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CONFIDENTIAL

September 12, 2014

To: Members of the Executive Board

From: The Secretary

Subject: **October 2014 Global Financial Stability Report—Executive Summary and Chapter 1**

Attached for consideration by the Executive Directors is the executive summary and chapter 1 of the *October 2014 Global Financial Stability Report*, which is tentatively scheduled for discussion on **Thursday, September 25, 2014**.

Questions may be referred to Mr. Dattels (ext. 37938) and Mr. Jones (ext. 35633) in MCM.

This report will be revised for publication in light of the Executive Board discussion. An edited version of the executive summary and chapter 1 will be made available to media in advance of the press conference tentatively scheduled for **Wednesday, October 8, 2014**, and subsequently published on the IMF's external website. If Executive Directors have additional comments they may notify Mr. Dattels or Mr. Jones by the **close of business on Tuesday, September 23, 2014**.

This document will shortly be posted on the extranet, a secure website for Executive Directors and member country authorities.

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Department Heads

OCTOBER 2014 GLOBAL FINANCIAL STABILITY REPORT

EXECUTIVE SUMMARY

September 12, 2014

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 tradeoff between the upside economic benefits against 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 pre-crisis 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 pre-crisis levels, banks have only recently stopped tightening corporate lending, and economic policy uncertainty remains elevated. Major emerging market economies—Brazil, China, India, Russia, and South Africa—face weakening export growth, tightening credit standards, and deteriorating business confidence. 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. With a growing share of credit instruments held in mutual fund portfolios, they now hold 27 percent of global high-yield debt, a doubling in share since 2007. At the same time, the fund management industry has become more concentrated. The top 10 global asset management firms now account for over $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 U.S., 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 potentially risks to credit markets, the report examines the impact of a rapid market adjustment that causes term premia in bond markets to revert to historic norms (increasing by 100 basis points) and credit risk premia 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 in different stages, with the first stage focusing 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 breath 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, where they will need a more fundamental overhaul in their business models. This will include a combination of re-pricing existing business lines, re-allocating 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 re-pricing to generate sustainable profits and rebuild capital buffers. Such a re-pricing 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 headwinds 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 over 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 which can threaten stability. Improving the monetary policy trade-off and containing the financial stability risks identified in this report requires 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.

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, through 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 (NAVs), 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.

Policy makers 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 performing 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, broadly defined measures of shadow banking that include investment funds show that it is growing. 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 their ownership structure, governance, and executive pay incentives. The results show that banks with board members that 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. They 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.

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TABLES

ANNEXES

CHAPTER 1: IMPROVING THE BALANCE BETWEEN FINANCIAL AND ECONOMIC RISK TAKING

Overall, this report's assessment is that current stability risks calls for increased vigilance. According to the 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.

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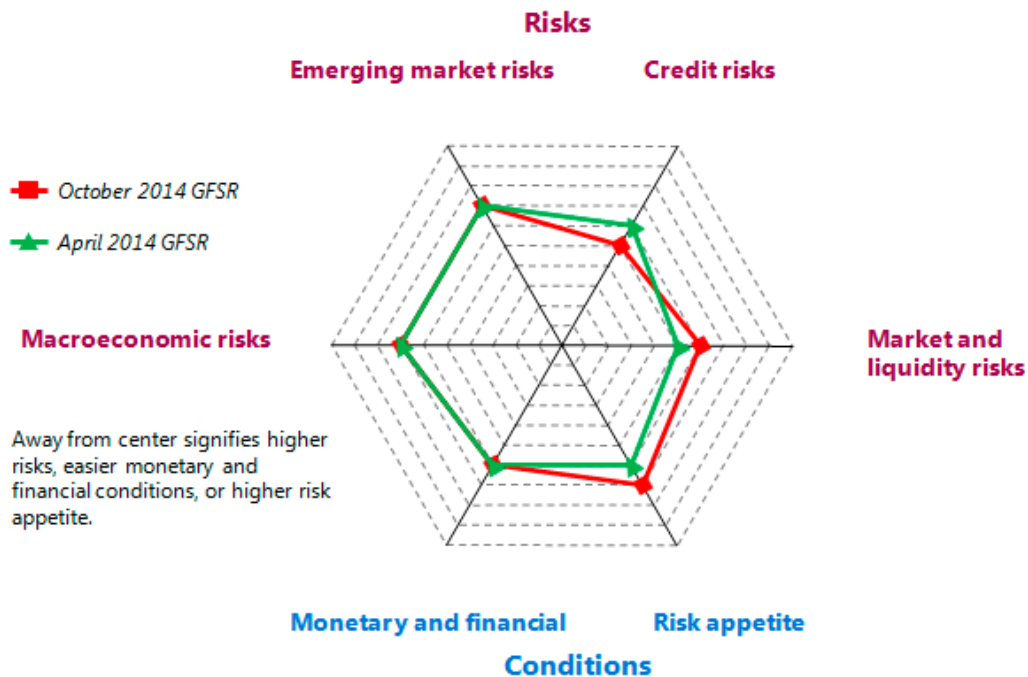
Source: IMF staff estimates.

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.
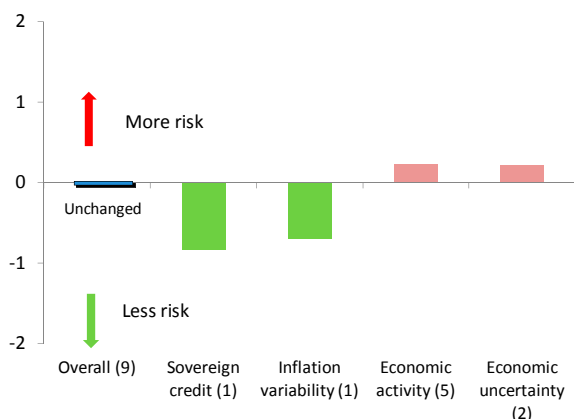
Emerging market risks are unchanged because subdued growth was offset by supportive policy actions and improved external conditions.
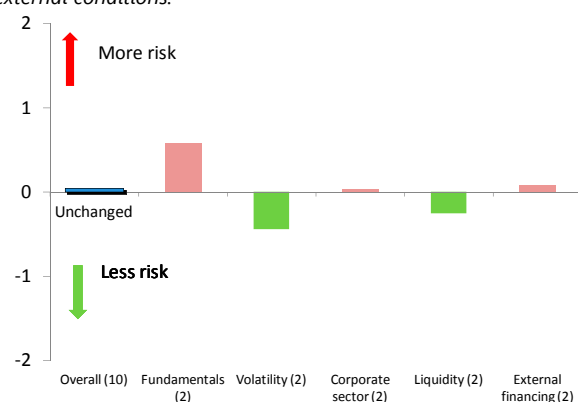
Credit risks have declined, led by improved bank funding conditions and balance sheet repair.
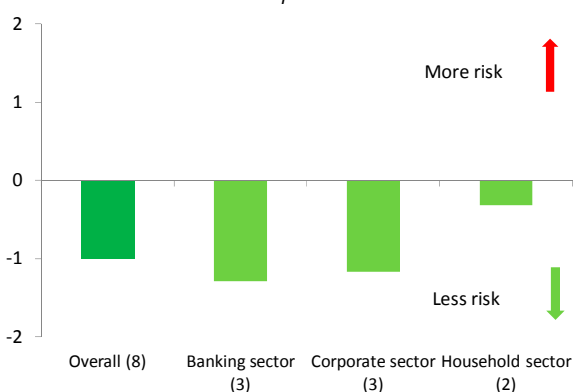
Monetary and financial conditions remain accommodative, with lending conditions and excess liquidity mostly unchanged.
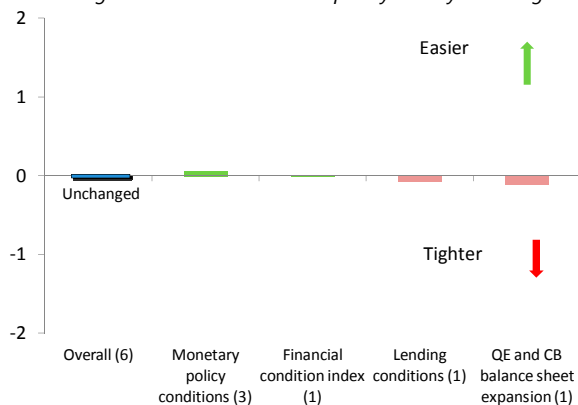
Risk appetite increased on expectations that continued monetary accommodation will support asset prices.
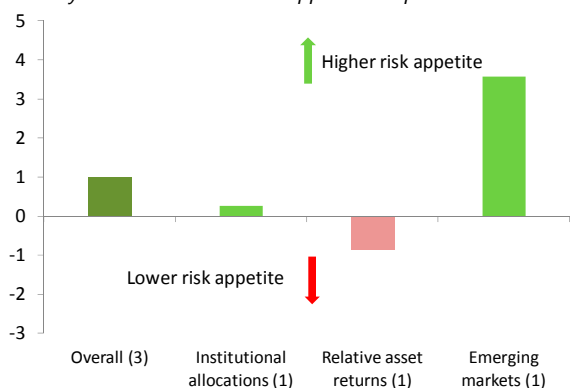
Market and liquidity risks have increased as investors reach for yield in less liquid assets.
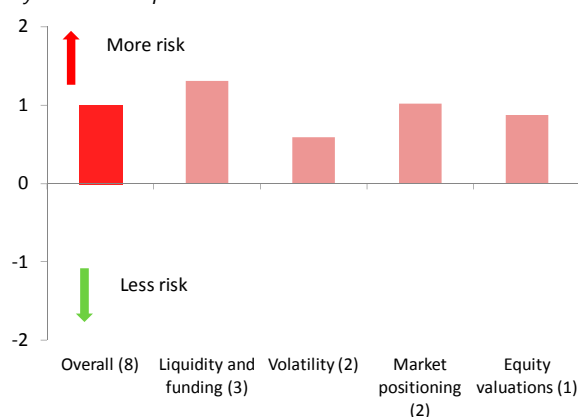
Source: IMF staff estimates.
Note: Changes in risks and conditions are based on a range of indicators, complemented with IMF staff judgment (see Annex 1.1. in the April 2010 GFSR and Dattels and others (2010) for a description of the methodology underlying the Global Financial Stability Map). Overall 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.

1.   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").

2.   *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 build-up of leverage and deteriorating credit quality. The imbalances between economic and financial risk taking are examined further in the section "Monetary Policy and the Balance between Financial and Economic Risk Taking."

3.   *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 in the 10-year Treasury rate since April 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 lower for longer extend the search for yield and the build-up of financial stability risks discussed throughout this chapter.

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)
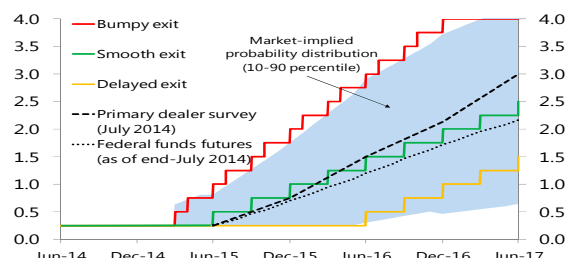
Sources: Bloomberg L.P.; Federal Reserve; and IMF staff calculations.
Note: Market implied probability distribiion is derived from eurodollar options as of end-July 2014.

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

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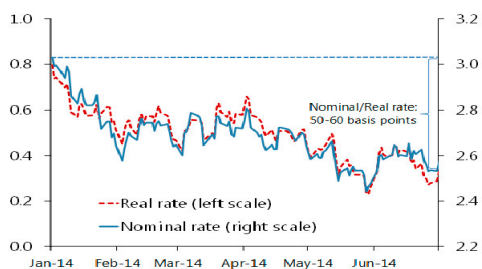
Source: Bloomberg L.P.

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

5. Terminal Federal Funds Rate
   (Percent)
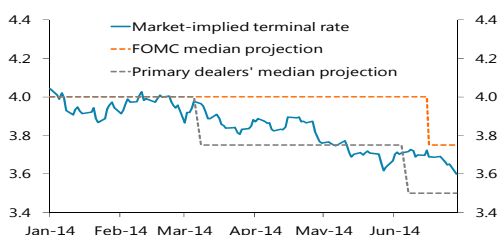
Sources: Bloomberg L.P.; Kim and Wright (K and W) (2005, updated); and IMF staff estimates.
Note: The market-implied terminal rate is derived from the 10-year Treasury rate, the 10-year term premium (Kim and Wright 2005) and the expected months to liftoff in Federal funds rate. The pace of rate hikes is assumed to be 100 basis points per year until the terminal rate is reached. FOMC = Federal Open Market 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)
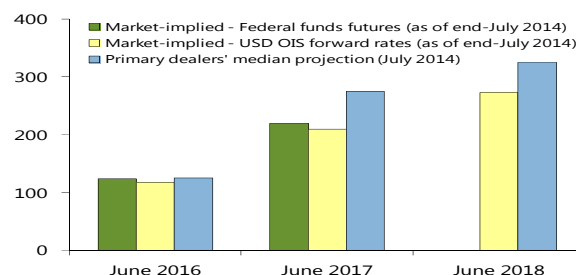
Sources: Bloomberg L.P.; and Federal Reserve Bank of New York.
Note: Federal Fund futures are not available beyond July 2017. USD OIS = U.S. dollar overnight indexed swap.

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

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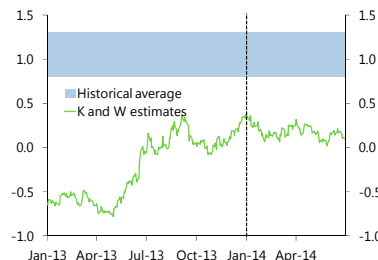
Sources: Kim and Wright (K andW) (2005, updated); and IMF staff estimates.
Note: The upper bound of the blue bar indicates the average K andW term premium from 1990 to 2007, while the lower bound indicates the average term premium from 2000 to 2007.

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)
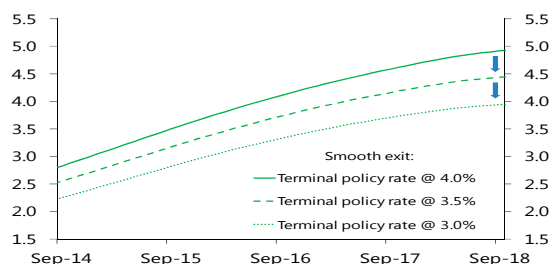
Source: IMF staff projections.

4.   *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 default. External imbalances that led to currency and bond selloffs 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 favorable 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.

5.   *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 birds-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 low) 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 "Global Markets at Increased Risk from a Liquidity Shock") may amplify the impact of liquidity shocks.

6.   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 (Annex 1.1).

Figure 1.4. Emerging Market Developments

Improvements in external balances . . .

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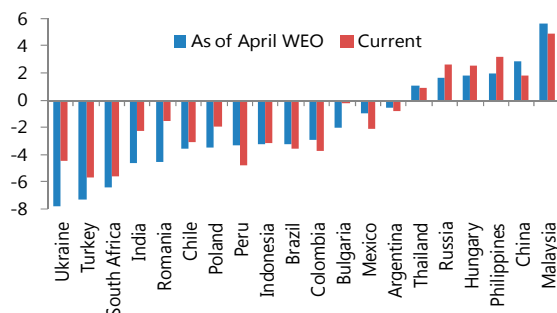
Source: IMF, World Economic Outlook database.

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

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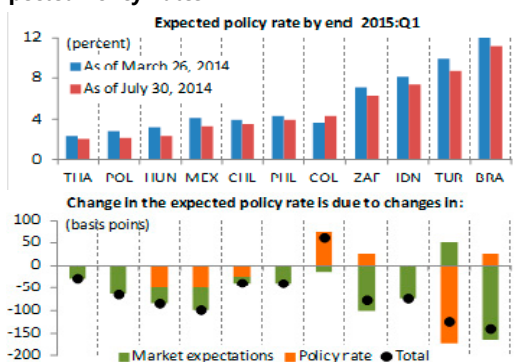
Sources: Haver Analytics; IMF, Economic Data Sharing System database; and IMF staff calculations.
Note: Data labels use International Organization for Standardization country codes.

But corporate leverage and household indebtedness have continued to rise.

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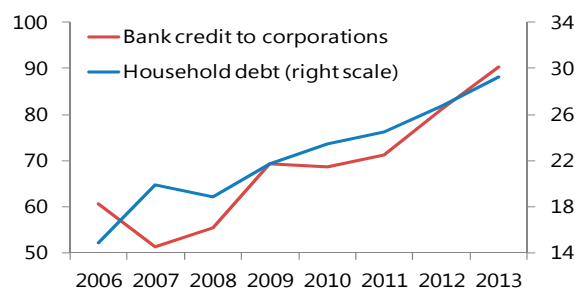
Sources: Bank for International Settlements; CEIC; IMF, Financial Soundness Indicators database; and IMF staff calculations.

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

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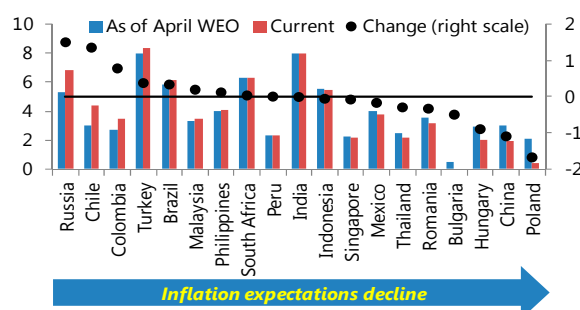
Source: IMF, World Economic Outlook database.

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

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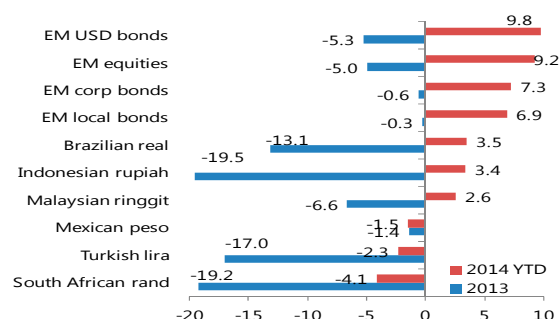
Sources: Bloomberg L.P.; and JPMorgan Chase & Co.
Note: EM = emerging market; SA = South Africa; USD = U.S. dollar.

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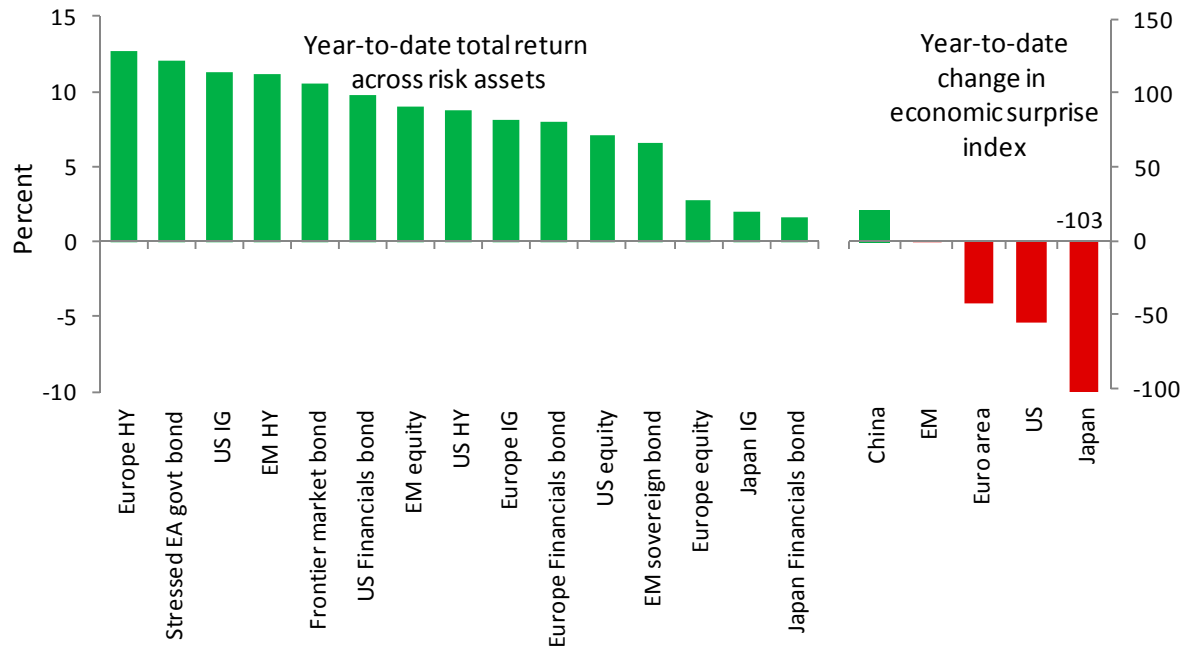
Source: IMF staff calculations.
Note: emerging market = emerging markets, EA = euro area; HY = high yield; IG = investment grade; YTD = year to date.

