/equity for 2013.
[3]Sample covers all products issued by banks covered in WIND Info.

Figure 2.7. Drivers of Shadow Banking
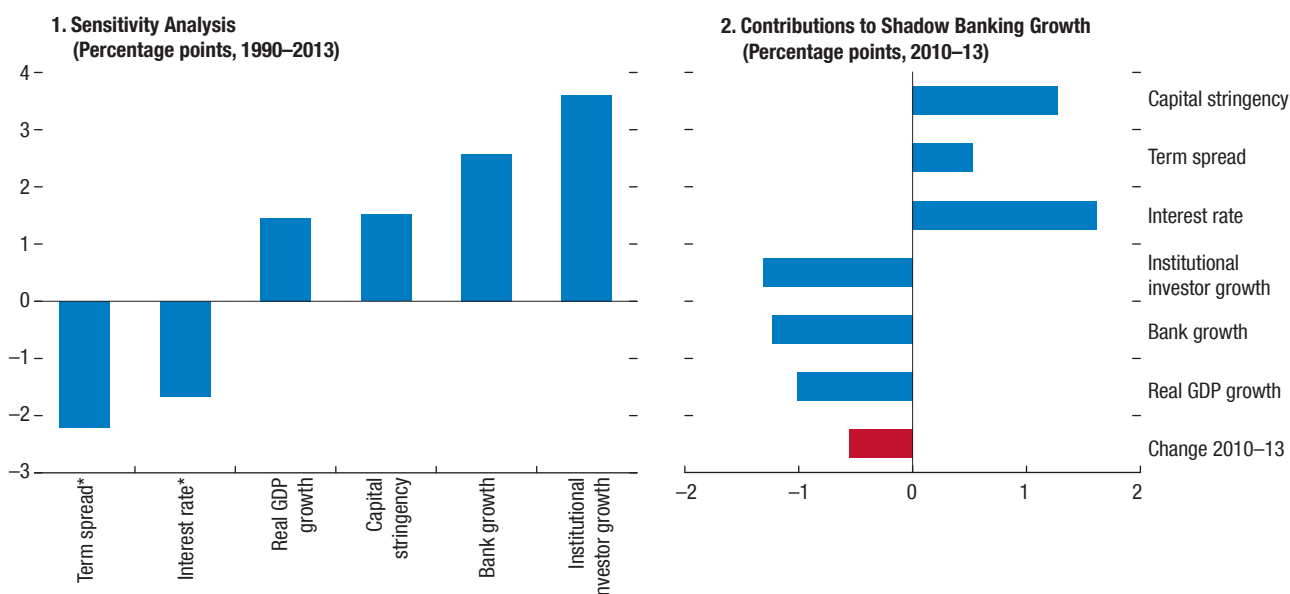
Source: IMF staff calculations.
Note: Panel 1 shows the impact on growth rates for shadow banking (flow of funds measure) of a 1 standard deviation shock in each of the shown dependent variables (* = post-2008). Panel 2 shows the contribution to the change in average shadow banking growth rates from 2010 to 2013 of the changes in each of the listed independent variables over the same period. All variables are significant at the 5 percent level. The underlying model also includes a systemic crisis dummy. The model is estimated using panel data covering the period 1990–2013 and a sample of 29 mostly advanced economies. For more details on estimations and data, see Annex 2.3.

Table 2.2. Summary of Panel Regression on Shadow Banking Growth
(Flow of funds shadow banking measure)

	Expected sign	Estimate
Macrofinancial variables		
Real GDP growth	+	+
Banking sector size	+	+
Institutional investors size	+	+
Real short-term rate (lag 4)	–	n.s.
Real short-term rate (lag 4, post 2008)	–	–
Term spread (lag 4)	–	n.s.
Term spread (lag 4, post 2008)	–	–
Regulatory variables		
Overall capital stringency	+	+
Capital regulatory index	+	+
Supervisory power index	–	n.s.
Financial statement transparency	+/–	–
Global liquidity quantities (lag 4)	+	n.s.

Source: IMF staff calculations.
Note: This table shows the expected and estimated signs of the determinants of the growth of shadow banking assets from panel regression models. If statistically significant at the 5 percent confidence level, the sign of the estimated coefficients is shown (+ or –). The table shows "n.s." if the variable is not statistically significant. Coefficients of macrofinancial variables are taken from the baseline regression results (without regulatory variables), whereas coefficients of regulatory and global liquidity variables are taken from a regression where these variables are added one by one to the baseline regression. See Annex 2.3 for further details.

- *Liquidity conditions:* The negative correlation of shadow banking growth with term spreads and interest rates becomes considerably stronger after 2008.[16] This shift is in line with the changed role of the term spread in the context of quantitative monetary easing since then. However, there was no direct evidence for the role of capital flows, possibly because their effects are already captured by the other explanatory variables.
- *Institutional cash pools and financial development:* Stronger growth of institutional investors is associated with higher growth in shadow banking, consistent with complementarities and demand-side effects. Alternatively, this could reflect a general trend in financial development.
- *Growing banking sector:* Countries with higher banking sector growth rates tend to experience higher growth of shadow banking, again suggesting

[16]Some studies argue that, at least in the United States, other effects related to the quantitative easing by the Federal Reserve have played a role in this period (Pozsar 2011; Singh 2013b).

Figure 2.8. Sensitivity Analysis by Subsector
(Percentage points)
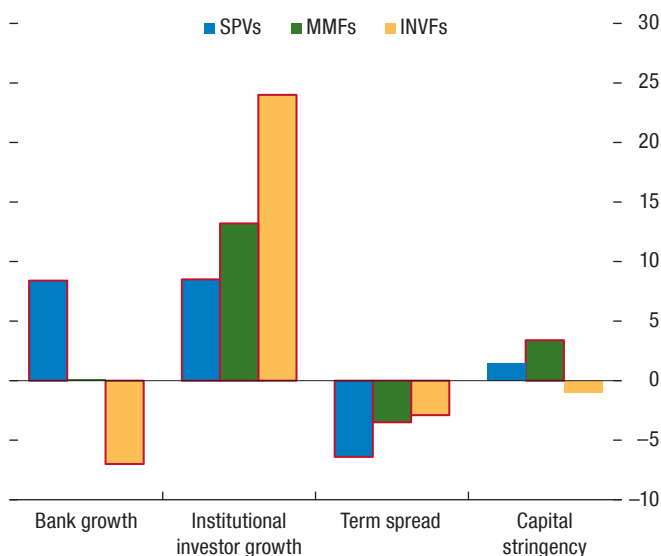
Source: IMF staff calculations.
Note: INVF = investment funds (sum of equity, bond, and mixed funds); MMF = money market mutual fund; SPV = special purpose vehicle. The impact on sectoral growth rates for SPVs, MMFs, and INVFs of a 1 standard deviation shock is shown for the independent variables indicated. A red border denotes significance at the 5 percent level. The underlying model also includes a systemic crisis dummy and the year-over-year growth in real GDP. The model is estimated using panel data covering the period 2003–12 and a sample of 17 to 21 advanced and emerging market economies. For more details on estimations and data, see Annex 2.3.

complementarities.[17] Alternatively, the results could reflect a general trend in financial deepening driven by other factors.

To gain further insight into the drivers of growth within subsectors of the shadow banking system, MMFs, investment funds, and securitization were examined separately (Figure 2.8). Because data for these particular shadow banking activities are more limited—they are available only since 2002, on an annual basis, and for a smaller number of countries—their explanatory power is more limited.

- *MMFs and investment funds:* Banking growth is not important in explaining the growth of MMFs, and the correlation is negative for investment funds, in line with the notion that the latter substitute for, rather than complement, the banking system.[18]

[17]Banks have also often sponsored shadow banking activities (see Mandel, Morgan, and Wei, 2012, for details).

[18]For MMFs, the insignificance of the banking sector may also reflect heterogeneity in the composition of MMFs: MMFs with fixed net asset values (NAVs) resemble bank deposits more closely than those with variable NAVs.

However, the growth of MMFs and investment funds is strongly associated with the growth of institutional investors, which supports the cash-pool demand hypothesis. Similarly, the compression of the term spread (capturing search for yield) plays only a small role for MMFs and investment funds.

- *Securitization:* The growth of private-label securitization via SPVs is strongly associated with growth of the banking sector, probably because SPVs are frequently sponsored or owned by banks. As expected, the growth of institutional investors is less correlated with the growth of securitization. Securitization growth is more strongly (and negatively) associated with the term spread than are MMFs. The impact of capital regulations is less important for securitization than for MMFs.

Country-specific evidence

This section complements the previous findings with country-specific examples. Viewed globally, shadow banking is highly varied, but the factors advancing its growth are often very similar.

Advanced economies

- *Regulatory arbitrage* following the 1988 Basel Accord spurred the growth of securitization in Europe and the United States. The Basel Accord on bank capital rules boosted the securitization of low-risk loan portfolios and the retention of high-risk loans because of a lack of differentiation between high- and low-quality loans (Allen 2004). In the late 1980s, regulatory arbitrage also motivated the introduction of collateralized debt obligations (CDOs) and structured investment vehicles (SIVs). The growth in securitization markets strengthened in the low-interest-rate environment in the mid-2000s, in line with the econometric evidence.
- *Bank restrictions, low real interest rates, and demand from institutional cash pools* have been key drivers behind the growth of MMFs in the United States. MMFs originated in the 1970s as a way to circumvent bank interest rate restrictions during times of rising inflation, which made real interest rates on regulated deposits increasingly negative (Calomiris 2013).[19] Today, there is large demand for MMFs

[19]In addition, MMFs are exempt from reserve requirements and Federal Deposit Insurance Corporation deposit insurance taxes, and can take on some credit, market, and maturity risk without being subject to the full set of prudential regulation. Moreover, in the United States, MMFs have so far been able use stable net asset

from so-called institutional cash pools (Pozsar 2011). However, bank regulation, now in the form of limits on deposit insurance, still contributes to demand because the limits induce large depositors to seek higher-seniority claim status with nonbank institutions that offer liquidity similar to that of bank deposits.

- *Search for yield, which began around the mid-2000s,* accelerated flows into hedge funds and private equity funds and stimulated the rapid growth of structured finance and investment funds. In the euro area, for example, low sovereign yields and ample liquidity in global financial markets were key factors in driving investors to seek higher returns in riskier markets (such as structured finance and leveraged buyouts [ECB 2006]).

Emerging market economies

- *Heightened restrictions on banks,* including on deposit rates, seem to be an important driver of shadow banking in China. In response to the rapid growth of bank lending and concerns about inflation, in 2010, the Chinese government placed significant restrictions on the traditional banking system (including more conservative credit quotas). The intervention slowed conventional lending but not off-balance-sheet loan originations (see Boxes 2.2 and 2.3).

- *Regulatory arbitrage and government support* encouraged the growth of special-purpose nonbank financial institutions (Sofoles) in Mexico. These institutions specialized in mortgage financing to lower- and middle-income households in the informal sector, and they were subject to less stringent regulations because they did not take deposits. Moreover, to improve financial access, the federal government provided them with support and backstopping, allowing their mortgage-backed securities to receive the highest credit rating. Severely hit during the global financial crisis, Sofoles had to transform into different legal entities, such as unregulated Sofomes.

- *Banking activity is complemented in India by nonbank financing companies.* Acharya, Khandwala, and Öncü (2013) find that these companies are seen by banks with less-developed branching networks as a way to complement credit allocation in nonurban areas of the Indian economy, in particular to meet their

values for reporting and redemption purposes—which sustained the perception of MMFs as a "safe" asset, although new regulations may alter this feature.

Figure 2.9. Brazil: Investment Funds, Insurance Companies and Pension Funds, and the Interest Rate
(Percent)
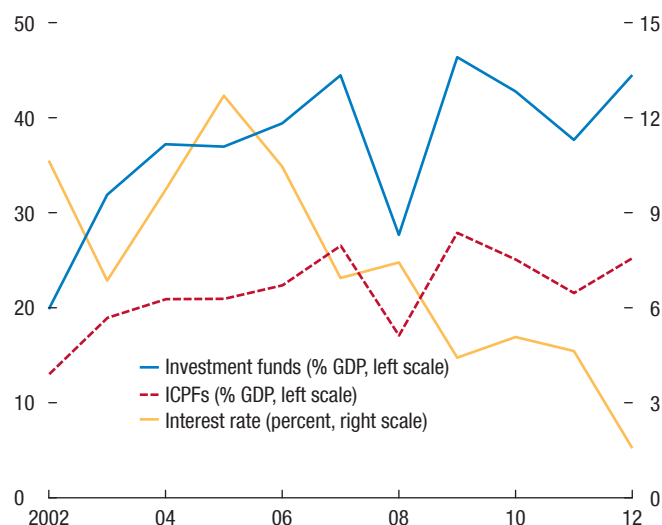
Sources: Financial Stability Board; IMF, International Financial Statistics database; and IMF staff estimates.
Note: ICPF = insurance companies and pension fund. The interest rate is the real money market rate.

assigned targets for lending to priority sectors.[20] Hence, nonbank financial institutions sometimes are more able than banks to reach out to certain groups of borrowers.

- *The demand from institutional cash pools* appears to have played a role in the growth of investment funds in Brazil, where assets increased from 25 percent of GDP to 50 percent between 2002 and 2013. This growth was due in part to an increase in institutional investors (such as pension funds and insurance companies), which account for roughly 40 percent of the funds' investor base (Figure 2.9). A search for yield in a period of falling real interest rates also likely contributed. Relative to total financial assets, however, the share of investment funds fell slightly.

Where Are the Risks, and What Is New?

This section assesses the various risks surrounding shadow banking entities. It analyzes systemic risk and interconnectedness in the financial sector for the euro area, the United Kingdom, and the United States. It also discusses benefits and risks related to recent devel-

[20]"Priority sectors" are those that may not get timely or adequate credit in the absence of a special policy, and hence lending targets have been established for them.

opments in the shadow banking systems of advanced and emerging market economies (see Chapter 1).

Balance Sheet Risk Measures

Data from flow of funds and sectoral accounts can provide a quantitative approximation of various sources of shadow banking risk and their evolution. Specifically, in addition to size, rough approximations of maturity risk (based on whether assets are of long or short duration), liquidity risk (based on whether assets are liquid and easy to trade), credit risk (based on the share of loan assets that carry substantial credit risk), leverage (total assets to equity), and interconnectedness (how these entities are exposed to banks through asset holdings or liabilities) can be inferred from the flow of funds and sectoral balance sheet breakdowns.[21] Using this information, rough risk scores can be constructed based on simple ratios for various entities in the euro area, Japan, and the United States.

Although useful, a risk analysis based on this type of data has limitations. Aggregation at the sectoral level can mask important vulnerabilities at the entity level. Some risks, such as fire sale and run risks, cannot be easily quantified, nor can some risks associated with the environment in which shadow banks operate (such as the extent of regulation and supervision and the availability of backstops). Moreover, risk scores of individual sectors may underestimate both interdependence among shadow banking entities and exposure to common factors, which can result in sudden and disproportional deterioration of these entities' balance sheets (Box 2.1 and the section "Systemic Risk and Distress Dependence" address some of these issues through the use of market prices). Nevertheless, despite its limitations, this level of analysis may be a useful starting point for assessing the magnitude of risks posed by shadow banking entities and for tracking their evolution over time.

A look at some key shadow banking sectors for major advanced economies supports the notion that a granular examination is required to assess risks (Figure 2.10). Even this relatively simple scoring method reveals significant variations in risk dimensions across activities. Moreover, as highlighted earlier, similar types of activities carry different types of risks across countries and over time. For example, euro area MMFs

seem to be more directly connected with banks and have longer-maturity and less-liquid assets than their U.S. and Japanese counterparts.

In the euro area and the United States, traditionally less risky activities have been growing the fastest since 2009, but to some extent, they are taking on more liquidity risk. In the euro area, bond, mixed, and other funds grew strongly, whereas securitization and the size of MMFs fell (see Figure 2.10). These funds tend to be exposed to some liquidity and maturity risk but score low on other risk dimensions. At least in the euro area, however, bond funds now tend to hold less-liquid and longer-maturity assets than five years ago. Similarly, in the United States, investment funds—which entail some maturity risk, but do not display high risk scores in other areas—have been the fastest-growing form of shadow banking, expanding from 35 percent to 70 percent of GDP. Their aggregate risk profile has, however, not changed markedly. A caveat to this is that the breakdown between different types of non-MMF funds is not available for the United States, where "other funds" also include equity funds. Chapter 1 highlights the rising asset flows into mutual funds focused on less liquid high-yield fixed-income assets, which can only partially be captured with the type of data examined here.[22]

In Japan, broker/dealers (which show relatively high exposure to credit risk and leverage) gained market share. They grew from 25 percent to 31 percent of GDP, mainly because of higher repo holdings related to their market-making activity in Japanese government bonds (JGBs), while other shadow activities either declined or remained relatively small. Compared with U.S. broker/dealers, their Japanese counterparts appear to have higher (albeit falling) leverage and higher credit risk (but lower liquidity risk), but credit exposures pertain mainly to short-term loans and repos collateralized by JGBs. Other shadow banking entities do not seem to be systemically important in terms of size, although on certain risk dimensions they have relatively high scores (for example, finance companies on credit and liquidity risk, and securitization on interconnectedness).

Data limitations prevent computing similar risk scores for many (new) shadow banking activities, although this would be useful for monitoring pur-

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[21]The method used here largely follows the methodology proposed in FSB (2014).

[22]For some other fund types, even fewer data are available. For example, exchange-traded funds (not included in "other funds") can transmit and amplify financial shocks originating in other parts of the financial system (OFR 2013). These products have grown rapidly, with $1.7 trillion in combined U.S. assets at the end of March 2014.

Figure 2.10. Shadow Banking Risks in the Euro Area, the United States, and Japan
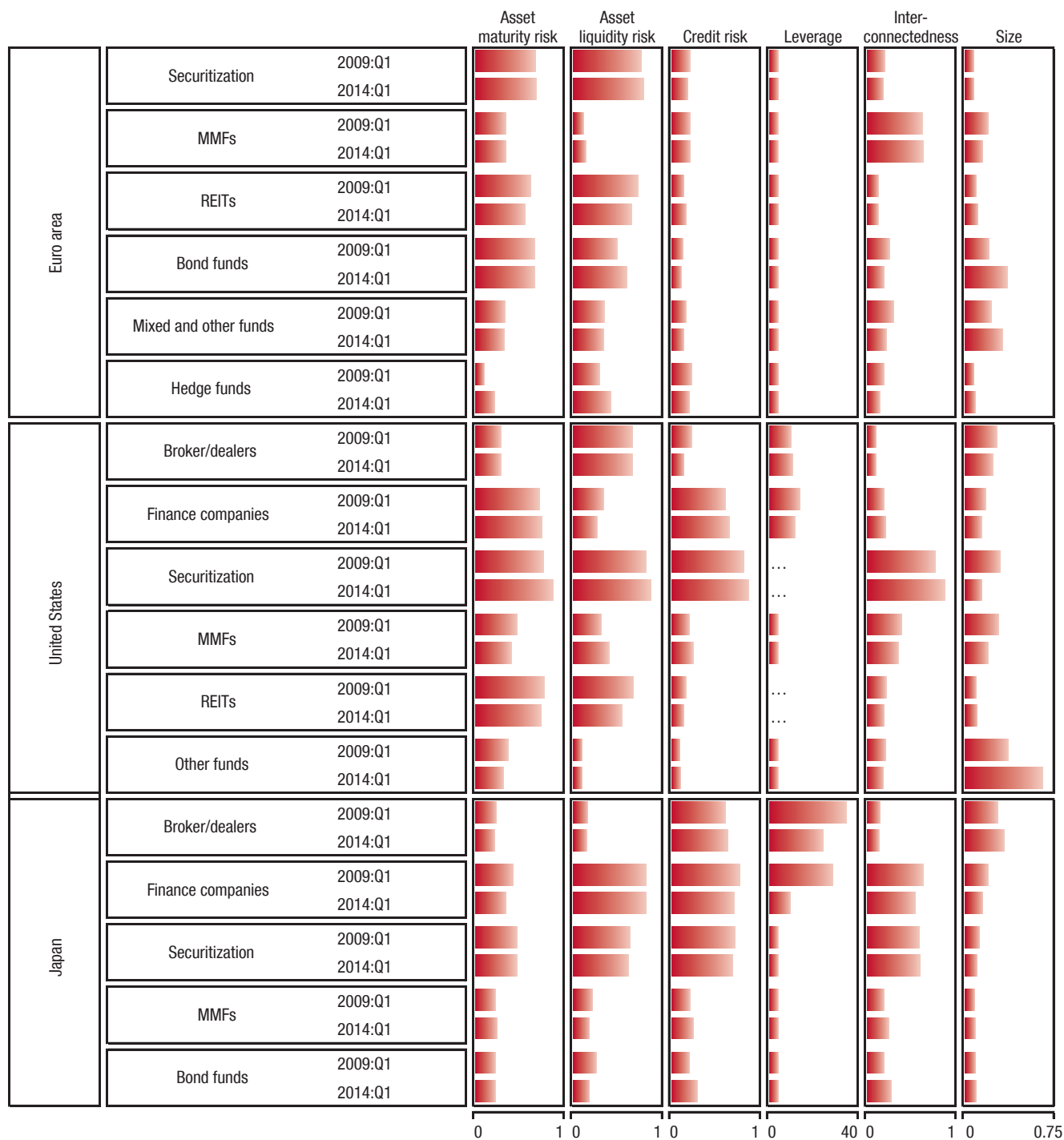
Sources: European Central Bank; Federal Reserve; Bank of Japan; Haver Analytics; SNL Financial; and IMF staff estimates.
Note: This figure shows metrics of various sources of risk across shadow banking sectors. Longer bars indicate greater risk. Maturity risk = long-term assets to total assets; Liquidity risk = 1 minus liquid assets to total assets; Credit risk = loans to assets; Leverage = asset/equity multiplier; Interconnectedness = holdings of bank debt and loans to total assets; Size = ratio of sector's assets to GDP; MMF = money market mutual fund; REITs = real estate investment trusts. For U.S. funds and securitization vehicles (asset-backed securities issuers) and for Japanese shadow banking entities, some assumptions were made regarding asset liquidity and maturity, due to lack of disaggregated data. In the United States, "other funds" refers to non-MMF (open-end) mutual funds.

poses. So far, data are generally lacking to systematically monitor new, or even a range of existing, shadow banking activities and entities in most countries along these lines. Box 2.2 provides a qualitative discussion of some recent shadow banking developments around the world, together with a qualitative risk assessment.

Systemic Risk and Distress Dependence

This section estimates the contribution to systemic risk by subsectors of the financial system, including the shadow banking sector. It also estimates the vulnerability to distress of the banking sectors in the euro area, the United Kingdom, and the United States.[23] The financial system is treated as a portfolio consisting of several different subsectors (Segoviano and Goodhart 2009). Asset prices and size information from each subsector are used to estimate a joint probability distribution of portfolio (systemic) losses. This joint distribution allows computation of a measure of "marginal contribution to systemic risk" (MCSR) by each subsector, where systemic risk is measured as the losses to the system that occur with a probability of 1 percent or less.[24] A related exercise examines "vulnerability to distress," defined as the risk that distress spills over to banks from other sectors and entities, either because of direct (balance sheet) exposures or indirect (common factor) linkages. Although the analysis attempts to span a substantial proportion of shadow banking activities, it does not cover all of them, and therefore likely underestimates the sector's total contribution to risk. In particular, for cross-country comparability purposes, non–sovereign bond funds (discussed in Chapter 1) are excluded here. Moreover, the aggregate nature of the analysis means that not all types of risks can be fully captured; for example, certain funds may offer easier

redemption options than others and therefore be more exposed to run risk.

Nonbank financial intermediaries contribute substantially more to systemic risk in the United States than in the euro area or the United Kingdom (Figure 2.11). According to this analysis, in the United States, the largest MCSR does not come from the banking system but from pension funds and insurance companies and from shadow banks (captured by the sum of mutual funds—money market, equity, and bond funds—and hedge funds).[25] In the euro area and the United Kingdom, the banking sector contributes relatively more to systemic risk because of its size and direct and indirect interlinkages; the next most important systemic risks are related to pension funds and insurance companies—most likely because the euro area and the United Kingdom have more bank-based financial systems.[26] In the United States at the end of 2013, the shadow banking sector accounted for about 30 percent of systemic risk, about as much as the banking sector. However, for the euro area and the United Kingdom, the shadow banking sector MCSR amounts to only 13 percent and 7 percent, respectively. The contribution of different sectors to systemic risk is fairly stable over time.

The contribution of the shadow banking sector to banks' vulnerability to distress is more elevated around crises. During stress periods in the United States, the contribution of the asset management sector (especially MMFs in 2007 and hedge funds in 2007–08) appears to increase, likely because of redemption pressures that led to fire sales of their assets. In the euro area, hedge funds as well as insurers seem to have contributed substantially to the vulnerability to distress in the banking sector in 2007–08, but the role of hedge funds was subsequently superseded by that of the equity and bond fund sectors (the latter is in line with the balance sheet risk measures in the previous section). In the United Kingdom, the overall contribution to the banking sector's vulnerability to distress between 2007 and 2012 appears equally divided between insurance companies, pension funds, and equity funds; subsequently, insurance companies have become the largest contributor.

The growing contribution of the insurance sector to the banking system's vulnerability to distress may

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[23]See Segoviano and others (forthcoming) for more details on methodology and results.

[24]The MCSR is not a directional measure—that is, it does not imply causality (for example, it can be driven by a third factor). The MCSR from a particular sector represents the percentage of total systemic risk attributed to that sector. The sum of the MCSR of all sectors equals 100 percent. MCSR is based on the (Shapley-value-based) risk attribution methodology proposed by Tarashev, Borio, and Tsatsaronis (2010). For the purpose of this analysis, the system's "expected shortfall" (ES) is chosen as the measure of systemic risk in the financial system. The systemic ES takes into account the size of each sector (bank and nonbank) in the system and sector interconnectedness. The ES represents the (average) extreme loss to the system that occurs with a probability of 1 percent (or less).

[25]This is commensurate with these sectors' relative sizes and, especially as regards pension funds, with the fact that this sector has large holdings of relatively less liquid fixed-income instruments, such as corporate bonds (similar in size to holdings of U.S. banks).

[26]The contribution to systemic risk also includes "shadowy activity" by banks.

Figure 2.11. Systemic Risk and Interdependence of Financial Intermediaries

1. Marginal Contribution to Systemic Risk
(Percent)

2. Contributions to Distress Vulnerability of Banking Sector
(Percent)
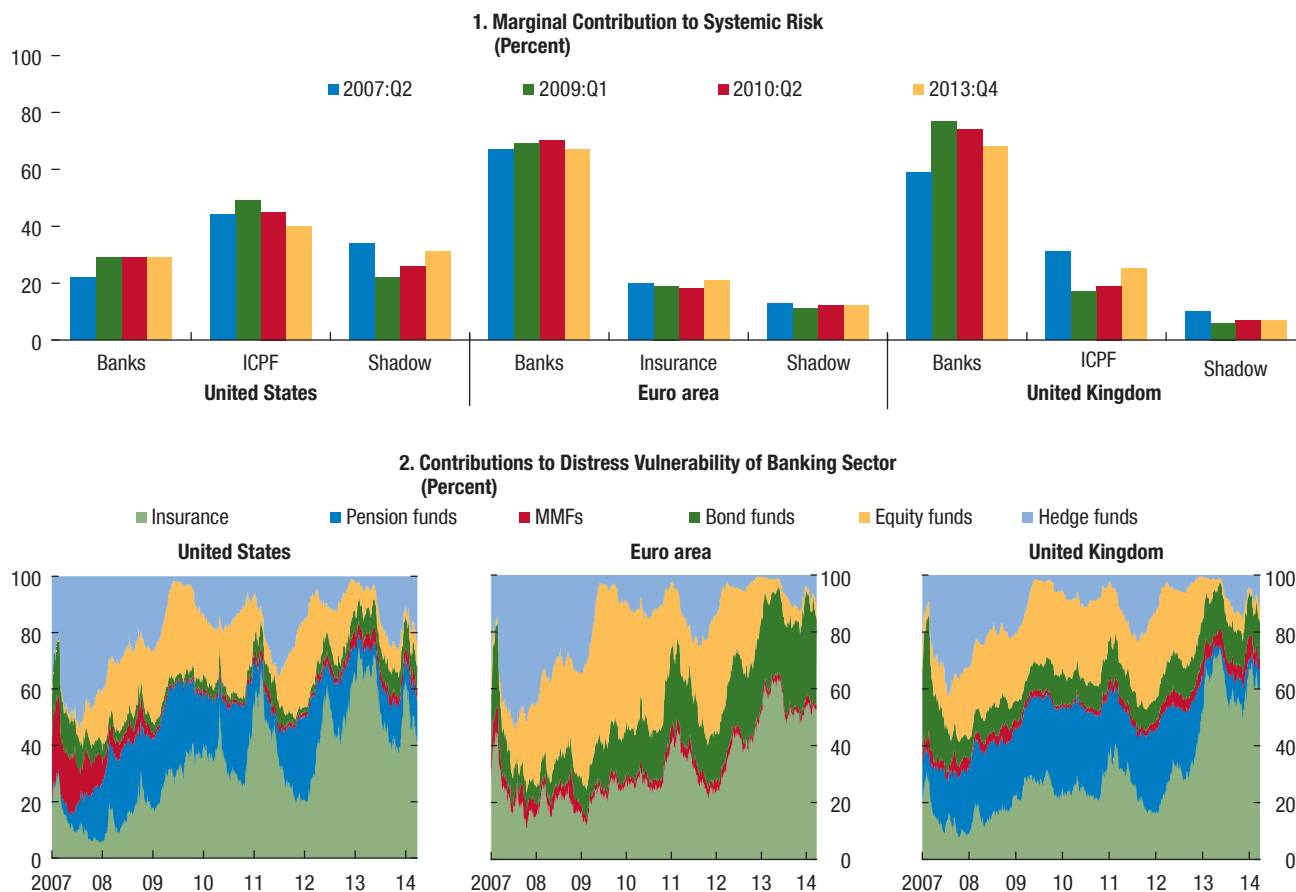
Sources: Bank of England; BarclayHedge; Bloomberg L.P.; European Central Bank; Federal Reserve; International Organization of Securities Commissions; Investment Company Institute; Investment Management Association; Thomson Reuters Datastream; Towers Watson; and IMF staff calculations.
Note: Contribution to the banking sector's vulnerability to distress is defined as the risk of distress spilling over from insurance companies and pension funds (ICPFs) and shadow banking sectors to banks. MMF = money market mutual fund. Shadow = the sum of contributions by mutual funds (money market, bond, equity) and hedge funds. Marginal contribution to systemic risk is defined as the percentage contribution to the expected systemic shortfall, following Tarashev, Borio, and Tsatsaronis (2010). For banks and insurance companies, the sample consists of the largest institutions by total assets. The analysis combines volume data from flow of funds accounts and asset price data. For pension funds, MMFs, and equity funds, asset price data are based on the sector's asset portfolio; data for hedge and bond funds are based on sectoral indices; and for banks and insurers, credit default swap spreads are used.

reflect growing similarities in exposure, partly because insurance companies have been engaging more in lending to companies. As discussed earlier (Box 2.2), this lending has often been channeled through the shadow banking system.[27,28] Moreover, insurance companies

[27]A greater exposure to common risks would be reflected in a higher contribution to banking system distress vulnerability, without implying a causal direction. More broadly, the finding is also in line with those of Acharya and Richardson (2014), who argue that the insurance industry is no longer traditional: it now offers products with nondiversifiable risk, is more prone to a run, insures against economy-wide events, and has expanded its role in financial markets.
[28]The International Association of Insurance Supervisors has developed a framework of policy measures for global systemically important insurers to increase their loss-absorbing capacity, mainly

have become the dominant purchaser of collateralized loan obligations as banks' interest in such securities has declined. Similarly, in the United States, life insurance companies are the largest investor in the corporate bond market (see Chapter 1). The insurance sector's overall contribution to systemic risk has, however, remained broadly stable since 2007.

An assessment of cross-border spillover reveals significant but declining linkages between U.S. shadow banks and the European banking system. The euro area banking sector's vulnerability to distress from shocks

because of engagement in nontraditional insurance and noninsurance activities.

Figure 2.12. U.S. Intermediaries' Contribution to Distress Vulnerability of the Euro Area Banking Sector
(Percent)
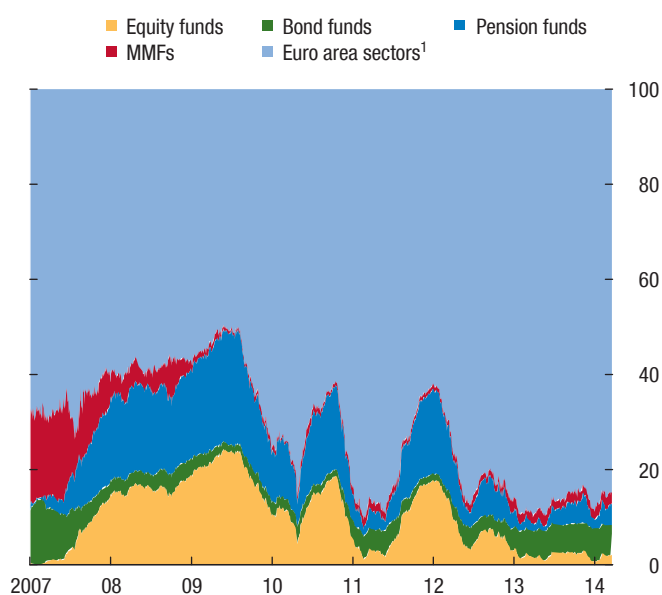
Source: IMF staff calculations.
Note: See the notes to Figure 2.11 for more information. MMF = money market mutual fund.
[1]Remaining contributions to the euro area banking sector's vulnerability to distress are from euro area financial sectors (see bottom middle panel of Figure 2.11 for the breakdown).

to U.S. financial intermediaries and shadow banks was elevated in the period leading up to the global financial crisis as a result of MMF funding of euro area banks (Figure 2.12) but has recently been falling. Since the start of 2012, the most important contribution from the U.S. shadow banking sector to euro area banking distress vulnerability has come from U.S. bond funds likely seeking exposure to European sovereign risk in the context of enhanced confidence following the announcement of the Outright Monetary Transactions program by the European Central Bank. Still, the relative contribution of these U.S. funds compared with European funds remains much below their pre-2009 levels.

What Should Be the Role of Regulation and Oversight?

The challenge for policymakers is to maximize the benefits of shadow banking for the economy while minimizing its systemic risks. As outlined earlier, shadow banking entails potential externalities and market

failures that are unlikely to be solved privately. Policymakers must strike the right balance between containing systemic vulnerabilities related to these risks (see the previous section) and preserving the benefits of shadow banks, including the provision of financing to the real economy. Overall, the degree to which shadow banking requires regulation and oversight depends largely on the degree to which it contributes to systemic risk.[29]

The monitoring of shadow banking should be part of the macroprudential policy framework that aims to address systemic stability risks more broadly. Differences in legal and regulatory structures imply that a type of firm considered to be a bank in one country may be regarded as a shadow bank in another.[30] Moreover, as discussed earlier, risk characteristics of shadow banking activities can differ substantially depending on the context in which they are conducted. Therefore, a one-size-fits-all approach to shadow banking regulation is not likely to work.[31] Nonetheless, this chapter has shown that the drivers of shadow banking growth have been fundamentally similar across countries and types of activities (albeit to different degrees). This suggests the need for an encompassing policy framework to minimize the scope for regulatory circumvention induced by the so-called boundary problem.[32] In this vein, macroprudential policy may be best suited to address shadow banking risks, building on recent progress in this area (IIF 2011; IMF 2013). Notably, dedicated macroprudential oversight agencies have been established in many countries, and macroprudential policy frameworks—aimed at identification and

[29]Investor protection is another motive for regulation and oversight.
[30]A narrow definition of a bank includes taking deposits and making loans (for example, as applied in the European Union's Capital Requirements Regulation). However, licensing requirements to perform certain activities and therefore the perimeters of banking supervision differ across countries. Countries using a broader definition of a bank require that firms hold a banking license to engage, for example, in factoring, securities underwriting, private equity financing, and extending financial guarantees.
[31]Financial sector entities operate under different legal forms and regulatory regimes, complicating a harmonized treatment.
[32]The boundary problem implies that tightening of prudential requirements for entities within the regulatory perimeter comes with incentives to shift activities outside it or to areas where regulation and supervision are weakest (Goodhart 2008; Goodhart and Lastra 2010). Croatia provides a case in point. As a result of a credit growth cap imposed on banks in 2003, bank credit growth slowed, but the annual growth of the loan and financial lease portfolio of domestic leasing companies exceeded 100 percent in 2003 and 40 percent in the next two years (Galac 2010). In 2007, the credit growth cap was expanded to cover funding of leasing companies.

response to nascent threats to financial stability—have improved substantially since the global financial crisis.

A decomposition of shadow banking entities and activities by function and level of risk may serve as a guide to identify systemic stability risks (see the section "Balance Sheet Risk Measures" and the FSB high-level policy framework [FSB 2013a]). Credit intermediation activities that involve significant maturity or liquidity transformation, imperfect credit risk transfer, or excessive leverage should be subject to additional regulation and oversight. Moreover, given the role of liquidity conditions and the search for yield in driving shadow banking growth discussed earlier in the chapter, macroprudential policymakers should be alert to interactions with other policies affecting financial stability, including monetary, fiscal, and structural policies (IMF 2013).

Policymakers have essentially four toolkits at their disposal to address financial stability risks related to shadow banking. First, they may impose regulations on shadow banks or address risks indirectly by targeting banks' exposure to shadow banks. Second, they may address the underlying causes of the growth of shadow banking. Third, they may, under certain conditions, extend the public safety net to (systemically) important shadow banking markets or entities. Fourth, they may change certain features of bankruptcy laws. Depending on the risks to be addressed, these various toolkits may need to be used simultaneously:

- *Regulation:* Policymakers can regulate shadow banks either directly, through tailored regulatory measures, or indirectly, by extending the regulatory boundary, limiting the ability of banks to support shadow banking activities, or by managing the implicit government guarantees of banks (Claessens and Ratnovski 2014). For example, shadow banking growth related to regulatory arbitrage (discussed earlier) could be curbed by applying prudential bank-like regulatory tools such as capital requirements to shadow banks. Specific risks can be mitigated through tools such as redemption limits for collective investment vehicles or restrictions on leverage and maturity or liquidity transformation. Enhancing reporting requirements may raise overall transparency and allow for better risk monitoring. The possibility of cross-border spillovers requires authorities to coordinate closely with their foreign counterparts. The lack of a safety net means that, for a given contribution to systemic risk, more conservative regulatory measures are needed for shadow banks than for banks. The FSB's regulatory work on

shadow banking regulation, summarized in Annex 2.4, aims to achieve these goals.

- *Addressing the underlying causes:* Supply-side and demand-side measures are a more indirect but potentially powerful way of addressing shadow banking stability risks. Applying such measures would require intensive coordination with authorities in charge of monetary, fiscal, and structural policies. Demand-side measures tackle the factors stimulating the growth of shadow banking, as discussed earlier. For example, the demand for shadow banking assets that arises from safety considerations (such as by institutional cash pools) could be redirected by ensuring a sufficient supply of publicly generated safe assets (Pozsar 2011).[33,34] However, among other complications, this may entail moral hazard risks, as the private sector may come to expect such demand accommodation by the government (Singh 2013a). Measures on the supply side include imposing restrictions on new instruments. A discussion of the conduct of monetary policy is beyond the scope of this chapter, but evidence presented earlier on the role of the search for yield suggests that, at a minimum, macroeconomic conditions need to be taken into account by policymakers when assessing the development of shadow banking.

- *Access to central bank facilities:* In principle, it is conceivable to extend the lender-of-last-resort function to certain kinds of systemically important shadow banks to protect the financial system against liquidity shocks (Bayoumi and others 2014).[35] However, extending access to central bank funding entails substantial moral hazard risks. Therefore, explicit public backstops should be considered only if appropriate regulatory oversight mechanisms are in place, including for collateral and governance.[36]

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[33]Claims on the private sector are inherently risky, so public debt may be a better basis for the production of safe assets and may provide better protection against negative aggregate shocks, which tend to degrade private-label safe assets (Bernanke and others 2011; Gourinchas and Jeanne 2012).

[34]A sufficient supply of public safe short-term assets can be achieved in two ways. First, the sovereign could expand its supply of safe assets. Second, improving fiscal policies could increase the share of existing assets that qualify as safe.

[35]Emergency lending assistance should be at the discretion of the central bank, involve heightened regulatory intervention, and should have a clear justification in terms of the central bank's authority. Moreover, it should be appropriately priced and not be provided on more favorable terms than available to banks.

[36]Expanding the list of nonbank counterparties to which central banks can provide liquidity could have unanticipated consequences for the structure and operation of the financial system (Bayoumi and

• *Changes to bankruptcy regimes and privileges:* Ordinary insolvency law may not provide for the specific recovery and resolution tools needed to manage systemic failures of shadow banking entities or activities. Setting up tailored recovery and resolution frameworks would increase the authorities' ability to mitigate systemic risk in crisis situations.[37] Bankruptcy privileges, such as safe harbor status, allow shadow banks to provide their lenders with safe, money-like assets (similar to insured deposits of regulated banks [Perotti 2010]).[38] Prudential policies to contain the risk associated with safe harbor status mostly aim at restricting eligibility. Safe harbor exemptions may also be restricted to certain market segments or transactions, such as claims publicly registered with

a central repository or backed by liquid collateral (Perotti 2010; Duffie and Skeel 2012; Perotti 2013). Alternatively, to maintain the eligibility of less liquid collateral and to facilitate an orderly resolution, an authority could be established to dispose of collateral (Acharya and Öncü 2012). Pursuing changes to bankruptcy privileges requires a careful impact assessment for shadow banks and could have potentially far-reaching consequences for other sectors as well.

Policymakers will have to better integrate the entity and activity dimensions of shadow banking regulation. Monitoring and risk identification should focus primarily on economic functions and activities, but regulation and supervision have so far mostly focused on entities. This has been recognized by the FSB (see Annex 2.4).[39] Doing so may help overcome the boundary problem and reduce the scope for regulatory arbitrage (Figure 2.13) (Greene and Broomfield, forthcoming).[40] Regulators need to consider the

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others 2014). Liquidity provided to structurally weak and insufficiently robust markets may shift risks to the central banks (Moe 2014). It may also prove politically difficult to establish a public safety net if shadow banking garners little public support on account of limited (tangible) economic benefits, against potentially large contingent liabilities for the government. Moreover, large heterogeneity within the shadow banking sector and difficulty identifying appropriate cost-sharing mechanisms may deter the shadow banking industry from entering into safety net arrangements.

[37]See FSB (2013d) for details on potential key attributes of effective resolution regimes for shadow banks.

[38]General bankruptcy law prohibits a lender from taking action to collect the amount owed by the borrower once a firm files for bankruptcy. Claims enjoying safe harbor privileges are granted an exemption to this rule and afford lenders a position senior to those of other investors (Duffie and Skeel 2012; Perotti 2010).

[39]For example, the FSB has covered repo and securitization activities, and its work on "other" shadow banking entities is largely activity-functions based.

[40]To account for network effects and to prevent the migration of activities within one sector, the entity dimension should focus on sectors and not on single entities. Similarly, to capture all transactions that fulfill a function, the activity dimension should focus on clusters of activities (for example, lending that is dependent on short-term funding) instead of on a single narrowly defined activity (such as lending funded by commercial paper).

Figure 2.13. Effective Shadow Banking Regulation Must Cover Activities and Entities
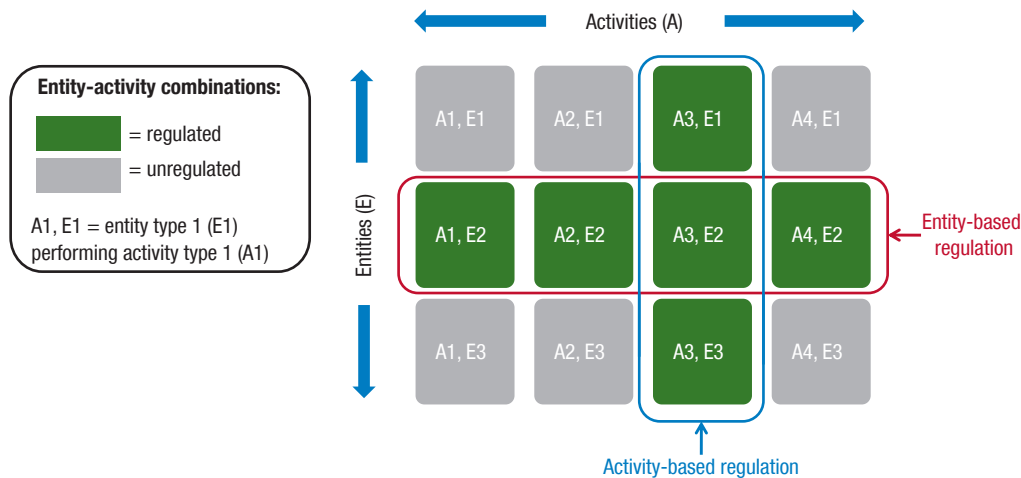
Source: IMF staff illustration.
Note: The figure shows four activity types (A1–A4) and three entity types (E1–E3). Entity-based regulation that covers only entity type E2 would miss the migration of, say, activity type A3 from E2 to E1; but that migration would be picked up by activity-based regulation covering A3. Similarly, activity-based regulation that covers activity type A3 would miss situations in which covered entities (E1–E3) migrate to activities, say A2, that are not covered but have similar economic outcomes.

characteristics of the entities pursuing the activities to be regulated. For example, highly leveraged entities engaged in a certain activity may need stricter rules than entities that are less leveraged. In the same vein, certain risky activities may be tolerable if carried out by highly capitalized entities. Moreover, entity- and activity-based reforms influence each other. For example, reforming securities financing transactions might make it unnecessary to impose leverage limits on entities that mainly use repos to obtain leverage. As noted, complex and detailed rules governing entities or activities increase opportunities for regulatory circumvention (Tucker 2014). Indeed, given the dynamic nature of shadow banking, the current architecture of financial regulation may soon need to be revisited (Schwarcz 2014).

Addressing shadow banking risks involves close cooperation with microprudential and business conduct regulators. One possible approach to implement a regulatory response to shadow banking proceeds in four phases (Figure 2.14): (1) identification of systemic risks based on broad financial sector surveillance by the macroprudential authority; (2) consideration and possible adoption of policy measures comprising prudential, business conduct, and nonregulatory measures;[41] (3) supervision and enforcement, relying on the expertise of

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[41]Nonregulatory measures include targeted communications to the public, improved transparency and disclosure, improved risk governance, and new industry-wide standards (IIF 2011).

Figure 2.14. Policy Framework to Mitigate Shadow Banking Risks
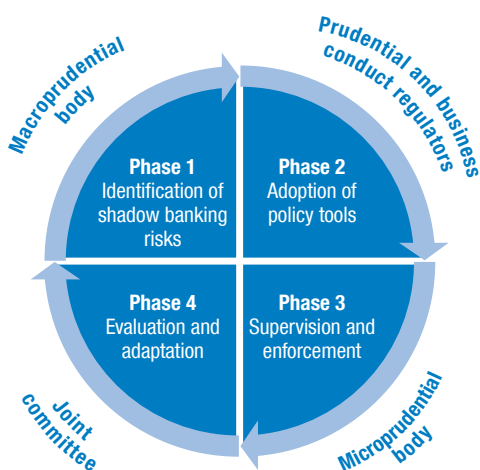
Source: IMF staff.

the microprudential authorities; and (4) an evaluation phase, in which micro- and macroprudential as well as conduct authorities assess the effectiveness of previous policy measures and relay the findings to their international counterparts. Policymakers should regularly conduct this dynamic exercise (perhaps once a year) to update their view on the risks posed by different activity-entity combinations and act on the conclusions drawn, including the adoption of new measures and the removal of outdated ones. The methodology proposed earlier in this chapter may be useful in this respect.

Granular data are a prerequisite for effective regulation and supervision. The assessment of risks in this chapter was limited by the availability of detailed data on assets and liabilities as well as structural features (such as redemption policies or benchmark orientation) at the firm and sector levels. Policymakers should aim to close these data gaps, in particular regarding information that would allow for a more accurate assessment of maturity, liquidity, and credit risks, as well as leverage in the financial system; monitoring of common exposures and interconnectedness; and broad financial system stress tests.[42] As a first step, sectoral and flow of funds accounts need to be revamped, in the context of the G20 Data Gaps Initiative and the FSB's annual shadow banking monitoring exercise.

Finally, strong international policy cooperation is needed to prevent cross-border regulatory arbitrage and to address risks to global financial stability. Risks are more likely to increase when regulatory initiatives are implemented by only a few countries, or when they are poorly coordinated. Regulatory changes in one country, for example, might lead to spillovers and increased risks in others. Important steps that have already been taken toward international policy coordination include the FSB process for data sharing; peer reviews conducted under the auspices of the International Organization of Securities Commissions on the progress of national regulatory reforms for MMFs; and the establishment of an international oversight group under the nonbank, noninsurer global systemically important financial institutions framework (FSB 2013b). However, although most FSB-led reforms of shadow banking regulation are near completion at the international level, implementation at the national level has advanced substantially in only a few areas (see Annex 2.4).

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[42]See also IMF (forthcoming).

Conclusions and Policy Recommendations

For advanced economies, broad measures of shadow banking point to recent growth, while narrower measures indicate stagnation. This discrepancy is driven by two opposing forces: a decline in the role of certain activities, such as securitization, and a concurrent expansion of investment funds (included only in the broad measures).

In emerging market economies, shadow banking continues to grow strongly. To some extent, this is a natural by-product of the deepening of financial markets, with a concomitant rise in other financial institutions. In emerging market economies, the size and growth of shadow banking activities in China stand out and warrant particular monitoring.

The main factors behind the growth of different types of shadow banking are similar over time and across countries: stringent banking regulation, ample liquidity, and complementarities with the rest of the financial system. Tighter regulation of banks (such as changes in capital requirements) often induces growth in shadow banking activities. Moreover, low real interest rates and a compression of term spreads tend to be associated with more rapid growth of shadow banks, especially in the context of tighter bank capital rules. In addition, complementarities with the rest of the financial system often play a role. The growth of pension funds and insurance companies is associated with higher growth of shadow banks, possibly reflecting the demand for shadow banking services.

Overall, shadow banking is set to grow further in the current environment of tighter bank regulations and low interest rates. Many indications point to the migration of some activities—such as lending to firms—from traditional banking to the nonbank sector. That is, some of the fastest-growing shadow banking activities substitute for, rather than complement, traditional banking. An example is direct lending by or through a broad range of investment funds. In the long run, demographics and population aging may continue to lead to an increase in assets under management by institutional investors and hence contribute to the sustained growth of shadow banking.

Whether these cyclical and structural developments imply an overall increase or decline in systemic risk is difficult to assess at this juncture—but there are some indications of increased market and liquidity risk in advanced economies. Overall, the outcome will, among other things, depend on the degree to which funds engaging in bank-like activities further deepen their liquidity mismatches and become more exposed to run risks, the extent to which these activities involve leverage, and the extent to which concentration increases further (see also Chapter 1). Another factor will be whether transparency in the system improves, allowing investors to assess risks properly (and reduce herd behavior), and regulatory authorities to take appropriate action when needed. In this context, there appears to be a shift in shadow banking toward activities that are less well understood or monitored, which poses challenges for supervisors and regulators. In any case, the appropriate policy response is not to lower prudential standards for banks, but to ensure adequate standards for shadow banks.

So far, in the United States, the (imperfectly) measurable contribution of shadow banking to systemic risk has been significant, but it remains modest in the United Kingdom and in the euro area. In the United States, the risk contribution of shadow banking activities seems to have been rising while remaining slightly below precrisis levels, while in the euro area and the United Kingdom, this remained more or less constant. Data problems, however, prevent a reliable and comprehensive assessment. The evidence also suggests noteworthy cross-border effects of shadow banking. In emerging market economies, the growth of shadow banking size and activities in China stands out and warrants particular monitoring.

Better integration of the entity and activity dimensions is needed in shadow banking regulation. The current regulatory reform agenda, led by the FSB, has yielded important progress. However, many of the agreed principles have not yet been implemented nationally, potentially leading to a migration of risks across countries (for example, to non-FSB jurisdictions) or sectors. To counter such effects, financial sector regulation needs to take a more encompassing view of the financial system. This chapter advocates a macroprudential approach. Moreover, the entity and activity dimensions of shadow banking should be integrated in supervision and regulation. This chapter lays out a concrete framework for collaboration and task sharing among microprudential, macroprudential, and business conduct regulators. International coordination and information sharing between supervisors and regulators must also be enhanced to safeguard global financial stability.

Finally, data gaps remain challenging and need to be addressed. For example, only five jurisdictions provide statistics on all three shadow banking measures used here. Ideally, balance sheet data on individual entities or sectors would allow for detailed monitoring. A first step forward would be for all country authorities to construct sectoral and flow of funds accounts building on their system of national accounts with sufficient details to assess maturity and liquidity risks as well as interconnectedness. Expanding the reporting of monetary data would also aid in obtaining a macro view of shadow banking. All this would further the understanding and monitoring of different aspects of shadow banking.

Annex 2.1. Shadow Banking Definitions

This annex provides a schematic summary of the different definitions of and perspectives on shadow banking (Figure 2.15) and discusses in detail the new definition based on the concept of noncore liabilities.

Noncore Liabilities Approach to Measuring Shadow Banking

Noncore liabilities provide a measure of the shadow banking system (SBS). Noncore liabilities (funding sources) cover all bank and nonbank financial institutions (Harutyunyan and others, forthcoming).[43] Core liabilities represent the traditional financial intermediation function of the banking system. These liabilities are defined as the funding that other depository corpo-

rations traditionally draw on, namely regular deposits of "ultimate creditors."[44,45]

Noncore liabilities encompass sources of funding for the financial system that fall outside the core liabilities definition. The financial corporations that are issuers of noncore liabilities in this approach are also other depository corporations, including money market mutual funds (MMFs) and all other financial corporations[46] except insurance companies, pension funds, and non-MMF investment funds. The latter three types are

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[43]This approach expands the concept of "noncore" liabilities developed in the recent literature by Shin and Shin (2011).

[44]Shin and Shin (2011) define ultimate creditors to include resident households, nonfinancial corporations, state and local governments, insurance corporations, pension funds, and non-MMF investment funds.

[45]As defined in the IMF's *Monetary and Financial Statistics Manual,* the other depository corporation subsector consists of all resident financial corporations (except the central bank) that engage in financial intermediation and that issue liabilities included in broad money.

[46]The other financial corporations include resident financial corporations that do not issue liabilities included in broad money.

Figure 2.15. Different Definitions of Shadow Banking

Activities	**Entities**	**Activities and Entities**
Claessens and Ratnovski (2014): All financial activities, except traditional banking, requiring private or public backstop to operate	**McCulley (2007):** Levered-up financial intermediaries with liabilities perceived akin to bank deposits ("the whole alphabet soup")	**FSB (2013c):** Credit intermediation involving entities and activities outside the regular banking system
FCIC (2010): Unregulated or lightly regulated bank-like intermediation	**Ricks (2010):** Maturity transformation outside banking social contract	**Schwarcz (2012):** Provision of financial products and services by shadow entities and financial markets
Mehrling and others (2013): Money market funding of capital market lending	**Acharya, Khandwala, and Öncü (2013):** Nonbank financial institutions that behave like banks, borrow short, leverage, and lend and invest long in illiquid assets, but less regulated	**Gorton and Metrick (2012):** Institutions, old contracts (repo), and more esoteric instruments (ABCP, ABS, CDO, and the like)
Deloitte (2012): Market-funded, credit intermediation system involving maturity or liquidity transformation through securitization and secured-funding mechanisms	**Pozsar and others (2013):** Entities that conduct maturity, credit, and liquidity transformation without government guarantee or access to central bank liquidity	**Kane (2014):** Entities with liabilities supposedly redeemable at par but without a government guarantee, and instruments that trade as if they have a zero performance risk
Harutyunyan and others (forthcoming): Noncore liabilities capturing nontraditional funding		

Sources: See works cited in the Chapter 2 references.
Note: ABCP = asset-backed commercial paper; ABS = asset-backed security; CDO = collateralized debt obligation; repo = repurchase agreement.

excluded because of the specific nature of the financial intermediation services they provide, which is different from both traditional and shadow banking. The main financial instruments that are considered to be components of noncore liabilities are debt securities, loans, MMF shares, and a small portion of restricted deposits (that is, deposits excluded from broad money). Finally, the holders of noncore liabilities consist of the ultimate creditors, as noted above, plus all nonresident sectors.

One advantage of the noncore liabilities approach is that it captures nontraditional financial intermediation that occurs within traditional banks, thus filling a gap in the estimation of the size and interconnectedness of the SBS. For example, if a bank establishes a special purpose vehicle to securitize a portion of its balance sheet, those securities would be captured by existing methodologies attempting to measure nontraditional intermediation. However, on-balance-sheet securitization by banks, including covered bonds, would not be captured. This approach does not distinguish between the institutions that issue the liabilities. Instead, it focuses on funding sources that diverge from the traditional financial intermediation model of collecting deposits.

Another important advantage of this approach is that it can be constructed to include intra-financial-sector positions (the broad measure of noncore liabilities) or exclude them (the narrow measure). Including intra-SBS positions is useful for the assessment of financial stability, because the gross size of the SBS reflects its total exposure and its level of interconnectedness. Nonetheless, including them may overstate the importance of the SBS in the overall financial system, in particular the level of exposure to the real economy or vice versa. Thus, the two measures can be seen as complementary in providing the upper and lower esti-

Figure 2.16. Components of Broad and Narrow Measures of Noncore Liabilities
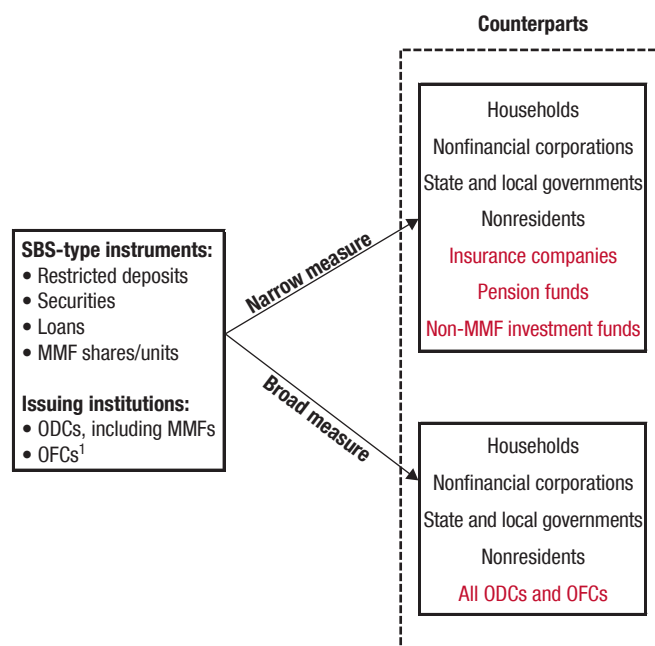
Source: IMF staff.
Note: MMF = money market mutual fund; ODC = other depository corporation; OFC = other financial corporation; SBS = shadow banking system.
[1]Excluding insurance corporations, pension funds, and non-MMF investment funds. The box on the left shows the issuers and types of instruments included in both the narrow and broad measures of noncore liabilities. The distinction between the two measures is derived from the counterparts, shown inside the dashed box on the right. Both measures include ultimate creditors and nonresidents as counterparts. The narrow measure includes only a subset of the OFC sector, while the broad measure includes all OFCs and all ODCs.

mates of the size and interconnectedness of the SBS in a given jurisdiction. Figure 2.16 provides an overview of the broad and narrow measures.

Annex 2.2. Shadow Banking Entities, Activities, and Risks

This annex describes various nonbank financial institutions and activities in the shadow banking system, and it discusses in broad terms the key dimensions of their risks to financial stability.

Money market mutual funds (MMFs) are open-ended mutual funds that invest in short-term debt securities, including government securities, commercial paper, certificates of deposit, repurchase agreements (repos), short-term bonds, and other money funds. In some markets, such as in the United States, MMFs are closely connected to other financial institutions because they play a pivotal role in short-term funding markets. The MMF business model and risk profile are similar to those of banks. They undertake credit risks and maturity and liquidity transformation, although regulations seek to limit MMF exposures to losses due to credit, market, and liquidity risks. While returns to MMFs are typically not guaranteed, their shareholders often perceive them as short-term, liquid, deposit-like instruments. As a result, given their lack of deposit insurance or access to liquidity facilities, uncertainty over their asset value could stress MMFs through large-scale redemptions. When redemptions spread to the broader financial system, the functioning of the short-term funding markets can be severely disrupted.

Other investment funds act primarily as fiduciary agents, investing in a range of assets on behalf of clients, who bear the risk of loss. Asset management companies may maintain proprietary trading positions with limited transparency, but their proprietary balance sheet is typically much smaller than their funds' assets under management. Most mutual funds are not very leveraged and do not directly engage in credit transformation. Most investment funds are open-ended funds whose shareholders may redeem their shares freely at the funds' net asset value. A loss of confidence and massive redemptions—a run—may not necessarily cause a fund failure because it can respond by selling securities and absorbing valuation losses (through a decline in its net asset value). However, such events could lead to a fire sale of portfolio assets—especially when portfolio assets are illiquid—and adversely affect other market players. The fund's parent asset management company can also be affected, as well as other funds in the same family that share redemption lines of credit and risk-management frameworks. Funds may be interconnected with other financial institutions

and therefore propagate shocks, whether they originate in the industry or not. Interconnectedness can stem directly from counterparty risk—for those engaged in securities lending, repos, and derivatives, and from investment in other financial institutions' securities—or indirectly from fire sales of assets held by various financial institutions.

Broker/dealers trade securities on their own account or on behalf of customers. They are usually more highly leveraged than banks through the use of short-term secured lending arrangements, such as repos. In periods of stress, liquidity runs may undermine their funding model and cause system-wide fire sales.

Real estate investment trusts (REITs) are special purpose companies that own income-producing real estate or mortgages. They come in two varieties: equity REITs, which own and manage real estate properties, and mortgage REITs, which rely on short-term funding to finance their mortgage holdings. Mortgage REITs, in particular, engage in leveraged maturity transformation by relying on short-term repo funding—some of which is channeled indirectly from MMFs via securities dealers—to finance their longer-term, less liquid assets (see the October 2013 GFSR).

Securitization is a process that involves repackaging portfolios of cash-flow-producing, illiquid financial instruments (often loans) into special purpose vehicles funded by issuing securities (liquidity transformation).[47] Credit transformation is achieved through diversification and the use of various credit enhancements. For example, portfolio cash flows can be divided into tranches that pay out in a specific order, starting with the senior (least risky) tranches and working down through one or more "mezzanine" tranches, and then to the equity (most risky) tranche. If some of the expected cash flow is not forthcoming (for example, because some loans default), after any cash flow buffers are depleted, the payments to the equity tranche are reduced. If the equity tranche is depleted, payments to holders of the mezzanine tranche are reduced, and so on, up to the senior tranches. The amount of loss absorption provided by the equity and mezzanine tranches is structured so that it is unlikely that the senior tranches do not receive

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[47]Special purpose vehicles are limited-purpose legal entities into which firms transfer assets or through which they carry out specific activities or transactions. The vehicles and conduits fund themselves by issuing securities to investors in the capital markets and are structured so that the transferred assets are not at risk if either the firm or the vehicle or conduit becomes insolvent, so the issued securities are usually viewed as less risky than those of the sponsor.

their promised payments. Credit enhancement is also achieved with credit puts from banks and monoline insurance.

Not all securitization structures involve maturity transformation. Most asset- and mortgage-backed securities and collateralized debt obligations simply pass cash flow through from the loan to the security holders. However, before the recent global financial crisis, some asset-backed commercial paper (ABCP) conduits and most structured investment vehicles (SIVs) issued short-term paper to fund positions in long-term assets. Hence, they were highly exposed to rollover risk. Investor demand for senior tranches was spurred by inappropriate AAA/Aaa ratings assigned by the major rating agencies (Fender and Kiff 2005). Although securitization transactions are not themselves leveraged, until accounting rules were recently changed in many jurisdictions, banks could use securitization to effectively leverage up their balance sheets (Beccalli, Boitani, and Di Giuliantonio, forthcoming).

Hedge funds are investment pools, typically organized as a private partnership, that face few regulatory restrictions on their portfolio transactions. Hence, compared with more regulated institutions, hedge funds use a wider variety of investment techniques in their effort to boost returns and manage risks. Credit-oriented hedge funds undertake long, short, and leveraged positions in fixed-income securities and may also engage in direct lending activities, but typically to a lesser extent. These hedge funds face fire sale risks and possible redemption risks, though the use of redemption gates helps alleviate these risks to some extent.

Private equity funds manage large asset portfolios and may provide direct lending to smaller enterprises and firms that cannot access private capital markets. Private equity funds do not offer early redemptions and thus are not subject to run risk.

Specialty finance companies provide credit in various segments, such as credit cards, automobile financing, student loans, and equipment leases. These credit types are often securitized, with demand depending on credit risk and yields offered. They may be subject to rollover risk in the form of early amortization triggers (that is, provisions in, say, credit card receivables–backed securities that require early amortization of principal cash flows if certain events occur).

Repo agreements are contracts in which one party agrees to sell securities to another party and buy them back at a specified date and repurchase price.[48] The transaction is effectively a collateralized loan with the difference between the repurchase and sale price representing interest. The borrower typically posts excess collateral (the "haircut"). Dealers use repos to borrow from MMFs and other cash lenders to finance their own securities holdings and to make loans to hedge funds and other clients seeking to leverage their investments. Lenders typically rehypothecate repo collateral, that is, they reuse it in other repo transactions with cash borrowers.[49]

Securities lending involves one party agreeing to lend securities to another party in return for a fee and the posting of collateral in the form of cash or high-quality liquid securities.[50] Securities lenders are seeking to gain additional revenue from their securities holdings; they may be insurers, pension funds, sovereign wealth funds, and central banks operating through custodians. Securities borrowers are often short sellers who must borrow the securities to trade (since they need to deliver the securities). They post cash collateral to the securities lender in an amount at least as high as the value of the borrowed securities. Securities lenders then reinvest this cash posted as collateral in money and repo markets.

Repo and securities lending transactions involve both maturity transformation and rollover risk, because the terms of the agreements are typically much shorter than the maturities of the underlying securities. Rollover risk can be particularly acute during periods of market stress, when collateral values fall while haircuts increase on counterparty risk concerns.

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[48]See the October 2010 GFSR, particularly Box 2.3, for more details on how repo markets work.

[49]Singh (2013a) points out that this collateral reuse effectively "lubricates" the financial system by facilitating financial transactions and by contributing to the supply of credit in the economy. In that sense, the collateral can be viewed as high-powered money, in which the haircut is equivalent to a bank reserve ratio, and the number of reuses is equivalent to a money multiplier.

[50]Broadly speaking, repo and securities lending transactions are very similar, but repo agreements have fixed end dates and repurchase prices, whereas securities lending transactions typically do not (but are subject to termination on a continuous basis).

Annex 2.3. Econometric Results

This annex describes the data sources and the methodology used in the empirical analysis and provides key results and findings.

Sample Coverage and Data

Two data frequencies (quarterly and annual) and three data sources were used to measure shadow banking dynamics.[51] Countries used in the empirical analysis are listed in Table 2.3. Specifics on the data frequencies are as follows:

- *Quarterly data:* The quarterly data set comes mainly from Haver Analytics and the national flow of funds data. For most countries, shadow banking activity is measured as financial liabilities of other financial intermediaries and financial auxiliaries adjusted for

[51]See Harutyunyan and others (forthcoming) for a more detailed analysis with noncore liabilities.

mutual fund shares (see Table 2.4. for more details). The flow of funds data run from 1990 to 2013.

- *Annual data:* The Financial Stability Board (FSB 2013c) is the source for the annual data. The data are based on national flow of funds and sectoral balance sheet data or national authorities' submission to the FSB when the shadow banking activity is measured as financial assets of other financial intermediaries. The sample consists of 24 countries, of which 14 are emerging market economies and the rest are advanced economies. The data set also has detailed data on financial assets of subsectors of the shadow banking system, including money market mutual funds (MMFs), broker/dealers, structured investment vehicles, finance companies, hedge funds, other investment funds (equity funds, fixed-income and bond funds, other funds), and "other." The FSB data run from 2002 to 2012.

The main sources of explanatory variables are the IMF's International Financial Statistics and World

Table 2.3. List of Economies Included in the Empirical Studies

Financial Stability Board measure	Flow of funds measure	Noncore liabilities
Advanced economies	**Advanced economies**	**Advanced economies**
Australia	Australia	Austria
Canada	Austria	Belgium
Euro area[1]	Belgium	Cyprus
France	Canada	Estonia
Germany	Czech Republic	Euro area[1]
Hong Kong SAR	Denmark	Finland
Italy	Estonia	France
Japan	Euro area[1]	Germany
Korea	Finland	Greece
Netherlands	France	Ireland
Singapore	Germany	Italy
Spain	Greece	Japan
Switzerland	Ireland	Korea
United Kingdom	Italy	Luxembourg
United States	Japan	Malta
	Korea	Netherlands
Emerging market economies	Luxembourg	Portugal
Argentina[2]	Malta	Slovak Republic
Brazil	Netherlands	Slovenia
Chile	Norway	Spain
China[2]	Portugal	United Kingdom
India	Slovak Republic	United States
Indonesia	Slovenia	
Mexico	Spain	**Emerging market economies**
Russia	Sweden	Mexico
Saudi Arabia	United Kingdom	South Africa
South Africa	United States	Turkey
Turkey		
	Emerging market economies	
	Hungary	
	Lithuania	
	Poland	

Source: IMF staff.
[1]Euro area data were not used in the panel estimations.
[2]Financial Stability Board data for China and Argentina were not available. Data for China were compiled by IMF staff.

Table 2.4. List of Variables Used in Regression Analysis

Variables	Description	Data source
Flow of funds shadow banks	The sum of other financial intermediaries and financial auxiliaries for the flow of funds. For countries that have granular flow of funds data, the following definitions were used: Australia (other depository corporations, MMFs, securitizers, other financial corporations), Canada (total other private financial institutions excluding mutual funds), Korea (nonbanks, collectively managed funds, finance companies, investment institutions, OFI excluding public financial institutions), Norway (MMFs, mortgage companies, finance companies, financial holding companies, investment companies excluding state lending institutions), Sweden (other monetary credit market corporations; finance companies; OFI, excluding housing credit institutions), and the United States (MMFs, GSEs, ABS issuers, GSE pool securities, net securities lending, overnight repo, open market paper).	Haver Analytics
FSB shadow banks	FSB definition of OFI that is a sum of MMFs, finance companies, structured finance vehicles, hedge funds, other investment funds, money market corporations, broker/dealers, financial auxiliaries, and other nonbank financial corporations	FSB
Real GDP	Series for Poland and Hungary are seasonally adjusted in Eviews using Hodrick-Prescott filter (lambda = 1,600).	WEO
Policy rate	Monetary policy rate.	Bloomberg L.P.
Money market rates	IFS is the main data source except for Austria, Belgium, and Greece (1-month euribor from 1999 used); Estonia (EONIA from 2011); France, Netherlands, Portugal, and Luxembourg (EONIA from 1999); Germany (EONIA from 2012); Hungary (overnight bubor); Malta (EONIA from 2008); Norway (1-week interbank rate from 2009:Q3); and Slovak Republic (EONIA from 2009).	IFS
Long-term rates	Long-term interest rates.	IFS
Short-term rates	3-month interest rates on T-bills except for Austria and Estonia, where money market rates used.	Thomson Reuters Datastream
Inflation rate	Year-over-year growth rates of consumer price index.	IFS
Institutional investors	Financial liabilities of insurance companies and pension funds from flow of funds data. Assets of insurance companies and pension funds from FSB data.	Haver Analytics; FSB
Global liquidity indicators	Global liquidity indicators, quantity data (volume of credit).	IMF (2014a)
Systemic banking crisis dummy	A banking crisis is defined as systemic if two conditions are met: (1) significant signs of distress in the banking system (as indicated by significant bank runs, losses in the banking system, and bank liquidations); and (2) significant banking policy interventions in response to significant losses in the banking system.	Laeven and Valencia (2013)
Bank regulatory and supervisory variables	Scaled indices of overall capital stringency, capital regulatory index, official supervisory power, and financial statement transparency.	Barth, Caprio, and Levine (2013)

Source: IMF staff.
Note: ABS = asset-backed securities; BCBS = Basel Committee on Banking Supervision; EONIA = Euro Overnight Index Average; euribor = Euro Interbank Offered Rate; FSB = Financial Stability Board; GSE = government-sponsored entities; IFS = IMF, International Financial Statistics database; IOSCO = International Organization of Securities Commissions; MMF = money market mutual fund; OFI = other financial intermediary; repo = repurchase agreement; WEO = IMF, World Economic Outlook database.

Economic Outlook databases; the source for regulatory variables is Barth, Caprio, and Levine (2013). The definition of the variables and sources are provided in Table 2.4. The analysis uses real money market rates and term premiums to capture the search-for-yield effect. Various measures of bank regulatory and supervisory policies were used to capture the regulatory arbitrage effect. The regressions control for the macroeconomic environment (real GDP growth) and factors that may affect demand for shadow banking products (growth in total assets of institutional investors and traditional banks).

Results

The extent to which regulatory arbitrage and search for yield contributed to the growth of shadow banking is formally assessed for a set of advanced and emerging market economies. To this end a panel regression is run with different measures of shadow banking activity as dependent variables and possible determinants of shadow banking dynamics found in the literature as explanatory variables. A general specification of a regression model is as follows:

$$\Delta SBS_{jt} = \alpha_1\ MONPOL_{jt-1} + \alpha_2\ MACRO_{jt-1} \\ + \alpha_3\ REG_{jt-1} + \alpha_4\ OTHER_{jt-1} \\ + \text{Fixed effects} + \varepsilon_{jt}, \quad (2.1)$$

in which α_k ($k = 1,\ldots,4$) are coefficients (or coefficient vectors) to be estimated, and ε_{jt} is an error term for the shadow banking (sub)sector in country j at time t. The dependent variable, SBS_{jt}, is the real growth in the size of the shadow banking system.[52] MONPOL

[52]Year-over-year growth rates using quarterly flow of funds data and annual FSB data are used. Quarterly growth rates on flow of

refers to the general monetary stance measured by real interest rates. In addition to the real interest rate, the term spread is used to capture the search-for-yield effect.[53] *MACRO* refers to general macroeconomic and financial market factors (including real GDP growth and global liquidity conditions). *OTHER* captures the real growth rate of the size of other financial sectors to account for possible links between traditional banks and shadow banks and to control for the demand for shadow banking products from institutional investors such as insurance companies and pension funds. *REG* includes variables related to banking sector regulation and supervision, capturing regulatory circumvention.[54] A separate set of regressions was estimated to examine various interaction effects, such as between the monetary stance and regulatory variables and between regulatory and supervisory variables. Standard errors are Driscoll and Kraay (1998) standard errors robust to heteroscedasticity, autocorrelation with MA(q), and cross-sectional dependence.

The growth rate of shadow banking is affected by search for yield (after 2008) and regulatory circumvention, controlling for macroeconomic, financial, and demand factors.[55] In the flow of funds data regression, real GDP, the growth rate of banking sector assets, and the growth rate of institutional investors have the expected signs and are significant (benchmark specification, column 1 of Table 2.5). The variables capturing the monetary policy stance, namely the real interest

rate and the term spread, also have the expected signs but appear significant only after 2008.[56] The benchmark regression is expanded to include regulatory variables for the banking sector (columns 2–5 of Table 2.5). Banks' capital stringency measures have a significant positive impact on shadow banking growth.[57] High transparency in bank financial statements has a significant negative impact.

The results of the regression using FSB annual data generally support the results using the quarterly flow of funds data. Given their annual frequency, the fact that they are not available before 2002, and their coverage of fewer countries, the FSB data can support only limited inferences. For the aggregate shadow banking measure, results broadly confirm our prior results ("All" column of Table 2.6). Regulatory variables are generally not significant, probably as a result of limited variation in the covered period.[58] The chapter examined separately the growth in certain subsectors of the shadow banking system: money market mutual funds, investment funds, and special purpose vehicles (remaining columns of Table 2.6). The results suggest that banking growth is not important for the growth of MMFs, is negative for investment funds (in line with the notion that they substitute for, rather than complement, banks), and is positive for securitization (probably because special purpose vehicles have been frequently sponsored or owned by banks). In contrast, the growth of institutional investors is strongly correlated with the growth of both MMFs and investment funds (in line with the institutional cash pool view) but less so with the growth of securitization. The compression of the term spread is significant for all three subsectors, but it is most strongly (negatively) associated with securitization. The impact of bank capital regulations is significant only for MMF growth.

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funds data were also tried. The results are almost the same as in the regression with yearly growth rates, but the explanatory power of these models is lower since quarterly rates are in general much more volatile than yearly rates.

[53]Monetary conditions indices and shadow interest rates (calculated using a simple Taylor rule) were tried instead of real interest rates. Overall, the results do not change by much.

[54]Due to high cross correlation, the regulatory and supervisory variables are added one by one to the benchmark regression that includes real GDP, size of the banking sector, size of institutional investors, real interest rates, and term spread. Moreover, because of high correlation with fixed effects, the regressions with regulatory variables do not contain fixed effects.

[55]Other measures of the dependent variable (the size of the shadow banking system relative to total financial system assets or GDP and the ratio of shadow bank lending to total financial sector lending) yield counterintuitive results: the signs of the coefficients change according to whether fixed effects or trends are included; many regulatory variables have unexpected signs; and many macroeconomic and financial variables are insignificant. Moreover, specifications with interaction terms did not produce consistent results.

[56]Since the flow of funds data set includes mostly advanced economies, no regressions were run on these data to examine advanced versus emerging market economies separately.

[57]The overall capital stringency index measures whether capital requirements reflect certain risk elements and deducts certain market value losses from capital before determining minimum capital adequacy. The capital regulatory index is constructed as a combination of the overall capital stringency index and an assessment of whether certain funds may be used to initially capitalize a bank.

[58]For illustrative purposes, this annex shows the results for the regressions including the overall capital stringency index.

Table 2.5. Panel Regression of Shadow Banking Growth: Flow of Funds Sample, 1990–2013

	Expected sign	(1)	(2)	(3)	(4)	(5)	(6)
Crisis dummy	−	−4.09**	0.38	0.15	1.26	1.13	0.58
		(1.73)	(0.77)	(0.78)	(1.19)	(1.10)	(1.20)
Real GDP growth	+	0.41*	0.53**	0.51**	0.60***	0.61**	0.55***
		(0.24)	(0.26)	(0.25)	(0.21)	(0.27)	(0.20)
Banking sector size	+	0.36***	0.34***	0.35***	0.34***	0.39***	0.35**
		(0.10)	(0.11)	(0.11)	(0.12)	(0.14)	(0.14)
Institutional investors size	+	0.52***	0.43***	0.42***	0.42***	0.40***	0.41***
		(0.08)	(0.08)	(0.09)	(0.08)	(0.08)	(0.09)
Real short-term rate (lag 4)	−	−0.04	0.51	0.62	0.43	0.42	0.39
		(0.36)	(0.70)	(0.65)	(0.68)	(0.79)	(0.77)
Term spread (lag 4)	−	0.93	1.26	1.33	0.60	0.62	0.93
		(0.71)	(0.92)	(0.85)	(0.66)	(0.90)	(0.85)
Real short-term rate (lag 4) and post-2008 dummy	−	−0.81**	−1.41***	−1.51***	−1.61***	−1.52***	−1.38**
		(0.39)	(0.45)	(0.43)	(0.52)	(0.55)	(0.52)
Term spread (lag 4) and post-2008 dummy	−	−1.76**	−2.48***	−2.45***	−2.08***	−1.84**	−2.07**
		(0.77)	(0.75)	(0.73)	(0.62)	(0.91)	(0.81)
Overall capital stringency	+		0.84**				
			(0.40)				
Capital regulatory index	+			1.02**			
				(0.47)			
Supervisory power index	−				−0.49		
					(0.47)		
Financial statement transparency	+/−					−2.69**	
						(1.08)	
Global liquidity quantities (lag 4)	+						0.34
							(0.76)
Number of observations		1,501	1,233	1,233	1,234	1,245	1,221
Fixed effects/pooled OLS		Fixed	Pooled	Pooled	Pooled	Pooled	Pooled
R squared		0.29	0.25	0.26	0.25	0.26	0.25
Number of countries		29	29	29	29	29	29

Source: IMF staff calculations.

Note: OLS = ordinary least squares. ***, **, * indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively. Standard errors are Driscoll and Kraay (1998) robust to heteroscedasticity, autocorrelation with MA(q), and cross-sectional dependency. The estimation period is 1990–2013. Equations are estimated by pooled OLS or fixed effects (within regression). The sample countries are as follows: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Ireland, Japan, Korea, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, the United Kingdom, and the United States.

Table 2.6. Panel Regression of Shadow Banking Growth: Financial Stability Board Sample, 2002–12

	Expected sign	All	MMFs	INVFs	SPVs
Crisis dummy	−	−3.28***	−5.30*	−3.95	−14.13**
		(0.98)	(2.35)	(2.92)	(5.57)
Real GDP growth	+	0.13	0.57	0.14	1.13**
		(0.21)	(0.64)	(0.20)	(0.37)
Banking sector size	+/−	0.43***	0.00	−0.40***	0.48***
		(0.04)	(0.08)	(0.04)	(0.06)
Institutional investors size	+	0.53***	0.70***	1.27***	0.45***
		(0.05)	(0.07)	(0.05)	(0.06)
Term spread (lag 1)	−	−1.36**	−2.69**	−2.28**	−5.01**
		(0.46)	(0.89)	(0.77)	(1.87)
Overall capital stringency	+	0.22	2.03**	−0.60	0.86
		(0.23)	(0.69)	(0.61)	(1.26)
Number of observations		181	153	155	117
R squared		0.68	0.27	0.64	0.58
Number of countries		23	21	21	17

Source: IMF staff calculations.