Figure 1.6. Global Heat Maps

1. Asset Price Heat Map

AE equities
EM equities
AE bonds
EM bonds
Credit
AE FX
EM FX
Commodities

2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014

Percentile

0   0.25   0.50   0.75   1.00
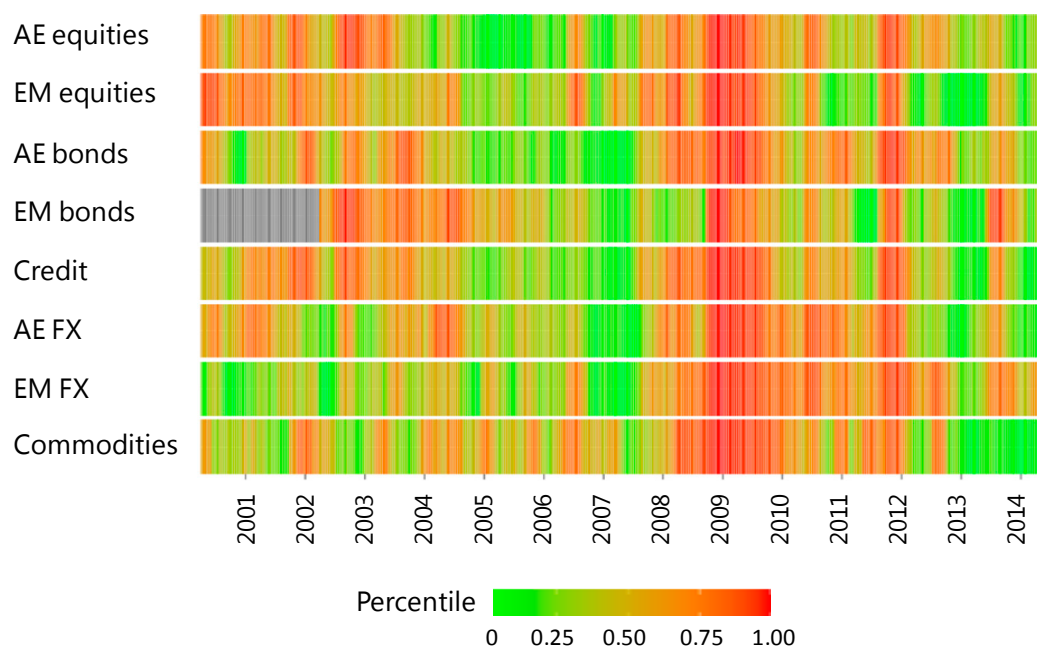
Source: IMF staff calculations.
Note: red = top (bottom) 10 percent of equity prices (bond spreads); green = bottom (top) 50 percent of equity prices (bond spreads);
yellow = remainder of the price (spread) distribution over July 2004 – June 2014. EM = emerging market; EU = European Union; US = United States.

2. Volatility Heat Map

AE equities
EM equities
AE bonds
EM bonds
Credit
AE FX
EM FX
Commodities

2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014

Percentile

0   0.25   0.50   0.75   1.00
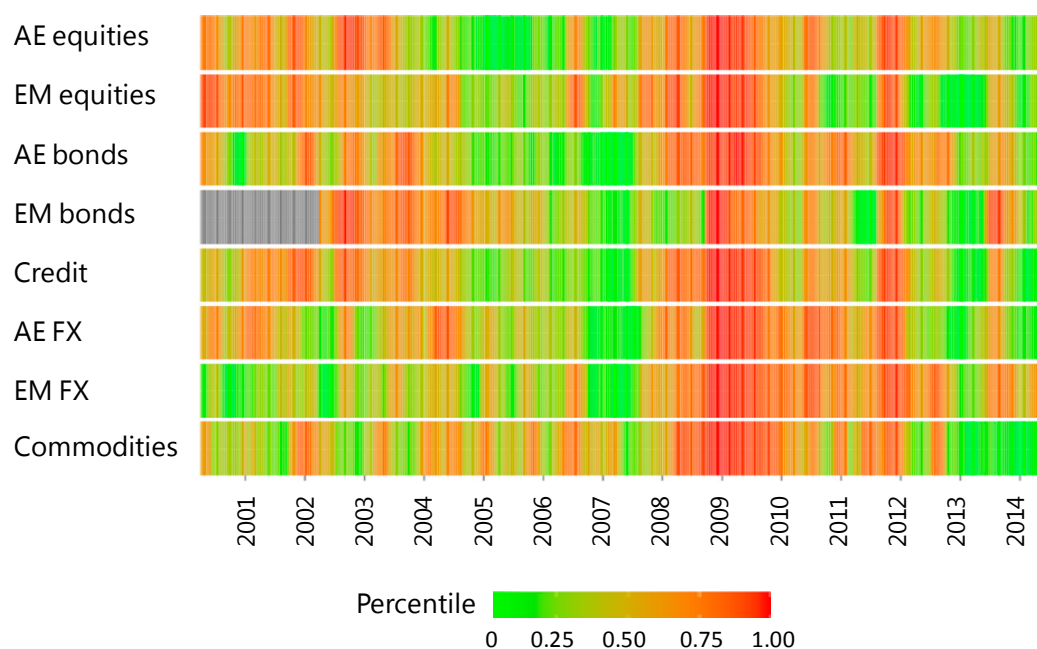
Sources: Bloomberg L.P.; and IMF staff calculations.
Note: Percentiles of three-month realized volatility. AE = advanced economy; emerging market = emerging markets; FX = foreign exchange. Percentile
value of 1 corresponds to the maximum level of asset volatility for the entire period, 0 corresponds to the minimum.

- *Sovereign bond spreads in some euro area countries have become compressed by more than predicted by models of fair value.* A model-based analysis of bond valuations (Annex 1.1) indicates that spreads are 40–60 bps lower for Italy, 30–60 bps for Spain, and 10–20 bps for France relative to estimated equilibrium levels. Although any modeling exercise of this type faces methodological issues that create uncertainty around the estimates, it is clear that unwinding an overvaluation may affect banks and their funding costs. This outcome, possibly combined with uncertainties about the pending results of the European Central Bank (ECB) comprehensive assessment and related corrective action, could lead to increased volatility.

- *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 is rising foreshadows sub-par returns. Indeed, high-yield issuance has taken off in both the United States and the rest of the world, and in both 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 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 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.

IS 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 States, and the United Kingdom. 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 emerging market companies, but corporate vulnerabilities are more pronounced in China.

7. The use of accommodative conventional and unconventional monetary policies involves a tradeoff 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 markets.

Despite improvements, balance sheet repair is incomplete

8. 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, household balance sheet repair 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. Net asset positions remain fragile in Greece, Ireland and Spain despite recent improvements, and household liabilities as a share of GDP are high in Ireland, Portugal, and Spain.

9.   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 relatively high compared with 2005–07. 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. In these countries, the benefits of unconventional monetary policy have been transmitted only very gradually given the still fragmented state of euro area financial markets.

Figure 1.7. Indebtedness and Leverage in Selected Advanced Economies

1. Financial Assets and Liabilities of Households, 2000–13 (Percent of GDP)

2. Equity and Debt of Nonfinancial Corporates (Percent GDP)
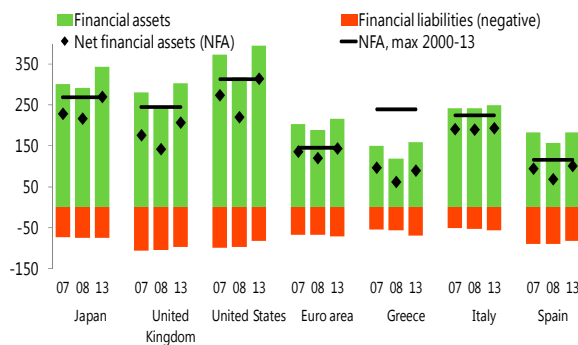
Note: Last quarter scaled by GDP in year.
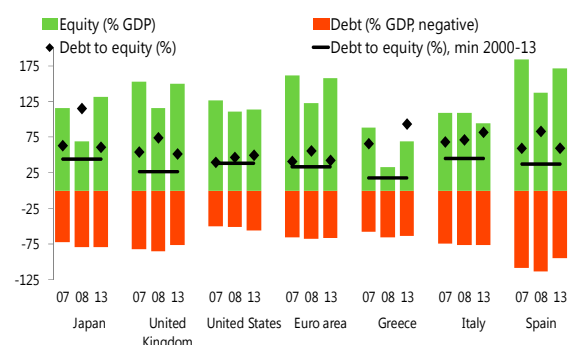
Note: Debt calculations include an adjustment for estimated intercompany loans, where necessary. Credit market debt over net worth (market value) for United States.

Economic risk taking is lagging financial risk taking

10.   Low rates have encouraged firms to take on greater levels 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 developed economies 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*.

11.   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 supportive,

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[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, relationship 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

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.

12. 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 pre-crisis 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 more recently shifted from use for equity buybacks (increasing financial leverage) to investment (raising future earnings). If sustained, these trends could lead to further gains in capital investment and economic risk taking in the United States in the coming months.

13. 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 accelerating business fixed investment. An aging capital stock and high capacity utilization rates have also contributed to the investment pickup, along with stronger corporate earnings and easier financing conditions. Healthy balance sheets have enabled firms to respond to stepped-up growth expectations.

14. In contrast, in the euro area, business fixed investment—although trending up—remains weak. Capacity utilization is still below pre-crisis levels, bank lending standards have been tightening until recently, and economic policy uncertainty remains elevated relative to the pre-crisis period. As a result, growth in bank lending to euro area firms continues to contract in the periphery and is anemic in the core. 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 stressed economies (as discussed in past GFSRs). Overall, corporate capital expenditures, as a percentage of operating cash flows remain 15 percent below the historical average in the periphery and 2 percent below that in the core (Figure 1.9, panel 4).

15. In major emerging market economies—Brazil, China, India, Russia, and South Africa—capital expenditures by nonfinancial firms declined across the board in 2013, amid weakening export growth, tightening credit standards, and deteriorating business confidence. As a result, in these countries growth in corporate borrowing from banks has decelerated from about 10 percent (pre-crisis average) to 5 percent, in real terms, and leading indicators do not point to a strong pickup in capital expenditures in the near future.

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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: Nonfinancial Firms: Capital Expenditure Developments

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

1. Capacity Utilization and Business Fixed Investment
(Percent)
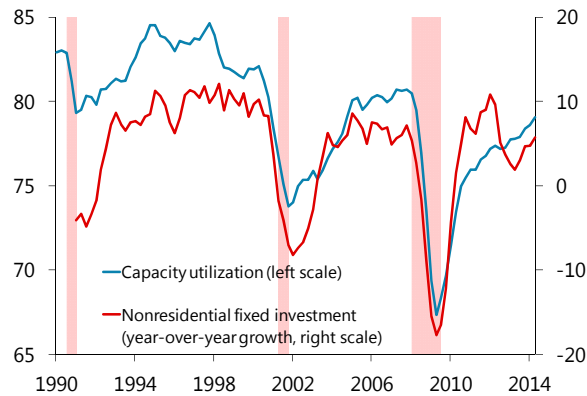
Sources: Bureau of Economic Analysis; Federal Reserve; and IMF staff estimates.

Economic policy uncertainty is declining . . .

3. Economic Policy Uncertainty Index
(1985–2009=100, 6-month moving average)
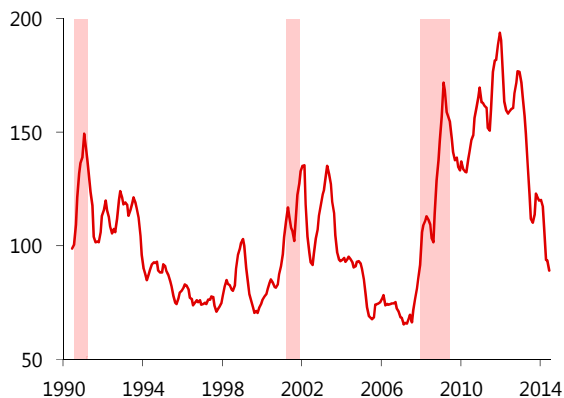
Sources: Baker, Bloom, and Davis (2012); Haver Analytics; and IMF staff estimates.
Note: Pink bars indicate National Bureau of Economic Research recession dates.

. . . and banks are loosening lending standards.

2. Lending Standards for Corporate Loans and Commercial and Industrial (C&I) Loan Growth
(Percent)
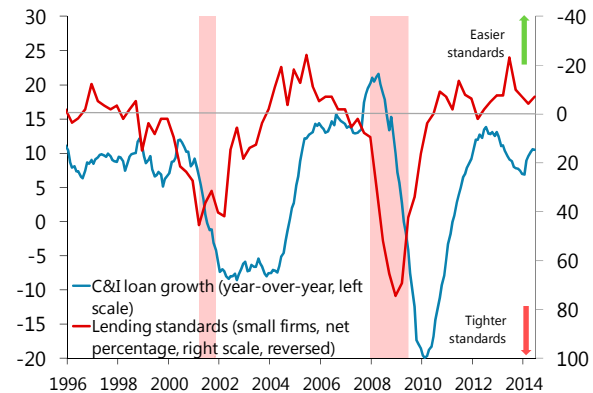
Source: Federal Reserve Senior Loan Officer Survey.

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

4. NFCs: Debt Issuance, Capex, and Equity Buybacks
(Percent of operating cash flows on a four-quarter trailing basis)
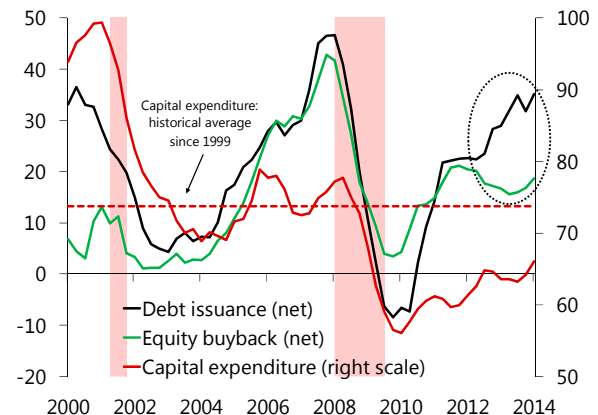
Sources: Federal Reserve; and IMF staff estimates.
Note: NFC = nonfinancial corporation.

Figure 1.9. Euro Area Nonfinancial Firms: Capital Expenditure Developments

Bank lending remains anemic as . . .

1. Euro Area Credit Conditions
   (Percent)
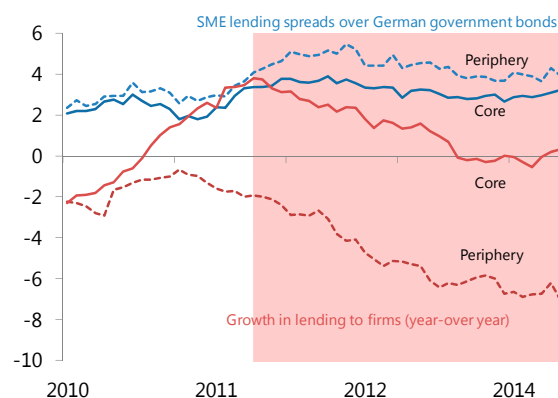
Sources: Eurostat; European Commission ; and IMF staff estimates.
Note : Shows spreads of one- to five-year corporate loans of less than
€1 million to five-year German government bonds. SME = small and
medium-sized enterprises.

. . . continue to dampen prospects for capex, while income data do not point to a strong pickup either...

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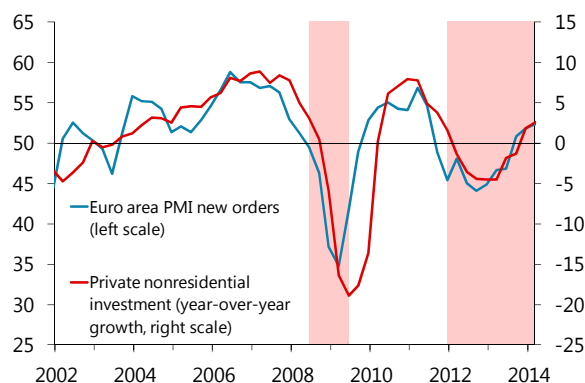
Sources: Haver Analytics; and IMF staff calculations.
Note: Pink bars indicate Center for Economic Policy Research recession dates.

. . . tight lending standards and elevated economic policy uncertainty . . .

2. European Economic Policy Uncertainty and Lending
   Standards
   (Percent)
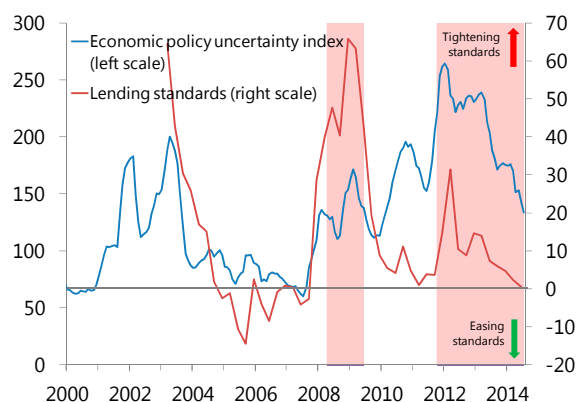
Sources: Baker, Bloom, and Davis (2012); Haver Analytics; and IMF staff
estimates.

Capital expenditure remains below its historical average.

4. Euro Area Nonfinancial Firms: Capital Expenditures
   (Percent of operating cash flows; four quarter cumulated
   flows)
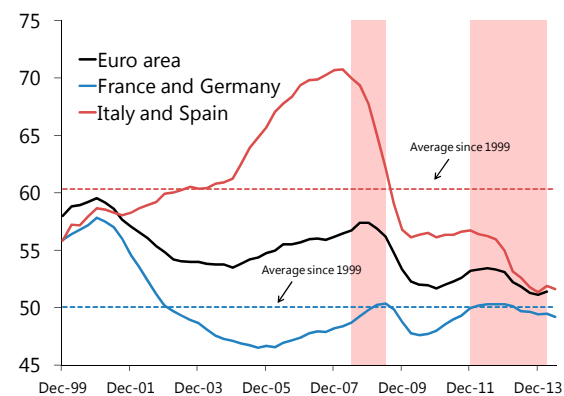
Sources: European Central Bank; Haver Analytics; and IMF staff estimates.

Figure 1.10. Financial Risk Taking and Volatility

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

1. **Risk-Return Tradeoffs under Different Monetary Policies**

Low volatility and high asset prices are highly synchronized.

2. **Volatility and Asset Price Percentiles**
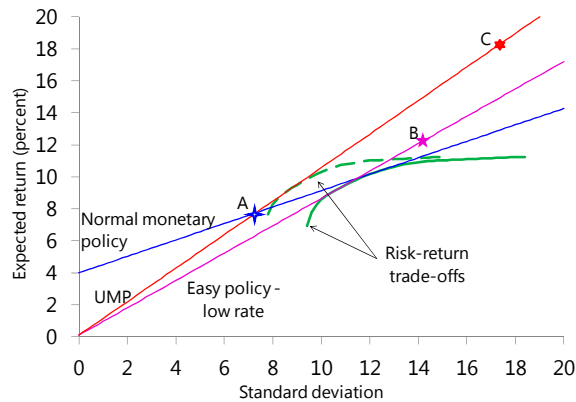
Sources: Bloomberg L.P.; and IMF staff calculations.
Note: A decline in the policy rate shifts the efficient frontier (from blue to green) and moves the optimal portfolio from A to B. A decline in volatility with UMP shifts the efficient frontier again (from green to red) and the optimal portfolio moves from B to C. UMP = unconventional monetary policy.
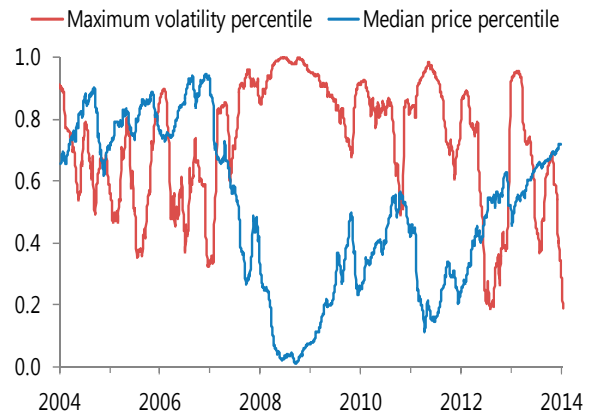
Sources: Bloomberg L.P.; and IMF staff calculations.
Note: The eight asset classes are advance economy equities; emerging market equities; advanced economy bonds; emerging market bonds; corporate credit; advanced economy foreign exchange rates; emerging market foreign exchange rates; and commodities.