Note: INVFs = investment funds; MMFs = money market mutual funds; SPVs = special purpose vehicles. ***, **, * indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively. Standard errors are Driscoll and Kraay (1998) robust to heteroscedasticity, autocorrelation with MA(q), and cross-sectional dependency. The estimation period is 2002–12. Equations are estimated by fixed effects (within regression). The countries in the sample are as follows: Australia, Brazil, Canada, China, Chile, France, Germany, Hong Kong SAR, Indonesia, India, Italy, Japan, Korea, Mexico, the Netherlands, Russia, Saudi Arabia, South Africa, Singapore, Spain, Switzerland, Turkey, the United Kingdom, and the United States.

Annex 2.4. Regulatory Developments

This annex provides a global overview of shadow banking regulation reform and its implementation in key jurisdictions.

Developments at the international level have progressed and will be presented to the Group of Twenty in November 2014. The Financial Stability Board (FSB), in cooperation with other international regulatory bodies, carried out work in five areas:

- *Mitigating banks' interactions with shadow banks:* To appropriately capture banks' interactions with the shadow banking sector, the Basel Committee on Banking Supervision (BCBS) has improved its frameworks for (1) measuring and controlling banks' large exposures, and (2) capital requirements on banks' equity investments in funds, and is working toward developing guidance on the scope of regulatory consolidation.

- *Reducing the susceptibility of money market mutual funds (MMFs) to runs:* The FSB endorsed recommendations of the International Organization of Securities Commissions (IOSCO), including the conversion of constant net asset value (NAV) MMFs into floating NAV MMFs where workable. IOSCO recommends that constant NAV MMFs be protected against investor runs through redemption gates, redemption fees, or "side pockets."[59] IOSCO is conducting peer review of the progress of national regulation.

- *Oversight and regulation of other shadow banking entities:* The FSB issued a policy framework consisting of an assessment of economic functions and activities of shadow banking, adoption of policy tools, and an information-sharing process between authorities, complemented by peer review. Recommended policy tools included primarily prudential measures, such as capital requirements, leverage limits, liquidity buffers, and restrictions on maturity and liquidity transformation.

- *Securitization:* The FSB endorsed IOSCO recommendations to better align the incentives of securitization markets, including issuer risk retention and improved transparency and disclosure. IOSCO is conducting peer review in this area as well. The BCBS and IOSCO are jointly reviewing develop-

ments in securitization markets and discussing criteria to identify simple and transparent securitizations.

- *Dampening procyclicality in repurchase agreement (repo) and securities lending:* The FSB policy recommendations seek to enhance transparency, regulation, and improvements to the structure of repo and securities lending markets and to address risks associated with rehypothecation (reuse of funds in other repo transactions), collateral valuation, and "haircuts" (reduction in the principal paid to creditors).

In addition, the FSB is developing methodologies to identify systemically important nonbank, noninsurer financial institutions. Its first consultation paper on the topic, released in January 2014, proposed separate methodologies for finance companies, market intermediaries, and investment funds. The scope of this work is wider than shadow banking, but it will provide additional regulatory guidance on shadow banking entities. Concrete policy measures will be developed once the methodologies are finalized.

In contrast to the progress on the international level, the national implementation of policies on several issues is still at an early stage. Only a few national regulators have acted in response to the international policy developments, although in specific markets some reform proposals were implemented.

United States

- *MMFs:* In July 2014, the U.S. Securities and Exchange Commission issued final rules for the reform of MMFs, under which prime institutional MMFs will be required to transact at a floating NAV and daily share prices float with the market-based value of their portfolio securities; retail and government MMFs will continue to use constant NAV pricing.[60] However, in times of stress, all MMFs may impose liquidity fees and redemption gates.

- *Securitization:* U.S. regulators proposed credit risk retention requirements in securitizations and a prohibition against hedging the retained credit risk portion; the actions were taken after the Financial Accounting Standards Board modified its

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[59]Side pockets are special accounts that allow fund managers to separate parts of an investment portfolio from other assets until market conditions allow for proper valuation and liquidation.

[60]Government bond MMFs hold cash or invest in government debt. Prime MMFs invest primarily in corporate debt securities. Retail MMFs are limited to investments by natural persons, and institutional prime MMFs are geared toward institutional investors. The latter hold a riskier pool of assets than other funds, such as certificates of deposit, commercial paper, and repurchase agreements.

Table 2.7. Snapshot of the New International Regulatory Initiatives

Key reforms	Elements	Global timeline	National timeline
Banking sector reforms: **Banks' interactions with shadow banking entities**			
BCBS: Policy Proposal Based on Work of BCBS Accounting Task Force (FSB 2013e)	Improve international consistency of the scope of consolidation for prudential regulatory purposes and ensure that banks' activities and their interaction with shadow banks are appropriately captured.	Completion in 2014	
BCBS (2013a)	Introduce risk-sensitive capital requirements for banks' equity investments in all types of funds (for example, hedge funds, managed funds, investment funds).	Completed	Effective January 2017
BCBS (2014)	Limit banks' large exposure to single counterparties (including to shadow banking entities).	Completed	Effective January 2019
Shadow banking entity reforms: **Reducing susceptibility of MMFs to runs**			
IOSCO (2012a)	Introduce common standards of regulation and management of MMFs across jurisdictions.	Completed	
Other shadow banking entities			
FSB (2013a)	Assess and mitigate systemic risks posed by other shadow banking entities and activities (credit intermediation activities by nonbank financial entities, involving maturity/liquidity transformation, leverage and/or credit risk transfer), introduce a framework of policy toolkits and information sharing among authorities.	Completed. Information-sharing process to be completed in 2014.	
FSB (2014)	Prepare methodologies to identify systemically important nonbank and noninsurer financial institutions.	Pending. Consultation ended in April 2014.	
Shadow banking market reforms: **Securitization**			
IOSCO (2012b)	Policy recommendations are related to transparency, standardization, and risk retention requirements.	Completed	
BCBS (2013b)	Revisions to the securitization framework aim at making capital requirements more prudent and risk sensitive. Other objectives are to reduce the mechanistic reliance on external credit ratings and cliff effects.	Pending. Consultation ended in March 2014.	
Securities lending and repos			
FSB (2013b)	Dampen financial stability risks and procyclical incentives associated with securities financing transactions such as repos and securities lending that may exacerbate funding strains in times of market stress.	Policy recommendations completed. Minimum haircut standards to be finalized in 2014. Implementation January 2017.	Implementation January 2017

Source: IMF staff compilation.
Note: BCBS = Basel Committee on Banking Supervision; FSB = Financial Stability Board; IOSCO = International Organization of Securities Commissions; MMF = money market mutual fund; repo = repurchase agreement.

consolidation rules, and the federal banking and thrift regulatory agencies required banks to include assets of asset-backed commercial paper programs in the calculation of their risk-weighted assets.[61]

- *Other shadow banking entities:* The process established by Section 113 of the Dodd-Frank Act for designation of systemically important nonbanks allows for extending the perimeter of prudential regulation and supervision by the Federal Reserve.[62]

Europe

The European Commission's reform agenda has aimed at transactions between regulated banks and the shadow banking sector, and the improvement of market integrity (EC 2013).

- *MMFs:* Proposed new rules for money market funds include a capital buffer of 3 percent of a fund's assets for constant NAV funds (with a maximum residual maturity of 397 days) or the conversion to variable NAV structures (EC 2013). Other elements contain new requirements on diversification, liquidity, concentration, and the eligibility of assets.
- *Securitization:* Reform measures include better alignment of interest and information between the parties involved in securitization transactions, such as risk retention of at least 5 percent of the securitized assets by the originator, sponsor, or original lender institution. In addition, higher capital requirements will be applied to noncompliant banks. Furthermore, changes to accounting standards on consolidation have been introduced and disclosure requirements for unconsolidated structured entities strengthened.
- *Repo and securities financing:* New rules on reporting and transparency of securities financing transactions

[61]Exemptions are granted for mortgage-backed securities backed by residential mortgages that meet certain underwriting standards ("qualified residential mortgages"), as well as by commercial loans, commercial mortgages, and automobile loans.

[62]By July 2014, three companies had been designated systemically important: American International Group, General Electric Capital Corporation, and Prudential Financial.

are proposed. Planned measures in the area of securities law are meant to limit the risks associated with rehypothecation. Proposed measures also aim to improve investors' understanding of the investment fund risks stemming from their use in transactions that finance securities.

- *Other shadow banking entities:* As of July 2013, the Alternative Investment Fund Managers Directive imposes new rules governing hedge funds, private equity funds, and real estate funds, and it introduces requirements regarding capital, risk and liquidity management, designation of a single depository for asset holdings, transparency, and supervisors' ability to restrict leverage.
- *Monitoring:* Work is under way to improve the collection and exchange of data as part of the September 2013 European Commission road map. Central repositories have been set up to collect data on derivatives within the framework of the European Market Infrastructure Regulation and have been proposed for repurchase transactions. Beginning in 2014, banks must report exposures related to shadow banking to their supervisors, and the European Banking Authority is set to draft guidelines on respective limits by the end of 2014. In addition, the definition of "credit institution" is being reviewed with a view to possible extension of the prudential regulatory perimeter.

Japan

- *Other shadow banking entities:* Consolidated regulation and supervision of broker/dealers was introduced in April 2011. It requires large broker/dealers whose total assets are more than ¥1 trillion to be designated as special financial instruments business operators and their ultimate parent companies as designated ultimate parent companies. Currently, the Nomura and Daiwa groups have been so designated and are subject to bank-like prudential requirements, including intensive supervision and Basel III capital requirements.

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RISK TAKING BY BANKS: THE ROLE OF GOVERNANCE AND EXECUTIVE PAY

Summary

There is broad consensus that excessive risk taking by banks contributed to the global financial crisis. Equally important were lapses in the regulatory framework that failed to prevent such risk taking. Reforms are under way to further strengthen the regulatory framework, realign incentives, and foster prudent behavior by bankers. These reforms aim to enhance capital and liquidity buffers and influence the incentives that induce bankers to take excessive risk. Regarding the latter, measures are being introduced to enhance risk governance and to ensure that pay practices fully reflect the risks that bankers take.

To be effective and avoid unintended consequences, such reforms must be based on a thorough understanding of what drives risk taking in banks. This chapter aims to contribute to that understanding through an empirical investigation that relates various measures of bank performance and risks to bank characteristics of governance, risk management, pay practices, and ownership structures.

The results show that banks with board members who are independent of bank management tend to take less risk. The level of executive compensation in banks is not consistently related to their risk taking. More pay that is related to longer-term job performance is associated with less risk. Moreover, banks that have large institutional ownership tend to take less risk. As expected, periods of severe financial stress alter some of these effects because incentives change when a bank gets closer to default.

With these results in hand, the chapter recommends policy measures, some of which are part of the current policy debate but have so far not been empirically validated. Measures include more appropriate alignment of bank executives' compensation with risk (including the risk exposure of bank creditors), deferment of some compensation, and providing for clawbacks. Bank boards should be independent of management and should establish risk committees. Supervisors should ensure that board oversight of risk taking in banks is effective. Consideration should be given to including debt holders in addition to shareholders on bank boards. Finally, transparency is critical to accountability and the effectiveness of market discipline.

Introduction

The run-up to the global financial crisis was marked by excessive risk taking in the financial sector, and once the crisis hit, the accumulated risks led to systemic problems and the failure of many individual financial institutions. The causes of such risk taking were many and complex, but there is general agreement in the financial industry, the public sector, and academia that incentive structures at some financial institutions played an important role. Moreover, some have called into question the integrity of banks and their executives, leading to reputational damage to the industry.

To tackle the issue of excessive risk taking, the postcrisis financial reform agenda has focused in part on improving the regulation of corporate governance in banks and regulating bank executives' pay. Thus, in addition to addressing the problem of banks being "too important to fail" and improving the financial capacity of banks to absorb losses, measures have been proposed to enhance board oversight of bank risk and to ensure that executive pay imparts the appropriate incentives to curb excessive risk taking.

The reform measures should be based on a thorough understanding of the underlying factors that led to excessive risk taking in banks, and this chapter aims to add to that understanding. By considering how incentives (such as compensation and ownership) and controls (such as board structure and the risk-management framework) shape bank risk taking (in theory and in practice), the analysis in this chapter can inform the design of regulation in these areas.

Specifically, the chapter investigates the following questions:

- To what extent does the design of corporate governance and compensation incentives in banks contribute to bank risk taking and to financial stability risks?
- How does the interaction of the interests of managers, shareholders, and creditors affect a bank's risk appetite, and how does it relate to public policy objectives, including the protection of depositors and taxpayers?
- How can regulation contribute to prudent risk taking in banks and thus foster financial stability?

To answer these questions, the chapter conducts a novel empirical investigation that links measures of corporate governance and managerial incentives (including compensation structures) to risk metrics of banks, including their contribution to systemic risk. It finds that some of these measures are consistently associated with risk taking in banks across countries. For example, more board members who are independent of bank management, a high share of equity awards in bank chief executive officer (CEO) compensation, and the presence of institutional investors are related to less risk taking. Although much of the public discussion has focused on the *level* of compensation, this analysis does not find a consistent relationship between the total amount of executive compensation (adjusted for firm size) and risk taking.

With these and other results in hand, the chapter makes the following policy recommendations: Reform measures should ensure that executive compensation of bankers is sufficiently risk sensitive through mandatory deferrals of compensation and a link to default risk and should require bank boards to be independent of management. Boards should establish board risk committees to improve board oversight and internal risk controls. In addition, policymakers should investigate the merits and pitfalls of having debt holders represented on bank boards.

Risk Taking in Banks: The Theory

This section (1) explains the traditional tension in objectives between managers and shareholders and argues that such tension is more severe for banks; (2) notes that especially for banks, maximizing shareholder value is not in the best interests of creditors; and (3) highlights the major conflicting interests vis-à-vis society that arise from the presence of externalities related to systemic risk.

Banks Are Different

It is worth remembering that modern compensation systems grew partly out of concern about insufficient risk taking by managers. The traditional corporate governance literature points to the well-known "agency" problems between the owners of a firm and the day-to-day managers (Jensen and Meckling 1976). That is, managers may not always act in the best interests of shareholders because of competing interests.[1] Manag-

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[1]Managers may not put enough effort into supervising employees, seeking new clients, and selecting low-cost suppliers. Managers may also aim to make themselves indispensable in ways that do not necessarily add value to shareholders. Tirole (2006) provides a comprehensive survey of these matters.

ers' attitudes toward risk may also not be optimal from the shareholder's point of view: without additional incentives, managers may be too risk averse when the firm is doing well because they do not want to risk losing their personal financial wealth or the human capital they have invested in the firm. Pay incentives and corporate governance structures are intended to ensure that managers and workers act in the best interests of the firm's owners—that is, to maximize shareholder wealth by taking on appropriately risky projects.[2] Managers are monitored not only by the board of directors, but also by large shareholders, debt holders, market analysts, and credit rating agencies.[3] But monitoring is costly and may not be effective. Firms therefore aim to align managers' incentives with those of shareholders through schemes such as performance-based compensation packages (cash bonuses, stocks, or stock options), which generally make the manager more sensitive to changes in shareholder value (Box 3.1).

Agency problems are particularly relevant for banks, mainly because of the greater importance and difficulty of risk management. Risk management and the alignment of risk incentives between bank owners and managers are highly relevant for banks because risk taking is at the core of their business model. In addition, the relatively high complexity of banks' day-to-day business means that senior bank management must delegate much of the decision making about risk to less-senior workers.[4] That complexity also

means that monitoring and control of the actions of risk-taking staff are difficult to implement and often less effective. Managers therefore base the pay of these employees on measured performance, which acts as a partial substitute for direct monitoring and control of their behavior.[5]

True performance is difficult to measure, however, and pay incentives may go too far and encourage the bank staff to engage in too much risk taking from the shareholders' point of view. For example, by taking on loans that appear to be profitable in the short term but come with hidden, long-term risks, bankers can increase their immediate performance-based pay and move on before the risks materialize. An additional complication is that bank staff often must choose the amount of risk to take on without knowing how it might affect the overall risk of the institution.

The Interests of a Bank's Creditors

Even if banks manage to align the incentives of their staff with the interests of shareholders, not all stakeholders will be satisfied, because maximizing shareholder value is not necessarily in the best interests of the bank's bondholders. Shareholders have limited liability, which means that they have a limited downside to their investment, but receive all the gains from an increase in the company's value. This position implies that they can sometimes transfer wealth from creditors to themselves by choosing risky projects that do not create value for the firm (see example in Table 3.1).[6] This so-called risk shifting increases as firms get closer to default because managers, often on behalf of shareholders, tend to "gamble for resurrection"—that is, hope to recover solvency by taking large risks that are in their own interests but not those of the bondholders. They are willing to take more risk when firms get closer to default (when their equity stake is nearly depleted) because shareholders and managers have less

---

[2]The view that the goal of corporate governance is to align managers' interests with the maximization of shareholder wealth is more common in English-speaking countries; corporate governance systems elsewhere (such as in continental Europe and Asia) often take into account the interests of other stakeholders as well (see Allen and Gale 2001; Clarke 2007; and Macey and O'Hara 2003). However, the shareholder focus is becoming more widespread because of increased cross-listings and international convergence of corporate governance codes.

[3]In most countries boards of directors have a one-tier structure that brings together management and nonexecutive directors in a single body responsible for protecting shareholders' interests. This system is common in Australia, Canada, France, India, Italy, the United Kingdom, and the United States. In Germany (as well as in Austria, the Netherlands, and Poland, and to a lesser extent in Denmark, Finland, Norway, and Switzerland; see Aluchna 2013), boards have a two-tier structure in which various stakeholders are represented on a supervisory board that is separate from the management board, which is composed only of executives. The management board is responsible for the day-to-day management of the company, while the supervisory board is responsible for appointing and monitoring the executives. In this chapter and for the purpose of measuring board independence, "board" refers to the supervisory board for firms with a two-tier structure.

[4]The relatively high complexity and business uncertainty in the banking sector have two additional implications for executive and

employee compensation (Prendergast 2002). Because risk is high, overall compensation has to be high. Because delegation needs to be high, compensation must be indexed to some measure of performance or output to constrain employee discretion, and hence variable compensation needs to be a significant fraction of total compensation. Other factors may influence compensation (such as taxation), but those are not bank specific.

[5]See Prendergast (1999, 2000, 2002) on the trade-off between risk and incentives.

[6]There is evidence that the risk of creditor expropriation by shareholders may be significant: firms with stronger antitakeover protection provisions enjoy a lower cost of debt financing (Klock, Mansi, and Maxwell 2005).

Box 3.1. Types of Executive Compensation

Total compensation of executives can consist of a number of components (Figure 3.1.1):

- *Fixed compensation,* the level of which does not depend on performance. Fixed compensation may be awarded immediately (for example, a salary) or may be deferred (for example, a pension).
- *Variable compensation* (bonus), the level of which depends on a variety of performance measures, which may include profits or stock performance. The bonus may be awarded immediately or promised for some future date. The future vesting of the deferred bonus may depend merely on the passing of time (in three years, for example) or may be dependent on future performance (future profits or stock price, for example).
- Variable compensation may be subject to *clawbacks.* A clawback occurs when previously awarded variable compensation (awarded immediately or after

some time or after a performance test was met) is recouped in response to an adverse development (for example, a failed investment or a deterioration in the solvency position).

The performance tests that determine the amount of the variable compensation can be based on a variety of measures and should appropriately account for longer-term risk. Traditionally, compensation structures for bank executives have been based on operating profitability and stock price performance metrics such as return on equity and book value per share. These metrics are short term and do not account for operational, credit, and liquidity risks. More appropriate performance measures accounting for longer-term risk could include the sensitivity of a bank's stock to the wider stock market (beta), the credit default swap spread of a bank's debt, or risk-adjusted economic capital (measured by market capitalization plus total debt minus risk-weighted assets).

Figure 3.1.1. Types of Executive Compensation
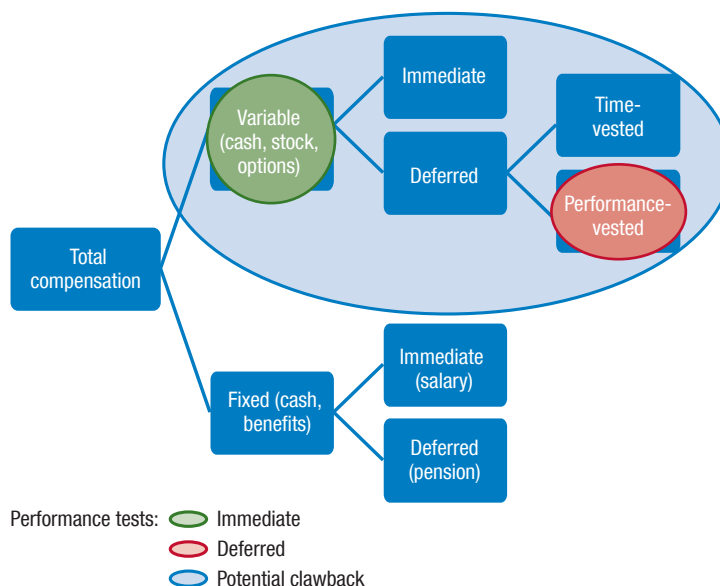
Source: IMF staff.

The author of this box is S. Erik Oppers, with contributions from Poonam Kulkarni

Table 3.1. Equity Payoffs with Various Distances to Default
(U.S. dollars)

	Initial value	Final value if project fails (probability = 50 percent)	Final value if project succeeds (probability = 50 percent)	Expected final value (if project is undertaken)
Scenario 1				
Value of equity	100	0	150	75
Value of debt	200	200	200	200
Total assets	300	200	350	275
Scenario 2				
Value of equity	50	0	100	50
Value of debt	200	150	200	175
Total assets	250	150	300	225
Scenario 3				
Value of equity	0	0	50	25
Value of debt	200	100	200	150
Total assets	200	100	250	175

Source: IMF staff.

Note: The table shows scenarios for a bank with $200 of debt and various levels of equity. In Scenario 1, the bank's total assets are initially worth $300, so the initial value of the equity is $100 ($300 − $200 = $100); in Scenario 2, the bank's assets are initially worth $250 and the equity, $50; in Scenario 3, the bank's assets are initially worth $200 and the equity is worthless. The bank is considering an investment project that costs $100 and has a 50 percent chance of failing and a 50 percent chance of succeeding. The yield is independent of all other projects (so the project's risk is not diversifiable). If the project fails, it yields nothing; if it succeeds, it yields $150. The project therefore has a negative expected return of $25, so it should not be undertaken by the bank. The last column of the table shows the expected value of the debt, the equity, and the total assets under each scenario if the project is undertaken. In Scenario 1, the expected final value of the equity is less than the initial value; in Scenario 2, it is identical; and in Scenario 3, it is larger. Hence, if the board and the management represent only the interests of the shareholders, they will undertake the project in Scenario 3 even though it reduces the total value of the bank and therefore reduces the welfare of society as a whole. They like the project because in that scenario the equity holders capture all the gains if the project succeeds but the debt holders suffer the losses if the project fails. In all scenarios, the alignment of incentives between managers and shareholders is taken as given, as well as the compensation practices used to achieve said alignment.

to lose from failure (and more to gain from success) as their stake in the firm loses value. To the extent that compensation structures are designed to align incentives between managers and shareholders, they increase the risk-taking appetite of managers when the bank is close to default—against the interests of bondholders, who would prefer less risk.

Shareholder conflicts with debt holders are potentially more severe for banks than for other firms as a result of a failure of market discipline. Banks' many small depositors have little incentive to monitor the banks' actions because they are protected from default by deposit insurance. In addition, banks have much more leverage than other firms (heightening the shareholder–debt holder conflict) because the cost of debt is lowered by deposit insurance and explicit and implicit government guarantees (including from banks being considered too important to fail) and because of the premium banks earn when issuing liquid financial claims (that is, deposits and commercial paper).[7]

[7]The implicit subsidies coming from bailout guarantees can be appropriated to a larger extent by banks if they choose risky activities. In addition, mispriced debt and leverage reinforce each other. See Chapter 3 of the April 2014 *Global Financial Stability Report* for an assessment of too-important-to-fail subsidies.

Finally, creditors find it more difficult to discipline (and monitor) banks through bond covenants and by requiring collateral because banks are very complex and opaque (Figure 3.1).

Externalities and the Interests of Society

The main conflicting interests, however, are between shareholders, managers, and debt holders on one side, and society at large on the other side. They arise because of the presence of externalities related to systemic risk, and have long been a concern for regulators. For instance, shareholders, debt holders, and managers will fail to take into account the bank's contribution to systemic risk and hence its effect on other institutions and taxpayers. Banks' preferred levels of risk—and the compensation practices used to achieve them—may therefore be inconsistent with financial stability. In addition, banks are subject to runs because of high leverage and maturity mismatches in their balance sheets. These issues have been addressed in various ways by regulation—for example, through capital requirements that are contingent on the riskiness of bank assets.

Figure 3.1. Corporate Complexity and Opacity: Dispersion of Earnings-per-Share Forecasts by Sector
(Coefficient of variation)
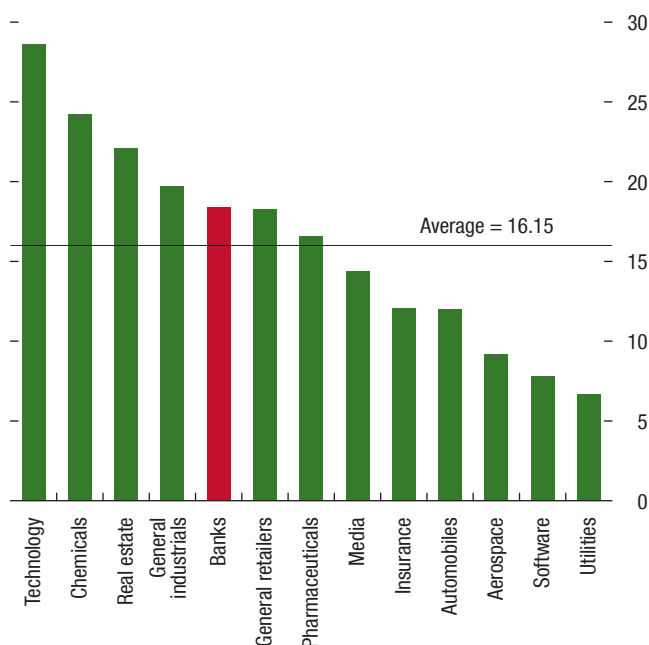
Sources: Thomson Reuters Datastream; and IMF staff calculations.
Note: The figure shows the coefficient of variation of analysts' earnings-per-share forecasts (2012–13) for the largest firms in each economic sector. The measure underestimates the relative opacity of banks because it mixes opacity with hard-to-measure risk, which is probably more prevalent in innovation-driven sectors such as technology. Furthermore, because disclosure requirements are much higher for financial companies than for nonfinancial firms, information-based ambiguity is smaller for banks than for nonbanks, and bank opacity is mostly due to disagreement about firm fundamentals (that is, difficulty in understanding the business model) as a result of corporate opacity.

The global financial crisis showed that existing regulation to address this issue had been insufficient, and a regulatory reform agenda is paying attention to the issue of incentives for banks in a broad sense. Measures to address the too-important-to-fail problem, the development of standards on debt instruments that can be "bailed-in" (that is, those that can be made part of the loss-absorbing liabilities of a bank), and discussions of principles for compensation practices and principles for corporate governance are examples. In addition, measures were proposed (and in some cases adopted) with the goal of enhancing the effectiveness of price-based tools (such as capital requirements) and steering banks' business cultures away from excessive risk taking (see Viñals and others 2013). Such measures include living wills and structural measures that force the bail-in of unsecured liabilities, ring-fence riskier business segments, and bar banks from engaging in certain types of risky activities.

A number of international reform initiatives for corporate governance in banks are under way. The Organisation for Economic Co-operation and Development, the Financial Stability Board (FSB), and the Basel Committee on Banking Supervision (BCBS) are revising the standards for corporate governance based on lessons from the crisis in areas such as risk governance, board structure, compensation, internal audit, and the role of supervisors. Individual countries have also taken various initiatives (Table 3.2).

The most prominent incentive-based recommendations aimed directly at individual behavior are in the FSB's 2009 "Principles and Standards for Sound Compensation Standards" (P&S) (Box 3.2). The FSB guidance is intended to ensure (1) proper governance of compensation, (2) effective alignment of compensation with prudent risk taking, and (3) effective supervisory oversight and engagement by stakeholders. In its latest review in August 2013, the FSB reported that all but two of its member jurisdictions had completed the incorporation of the principles into their national regulations or supervisory guidance. The current focus is on the actual implementation of these rules and on effective supervision. Most supervisory authorities report that they now have a good sense of pay practices in their markets and exercise a good degree of oversight of the evolution of pay structures at supervised institutions.

It is important that regulatory reform initiatives aimed at reducing excessive risk taking in banks be based on a thorough understanding of the drivers of risk. Determining the *optimal* level of risk taking by banks is beyond the scope of this chapter. However, given the evidence that risk taking before the crisis had been excessive, the empirical exercise in the next section investigates a number of factors that are associated with risk taking in banks. Thus, although the results of the analysis do not distinguish between healthy and potentially hazardous risks, they may help policymakers design or refine regulatory reforms that will curb excessive risk taking in banks, while minimizing unintended side effects.[8]

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[8]These measures of risk are tilted toward "bad risks" in that they cover negative tail risk, distance to default, and systemic risk. However, the analysis also uses more neutral measures of risk based on total or systematic risk, which can represent either healthy or hazardous risks.

Table 3.2. Reform Initiatives in Various Jurisdictions

Jurisdiction	Legislation/Initiative	Governance dimension	Measures
United States	Dodd-Frank Act (2010)	Compensation	"Say on pay": Listed companies are required to hold nonbinding vote on compensation of named executives at least once every three years; these companies must also hold a vote at least once every six years on the frequency of "vote on pay."
			"Say on golden parachutes": Listed companies must hold a nonbinding vote on "golden parachute" compensation when having to vote on a takeover bid.
			"Increased disclosures and transparency": Companies must disclose (1) the relationship between executive pay and the company's financial performance (including share value and dividend payout); (2) the median pay in firm (excluding CEO), the CEO's total pay, and its ratio; (3) any hedging against decreases in values of securities awarded to any employee or director.
			"Integrity and accuracy of executive compensation": (1) new standard for compensation committee independence, (2) clawback provisions allowing the recovery of any excess payment based on misreported financial data.
		Board of Directors	Risk management: (1) banks and some other financial companies with assets greater than $10 billion must have a separate board risk committee that includes at least one expert with experience in managing risks of large companies; (2) requirement may be extended to bank holding companies with assets less than $10 billion by the Federal Reserve.
	SEC proxy rules	Board of Directors	Banks must disclose in the annual report the extent of the board's role in risk oversight.
		Compensation	Companies must discuss: (1) the extent to which risks arising from compensation policies are likely to have a material adverse impact on the company; (2) how compensation policies and practices relate to risk management and risk-taking incentives.
European Union	CRD IV and CRR	Board of Directors	Requires separation between CEO and Chairman for banks with a one-tier board structure, unless authorized by competent authorities.
			Large banks must set up a nomination committee, making explicit its responsibilities (including self-evaluation).
			Requires the board to reflect "a broad range of experiences" and to possess sufficient collective knowledge to understand risks.
			Limits the number of directorships (subject to supervisor approval).
			Increases individual board members' responsibilities: Must have knowledge, integrity, and independence to assess and challenge management.
			Promotes diversity within boards.
		Compensation	Caps ratio of variable to fixed compensation at 1:1, which could be increased to 2:1 if approved by a super-majority of voting shareholders (65 percent if quorum exists and 75 percent otherwise).
			Up to 25 percent of variable pay may be exempt from the ratio requirement if paid in long-term deferred instruments (at least five years vesting period).
			Bonus-malus and clawback clauses must apply to 100 percent of variable compensation (that is, all compensation that is not required by law).
			At least 40 percent of each executive's bonus must be deferred and up to 60 percent for senior executives.
			Rules apply to MRTs (senior management, risk takers, control functions, and anyone receiving equal remuneration).
			Restrictions apply to worldwide employees of EEA firms, as well as to those of EEA-based subsidiaries of non-EEA firms, and to non-EEA-based employees with material responsibility for EEA operations.
			Bans hedging strategies or insurance contracts that would undermine the risk-alignment effects of the remuneration package.
			Requires complete and detailed disclosure of remuneration practices for large and complex firms: information on the link between pay and performance, shares award criteria, and aggregate figures of remuneration. Some qualitative disclosure required for smaller firms.

(continued)

Table 3.2. Reform Initiatives in Various Jurisdictions *(continued)*

Jurisdiction	Legislation/Initiative	Governance dimension	Measures
Canada	Ontario Securities Commission	Board Structure	Gender diversity: Requires disclosure of practices and policies — comply or explain. In consultation stage.
			Director term limits — comply or explain.
	Toronto Stock Exchange		Majority votes needed to confirm directors.
Bank for International Settlements	BCBS Principles for Enhancing Corporate Governance		Sets principles for sound corporate governance in six major areas:
			1. Board practices
			2. Senior management
			3. Risk management and internal controls
			4. Compensation
			5. Complex and opaque corporate structures
			6. Disclosure and transparency
Financial Stability Board	FSB Principles and Standards for Sound Compensation Standards	Compensation	Principles for effective governance of compensation:
			1. Board must oversee the design of compensation policies.
			2. Board must monitor and review compensation system.
			3. Financial and risk-control functions must be independent and have appropriate authority, and compensation must be independent of business functions.
			Principles for effective alignment of compensation with prudent risk taking:
			4. Compensation must be adjusted for all forms of risk.
			5. Compensation must be symmetric with risk outcomes.
			6. Compensation schedules must be sensitive to time horizon of risks.
			7. Mix of cash, equity, and other forms of pay must be consistent with risk alignment.
			Principles for effective supervisory oversight and engagement by stakeholders:
			8. Supervisory review of compensation practices must be rigorous and sustained; supervisors must include compensation practices in risk assessment of firms.
			9. There should be a comprehensive and timely disclosure of compensation practices, as well as risk-management control practices.
			Principles for sound compensation practices — implementation standards:
			1. Bonus-malus and clawback clauses must apply on cash bonuses.
			2. At least 40 percent of each executive's bonus must be deferred. The requirement increases to up to 60 percent for senior executives. At least 50 percent of variable compensation should be awarded in shares or share-linked instruments.
			3. Minimum deferral period is three years and at least half of bonuses are to be paid in restricted shares rather than cash.

Source: IMF staff.

Note: BCBS = Basel Committee on Banking Supervision; CEO = chief executive officer; CRD IV = Capital Requirements Directive (European Union Directive 2013/36/EU); CRR = Capital Requirements Regulation (European Union Regulation (EU) No. 575/2013); EEA = European Economic Area; FSB = Financial Stability Board; MRT = material risk taker; SEC = Securities and Exchange Commission.

Bank Governance and Pay: Empirical Evidence Regarding the Effects on Risk Taking

The Data

To examine the factors that affect risk taking in banks, the analysis in this chapter uses a large data set of relevant firm governance statistics for major banks in various advanced and emerging market economies.[9]

[9] The data on compensation and other incentives are limited to CEOs. However, if CEO incentives are aligned with shareholders'

The data cover more than 800 banks from 72 countries and include commercial banks, cooperative banks, savings banks, mortgage companies, and investment

interests, in principle the CEO will, in turn, accordingly condition the behavior of employees who are delegated to take financial risks. Furthermore, if excessive risk taking exists because of poor performance measurement, the problem should be common to senior and midlevel executives. Although agency problems between CEOs and those employees exist, they can be considered of second-order importance. Therefore, the findings based on CEO data provide a lower bound for the overall problem.

Box 3.2. Trends in the Regulation of Bankers' Pay

Several countries put caps on compensation at firms that received direct capital support during the global financial crisis to prevent public funds from being used to pay bonuses. Most of these countries (including Germany, the United Kingdom, and the United States) limited payouts to top executives, whereas others (such as Switzerland) aimed at limiting the bank-wide bonus pool. With crisis-related government support now withdrawn from most of these banks, the compensation caps have expired.

Separately, international standard setters have established compensation guidelines specifically for financial institutions. Under the mandate of the Group of 20, the Financial Stability Forum (which later became the Financial Stability Board, FSB) issued "Principles and Standards for Sound Compensation Practices" (P&S), which aims to align pay not only with performance, but also with risk. FSB members have agreed to implement these guidelines at least for "significant financial institutions," which in many countries means systemically important banks. The guidelines cover the following aspects:

- *Broad scope:* The rules should apply to senior management as well as to all other employees who have a "material" influence on the risk a financial firm is taking.
- *Ex ante risk adjustment:* Indicators that determine compensation amounts must recognize all types of risk, including the risk-adjusted cost of capital and funding, the correlation between total revenue and net income, and operational and compliance risks. Substantial portions of compensation packages should therefore be variable, although the FSB does

not recommend a specific split between fixed and variable compensation.

- *Ex post risk adjustment:* Risks may take a long time to be realized, and outcomes can differ significantly from projections. Compensation that has already been awarded should therefore be adjusted according to risk outcomes. Between 40 and 60 percent of variable compensation should be deferred by awarding shares that remain blocked for a certain time, and variable pay should also be subject to clawbacks. The guidelines discourage options and other compensation instruments that lack a significant downside.
- *Enhanced disclosure:* The guidelines strengthen disclosure requirements to enhance market oversight and facilitate supervision. Going beyond general "say-on-pay" disclosure, financial firms are required to provide comprehensive information about pay at all hierarchy levels, in particular for material risk takers.

The FSB principles have since been supplemented by requirements of the Basel Committee on Banking Supervision.

Although FSB member countries have broadly implemented the P&S, they exercised considerable discretion in setting concrete national rules. In particular, there is substantial variation in how prescriptive countries are in implementing the P&S. Some jurisdictions, such as European Union member states, have been more prescriptive by placing absolute caps on variable compensation, with exemptions being subject to shareholder approval. Differences in the rules across countries may have hampered internationally active banks in the setting of consistent firm-wide compensation strategies.

The author of this box is Oliver Wuensch.

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banks, among others. About 50 percent of the banks are from the United States; more than 20 percent are domiciled in Europe; and the remainder are located in Africa, the Asia and Pacific region, and the rest of the Americas (see Annex 3.1 for a detailed description of data sources).[10] The firm governance characteristics

were divided into four groups of variables: board characteristics, risk management, compensation practices, and ownership (Table 3.3).

The data show the following main trends:
- *Bank executive compensation* (Figure 3.2): After dropping markedly at the outset of the global financial crisis, total CEO pay has now largely recovered. The share of fixed salary has risen markedly in Europe,

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[10]Institutional coverage varies across the analyses because not all banks provide complete data. In particular, because many of the U.S. banks are smaller and often have incomplete data, they were excluded from the analysis in a number of cases, providing more institutional balance across geographical areas. Still, all regressions have some degree of oversampling of banks from regions where

regulatory reforms have been more extensive (the United States and Europe in particular). To some extent, this issue is controlled for by using bank or country fixed effects.

Table 3.3. Governance Characteristics Used as Explanatory Variables in the Empirical Analysis

Risk drivers	Variables	Description
Board characteristics	Board independence	Share of independent board members (as reported by each bank)[1]
	CEO is chairman	Dummy = 1 if CEO is also a chairman of the board
	Financial experience	Average of independent board members' financial experience as a share of their total professional experiences[2]
Risk management	Risk committee	Dummy = 1 if there is a board risk committee
	CRO board member	Dummy = 1 if the CRO is a member of the board
	CEO background	Dummy = 1 if the CEO has retail banking or risk experience but no investment banking experience
Compensation practices	Share of salary	Share of salary in total calculated CEO compensation
	Equity-linked compensation	Share of equity-linked compensation in total calculated CEO compensation
	Compensation horizon	Maximum time horizon to reach full senior executive compensation
	Level of compensation	Total calculated CEO compensation adjusted for bank size
Ownership	Institutional investors	Share of firm that is owned by institutional investors
	Inside investors	Share of firm that is owned by inside investors
	Large shareholder	Dummy = 1 if there is a blockholder owning at least 10 percent of the firm

Source: IMF staff.

Note: CEO = chief executive officer; CRO = chief risk officer.

[1]Independent board members are defined as directors who are not employees of the bank (currently or in the past few years) and do not have a direct relationship with the bank. The exact definition varies by jurisdiction. For example, large shareholders may or may not be considered independent. In banks with a two-tier board structure, only the supervisory board is considered.

[2]Formally, it is the average (across all independent directors) of the share of individual directors' financial sector experience to their total experience.

possibly due to more direct regulation of executive pay. The role of long-term incentives is on the rise because the vesting periods for variable pay have been extended. This is in line with the implementation of the FSB P&S, which require compensation to be sensitive to the time horizon of risks. Finally, bank shareholders are more engaged on matters of executive compensation, as evidenced by the marked increase in votes on such practices ("say on pay").

- *Board structure* (Figure 3.3): The share of independent directors on boards has increased in Europe and the United States but has declined in Asia (see Table 3.3 for a definition of independent board members). On average, most independent board members have some degree of experience in finance, and this share has increased modestly.

- *Risk management:* The role of risk-related functions has gained importance since the crisis. More boards have established board risk committees, and the chief risk officer (CRO) is more often a member of the board.[11] This enhanced role for risk-related functions is partly also in response to

regulations (for example, the Dodd-Frank Act in the United States and the Capital Requirements Directive—EU Directive 2013/36/EU, or CRD IV—in Europe) that require companies of a certain size to have board risk committees and CROs with direct access to board members. The BCBS Core Principles for Effective Banking Supervision also include a new principle stating that supervisors should require larger and more complex banks to have a dedicated risk-management unit overseen by a CRO.

In addition to pay and governance, corporate culture has a significant effect on risk taking in banks. It is impossible to design an incentive structure that leads a bank manager to make the "right" decision every time (Stulz 2014). In cases in which incentive rules are insufficient, corporate culture will guide decisions and complement a bank's ability to manage risk. Corporate culture thus provides a set of unwritten, but widely accepted, rules that determine acceptable behavior—which in some corporate cultures may include disregarding written rules. A key characteristic of culture is that it is adopted over time.

Although measuring a bank's culture is seemingly impossible, some indicators of a sound risk culture can be identified (FSB 2014). First, boards and management must set the expectation for integrity in behavior

[11]The measure "CRO is a board member" is a proxy for the centrality of this officer but is not meant to capture a best practice. For two-tier boards, the measure indicates whether the CRO is a member of the executive board (he or she can, of course, not be a member of the supervisory board).

Figure 3.2. Trends in Compensation Practices in Banks

Total bankers' pay has recovered...

1. Average Annual Total Calculated CEO Compensation
(Millions of U.S. dollars)
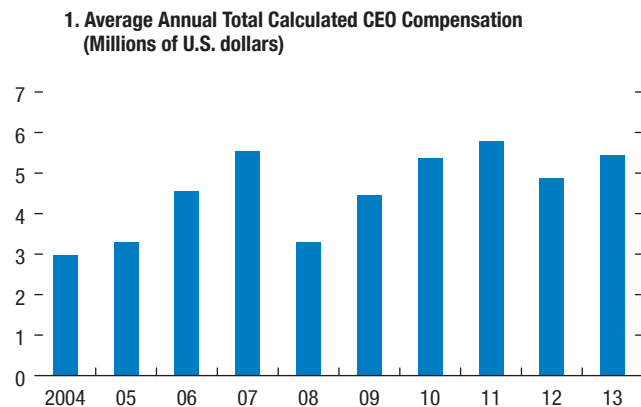
... and fixed pay has increased, mostly in Europe...

2. Total Compensation
(Percent)

■ Other incentive pay   ■ Cash bonus   ■ Salary
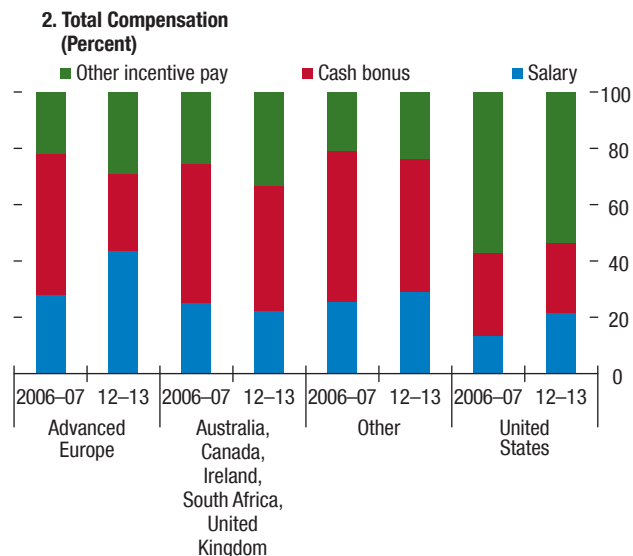
... but the vesting periods are becoming longer...

3. Number of Years to Reach Full Senior Executives'
Compensation
(Years)
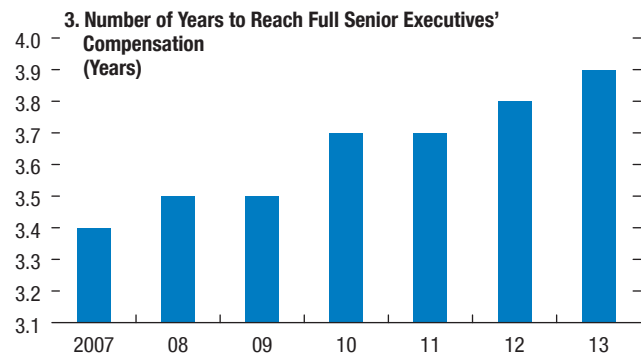
... and say-on-pay is becoming more widespread.
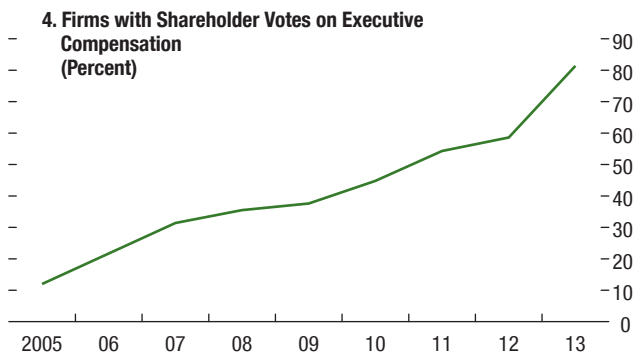
4. Firms with Shareholder Votes on Executive
Compensation
(Percent)

Sources: BoardEx; Standard and Poor's Capital IQ database; Thomson Reuters Datastream; and IMF staff estimates.
Note: CEO = chief executive officer; "Advanced Europe" comprises Austria, Belgium, Cyprus, Denmark, France, Germany, Greece, Iceland, Italy, Liechtenstein, Netherlands, Norway, Portugal, Spain, Sweden, and Switzerland; "Other" comprises China, Hong Kong SAR, India, Israel, Japan, Malaysia, Pakistan, Singapore, and South Africa. Only banks with assets of more than $10 billion are included. Panel 2 shows the share of the sum (across all banks in each region) of total compensation that was paid in salary, cash bonuses, and other incentive pay.

and make clear that noncompliance will not be tolerated (*tone from the top*). Second, a bank's staff must expect to be held accountable for their actions and their impact on risk taking (*accountability*). Third, a bank should have an environment that fosters communication and discussion of the decision-making process (*effective communication and challenge*). Fourth, financial and nonfinancial incentives must support and be consistent with the firm's core values (*incentives*). The empirical analysis in this chapter is only partially able to capture these elements.

The Existing Literature

The existing literature has partially investigated the links between governance, pay, and risk taking in various specific countries and cases (Table 3.4). Most studies look at a limited number of risk and governance dimensions and usually focus on the United States (despite a growing number of studies looking at specific variables using cross-country data). Although most issues remain unsettled, some of the main findings include the following:

Figure 3.3. Summary Statistics of Boards and Risk Management in Banks

Board independence is still lagging but the risk-management function is becoming more central.

Characteristics of Board Members

1. Independence
(Percent of board members)

2. Financial Expertise
(Percent of independent board members)
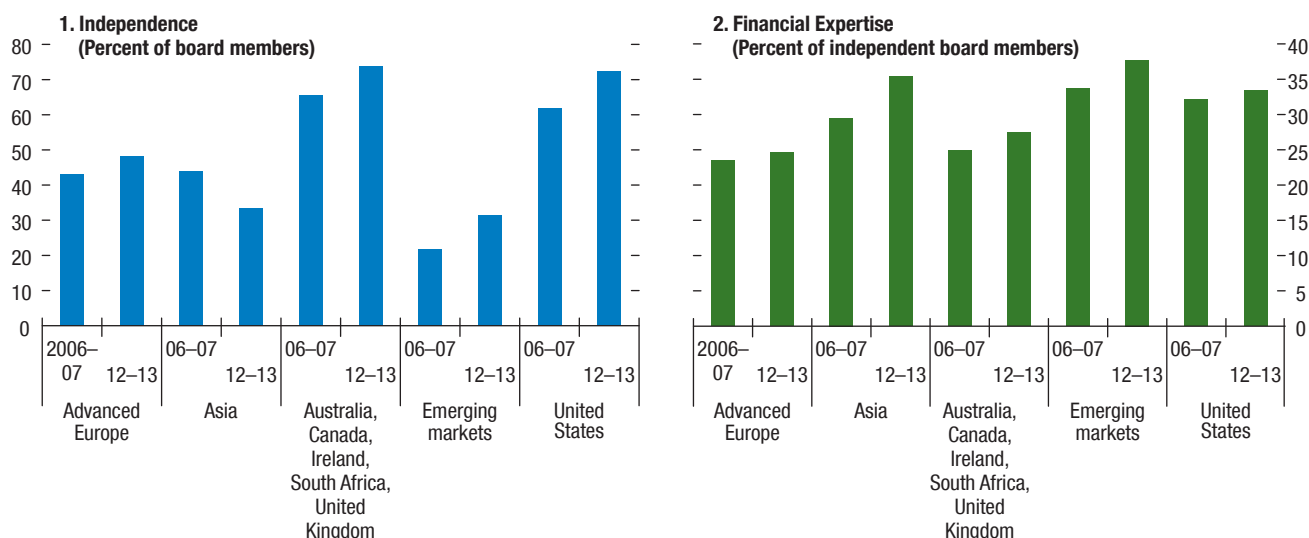
Risk-Related Board Functions

3. Board Risk Committee
(Percent of firms)

4. Chief Risk Officer Is Board Member
(Percent of firms)
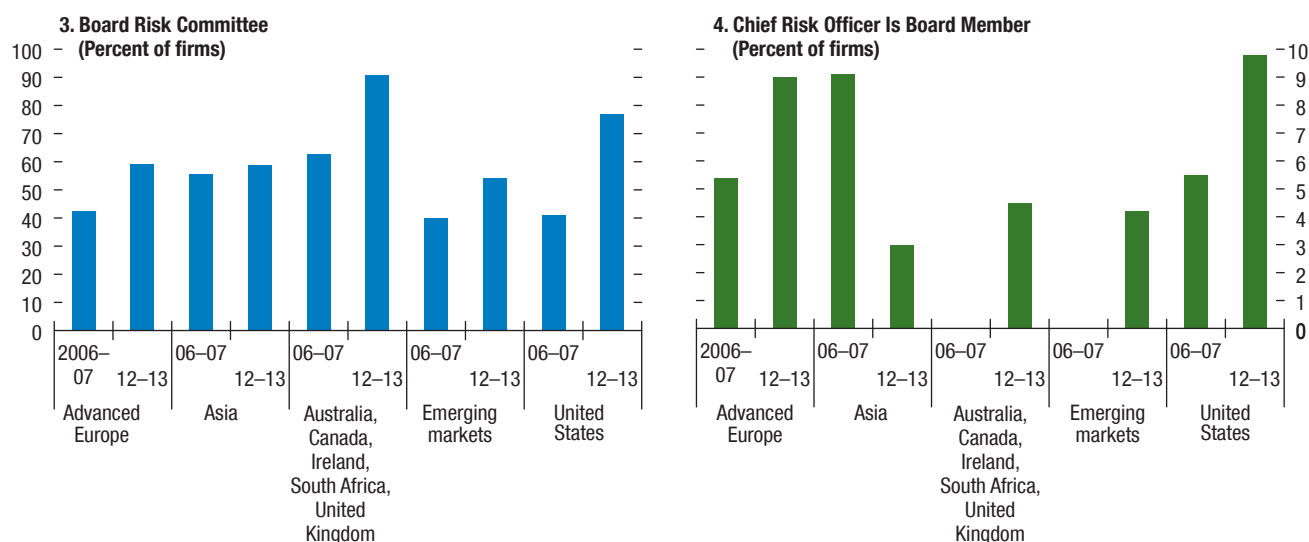
Sources: BoardEx; and IMF staff estimates.
Note: Asia comprises China, Hong Kong SAR, India, Japan, Korea, Malaysia, Philippines, Singapore, Taiwan Province of China, and Thailand. "Emerging markets" comprise Chile, Colombia, Hungary, Lebanon, Mexico, Nigeria, Oman, Peru, Poland, Qatar, Russia, Saudi Arabia, and Turkey. "Advanced Europe" comprises Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Italy, Liechtenstein, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, and Switzerland. For Asia and emerging markets, the data are shown only for 2007. For Asia, the data for panel 4 for 2007 are based on a small sample. Only banks with assets of more than $10 billion are included.

- Larger and more diverse boards have sometimes been found to be associated with more risk.
- The share of independent board members does not affect risk taking, and the results on board financial experience are mixed.
- Stronger risk-management functions and cultures tend to be associated with less risk.

- Performance-linked compensation in the form of options tends to be associated with more risk. The evidence on other forms of compensation is mixed.
- Most studies find a positive relationship between institutional or insider ownership and risk taking during the height of the financial crisis, but obtain ambiguous findings for other periods.

Table 3.4. Summary of the Empirical Literature

Governance dimension	Authors (year)	Independent variable	Sign	Risk Measure	Country coverage	Period
Board structure	Adams (2012)	Board independence, board size, and number of outside directorships	+	Bank bailouts	United States	2008–09
	Adams and Ragunathan (2013)	Gender diversity in the board	+	Idiosyncratic risk, tail risk, z-scores, percent of MBS or derivatives in total assets	United States	2006–09
	Battaglia, Curcio, and Gallo (2014)	Board size	+	Tail and systemic risks	European Union	2006–10
		Number of board meetings	–			
	Beltratti and Stulz (2012)	Shareholder-friendly board governance	–	Stock performance during the crisis	International	2007–08
	Berger, Kick, and Schaeck (forthcoming)	Executive director age	–	Risk-weighted assets over total assets and loan portfolio concentration	Germany	1994–2010
		Executive director education	–			
		Female representation in executive board	+			
	Erkens, Hung, and Matos (2012)	Board independence	None	Precrisis aggregate risk and expected default frequency	International	2008
	Fernandes and Fich (2013)	Financial experience of outside directors	–	Bank failure and bailouts	United States	2006–07
	Ferreira and others (2013)	Management insulation from shareholders	–	Bank bailouts	United States	2008–09
	Hau and Thum (2009)	Financial experience of directors	–	Write-downs and losses	Germany	2007–08
	Minton, Taillard, and Williamson (forthcoming)	Financial experience of outside directors	+	Aggregate risk and debt ratio	United States	2004–06
	Pathan (2009)	Shareholder-friendly governance	+	Aggregate, idiosyncratic, and systematic risks	United States	1997–2004
	Wang and Hsu (2013)	Board size	–	Operational risk	United States	1996–2010
		Board independence	–			
		Age heterogeneity	+			
		Tenure heterogeneity	None			
Risk management/ risk culture	Aebi, Sabato, and Schmid (2012)	CRO reports to board instead of CEO	+	Stock performance during the crisis	United States and Canada	2007–08
	Ellul and Yerramilli (2013)	Risk-management index	–	Tail risk	United States	2007–08
	Fahlenbrach, Prilmeier, and Stulz (2012)	Stock return in 1998	–	Bank failure	United States	2007–09
	Keys and others (2009)	CRO compensation	–	Delinquency of mortgage loans	United States	2001–06
	Lingel and Sheedy (2012)	Risk governance index	–	Aggregate and tail risks	International	2004–10
Compensation	Acrey, McCumber, and Nguyen (2011)	Compensation elements (salary, bonus, shares, and options)	Mostly none	Risk-rating variables and expected default frequency	United States	2008
	Bai and Elyasiani (2013)	Sensitivity to asset return volatility	+	Default risk and volatility of ROA	United States	1992–2008
	Balachandran, Kogut, and Harnal (2011)	More equity-based pay and less nonequity pay	+	Default risk	United States	1995–2008
	Chen, Steiner, and Whyte (2006)	More option-based pay	+	Aggregate risk and beta	United States	1992–2000
	Cheng, Hong, and Scheinkman (forthcoming)	Residual compensation (adjusted for firm size and specialization)	+	Various risks (aggregate and tail risks as well as various betas)	United States	1992–2008
	Chesney, Stromberg, and Wagner (2012)	Sensitivity to asset return volatility	+	Write-downs	United States	2007–08
	DeYoung, Peng, and Yan (2013)	Sensitivity to asset return volatility	+	Idiosyncratic risk as well as beta	United States	1994–2006
		Sensitivity to asset return	None			
	Fahlenbrach and Stulz (2011)	Cash bonus relative to salary	None	Buy-and-hold equity returns, ROE, and ROE during crisis	United States	2007–08
		Sensitivity to asset return	–			
	Hagendorff and Vallascas (2011)	Sensitivity to asset return volatility	+	Merger-related default risk	United States	1993–2007
		Sensitivity to asset return	–			

(continued)

Table 3.4. Summary of the Empirical Literature *(continued)*

Governance dimension	Authors (year)	Independent variable	Risk — Sign	Risk — Measure	Country coverage	Period
	Jokivuolle and Keppo (2014)	Sensitivity to asset return volatility	None or –	Buy-and-hold equity returns	United States	2008
	Keys and others (2009)	Cash bonus per net income	None	Delinquency of mortgage loans	United States	2001–06
	Tung and Wang (2011)	CEO compensation	–	Idiosyncratic risk and reduction in bond price	United States	2007–08
	Vallascas and Hagendorff (2013)	Inside debt holding	None or –	Default risk	United States and Europe	2000–08
		CEO cash bonus				
Ownership	Barry, Lepetit, and Tarazi (2011)	Individual or family ownership	–	Default risk and volatility of operating returns	Advanced Europe	1999–2005
		Bank ownership	None or –			
		Manager ownership	+			
	Beltratti and Stulz (2012)	Ownership by a large shareholder	None or +	Stock performance during the crisis	International	2007–08
	Berger, Imbierowicz, and Rauch (2014)	Ownership by lower management	+	Probability of default	United States	2007–10
		Ownership by chief officers and outside directors				
	Dolde and Knopf (2006)	Insider ownership	U-shape	Aggregate risk and volatility of operating returns	United States	1990–2003
		Institutional ownership	–			
	Erkens, Hung, and Matos (2012)	Institutional ownership	+	Precrisis aggregate risk and expected default frequency	International	2008
	Forssbaeck (2011)	Insider ownership	U-shape	Nonperforming loans/equity and default risk	International	1994–2005
	Gropp and Kohler (2010)	Ownership concentration	+	Deviation from the long-term average ROE	International	2008
	Laeven and Levine (2009)	Ownership concentration	+	Default risk, aggregate risk, and volatility of operating returns	International	1996–2001

Source: IMF staff.

Note: CEO = chief executive officer; CRO = chief risk officer; MBS = mortgage-backed securities; ROA = return on assets; ROE = return on equity.

- The few studies that examine the impact of concentrated ownership in banks typically find a positive relationship with risk taking.

The next section provides a comprehensive analysis of the contribution of many of these and other previously unexplored governance characteristics to risk taking. By covering a large number of banks from many different countries, and by using several measures of risk, the analysis tries to overcome the fragmentary nature of most published research and to contribute to a much-needed stock taking.

The Analysis

The analysis relates a variety of risk variables to a variety of corporate governance measures without necessarily implying causation. Risk is measured across eight dimensions, capturing both balance sheet and market measures of risk (Table 3.5). These measures can be grouped into four categories: (1) the distance to default captured by the market-implied and balance sheet z-scores; (2) the market assessment of risk captured by equity beta, equity return volatility, and asset return volatility; (3) tail risk captured by the Ellul and Yerramilli (2013) tail risk measure and the marginal expected shortfall developed by Brownlees and Engle (2011); and (4) the systemic risk measure developed by Acharya, Engle, and Richardson (2012), which captures the expected capital shortfall conditional on a systemic financial crisis.[12] The firm governance characteristics are also grouped into four categories: (1) board characteristics, (2) compensation, (3) risk management and culture, and (4) ownership structure (see Table 3.3).

These variables have complicated interactions and causality may run both ways. For example, banks that wish to take more risk may feel it is necessary to put in place more risk-management measures. This may make it seem as if more risk-control measures lead to higher risk, although the causality actually runs the other way. It is difficult to control fully for such endogeneity, and

although the analysis tries to do this to some extent, most of the results should be read as reflecting correlations and not necessarily causation.[13]

Three different approaches are used to link corporate governance characteristics of banks to their risk profiles and performance.

- A *difference-in-means approach* that ranks banks based on their governance indicators in 2007: This approach asks whether there is a significant difference between the average risk profile and performance (as measured by the associated variables in Table 3.5) during 2009–13 of banks in the top and the bottom quartiles of each governance indicator in 2007.[14] Focusing on a longer performance period for measuring risk (instead of, say, only one year) reduces measurement error. The approach presupposes, however, that bank-level governance variables change slowly over time.

- A *panel regression approach* that uses data for all banks with sufficient coverage for all available time periods (2005–13): Lagged bank-level characteristics are used in an attempt to ameliorate potential endogeneity problems. In the case of risk controls, if the endogeneity problem is particularly severe, an instrumental variables approach is used. A set of bank-level and country-level control variables is included to account for effects that can be explained by these other factors.[15] The analysis also explores

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[12]With the exception of the balance sheet z-score, the measures of risk used as dependent variables in the analysis are based on market data and thus cover only publicly listed firms. Given that the degree of market discipline and information disclosure for listed banks is likely to be higher than for unlisted banks, the results should be interpreted as applying first and foremost to listed banks. However, there is no evidence that sample selection in this dimension affected the results (see Annex 3.2).

[13]The endogeneity may arise because of reverse causation (as mentioned in the text) or because of omitted explanatory variables. The exercise ameliorates the problem by controlling for time-invariant firm characteristics (via fixed effects and first differences), using instrumental variables, or by including many control variables in the regressions.

[14]The difference-in-means approach compares risk outcomes in a postcrisis period (2009–13) to bank characteristics before the crisis. Although the postcrisis period excludes the most critical period of the crisis, it still includes a period of distress. Using a stronger definition of the postcrisis period (2010–13 or 2011–13) significantly weakens the results, as the 2007 rankings become less and less relevant, especially in light of the postcrisis regulatory reforms. To select a sample of relatively homogeneous banks, the sample is restricted to banks with balance sheet size of at least $10 billion in 2012. Because the domicile and other bank characteristics can affect bank performance independently of governance characteristics, those effects are removed from the analysis by first regressing the various indicators on a set of bank- and country-level variables (usually referred to in econometric analysis as controls). Country dummies are also included to capture country-level differences not captured by the country controls.

[15]The bank-level control variables are return on book assets, log book assets, the deposit-to-asset ratio, the Tier 1 capital ratio, and revenue growth. The country-level control variables are log GDP per capita (at purchasing power parity), current account balance as a fraction of GDP, the average of the six Worldwide Governance

Table 3.5. Measures of Risk Used in the Empirical Analysis

Measures of risk	Description	Risk dimension
Market-implied z-score[1]	Captures bank's market-implied distance to default, taking into account profitability, capital levels, and volatility of returns	Sign switched so that higher values mean higher risk
Balance sheet z-score[1]	Same as above, but calculated using only balance sheet data (suitable for unlisted banks)	Sign switched so that higher values mean higher risk
Equity beta	Captures systematic risk—risk arising from exposure to general market movements as opposed to idiosyncratic factors	Higher values mean higher risk
Equity return volatility	Volatility of return on equity	Higher values mean higher risk
Asset return volatility[2]	Volatility of return on assets, calculated using equity prices and the structure of the balance sheet	Higher values mean higher risk
Tail risk[3]	Average of the bank's worst five daily returns over the given year	Higher values mean higher risk
Marginal expected shortfall[4]	The bank's percentage of expected financial sector capital shortfall in a crisis	Higher values mean higher risk
Systemic risk[4]	Measures bank's share of total financial sector capital shortfall	Higher values mean larger contribution to systemic risk

Source: IMF staff.

[1]Z-scores are defined as the return on assets plus capital to asset ratio, divided by the standard deviation of return on assets. The balance sheet z-score uses balance sheet data to calculate this ratio. The market z-score uses the equity implied volatility and return on assets.

[2]Standard deviation of the annual change in the market value of assets. The market value of assets is derived from equity prices by treating the value of equity as an implicit call option on the assets with strike equal to the outstanding liabilities. See Merton (1974) for details.

[3]A bank's tail risk is defined for each year as the negative of the average return on the bank's stock during that stock's 5-percent-worst-return days that year. See Ellul and Yerramilli (2013) for details.

[4]Marginal expected shortfall captures the daily expected drop in equity value if the aggregate market falls more than 2 percent. It incorporates the volatility of the firm and its correlation with the market, as well as its performance in extremes. Systemic risk is the expected capital shortfall of this firm if there is another crisis. See Brownlees and Engle (2011) for details.

how bank-level governance measures interact with indicators of the regulatory environment at the country level.

- A *first-difference approach* that relates the difference between average risk taking in 2005–07 and 2011–13 to the change over the same periods in each governance dimension: This analysis includes country dummies. The approach mitigates endogeneity problems, which are less severe in comparisons of differences than when levels are used.

The analysis also examines the relationship between the governance indicators and risk taking in times of stress, using financial outcomes at the height of the global financial crisis in 2008. The expectation is that this relationship is different in times of extreme stress (during so-called tail events). In particular, given the complicated interactions between bank stress (measured by the distance to default) and compensation and ownership, the results along these two dimensions are expected to diverge in a banking crisis. This

analysis uses dependent risk variables for all banks for 2008 and lagged explanatory variables for 2007 to investigate how bank risk, as it materialized during the crisis (a measure of exposure to extreme events), was related to banks' corporate governance characteristics in the previous year.

The analyses show a number of important correlations between governance, executive pay, and risk taking in banks. Many of these correlations are also economically significant when compared with the effect of Tier 1 capital ratios and size (see "Economic Significance and the Regulatory Environment" in Annex 3.2). As expected, different results are obtained for the crisis regression in a number of cases. All the dependent variables were normalized so that higher values signify more risk (see Table 3.6 and Figures 3.4 and 3.5).[16] Specific results follow.

Indicators variables, and a dummy that equals 1 if the country has deposit insurance (for each year). The panel regressions use firm and time fixed effects and the cross-section regressions use country fixed effects. The analysis controls for different bank business models using bank-level fixed effects. The results are robust to the inclusion of controls to capture the effect of overall risk appetite over the global interest rate cycle. See Annex 3.2.

[16]Figures 3.4 and 3.5 and the last rows in each section of Table 3.6 show Stouffer's z-statistic, a measure that summarizes the joint statistical significance of a number of t-tests having the same null hypothesis (and not to be confused with a z-score measuring risk). In this case, it gives a statistical indication of the joint significance of the effect of each explanatory variable on risk as measured by the different risk variables. The significance levels were adjusted using the Benjamini-Hochberg procedure to account for correlation among dependent variables.

Table 3.6. Summary Results of the Empirical Analysis

	Board characteristics			Risk management and culture			Compensation			Ownership structure		
	Board independence	CEO is chairman	Independents financial experience	Risk committee exists	CRO on board	CEO has retail banking or risk background	Share of salary	Equity-linked compensation	Compensation horizon	Share of institutional investors	Share of inside investors	10 percent blockholder exists
Difference-in-means approach												
Market-implied z-score	−0.56	1.66	1.65	−0.05	0.06	3.13	3.53	−2.12	0.45	−0.51	3.74	−0.56
Balance sheet z-score	−1.28	1.10	1.48	2.00	−0.16	0.34	3.94	−0.05	1.26	−2.57	−2.48	−4.49
Beta (local index)	−1.06	1.92	2.43	5.45	1.29	1.14	0.22	2.52	−0.05	−0.62	−3.49	−5.57
Equity return volatility	−0.47	0.81	1.16	1.80	1.26	0.56	1.65	0.22	0.30	0.34	−1.24	−4.54
Market-implied asset volatility	−0.67	0.25	−1.48	−1.36	1.73	−0.83	1.89	0.44	−1.49	−3.20	−2.08	0.63
Tail risk	−0.12	0.85	1.49	1.62	1.27	0.30	1.76	0.03	0.33	0.58	−1.64	−4.53
Marginal expected shortfall	−0.29	0.52	2.91	2.65	1.45	1.49	0.26	−1.24	1.56	0.37	−0.82	−4.88
Systemic risk	−3.92	1.10	1.77	−0.96	0.08	−0.87	−0.73	−0.30	1.22	−3.00	2.27	−3.66
Stouffer's z-statistic	**−2.96**	**2.91**	**4.03**	**3.94**	**2.47**	**1.86**	**4.43**	**−0.18**	**1.26**	**−3.04**	**−2.03**	**−9.76**
Panel regression analysis												
Market-implied z-score	0.58	2.37	1.72	−0.17	1.42	2.85	4.28	0.32	−1.80	−1.92	0.63	0.45
Balance sheet z-score	−3.91	1.08	0.97	−1.36	−3.17	−5.97	4.67	0.24	−2.33	0.53	−0.92	−0.43
Beta (local index)	0.91	−1.42	−0.89	0.73	0.77	1.62	3.22	−2.86	−2.25	1.18	−0.37	0.56
Equity return volatility	−3.77	4.66	2.08	−2.51	1.12	−2.35	4.17	−9.41	−1.31	−3.82	0.71	−1.59
Market-implied asset volatility	−1.92	3.11	5.28	1.95	2.08	2.94	1.07	0.63	−0.41	−0.22	−0.78	0.80
Tail risk	−5.04	3.22	1.11	−2.79	1.06	−2.59	4.94	−5.32	−1.32	−3.52	−1.40	−1.99
Marginal expected shortfall	0.38	−0.17	−0.30	−3.01	−0.30	−1.39	0.22	−0.16	−1.00	−0.36	1.30	−0.61
Systemic risk	−1.60	−2.83	−0.27	2.34	−0.18	−2.74	1.27	−2.33	1.36	−0.01	0.00	−0.62
Stouffer's z-statistic	**−5.08**	**3.54**	**3.43**	**−1.70**	**0.99**	**−2.70**	**8.43**	**−6.67**	**−3.20**	**−2.88**	**−0.29**	**−1.21**
First-difference approach												
Market-implied z-score	−0.83	−2.39	−1.48	2.02	1.51	−0.46	4.62	0.70	−0.11	−1.20	0.45	0.91
Balance sheet z-score	−2.67	8.02	3.22	−2.57	3.57	−5.97	5.49	−1.36	−4.80	1.75	−1.78	2.65
Beta (local index)	1.08	1.24	0.75	1.24	−0.90	3.02	2.77	0.26	−0.86	−1.33	−2.93	−0.02
Equity return volatility	−1.62	−0.25	4.85	−2.64	−0.00	−4.94	7.70	−6.72	−0.57	−2.47	−1.63	0.13
Market-implied asset volatility	−0.76	−0.44	3.02	1.11	1.02	−0.14	0.06	−0.36	0.32	0.95	0.20	1.15
Tail risk	−1.93	0.62	4.88	−1.88	0.37	−5.11	8.28	−5.07	−0.52	−2.20	−1.53	0.63
Marginal expected shortfall	1.00	−0.65	−0.27	0.04	0.28	0.33	2.44	−1.53	−2.82	−1.84	1.70	−0.95
Systemic risk	−0.74	−3.30	0.66	−1.70	−1.58	−1.67	1.31	0.35	2.90	−1.22	0.78	−0.12
Stouffer's z-statistic	**−2.29**	**1.01**	**5.53**	**−1.55**	**1.51**	**−5.28**	**11.55**	**−4.85**	**−2.29**	**−2.67**	**−1.68**	**1.55**
2008 regression analysis												
Market-implied z-score	−1.03	−0.19	−0.92	1.33	−0.63	−1.32	0.71	−2.65	1.13	−0.10	0.06	0.71
Balance sheet z-score	−1.98	2.32	3.55	3.65	7.04	−2.59	3.64	2.68	8.03	0.96	2.41	0.66
Beta (local index)	−0.89	3.60	−0.11	−0.56	−0.57	−0.98	−3.46	0.85	−0.45	1.44	1.80	−0.82
Equity return volatility	−1.91	1.92	−6.20	−0.82	−0.94	−2.36	3.31	2.09	−1.40	2.66	4.65	0.25
Market-implied asset volatility	−1.81	−2.03	−0.62	1.09	−0.40	−2.95	−0.99	4.20	2.00	0.94	2.00	−0.40
Tail risk	−1.45	−0.21	−4.24	−0.89	−0.95	−2.11	2.85	2.19	−2.33	2.51	5.08	0.49
Marginal expected shortfall	−1.12	−1.25	−0.22	−0.46	−0.24	0.08	−1.01	0.11	−1.57	−0.12	−0.99	−1.04
Systemic risk	−0.17	−0.28	0.74	0.38	0.74	−0.73	−1.44	−3.39	−3.51	−0.13	0.56	−1.85
Stouffer's z-statistic	**−3.66**	**1.37**	**−2.84**	**1.31**	**1.43**	**−4.58**	**1.28**	**2.15**	**0.68**	**2.89**	**5.51**	**−0.70**

Source: IMF staff estimates.

Note: The table shows t-statistics (in plain text) and Stouffer's z-statistics (in bold). The latter is a measure that summarizes the joint statistical significance of a number of t-tests having the same null hypothesis. In this case, it gives a statistical indication of the significance of the effect of each explanatory variable on risk as measured jointly by the regressions with the different risk variables on the left side of the equation. The significance levels were adjusted using the Benjamini-Hochberg procedure to account for correlation among dependent variables. CEO = chief executive officer; CRO = chief risk officer.

Figure 3.4. Bank Governance and Risk Taking
(z-statistics)

Various approaches to investigating the relationship between governance, pay practices, and risk taking in banks give generally consistent results.
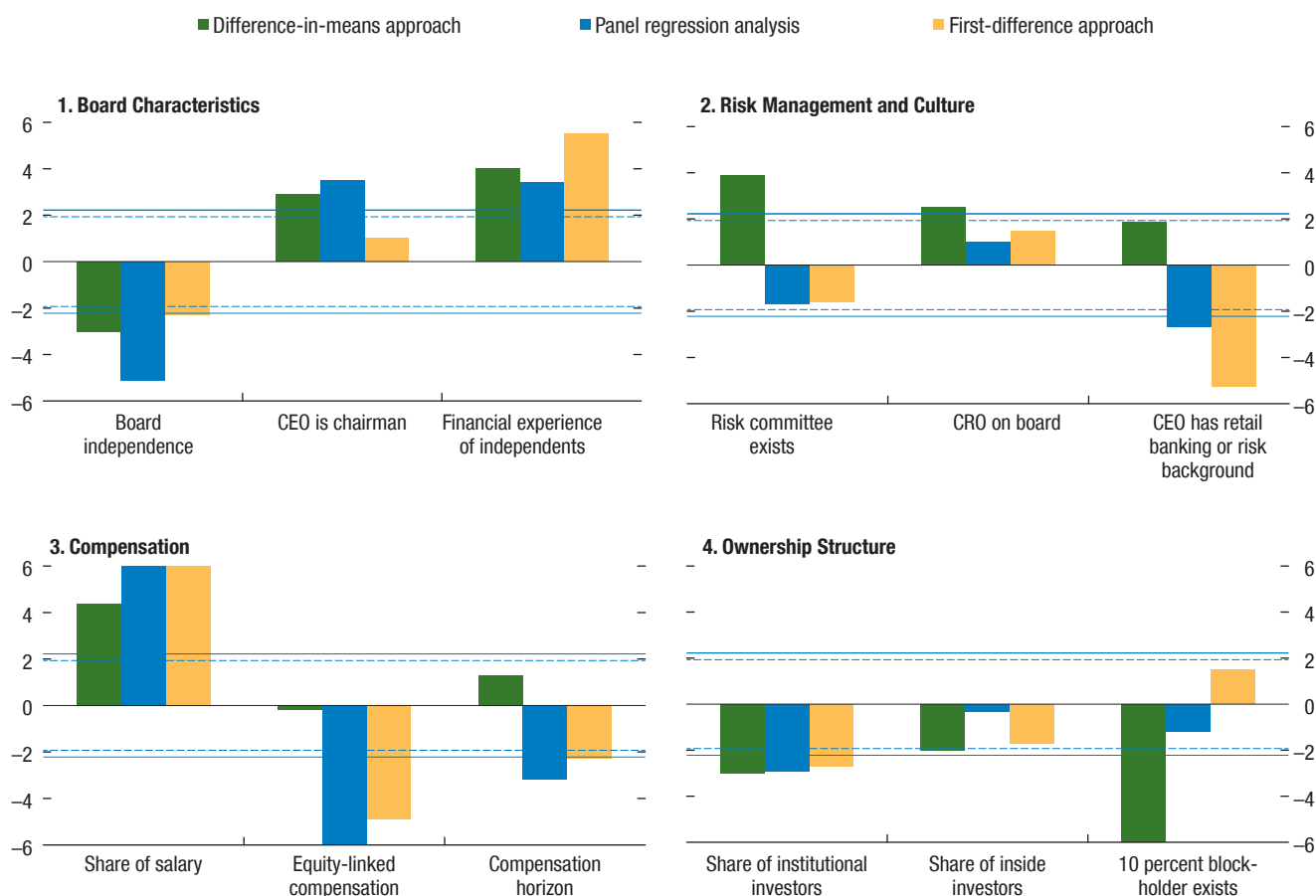
■ Difference-in-means approach   ■ Panel regression analysis   ■ First-difference approach

Sources: Bankscope; BoardEx; Standard and Poor's Capital IQ database; Thomson Reuters Datastream; and IMF staff estimates.
Note: The figures show Stouffer's *z*-statistics—a measure that summarizes the joint statistical significance of a number of *t*-tests having the same null hypothesis. In this case, it gives a statistical indication of the significance of the effect of each explanatory variable on risk as measured jointly by the regressions with the different risk variables on the left side of the equation. The significance levels were adjusted using the Benjamini-Hochberg procedure to account for correlation among dependent variables. Solid and dashed lines indicate 5 and 10 percent levels of significance, respectively. CEO = chief executive officer; CRO = chief risk officer.

Board characteristics

- *Board independence* is associated with lower risk.[17] A board that is more independent of management may be better placed to supervise and control risk

taking.[18] This is especially important when executive compensation (designed to counteract the managers' natural risk-aversion) gives managers incentives to take too much risk.

- The *CEO chairs the board* variable also appears to be associated with higher risk taking in banks, reinforcing the important role of board independence in curbing risk taking.[19]

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[17]Because the definition of an independent director may vary from country to country, the panel regression was repeated allowing the slope coefficients to vary by region, following Macey and O'Hara's (2003) definition of regional corporate governance models: Anglo-American, Franco-German or Advanced European, and Other. Board independence remains significantly associated with lower risk in the first two regions. These results are stronger for regions where board independence is more homogeneous and more data are available.

[18]A more independent board may also improve the measurement of performance and, in this way, curb risk taking. The two effects are probably observationally equivalent.

[19]Under CRD IV, the separation of the CEO and chairman roles is now required for European banks with a one-tier board structure.

Figure 3.5. Bank Governance and Risk Taking during the Global Financial Crisis
(z-statistics)

Vigilant and experienced boards mitigated measured risk, but institutional and insider ownership show evidence of "gambling for resurrection."
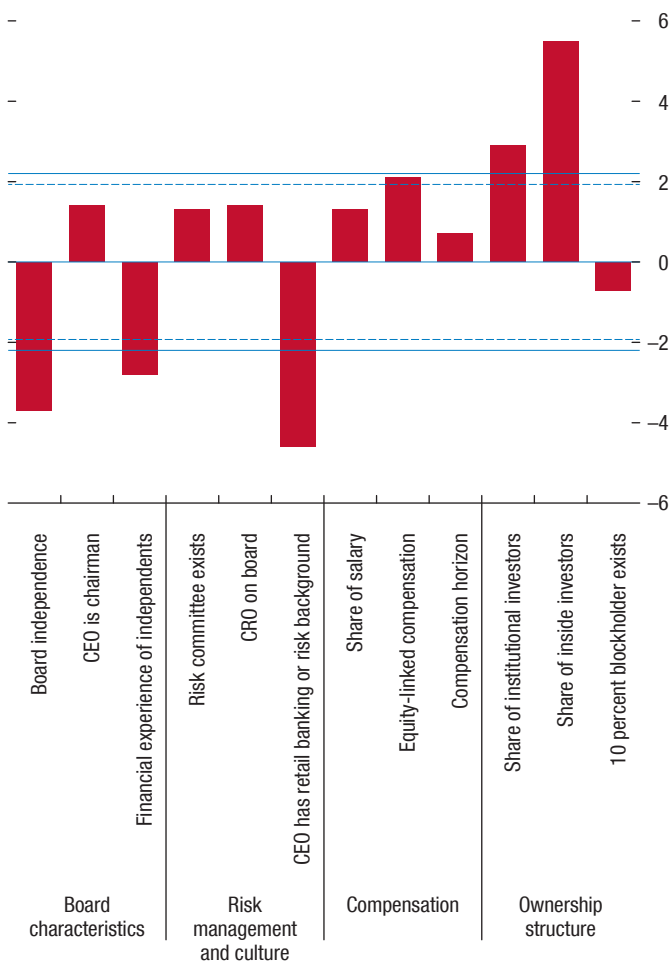
Sources: Bankscope; BoardEx; Standard and Poor's Capital IQ database; Thomson Reuters Datastream; and IMF staff estimates.
Note: The figure shows Stouffer's *z*-statistics using a cross-section regression of 2008 outcomes on 2007 characteristics. Stouffer's *z*-statistic is a measure that summarizes the joint statistical significance of a number of *t*-tests having the same null hypothesis. In this case, it gives a statistical indication of the significance of the effect of each explanatory variable on risk as measured jointly by the regressions with the different risk variables on the left side of the equation. The significance levels were adjusted using the Benjamini-Hochberg procedure to account for correlation among dependent variables. Solid and dashed lines indicate 5 and 10 percent levels of significance, respectively. CEO = chief executive officer; CRO = chief risk officer.