Financial risk taking is on the rise

16. 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, as shown below.

17. 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 purple line) and inducing investors who have the capacity to do so to increase leverage (from

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[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 over the period 2001–13, while "safe" rates are based on prevailing policy rates. The shift in the risk-return tradeoff 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 2011–2013 period.

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 due to lower interest rates, leveraged investors become even more willing to hold risky assets (point C), since 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 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, no extreme valuations in major asset classes.

18.   Corporates 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. Previously, a reading this high would indicate that the economy was moving towards the later stages of the credit cycle (Figure 1.11, panel 2). 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.

19.   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

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[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.

[4] The CAPM exercise has the implication 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 over a five-year period minus expected losses over 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.

Figure 1.11. United States: Nonfinancial Corporations' Credit Fundamentals

U.S. firms do not face imminent debt repayment problems . . .

1. Nonfinancial Corporations: Refinancing Risks

So   1988   1992   1996   2000   2004   2008   2012

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

2. Nonfinancial Corporations: Leverage and Spreads

Sources: Bank of America Merrill Lynch; Federal Reserve; and IMF staff estimates.
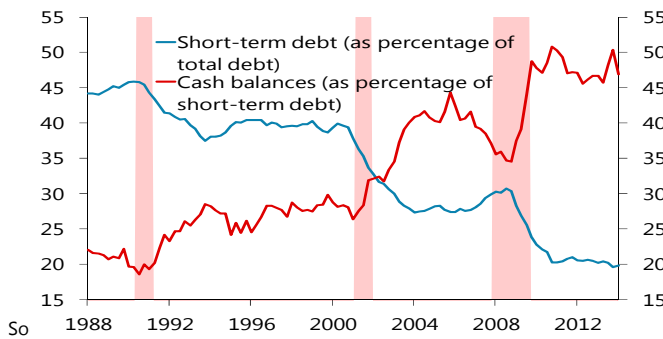
Default cushions have eroded in lower-rated segments of high-yield corporate bonds . . .

3. B-Rated Corporate Bond Spreads
(Basis points)
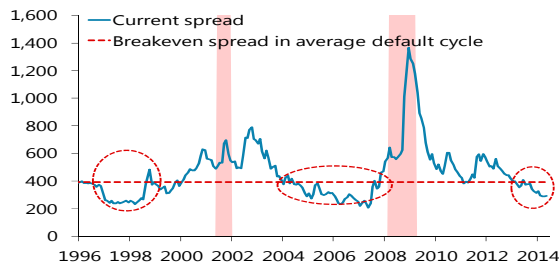
Sources: Bank of America Merrill Lynch; Moody's; and IMF staff estimates.

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

4. Leveraged Loan Transactions Greater than Six Times Earnings
(Percent of sample)
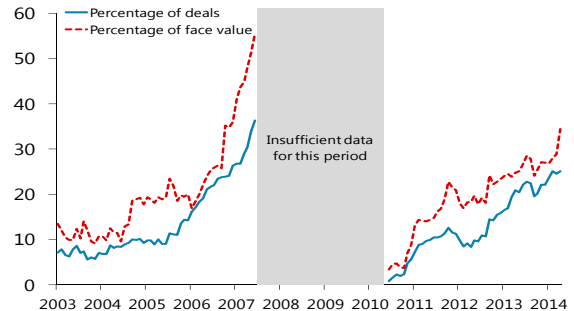
Sources: Deutsche Bank; and IMF staff estimates.

Corporate bond and leveraged loan indicators show deterioration.

5. Search-for-Yield Heat Map

Sources: Bank of America Merrill Lynch; Bloomberg L.P.; Haver Analytics; JPMorgan Chase & Co.; SIFMA; 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 historical distribution since January 2007.

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

Source: Haver Analytics; I/B/E/S; and IMF staff calculations.
Note: P/E = price to earnings. Long-term averages are from 1954 for Shiller P/E and 1-year trailing P/E, and from 1985 for 1-year forward P/E.
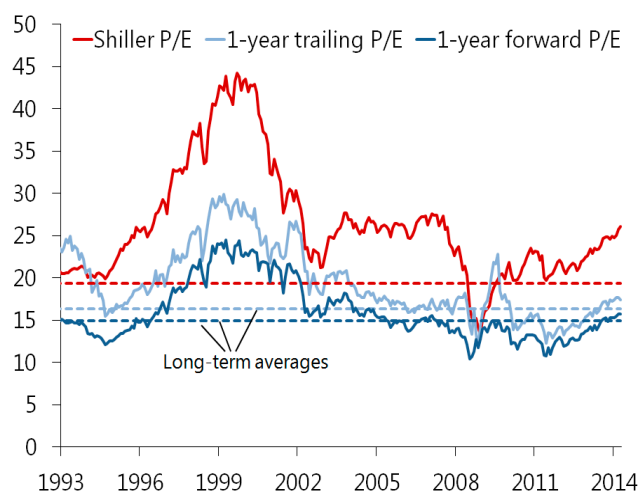
Earnings have been boosted by rising profit margins . . .

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

Sources: Standard & Poor's; and IMF staff calculations.
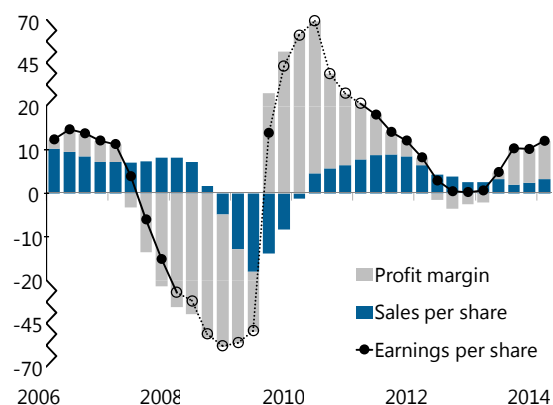
Growth in earnings accounts for only about half of the rise in U.S. equity prices.

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

Sources: Haver Analytics; I/B/E/S; JPMorgan Chase & Co,; and IMF staff estimates.
Note: Based on a three-stage dividend discount model.
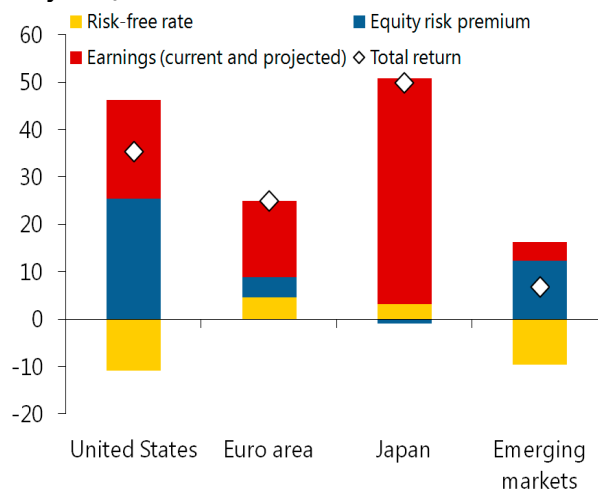
. . . which are at peak levels, but sales growth is anemic.

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

Sources: Standard & Poor's; and IMF staff calculations.
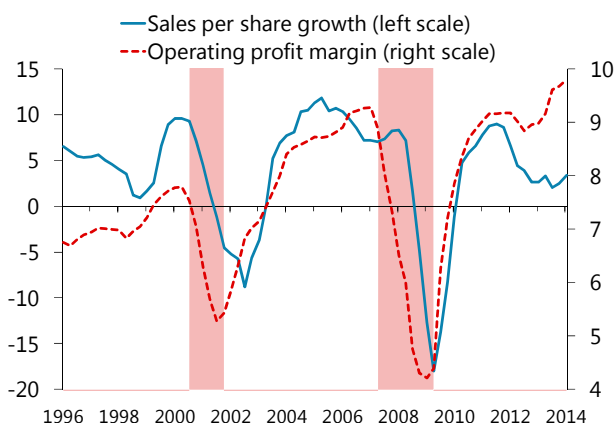
Figure 1.12. United States: Equity Market Fundamentals (concluded)

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

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

Corporates have to increase sales further to meet earnings expectations.

6. S&P 500 Earnings per Share and Sales per Share Growth (Percent, on a 12-month trailing basis)
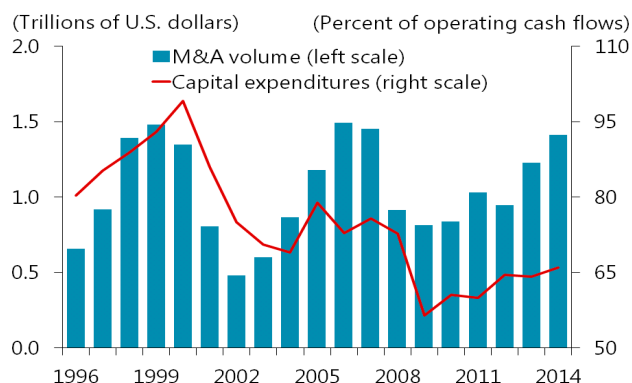
Sources: Dealogic; Board of Governors of the Federal Reserve System; and IMF staff calculations.
Note: Capital expenditures as of 2014:Q1. M&A volume for 2014 annualized as of 2014:Q2. M&A = mergers and acquisitions.
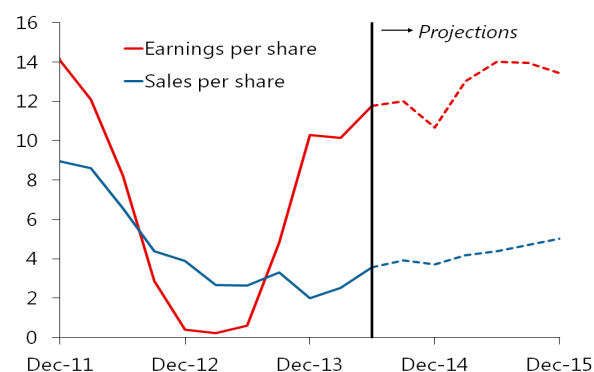
Sources: Standard & Poor's; Blue Chip Survey; and IMF staff estimates.
Note: Projected earnings per share growth is based on market expectations compiled by S&P. Projected sales per share growth is derived from expected GDP growth from Blue Chip Survey.

regulated.[6] A further indication of the uptick in financial risk taking is the acceleration in mergers and acquisitions (M&A) by U.S. companies, with 2014 trending to be a potentially record year.

20. 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&P500 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.

21. Financial excesses are more limited in the euro area. 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, as the pace of European

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

high yield issuance has exceeded that of U.S. issuance this year, as banks retreat and companies turn increasingly to the bond markets. Thought 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.

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

22.   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.

23.   Overall, leverage does not yet appear to be at critical levels (Table 1.1), but there are some countries and sectors with 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 worsened 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, while 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

24.   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 vulnerabilities reflect not only the level but also the distribution of debt and leverage, which is now concentrated in certain segments, including a weak tail in the real estate and construction sectors and among state-owned enterprises (INF 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).

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[7] Defined as debts of weak firms with interest coverage ratios of less than 2 (see April 2014 GFSR).

[8] Including bank loans to firms, trust loans, and non-financial corporate bonds outstanding. Also includes borrowing by LGFVs for which debt stands at an estimated 30 percent of GDP.

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)

. . . prompting leverage to rise further.

2. Total Debt, 2011 and 2013
   (Percent of total equity)
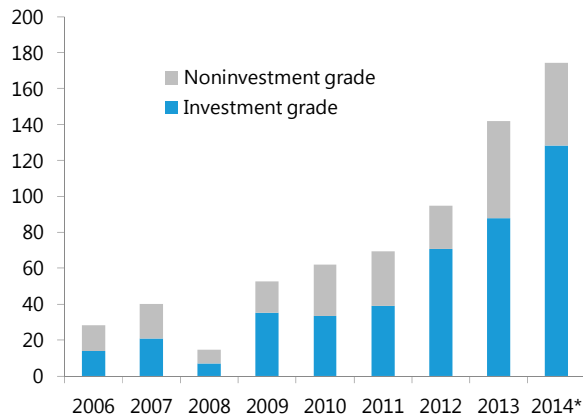
Source: Bond Radar.
Note: Includes bond issuance from Argentina, Brazil, Chile, Colombia, Mexico, China, India, Indonesia, Malaysia, Vietnam, Thailand, Philippines, Russia, Turkey, Poland, Bulgaria, Romania, Ukraine, and South Africa.
*As at end-June 2014, annualized.
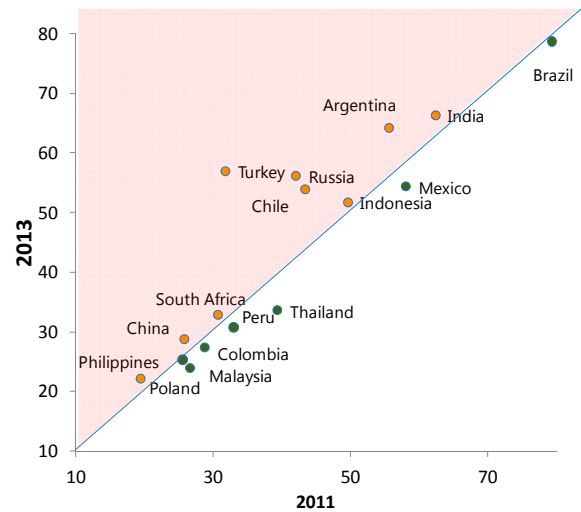
Source: Capital IQ.
Note: Based on sample median.

Weak firms are still earning negative returns . . .

3. Return on Assets
   (Percent)

. . . with earnings falling across sectors.

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

Source: Capital IQ.
Note: Weak firms refer to those with interest coverage ratios below 2.
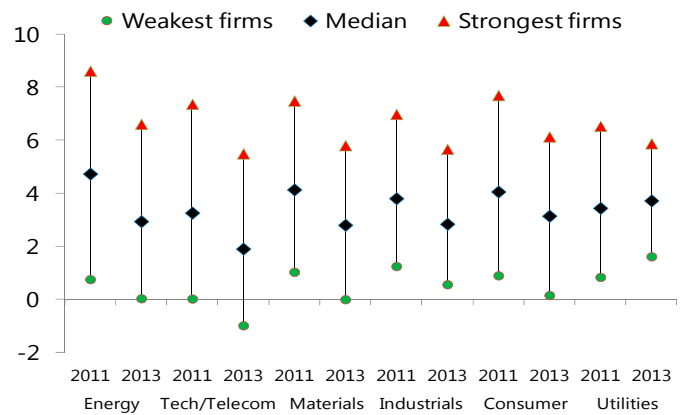
Source: Capital IQ.
Note: Weakest firms are based on the 25th percentile, strongest firms are 75th percentile.

Figure 1.13. Emerging Market Corporate Debt and Fundamentals (concluded)

Debt servicing capacity has weakened . . .   *. . . and debt-at-risk is still high or rising*

5. Interest Coverage Ratio by Sector, 2011 and 2013

● Weakest firms   ◆ Median   ▲ Strongest firms

(y-axis: 0, 5, 10, 15, 20, 25, 30, 35, 40, 45)

x-axis: 2011 2013 | 2011 2013 | 2011 2013 | 2011 2013 | 2011 2013 | 2011 2013
Telecom/Tech | Energy | Materials | Industrials | Consumer | Utilities

6. Share of Debt from Firms with Interest Coverage below 2 (Percent of total debt)

(y-axis: 5, 10, 15, 20, 25)

x-axis: 2007 ... 2013 (Asia) | 2007 ... 2013 (Latin America) | 2007 ... 2013 (EMEA)
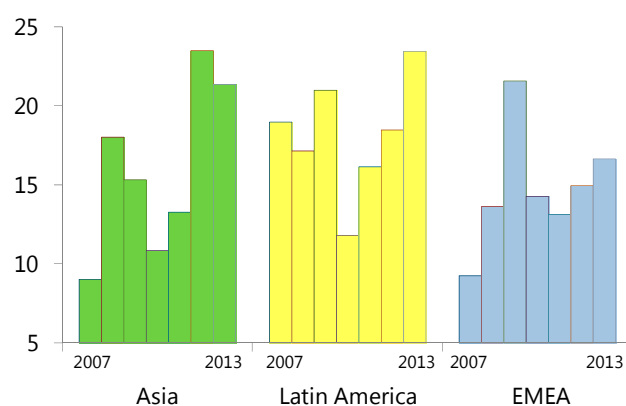
Source: Capital IQ.

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, 2014F	-1.4	1.1	3.2	2.4	7.4	5.4	5.2	5.4	6.2	0.8	3.5	0.2	1.7	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														
Asset:														
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 Non-Customer 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; Financial Soundness Indicators and IMF staff estimates.

Note: As definitions of capital (e.g., Basel II vs. Basel III), provisioning, and NPL vary across countries, caution is recommended when comparing these data across countries. EBITOA = earnings before interest, taxes, depreciation, and amortization; EMEA = Europe, Middle East, and Africa; NPL = nonperforming loans. Indicators are based on 2013 financial statements. Red denotes deterioration relative to five-year average (2009–2013);, green indicates improvement relative to the five-year average, except for "Change in Corporate Credit Spreads" where deterioration/improvement is for H1, 2014.

[1] Based on change in JPMorgan's Corporate Emerging markets Bank Index spreads for 2014:H1.
[2] Based on sample median.
[3] Computed as Total *Liabilities minus* Tier 1 capital *minus* Customer Deposit, all dividend by Total Liabilities *minus* Tier 1 Capital
[4] Computed as 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*.

25.   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 & Poors 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 exchange-traded 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]

26.   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 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).

27.   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. 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.

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[9] Based on the methodology described in Jobst and Gray (2013) and Gray (2009). The results presented are actual 1-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 listed only 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 1.14. China Corporate Indicators

Leverage appears not to have increased significantly . . .

1. Debt-to-Equity Ratios
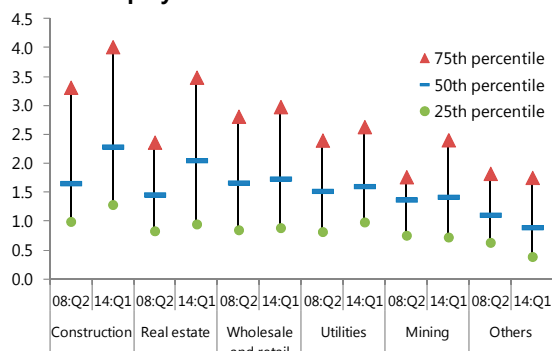
Sources: WIND; and IMF staff calculations.
Note: Sample of firms that had listed on a stock exchange or issued bonds by 2008:Q2 (about 2,412 firms) and 2014:Q1 (about 3,412 firms).

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

2. Debt-to-EBIT Ratios
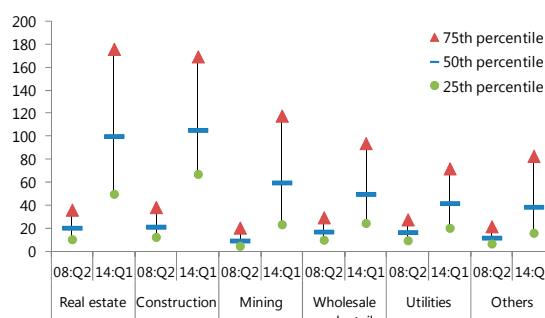
Sources: WIND; and IMF staff calculations.
Note: Sample of firms that had listed on a stock exchange or issued bonds by 2008:Q2 (about 2,251 firms) and 2014:Q1 (about 3,038 firms). EBIT = earnings before interest and taxes

. . . increasing risk of default.