- *Board financial experience* is associated with increased risk in banks. This suggests that board members with financial experience are generally more comfortable with the bank taking more risk. However, the regression using 2008 data shows the opposite effect, suggesting that more financial experience

on the board may guard banks against tail risks or enable boards to better manage the consequences if these risks materialize.[20]

Risk management and culture

- The evidence on the effect of *risk controls* is mixed. It suggests that although risk controls may help manage risks in general, they may not shelter the bank from tail risks. The panel regressions suggest that the existence of a *board risk committee* is associated with lower risk in banks (after addressing the possible endogeneity of the risk-management function using instruments), but the relationship is weak.[21] Only when simultaneously controlling for all governance variables does the analysis find that a risk committee is significantly related to less risk (see "Summary" section). Moreover, there is no such evidence in the 2008 cross-section regressions.
- The *professional background of the CEO* (an imperfect proxy for different risk cultures) is related to the bank's risk taking. When the CEO comes from retail banking or has previous experience in the risk function of a financial institution, banks tend to take on less risk, with the opposite being generally true for bankers with a background in investment banking.[22] These results are interpreted as indirect evidence that risk culture is an important determinant of bank risk taking.[23]

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[20]This interpretation of the results is reinforced by the finding that financial experience is negatively (though not very strongly) associated with the measures of tail and systemic risks, at least in the regression approach, and is also in line with several studies of bank performance during the global financial crisis (see Table 3.4). The impact of other dimensions of board structure, such as board size and directors' workload, were also tested, but the results were either ambiguous or not significant. See Annex 3.2.

[21]Banks with higher risk may choose to have risk controls in place while less risky banks do not; see Annex 3.1 for details of how the regressions control for this potential endogeneity issue. Annex 3.2 provides extensive robustness checks of the findings, including for potential sample selection issues, which are rarely accounted for in the literature.

[22]The measure also gives a rough indication of who gets promoted within the institution. This new finding is in line with another study using a different approach to assess the impact of culture on risk taking in the financial sector (Fahlenbrach, Prilmeier, and Stulz 2012; see Table 3.4), which suggests that there are time-invariant firm characteristics that shape the willingness to take on risk.

[23]The "Culture and Business Model" section of Annex 3.2 shows that country and specialization characteristics (including investor protection and legal regimes) explain about half of the remaining firm-level heterogeneity in risk taking. The unexplained variation can be attributed to unobservable time-invariant characteristics—including firm culture—and omitted controls.

- As expected, the importance of board oversight and risk management is greater in countries with stronger legal frameworks and government effectiveness (see the "Economic Significance and the Regulatory Environment" section of Annex 3.2 for more details).[24] However, the association between board and risk governance indicators and risk taking is not consistently stronger in countries with strong supervisors.

Compensation

- *A higher share of salary (fixed pay)* is associated with higher risk, but only for small banks (with less than $10 billion in assets). This may reflect different compensation practices, reverse causality, or other omitted factors. For instance, smaller banks have a low charter value, which tends to lead them to take on more risk. Taking on more risk, in turn, means that their managers will require higher fixed pay. For larger banks, however, higher risk is usually associated with higher complexity, which demands delegation of responsibilities to managers, but also a higher share of variable compensation (see discussion in footnote 4). In line with the existing empirical literature, the relationship between *cash bonuses* and risk is ambiguous. There is generally no relationship using cash bonus as a percentage of total compensation, but an alternative measure (bonus as a share of salary) shows a positive association with risk during the crisis. See Annex 3.2 for a lengthier discussion.

- *Equity-linked* and *long-term incentive pay* are associated with less risk in general, except for the year of the crisis, when equity awards are positively related to risk.[25] The same holds for restricted stock awards.[26] Restricted equity awards can lead to increased risk taking if the bank is close to default (gambling for resurrection), but the opposite is true if the default probability is low because of managers' inability to diversify personal risk (related to

their job tenure and personal wealth invested in the firm). Results reported in Annex 3.2 confirm this intuition: the impact of equity awards on risk taking during the global financial crisis was much higher and significant for banks closer to default, which suggests that extending the horizon of compensation reduces the incentive for managers to favor short-term risks.

- The *level of compensation* (fixed plus variable) is not consistently related to risk taking. The level of compensation (adjusted for bank size) was related to higher risk taking during the global financial crisis (as found by Cheng, Hong, and Scheinkman forthcoming), but the other approaches show that it is either negatively or not significantly related to bank risk (Figure 3.6). The findings reinforce the notion put forward by the Squam Lake Report

Figure 3.6. Size-Adjusted Compensation and Risk Taking
(z-statistics)

The level of compensation (conditional on bank size) does not relate consistently to measured bank risk.
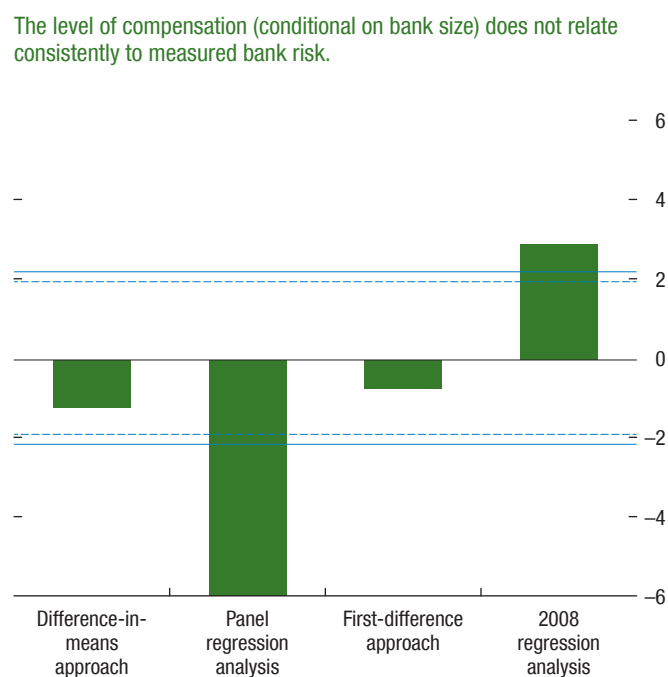
Sources: Bankscope; Standard and Poor's Capital IQ database; and IMF staff estimates.
Note: The figure shows Stouffer's *z*-statistics—a measure that summarizes the joint statistical significance of a number of *t*-tests having the same null hypothesis. In this case, it gives a statistical indication of the significance of the effect of each explanatory variable on risk as measured jointly by the regressions with the different risk variables on the left side of the equation. The significance levels were adjusted using the Benjamini-Hochberg procedure to account for correlation among dependent variables. Solid and dashed lines indicate 5 and 10 percent levels of significance, respectively. The level of compensation is adjusted for bank size by regressing total compensation on the logarithm of book assets.

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[24]As measured by the Worldwide Governance Indicators for Rule of Law and Government Effectiveness (World Bank 2013). See Annex 3.2.

[25]A high level of equity-linked pay is interpreted by some authors to indicate better alignment of the managers' incentives with the shareholders' interests. However, as discussed earlier, because of difficulties in performance measurement, a higher share of equity pay may lead to excessive risk taking even from the shareholders' perspective.

[26]Restricted stocks typically can only be sold after a minimum holding period.

(French and others 2010) that *how* you pay matters more than *how much* you pay.

Ownership structure

- In general, institutional ownership is associated with less risk taking, and insider ownership is not correlated with risk. However, the presence of *institutional investors* and of large *insider ownership* correlates with more measured risk in 2008. This result is in line with the idea that banks in which corporate insiders (managers) or institutional investors hold a higher fraction of the ownership of the company should show less risk taking if the bank is financially strong, because they have a lot to lose. When the firm is close to defaulting on its debt (as many did in 2008), managers have less to lose by taking more risk (see Table 3.1). In fact, the latter result can be seen as indicative of a significant gambling-for-resurrection problem, captured by the 2008 crisis regression.[27] These results are broadly consistent with previous empirical findings, which point to a different relationship between institutional or insider ownership and risk taking or performance during the crisis (see the "Ownership" section of Table 3.4).[28]

Summary

In sum, the empirical analysis suggests that board independence, risk committees, equity pay, and institutional investors (the four dimensions of governance that have received the most attention in the literature) are each related to less risk taking in banks.

The importance of board independence, risk committees, equity pay, and institutional investors can be confirmed in an overall regression that includes all four variables. The previous analysis has separately related each governance variable to risk taking. A more general regression would relate risk taking to all four variables simultaneously (at the expense of considerably smaller

Figure 3.7. Summary of Main Findings: Impact on Risk Taking
(z-statistics)

Findings are even stronger when all governance dimensions are considered simultaneously.

Sources: BoardEx; Standard and Poor's Capital IQ database; and IMF staff estimates.
Note: The figure shows Stouffer's *z*-statistics—a measure that summarizes the joint statistical significance of a number of *t*-tests having the same null hypothesis. In this case, it gives a statistical indication of the significance of the effect of each explanatory variable on risk as measured jointly by the regressions with the different risk variables on the left side of the equation. The significance levels were adjusted using the Benjamini-Hochberg procedure to account for correlation among dependent variables. Solid and dashed lines indicate 5 and 10 percent levels of significance, respectively.

sample sizes). Figure 3.7 shows the results of panel regressions of each risk measure on all four measures of governance that were found to most robustly relate to risk taking: board independence, the existence of a risk committee, the share of equity-linked compensation in total compensation, and the share of ownership by institutional investors.[29] The results are largely consistent with the previous results—except that having a risk-management committee in the board is now found to be significantly associated with lower risk.

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[27]This hypothesis is further confirmed by results of the panel regressions when insider ownership is interacted with a measure of distance to default (the expected default frequency). These results in the "Gambling for Resurrection" section of Annex 3.2 show that when a bank is close to default, larger insider ownership is correlated with more risk, with the opposite being true for safer banks. This result is driven by the fact that insiders tend to have more concentrated wealth (and therefore find it harder to fully diversify risk) than shareholders who typically disperse their holdings.

[28]The result on ownership concentration, however, is not consistent with Laeven and Levine's (2009) finding. This may be due to the use of a different measure of concentration or to the fact that the authors measure risk in 2001 only.

[29]The panel regressions with all four governance variables use significantly smaller samples and therefore were not the preferred specification. The regressions do not use instrumental variables (for the existence of a risk committee), but this does not significantly change the results.

Policy Discussion

These empirical results have implications for the policy debate. Some of the recommendations suggested by the analysis are already included in ongoing policy initiatives (although until now they had not been systematically corroborated empirically), and some are more novel.

On compensation

- Reforms of compensation practices should improve the link between compensation and the various sources of risk as well as extend the horizon over which compensation is awarded to better capture such risks.
- Compensation packages should be adequately sensitive to the risk exposure from the perspective of the bank as a whole, including debt holders. This recommendation is justified by the presence of significant incentives for risk shifting when banks are close to default (see the "Gambling for Resurrection" section in Annex 3.2 for econometric results) and of negative externalities in bank risk taking. A better mix of incentives could be achieved by making long-term illiquid bank debt a part of compensation (possibly with long vesting periods) or through inverse indexation of compensation to bank credit default swap spreads, if those markets are sufficiently liquid to reflect the riskiness of the bank. These suggestions are an important element that has largely been absent from reform initiatives.[30]
- The analysis in the previous section suggests that more pay tied to longer-term equity performance is related to less risk taking, provided banks are not distressed. Equity awards, especially with sufficiently long vesting periods, should therefore be encouraged. The imposition of overall caps, however, should not be expected to reduce risk taking given that no evidence was found that more fixed pay correlates with less risk in large banks. The analysis in Box 3.3 shows that, in theory, a cap on variable pay may actually increase the incentive for managers to take on risk at the expense of shareholders and debt

holders.[31] Therefore, measures aimed at reducing the share of variable compensation should be subject to additional study.
- Deferred compensation should be mandatory with the creation of bonus accounts (to support bonus-malus clauses), restricted stock and bond awards, and clawbacks. These mechanisms are especially useful when longer-term performance is difficult to measure, because they allow for variable compensation to be adjusted later based on actual risk outcomes. Although more research is needed to determine the appropriate length of the deferral period, it should be long enough to take into account the fact that banking risks often take many years to materialize.[32]

On board oversight and risk management

- Authorities should give consideration to making board directors represent the interests not only of shareholders but also of creditors. In principle, board representation for creditors could improve monitoring and reduce the incentive for risk shifting.[33] Although the analysis suggests that this recommendation has potential merit, it is not currently part of reform proposals, and its practical aspects and consequences should be thoroughly analyzed before it is implemented.[34]
- Relying on simple metrics of financial sector experience or education to evaluate the suitability

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[30]This recommendation is also supported by the theoretical analysis in Bolton, Mehran, and Shapiro (2011). Srivastav, Armitage, and Hagendorff (2014) provide additional empirical support that paying CEOs with bank debt reduces risk shifting.

[31]In addition, bonus caps can lead to distorted incentives. For example, a banker reaching a bonus cap has an incentive to "manage earnings" and to spread earnings across periods to maximize bonuses. This behavior is potentially costly to banks and may affect their financial performance and risk taking across periods. On the alignment of compensation with risk-adjusted performance, see IIF (2013) and on risk shifting see Murphy (2013) and Box 3.3.

[32]The FSB P&S stipulates that the deferral period "should not be less than three years, provided that the period is correctly aligned with the nature of the business, its risks and the activities of the employee in question" (FSB 2009, 3). See also IMF (2009) for tax implications of executive compensation reforms.

[33]Expanding board representation to creditors will probably lead to increased monitoring because of the reduced expectations of government bailouts of unsecured creditors under the new bank resolution frameworks. Board representation could be most useful for creditors that are most vulnerable to bank risk, for example, those holding contingent convertible bonds that convert to equity in case of financial distress.

[34]Extending control rights beyond shareholders, namely to bondholders, has been suggested by Macey and O'Hara (2003); Becht, Bolton, and Röell (2011); and Ellis, Haldane, and Moshirian (2014). A more ample policy discussion on this topic has also been requested in the United Kingdom (Parliamentary Commission on Banking Standards 2013).

Box 3.3. Adjusting Compensation for Bank Managers: Advantages and Pitfalls

Suppose that a manager in a bank has an investment project that has a chance for a good outcome (G) and a chance for a bad outcome (B). The expected profit from the project for the bank is P_E, which depends on the relative likelihood of the good and the bad

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outcomes. The manager's expected pay depends on the bank's profit if profits exceed a certain base level, and the manager's expected payoff from the project is M_E. If the project is not undertaken, the bank and manager get a certain payoff of P_0 and M_0, respectively.

Panel 1 in Figure 3.3.1 shows that a convex pay schedule may make the manager prefer to under-

Figure 3.3.1. Risk Taking and Executive Compensation

★ Outcome if the project is not undertaken
★ Expected outcome if the project is undertaken

– – Manager's compensation schedule
– – Helps determine expected payoffs

Risk shifting occurs if the compensation schedule is convex.

Risk shifting can be counteracted by making the compensation schedule less convex.

The labor market for bank managers may offset the policy measures …

… and may even increase risk shifting.

Source: IMF staff.
Note: M_E, M_0 is the manager's expected pay if the project is/is not undertaken; P_E, P_0 is the bank's expected profit if the project is/is not undertaken.

Box 3.3 *(continued)*

take the risky project even though doing so does not benefit the bank. The manager's expected payoff if the project is undertaken (M_E) is higher than the payoff without the project (M_0). Therefore, the manager will prefer to undertake the project, even though P_E is less than P_0. The loss—the difference between P_E and P_0—is borne by the bank's owners (and its creditors in the case of default); the manager's undertaking of the project is an example of risk shifting.

Panel 2 shows how the pay schedule for the manager can be adjusted by regulation to eliminate the incentive for risk shifting by imposing a bonus cap. A cap on variable compensation (making the manager's pay not depend on the bank's profits above a certain profit threshold) can make the pay schedule less convex and reduce the project's expected payoff for the manager. In panel 2, the bonus cap reduces M_E to a value that is less than M_0, thereby ensuring that the risky project is not undertaken. Similarly, a clawback—which penalizes the manager if the project yields a bad outcome—can also eliminate the incentive for risk shifting.

Panel 3 shows how this solution can be undermined if developments in the labor market for managers lead to an increase in managers' pay. If restrictions on variable pay—such as a cap on the ratio of variable to fixed compensation—make bank managers move

to jurisdictions where pay has not been capped or to other industries to avoid the regulation, banks may respond to the ensuing shortage of qualified managers by increasing their base pay. This action may undo the effect of the cap if it raises the manager's expected payoff from the risky project above the amount of pay if the project is not undertaken. The same reasoning applies to the case of a clawback clause.

Panel 4 shows that if the probability of a bad outcome is sufficiently large, imposing a cap could actually induce risk shifting by the manager even if this incentive did not exist before implementation of the policy action. If the probability of a bad outcome is high enough, M_E on the original convex compensation schedule from panel 1 may be less than M_0 on that schedule, and the manager may not have an incentive to undertake the project. But the imposition of the pay cap and the ensuing labor market developments can raise the manager's base pay (and with it the variable pay cap itself) such that M_E is larger than M_0 on the compensation schedule from panel 3. This unintended consequence stems from the fact that the increase in fixed pay caused by labor market developments in response to the cap decreases the manager's penalty associated with bad performance (this point is also made by Murphy [2013]).

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of board members may not be sufficient. It may be equally important to assess board members on their ability to effectively challenge management. Further regulatory guidance for fit-and-proper processes for board members also has a useful role to play.

- A sufficient number of bank board members should be independent, and boards should be required to establish an independent risk committee. In addition, independent directors must have the necessary expertise and ability to monitor management. This recommendation is in line with guidelines put forward by the European Banking Authority (EBA 2011) and is already being implemented in the European Economic Area. In the United States, a separate risk committee is required for certain financial companies under the Dodd-Frank Act (see Table 3.2). However, the Federal Reserve has discretion regarding the number of independent board members it requires.

- Risk culture matters. The indirect evidence on the importance of the CEO's professional background suggests that the "tone from the top" is important in shaping risk taking (see also Group of Thirty 2013). Hence, supervisors should evaluate bank risk culture and governance regularly. A good example of such evaluation is the qualitative assessment of bank conduct and culture undertaken by the Central Bank of the Netherlands as a complement to the more traditional prudential supervision (see Box 3.4 and Nuijts and de Haan 2013).

The measures proposed here are potentially economically significant. For instance, the analysis shows that increasing the ratio of independent members on the board by 10 percentage points is typically associated with a decline in risk taking as large as that induced by a 2.3 percentage point increase in the Tier 1 capital ratio. Similarly, the reduction in risk achieved by the creation of a board risk committee is equivalent to

Box 3.4. Integrity in Financial Institutions

In recent years, the financial industry has been rocked by corporate scandals in which alleged misconduct and unethical behavior by top- and middle-tier employees has been common. According to the Edelman Trust Barometer, since 2006, in several economies around the world, banking has gone from being one of the public's most trusted sectors to the least trusted (Edelman 2007, 2014). At the same time, the number of customer complaints against banks has greatly increased, especially when compared with other sectors (Figure 3.4.1).

A number of factors may play a role in why the financial industry in general and the banking sector in particular have been so afflicted by accusations of unethical behavior. Financial services and banking activities are often complex and opaque, and it is often difficult for customers to assess the value of financial products, which presents an opportunity for deception. Moreover, the fast pace of financial transactions makes it difficult for internal and external auditors to monitor misconduct thoroughly. At the same time, the financial industry is subject to stricter rules of disclosure and tighter regulation and supervision, which may increase the number of reported cases of misconduct compared with other industries. Finally, the sensitive nature of some activities—such as price fixing—creates powerful incentives for misbehavior.

Incentives and controls can go some way toward addressing these issues, but the role of corporate culture is key. Improved transparency and disclosure, addressing perverse incentives, and internal and external controls are important, but none of these measures can always prevent such behavior. In instances in which incentives are poorly designed or rules insufficient, corporate culture—the set of unwritten rules and shared beliefs that govern how to act in the absence of rules—will be a powerful tool for improving risk management, discouraging misconduct, and even improving performance and creating value (Sørensen 2002).[1] Corporate culture plays an important role in banks because to a much larger extent than in other sectors, bank employees often face decisions in situations for which rules are ambiguous

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[1]Although corporate culture complements and may reinforce corporate governance, culture is different from governance and does not seem to be much affected by it. For instance, Guiso, Sapienza, and Zingales (forthcoming) do not find a significant relationship between measures of executive compensation or firm ownership and managerial integrity and ethics.

Figure 3.4.1. Customer Complaints
(Percentage of companies with customer complaints)

Banks are increasingly under the spotlight because of consumer complaints or dissatisfaction.
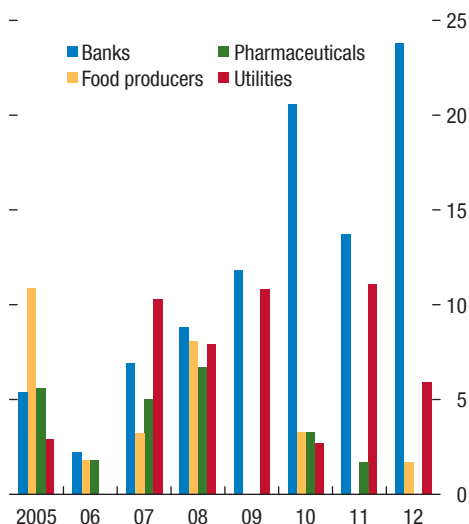
Sources: Thomson Reuters Datastream; and IMF staff calculations.

or allow for discretion, which may lead to an expectation that bad behavior will go unpunished and good behavior unrewarded.

Emphasizing the right tone at the top is an important step toward improving the business culture in banks, but attention should also be given to improving the tone in the middle. The tone at the top may not necessarily trickle down to middle management (Zinkin 2013). Indeed, strengthening integrity in financial institutions requires a culture in which ethical behavior is consistently rewarded throughout the ranks.

Supervisors are paying attention to risks arising from corporate culture and conduct. The Financial Stability Board has issued recommendations on how to assess the soundness and efficacy of the risk culture in a financial institution (FSB 2014). Similarly, at the country level, authorities are supplementing more traditional prudential supervision with supervision of conduct and culture (see Nuijts and de Haan [2013] for the example of the Netherlands). Supervision in this area focuses on leadership styles and the example

Box 3.4 *(continued)*

that leaders set and on accountability, shared values, openness to discussion, and the effects of groupthink.

Integrity and ethical behavior must also be a requirement for financial supervisors. In particular, closing the revolving door between financial institutions and supervisory agencies will help minimize regulatory capture.

To support these supervisory efforts, a thorough analysis of the link between the different flavors of cor-

porate culture and sound risk taking is needed, as is a taxonomy of socially unacceptable behavior in finance. Such research would fill a gap in the literature; few studies have explored the role of culture in risk taking and fewer still have done so for the financial industry (see Table 3.4). Accordingly, the IMF is conducting work on the enhancement of integrity in the financial sector.

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that achieved by increasing the Tier 1 capital ratio by 0.9 percentage points (see the "Economic Significance and the Regulatory Environment" section of Annex 3.2).[35]

When implementing new measures for banks, policymakers need to consider the possibility that activities may shift from banks to the shadow banking sector. New measures could increase the incentive for regulated institutions to shift activities outside the regulatory perimeter. Executives may also choose to leave bank employment and take jobs in less-regulated financial institutions if doing so would allow them to escape executive pay regulation. These incentives could fuel the growth of the shadow banking sector. Although shadow banking has benefits, including expanding access to credit and supporting market liquidity, maturity transformation, and risk sharing (see Chapter 2), by taking on bank-like risks, the shadow banking sector may contribute to overall systemic risk in the financial system. Policymakers should therefore take a broad view of the potential effects on the entire financial system of new regulatory measures on executive pay and governance in banks.

Furthermore, the policy measures should be considered to be complementary to capital and liquidity regulations designed to foster safe and sound financial structures. Specifically, liquidity and capital buffers help induce managers to adopt more prudent behavior by reducing the risk of bank failure and hence lowering bankers' incentives to gamble for resurrection in an environment of limited liability.

Transparency is important in promoting accountability. Regulation can play a forceful role by requiring timely and accurate disclosure not only of the financial situation of banks but also of risk management and corporate governance matters. The Comprehensive Capital Analysis and Review implemented in the United States, where the Federal Reserve discloses its qualitative assessment of a bank's corporate governance and risk-management framework, is an example of how to enhance transparency in practice (Board of Governors of the Federal Reserve System 2014). In addition, transparency of the work and decision making of regulators and supervisors can add to "supervisory discipline," which is strongly linked to effective supervisory outcomes (Viñals and others 2010).

Finally, supervisory effectiveness has a strong bearing on incentives and risk outcomes. This is why the BCBS has steadily enhanced the framework for risk supervision in banks, starting with the 1988 Basel I Accord, and especially with Basel II in 2005 (Box 3.5). In addition, attention is being paid to "softer" issues that rules alone cannot address, such as enhancing supervisor-board relations to improve supervisor and board effectiveness, and to the risk culture in financial institutions.

Conclusion

The agency problems typical of corporations—shareholders versus managers—are magnified in banks through the additional competing interests of shareholders and managers with those of bondholders, depositors, and society at large. Although taking risks is part of a bank's mission (for example, by funding uncertain but productive investment), banks may take more risks than is socially desirable with regard to systemic financial stability, as evidenced by the recent global financial

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[35]The uncertainty associated with the estimates and the understanding that the measures should be considered to be a package of reforms of bank governance and compensation preclude a formal ranking of the measures.

Box 3.5. Regulation and Risk-Taking Incentives: Basel I to III

Although capital adequacy requirements have a long history in some countries—the United States had capital adequacy rules starting in the early 1900s, for example—Basel I (1988) introduced uniform, risk-sensitive minimum capital standards at the international level. Under Basel I, credit risk was divided into five buckets, ranging from zero percent to 100 percent depending on the riskiness of the underlying asset. Although Basel I was hailed for incorporating risk into the calculation of capital requirements and was regarded as a big step forward, it was also criticized for not taking into account hedging, diversification, and differences in risk-management techniques. It also did not take into account other types of risk, particularly market risk.

Advances in technology and risk-management techniques allowed banks to develop their own internal capital allocation models in the 1990s, which enabled them to align the amount of risk they undertook on a loan with the overall goals of the bank (internal risk tolerance). For example, Basel I placed all commercial loans into the 8 percent capital category. In contrast, internal model calculations led to capital allocations on commercial loans that varied from 1 to 30 percent, depending on the loan's estimated risk. It was hence argued that although Basel I was a step in the right direction, it was not sufficiently risk sensitive and could result in arbitrage: if capital regulation was binding, a

lack of risk sensitivity encouraged banks to shift toward the riskiest activity within each category (see Koehn and Santomero 1980; Kim and Santomero 1988; Keeley and Furlong 1989, 1990; and Rochet 1991).

The Market Risk Amendment (1996) and Basel II (2005) were introduced to address these shortcomings, allowing internal models for market and credit risk, respectively. These measures allowed banks to use internal models to more finely differentiate risks of individual loans. Risk could now be differentiated not only between but also within loan categories. The regulations were designed to induce banks to invest more in risk-management and modeling technology by providing capital relief—the standardized approaches were calibrated to be more conservative than risk-sensitive internal models.

Before these changes were introduced, banks' internal risk models (and other risk-management functions) were designed to measure risk accurately. However, after the Market Risk Amendment and Basel II, subject to regulatory approval, models became a key input in determining capital requirements, generating a competing objective of using models to *minimize measured risk* to minimize capital requirements. These incentives may have contributed to the global financial crisis, during which banks, particularly large banks, were found to hold insufficient capital. Since the crisis, Basel III has raised the capital requirements for banks, and work is ongoing to better capture risk.

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crisis. Excessive risk taking may occur even when managers' incentives are aligned with those of shareholders, particularly when performance is improperly measured (as was often the case in banks). Risks are heightened when leverage is high and when a bank is close to defaulting, with managers gambling for resurrection through high-risk bets because their losses are limited and the potential gains are substantial.

The empirical analysis in this chapter has provided a link between several aspects of corporate ownership, governance practices, and risk taking in banks. The strongest link is between board independence and lower risk taking. Although the *level* of compensation is not consistently associated with the degree of risk taking, its composition is: a larger share of equity pay and long-term pay for CEOs is related to lower risk in banks, especially when the banks are not in distress. Ownership matters: the presence of institutional own-

ership is associated with less risk taking, provided the bank's default risk is low.

The analysis in this chapter provides the first systematic empirical support for many of the ongoing reform efforts, and two areas warrant particular emphasis in the policy process. The analysis lends support to the ongoing push for more bank board members that are independent of management, for long vesting periods, and for clawback clauses. It also validates the concept that a company's culture has a large influence on a bank's risk taking. This chapter provides two recommendations that have not figured prominently in the reform effort but should be considered: (1) that creditors' interests could be represented on boards of directors in addition to those of shareholders; and (2) that the sensitivity of executive compensation to default risk should be enhanced through long-term debt awards or inverse indexation to bank default risk.

Annex 3.1. Data and Methods

Data Set

To analyze the factors that affect risk taking in financial firms, this chapter examined a large data set of risk-taking measures and governance statistics for banks in various advanced and emerging market economies.

- *Dependent variables:* Risk was measured across eight dimensions, capturing both balance sheet and market measures of risk. Measures of distance to default, volatility, tail risk, and systemic risk were included (see Table 3.5 for details). The balance sheet measures were derived from the data on bank financials available at Bankscope, and the market measures of risk were calculated using market data from Thomson Reuters Datastream and Moody's CreditEdge. The data for systemic risk were obtained from the New York University Stern School of Business Volatility Institute.

- *Explanatory variables:* A large set of potentially relevant explanatory variables was considered, which could be classified across four main dimensions of corporate governance—board characteristics, risk management, compensation practices, and ownership (see Table 3.3). The data on board characteristics and risk management were calculated using BoardEx data, and the Standard and Poor's Capital IQ database was the main source for the compensation and ownership data. The data on horizon of compensation were obtained from ASSET4-ESG, available via Thomson Reuters Datastream.

- *Country-level control variables:* A set of country-level control variables was included: log GDP per capita (adjusted for purchasing power parity); current account balance as a fraction of GDP (from the IMF World Economic Outlook database); the average of the six Worldwide Governance Indicators variables (from World Bank 2013); and a deposit insurance dummy (from Demirgüç-Kunt, Kane, and Laeven 2007).

- *Bank-level control variables:* A set of bank-level control variables from Bankscope was also included: return on book assets, log book assets, the deposit-to-asset ratio, the Tier 1 capital ratio, and revenue growth.

The resulting data set included more than 800 banks (although data are incomplete for a number of banks). The banks are from 72 countries, with slightly more than half from the United States, more than 20 per-cent from Europe, and the rest from Asia, the Americas, and Africa. Table 3.7 shows the breakdown of banks by country for the panel regressions of tail risk on each of the four dimensions of governance.

Methods

Four main methods were used to explore the determinants of bank risk taking during the past decade: (1) a nonparametric difference-in-means approach, (2) panel regressions, (3) a first-difference approach, and (4) cross-section regressions.

Difference-in-means approach

For each governance measure, banks were ranked according to their value in 2007 and were grouped in quartiles. The average difference was compared between the performance of banks belonging to the top and bottom quartiles for the period 2009–13. To select a sample of relatively homogeneous banks, the sample was restricted to banks with total assets of at least $10 billion in 2012. Furthermore, the effect of bank- and country-level differences that can influence bank incentive structures was stripped out by regressing the various indicators on the bank- and country-level controls. Country dummies were included to capture country-level differences not captured by the country controls.

Panel regressions

The explanatory variables (lagged to account for possible endogeneity) were regressed one by one, along with the lagged bank control variables, the lagged country control variables, year dummies, and bank fixed effects. Standard errors were clustered by country. Dependent variables were used from 2005 to 2013 (because the explanatory variables were lagged, they are from 2004 to 2012). For this and the remaining approaches the full sample of banks was used because the regressions explicitly control for bank size.

Although lagged explanatory variables were used to control for endogeneity, for some of the more structural explanatory variables that are related to the banks' business models, doing so may be insufficient. To illustrate, if a bank has a high risk appetite, it may naturally take on more risk while intentionally increasing the involvement of its board in risk management by creating a board risk committee and having its chief risk officer (CRO) sit on the board. In that case, a positive association between bank risk taking and the variables "risk committee exists" and "CRO on

Table 3.7. Number of Banks by Country in Samples for Various Regressions

	Board characteristics	Risk management	Compensation	Ownership structure
Australia	10	10	7	10
Austria	4	4	1	6
Belgium	2	2	2	2
Brazil	0	0	0	3
China	4	4	2	8
Denmark	4	4	6	11
Egypt	1	1	0	1
Finland	1	1	1	3
France	3	3	2	4
Germany	4	4	4	7
Greece	1	1	0	2
Hong Kong SAR	1	1	2	2
India	8	8	1	8
Indonesia	0	0	0	5
Ireland	1	1	1	1
Israel	5	5	5	5
Italy	12	12	8	13
Japan	17	17	3	86
Luxembourg	1	1	0	1
Mexico	1	1	0	2
Netherlands	3	3	0	3
Norway	4	4	7	15
Philippines	5	5	0	7
Poland	1	1	0	2
Portugal	3	3	2	3
Russia	1	1	0	4
Saudi Arabia	2	2	0	7
Singapore	3	3	2	3
South Africa	3	3	4	5
Spain	5	5	4	5
Sweden	4	4	3	4
Switzerland	6	6	6	8
Thailand	3	3	0	8
Turkey	4	4	0	5
United Kingdom	8	8	8	8
United States	373	373	273	498
Other	25	25	15	69
Total	533	533	369	834

Source: IMF staff.

Note: The table shows the sample used for the regressions of the tail risk measure on variables from each of the four dimensions of governance.

board" is observed, but it is not possible to conclude that these two governance variables are responsible for greater risk taking. To address this concern, an instrumental variable approach was used for the two risk-management measures: the "risk committee exists" and "CRO on board" measures were instrumented by net loans over deposits and short-term funding and a country-specific time trend. The rationale is that net loans over deposits and short-term funding can be considered a proxy for a bank's business model (and thus may cause variation in the two risk-management measures) but are not directly related to risk taking. The instruments passed the standard under-identification, weak-identification, and over-identification tests and were statistically valid. A robustness check was run by using the change in impaired loans over gross loans as an instrument, which yielded similar results.

First-difference approach

A first-difference approach was used to relate the change in risk taking between 2005–07 and 2011–13 to the change between the same periods in each

governance measure. Using first differences bypasses some of the endogeneity problems associated with the regressions in levels. Country dummies were included to incorporate country-level differences.

Cross-section regressions

Dependent variables from 2008 were regressed on independent variables from 2007 to capture the effects of the crisis. Bank control variables from 2007 and country fixed effects were included in the regressions. Standard errors were clustered by country. As in the panel regressions, an instrumental variable approach was used to account for endogeneity in the regressions involving the risk-management measures.

Summary statistics: Stouffer's z-statistic

The individual impact of each governance measure was calculated for each dimension of risk using t-statistics. Stouffer's z-statistic was used to summarize the result,

$$z = \frac{\Sigma_{i=1}^{k} Z_i}{\sqrt{k}} \sim N(0,1), \tag{3.1}$$

in which $Z_i = \varphi^{-1}(p_i)$ is the t-statistic for test i. Stouffer's z-statistic assumes that each regression is independent. Because the ($k = 8$) regressions run for each governance measure in these analyses (one regression for each risk variable) were not independent, the Benjamini-Hochberg procedure was used and the critical values were adjusted using the approximate false discovery rate $\alpha(k+1)/2k$.

Annex 3.2. Additional Results

Robustness

To test the robustness of the positive association between the share of fixed compensation and bank risk, a series of additional analyses were performed. First, to investigate whether the results were affected by bank size, the sample was restricted to banks with total assets of more than $10 billion; the correlation vanished both in the panel regression (Table 3.8) and in the crisis cross-section regression. When the exercise was repeated with different size thresholds the conclusion was the same each time. Then, using the entire sample, an interaction of fixed pay with bank size was included; the interaction term came in significantly negative, which reinforces the previous finding. Second, a differences-in-differences panel regression was performed in which fixed pay was interacted with a regulatory dummy for the European Union Capital Requirements Directive (CRD IV). The assumption was that those regulatory changes affected the ratio of fixed to total compensation and were exogenous. The effect of fixed pay on risk, measured by the coefficient of its interaction with CRD IV, was not significant.

The global macroeconomic environment could play a significant role in explaining bank risk taking. For instance, access to abundant liquidity combined with volume-based compensation for loan officers could lead to more risk taking and the formation of asset price bubbles (Acharya and Naqvi 2012; Adrian and Shin

2014). To test the robustness of the results when controlling for the macroeconomic environment, the panel regressions were run with interest rates on the three-month and 10-year securities of each bank's national government as additional controls. Separately, the above panel regressions were also run with country average equity returns as an additional control. The results were robust and similar to those shown in Figure 3.7.

An additional robustness check was performed on the results by extending the specification to include several measures of regulatory and supervisory quality as additional controls. Specifically, measures of the powers of the official supervisory entities, permissible bank activities, capital requirements, and private monitoring were added (Barth, Caprio, and Levine 2013). The results were qualitatively similar. Of the new variables only the official supervisory power index turned out to be significant, usually associated with more risk.

The previous analyses were also performed on a sample restricted to bank holding companies and commercial banks (that is, excluding cooperative banks, savings banks, mortgage companies, and investment banks, among others). The results were unchanged. The results also held for subsamples of banks from the United States and Europe (Table 3.8). Because splitting the sample greatly reduces the number of available observations and reduces the statistical power of the tests, the panel regression was repeated allowing the slope coefficients to vary by region, following Macey and O'Hara's (2003) definition of regional corporate

Table 3.8. Robustness in Subsamples

Variable	All sample	Commercial banks and bank holding companies	United States	Non-United States	Europe	Large banks (assets greater than $10 billion)
Board independence	↓	↓	↓	–	–	–
CEO is chairman	↑	–	–	–	–	↑
Financial experience	↑	↑	↑	↓	–	–
Risk committee	–	–	↑	–	–	↓
CRO board member	–	↑	–	–	↓	–
CEO background	↓	↓	–	–	–	↓
Share of salary	↑	↑	↑	↑	–	–
Equity-linked compensation	↓	–	–	–	–	–
Compensation horizon	↓	↓	–	↓	–	↓
Level of compensation	↓	↓	–	–	↓	↓
Institutional investors	↓	↓	–	–	–	–
Inside investors	–	–	–	–	↓	↓
Large shareholder	–	–	–	–	–	–

Source: IMF staff.

Note: ↑ = significant, higher risk; ↓ = significant, lower risk; – = not significant; CEO = chief executive officer; CRO = chief risk officer.

governance models: Anglo-American, Franco-German or Advanced European, and Other. Again, the results were similar but more significant than in the previous case.[36]

A check was performed to determine whether there was selection bias in the samples. Specifically, BoardEx and the Standard and Poor's Capital IQ database may sample only some types of banks. For instance, their coverage may be better for large banks or for U.S. or British banks. To check whether the results were robust to this potentially serious problem, the panel data analyses were performed using the Heckit method (Heckman 1976). The procedure involved running a first-stage pooled probit regression to estimate the probability that BoardEx or Standard and Poor's Capital IQ covers a bank based on its size, specialization, or country and whether it is listed on a major stock exchange. The panel regressions were then run with the inverse Mills ratio (estimated separately in the first stage for each regression) as an additional control. In several instances the hypothesis that the samples were nonrandom could not be rejected, but the estimated relationships of the governance variables with measured risk were qualitatively similar.

Finally, the dynamic panel generalized method of moments estimator developed by Arellano and Bond (1991) was used to control for lagged values of the dependent variables in the panel regressions. The results for board independence, the existence of a risk committee, compensation horizon, and large shareholders were robust, but the results for the CEO as chairman, share of salary, financial experience, equity-linked compensation, and institutional investor variables were not robust. This should not be surprising because including a lagged value of the dependent variable in the panel regression is a stringent control that strongly mitigates the effect of the lagged governance variable whenever the governance variable has a contemporaneous effect on the dependent variable.

Economic Significance and the Regulatory Environment

The economic impact of each variable in the subset of governance variables (board independence, existence of a risk committee, share of equity-linked compensation in total compensation, and share of ownership by insti-

tutional investors) on the eight measures of bank risk was compared to the impact of increasing (1) the Tier 1 capital ratio and (2) the size of the bank. To illustrate the effect, the results from the tail risk regression were selected for the comparison with an increase in the capital ratio while the regression with the systemic risk contribution was used for the comparison with bank size (Figure 3.8). The capital ratio is closely linked to microprudential policy.