3. Corportate Sector Default Probabilities after Stress (Percent)
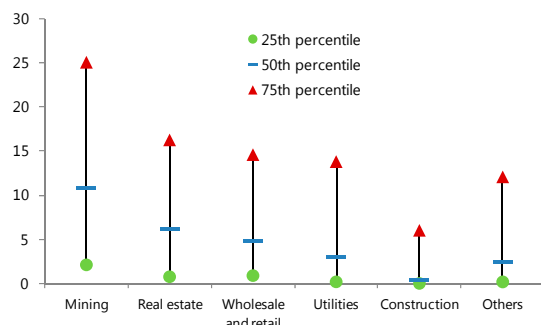
Sources: WIND; and IMF staff calculations.

28.   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 non-viable firms, and a rebalancing of credit allocation toward more productive areas of the economy.

Risks of default are concentrated in the nonbank sector

29.   Progress has been made during 2014 to address some potential vulnerabilities, particularly with 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.

30.   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

31.   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 $1.2 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 second quarter of 2014, bringing the outstanding stock to about $335 billion.

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[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.

A

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)
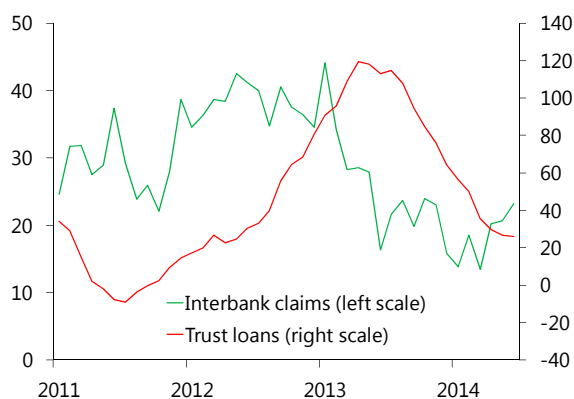
2. **Listed Property Developer Cash Flows**
   (Billions of yuan)
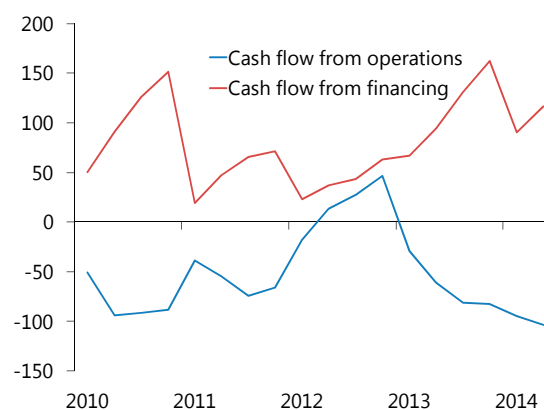
Sources: CEIC; WIND; and IMF staff calculations.

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, re-allocating 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

32.　The global financial crisis uncovered major fault lines in the financial regulatory landscape. Large banks with over-leveraged 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.

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

34.　Regulatory reforms have also sought to increase bank resilience by reducing risks associated with wholesale funding and proprietary trading. This has helped to 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 derivative markets will undoubtedly

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[11] Although the current capital benchmark is (common equity) Tier 1 capital, this chapter focuses on core Tier 1 capital because of data limitations.

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)

Legend: ■ Greater than 12 ■ 10 to 12 ■ 8 to 10 ■ Less than 8

(Chart with categories: Other Europe, Asia-Pacific, Euro area, North America; y-axis 0–100)
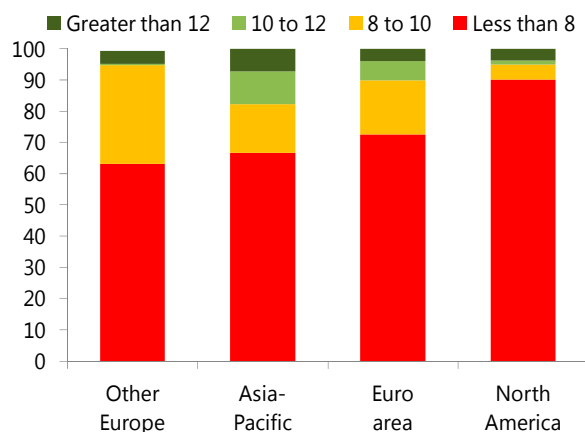
2. Tier 1 Common Capital Ratio, June 2014
   (Percent of sample assets)

Legend: ■ Greater than 12 ■ 10 to 12 ■ 8 to 10 ■ Less than 8

(Chart with categories: Other Europe, North America, Euro area, Asia-Pacific; y-axis 0–100)
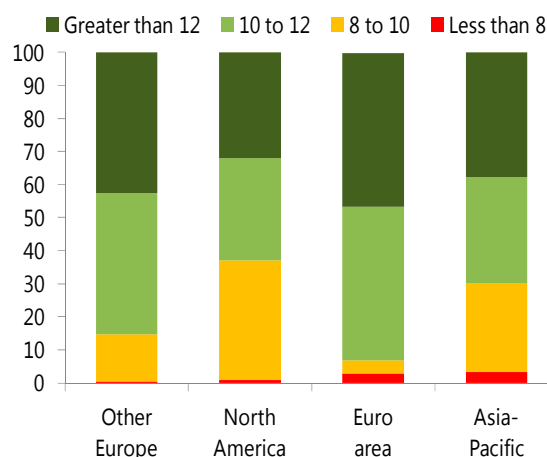
. . . driven in large part by recapitalization . . .

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

Legend: ■ Derisking ■ Deleveraging ■ Recapitalization ■ Ratio (Dec 2008) ◆ Ratio (June 2014)

(Chart with categories: Other Europe, Other euro area, North America, Vulnerable euro area, Asia-Pacific; y-axis −4 to 16)
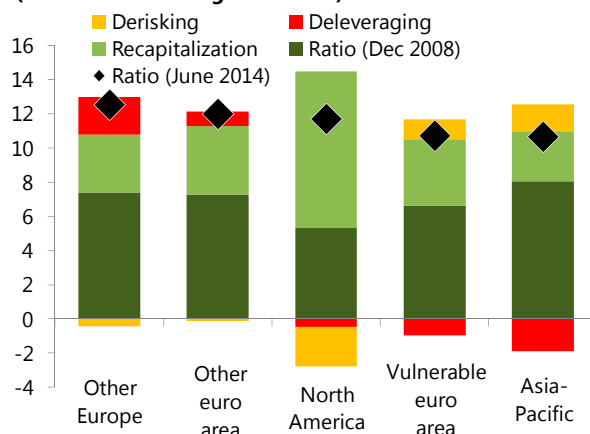
. . . but progress has been uneven.

4. Change in Bank Leverage and Average Risk Weight, 2008–14

Legend: ● Euro area ● Other Europe ● North America ● Asia-Pacific

Change in leverage (y-axis −120 to 20)

Banks reduce leverage and derisk assets

Banks reduce leverage and increase risk

Change in average risk weight (percentage points) (x-axis −30 to 20)
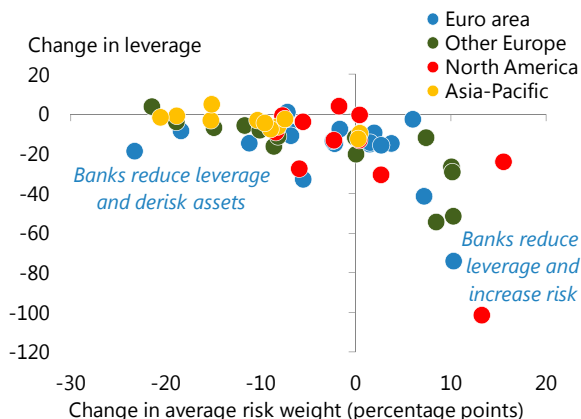
Sources: SNL Financial; and IMF staff calculations.
Note: Panels 1–3 are based on a sample of more than 1,500 advanced economy banks. Panel 4 is based on a sample of about 90 large banks. 2014 data are for 2014:Q2 or latest available.

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 "Global Markets at Increased Risk from a Liquidity Shock". 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

35.   Now large banks are entering the third phase—they have become stronger and are emerging from post-crisis 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 regulatory reforms, and acute competition in the context of excess capacity.[12]

36.   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 downwards to 13 percent but is still 5 percentage points higher than its 2000–05 historical average as of end-March 2014 (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]

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[12] In Europe, the on-going 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 non-viable 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 using the risk free rate as well as the correlation between the risk premium of the equity in question and that of the overall market (beta) multiplied by the market risk premium.

[14] For example, the top four U.S. banks incurred about US$80 billion in legal costs in 2013, while the top 25 European banks spent US$37.2 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 (that is, where the return-on-equity is below the cost of capital demanded by shareholders) and those with a low price-to-book ratio (that is, where equity market valuation is close to or below book valuation) across both time and type of bank.

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)

- Other assets
- Trading assets
- Customer loans
- Liquid assets
- Interbank loans

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

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

- Euro area
- Other Europe
- United States

-23 percent
-34 percent
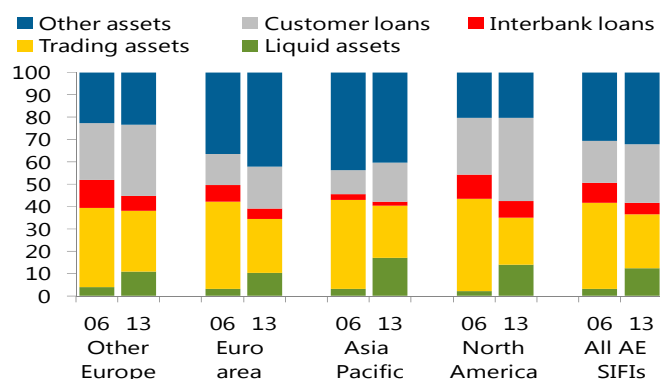
Sources: Bankscope; and IMF staff estimates.
Note: Other assets include nongovernment securities in the banking book, reverse repo and fixed assets. Based on 90 large banks. AE SIFI = advanced economy systemically important financial institution.
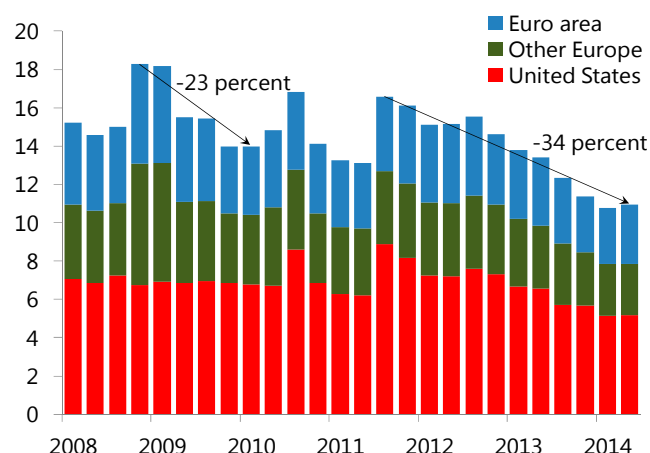
Sources: SNL Financial; and IMF staff estimates.
Note: Figure drawn on 27 advanced economy banks identified by the Bank for International Settlements as systemically important.

Return on equity is generally lower . . .

3. Bank Return on Equity by Region
   (Percent)

Euro area

Other Europe

North America

Asia-Pacific

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

4. Return on Equity and Cost of Equity
   (Percent)

- Return on equity
- Cost of equity
- Return on assets (right scale)

RoE gap

Sources: Bloomberg L.P.; and IMF staff estimates.
Note: Shows asset-weighted averages. Based on a sample of around 300 large banks. Dotted line shows the 2000–2005 average.
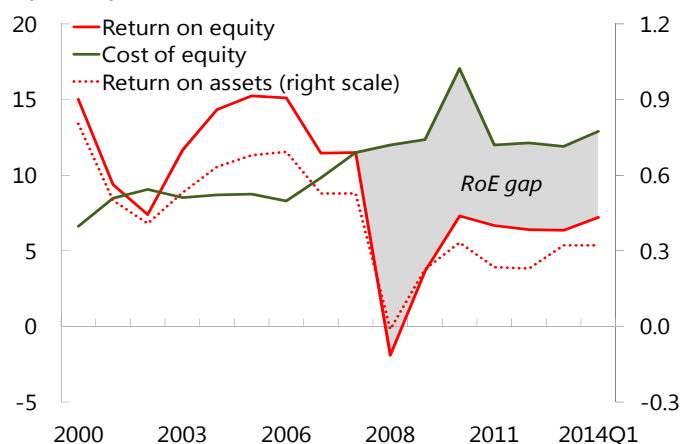
Sources: Bloomberg L.P.; and IMF staff calculations.
Note: Cost of equity derived from the capital asset pricing model, with the risk-free rate plus the market risk premium multiplied by the nondiversifiable risk (beta). Shows asset-weighted averages. Based on a sample of about 300 large banks.

Figure 1.17. Bank Balance Sheets and Profitability (concluded)

. . . leading many banks to miss return expectations.

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

Legend:
- Euro area
- Other Europe
- North America
- Asia-Pacific

(Years on x-axis: 2004, 2006, 2008, 2010, 2012, 2014Q1; y-axis 0 to 100)

Regulatory reforms are changing banks' incentives.

6. Impact of Leverage Ratio on Holding a Corporate loan
   (Basis points)

Legend:
- Spread required to cover Basel III capital costs
- Additional spread to cover SLR capital charge
- Loan margin (proxied by spread on representative corporate bond index)

Margin to cover other costs (beyond capital costs)

Uneconomical to hold loan (capital cost exceeds loan margin)

(Ratings on x-axis: AAA, AA, A, BBB, BB, B; y-axis 0 to 400)

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

Note: Based on a sample of about 300 large banks.

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 US corporate loan for a representative large bank under the IRB model. In this stylized example, the capital cost for an A-rated loan is around 33bps (assuming a 35% risk weight X 9.5% T1 ratio X 10% ROE target). The red bars measure the additional spread (over US dollar Libor) to cover the SLR capital costs. The 50bps floor is equal to 100% leverage exposure X 5% SLR X 10% ROE target. The diamonds represent the current loan margin proxied by a representative US corporate bond index spread (over US 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.

37.   Until now, banks have focused primarily on raising capital and rerisking 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 17 in Annex 1.3). For example, the LR and the supplementary leverage ratio (SLR) in the United States (both mandatory beginning from 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 (LCR) and the net stable funding ratio (NSFR), 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, creating non-price constrictions on lending. These new regulations have increased the strength and resilience of national banking systems and we are not advocating 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.

38.   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 non-core 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 to entail a combination of repricing current business lines, re-allocating capital away from low-risk assets, and—in some cases—selective retrenchment.

39.   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 close to record-low risk-weighted asset and will see their risk-weighted 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 pre-crisis 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.

40.   New regulatory requirements may induce banks to retrench from some activities if they are unable to reprice. For example, when binding, the leverage ratio (LR) 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 (SLR), 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, hedging and arbitrage activities, with a possibly adverse impact on the corporate sector, which may not longer be able to access critical services, such as financial commitments or derivative instruments to hedge their long-term investments.

41.   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. Re-pricing is likely to be easier with bank-dependent borrowers, such as in small and medium-sized enterprise (SME) and consumer credit. With regards to products, the cost of mortgage loans and other lower-risk longer-term loans such as infrastructure finance, are likely to rise as banks

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[16] Substantial cost-cutting efforts have taken place, with the average cost-to-income ratio of 300 large banks having fallen by 7 percentage points to 66 percent since 2008, in line with the 1995–2005 historical average of 65 percent.

[17] The regulatory LR is binding for some large banks. At end-June 2013, based on a conservative "fully loaded" capital definition, 20 percent of 227 surveyed banks were not meeting the 3 percent Basel III Tier 1 LR (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 LR requirement.

adjust to the LR, the NSFR, 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.

42.   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 repricing or by weaker banks that under-price 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 exit of unviable banks.

43.   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 (FICC). 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 M&A 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 notable exception is infrastructure finance, where many global banks are reducing their presence or exiting.

Retrenchment and re-pricing could add headwinds to the recovery

44.   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.

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[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

Exit	Selectively shrinking	Expanding	No or little change	No critical business

	Commercial Bank			Investment Bank			Asset Management / Private Wealth
	Retail & SME	Corporate	Infrastructure Finance	Fixed Income, currencies, and commodities (FICC)	Equities (market making and proprietary trading)	M&A and Securities Underwriting	
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 APAC	Selective, except growth in Asia	Selective, 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 focus			Selective, focus on Securitization (U.S.), EM & Global Credit (U.K.), and introducing capital light FI agency model	Cash Equities (U.K.)	Europe focused	Slow growth with Wealth focus
Deutsche Bank	Heavily German focus	Selective, except growth in Asia	Reducing	Selective reductions (structured credit, large foreign exposures, derivative book), but still broad based (U.K., U.S.). Top 3 player in securitization	Large offering (U.K., U.S.)	Top 3 in bonds	Growth with AM 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		Bond focus (e.g. #1 in renminbi bonds)	Asia and Middle East focus
UBS	Heavily Swiss focus			Exited 2012	Broad offering (Europe, US), strong distribution	Equity and Europe focus	Strong growth with Wealth focus
U.S. Banks							
Goldman Sachs				Selectively shrinking	Rebalancing B/S use from financial instruments towards direct investments	Expand global leadership (# 1 in Equity and #2 in Bonds)	Growth with Wealth focus
JPMorgan	U.S. focus, market leader by total assets	Maintain global leadership (e.g. in syndicated loans)		Maintain global leadership in G10 rates and securitization, selective capital use by clients and products	Selective international growth – Equity derivative focus	Expand global leadership in Corporate bonds (#1) and growing in Equity (#2)	Growth with focus on institutional and retail asset management
Morgan Stanley				Selectively shrinking; broad based move towards hybrid principal & agency model		Maintain leadership in Equity and M&A (Top 3)	Growth with Wealth focus; taking advantage of large broker sales force

Note: Indicative rankings as of end 2013.

45. These transition challenges are illustrated through a balance sheet simulation. The simulation, which is based on more than 300 advanced economy banks (representing around two-third 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.

46. 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—in order to meet the capital targets. Banks must have adequate capital buffers to meet credit demand when the economy recovers.

47. 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 50 basis points on their entire loan book —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).

48. The results are confirmed at the country level, where the largest transition needs are concentrated in euro area countries and, to a lesser extent, in the United Kingdom and Japan (Figure

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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 equity 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' forecast.

[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 Fund staff).

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

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).

49.   A further insight is that even among the banks that have the capacity to supply more credit, a group of institutions have high required repricing needs (highlighted in the shaded area in 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). 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 non-viable banks--where necessary—to produce a strong cross-border banking system.

50.   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 – not a solution to compensate for sluggish bank credit

51.   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 co-financing. Balance sheet constrained banks are partnering with nonbanks—such as insurance companies and pension funds (ICPF), 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 towards greater nonbank financial intermediation will help support the provision of financial services but requires also the strengthening of the regulatory framework for nonbanks. Supervisors must be in a position to adequately monitor credit developments, assess the build-up of risks, and have the authority and the tools to address the attendant risks.

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

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)

Bubble size = tangible assets

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
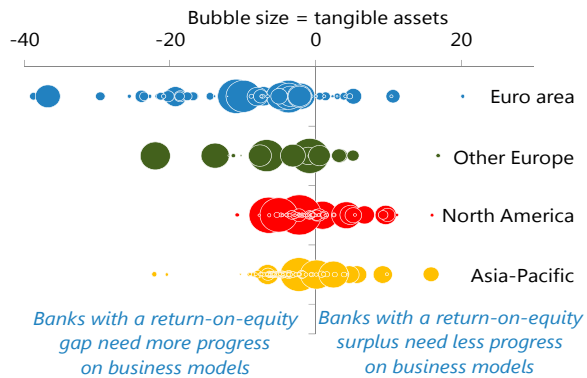
While lending capacity varies . . .