Some of the governance variables had impacts comparable to that of changing the Tier 1 capital ratio or the size of the bank. For instance, an increase in board independence of 10 percentage points had roughly the same impact on tail risk as increasing the Tier 1 capital ratio by 2.3 percentage points. Similarly, creating a board risk committee or decreasing the share of salary by 10 percentage points would be equivalent to increasing the Tier 1 capital ratio by 0.9 and 1.8 percentage points, respectively.

Further analysis showed that the importance of board oversight and risk management was greater in countries with stronger legal frameworks and government effectiveness. Additional panel regressions with interaction terms of board independence, CEO as chairman, existence of a risk committee, and presence of the CRO on the board of directors with measures of government effectiveness and the strength of the rule of law (from World Bank 2013) were used to test this hypothesis. The results generally indicated that oversight by the board and the risk function were better in countries with stronger institutional environments. The importance of board oversight and of the risk function was also greater when banks faced few activity restrictions (measure from Barth, Caprio, and Levine 2013). However, the association between board and risk governance indicators and risk taking was not consistently stronger in countries with strong supervisors (measured by the index of official supervisory power, also from Barth, Caprio, and Levine 2013).

Gambling for Resurrection

CEOs who own a lot of equity in the bank they head may have an incentive to "gamble for resurrection" when the bank is in financial distress. As Table 3.1 shows, when the bank's equity has almost been wiped out (that is, when the bank has a high probability of default), the equity holders have an incentive to

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[36]It would have been desirable to perform the same exercise for government-owned banks, but sufficient data were not available for a meaningful analysis.

Figure 3.8. Economic Significance of Bank Governance Variables
(Percent)

Bank governance variables have an impact on risk comparable to that of the Tier 1 ratio and size.
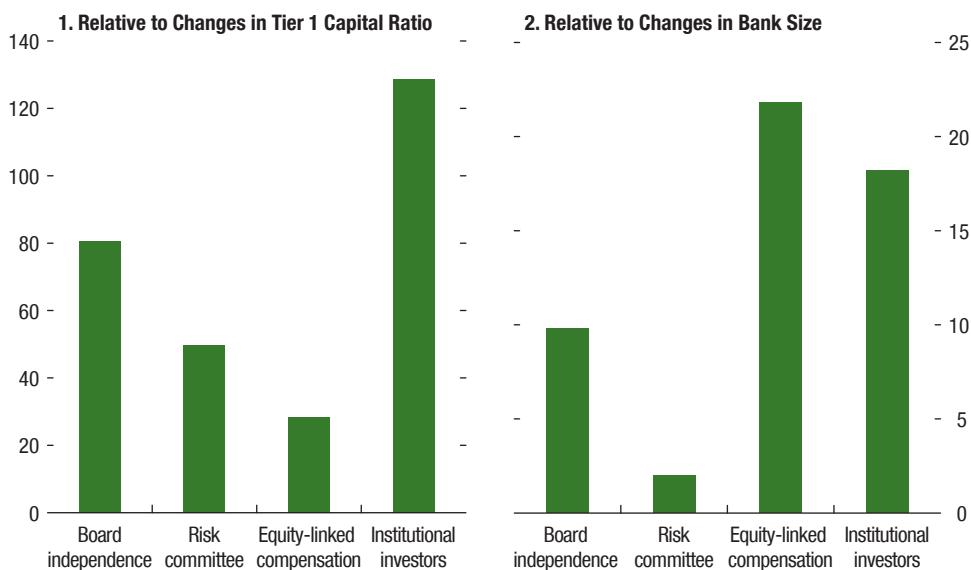
Source: IMF staff estimates.
Note: The bars show the impact on risk of a standard deviation change in the governance measure relative to the impact of a standard deviation change in the Tier 1 capital ratio and bank size. Risk is measured by tail risk for the comparison with the Tier 1 capital ratio and systemic risk for the comparison with bank size.

take high risks, because they will capture any possible upside, whereas the possible downsides will be mostly borne by debt holders. This effect may drive the somewhat different results in Figure 3.5 (relative to Figure 3.4), which focus on the crisis period when banks' distances to default were smaller than usual.

To formally test this supposition, the 2008 cross-section regressions were repeated for each dependent variable using equity-linked compensation in 2007 as the explanatory variable (as well as the customary control variables), with the addition of an interaction term between 2007 equity-linked compensation and a measure of the bank's distance to default in 2007. The distance to default was measured by the expected default frequency (EDF).[37] The exercise was then repeated with the share of inside investors instead of equity-linked compensation. If CEOs who own more equity do gamble for resurrection when their banks

have a higher probability of default, the coefficients on the interaction terms should be positive.

The results suggest that there is indeed a practice of gambling for resurrection. As Table 3.9 shows, for both equity-linked compensation and the share of inside owners, the interaction terms with the probability of default were positive and significant at the 5 percent level in most of the eight regressions. The results also held when the exercise was repeated with the share of restricted stock instead of equity-linked compensation.

Culture and Business Model

One limitation of the empirical analysis in the main text of this chapter (and common to most of the empirical literature) is that some governance measures and dependent variables may be affected by the bank's business model or culture. To assess how much of the time-invariant bank-level heterogeneity is captured by variation across countries and business segments, the following exercise was conducted.

For each dependent variable, a panel regression was first run of the dependent variable on a subset of governance measures (board independence, existence of

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[37] The baseline specification used the EDF measured at the five-year horizon available from Moody's (EDF5). The analysis was repeated with the EDF measured at the one-year horizon (EDF1) and, given that the distributions of EDF1 and EDF5 were highly skewed, with their logs. The results are robust to these alternative specifications.

Table 3.9. Gambling for Resurrection

A higher level of equity-linked compensation (current or cumulative) is associated with increased incentives to gamble for resurrection.

	Market-implied z-score	Balance sheet z-score	Beta (local index)	Equity return volatility	Market-implied asset volatility	Tail risk	Marginal expected shortfall	Systemic risk	Stouffer's z-statistic
Equity-linked compensation and probability of default									
Equity-linked compensation	−0.23 (0.17)	2.15*** (0.00)	−0.05 (0.74)	−0.57 (0.32)	−0.01** (0.03)	−1.63 (0.15)	−0.52 (0.64)	−2.24** (0.02)	−4.25
Equity-linked compensation X Probability of default	−1.35** (0.02)	−9.22*** (0.00)	0.31* (0.10)	6.01*** (0.00)	0.14*** (0.00)	11.18*** (0.00)	8.04 (0.12)	−0.67 (0.85)	14.54
Share of inside investors and probability of default									
Share of inside investors	−0.01*** (0.01)	−0.05*** (0.00)	−0.002* (0.05)	−0.01** (0.03)	−0.0002*** (0.00)	−0.01 (0.14)	−0.04 (0.10)	0.02 (0.27)	−4.93
Share of inside investors X Probability of default	0.03** (0.05)	0.17*** (0.00)	0.01** (0.01)	0.08*** (0.00)	0.001*** (0.00)	0.17*** (0.00)	0.14*** (0.01)	−0.11** (0.03)	11.11

Source: IMF staff estimates.

Note: The table shows the estimated coefficients and p-values in parentheses. Stouffer's z-statistic is a measure that summarizes the joint statistical significance of a number of t-tests with the same null hypothesis. In this case, it gives a statistical indication of the significance of the effect of each explanatory variable on risk as measured jointly by the regressions with the different risk variables on the left side of the equation. ***, **, * indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

a risk committee, share of salary, share of institutional investors) and controls together in the regressions. Second, the resulting fixed effects were regressed on country and specialization dummies. Third, the weighted average of the R squared measures of these second regressions was computed, with the weights equal to the regression sample sizes. The result was a (weighted) average R squared of 52 percent, indicating that about half of the bank-level heterogeneity can be captured by the country and specialization dummies. The other half was attributable to other time-invariant bank characteristics that vary within countries and with bank specialization (such as culture and the business model) that were not controlled for in the cross-section regressions and difference-in-means analyses.

The analysis also sought to identify the share of the bank-level heterogeneity that can be captured by variables that aim to measure the legal and regulatory environment in various countries. To address this question, the above analysis was repeated with the second step replaced by a regression of the fixed effects on (1) the dummy variables measuring legal origin, from Spamann (2010); (2) the four variables measuring country-level bank regulation from the World Bank surveys on bank regulation (namely, overall restrictions on banking activities, official supervisory power, private monitoring index, and overall capital stringency); (3) the deposit insurance dummy from Demirgüç-Kunt, Kane, and Laeven (2007); and (4) the legal rights measure from the World Bank Doing Business project.

The weighted average R squared obtained was 24 percent, indicating that slightly less than half (24/52, or 46 percent) of the country-level variation in bank fixed effects identified in the first analysis was attributable to the measured variation in the legal and regulatory environment.

Other Governance Variables

The analysis of the association of CEO compensation with bank risk was extended by including, in both panel and cross-section regressions, a dummy variable for options awards and the fraction of cash bonuses in total compensation. Stock option grants were positively and robustly associated with risk, but few banks outside the United States use this type of compensation. Cash bonuses, in contrast, were not associated with risk in this sample. This result prevailed even when the sample was restricted to larger banks.

In addition to the board governance variables described in the baseline analysis, the association between director workload (measured by the average number of outside directorships), the fraction of directors who are female, and the nationality mix of the directors and bank risk taking was examined. The results were either not robust or not significant for any of these variables.

A look at the relationship between risk taking and (1) the number of directors, (2) a dummy indicating small boards (with five or fewer directors), and (3)

a dummy indicating large boards (with 16 or more directors) followed. The number of directors was found to be significantly associated with less risk taking, and the small board dummy was significantly associated with more risk taking. The results were not significant and robust for the large-board dummy. This suggests that the negative effect of the number of directors on risk taking is driven by the effect of small boards, which is consistent with the hypothesis that small boards do not have sufficient resources to monitor management. No support was found for the hypothesis that large boards are inefficient at monitoring because they encourage free riding by directors.

Finally, restricted stock as a percentage of total CEO compensation was examined. More pay in restricted stock was found to be significantly associated with less risk taking in the difference-in-means and first-difference regressions but not in the panel regressions. This result is consistent with the results that more equity-linked compensation and longer compensation horizon are associated with less risk taking. The association becomes significantly positive in the crisis regression, which is consistent with the hypothesis that managers tend to gamble for resurrection when the risk of default is high.

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GLOSSARY

Agency problem   Also called the principal-agent problem, the agency problem occurs when one person or entity (the "agent") is able to make decisions on behalf of another person or entity (the "principal"). In this situation, the agent may be motivated to act in his or her own best interests rather than those of the principal.

Asset manager   An individual in a financial institution, such as a mutual fund, who manages asset portfolios on behalf of investors.

Bail-in   A statutory power of the government to restructure the liabilities of a distressed financial institution by writing down, and/or converting to equity, its unsecured debt.

Basel Committee on Banking Supervision (BCBS)   A committee of banking supervisory authorities that provides a forum for regular cooperation on banking supervisory matters. Its objective is to enhance understanding of key supervisory issues and improve the quality of banking supervision worldwide. The Committee also develops guidelines and supervisory standards in various areas, including the international standards on capital adequacy, the Core Principles for Effective Banking Supervision, and the Concordat on cross-border banking supervision.

Basel I   A set of minimum capital requirements for banks published in 1988 by the Basel Committee on Banking Supervision. See also Basel II and Basel III.

Basel II   A 2004 accord among national bank supervisory authorities (the Basel Committee on Banking Supervision) that revised the Committee's 1988 adequacy standards concerning bank capital for credit risk and introduced capital requirements for operational risk. It made the capital requirement more sensitive to variations in the riskiness of the bank's assets. Basel II also revised its recommended supervision processes and increased disclosure by banks. Pillar 1 of the Basel Accord covers the minimum capital adequacy standards for banks; Pillar 2 focuses on enhancing the supervisory review process; and Pillar 3 encourages market discipline through increased quantitative and qualitative disclosure of banks' risk exposures and capital adequacy. See also Basel III.

Basel III   A comprehensive set of reform measures introduced in the aftermath of the global financial crisis to improve the banking sector's ability to absorb financial and economic shocks, enhance banks' risk management and governance, and increase banks' transparency and disclosure. These measures revise the existing definition of regulatory capital under the Basel Accord, enhance capital adequacy standards, and introduce, for the first time, minimum liquidity adequacy standards for banks.

Beta   Measure of a security's systematic or non-diversifiable risk. The beta is the expected percentage change in an asset's excess return in response to a 1 percentage point increase in the excess return of the market portfolio (or some well-diversified portfolio). Securities with a beta greater than one, on average, move more than the market as a whole, while those with a lower beta move less.

Bonus cap   An upper limit on variable compensation. Usually defined as an upper limit on the ratio of variable-to-fixed compensation.

Bonus-malus clauses   Clauses in an employment contract that financially reward or penalize an employee based on performance.

Boundary problem   The boundary problem refers to the fact that (higher) regulatory requirements for regulated entities increase their incentives to shift activities outside the regulatory perimeter.

Central repository   A central location or entity in which financial data are stored and managed.

Clawbacks   In this report, a situation in which previously awarded compensation is recouped in response to an adverse development (for example, an investment that fails or a deterioration in a firm's solvency position).

Cointegration   Two or more variables are said to be cointegrated if they share a common long-term trend. For example household consumption and labor income are often found to cointegrate, as consumption and income tend to move together over time. Cointegrated variables are individually nonstationary, but they become

jointly stationary if their initial order of integration is 1 (see stationarity). If they are both individually integrated of order 2 (~I(2)), they will be jointly ~I(1) if they cointegrate.

Collateral   Assets pledged or posted to a counterparty to secure an outstanding exposure, derivative contract, or loan.

Collateralized loan obligation   A type of collateralized debt obligation (CDO) that is backed by a pool of commercial and personal loans.

Collective investment vehicles   Institutions that sell their shares to retail and institutional investors and invest the proceeds in securities. These vehicles are often referred to as investment funds, management funds, mutual funds, or funds.

Commercial paper   An unsecured promissory note with a fixed maturity of 1 to 270 days.

Core liabilities   Traditional funding source for banks through regular deposits.

Credit default spread   A credit default swap (CDS) is a credit derivative whose payout is triggered by a "credit event," often a default. The "spread" of a CDS is the annual amount (the "premium") the protection buyer must pay the protection seller over the length of the contract, expressed as a percentage of the notional amount.

Credit enhancement   A method whereby a firm attempts to improve its debt or credit worthiness, for example through guarantees from an affiliated company or through the specific structure or quality of the assets (such as collateral, bankruptcy remoteness).

Cross-sectional regression   A regression model in which dependent and explanatory variables are related in only one period. This is in contrast to a time-series regression, which relates dependent and explanatory variables over multiple time periods.

Deferred compensation   Compensation that is promised for payout at a future date. Payout may be conditional on certain measures of performance.

Derivative product company   A special purpose company set up by a bank, jointly with private equity firms or hedge funds, to trade in derivatives products.

Direct lending   The direct provision of loans to borrowers by entities other than banks (for example, by insurance companies or mutual funds).

Early amortization trigger   An event that leads to early (full) repayment of a loan.

Endogeneity   In a statistical model, endogeneity issues arise when an independent variable (regressor) is correlated with the error term. Endogeneity can be caused for example by omitted variables, simultaneity, and certain forms of measurement error.

Entrusted loan   A loan between firms with banks or finance companies as payment agent.

Externality   Cost or benefit arising from an economic activity that affects somebody other than the people engaged in the economic activity.

Financial repression   Government policies, such as directed lending, caps on interest rates, and regulation of capital movements, that limit the functioning of financial and banking markets.

Fit and proper   A process by which a person is evaluated to be suited for employment, especially as an executive in a financial institution. A fit and proper person is generally considered to be financially sound, competent, reputable, and reliable.

Flow of funds accounts   Financial accounts that present the stock positions and flows of financial assets and liabilities among all sectors of the economy and between the sectors of the economy and the rest of the world.

Gambling for resurrection   Actions by a manager that aim to recover solvency by taking large risks.

Generalized method of moments (GMM)   A generalized statistical method, used primarily in econometrics, for obtaining estimates of parameters of statistical models; many common estimators in econometrics, such as ordinary least squares, are special cases of the GMM. The GMM estimator is robust in that it does not require information on the exact distribution of the disturbances.

Haircut   A discount applied to the market value of collateral to reflect its credit, liquidity, and market risk.

Hedge fund   An investment pool, typically organized as a private partnership, that faces few restrictions on its portfolio and transactions. Hence, compared with

more regulated financial institutions, hedge funds use a wider variety of investment techniques—including short positions, derivatives transactions, and leverage—in their effort to boost returns and manage risk.

Herding   A behavior characterized by individuals taking decisions which they would not take if they did not observe other investors taking them.

Incentive pay   A pay structure that is designed to affect an employee's professional incentives, for example when pay is based on profits or other measures of performance.

Insider ownership   Ownership by employees of a firm.

Institutional cash pools   Large short-term cash balances of global nonfinancial corporations and institutional investors such as asset managers, securities lenders, and pension funds.

Institutional investor   Professional financial institutions that pool money and make investments. In Chapter 2, institutional investors are defined narrowly as those with a long-term investment horizon such as pension funds, insurance companies, and official sector institutions. Banks, hedge funds, and mutual funds are excluded from this narrow definition.

Institutional ownership   Ownership by institutional investors.

Instrumental variable approach   Instrumental variable methods allow consistent estimation when the explanatory variables are correlated with the error terms of a regression relationship. Such correlation may occur when the dependent variable causes at least one of the explanatory variables ("reverse causation"); when there are omitted explanatory variables; or when the explanatory variables are subject to measurement error. An ideal instrument is highly correlated with the original explanatory variable but should have little correlation with the dependent variable.

Interconnectedness   Linkages between entities within the financial system that drive financial contagion and risk concentration.

Lender of last resort   An institution, usually a country's central bank, that offers loans to banks or other eligible institutions that are experiencing financial difficulty. Lender-of-last-resort facilities aim to prevent widespread panic in the financial system.

Leverage   The proportion of debt to equity (also assets to equity or capital to assets in banking). Leverage can

be built up by borrowing (on-balance-sheet leverage, commonly measured by debt-to-equity ratios) or by using off-balance-sheet transactions.

Liquidity transformation   A function of financial intermediaries to fund illiquid assets (such as loans) with liquid liabilities.

Market failure   A situation in which free markets fail to allocate resources efficiently. Market failures are often associated with asymmetric information (when buyers and sellers do not operate with the same set of information), noncompetitive markets (such as monopolies), externalities (see externality), or public goods (when the traded good cannot be excluded from others' use).

Maturity transformation   A function of financial intermediaries, to fund long-term assets (loans) with short-term liabilities (such as demand deposits or short-term loans)

Mortgage servicing right   The right to receive a portion of mortgage interest and fees collected from borrowers in return for administering loans.

Mutual fund   A collective investment vehicle that is made up of a pool of funds collected from many investors for the purpose of investing in financial assets such as stocks and bonds.

Net asset value (NAV)   The value of a company's total assets minus its total liabilities. For example, if an investment company has securities and other assets worth $100 million, and has liabilities of $10 million, the investment company's NAV will be $90 million.

Net stable funding ratio (NSFR)   The NSFR was introduced by Basel III to provide a sustainable maturity structure of assets and liabilities. It requires a minimum amount of stable sources of funding at a bank relative to the liquidity profiles of the assets as well as to the potential for contingent liquidity needs arising from off-balance-sheet commitments, over a one-year horizon.

Noncore liabilities   Nontraditional funding sources for banks and other financial corporations that fall outside core deposit liabilities.

Other depository corporation   Term used in the international methodology of monetary statistics covering all financial corporations (other than the central bank) that incur liabilities included in broad money (such as traditional banks and money market fund investment funds).

Other financial corporation   Term used in the international methodology of monetary statistics covering

all financial corporations other than the central bank and other depository corporations.

Over-the-counter (OTC)   In the case of financial securities, those that are traded directly between two parties rather than on a financial exchange.

Panel regression   Econometric technique to estimate relationships among variables in a panel data set. A panel data set is two dimensional: one for the time dimension (year, quarter, month, etc.) and the other for the cross-sectional dimension (people, firms, countries). Various estimation techniques can be used depending on the nature of these two dimensions.

Peer-to-peer lending   A new lending mechanism by which individual small investors and borrowers are matched, without intermediation through the traditional banking system.

Procyclicality   The tendency of changes in asset prices and capital flows to move in line with macroeconomic business and financial cycles.

Proprietary trading   Taking positions in the market using the firm's own capital.

Real estate investment trust (REIT)   A special purpose company that owns income-producing real estate or mortgages. They come in two varieties: equity REITs, which own and manage real estate properties, and mortgage REITs, which rely on short-term funding to finance their mortgages holdings.

Redeemable at par   A feature of an investment indicating that it is repayable in full on demand either at maturity or at some point in time.

Redemption   The act of returning money to an ultimate investor of a fund.

Redemption gate   A mechanism in asset management to slow down money outflows and control run risk, by imposing quantitative or qualitative restrictions on outflows.

Regulatory arbitrage   Reducing regulatory capital requirements by taking advantage of differences in regulatory treatment across countries or across types of financial institutions, as well as of differences between economic risk and risk as measured by regulatory guidelines.

Regulatory perimeter   Entities or activities subject to regulation and supervision.

Retail investors   Typically small individual investors who buy and sell financial assets for their personal account instead of another investor, company, or organization.

Restricted stock   Stock of a company that is not fully transferable until certain conditions have been met. Used as employee compensation, it typically becomes transferrable ("vests") after a period of continued employment or the achievement of particular performance targets.

Reverse causality   A two-way causal relationship or a direction of cause-and-effect contrary to a common presumption.

Ring fencing   Measures imposed by prudential supervisors with the objective of protecting the domestic assets of a bank so they can be seized and liquidated under local law in case of failure of the whole or part of the international banking group.

Risk committee   A committee of the board of directors of a company that is tasked with risk management.

Risk shifting   In this report, actions by a manager that shift risk from shareholders to bond holders. Risk shifting is possible because of limited liability of shareholders.

Risk-weighted assets   The total of all assets held by a bank weighted by credit, market, and operational risk weights according to formulae determined by the national regulator or supervisor. Most regulators/supervisors adopt the Basel Committee on Banking Supervision capital standards in setting formulae for asset risk weights.

Robustness   Regression results are said to be "robust" when the estimated coefficients change little among several differently specified regressions or among different estimation methods.

Run risk   The risk that many depositors or security holders will suddenly and simultaneously seek to redeem their investment placed with financial intermediaries.

Safe assets   Assets that provide identical real payoffs under all possible circumstances; that is, the value of the asset is protected from credit, market, inflation, liquidity, currency, and idiosyncratic risks.

Safe harbor status   An exemption to general bankruptcy rules that affords certain lenders seniority to other investors (that is, they are paid before other debt or equity holders can recoup their investment—also called bankruptcy remoteness).

Say on pay   A rule that allows a firm's shareholders to vote on the remuneration of executives.

Search for yield   The search by investors for investments with higher returns, usually within the context of a low-interest environment.

Stationarity   A stationary variable has a constant mean and variance, and it does not tend to drift endlessly in any particular direction. Economic and financial data are often nonstationary. For example, the price level (as captured, for example, by the CPI index) tends to rise over time, and it is nonstationary. The rate of change of the price, level, and inflation is typically stationary. Indeed, differencing (such as taking the percentage change) lowers the order of integration of nonstationary variables.

Subprime   A characteristic of a borrower or loan indicating a low credit quality.

Systemic risk   The risk that the failure of a particular financial institution would cause large losses to other financial institutions, thus threatening the stability of the financial system.

Tail risk   The risk of extremely rare events, in finance often defined as the risk that an asset price moves three standard deviations from its mean.

Term premium   The premium that the investor expects to be paid for buying longer-dated securities compared with shorter-dated ones.

Tier 1 capital   Tier 1 capital is composed of common shares or equivalent for non-joint-stock companies, retained earnings, and certain subordinated instruments. It serves the purpose of absorbing losses on a going-concern basis. Under Basel III, the predominant form of regulatory capital must be Tier 1 capital.

Trust loan   A loan by a trust company. The trust company structures these loans into securities to sell to investors.

Vesting period   The period of time before shares or other compensation is owned unconditionally by an employee.

Wealth management product   A specific investment product sold by banks and securities firms repayable at relatively short maturities, usually earning a higher yield than bank deposits, and which may come with a guaranteed return.

Z-score   In this report, the z-score is a measure of distance to default. It measures the magnitude of drop in returns on assets (in standard deviations) needed to make a firm insolvent.

IMF EXECUTIVE BOARD DISCUSSION SUMMARY

The following remarks were made by the Chair at the conclusion of the Executive Board's discussion of the World Economic Outlook, Global Financial Stability Report, *and* Fiscal Monitor *on September 25, 2014.*

Executive Directors noted that an uneven global recovery continues, notwithstanding setbacks in the first half of the year. However, the pace of recovery remains weak as the legacies of the crisis continue to cast a shadow. Investment has not picked up solidly in many advanced economies, and emerging market economies are adjusting to lower rates of economic growth than those reached during the immediate postcrisis recovery. Moreover, activity in some regions is being negatively affected by ongoing geopolitical tensions. Directors also observed that some problems that predate the global financial crisis—including the effects of an aging population on labor force growth, weak productivity growth, and infrastructure gaps—are coming back to the fore and affecting the pace of recovery through lower potential growth in a number of economies.

Directors noted that global growth should increase as growth in major advanced economies picks up on accommodative monetary policies, supportive financial market conditions, and the more gradual pace of fiscal consolidation (except in a few countries, including Japan). Growth in emerging market and developing economies should also increase with a gradual improvement in structural factors affecting activity in some economies and further strengthening in external demand as advanced economies' growth recovers.

Notwithstanding this expected pickup in growth, Directors underscored that the recovery remains fragile and subject to significant downside risks. If geopolitical tensions persist it could have negative effects on confidence and contribute to increases in oil prices and declines in asset prices. In some advanced economies, risks also arise from the effects of protracted low inflation or deflation on activity or on public debt dynamics.

Directors underscored concerns about increased financial risk taking arising from the prolonged period of low interest rates, resulting in asset price appreciation, spread compression, and record-low volatility across a broad range of asset classes. They also noted that asset holdings are now concentrated in a small number of large managers. These increased market and liquidity risks could spill over to global markets, potentially triggered by heightened geopolitical risks or volatility associated with monetary policy normalization. Directors noted that the largest banks have strengthened their balance sheets in response to tighter regulation, but low profitability at some banks has created the need for an overhaul of business models, potentially creating headwinds for the economic recovery. Moreover, credit intermediation has been migrating to the shadow banking sector, creating new challenges for supervision and regulation. Against this backdrop, Directors observed that a tighter financing environment could adversely affect the sovereign debt dynamics of many emerging market and developing economies, particularly if coupled with lower growth.

Directors also remained concerned about medium-term risks to the global recovery. Growth in advanced economies could continue to disappoint over a longer period because of lower potential growth or because of a sustained weakness in demand. Directors noted that absent structural reforms, potential growth may be lower than currently projected.

Directors called for greater efforts in most economies to restore growth. They considered that premature normalization in monetary policy should be avoided, given the absence of robust demand growth in advanced economies. Some Directors also

saw a need for additional actions by the European Central Bank, while a few Directors cautioned that more time is needed to gauge the effectiveness of policies already introduced. A few other Directors saw little or no scope for further unconventional monetary accommodation in the euro area, as it may not be effective in promoting demand and sustainable growth, and cautioned against maintaining such accommodation longer than necessary, in view of the financial stability risks.

Directors highlighted the need to restructure weak banks and resolve nonviable institutions and to enhance the transmission of monetary policy through balance sheet repair. Moreover, adequate data to monitor the buildup of risks and a mandate for authorities to limit these risks, particularly in the shadow banking sector, are required. Directors broadly supported the use of macroprudential policies to improve the trade-off between financial and economic risk taking as well as regulate and supervise the shadow banking sector, although a number of Directors noted the limited experience regarding the effectiveness of such measures. To ensure adequate incentives for risk taking in the banking sector, some Directors underscored the importance of governance and executive compensation reforms.

Directors stressed that fiscal adjustment in advanced economies needs to be attuned, in pace and composition, to support the immediate recovery as well as lay the ground for medium-term plans (especially in the United States and Japan). More generally, debt and deficit reduction should be designed to minimize their adverse effects on jobs and growth. Directors broadly agreed that for countries with clearly identified infrastructure needs and in which efficient public investment processes exist, an increase in public infrastructure investment could provide a boost to demand as well as raise potential output in the medium term. Directors also broadly noted that in some cases a more supportive fiscal stance could help to bring forward the growth benefits of structural reforms, provided that there is enough fiscal room and that the costs and benefits of the reforms, as well as their implementation prospects, are sufficiently certain. In some countries, fiscal conditions put a premium on structural reforms that can be implemented without budgetary costs.

Directors noted that emerging markets' efforts to rebalance growth toward domestic sources have supported global growth, although this rebalancing, combined with lower-than-expected growth, has also reduced policy space and raised vulnerabilities for some countries. In this context, the scope for macroeconomic policies to support growth, should downside risks materialize, is limited for economies with weak fiscal or external current account positions or high or increasing inflation levels or those facing financial system risks from a sustained period of credit expansion. Directors underscored the importance of reducing these vulnerabilities, including by rebuilding fiscal buffers. They also stressed that continued strong growth in low-income countries calls for greater progress in strengthening policies—by boosting fiscal positions with stronger revenues and rationalizing public spending, achieving greater monetary policy independence, and strengthening public financial management. Directors emphasized the importance for emerging markets to continue managing external financial shocks with exchange rate flexibility, complemented with other measures to limit excessive exchange rate volatility.

Directors underscored the importance of structural reforms to raise potential growth in both advanced and emerging market and developing economies. Within the euro area, these include active labor market policies and better-targeted training programs. Higher public investment in some creditor economies, complemented by policies to encourage private investment, could boost demand in the short term while raising potential output over the medium term. More forceful structural reforms in Japan are also needed to increase labor supply and raise productivity in some sectors through deregulation. Other advanced economies could also raise potential growth with measures to augment human and physical capital and increase labor force participation. Among emerging market and developing economies, the priorities vary. These include removing infrastructure bottlenecks; reforms to education, labor, and product markets; and better government services delivery. While the current account surplus in China has decreased markedly, further progress to gradually shift its growth toward domestic consumption and reduce reliance on credit

and investment would help forestall medium-term risks of financial disruption or a sharp slowdown. Joint efforts by both surplus and deficit economies are needed to contribute to a further narrowing of global external imbalances. Further diversification and structural transformation remains a key priority for low-income countries.

GLOBAL FINANCIAL STABILITY REPORT STATISTICAL APPENDIX, OCTOBER 2014

This presentation complements the main text of the *Global Financial Stability Report* (GFSR) with data on financial developments in regions and countries as well as in selected sectors.

Unless noted otherwise, the data reflect information available up to July 31, 2014. The data come for the most part from sources outside the IMF. Although the IMF endeavors to use the highest quality data available, it cannot be responsible for the accuracy of information obtained from independent sources.

Please note that effective with the April 2011 issue, the IMF's Statistics Department has assumed responsibility for compiling the Financial Soundness Indicators tables, and those tables are no longer part of this appendix. However, those tables will continue to be linked to the GFSR Statistical Appendix on the IMF's public website.

The following symbols are used in this appendix:

. . .   to indicate that data are not available;

—   to indicate that the figure is zero or less than half the final digit shown or that the item does not exist;

–   between years and months (for example, 2008–09 or January–June) to indicate the years or months covered, including the beginning and ending years or months;

/   between years (for example, 2008/09) to indicate a fiscal or financial year.

"Billion" means a thousand million; "trillion" means a thousand billion.

"Basis points" refers to hundredths of 1 percentage point (for example, 25 basis points is equivalent to ¼ of 1 percentage point).

"n.a." means not applicable.

Minor discrepancies between constituent figures and totals are due to rounding.

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

Contents

Figure 1. Major Net Exporters and Importers of Capital, 2013

1. Economies That Export Capital[1]

2. Economies That Import Capital[3]
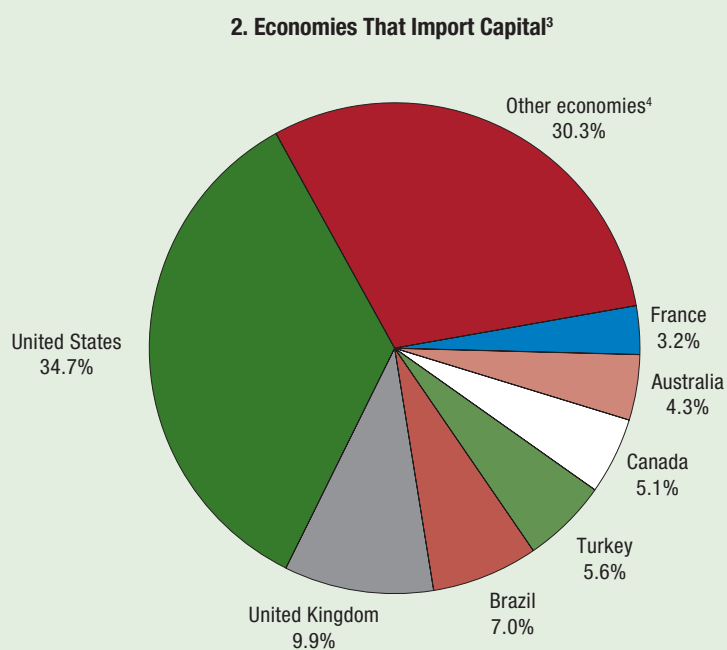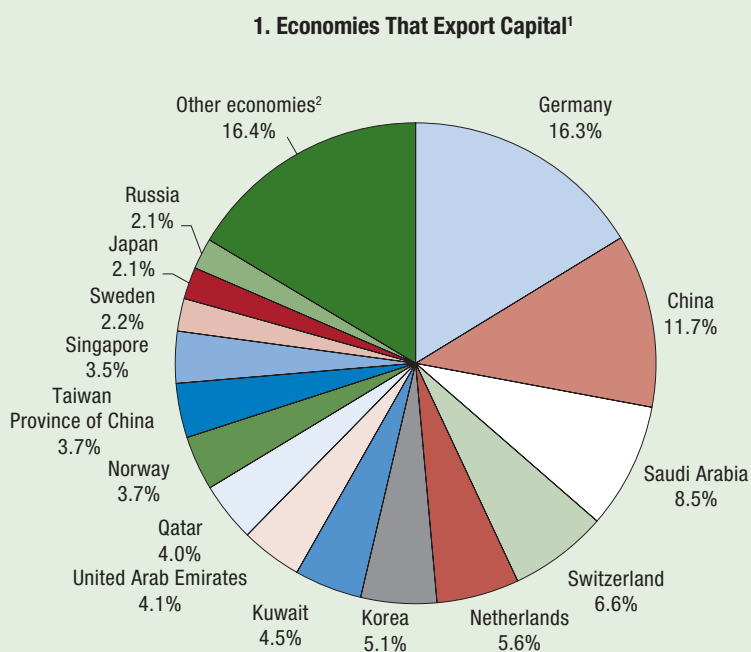
Source: IMF, World Economic Outlook database as of September 22, 2014.
[1]As measured by economies' current account surplus (assuming errors and omissions are part of the capital and financial accounts).
[2]Other economies include all economies with shares of total surplus less than 2.1 percent.
[3]As measured by economies' current account deficit (assuming errors and omissions are part of the capital and financial accounts).
[4]Other economies include all economies with shares of total deficit less than 3.2 percent.

Figure 2. Sovereign Credit Default Swap Spreads
(Five-year tenors; basis points)
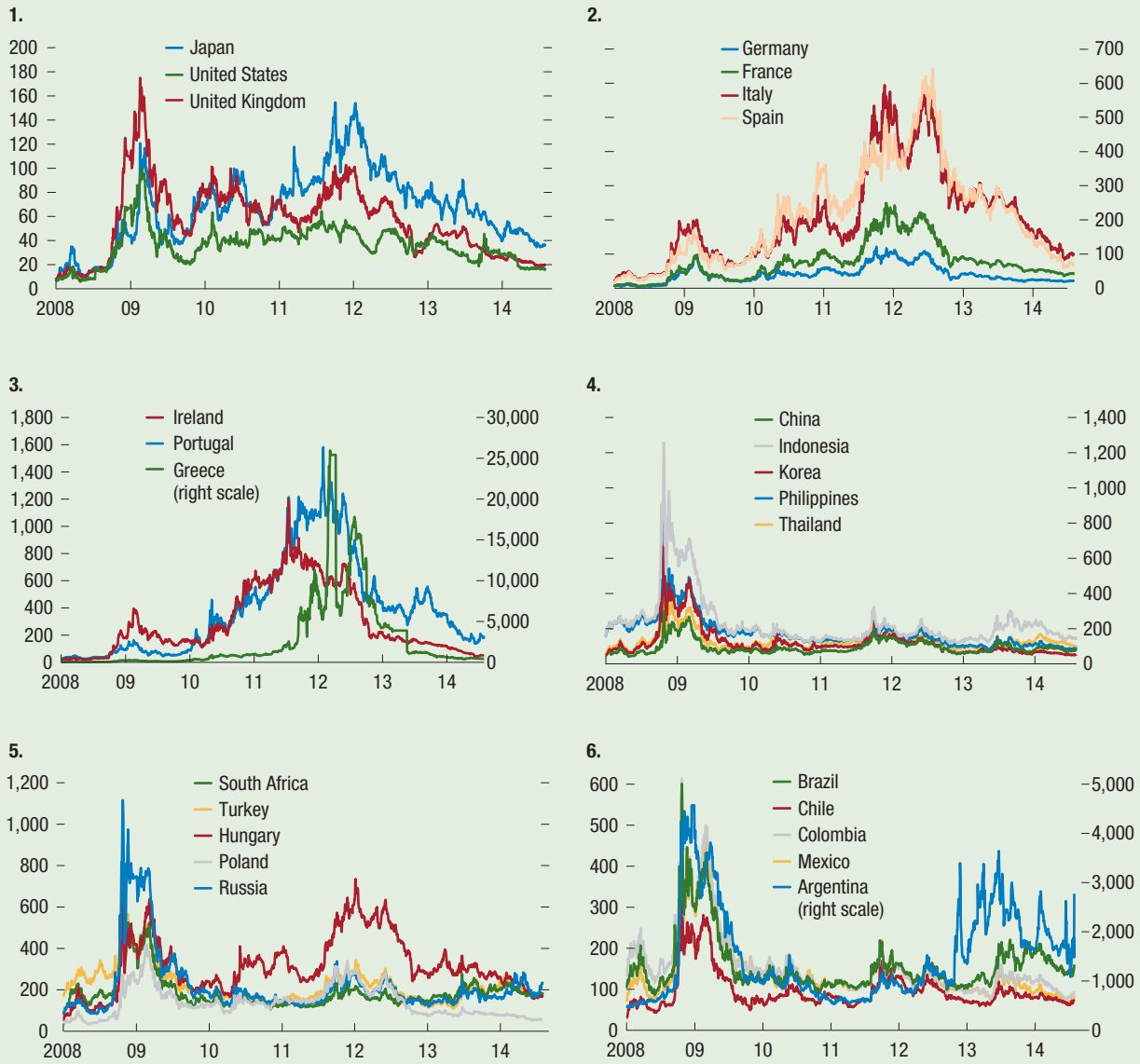
Source: Bloomberg L.P.

Figure 3. Selected Credit Default Swap Spreads
(Five-year tenors; basis points)

1. Sovereign by Region

Legend:
- Western Europe
- Asia Pacific
- Emerging markets
- CEEMEA
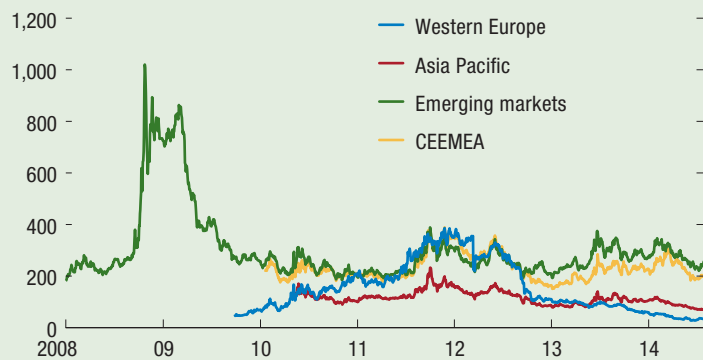
2. Corporates by Credit Quality

Legend:
- European investment grade
- European crossover
- North American investment grade
- North American crossover

3. Banks by Region

Legend:
- Euro area
- United Kingdom
- United States
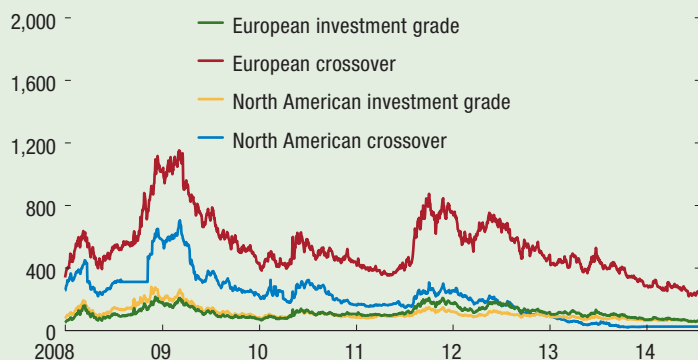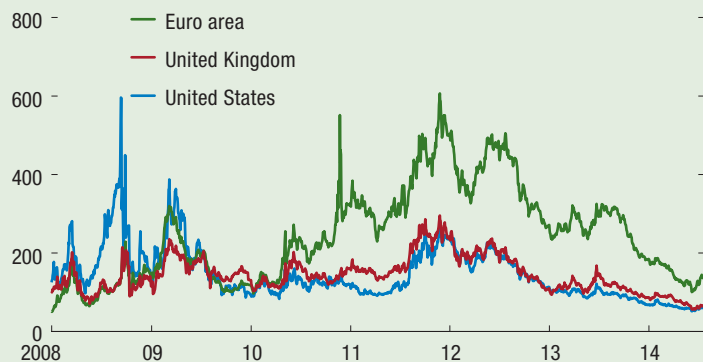
Sources: Bloomberg LP; and Thomson Reuters Datastream.
CEEMEA = central and eastern Europe, Middle East, and Africa.