2. Potential Credit Supply Expansion, by Cumulated Assets

Cumulative proportion of sample assets (*percent*)

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

(Percent)	Assets	Number
Asia-Pacific	27	46
North America	16	6
Other Europe	28	7
Euro area	59	46
Total	36	25

Potential credit supply expansion (*percent, annualized*)
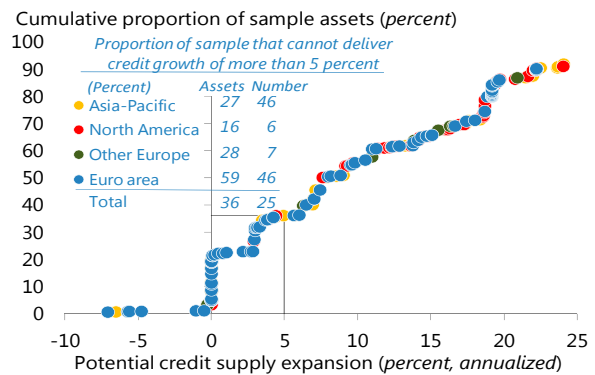
. . . some banks have unrealistic repricing needs . . .

3. Required Repricing of Loans, by Cumulated Assets

Cumulative proportion of sample assets (*percent*)

Proportion of sample with repricing needs greater than 50 basis points

(Percent)	Assets	Number
Asia-Pacific	1	6
North America	2	7
Other Europe	28	7
Euro area	41	40
Total	21	19

Repricing of net interest margin (*basis points*)

. . . raising a question about actual credit supply.
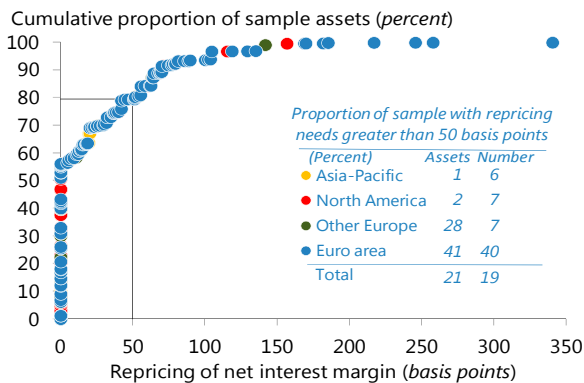
4. Required Repricing and Potential Credit Supply Expansion

Repricing of net interest margin (*basis points*)

- Euro area
- Other Europe
- North America
- Asia-Pacific

Potential credit supply expansion (*percent, annualized*)
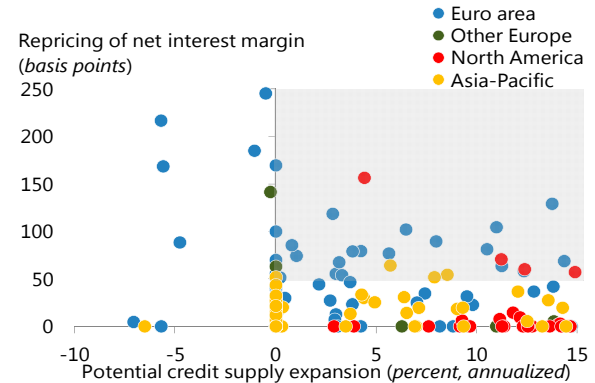
Transition needs differ across countries . . .

5. Required Repricing, by Country

Repricing of net interest margin (*basis points*)

- Asia-Pacific
- North America
- Euro area
- Other Europe

Greater need to change business models

Lesser need to change business models

VEA, DEU, ITA, ESP, FRA, JPN, GBR, AUT, USA, SWE, NLD, CHE, SGP, CAN, AUS, BEL

Simulated return-on-equity gap after reallocation (*percentage points*)
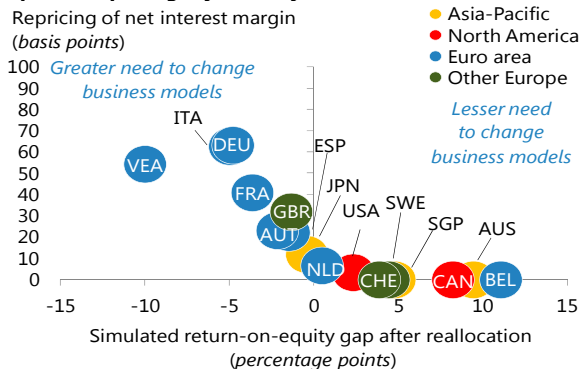
. . . and by type of banks.

6. Required Repricing, by Type of Bank

Repricing of net interest margin (*basis points*)

- Other banks
- Domestic SIB
- Large investment bank
- Global SIB

Greater need to change business models

Lesser need to change business models

Simulated return-on-equity gap after reallocation (*percentage points*)
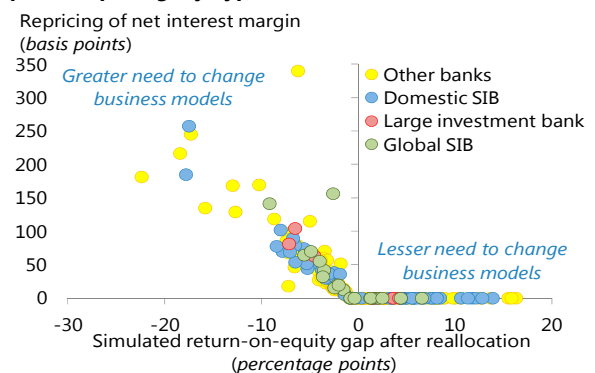
Sources: SNL Financial; Bloomberg L.P.; and IMF staff estimates.

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. Panel 5 uses International Organization for Standardization country codes; other than VEA, which is vulnerable euro area countries (in this case Cyprus, Greece, Ireland, Portugal and 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).

52.   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 the more vulnerable economies in the euro area (Figure 1.19, panel 3).[24]

53.   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 SME lending is mixed because of unfamiliarity with the risks (even when central bank data on SMEs are made available), and joint ventures between banks and insurers are only developing slowly.

54.   Regulatory frameworks explain some of the regional differences in the use of nonbank credit. In the United States and in Japan, ICPF 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"[25]), which is not allowed in Europe by the Undertakings for the Collective Investment in Transferable Securities (UCITS) directive.[26] 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.

55.   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.

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[24] The group of vulnerable euro area countries generally includes Cyprus, Greece, Ireland, Italy, Portugal, Spain, and Slovenia—though in some parts of this section the term may refer to a subset of these economies.

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

[26] In Europe, some funds are not subject to the Collective Investment in Transferable Securities directive and fall under the less stringent Alternative Investment Funds Management directive. Their volume 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 build-up of risks arising from such funds (see, for example, Central Bank of Ireland 2014).

Figure 1.19. Bank Lending and Nonbank Sources of Credit

Bank lending remains lackluster in Europe.

1. Bank Lending Relative to Past Crises

Real credit growth (*percent*)

- 40th–60th percentile
- Interquartile range
- Median

United Kingdom

Other euro area

United States

Vulnerable euro area

Years since start of negative real credit growth
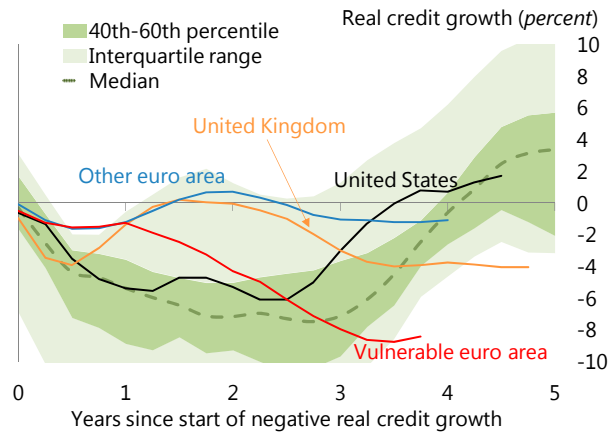
Source: Haver Analytics; *World Economic Outlook*; and IMF staff calculations.
Note: Green shaded area is for past crisis periods in advanced and emerging economies from the late 1980s to the period before the global financial crisis.

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

3. Euro Area Corporate Credit
   (Billions of euro)

Other euro area

Vulnerable euro area

- Total loans ■ Securities

07 08 09 10 11 12 13 14   07 08 09 10 11 12 13 14
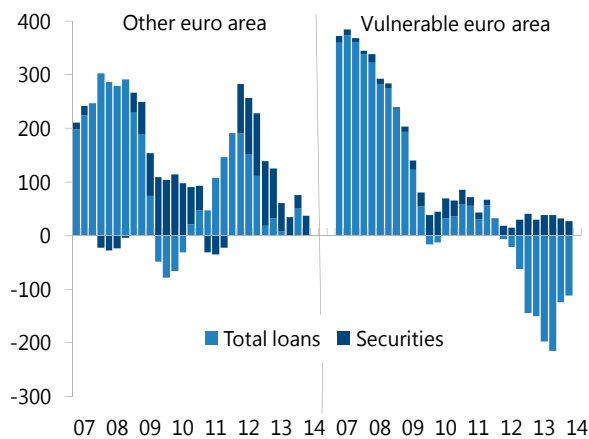
Sources: National central banks; and IMF staff estimates.
Note: Shows a four-quarter sum of changes in levels.

Large firms turn to nonbank credit …

2. Corporate Borrowing
   (Percent of total borrowing)

■ Securities ■ Other loans ■ Bank loans

	United States		United Kingdom		Euro area	
	2008	2014	2008	2014	2008	2014
Securities	59	76	27	34	11	17
Other loans	20	12	6	23	16	17
Bank loans	20	12	68	44	74	66
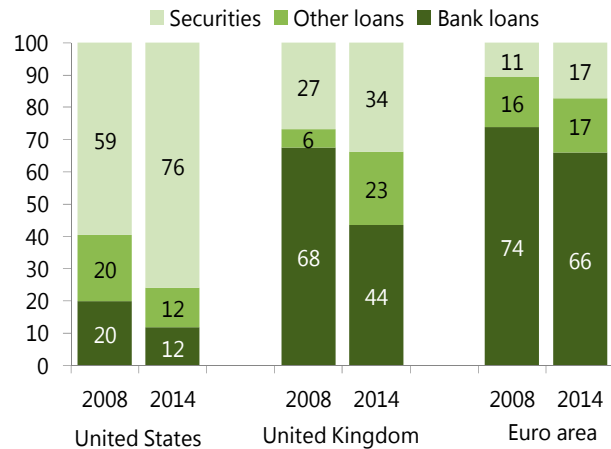
Sources: National central banks; and IMF staff estimates.
Note: Excludes estimated value of intercompany loans. Rest of World Bank loans are included in bank loans in the United States and United Kingdom but are included in other loans in the euro area.

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

4. Securitization Issuance
   (Billions of U.S. dollars)

- ■ Europe RMBS
- ■ Europe other securities
- ■ U.S. RMBS
- ■ U.S. other securities

United States

Europe

2004 2005 2006 2007 2008 2009 2010 2011 2012 2013   2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
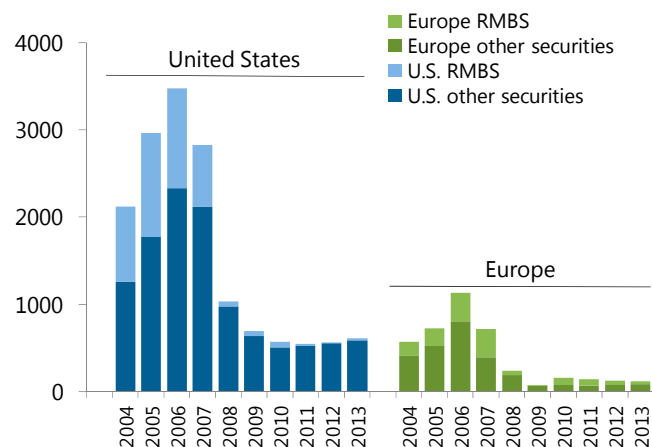
Sources: Association for Financial Markets in Europe; Commercial Research Finance Council; Inside Mortgage Finance; JPMorgan Chase & Co.; Federal Reserve; and IMF staff calculations.
Note: All data are issuance volumes, except for asset-backed commercial paper, which are end-period outstanding. RMBS = residential mortgage-backed securities.

56.   The expansion of securitization markets, however, faces a number of challenges. Structural market factors (high cost of issuance, heterogeneity of loan portfolios across countries), adverse cyclical factors (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.[27] 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 (guarantees by pan-European agencies) would further encourage this type of market-based funding.

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[27] 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.

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

57. 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 1–2). The nonbank sector,[28] 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 and ETFs have become the largest owners of U.S. corporate and foreign bonds, accounting for 35 percent of total holdings.

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

58. 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).[29] 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.[30]

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

[29] 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").

[30] 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. $\Delta LCS = 0.03 + (-7.55) \times \Delta NF + (.07) \times \Delta NS + \varepsilon$, with both factors statistically significant at the 95 percent level and an adjusted $R2 = 0.623$.

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)**
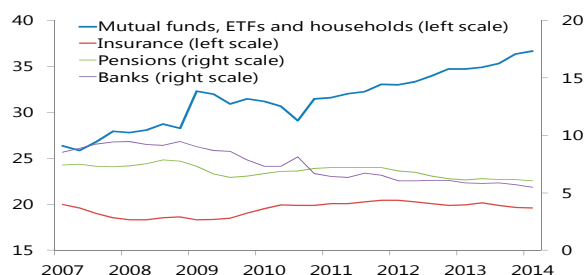
Sources: Federal Reserve; and IMF staff calculations.
Note: ETF = exchange-traded fund.

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

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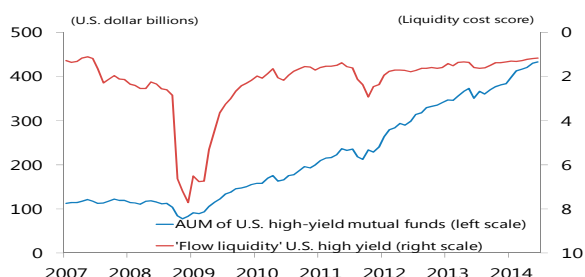
Sources: Barclays Capital; and EPFR Global.
Note: AUM = assets under management.

. . . lower trading size . . .

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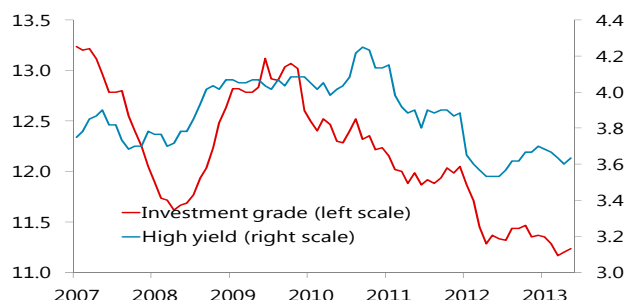
Source: TRACE.
Note: NY = high-yield; IG = investment grade.

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

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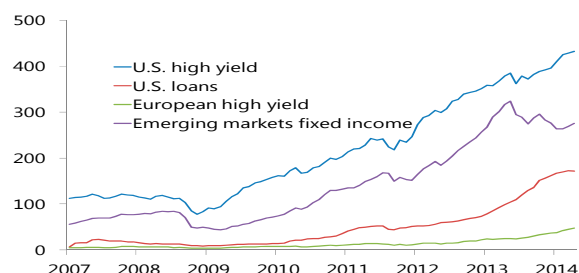
Source: EPFR. Global.
Note: ETF = exchange-traded fund.

. . . but lower trading volumes . . .

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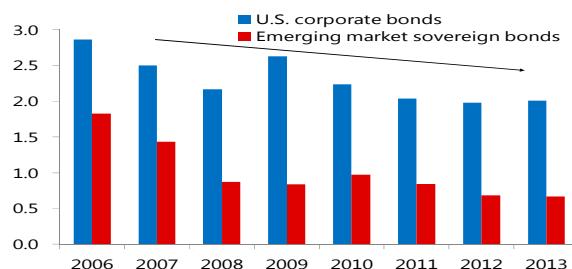
Sources: EMTA; JPMorgan Chase & Co.; Securities Industry and Financial Markets
Association; TRACE; and IMF staff calculations.

. . . and infrequent trading suggest less market depth.

**6. Percent of Tradings Days per Quartile: Barclays High-Yield Index
   Constituents**
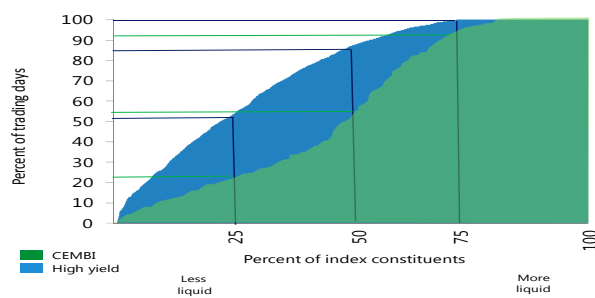
Source: Barclays Capital.
Note: CEMBI = Corportate Emerging Market Bond Index.

59.   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[31]

60.   In the post-crisis financial landscape—in which the banking and insurance sectors have been more constrained by regulation—investment funds have been 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.[32] For example, the investment risk is borne largely by investors in the fund, not the asset manager because there are no public guarantees like 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.

61.   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, 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 draw-downs 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.

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

[32] Although, both asset managers and banks share the same tendency towards 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.

62. 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
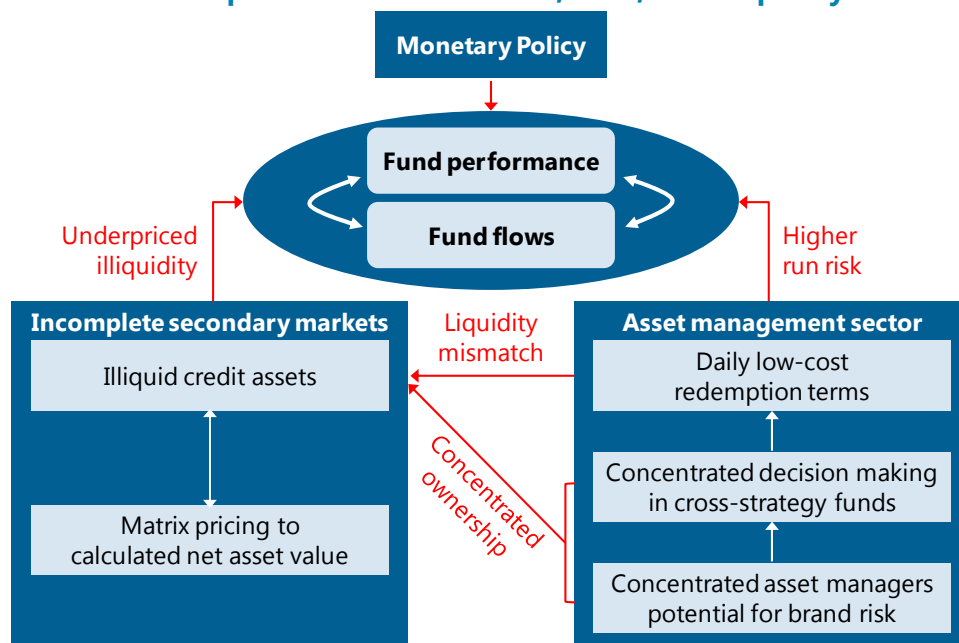
Source: IMF staff calculations.

63. 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 upon 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.

64. 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 of assets under management globally.[33] 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

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

value to end-investors is liquidity, market dislocations that limit redeemability could also undermine product appeal and brand reputation.

65. 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, panel 1 and 2). For example, more than 50 percent of all debt issued by the top 20 non-resource firms in the JPMorgan Corporate Emerging Market 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 comingled 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.