Figure 4. Selected Spreads
(Basis points; monthly data)

1. Repo Spread[1]

2. Commercial Paper Spread[2]
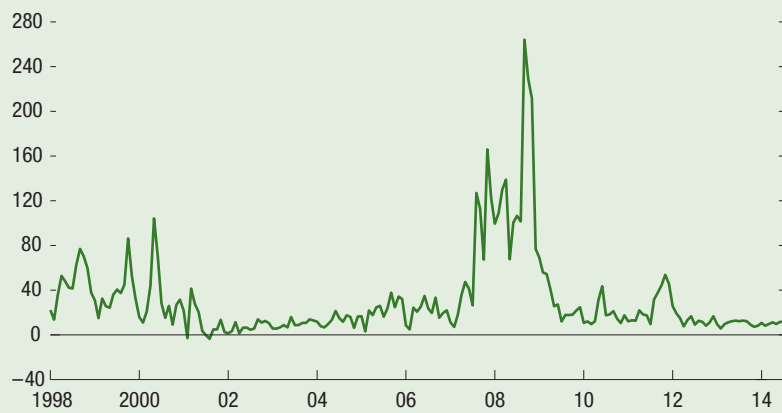
3. Swap Spreads[3]
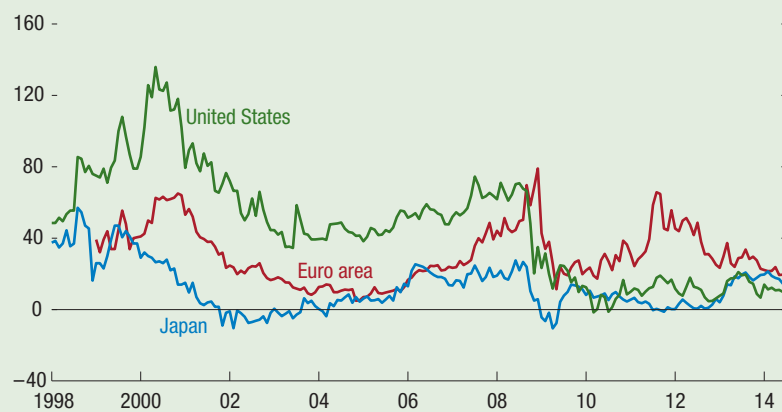
Sources: Bank of America Merrill Lynch; and Bloomberg L.P.
[1]Spread between yields on three-month U.S. Treasury repo and on three-month U.S. Treasury bill.
[2]Spread between yields on 90-day investment-grade (financial and nonfinancial) commercial paper and on three-month U.S. Treasury bill.
[3]Spread over 10-year government bond.

Figure 5. Implied Volatility Indices
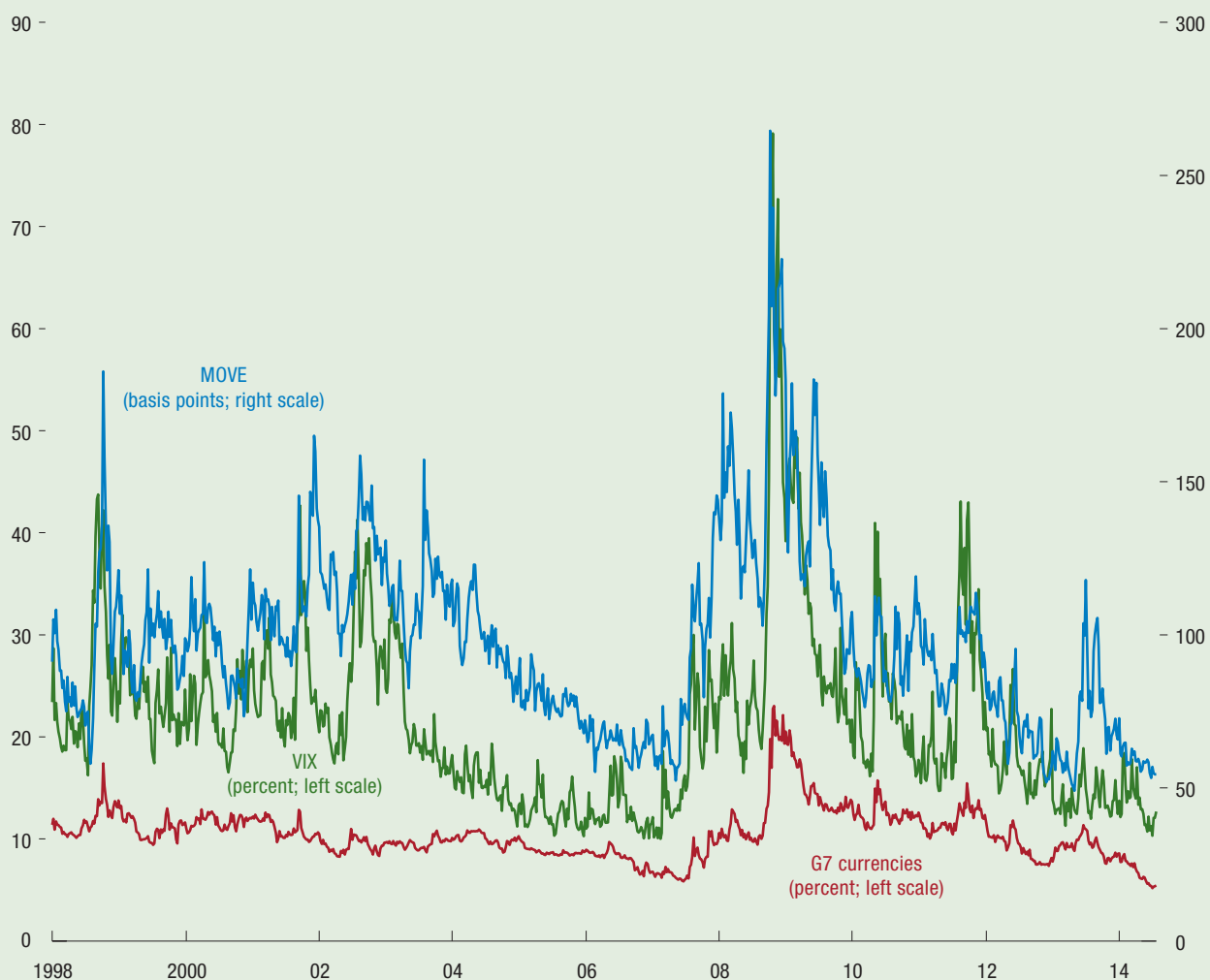
Source: Bloomberg, L.P.
Note: VIX = Chicago Board Options Exchange volatility index on the Standard & Poor's 500 and denotes equity volatility. MOVE = Bank of America Merrill Lynch Option Volatility Estimate index and denotes one-month Treasury options volatility. G7 currencies = VXY index from JPMorgan Chase & Co. and denotes G7 foreign exchange volatility.

Figure 6. U.S. Corporate Bond Market
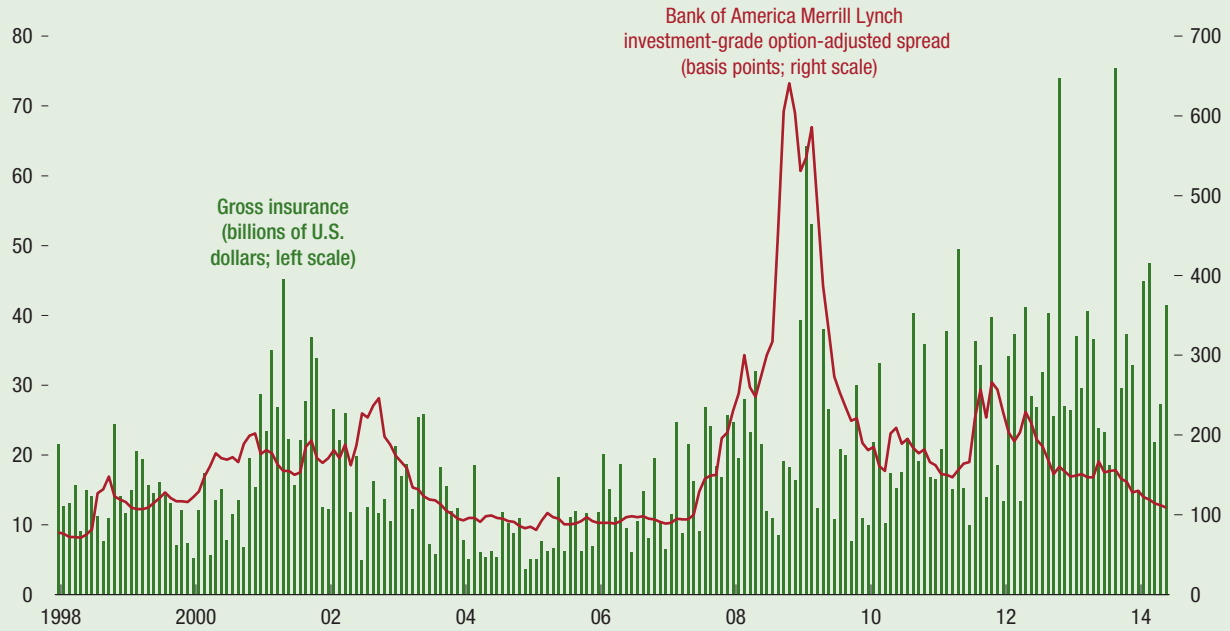
1. Investment Grade

2. High Yield

Sources: Bank of America Merrill Lynch; and Board of Governors of the Federal Reserve System.

Figure 7. Euro Area Corporate Bond Market

1. Investment Grade

Bank of America Merrill Lynch
investment-grade option-adjusted spread
(basis points; right scale)

Gross insurance
(billions of U.S. dollars; left scale)

2. High Yield

Bank of America Merrill Lynch
high-yield option-adjusted spread
(basis points; right scale)

Gross insurance
(billions of U.S. dollars; left scale)

Sources: Bank of America Merrill Lynch; and Dealogic.

Figure 8. U.S. Commercial Paper Market

1. Discount Rate Spread[1]
(basis points; weekly data)
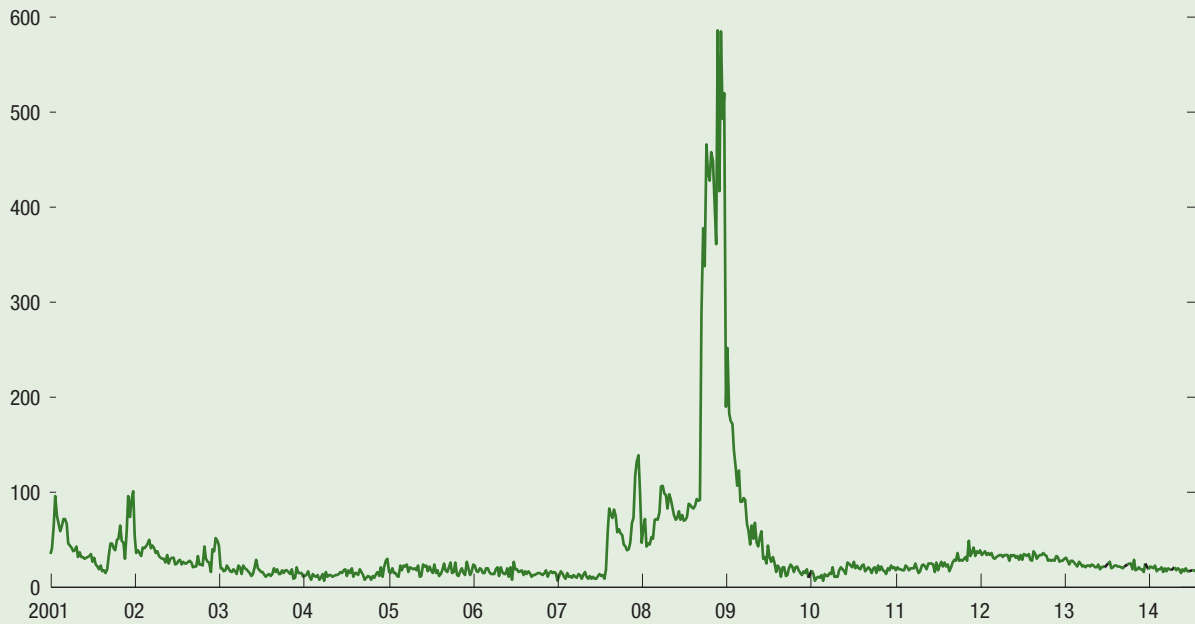
2. Amount Outstanding
(billions of U.S. dollars; monthly data)
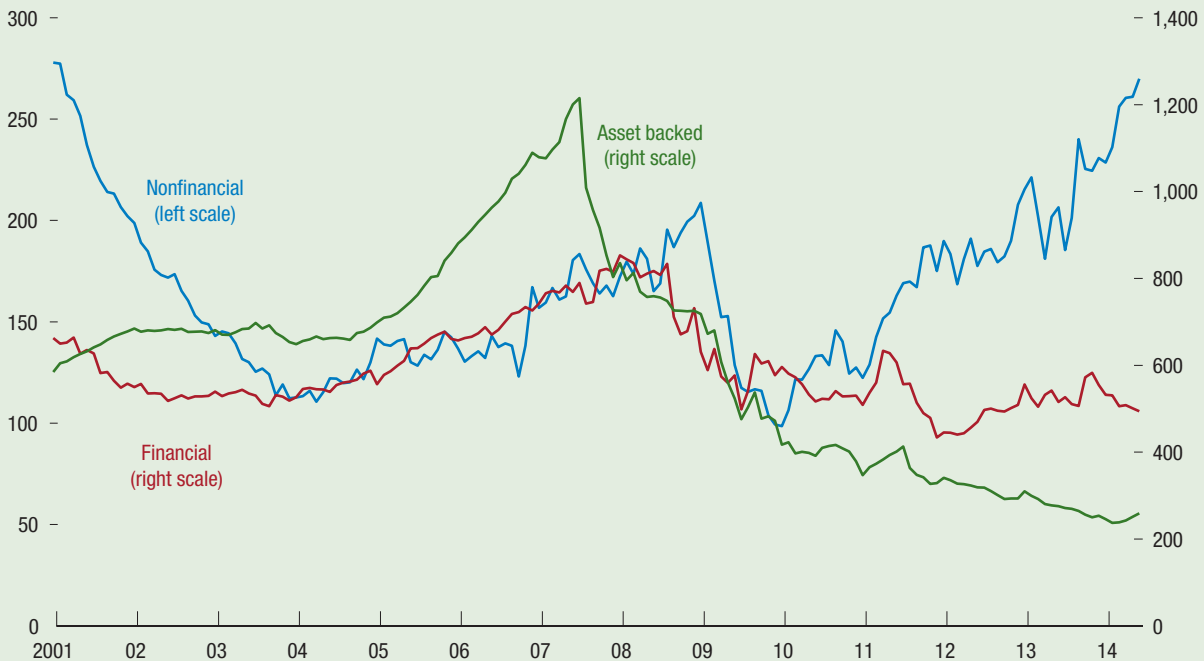
Source: Board of Governors of the Federal Reserve System.
[1]Difference between 30-day A2/P2 and AA nonfinancial commercial paper.

Table 1. Capital Market Size: Selected Indicators, 2013
(Billions of U.S. dollars unless noted otherwise)

	GDP	Total Reserves Minus Gold[2]	Stock Market Capitalization	Total Debt Securities[3]	Bank Assets[4]	Bonds, Equities, and Bank Assets	Bonds, Equities, and Bank Assets[5] *(in percent of GDP)*
World	**74,699.3**	**12,129.7**	**62,552.0**	**99,788.8**	**120,421.6**	**282,762.4**	**378.5**
European Union[1]	**16,286.9**	**570.0**	**12,646.3**	**30,072.5**	**44,871.4**	**87,590.2**	**537.8**
Euro area	12,874.1	331.0	7,539.2	22,478.9	32,394.2	62,412.3	484.8
North America	**18,594.8**	**205.4**	**24,417.8**	**39,130.0**	**19,809.5**	**83,357.3**	**448.3**
Canada	1,826.8	71.8	2,137.1	2,187.6	3,881.7	8,206.4	449.2
United States	16,768.1	133.5	22,280.7	36,942.4	15,927.8	75,150.9	448.2
Japan	4,898.5	1,237.2	4,599.3	12,243.6	11,422.5	28,265.4	577.0
Memorandum items:							
EU countries							
Austria	416.1	12.5	121.8	658.8	1,502.8	2,283.4	548.8
Belgium	508.3	18.1	366.7	776.5	1,162.6	2,305.8	453.7
Denmark	330.6	86.1	320.4	901.0	1,174.9	2,396.3	724.8
Finland	267.4	9.4	218.1	310.4	544.3	1,072.8	401.2
France	2,807.3	50.8	2,140.1	4,756.7	8,178.3	15,075.0	537.0
Germany	3,636.0	67.4	2,030.4	4,356.9	8,281.5	14,668.8	403.4
Greece	241.8	1.4	82.6	222.1	560.9	865.6	358.0
Ireland	232.2	1.4	168.1	1,195.6	1,021.4	2,385.1	1,027.4
Italy	2,072.0	50.8	631.1	4,074.3	2,986.2	7,691.6	371.2
Luxembourg	60.4	0.9	78.6	841.5	983.8	1,903.9	3,152.1
Netherlands	853.8	22.6	818.6	2,377.8	2,514.8	5,711.2	668.9
Portugal	220.1	2.8	85.9	395.5	636.4	1,117.7	507.9
Spain	1,358.7	35.4	774.8	2,389.2	3,834.4	6,998.3	515.1
Sweden	558.9	60.5	751.3	848.9	1,019.6	2,619.8	468.7
United Kingdom	2,523.2	92.4	4,035.4	5,843.8	10,282.6	20,161.7	799.0
Newly industrialized Asian economies[6]	**2,365.5**	**1,342.5**	**6,252.7**	**2,566.8**	**5,228.7**	**14,048.1**	**593.9**
Emerging market economies[7]	**28,913.0**	**7,995.2**	**11,232.7**	**11,226.4**	**31,782.5**	**54,241.6**	**187.6**
Of which:							
Asia	13,750.4	4,679.1	6,024.8	5,796.6	22,612.2	34,433.6	250.4
Latin America and the Caribbean	5,748.7	802.9	2,183.6	3,564.8	3,761.2	9,509.6	165.4
Middle East and North Africa	3,127.3	1,396.8	1,114.3	236.6	1,927.5	3,278.4	104.8
Sub-Saharan Africa	1,575.9	204.2	609.1	244.7	579.6	1,433.4	91.0
Europe	4,710.7	912.2	1,301.0	1,383.6	2,901.9	5,586.5	118.6

Sources: Bank for International Settlements (BIS); Bankscope; Board of Governors of the Federal Reserve System, *Flow of Funds*; Bloomberg, L.P.; IMF, International Financial Statistics (IFS) and World Economic Outlook databases as of September 22, 2014; and World Federation of Exchanges.

[1]This aggregate includes euro area countries, Denmark, Sweden, and the United Kingdom.

[2]Data are from IFS. For euro area, the data also include the total reserves minus gold holdings of the European Central Bank.

[3]Data are from BIS as of June 27, 2014. The data include total debt securities, all issuers, amounts outstanding by residence of issuer. BIS compilation methodology changed in December 2012. For the new data definition and classification, refer to the "Enhancements to the BIS debt securities statistics" publication.

[4]Total assets of domestic commercial banks, including foreign banks' subsidiaries operated domestically. For Austria, the data are from Austrian National Bank. For Germany, the data are from Deutsche Bundesbank. It comprises the assets of monetary and financial institutions, excluding special purpose banks, mortgage banks, and building and loan associations. For Greece, the data are from Bank of Greece. For Ireland, the data are from Central Bank of Ireland. For Luxembourg, the data are from Commission de Surveillance du Secteur Financier. It comprises the assets of commercial, savings, and private banks. For Portugal, the data are from Bank of Portugal. For Sweden, the data are from Sveriges Riksbank. For the United States, the data are from the Flow of Funds. It comprises the assets of private depository institutions.

[5]Sum of the stock market capitalization, debt securities, and bank assets. To the extent that banks hold equities and bonds as assets, these would be double-counted in the summary data. Due to limitations in data availability, such double-counting cannot fully be eliminated.

[6]Hong Kong SAR, Korea, Singapore, and Taiwan Province of China.

[7]This aggregate comprises the group of emerging and developing economies defined in the *World Economic Outlook*.

Table 2. MSCI Equity Market Indices
(Period-over-period percent change)

	2010	2011	2012	2013	2013 Q3	2013 Q4	2014 Q1	2014 Q2
Global	**10.4**	**−9.4**	**13.4**	**20.3**	**7.4**	**6.9**	**0.6**	**4.3**
Emerging Markets Index[1]	**16.4**	**−20.4**	**15.1**	**−5.0**	**5.0**	**1.5**	**−0.8**	**5.6**
Latin America	**12.1**	**−21.9**	**5.4**	**−15.7**	**3.6**	**−3.1**	**−0.2**	**5.5**
Brazil	3.8	−24.9	−3.5	−18.7	7.7	−6.2	2.0	5.7
Chile	41.8	−22.1	5.6	−23.0	−5.6	−7.3	−2.9	1.3
Colombia	40.8	−7.1	31.6	−23.7	9.1	−11.5	4.7	5.7
Mexico	26.0	−13.5	27.1	−2.0	−2.0	7.0	−5.1	6.2
Peru	49.2	−23.9	15.5	−31.0	−3.8	2.9	4.2	7.6
Asia	**16.6**	**−19.1**	**18.1**	**−0.2**	**4.5**	**3.6**	**−0.6**	**6.3**
China	2.6	−20.4	18.7	0.4	11.5	3.7	−5.8	3.4
India	14.7	−26.3	27.9	6.9	−0.7	8.8	4.1	12.9
Indonesia	25.8	4.7	8.8	−5.3	−11.5	−0.2	12.9	3.3
Korea	22.1	−11.5	11.7	1.6	8.1	2.2	−2.2	1.1
Malaysia	19.3	−0.2	6.8	11.6	−0.8	5.2	−1.3	0.8
Pakistan	21.4	−12.9	33.5	36.9	4.9	11.0	−1.4	7.8
Philippines	23.5	−3.1	34.7	3.4	−4.9	−3.3	10.2	5.8
Taiwan Province of China	7.9	−20.3	8.8	9.4	−0.5	5.1	3.3	7.9
Thailand	36.4	−1.2	26.9	−10.7	−5.3	−6.0	5.2	6.5
Europe, Middle East, & Africa	**20.9**	**−22.6**	**17.7**	**−8.0**	**8.5**	**−0.2**	**−2.1**	**3.6**
Czech Republic[1]	−5.9	−6.8	−6.1	−11.2	7.8	3.6	7.8	0.9
Egypt	15.9	−46.8	52.5	15.9	10.5	20.4	7.9	2.9
Hungary	−1.6	−23.7	8.1	−11.2	−7.8	−8.1	−5.6	2.9
Morocco	17.2	−16.5	−17.6	−10.4	−3.2	0.6	5.5	−4.3
Poland	16.3	−21.7	19.0	−4.2	6.9	−0.1	3.6	−1.8
Russia	17.2	−20.9	9.6	−2.6	13.1	0.2	−14.4	9.8
South Africa	17.4	0.9	20.6	12.5	9.4	5.8	4.3	5.2
Turkey	21.5	−22.4	51.7	−13.4	−2.2	−8.9	4.1	12.5
Sectors								
Energy	7.5	−20.1	2.5	−13.6	9.9	−2.8	−4.7	8.4
Materials	14.7	−23.0	6.4	−13.4	7.9	3.1	−4.3	1.3
Industrials	27.1	−30.6	14.9	−2.8	6.5	2.5	−0.5	4.4
Consumer Discretionary	29.5	−10.4	14.6	4.3	8.6	2.3	3.5	3.7
Consumer Staple	27.6	−1.4	23.0	−5.5	−0.7	−1.9	−1.9	3.4
Health Care	25.7	−23.2	31.6	8.0	2.0	4.4	1.4	7.7
Financials	14.5	−25.6	22.0	−7.0	2.7	0.6	−0.8	3.8
Information Technology	13.9	−17.1	26.3	12.2	7.5	7.8	3.6	11.0
Telecommunications	10.9	−8.0	9.6	−5.3	1.6	−0.3	−6.5	4.5
Utilities	4.9	−16.4	2.4	−5.9	0.7	4.3	2.5	8.3

Table 2. *(concluded)*

	2010	2011	2012	2013	2013 Q3	2013 Q4	2014 Q1	2014 Q2
Developed Markets	**9.6**	**−7.6**	**13.2**	**24.1**	**7.7**	**7.6**	**0.8**	**4.2**
Australia	−3.5	−14.9	14.9	15.7	8.1	2.7	1.0	0.0
Austria	14.8	−35.7	20.7	6.1	13.6	1.0	−2.9	−1.1
Belgium	4.6	−9.6	34.0	19.2	9.0	5.7	2.3	4.2
Canada	12.0	−12.2	4.3	10.2	5.4	6.9	4.9	5.5
Denmark	39.0	−14.3	28.1	18.1	9.0	8.3	14.9	3.4
Finland	7.1	−34.2	10.0	41.6	26.6	11.6	−0.7	1.4
France	−6.7	−19.3	17.7	23.3	15.3	5.7	2.8	−0.1
Germany	6.0	−20.1	27.2	28.2	12.7	13.3	−0.5	−0.2
Greece	−46.4	−63.6	−0.8	46.2	33.6	10.1	18.1	−11.0
Hong Kong SAR	19.7	−18.4	24.4	8.1	8.1	3.0	−3.8	6.7
Ireland	−19.7	11.4	3.8	38.9	16.4	11.3	13.1	−9.1
Israel	2.2	−29.8	−7.0	8.0	1.2	5.7	17.8	1.6
Italy	−17.6	−25.8	8.6	16.9	19.0	10.5	14.6	−1.7
Japan	13.4	−16.2	5.8	24.9	6.0	2.1	−6.3	6.5
Netherlands	−0.6	−14.4	17.2	28.5	14.4	8.4	0.9	−0.4
New Zealand	3.2	1.1	23.0	6.2	14.9	−4.5	14.7	−2.3
Norway	7.4	−12.8	13.7	5.3	8.6	5.5	1.8	6.6
Portugal	−14.6	−25.7	−0.7	7.5	10.5	1.3	9.7	−4.8
Singapore	18.4	−21.0	26.4	−1.8	3.2	0.2	−1.1	4.1
Spain	−25.4	−16.9	−3.3	27.7	25.1	10.8	4.7	6.5
Sweden	31.3	−17.8	18.7	21.4	15.2	5.2	1.5	−2.4
Switzerland	9.8	−9.1	17.3	23.8	9.4	4.3	3.9	0.6
United Kingdom	8.5	−5.4	5.9	14.1	4.0	4.3	−2.5	2.3
United States	13.2	−0.1	13.5	29.9	5.2	9.7	1.3	4.7

Source: Morgan Stanley Capital International (MSCI).
Note: Price indices are in local currency terms.
[1]The country and regional classifications used in this table follow the conventions of MSCI and do not necessarily conform to IMF country classifications or regional groupings.

Table 3. Emerging Markets Bond Index: EMBI Global Sovereign Yield Spreads

(Basis points)

	(end-of-period spread levels)				2013		2014	
	2010	2011	2012	2013	Q3	Q4	Q1	Q2
EMBI Global	**289**	**426**	**266**	**327**	**355**	**327**	**324**	**285**
Latin America	**357**	**468**	**326**	**393**	**412**	**393**	**393**	**340**
Argentina	507	925	991	808	1,035	808	799	724
Belize	617	1,391	2,245	807	872	807	724	765
Brazil	189	225	140	230	245	230	230	211
Chile	115	172	116	148	171	148	143	123
Colombia	172	191	112	163	187	163	168	144
Dominican Republic	322	597	343	349	429	349	330	326
Ecuador	913	846	826	530	628	530	508	376
El Salvador	302	478	396	389	409	389	420	376
Jamaica	427	637	711	641	637	641	531	496
Mexico	173	222	155	177	210	177	182	160
Panama	162	201	129	199	208	199	188	177
Peru	165	216	114	162	184	162	165	151
Uruguay	188	213	127	194	200	194	192	169
Venezuela	1,114	1,258	786	1,141	1,010	1,141	1,165	938
Europe	**232**	**440**	**208**	**280**	**310**	**280**	**282**	**241**
Bulgaria	195	340	94	68	65	68	…	…
Belarus	623	1,164	695	714	950	714	648	517
Croatia	298	602	311	306	366	306	273	252
Georgia	504	471	357	382	416	382	364	295
Hungary	345	605	345	278	329	278	267	204
Kazakhstan[1]	324	453	207	275	295	275	288	264
Lithuania	267	447	149	149	175	149	148	120
Poland	151	310	108	118	153	118	112	103
Romania	…	…	235	201	241	201	199	172
Russia	224	364	157	208	231	208	280	237
Serbia	418	601	391	374	432	374	282	268
Turkey	177	385	177	310	284	310	271	224
Ukraine	461	940	632	763	996	763	762	723
Middle East	**284**	**439**	**426**	**393**	**459**	**393**	**388**	**375**
Iraq	314	603	465	511	535	511	489	482
Jordan	…	500	436	290	321	290	301	283
Lebanon	270	384	412	366	443	366	362	352
Africa	**329**	**452**	**264**	**322**	**360**	**322**	**299**	**285**
Côte d'Ivoire	1,154	1,192	473	442	492	442	393	365
Egypt	221	607	453	443	537	443	367	340
Gabon	258	422	252	348	353	348	293	265
Ghana	363	534	397	547	552	547	663	582
Nigeria	…	435	261	293	348	293	327	277
South Africa	145	261	163	247	275	247	225	222
Asia	**175**	**271**	**165**	**224**	**260**	**224**	**210**	**202**
China	126	278	146	149	175	149	155	133
Indonesia	183	274	179	292	324	292	267	253
Malaysia	117	178	98	139	152	139	93	80
Pakistan	654	1,274	798	606	637	606	461	501
Philippines	163	242	121	133	173	133	131	137
Sri Lanka	290	461	342	439	469	439	336	320
Vietnam	323	510	304	274	329	274	214	203

Table 3. *(concluded)*

	(period-over-period spread level changes)							
					2013		2014	
	2010	2011	2012	2013	Q3	Q4	Q1	Q2
EMBI Global	**−6**	**138**	**−161**	**61**	**2**	**−28**	**−4**	**−39**
Latin America	**1**	**111**	**−142**	**67**	**−12**	**−19**	**0**	**−53**
Argentina	−153	418	66	−183	−164	−227	−9	−75
Belize	−560	774	854	−1,438	0	−65	−83	41
Brazil	0	36	−85	90	2	−15	0	−19
Chile	20	57	−56	32	−9	−23	−5	−20
Colombia	−26	19	−79	51	−6	−24	5	−24
Dominican Republic	−83	275	−254	6	28	−80	−19	−4
Ecuador	144	−67	−20	−296	−37	−98	−22	−132
El Salvador	−24	176	−82	−7	−27	−20	31	−44
Jamaica	−292	210	74	−70	14	4	−110	−35
Mexico	−19	49	−67	22	−13	−33	5	−22
Panama	−4	39	−72	70	−10	−9	−11	−11
Peru	0	51	−102	48	−17	−22	3	−14
Uruguay	−50	25	−86	67	−35	−6	−2	−23
Venezuela	73	144	−472	355	34	131	24	−227
Europe	**6**	**208**	**−232**	**72**	**10**	**−30**	**2**	**−41**
Bulgaria	16	145	−246	−26	−49	3	…	…
Belarus	…	541	−469	19	203	−236	−66	−131
Croatia	103	304	−291	−5	5	−60	−33	−21
Georgia	37	−33	−114	25	14	−34	−18	−69
Hungary	159	260	−260	−67	−23	−51	−11	−63
Kazakhstan[1]	−69	129	−246	68	−21	−20	13	−24
Lithuania	−65	180	−298	0	−36	−26	−1	−28
Poland	27	159	−202	10	−4	−35	−6	−9
Romania	…	…	…	−34	−28	−40	−2	−27
Russia	21	140	−207	51	−3	−23	72	−43
Serbia	85	183	−210	−17	−8	−58	−92	−14
Turkey	−20	208	−208	133	29	26	−39	−47
Ukraine	−528	479	−308	131	214	−233	−1	−39
Middle East	**−51**	**155**	**−13**	**−33**	**9**	**−66**	**−5**	**−13**
Iraq	−133	289	−138	46	−41	−24	−22	−7
Jordan	…	…	−64	−146	−27	−31	11	−18
Lebanon	−17	114	28	−46	24	−77	−4	−10
Africa	**118**	**123**	**−188**	**58**	**−21**	**−38**	**−23**	**−14**
Côte d'Ivoire	…	38	−719	−31	−81	−50	−49	−28
Egypt	224	386	−154	−10	−227	−94	−76	−27
Gabon	−132	164	−170	96	40	−5	−55	−28
Ghana	−99	171	−137	150	27	−5	116	−81
Nigeria	…	…	−174	32	−21	−55	34	−50
South Africa	−4	116	−98	84	7	−28	−22	−3
Asia	**−33**	**96**	**−106**	**59**	**21**	**−36**	**−14**	**−8**
China	62	152	−132	3	−19	−26	6	−22
Indonesia	−47	91	−95	113	49	−32	−25	−14
Malaysia	−19	61	−80	41	−11	−13	−46	−13
Pakistan	−34	620	−476	−192	−66	−31	−145	40
Philippines	−43	79	−121	12	1	−40	−2	6
Sri Lanka	−92	171	−119	97	33	−30	−103	−16
Vietnam	9	187	−206	−30	−29	−55	−60	−11

Source: JPMorgan Chase & Co.

Note: The country and regional classifications used in this table follow the conventions of JPMorgan and do not necessarily conform to IMF country classifications or regional groupings.

[1]Kazakh issuance consists of state-owned enterprises.

Table 4. Emerging Market Private External Financing: Total Bonds, Equities, and Loans
(Millions of U.S. dollars)

	2010	2011	2012	2013	2013 Q3	2013 Q4	2014 Q1	2014 Q2
Total	**746,598.5**	**622,682.1**	**708,927.4**	**811,372.4**	**168,841.0**	**197,885.8**	**180,921.6**	**191,773.1**
Sub-Saharan Africa	**15,840.6**	**20,417.0**	**25,198.6**	**30,745.1**	**9,565.0**	**8,045.4**	**950.3**	**7,212.1**
Angola	3,767.8	2,346.4	1,050.0	2,500.0	…	…	124.0	…
Botswana	44.9	…	79.7	…	…	…	…	…
Cameroon	…	150.0	102.8	91.0	…	…	…	…
Congo, Democratic Republic of the	…	…	100.0	…	…	…	…	…
Ethiopia	693.9	377.2	362.6	90.2	90.2	…	…	…
Gabon	119.0	63.9	…	1,593.0	…	1,593.0	…	…
Ghana	45.5	2,280.0	3,710.9	1,236.3	1,086.1	150.2	…	…
Kenya	…	37.9	1,006.2	166.4	…	…	…	2,000.0
Madagascar	78.8	…	…	75.2	…	…	…	…
Mauritius	…	14.0	…	2,255.0	…	1,985.0	270.0	…
Mozambique	…	90.1	12.0	854.8	460.3	394.6	…	…
Namibia	…	490.6	…	…	…	…	…	…
Nigeria	1,779.0	2,302.7	919.9	6,163.6	1,382.5	747.8	…	1,629.5
Rwanda	…	90.9	…	392.9	…	…	…	…
Senegal	118.9	295.0	…	107.7	…	…	…	…
South Africa	9,129.4	11,648.4	15,970.4	14,450.8	6,546.0	3,006.6	556.2	2,492.6
Tanzania	60.0	158.7	142.0	648.2	…	48.2	…	…
Togo	…	…	52.4	…	…	…	…	…
Uganda	3.5	…	65.8	120.0	…	120.0	…	98.3
Zambia	…	71.2	1,623.9	…	…	…	0.1	991.7
Central and Eastern Europe	**56,005.8**	**60,694.4**	**77,407.9**	**75,706.6**	**11,779.3**	**24,485.4**	**17,674.6**	**18,555.8**
Albania	405.3	…	…	…	…	…	…	…
Bulgaria	…	18.4	2,101.3	1,225.3	…	1,225.3	…	2,014.5
Croatia	1,939.0	3,991.7	3,569.6	3,853.8	199.0	2,169.0	…	1,694.9
Hungary	3,827.1	9,293.5	1,991.2	8,747.3	518.7	4,598.0	2,966.8	…
Lithuania	2,919.8	1,495.7	2,244.6	899.4	…	…	675.8	…
Macedonia	…	189.7	…	…	…	…	…	…
Montenegro	252.8	252.5	…	108.5	…	108.5	…	383.3
Poland	20,798.1	13,028.1	20,562.6	11,996.5	1,643.9	3,561.6	5,972.0	2,573.0
Romania	1,446.0	2,487.3	5,651.6	5,586.7	2,062.1	1,455.7	1,970.7	2,521.9
Serbia	…	982.6	1,785.3	3,494.6	…	2,018.6	383.9	234.6
Turkey	24,417.8	28,955.0	39,501.7	39,794.7	7,355.6	9,348.7	5,705.5	9,133.6
Commonwealth of Independent States	**67,860.7**	**75,928.0**	**95,052.6**	**104,311.8**	**16,235.2**	**18,791.6**	**7,359.8**	**6,734.3**
Armenia	…	86.6	…	840.2	840.2	…	…	…
Azerbaijan	2,425.0	125.0	610.0	1,193.3	…	…	1,285.6	660.0
Belarus	1,738.8	858.5	…	63.5	…	63.5	…	…
Georgia[1]	248.8	491.2	1,108.6	232.7	…	157.9	…	255.9
Kazakhstan	5,149.7	2,734.2	6,663.2	5,468.7	…	459.4	400.0	1,045.7
Kyrgyz Republic	5.8	…	…	…	…	…	…	…
Moldova	…	…	55.0	…	…	…	…	…
Russia	52,359.1	64,739.0	75,151.8	78,671.7	14,996.0	15,030.9	5,674.2	3,772.7
Ukraine	5,933.5	6,893.7	8,510.0	9,941.7	399.0	3,080.0	…	1,000.0
Uzbekistan	…	…	2,954.0	7,900.0	…	…	…	…
Developing Asia	**319,336.0**	**265,855.5**	**283,052.4**	**337,018.5**	**68,662.3**	**92,748.0**	**89,479.1**	**85,372.2**
Bangladesh	…	86.0	261.6	745.0	…	400.0	…	…
Bhutan	92.2	…	…	…	…	…	…	…
Brunei Darussalam	…	…	353.5	…	…	…	…	…
Cambodia	…	…	155.8	156.0	…	…	…	…
China	117,261.8	90,835.7	109,503.8	182,192.0	46,735.5	60,665.3	37,966.5	60,749.6

Table 4. *(concluded)*

	2010	2011	2012	2013	2013 Q3	2013 Q4	2014 Q1	2014 Q2
Fiji	...	250.2	...	1.1	...	1.1	...	...
India	123,977.3	96,169.0	83,430.6	71,607.6	9,148.7	17,649.5	23,933.8	8,998.6
Indonesia	23,657.0	22,047.4	28,009.5	27,896.2	4,893.1	3,377.6	8,533.2	4,546.6
Lao P.D.R.	3,000.0	...	241.5	995.3	...	945.0	...	...
Macao SAR	3,937.8	7,852.9	4,156.5	2,020.7	272.7	600.0	2,527.4	1,377.7
Malaysia	18,612.4	19,622.9	25,236.4	14,271.3	1,728.3	2,948.4	8,485.2	2,041.6
Maldives	...	...	16.0	...	...	...	...	...
Marshall Islands	660.0	2,067.2	240.0	690.0	360.0	...	584.0	...
Mongolia	893.6	150.0	3,379.6	463.5	82.0	381.5	114.2	...
Pakistan	503.2	834.7	67.2	150.0	...	148.5	...	2,543.2
Papua New Guinea	...	718.0	57.0	600.0	...	600.0	...	...
Philippines	11,314.8	8,487.1	8,184.5	14,269.4	1,808.3	2,595.7	2,035.3	1,248.1
Sri Lanka	1,205.6	1,150.0	1,837.5	1,450.0	750.0	100.0	1,000.0	675.0
Thailand	10,123.0	12,017.7	15,342.8	18,199.4	2,593.3	1,667.2	3,521.5	3,121.7
Vietnam	4,097.3	3,566.8	2,578.8	1,311.0	290.4	668.2	778.0	70.1
Middle East and North Africa	**68,303.8**	**47,192.0**	**68,079.1**	**77,973.2**	**13,784.5**	**16,297.9**	**8,558.0**	**22,354.9**
Algeria	1.9	...	...	...	...	...	...	...
Bahrain	4,340.8	1,748.0	2,989.8	2,892.4	1,491.7	...	...	140.5
Egypt	6,431.2	3,119.4	931.6	4,655.3	133.5	...	...	660.9
Iran	...	...	...	419.0	419.0	...	...	...
Iraq	...	408.5	...	...	...	...	...	...
Jordan	741.6	...	...	1,250.0	...	1,250.0	...	1,000.0
Kuwait	3,760.8	2,103.9	1,073.5	2,460.4	911.7	1,387.0	500.0	...
Lebanon	1,925.0	2,687.4	2,278.3	1,496.9	...	401.4	...	693.1
Libya	...	...	...	...	...	...	...	...
Morocco	1,360.9	13.0	3,119.3	1,215.0	...	466.2	...	3,219.5
Oman	2,739.0	1,277.0	994.2	1,821.5	931.2	384.8	600.0	692.2
Qatar	8,925.9	11,148.0	16,423.9	7,425.8	450.7	3,243.8	2,272.7	746.2
Saudi Arabia	18,099.6	1,895.0	14,353.2	15,849.0	2,195.6	4,141.1	2,520.8	3,465.8
Tunisia	175.7	85.0	1,288.4	576.3	228.4	87.0	36.5	28.7
United Arab Emirates	19,801.5	22,706.9	24,627.1	37,911.5	7,022.8	4,936.7	2,627.9	11,707.8
Latin America and the Caribbean	**219,251.7**	**152,595.3**	**160,136.8**	**185,617.2**	**48,814.7**	**37,517.5**	**56,899.9**	**51,543.8**
Anguilla	2.3	...	...	...	...	...	...	...
Antigua and Barbuda	...	...	...	94.0	...	...	...	...
Argentina	4,945.0	9,334.6	1,766.4	1,727.9	604.5	497.5	...	2,496.8
Aruba	...	...	253.0	...	...	...	...	...
Barbados	403.3	...	250.0	400.0	...	...	...	...
Bolivia	253.0	200.0	500.0	789.0	489.0	300.0	...	...
Brazil	145,196.5	59,160.9	69,697.8	68,281.3	12,269.0	11,163.4	25,428.5	18,679.9
Chile	10,536.5	15,446.0	17,534.5	24,073.3	3,644.1	6,573.2	4,161.5	2,005.5
Colombia	4,228.3	16,253.3	10,517.8	12,150.2	4,058.9	2,832.9	4,873.5	3,242.7
Costa Rica	5.8	425.0	1,322.4	3,125.8	500.0	1,067.0	...	1,000.0
Dominican Republic	2,024.7	777.6	700.0	1,797.4	...	500.0	...	1,250.0
Ecuador	...	36.0	...	48.6	48.6	...	16.0	2,000.0
El Salvador	644.1	653.5	1,099.9	304.5	...	...	120.0	...
Guatemala	...	300.0	1,429.9	1,293.9	...	493.9	785.9	300.0
Haiti	...	...	...	26.5	...	...	...	...
Honduras	...	30.0	...	1,049.3	...	549.3	44.4	...
Jamaica	1,833.5	1,568.4	1,750.0	1,821.5	1.9	519.1	1,002.1	...
Mexico	32,705.1	25,588.0	43,359.8	54,330.2	23,322.2	10,997.9	16,616.0	16,521.2
Nicaragua	...	...	...	...	...	...	...	...
Panama	477.3	1,699.3	1,764.9	2,165.5	169.9	692.6	105.0	369.8
Paraguay	...	100.0	500.0	500.0	...	...	298.5	...
Peru	8,186.1	2,973.7	7,190.3	8,743.7	1,543.7	780.7	3,448.5	1,309.8
Trinidad and Tobago	13.8	175.0	...	716.2	166.2	550.0	...	...
Turks and Caicos	...	170.0	...	...	...	...	...	...
Uruguay	...	2,169.8	500.0	2,178.5	1,996.7	...	...	2,368.2
Venezuela	7,796.5	15,534.2	...	...	...	...	...	...

Source: Dealogic.
Note: For inclusion criteria, please see notes for Tables 5, 6, and 7.
[1]Georgia is not a member of the Commonwealth of Independent States, but it is included in this group for reasons of geography and similarities in economic structure.

Table 5. Emerging Market Private External Financing: Bonds
(Millions of U.S. dollars)

	2010	2011	2012	2013	2013 Q3	2013 Q4	2014 Q1	2014 Q2
Total	**253,762.7**	**250,583.5**	**365,237.9**	**403,106.0**	**81,975.3**	**93,162.6**	**99,779.5**	**151,280.5**
Sub-Saharan Africa	**4,673.1**	**7,625.3**	**9,668.9**	**14,014.0**	**8,153.8**	**3,394.5**	**199.9**	**4,263.3**
Angola	...	...	1,000.0	...	...	...	...	...
Botswana	...	...	79.7	...	...	...	...	...
Ethiopia	...	...	362.6	90.2	90.2	...	...	...
Gabon	...	...	...	1,593.0	...	1,593.0	...	...
Ghana	...	...	...	993.6	993.6	...	...	...
Kenya	...	...	...	...	...	...	...	2,000.0
Mozambique	...	...	...	810.3	460.3	350.0	...	...
Namibia	...	490.6	...	...	...	...	...	...
Nigeria	...	986.0	350.0	2,553.9	1,282.6	397.9	...	1,088.9
Rwanda	...	...	...	392.9	...	...	...	...
South Africa	4,673.1	6,148.7	7,140.8	6,980.2	5,327.2	1,053.7	199.9	182.7
Tanzania	...	...	...	600.0	...	...	...	...
Zambia	...	...	735.8	...	...	...	...	991.7
Central and Eastern Europe	**30,879.2**	**31,362.2**	**50,955.7**	**42,113.7**	**4,817.6**	**15,190.3**	**15,098.4**	**14,860.4**
Albania	405.3	...	...	...	...	...	...	...
Bulgaria	...	...	1,343.3	1,225.3	...	1,225.3	...	2,014.5
Croatia	1,238.8	2,748.4	3,104.0	3,408.4	199.0	1,723.5	...	1,694.9
Hungary	3,518.1	8,752.3	1,763.5	7,406.2	514.9	3,395.5	2,966.8	...
Lithuania	2,710.1	1,495.7	2,214.4	860.4	...	...	675.8	...
Montenegro	252.8	252.5	...	108.5	...	108.5	...	383.3
Poland	11,512.9	7,773.0	16,283.2	4,683.5	1,184.5	1,548.8	5,518.5	2,028.9
Romania	1,418.4	2,106.1	5,182.5	4,162.4	1,974.6	703.4	1,970.7	1,718.7
Serbia	...	982.6	1,785.3	3,106.9	...	1,630.8	...	234.6
Turkey	9,822.9	7,251.6	19,279.6	17,152.2	944.5	4,854.6	3,966.7	6,785.6
Commonwealth of Independent States	**42,559.4**	**31,293.4**	**59,443.1**	**68,950.4**	**12,202.4**	**12,176.2**	**6,249.2**	**5,909.7**
Armenia	...	...	...	690.2	690.2	...	...	...
Azerbaijan	...	125.0	500.0	1,093.3	...	...	1,225.6	500.0
Belarus	1,327.3	800.0	...	...	...	...	...	...
Georgia[1]	248.8	491.2	996.1	157.9	...	157.9	...	...
Kazakhstan	4,840.5	1,072.9	3,242.7	4,902.7	...	399.4	400.0	1,045.7
Russia	30,869.5	22,924.6	49,261.5	52,683.4	11,512.2	8,618.9	4,623.6	3,364.0
Ukraine	5,273.4	5,879.8	5,442.8	9,423.0	...	3,000.0	...	1,000.0
Developing Asia	**46,734.7**	**59,911.0**	**86,728.8**	**115,391.9**	**14,719.1**	**26,849.7**	**32,877.1**	**64,923.7**
China	18,058.6	31,580.7	40,181.6	70,987.5	8,858.0	22,005.7	21,190.7	48,567.5
Fiji	...	250.0	...	...	...	...	...	...
India	9,045.8	9,307.0	10,435.2	14,685.7	648.3	2,769.4	3,232.1	5,586.1
Indonesia	5,794.1	6,363.9	12,475.0	12,103.4	2,693.9	150.0	4,219.6	3,434.7
Lao P.D.R.	...	...	...	143.6	...	93.2	...	...
Macao SAR	592.0	354.2	825.0	1,600.0	...	600.0	755.6	...
Malaysia	2,638.5	4,170.7	8,929.0	5,210.1	170.4	122.5	634.9	991.5
Marshall Islands	...	...	...	...	...	...	230.0	...
Mongolia	174.0	...	2,979.0	310.5	...	310.5	114.2	...
Pakistan	...	...	...	...	...	...	...	2,000.0
Philippines	6,400.0	4,175.6	3,769.5	3,653.5	99.2	300.1	1,500.0	873.4
Sri Lanka	1,000.0	1,000.0	1,500.0	1,350.0	750.0	100.0	1,000.0	675.0
Thailand	2,046.0	2,622.3	5,387.1	5,149.4	1,499.3	200.0	...	2,795.6
Vietnam	985.8	86.6	247.5	198.3	...	198.3	...	...

Table 5. *(concluded)*

	2010	2011	2012	2013	2013 Q3	2013 Q4	2014 Q1	2014 Q2
Middle East and North Africa	**32,641.4**	**26,666.5**	**41,180.5**	**39,160.7**	**4,106.4**	**10,521.3**	**2,167.6**	**20,311.7**
Bahrain	2,460.5	1,050.0	2,343.6	2,187.4	1,491.7	...	...	140.5
Egypt	2,095.3	500.0	...	4,236.4	...	...	...	30.0
Jordan	741.6	...	...	1,250.0	...	1,250.0	...	1,000.0
Kuwait	989.3	446.7	923.5	323.4	161.7	...	500.0	...
Lebanon	1,925.0	2,687.4	2,278.3	1,496.9	...	401.4	...	693.1
Morocco	1,340.1	...	1,479.6	1,045.7	...	296.8	...	3,148.9
Oman	320.0	...	...	846.5	...	350.0	...	...
Qatar	8,743.5	5,087.7	10,508.8	6,064.2	...	3,243.8	35.0	746.2
Saudi Arabia	2,586.4	...	3,800.0	5,739.6	995.6	1,296.4	...	3,245.8
Tunisia	...	...	1,288.4	228.4	228.4	...	...	...
United Arab Emirates	11,439.8	16,894.7	18,558.3	15,742.2	1,229.1	3,682.8	1,632.6	11,307.2
Latin America and the Caribbean	**96,274.8**	**93,725.2**	**117,260.9**	**123,475.3**	**37,975.9**	**25,030.6**	**43,187.2**	**41,011.6**
Argentina	4,122.4	2,552.8	1,111.2	1,550.1	554.5	497.5	...	1,200.0
Aruba	...	...	253.0	...	...	...	...	...
Barbados	403.3	...	250.0	400.0	...	...	...	...
Bolivia	...	...	500.0	489.0	489.0	...	...	...
Brazil	40,513.3	37,788.5	51,562.2	39,069.7	7,920.3	5,885.3	19,569.0	13,945.3
Chile	7,522.3	5,795.8	10,344.5	12,397.5	2,458.6	3,642.9	2,669.9	1,661.2
Colombia	1,939.8	6,374.3	7,342.5	10,191.7	4,058.9	1,753.8	2,343.5	3,242.7
Costa Rica	...	250.0	1,262.4	2,983.8	500.0	992.0	...	1,000.0
Dominican Republic	750.0	777.6	550.0	1,797.4	...	500.0	...	1,250.0
Ecuador	...	...	...	...	...	...	...	2,000.0
El Salvador	444.1	653.5	799.9	304.5	...	...	...	...
Guatemala	...	...	1,389.9	1,293.9	...	493.9	785.9	300.0
Honduras	...	...	...	1,000.0	...	500.0	...	...
Jamaica	1,083.3	695.2	1,750.0	1,815.0	...	515.0	1,000.0	...
Mexico	26,733.7	20,537.9	32,224.4	39,676.4	19,741.8	8,712.7	14,932.0	12,364.7
Panama	...	1,045.8	797.8	1,388.6	99.0	539.6	...	369.8
Paraguay	...	100.0	500.0	500.0	...	...	298.5	...
Peru	6,466.3	2,394.7	6,123.1	5,977.7	157.1	447.8	1,588.5	1,309.8
Trinidad and Tobago	...	175.0	...	550.0	...	550.0	...	...
Turks and Caicos	...	170.0	...	...	...	...	...	...
Uruguay	...	1,969.8	500.0	2,090.0	1,996.7	...	...	2,368.2
Venezuela	6,296.5	12,444.2	...	...	...	...	...	...

Source: Dealogic.

Note: Gross bond issuance of international tranches by governments and public and private sector entities, excluding supranationals.

[1]Georgia is not a member of the Commonwealth of Independent States, but it is included in this group for reasons of geography and similarities in economic structure.

Table 6. Emerging Market Private External Financing: Equity
(Millions of U.S. dollars)

	2010	2011	2012	2013	2013 Q3	2013 Q4	2014 Q1	2014 Q2
Total	**247,025.6**	**103,184.6**	**118,676.5**	**126,606.3**	**16,786.7**	**37,075.1**	**19,905.1**	**34,568.4**
Sub-Saharan Africa	**3,724.4**	**2,810.5**	**3,440.7**	**4,428.1**	**397.9**	**2,087.1**	**356.4**	**2,603.3**
Botswana	44.9	…	…	…	…	…	…	…
Ghana	45.5	…	…	…	…	…	…	…
Kenya	…	37.9	30.2	…	…	…	…	…
Madagascar	78.8	…	…	75.2	…	…	…	…
Mauritius	…	14.0	…	…	…	…	…	…
Mozambique	…	…	…	10.6	…	10.6	…	…
Nigeria	140.3	…	219.9	782.6	100.0	99.9	…	540.6
Rwanda	…	90.9	…	…	…	…	…	…
South Africa	3,411.5	2,572.8	3,119.3	3,511.5	297.9	1,928.4	356.3	1,964.3
Tanzania	…	23.7	…	48.2	…	48.2	…	…
Togo	…	…	2.4	…	…	…	…	…
Uganda	3.5	…	65.8	…	…	…	…	98.3
Zambia	…	71.2	3.1	…	…	…	0.1	…
Central and Eastern Europe	**10,482.8**	**5,980.9**	**6,986.3**	**10,220.0**	**113.7**	**4,478.1**	**453.6**	**1,369.2**
Bulgaria	…	18.4	1.6	…	…	…	…	…
Hungary	…	14.7	…	134.7	…	…	…	…
Lithuania	209.7	…	30.2	38.9	…	…	…	…
Poland	8,827.6	4,865.3	2,911.2	6,272.5	…	1,431.7	453.6	544.1
Romania	…	…	76.3	1,000.3	87.4	745.0	…	803.2
Turkey	1,445.6	1,082.5	3,967.0	2,773.6	26.2	2,301.4	…	21.8
Commonwealth of Independent States	**8,980.1**	**11,517.4**	**9,949.1**	**10,094.7**	**864.3**	**3,083.0**	**1,050.6**	**574.8**
Armenia	…	11.6	…	…	…	…	…	…
Georgia[1]	…	…	…	74.9	…	…	…	255.9
Kazakhstan	309.2	1.3	541.1	…	…	…	…	…
Kyrgyz Republic	5.8	…	…	…	…	…	…	…
Russia	8,005.0	11,137.0	9,400.6	9,961.1	840.3	3,083.0	1,050.6	318.9
Ukraine	660.1	367.5	7.4	58.8	24.0	…	…	…
Developing Asia	**121,364.9**	**51,740.5**	**68,014.8**	**60,909.5**	**8,399.8**	**19,422.4**	**11,888.8**	**18,248.3**
Bangladesh	…	86.0	…	…	…	…	…	…
Cambodia	…	…	155.8	156.0	…	…	…	…
China	75,061.6	31,890.8	31,015.6	36,502.4	6,301.2	15,395.9	6,357.4	11,350.1
Fiji	…	0.2	…	1.1	…	1.1	…	…
India	26,200.8	8,409.5	14,476.6	8,626.1	260.8	1,019.2	2,580.8	2,969.5
Indonesia	8,066.6	3,259.4	3,581.8	3,536.2	314.8	85.2	410.4	411.9
Lao P.D.R.	111.2	…	241.5	150.0	…	150.0	…	…
Macao SAR	140.6	2,397.6	2,025.0	420.7	272.7	…	175.8	1,377.7
Mongolia	683.5	…	81.6	…	…	…	…	…
Malaysia	6,930.5	2,644.1	7,315.6	2,843.1	163.2	1,051.6	1,795.3	824.9
Maldives	…	…	16.0	…	…	…	…	…
Pakistan	…	…	3.0	19.9	…	18.4	…	543.2
Philippines	1,783.3	1,047.1	2,721.3	5,372.4	926.1	1,295.7	535.3	374.7
Sri Lanka	5.6	…	…	…	…	…	…	…
Thailand	2,379.0	1,945.9	6,381.0	3,212.0	161.1	335.7	33.8	326.1
Vietnam	2.1	60.0	…	69.7	…	69.7	…	70.1

Table 6. *(concluded)*

	2010	2011	2012	2013	2013		2014	
					Q3	Q4	Q1	Q2
Middle East and North Africa	**4,416.4**	**414.7**	**5,296.8**	**3,109.7**	**1,331.5**	**864.0**	**1,293.6**	**2,043.1**
Bahrain	1,585.4	…	…	…	…	…	…	…
Egypt	1,095.3	…	…	133.5	133.5	…	…	630.9
Iran	…	…	…	419.0	419.0	…	…	…
Iraq	…	8.5	…	…	…	…	…	…
Morocco	20.8	13.0	…	169.3	…	169.3	…	70.6
Oman	474.8	63.9	357.2	181.8	138.0	34.8	…	692.2
Qatar	137.5	…	2,073.6	260.9	…	…	887.7	…
Saudi Arabia	720.8	105.6	2,384.8	269.2	…	144.0	72.0	220.0
Tunisia	175.7	…	…	251.2	…	87.0	36.5	28.7
United Arab Emirates	206.2	223.7	481.3	1,424.8	641.1	428.9	297.4	400.7
Latin America and the Caribbean	**98,056.9**	**30,720.7**	**24,988.8**	**37,844.3**	**5,679.5**	**7,140.5**	**4,862.2**	**9,729.7**
Anguilla	2.3	…	…	…	…	…	…	…
Argentina	109.7	4,978.0	60.2	127.9	…	…	…	1,296.8
Brazil	94,356.7	14,339.4	8,650.6	14,457.7	850.9	2,190.7	1,027.7	4,734.6
Chile	1,309.7	5,252.9	4,319.3	8,447.7	736.0	1,972.5	1,302.4	26.8
Colombia	295.5	5,307.2	2,461.5	1,958.5	…	1,079.1	2,530.0	…
Jamaica	…	…	…	6.5	1.9	4.1	2.1	…
Mexico	1,692.7	801.9	8,705.1	12,147.4	3,494.4	1,821.2	…	3,671.5
Panama	103.0	41.3	…	…	…	…	…	…
Peru	187.4	…	792.2	532.4	430.1	72.9	…	…
Trinidad and Tobago	…	…	…	166.2	166.2	…	…	…

Source: Dealogic.
Note: Gross issuance of international tranches of initial and follow-up offerings.
[1]Georgia is not a member of the Commonwealth of Independent States, but it is included in this group for reasons of geography and similarities in economic structure.

Table 7. Emerging Market Private External Financing: Loans
(Millions of U.S. dollars)

	2010	2011	2012	2013	2013 Q3	2013 Q4	2014 Q1	2014 Q2
Total	**245,810.3**	**268,914.0**	**225,013.1**	**281,660.1**	**70,079.0**	**67,648.1**	**61,237.0**	**5,924.2**
Sub-Saharan Africa	**7,443.0**	**9,981.3**	**12,089.0**	**12,303.0**	**1,013.3**	**2,563.7**	**394.0**	**345.5**
Angola	3,767.8	2,346.4	50.0	2,500.0	…	…	124.0	…
Cameroon	…	150.0	102.8	91.0	…	…	…	…
Congo, Democratic Republic of the	…	…	100.0	…	…	…	…	…
Ethiopia	693.9	377.2	…	…	…	…	…	…
Gabon	119.0	63.9	…	…	…	…	…	…
Ghana	…	2,280.0	3,710.9	242.7	92.5	150.2	…	…
Kenya	…	…	976.0	166.4	…	…	…	…
Mauritius	…	…	…	2,255.0	…	1,985.0	270.0	…
Mozambique	…	90.1	12.0	34.0	…	34.0	…	…
Nigeria	1,638.7	1,316.7	350.0	2,827.2	…	250.0	…	…
Senegal	118.9	295.0	…	107.7	…	…	…	…
South Africa	1,044.8	2,927.0	5,710.3	3,959.0	920.8	24.5	…	345.5
Tanzania	60.0	135.0	142.0	…	…	…	…	…
Togo	…	…	50.0	…	…	…	…	…
Uganda	…	…	…	120.0	…	120.0	…	…
Zambia	…	…	885.0	…	…	…	…	…
Central and Eastern Europe	**14,643.8**	**23,351.2**	**19,465.9**	**23,373.0**	**6,848.0**	**4,817.0**	**2,122.7**	**2,326.3**
Bulgaria	…	…	756.5	…	…	…	…	…
Croatia	700.2	1,243.3	465.6	445.4	…	445.4	…	…
Hungary	309.0	526.6	227.8	1,206.4	3.8	1,202.6	…	…
Macedonia	…	189.7	…	…	…	…	…	…
Poland	457.6	389.8	1,368.2	1,040.5	459.4	581.2	…	…
Romania	27.6	381.2	392.8	424.0	…	7.4	…	…
Serbia	…	…	…	387.7	…	387.7	383.9	…
Turkey	13,149.4	20,620.8	16,255.1	19,869.0	6,384.9	2,192.7	1,738.8	2,326.3
Commonwealth of Independent States	**16,321.1**	**33,117.2**	**25,660.5**	**25,266.7**	**3,168.4**	**3,532.5**	**60.0**	**249.8**
Armenia	…	75.0	…	150.0	150.0	…	…	…
Azerbaijan	2,425.0	…	110.0	100.0	…	…	60.0	160.0
Belarus	411.5	58.5	…	63.5	…	63.5	…	…
Georgia[1]	…	…	112.5	…	…	…	…	…
Kazakhstan	…	1,660.0	2,879.5	566.0	…	60.0	…	…
Moldova	…	…	55.0	…	…	…	…	…
Russia	13,484.6	30,677.4	16,489.7	16,027.2	2,643.4	3,329.0	…	89.8
Ukraine	…	646.3	3,059.9	460.0	375.0	80.0	…	…
Uzbekistan	…	…	2,954.0	7,900.0	…	…	…	…
Developing Asia	**151,236.4**	**154,204.0**	**128,308.8**	**160,717.0**	**45,543.4**	**46,475.9**	**44,713.2**	**2,200.1**
Bangladesh	…	…	261.6	745.0	…	400.0	…	…
Bhutan	92.2	…	…	…	…	…	…	…
Brunei Darussalam	…	…	353.5	…	…	…	…	…
China	24,141.6	27,364.2	38,306.6	74,702.1	31,576.2	23,263.7	10,418.4	832.0
India	88,730.7	78,452.5	58,518.8	48,295.8	8,239.7	13,860.9	18,120.9	442.9
Indonesia	9,796.3	12,424.2	11,952.7	12,256.6	1,884.4	3,142.4	3,903.3	700.0
Lao P.D.R.	2,888.7	…	…	701.7	…	701.7	…	…
Macao SAR	3,205.2	5,101.1	1,306.4	…	…	…	1,596.0	…
Malaysia	9,043.4	12,808.0	8,991.8	6,218.2	1,394.6	1,774.4	6,054.9	225.2
Marshall Islands	660.0	2,067.2	240.0	690.0	360.0	…	354.0	…
Mongolia	36.0	150.0	319.0	153.0	82.0	71.0	…	…
Pakistan	503.2	834.7	64.2	130.1	…	130.1	…	…
Papua New Guinea	…	718.0	57.0	600.0	…	600.0	…	…
Philippines	3,131.5	3,264.4	1,693.6	5,243.5	783.1	1,000.0	…	…
Sri Lanka	200.0	150.0	337.5	100.0	…	…	…	…
Thailand	5,698.0	7,449.6	3,574.7	9,838.0	933.0	1,131.5	3,487.6	…
Vietnam	3,109.5	3,420.2	2,331.3	1,043.1	290.4	400.3	778.0	…

Table 7. *(concluded)*

	2010	2011	2012	2013	2013 Q3	2013 Q4	2014 Q1	2014 Q2
Middle East and North Africa	**31,246.0**	**20,110.9**	**21,601.8**	**35,702.8**	**8,346.6**	**4,912.7**	**5,096.8**	...
Algeria	1.9	...	...	...	...	-	...	...
Bahrain	294.9	698.0	646.2	705.0	...	...	...	...
Egypt	3,240.6	2,619.4	931.6	285.4	...	...	...	...
Iraq	...	400.0	...	...	...	...	...	...
Kuwait	2,771.6	1,657.2	150.0	2,137.0	750.0	1,387.0	...	...
Morocco	...	...	1,639.7	...	...	...	...	...
Oman	1,944.2	1,213.1	637.0	793.2	793.2	...	600.0	...
Qatar	45.0	6,060.4	3,841.4	1,100.7	450.7	...	1,350.0	...
Saudi Arabia	14,792.4	1,789.4	8,168.4	9,840.3	1,200.0	2,700.7	2,448.8	...
Tunisia	...	85.0	...	96.7	...	...	...	...
United Arab Emirates	8,155.5	5,588.5	5,587.6	20,744.5	5,152.7	825.0	697.9	...
Latin America and the Caribbean	**24,919.9**	**28,149.4**	**17,887.1**	**24,297.6**	**5,159.3**	**5,346.5**	**8,850.5**	**802.5**
Antigua and Barbuda	...	...	...	94.0	...	...	...	...
Argentina	713.0	1,803.8	595.1	50.0	50.0	...	...	...
Bolivia	253.0	200.0	...	300.0	...	300.0	...	...
Brazil	10,326.5	7,033.0	9,485.0	14,753.9	3,497.8	3,087.5	4,831.9	...
Chile	1,704.4	4,397.2	2,870.7	3,228.0	449.5	957.7	189.2	317.5
Colombia	1,993.0	4,571.8	713.8	...	...	...	...	...
Costa Rica	5.8	175.0	60.0	142.0	...	75.0	...	...
Dominican Republic	1,274.7	...	150.0	...	...	...	...	...
Ecuador	...	36.0	...	48.6	48.6	...	16.0	...
El Salvador	200.0	...	300.0	...	...	...	120.0	...
Guatemala	...	300.0	40.0	...	...	...	...	...
Haiti	...	...	...	26.5	...	...	...	...
Honduras	...	30.0	...	49.3	...	49.3	44.4	...
Jamaica	750.2	873.2	...	...	...	...	...	...
Mexico	4,278.8	4,248.2	2,430.4	2,506.4	86.0	464.0	1,684.0	485.0
Panama	374.3	612.2	967.1	776.9	70.9	153.0	105.0	...
Peru	1,532.4	579.0	275.0	2,233.5	956.5	260.0	1,860.0	...
Trinidad and Tobago	13.8	...	...	...	...	...	...	...
Uruguay	...	200.0	...	88.5	...	...	...	...
Venezuela	1,500.0	3,090.0	...	...	...	...	...	...

Source: Dealogic.

Note: Deal inclusion for external private source gross lending on a committed basis to governments and public and private firms, which may or may not be fully disbursed, and generally excluding bilateral deals. Such new issuance or contract agreements are not directly comparable to flow data from the balance of payments nor imply increases in the stock of external debt, as the proceeds may have been offset with coinciding amortizations.

[1]Georgia is not a member of the Commonwealth of Independent States, but it is included in this group for reasons of geography and similarities in economic structure.

Table 8. Equity Valuation Measures: Dividend-Yield Ratios

	2009	2010	2011	2012	2013	2013 Q3	2013 Q4	2014 Q1	2014 Q2	Ten-Year Average
Emerging markets	**2.0**	**2.1**	**3.0**	**2.7**	**2.6**	**2.9**	**2.6**	**2.7**	**2.7**	**2.6**
Asia	**1.7**	**2.0**	**2.8**	**2.3**	**2.3**	**2.5**	**2.3**	**2.4**	**2.4**	**2.4**
Europe/Middle East/Africa	**2.2**	**2.1**	**3.2**	**3.5**	**3.2**	**3.7**	**3.2**	**3.4**	**3.2**	**2.7**
Latin America	**2.7**	**2.3**	**3.3**	**3.2**	**3.0**	**3.5**	**3.0**	**3.2**	**3.5**	**2.9**
Argentina	1.1	1.9	8.4	5.6	1.5	5.8	1.5	1.5	1.4	3.3
Brazil	2.9	2.7	4.1	4.1	3.8	4.7	3.8	4.2	4.7	3.6
Chile	1.6	1.4	2.3	2.1	2.2	1.9	2.2	2.3	2.6	2.2
China	1.9	2.2	3.2	2.9	3.1	3.5	3.1	3.4	3.4	2.5
Colombia	2.8	2.1	2.6	2.9	3.2	3.2	3.2	3.0	2.8	2.6
Egypt	4.8	3.5	5.3	3.5	2.2	3.3	2.2	2.3	2.4	3.3
Hungary	1.3	1.6	2.4	3.5	2.6	3.6	2.6	2.7	3.1	2.5
India	0.9	0.9	1.5	1.3	1.4	1.4	1.4	1.4	1.4	1.3
Indonesia	1.9	2.2	2.4	2.4	2.7	2.4	2.7	2.4	2.4	2.7
Jordan	3.1	2.5	3.1	4.3	4.4	4.8	4.4	4.0	3.6	2.9
Malaysia	2.4	2.3	2.8	2.9	2.8	2.9	2.8	2.9	2.8	2.7
Mexico	2.4	1.6	1.2	1.4	1.5	1.5	1.5	1.6	1.5	1.8
Morocco	4.9	4.3	5.5	4.7	4.5	4.5	4.5	4.3	4.0	3.9
Pakistan	6.4	5.6	8.3	7.1	6.3	7.0	6.3	5.9	4.5	6.4
Philippines	2.2	2.4	2.7	2.0	1.9	1.8	1.9	1.7	1.6	2.4
Poland	3.0	2.5	5.4	5.6	4.6	6.1	4.6	4.6	4.3	3.9
Russia	1.4	1.5	2.4	3.6	3.5	3.9	3.5	3.9	4.3	2.2
South Africa	2.7	2.3	3.2	3.2	2.9	3.2	2.9	3.1	2.8	3.0
Sri Lanka	1.6	1.2	2.2	2.2	2.2	2.1	2.2	2.1	2.1	2.6
Thailand	2.9	2.6	3.3	2.8	3.3	2.9	3.3	3.2	3.1	3.5
Turkey	2.1	2.2	3.3	2.2	2.7	2.3	2.7	2.3	1.9	2.9

Sources: Bloomberg L.P.; and Morgan Stanley Capital International (MSCI).
Note: The country and regional classifications used in this table follow the conventions of MSCI, and do not necessarily conform to IMF country classifications or regional groupings.

Table 9. Equity Valuation Measures: Price/Earnings Ratios

	2009	2010	2011	2012	2013	2013 Q3	2013 Q4	2014 Q1	2014 Q2	Ten-Year Average
Emerging markets	**20.6**	**14.6**	**10.8**	**12.7**	**12.1**	**11.8**	**12.1**	**12.3**	**12.9**	**13.7**
Asia	**24.3**	**15.2**	**11.4**	**13.2**	**12.3**	**12.1**	**12.3**	**12.3**	**12.6**	**14.5**
Europe/Middle East/Africa	**16.2**	**12.1**	**8.2**	**9.2**	**9.2**	**8.5**	**9.2**	**9.6**	**10.9**	**12.1**
Latin America	**18.3**	**15.9**	**11.8**	**16.4**	**16.0**	**15.8**	**16.0**	**16.9**	**17.4**	**14.2**
Argentina	8.0	8.8	5.2	3.3	6.3	3.9	6.3	7.9	6.8	17.7
Brazil	17.0	13.8	9.8	14.3	13.4	13.5	13.4	14.8	14.7	12.4
Chile	18.7	21.4	17.2	23.2	21.0	25.6	21.0	20.5	20.4	21.0
China	21.1	14.6	9.4	11.3	10.0	9.2	10.0	9.6	9.8	14.6
Colombia	25.1	23.5	17.2	19.3	18.0	18.4	18.0	19.4	19.1	20.1
Egypt	13.9	17.4	10.3	13.8	22.7	17.2	22.7	22.9	25.2	16.7
Hungary	14.2	12.2	8.7	13.7	12.3	12.6	12.3	13.1	13.1	11.4
India	21.8	22.4	14.4	16.3	17.1	15.4	17.1	17.3	19.0	18.6
Indonesia	16.4	19.0	15.2	16.2	14.6	17.7	14.6	16.4	16.2	15.5
Jordan	15.9	21.3	16.9	11.6	14.5	13.0	14.5	14.1	15.2	22.1
Malaysia	20.3	18.1	16.9	14.8	17.5	16.6	17.5	17.2	17.1	16.3
Mexico	22.7	23.9	21.8	21.5	22.9	20.9	22.9	21.7	24.8	18.2
Morocco	14.3	17.5	14.0	12.3	13.8	11.6	13.8	15.9	15.9	19.8
Pakistan	10.1	9.1	6.2	7.6	10.4	8.9	10.4	9.9	10.4	9.7
Philippines	19.1	17.5	15.8	19.9	18.8	20.6	18.8	20.5	23.0	16.9
Poland	19.3	14.1	8.0	8.7	12.8	10.2	12.8	14.3	15.0	12.6
Russia	15.6	8.3	4.9	5.6	5.2	4.9	5.2	5.0	5.5	9.6
South Africa	16.6	18.9	16.4	15.9	18.7	16.4	18.7	18.2	19.4	15.8
Sri Lanka	77.7	20.5	13.2	14.1	14.9	14.6	14.9	15.4	16.0	19.3
Thailand	19.3	14.8	11.1	15.9	12.8	15.0	12.8	13.5	15.1	12.9
Turkey	12.6	10.8	9.2	12.0	8.7	10.5	8.7	9.9	12.0	11.2

Sources: Bloomberg L.P.; and Morgan Stanley Capital International (MSCI).
Note: The country and regional classifications used in this table follow the conventions of MSCI and do not necessarily conform to IMF country classifications or regional groupings.

Table 10. Emerging Markets: Mutual Funds
(Billions of U.S. dollars)

Net Flows	2010	2011	2012	2013	2013 Q3	2013 Q4	2014 Q1	2014 Q2
Bonds	**53.3**	**15.9**	**58.8**	**−25.1**	**−19.5**	**−17.6**	**−18.4**	**12.4**
Global	46.5	13.6	47.1	−19.5	−15.8	−13.9	−14.8	15.9
Asia	6.6	2.6	0.8	−2.4	−2.7	−2.0	−2.7	−0.8
Europe/Middle East/Africa	−0.2	−1.0	−0.4	0.5	−0.2	−0.2	−0.2	−0.1
Latin America	0.4	0.8	0.7	−3.7	−0.7	−1.5	−0.6	−2.5
Equities	**95.7**	**−46.2**	**52.3**	**−25.1**	**−13.6**	**−11.0**	**−42.9**	**13.4**
Global	63.6	−4.6	33.8	−19.5	1.1	−3.5	−21.9	16.1
Asia	22.1	−23.7	−6.2	−2.4	−10.0	−1.4	−15.3	−1.4
Europe/Middle East/Africa	7.3	−7.0	−1.7	0.5	−1.6	−1.9	−1.9	−0.6
Latin America	2.6	−10.9	−1.5	−3.7	−3.1	−4.1	−3.7	−0.7

| Net Asset Values	2010	2011	2012	2013	2013 Q3	2013 Q4	2014 Q1	2014 Q2
Bonds	**162.0**	**183.3**	**301.8**	**326.2**	**336.8**	**326.2**	**319.6**	**348.5**
Global	141.9	157.3	264.7	265.5	277.9	265.5	260.3	288.5
Asia	14.5	20.0	28.7	30.3	30.8	30.3	28.7	30.5
Europe/Middle East/Africa	3.2	3.0	4.5	6.0	6.2	6.0	6.1	6.3
Latin America	2.4	2.9	4.0	24.5	21.9	24.5	24.4	23.2
Equities	**950.2**	**774.1**	**1,016.9**	**1,071.2**	**1,055.3**	**1,071.2**	**1,027.4**	**1,117.8**
Global	476.8	416.4	562.4	580.1	569.8	580.1	559.3	618.6
Asia	329.7	262.6	343.9	385.1	372.8	385.1	369.9	394.9
Europe/Middle East/Africa	62.6	40.1	52.2	55.3	57.1	55.3	52.1	55.2
Latin America	81.1	55.0	58.4	50.7	55.7	50.7	46.1	49.1

Source: EPFR Global.

Note: Flows data derive from both traditional and alternative funds domiciled globally with $23.5 trillion in assets. The country and regional classifications used in this table follow the conventions of Emerging Portfolio Fund Research and individual fund managers and do not necessarily conform to IMF country classifications or regional groupings.

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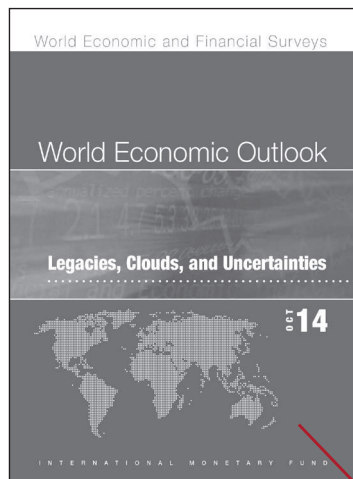
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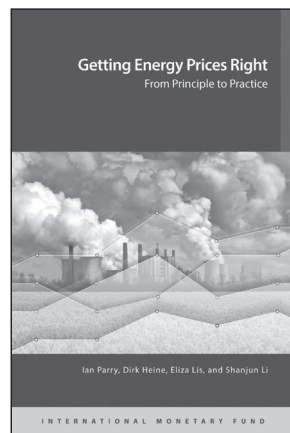
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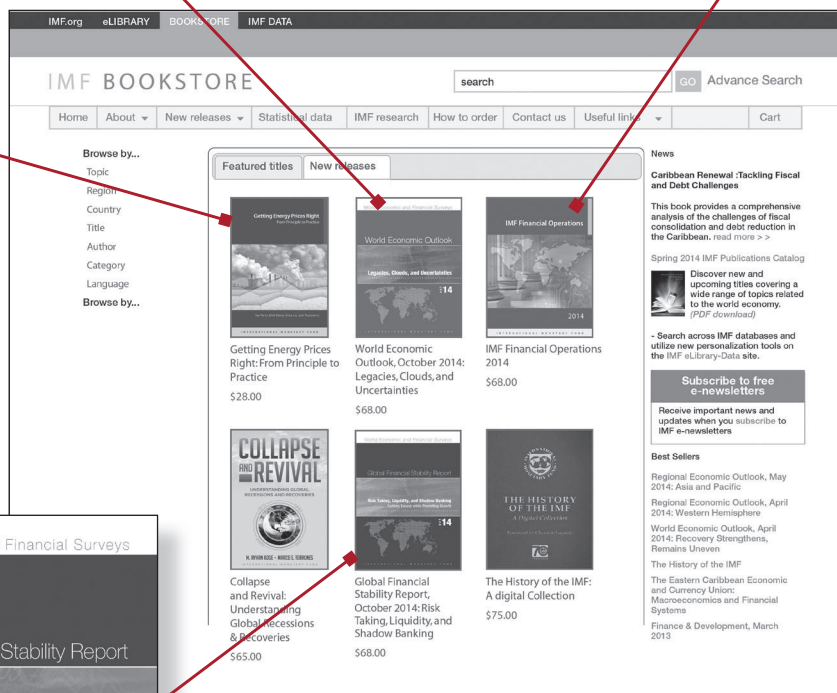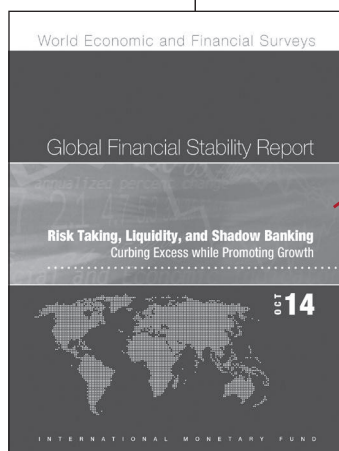
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