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)
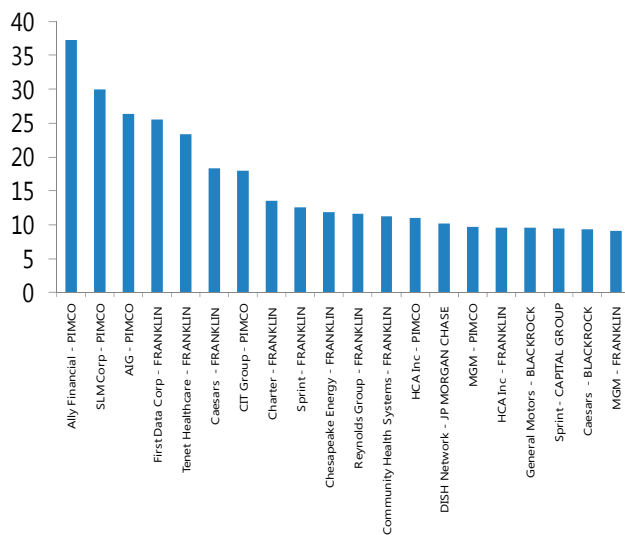
Sources: Bloomberg L.P.; and IMF staff calculations.
Note: According to Dealogic, the sample of 20 corporate borrowers in this figure has accounted for more than $0.4 trillion of debt issuance since 2007. Of that total, $0.3 trillion was issued as high yield debt, which amounts to about 10 percent of the total global high-yield bond issuance of $2.9 trillion during the same period.
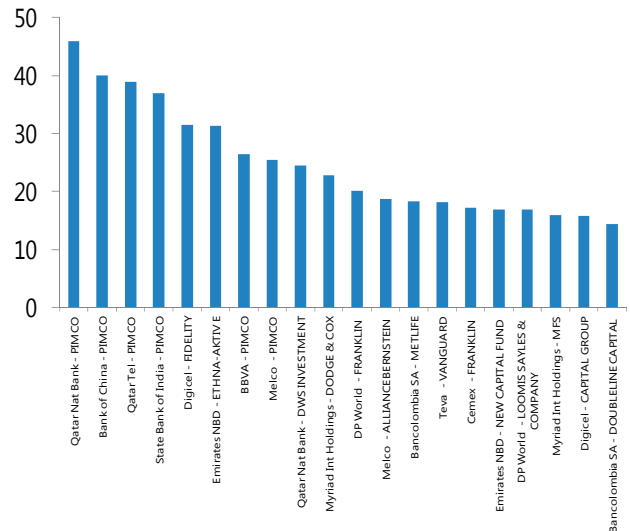
Sources: Bloomberg L.P.; and IMF staff calculations.
Note: Analysis of largest 20 by market value/index weight of issuance non-resource external emerging market corporate issuers within JPMorgan Corporate Emerging Markets Bond Index; exposures summed across all issues held by fund management firm.

66.   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.

67.   The risk of a run may be intensified by the increased holdings of mutual funds. Chen 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.[34] During the past five years, however, the share of credit instruments held by mutual funds, ETFs and households has increased substantially, and now represent more than a third of total credit holdings, which may also increase the risk of contagion across asset classes. Manconi and others (2012) found 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 available from traditional liquidity providers

68.   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). Despite a majority of mutual funds being unlevered, 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).[35] 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),[36] have reduced their market-

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

[35] Large cross-over mutual funds are defined as vehicles running more than $5 billion in assets under management and investing across most fixed-income sectors. This derivative exposure is often achieved by the regular use of credit default swaps (CDS), with academic research reporting that, amongst 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 than can enhance returns to manage their exposures given the difficulty of transacting in large sizes in the secondary bond markets.

[36] 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

(continued)

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 average daily turnover.

- Hedge funds are also increasingly behaving in a more benchmark-centric manner,[37] 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,[38] 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 are 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).[39]

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

69.   Mutual fund 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 in high-yield credit markets (Figure 1.23, panels 5 and 6).[40] 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.

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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.

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

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

[39] 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.

[40] 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.

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
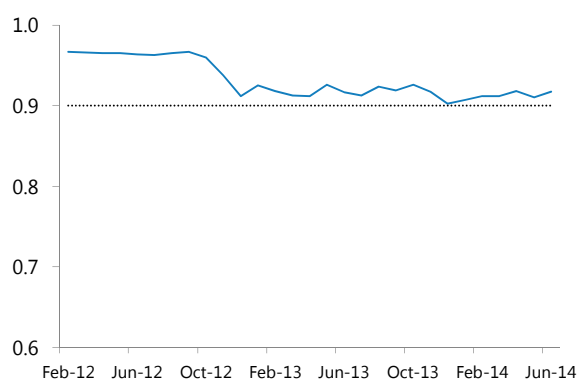
Sources: Bank of America Merrill Lynch; Bloomberg L.P.; EPFR Global; and IMF staff calculations.
Note: Twelve-month rolling correlation of the returns of the top 10 global high-yield mutual funds as measured by assets under management. ETF = exchange-traded funds.

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
   (Days)
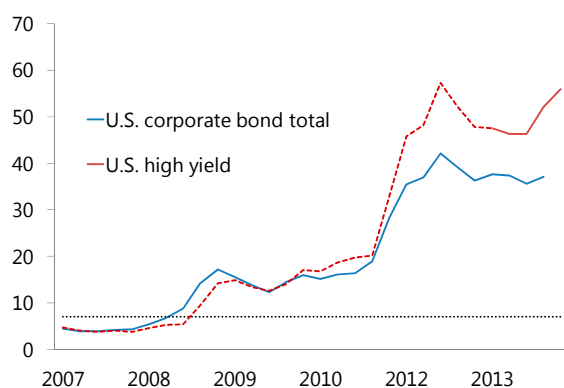
Sources: EPFR Global; Federal Reserve; and IMF staff calculations
Note: The number of days to liquidate is the ratio of assets of mutual funds and ETFs (exchange-traded funds) per average daily dealer inventories. Because there are no data for U.S. high-yield bond dealer inventories before April 2013, the dotted red line assumes a constant ratio of this amount to total corporate bonds before this date.

. . . which are amplified by the reported rise in synthetic leverage by large cross-over mutual funds.

2. Assets under Management to Large Crossover Fixed-Income Funds
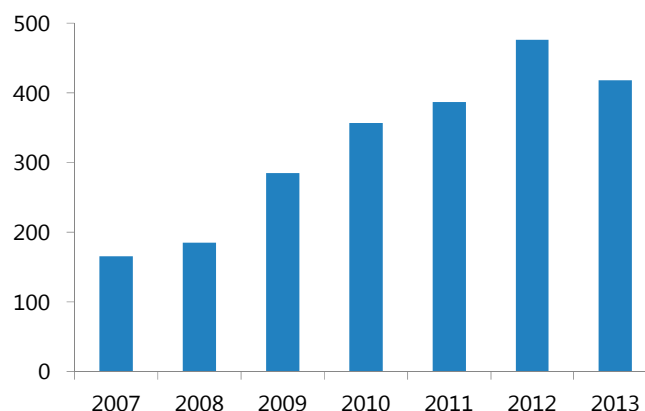
Sources: Bloomberg L.P.; EPFR Global; and IMF staff calculations.
Note: Sample of mutual funds with unconstrained mandates across fixed-income sectors, and with assets under management exceeding $5 billion.

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

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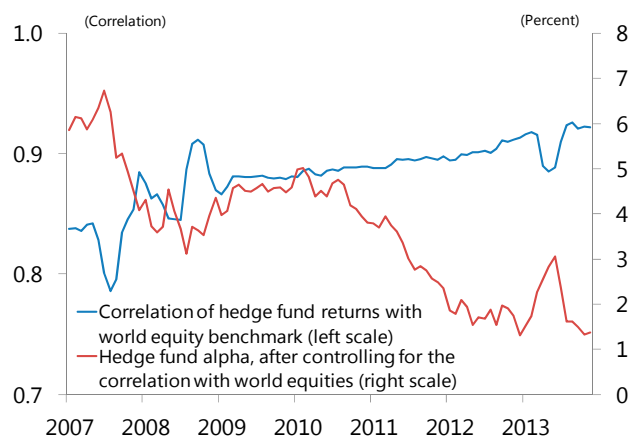
Sources: Bloomberg L.P.; Hedge Fund Research; and Morgan Stanley Capital International.
Note: Monthly returns measured over a rolling five-year observation window. Hedge fund returns are based on the Hedge Fund Research Fund-Weighted Composite Index.

Figure 1.23. Liquidity Risk Amplifiers (concluded)

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

. . . and with the insurance sector.

5. Contribution to Vulnerability of Distress in the Banking Sector

6. Contribution to Vulnerability of Distress in the Insurance Sector

Source: Segoviano and others (forthcoming).
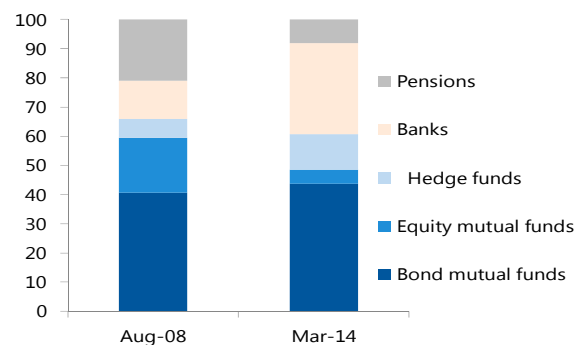
Source: Segoviano and others (forthcoming).

Emerging market economies are more vulnerable to shocks from advanced economies

70. Emerging market economies 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 market economies have increased substantially, from 7 percent of the total stock of developed market 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 markets in 2002 to almost 10 percent in 2012.[41]

71. These portfolio allocations to emerging market economies are highly concentrated in a few destination countries (Figure 1.24, panels 3 and 4). Of the $2.4 trillion stock of portfolio allocations to emerging market equities in 2012, about 80 percent is invested in only 12 of the 190 emerging market economies. China is the destination for $980 billion of that stock--more than any other emerging market economy. Concentration patterns are similar in fixed-income markets, with 12 emerging market economies absorbing $1.3 trillion of the $1.6 trillion stock of advanced economy bond allocations.

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[41] 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. Flows and Concentration of Asset Allocations to Emerging Markets

Portfolio allocations from developed markets to emerging market bonds have risen

1. Advanced Economy Bond Allocations to Emerging Markets (Percent of total)
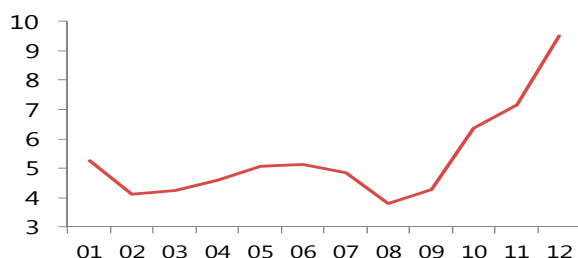
. . . as have allocations to emerging market equities.

2. Advanced Economy Equity Allocations to Emerging Markets (Percent of total)
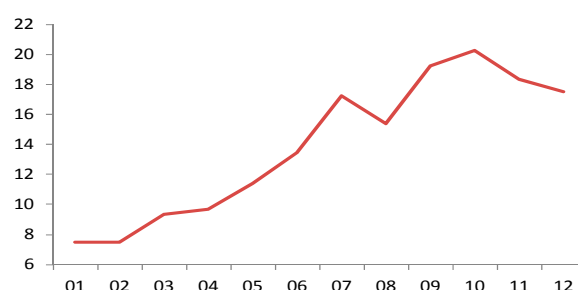
Sources: IMF Consolidated Portfolio Investment Survey; and IMF staff calculations.
Note: Portfolio stocks include revaluation effects.

3. 2012 Equity Allocations to EMEs: $2,440 billion

From   **To**

- Hong Kong SAR: $185.9 bn
- United States: $1,022.1 bn
- Singapore: $117.9 bn
- United Kingdom: $195.7 bn
- Ireland: $77.1 bn
- Other developed markets: $391.2 bn
- Luxembourg: $259.2 bn
- Netherlands: $69.6 bn
- Other offshore centers: $36.4 bn
- Mauritius: $84.8 bn

- China: $979.9 bn
- Mexico: $115.7 bn
- Israel: $54.2 bn
- South Africa: $120.8 bn
- Brazil: $285.7 bn
- Malaysia: $63.2 bn
- Indonesia: $77.9 bn
- Turkey: $60.9 bn
- Other EM: $175.5 bn
- Thailand: $80.2 bn
- Russia: $143.6 bn
- Poland: $32.9 bn
- India: $249.4 bn

4. 2012 Bond Allocations to EMEs: $1,648 billion

From   **To**

- Hong Kong SAR: $129.7 bn
- United Kingdom: $259.1 bn
- United States: $394.3 bn
- Other offshore centers: $99 bn
- Germany: $85.5 bn
- Other developed markets: $235.4 bn
- Luxembourg: $217.6 bn
- Netherlands: $47.9 bn
- Singapore: $90.3 bn
- Japan: $89.7 bn

- China: $170.8 bn
- Brazil: $284.3 bn
- Mexico: $184.8 bn
- Other EM: $388.2 bn
- Turkey: $100.5 bn
- Russia: $52.1 bn
- Hungary: $57.5 bn
- South Africa: $54.6 bn
- Malaysia: $85.8 bn
- Philippines: $33.9 bn
- Poland: $116 bn
- Indonesia: $58.5 bn
- India: $61.5 bn

Sources: IMF Coordinated Portfolio Investment Survey; and IMF staff calculations.
Note: bn = billion; EM = emerging markets.

72. Furthermore, the concentration among the advanced economies as the source of portfolio investment is even more striking. As of 2012, four of the world's most financially integrated countries, Hong Kong SAR, Singapore, the United States, and the United Kingdom, 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.

73. 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 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 to global markets

74. There are a wide variety of possible events that 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.

75. 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 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 drive up volatility in other asset classes rapidly 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

Figure 1.25. Volatility Developments

Increased synchronization of advanced economy and emerging market asset prices.

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)
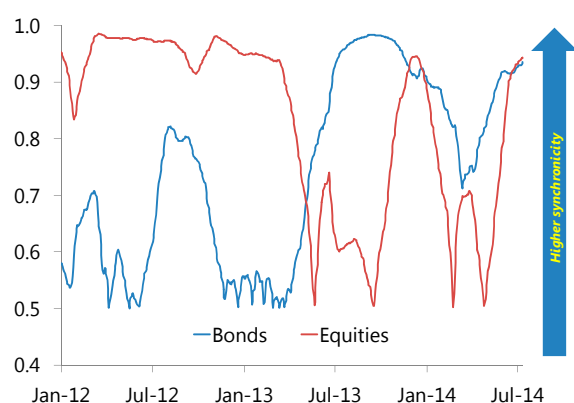
Sources: Bloomberg L.P.; JPMorgan Chase & Co.; and IMF staff calculations.

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 advanced economy assets during periods of high risk aversion.

3. Increase in Volatility from Moving from a Low to a High Volatility Regime
(Multiples)
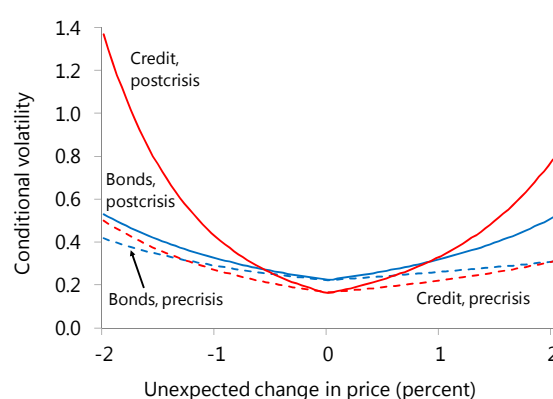
Source: IMF staff calculations.
Note: See Annex 1.4 for more information.

Longer-term implied volatility remains very low.

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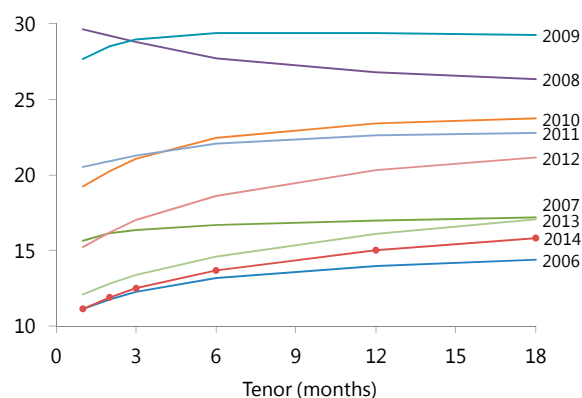
Sources: Bloomberg L.P.; and IMF staff calculations.

price shocks has already increased since the crisis (Figure 1.25, panel 2), especially for credit products, which can lead to faster selloffs.[42] The increased sensitivity of volatility to negative news is also true for emerging market and advanced economy equities (see Annex 1.4).

76.　　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 is 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 1.26, 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 remain 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.

77.　　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 basis points increase in the 10-year term premium, coupled with a 100 basis points 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.

78.　　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 show that three quarters of losses were during tightening cycles). This reflects a well-known phenomenon that fund flows follow performance (Feroli and others 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 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).

79.　　To illustrate these potential risks to credit markets, Table 1.3 shows the impact of a rapid market adjustment that causes term premia in bond markets to revert to historic norms (increasing by 100 basis points) and credit risk premia to normalize (a repricing of credit risks by 100 basis

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

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. A 100 basis points 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).

80.   Emerging market economies, 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 basis points increase in the yield of the 10-year U.S. Treasury note, 65 points 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 basis points, 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.

81.   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.

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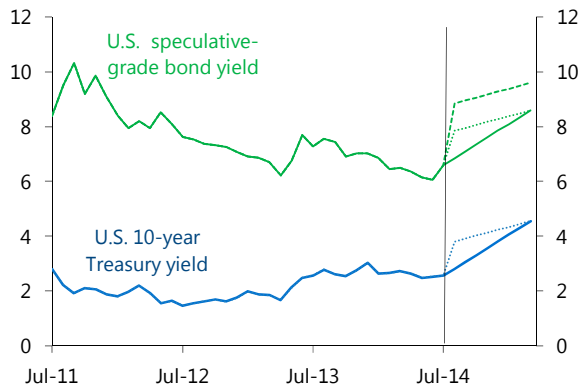
Sources: Federal Reserve; Bloomberg L.P; and IMF staff calculations.

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

3. Probability of Quarterly Loss
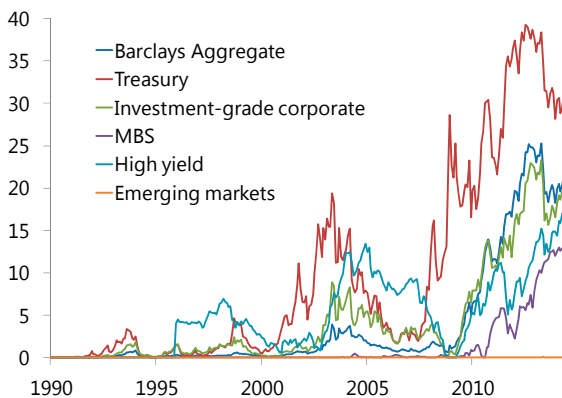
Source: Barclays Capital.
Note: MBS = mortgage-backed securities.

Monetary normalization could trigger outflows . . .

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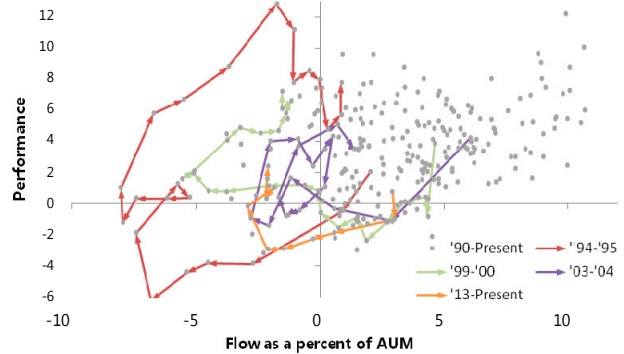
Source: Barclays Capital.
Note: AUM = assets under management.

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

4. Estimated Impact of Increase in Volatility and U.S. Rates on Emerging Market Local Currency Government Bond Yields
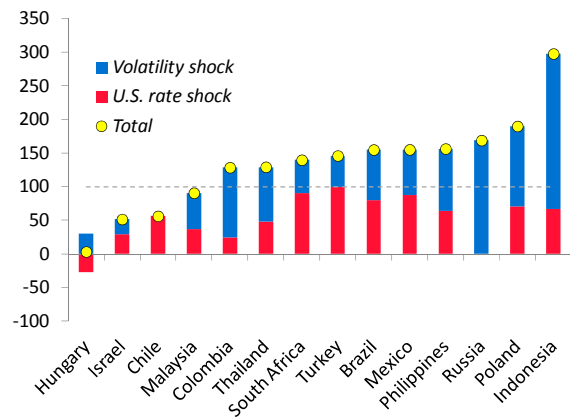
Source: IMF staff calculations.
Note: The figure shows the increase in yield of several emerging market 10-year local currency government bonds (10-year cross-currency swap for Turkey and Russia, 10-year TIIE 130x1 swap for Mexico, and five-year depositos interfinanceiros (DI) futures for Brazil) with respect to an increase in the yield of the U.S. Treasury note by 100 basis points, an increase of the Merill Option Volatility Estimate (MOVE) 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).

Table 1.3. Major Bond Index Sensitivities

	Global Bond Aggregate	Developed Market Government Bonds	U.S. Bond Aggregate	U.S. Corporate IG	U.S. Corporate HY	Agency MBS	Muni	Global IG	Global HY	Emerging Market Hard Currency	Emerging Market Local Currency[1]	Emerging Market Corporates & Quasi-Sovs
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
Increase of volatility from low to high state[4]	—	—	2.8	5.3	11.4	—	—	—	—	7.2	13.1	—

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

Note: bps = basis points; HY = high-yield; IG = investment grade; MBS = mortgage-backed securities; ... = not available.

[1] Data are unavailable before July 2008.

[2] Cycles include 1994–95, 1999–2000, 2004–06. For Emerging Market Hard Currency, only 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.

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 asset managers—thereby increasing market and liquidity risks. The banking system has been strengthened substantially, 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.

Is easy money increasing financial stability risks?

82.   This chapter has focused on the tradeoff 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?

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

84.   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.

85.   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. mortgage subprime 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.

86.   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 argues 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?

87.   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.

88.   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 re-allocating 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.

89.   Looking ahead, authorities need to gain a comprehensive view of the interplay of the different regulations and potential implications for the provision of credit and financial stability. Banks must operate in an environment in which they can adjust their business models, re-gain 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 macro-financial developments.

90.   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

91.   Against this backdrop, and in addition to having in place adequate micro-prudential 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 wihch financial excesses are apparent, such as the asset management segments, and are equally relevant for advanced and emerging market economies.

92.   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 pro-cyclical 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 where 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.

93.   The effective deployment of MPTs entails three steps to monitor, prepare, and act against the build-up 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.[43]

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

94.   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.

95.   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 upon to prevent system-wide financial excesses and prolonged use could lead to circumvention. In this context, monetary policy may need to adjust to address a systemic build-up 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

96.   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.

97.   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

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[43] 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.

appropriate. In less frequently traded markets in which bid-ask spreads are large, lower frequency redemption terms are more appropriate.

98.　　Redemption fees that benefit remaining shareholders are another option, however the calibration of such a fee 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 problems, but may simply accelerate redemptions ahead of potential imposition.

99.　　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.

100.　　Finally, reviewing liquidity and investment policy requirements for mutual funds invested in the 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. Also, greater emphasis should be placed on asset managers better communicating with investors about the risks inherent to mutual funds invested in certain markets that can be subject to greater liquidity risks and volatility, particularly during stress periods.

101.　　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...

102.　　Policy-makers 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.

103.　　Advanced economies with financial markets subject to run and fire sale risks 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 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/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 in emerging market economies

104.   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, policy-makers 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.

105.   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 performing 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 on-going 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.

106.   In China, policymakers should carefully monitor and contain the rapid growth of corporate leverage, particularly in the real estate and construction sector and in state-owned enterprises. Rebalancing credit allocation toward more productive areas of the economy requires moving to ore 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.

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 system-wide level. • Monitor holdings of mutual funds and ETFs and their linkages with the rest of the financial system. • Strengthen the monitoring capacity of policymakers by improving the accuracy of 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, LRs, 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), coming into force after a two-year transitional period.

Table 1.4. Key Macroprudential Policy Recommendations and Recent Country Examples (cont'd)

Objectives	Monitor	Prepare	Act	Recent Country Examples
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 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 LTV and 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 clean-up, 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 raising LTV and DTI requirements (for example, Sweden, Netherlands, 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 ECB Comprehensive Assessment and U.S. CCAR and Dodd-Frank Act stress testing). • In China, contain high domestic credit growth, partly intermediated by large shadow banking sector.	**China:** Raised bank provisioning requirements and risk weights on LGFVs, and 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). **Hungary:** Forced conversion of FX mortgages (July 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 on mortgage assets to 25 percent from 15 percent (effective fall 2014), introduced counter-cyclical buffer for all banks and 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 excessive leverage, introduced credit card limits and tightened provisioning rates for uncollateralized consumer loans and on export and small and medium-sized enterprise loans (October 2013). **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 (cont'd)

| Objectives	Monitor	Prepare	Act	Recent Country Examples
Strengthen the resilience to asset price shocks and contain excessive credit mis-pricing	• 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), introduce or tighten LTV and DTI requirements (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). • Encouraging safe securitization and removing 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 with 15 percent set as minimum (December 2013). **Canada:** Imposed 25-year cap on amortization period for high LTV loans, 5 percent minimum down payment for nonowner-occupied properties, and 44 percent cap on LTV ratios on refinancing loans and loans to nonowner 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 points lower LTV for real estate properties and a 300 basis point higher mortgage rate, and introduced 15 percent risk-weight floor on new residential mortgages secured on Hong Kong properties (February 2013). **Israel:** Tightened mortgage capital and provisioning requirements; imposed cap on repayment period (30 years), floating component of mortgages (two-third of loan), and DSI ratio of new loans (50 percent); added capital surcharges on mortgages with DSI ratio between 40 and50 percent (August 2013). **Korea:** On-going 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 ratio to 40 percent and adjusted DTI limits on bank mortgages. **Switzerland:** Introduced and subsequently increased countercyclical capital buffer targeting residential property mortgages (2013–14). **United States:** Enhanced monitoring of leveraged loan exposures and updated supervisory guidance on leveraged lending (2013–14).

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

Objectives	Monitor	Prepare	Act	Recent Country Examples
Strengthen resilience of financial systems to against global wholesale funding shocks and exposures to exchange rate shocks	• Monitor the share of non-core funding (short-term, FX, wholesale) in total liabilities. • Ensure adequate reporting and monitor private sectors' 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 levered 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 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 non-core 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 to eight largest credit institutions (January 2013).

Annex 1.1. Asset Valuations and Sovereign Spreads[44]

**Figure 1.27. Stretched Valuations Across Asset Classes (Z-scores)[45]**

1. Sovereign Bonds: Market-implied Term Premiums
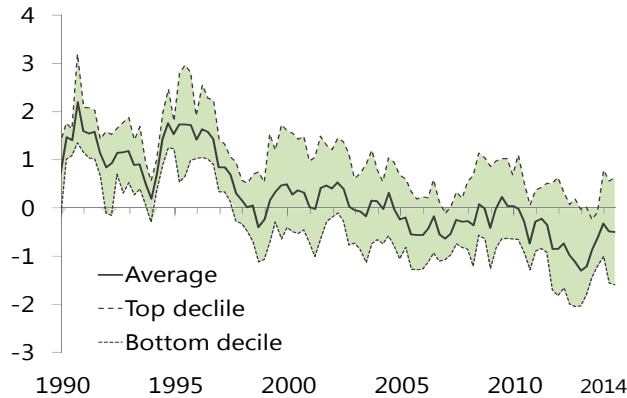
Sources: Consensus Economics; and IMF staff calculations.
Note: The z-scores for the implied bond term premium across 15 advanced economies and nine emerging markets. The implied ('Wicksellian') bond term premium is the 5y5y sovereign bond yield in local currency terms, minus the 5y5y survey-based expectation of real GDP growth and inflation. See Jones (2014).

2. Investment-grade and High-yield Credit Spreads
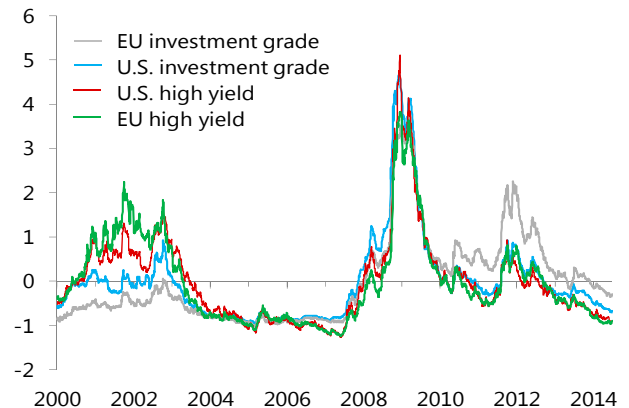
Source: IMF staff calculations.
Note: z-scores relative to the historical distribution of the respective option-adjusted spreads.

3. Equities: Market-implied Required Return
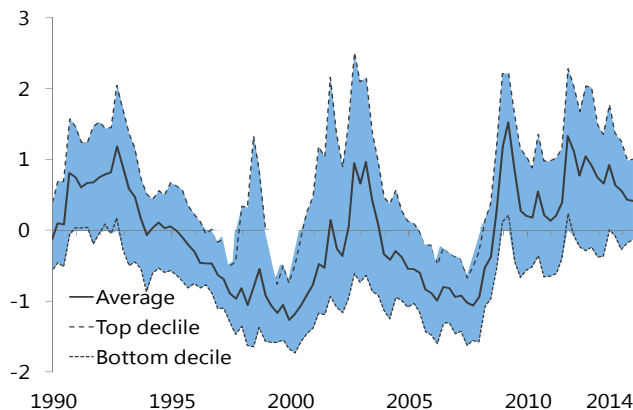
Sources: Consensus Economics; and IMF staff calculations.
Note: The z-scores for the implied required return to equity across 15 advanced economies and 10 emerging markets. The implied equity discount rate is the average of three model estimates backed out of current prices (a running yield based on cyclically-adjusted earnings, a single stage dividend discount model, and a multi-stage dividend discount model). See Jones (2014).

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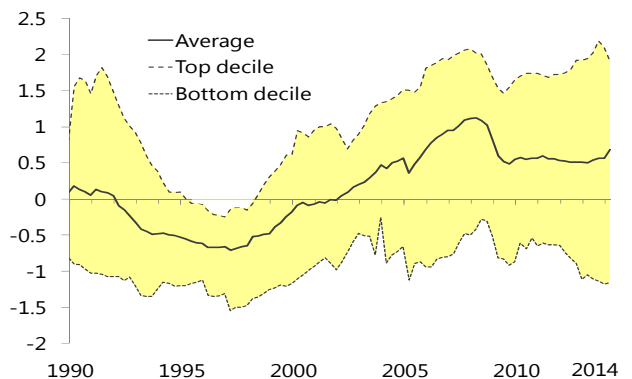
Sources: Haver Analytics; OECD data; and IMF staff calculations based on Global Property Guide.
Note: z-scores calculated over the respective historical distribution of the house price-to-rent ratio for each jurisdiction, data going back to 1970.

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[44] Annex prepared by Martin Čihák and Vladimir Pillonca.

[45] The z-score of an asset price (or other variable) y is the mean-adjusted return , scaled by the standard deviation: $(y - \bar{y})./\sigma$

Figure 1.28. Cross-country Distribution

1. Sovereign Bonds: Market-implied Term Premiums
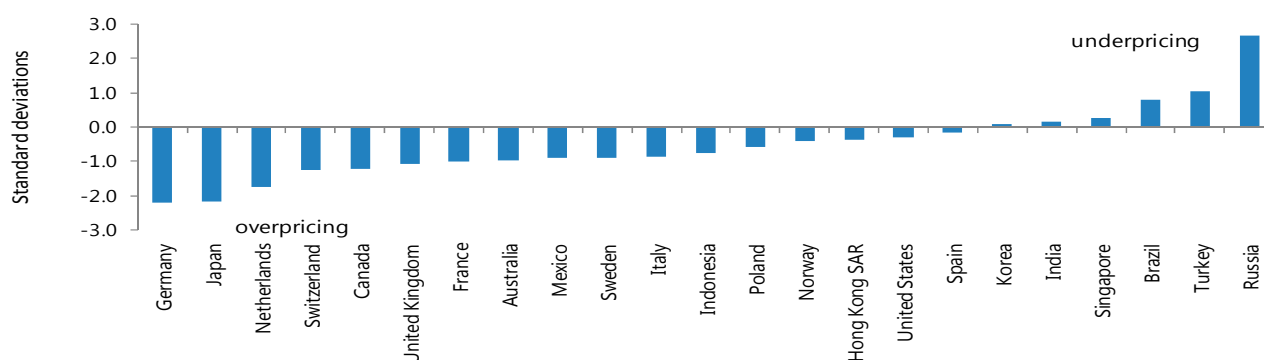
Source: IMF staff calculations.
Note: The implied bond term premium is defined as 5y5y rates (local currency terms) minus 5y5y survey-based expectations for real GDP growth and inflation. It is expressed as the number of standard deviations from the country-specific long-term average. Data start in 1989 (1953 for the United States). See Jones (2014).

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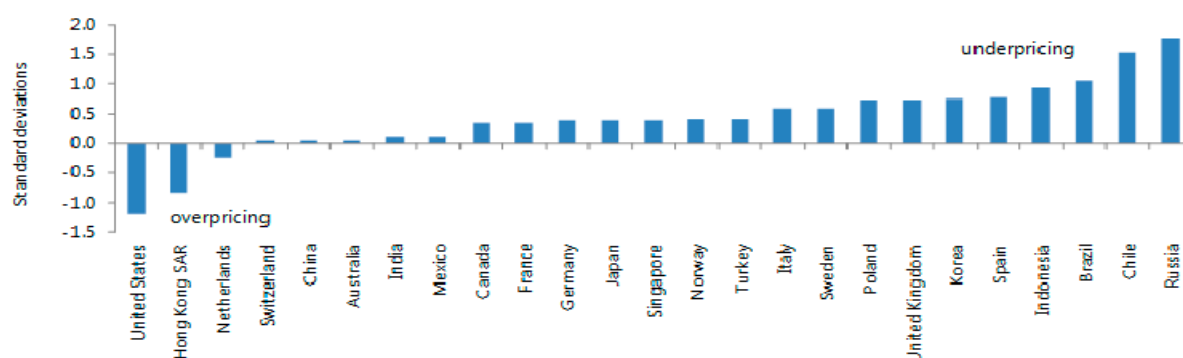
Source: IMF staff calculations.
Note: The implied real equity yield is the cost of capital for equities (or the required return to hold stocks), expressed as the number of standard deviations from the country-specific long-term average. Data start in 1989 (1953 for the United States). See Jones (2014).

3. House Price Fundamentals
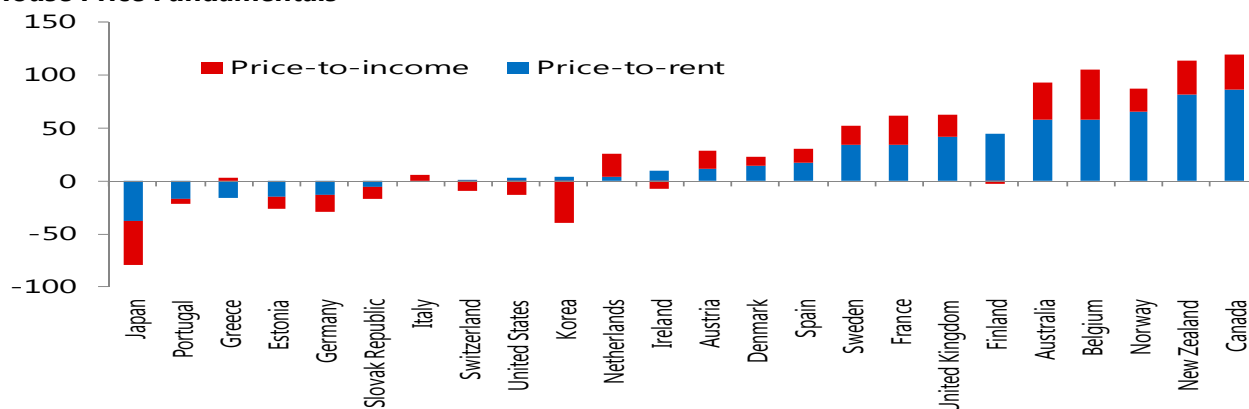
Source: IMF staff calculations based on OECD data.
Note: 2014:Q1 or latest, deviation from historical average, in percent.

An in-depth look at sovereign spreads

107. To further examine the considerable compression in sovereign bond spreads, econometric models were estimated with sovereign spreads for Italy, Spain, and France. 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 (Moody's, 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[46] (ease of deleveraging, see also IMF 2014); 5) A measure of external imbalances (TARGET2 or real effective exchange rates), which became focal points of attention during the crisis; and 6)Money market rates, a proxy for global market risk/liquidity (the VIX index), and a measure for flight to quality, enter the model exogenously (see October 2013 GFSR).

Methodology

108. Autoregressive specifications, namely Vector Error Correction Models (VECMs), were estimated on monthly data since 2001[47] for France, Italy and Spain (130–140 observations). The VECM specification allows to explain spreads as driven by the adjustment towards equilibrium, determined by the factors listed above. In this specification, 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 system for economy j, corresponding to the spread and debt dynamics, can be written as:

$$s10_t^j = \alpha_{11}^j \left[s10_{t-1}^j - \beta_1 \, \Delta Dbty_{t-1}^j - \beta_2 \, pbk_{t-1}^j - \beta_3 \, \Delta ip_{t-1}^j - \beta_4 \, \text{infl}_{t-1}^j - \beta_5 \, reer_{t-1}^j - v_{11}^j \right] +$$
$$+ \gamma_{11} \Delta \, s10_{t-1}^j + \gamma_{12} \Delta_2 \, Dbty_{t-1}^j + \gamma_{13} \Delta pbk_{t-1}^j + \gamma_{14} \Delta_2 \, ip_{t-1}^j + \gamma_{15} \Delta infl_{t-1}^j + \gamma_{16} \Delta reer_{t-1}^j + \chi_{11} \boldsymbol{\sigma_{t-i}} + \varepsilon_1$$
$$\Delta Dbty_{t-1}^j = \alpha_{11}^j \left[s10_{t-1}^j - \beta_1 \, \Delta Dbty_{t-1}^j - \beta_2 \, pbk_{t-1}^j - \beta_3 \, \Delta ip_{t-1}^j - \beta_4 \, \text{infl}_{t-1}^j - \beta_5 \, reer_{t-1}^j - v_{11}^j \right] +$$
$$+ \gamma_{21} \Delta \, s10_{t-1}^j + \gamma_{22} \Delta_2 \, Dbty_{t-1}^j + \gamma_{23} \Delta pbk_{t-1}^j + \gamma_{24} \Delta_2 \, ip_{t-1}^j + \gamma_{25} \Delta infl_{t-1}^j + \gamma_{26} \Delta reer_{t-1}^j + \chi_{21} \boldsymbol{\sigma_{t-i}} + \varepsilon_2$$

where $s10_t^j$ is the ten year sovereign yield spread against the German bund, $\Delta Dbty$ denotes changes in the debt-to-GDP ratio, pbk_{t-1}^j are price-to-book ratios in the banking sector, Δip_{t-1}^j captures the business cycle, as approximated by (log) changes in the industrial production index, infl_{t-1}^j is the annual rate of inflation, and $reer_{t-1}^j$ the real effective exchange rate.

The common cointegrating vector shared by the system's six equations is:

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[46] In relation to the business cycle, it may also indirectly measure the evolution of price competitiveness.

[47] Following the Johansen methodology; Trace and Max Eigenvalue tests alongside diagnostic testing, were performed; 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.

$$s10_{t-1}^{j} = \nu_{11}^{j} + \beta_1 \, \Delta \, Dbty_{t-1}^{j} + \beta_2 \, pbk_{t-1}^{j} + \beta_3 \, \Delta ip_{t-1}^{j} + \beta_4 \, \text{infl}_{t-1}^{j} + \beta_5 \, reer_{t-1}^{j} + \xi_{t-1},$$

so that when $\xi_{t-1} = 0$, spreads are at their equilibrium level, captured by the horizontal axis in the charts on the left side of Figure 1.29. Since the focus of the exercise is the behavior of sovereign spreads, the first equation is the most relevant. The beta coefficients associated with the model's cointegrating relationship are the same for each equation above, because all the endogenous variables share the same cointegrating equilibrium. The speed of adjustment towards 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 ν_{ij} and the error terms ε_i complete the specification. The vector $\boldsymbol{\sigma_{t-i}}$ includes exogenous variable such as money market rates and Germany's asset swap spread (proxy for flight-to-quality episodes).

**109.** 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 instead than price to book ratios). The cointegrating equilibrium spread was filtered using the asymmetric Christiano Fitzgerald band pass (Christiano and Fitzgerald, 1999) to smooth the trajectory, reduce its volatility, and control for outliers (a moving average yields similar results).

Results

110. It is possible that progress in fiscal frameworks at European level has offset the prolonged deterioration in public finances, and that the EU Bank Recovery and Resolution Directive has helped to reassure investors on the destabilizing nexus between contingent liabilities in the financial sector and government finances. The forthcoming Asset Quality Review may raise confidence on banks' progress towards balance sheet transparency and capital adequacy. Nonetheless, there is no hard evidence that market participants have revised down their medium-term forecasts of public debt ratios in view of lower future contingent liabilities. According to the IMF's *Fiscal Monitor* projections (general government debt ratios in the three countries are poised to increase further in 2014 and remain high thereafter, Imbalances, such as TARGET2 levels and real exchange rates, despite some improvements, remain at elevated levels, and still exert upward pressure on fair value spreads.

111. The estimated valuation paths appear historically plausible and consistent with other approaches (such as Seemingly Unrelated Regressions), despite the large shocks during the sovereign and banking crisis. As illustrated in the charts, spreads ultimately revert towards this notion of fair value.[48] It is clear that unwinding of an overvaluation of some sovereign banks may impact banks and their funding costs. This, possibly combined with uncertainties on the pending results of the comprehensive assessment, could lead to increased volatility.

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[48] The speed of adjustment is measured from 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).

Figure 1.29. Analysis of Selected European Spreads

1. Italy
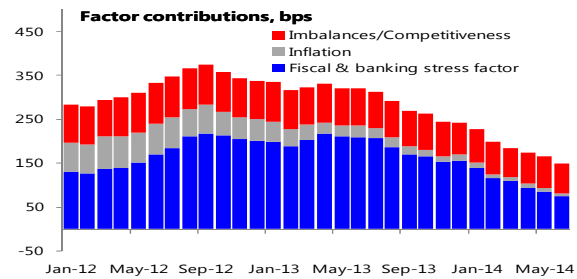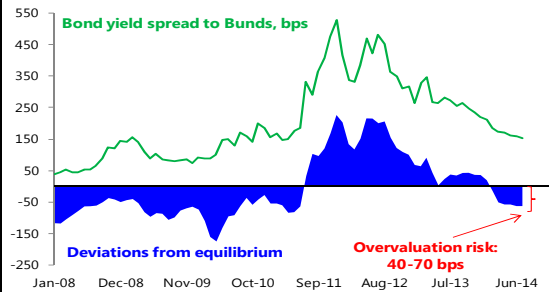
2. Spain
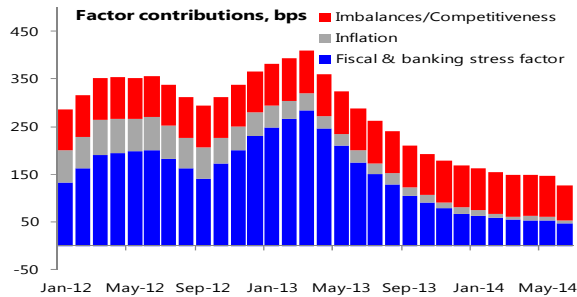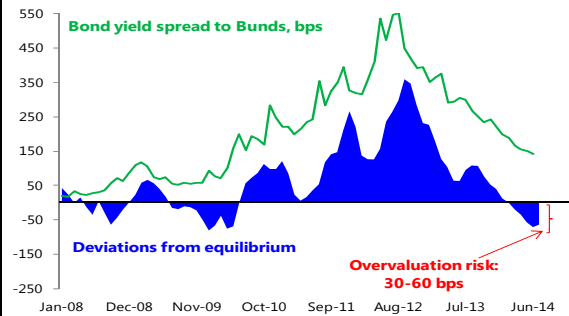
3. France
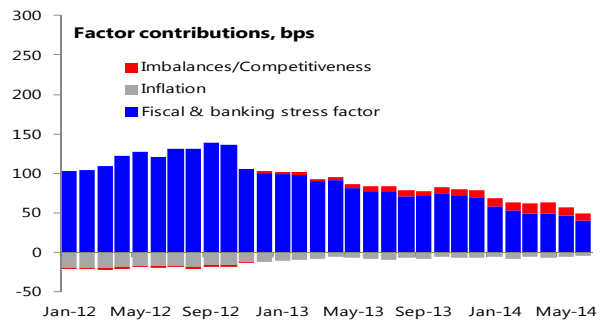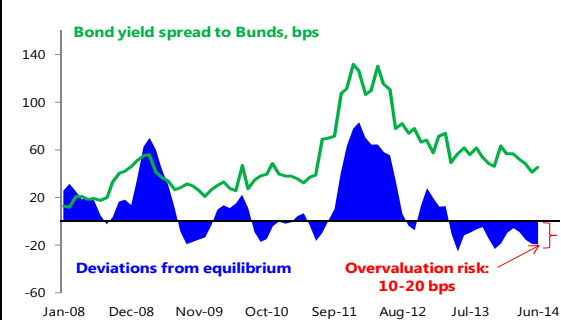
Source: IMF staff calculations

Annex 1.2 Corporate Conditions and Investment[49]

112. 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 which, for financial or economic reasons, are generally considered to affect firms' investment capacity and incentives. These 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).

113. A panel fixed effects strategy was employed, using corporate balance sheets in five major industrialized countries: U.S., U.K., Japan, Germany, and France. Data are quarterly, corresponding to the frequency of firms' financial statements, and covering the period 1999:Q1 to 2014:Q2. The sample consists of 895 firms overall, comprising members of the major equity indices in each country. All data are obtained from the S&P Capital IQ database.

114. 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 book value of equity. Leverage is the 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.

115. The baseline investment model is:

$$I_{ict} = \beta_1 * r_{i,c,t} + \beta_2 * ROA_{i,c,t} + \beta_3 * Leverage_{i,c,t-1} + \beta_4 * \Delta Debt_{i,c,t} + Firm\ FE + Time\ FE + Country\ FE + \epsilon_{i,c,t}$$

i: firm; c: country; t: time where *I* is investment; *r* is the cost of funds, and Δ*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.

116. It is expected that the coefficient on ROA will be positive and that 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, since a major reason for issuing debt is to fund investment projects. On the other hand, high *ex ante* debt levels are likely to slow investment flows due to the higher risk premiums and resulting higher cost of financing that they normally entail. While the cost of funds should capture some of the negative effects of risk premiums on investment, the company-specific measure employed corresponds more closely to the average than to the marginal cost of funds. The

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latter, however, is more relevant for funding decisions, and it is expected 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.

117. As shown in columns 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.

Table 1.5. Capital Investment Regressions

Dependent Var Investment	Model 1 2004Q1-2014Q1	Model 2 1999Q1-2014Q1	Model 3 2004Q1-2014Q1	Model 4 1999Q1-2014Q1
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 fund	-0.02269***	-0.02320***	-0.02321***	-0.02377***
	(0.00809)	(0.00827)	(0.00820)	(0.00832)
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-squared	0.01574	0.02129	0.02567	0.03440
Number of comp	794	803	794	803
Time FE	YES	YES	YES	YES
Country FE	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES

All variables are winsorized at the 1st and 99th percentiles
Firm-clustered standard errors are in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: IMF staff calculations; S&P Capital IQ.

118. Tobin's q is incorporated in versions (3) and (4) of the model to capture the effect of expected investment returns on firm investment decisions. Inclusion of 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 from additional capital is higher than its cost, the coefficient of q appears as significantly positive in the estimation. Since the marginal return from investment is not observed directly, the ratio of market value to the book value of firm assets is used as a proxy for marginal q. The estimation results are consistent with theoretical implications and findings in previous empirical studies (Fazzari et al., 1988; Kaplan & Zinglales, 1997).

119. 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 developed countries 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 Chapter 1, is the uncertainty associated with the future path of U.S. interest rates.

Estimating default probabilities for China's corporate sector

120.   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 pre-specified 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:

$$PD = \sum_{i=0}^{\infty} \frac{e^{-\lambda T}(\lambda T)^i}{i!} \cdot N\left(\frac{\ln(\xi) - \ln\left(\frac{V}{DB}\right) - \left(r - \frac{\sigma^2}{2} - \lambda v\right)T - i\mu_\pi}{\sqrt{\sigma^2 T + i\sigma_\pi^2}}\right) \tag{1}$$

121.   where *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 (1) 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 (1) was replaced by a linear function of the fitted asset drift μ and an estimated time-varying price of risk.

Data

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

123.   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 (TSF) as at the end of 2014:Q1; the sample size dropped to 70 percent and 48 percent of loans and TSF, respectively, in the stress

scenario due to difficulties in estimating *PD*s for some firms. The dataset is an unbalanced panel because of different listing dates for listed firms and some missing quarterly numbers for non-listed firms. Balance sheet variables are taken from the WIND database (see Table 1.6 for the data at 2014Q1 and 2008 crisis period). Total liabilities of each firm consist of current liabilities and non-current liabilities.

124.   Following Moody's KMV and previous studies, balance sheet variables with a 1-quarter lag are used in the estimation and the distress barrier is set to be current liabilities plus half of non-current liabilities. Estimated asset volatility is based on rolling 4-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

	2014Q1		2008 crisis*	
	Median	Std. Dev.	Median	Std. Dev.
Listed non-financial firms				
Total assets (RMB billion)	2.83	68.97	2.05	40.35
Total liabilities (RMB billion)	1.16	39.82	1.06	18.27
Current liabilities (RMB billion)	0.92	28.03	0.83	12.82
Non-current 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	
Non-listed non-financial 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
Non-current liabilities (RMB billion)	1.07	75.68	1.53	29.60
Number of firms	1,586		675	

Source: IMF staff calculations; S&P capital IQ.

Note: 2008:Q3 for listed firms and 2008:Q4 for non-listed firms.

Annex 1.3. Banking[50]

Regulatory reform agenda: state of pay ahead of the G20 Summit in Brisbane, Australia

125. Work on the G-20 regulatory reform agenda has focused on addressing the shortcomings revealed by the global crisis, paving the way toward 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 G-SIFIs and harmonization of cross-border application of OTC derivatives rules.

126. The main elements of the Basel III framework—capital, liquidity, and leverage—have 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 1 January 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.

127. To help restore trust in banking and Basel capital standards, the BCBS is working to address the high variability across risk-weighted assets reported across banks. While actual difference in risk is an important driver of differences in risk weights used by banks, 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.

128. Addressing the issue of 'too-big-to-fail' (TBTF) remains a key challenge. Notwithstanding progress since 2011, many jurisdictions are yet to fully align their resolution regimes with international best practice. Further efforts are needed to: (i) make progress on living wills and identify and remove barriers to firms' resolvability; (ii) reach consensus on banks' loss absorbing capacity in resolution, providing clarity on the nature, quantity, and location of eligible liabilities; (iii) address obstacles to cross border cooperation and recognition of resolution measures; and (iv) advance the agenda on recovery and resolution of non-banks, including CCPs.

129. Progress has been made by the International Accounting Standards Board (IASB) on key accounting reforms. Two new standards—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 earlier and fuller recognition of impairment losses. This

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[50] Annex prepared by Michaela Erbanova.

will help enhance investor confidence in bank balance sheets and improve capital market transparency and integrity.

130. Progress on the nonbank side of the global reform agenda has been mixed. The International Association of Insurance Supervisors (IAIS) is aiming to finalize, in time for the G20 summit, a group-wide capital standard for global systemically important insurers (G-SIIs). In addition, the FSB has issued for public consultation a draft methodology for identifying non-bank and non-insurer G-SIFIs. National regulators are also making efforts to implement agreed standards on shadow banking and important progress has been made by the U.S. SEC on money market fund (MMF) reform, including adopting mandatory floating NAV and/or liquidity fees for non-government MMFs. The FSB is now working to finalize minimum haircut requirements on securities lending and repos.

131. 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 Task Force on Securitization Markets has been formed (comprising the BCBS, IAIS, IASB and IOSCO) to assess the development and functioning of securitization markets.

132. 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 behind the original timetable.

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

Restricted or directly impacted	Indirectly impacted, and may make some operations uneconomical	Indirectly impacted, but 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 /Private Wealth
		Trade Finance	Retail & 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 (incl. G-SIB surcharge) (2013)	Higher capital charge for G-SIBs across lending products, particularly affecting higher risk weighted assets (such as Retail & SME lending on average)				Higher capital charge on long dated non cleared 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, 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, securities financing (for example, repo)	Significantly higher capital charge for derivatives, off-balance sheet items	
	Liquidity Coverage Ratio (2015)						Increased liquidity requirements for short term liabilities (for example, repo, commercial papers)		
	Net Stable Funding Ratio (2018) Consultation issued as of April 2014		85 percent long term funding requirement (RSF) for average quality loans not maturing within one year		65 percent for fully secured mortgages not maturing within a year	85 percent RSF for loans not maturing within one year	50 percent RSF for repo 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. FBO rule U.K. and EU structural measures		Higher cost of maintaining capital and liquidity, pressuring banks towards lower balance sheet size, fewer activities , or retreat							
Conduct rules (Anti-money Laundering and Combating the Financing of Terrorism (AML/CFT), Know-your-Clients (KYC)); Litigations		Increase in operational risks							

Annex 1.4. Volatility[51]

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

Realized volatility

133.   The daily annualized realized volatility σ_t of an asset with price P_t on day t, as

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

where *n* is the number of days in the volatility tenor, and log is the natural logarithm (i.e., log *e* = 1). The volatility heat map in Figure 1.30, panel 2, is a visual representation of how low the 3-month realized volatility of equities, bonds, credit and commodities was in 3Q of 2014. The aggregate realized volatility indices for the developed and emerging market equities, bonds and currency asset classes were constructed from the first principal component of the 3-month realized volatilities of the following sets.

- *Developed market 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.

- *Developed market currencies (all against the U.S. dollar):* Australian dollar, Canadian dollar, euro, Norwegian krone, sterling pound, Swedish krona, Swiss franc, and yen.

- *Emerging market currencies (all against the U.S. dollar):* Argentine peso, Brazilian real, Chilean peso, Chinese yuan, Colombia 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.

Modeling volatility

134.   This report borrows from the rich literature on volatility A common feature among volatility time series is 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

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[51] Annex prepared by Evan Papageorgiou.

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 Heteroskedasticity (ARCH) and Generalized ARCH (GARCH) models.

135.   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, being able 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.

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

$$r_t = a_0 + a_1 r_{t-1} + \varepsilon_t; \ \ \varepsilon_t = \sqrt{\gamma_{s_t}} u_t; \ u_t = h_t v_t; \ \ and \ h_t^2 = \alpha_0 + \alpha_1 u_{t-1}^2 \text{ where } \alpha_0 \geq 0, \alpha_1 \geq 0,$$

where $r_t = \log(P_t/P_{t-1})$ 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, 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

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

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.

137.   The SWARCH model estimates highlight the nature of volatility of certain asset classes, and their sensitivity to the current environment of impending monetary policy tightening in the United States. Figure 1.30 illustrates the results of the SWARCH(2, 1) model estimation for the yield on the 10-year U.S. Treasury note, the S&P 500 equity index, the JPMorgan EMBI Global U.S. dollar emerging market sovereign debt index (diversified), and the JPMorgan GBI-EM local currency emerging market government bond yield index, by superimposing the volatility state on either the level or the first difference (or log-return) for each asset. The red areas clearly capture the increase in the instantaneous (in this case, weekly) volatility relative to the green areas. The S&P 500 and the 10-year U.S. Treasury note spent long periods in their high volatility state during the global financial crisis and subsequently following the U.S. credit rating downgrade by Standard and Poor's in August 2011. Emerging market bonds had shorter periods of high volatility over the same events, conceivably as these events were less related to emerging market developments. On the other hand, the May 2013 risk-off episode resulted in a much stronger and prolonged volatility shock to emerging market bonds than U.S. Treasury bonds.

138. 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 to developed market bonds, currencies, and investment grade credit as shown in Figure 1.30. For example, over the last 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. Therefore, although high volatility episodes for emerging market assets and high-yield credit are more short-lived, they tend to be much stronger.

Figure 1.30. Volatility Muliples Between High and Low States (γ factors of SWARCH model)
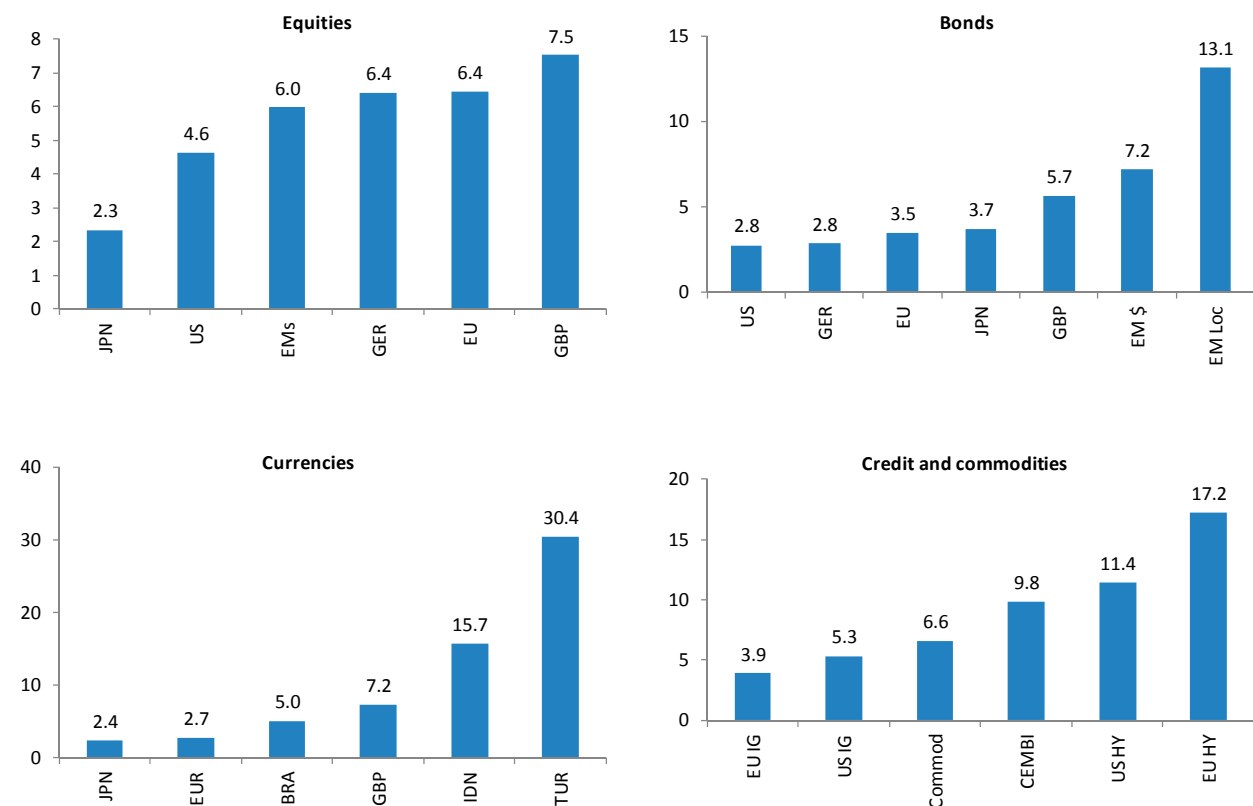
Source: IMF staff calculations.

Quantifying the effect of negative surprises on volatility and prices

139.   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).[52] 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 developed economy government bonds tend to have the opposite behavior.

140.   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 purchasing programs that have tempered the directional impact of price shocks on bond volatility.

141.   There is strong evidence that the Federal Reserve's policies have suppressed volatility in the equity market via the 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 from 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.

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	Eur Equities (Euro Stoxx)	EM equities (MSCI EM)	U.S. IG credit	GBI-EM (Local Currency EM Bonds)
Log-likelihood, independent model	-2186	-2365	-2420	-874	-438
Log-likelihood, fully-specified SWARCH model	-2231	-2396	-2438	-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.					

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

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