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Transition Challenges to Stability

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ASSUMPTIONS AND CONVENTIONS

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

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

– between years or months (for example, 2012–13 or January–June) to indicate the years or months covered, including the beginning and ending years or months;

/ between years or months (for example, 2012/13) to indicate a fiscal or financial year.

"Billion" means a thousand million.

"Trillion" means a thousand billion.

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

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

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

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

Further Information and Data

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

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

PREFACE

The *Global Financial Stability Report* (GFSR) assesses key risks facing the global financial system. In normal times, the report seeks to play a role in preventing crises by highlighting policies that may mitigate systemic risks, thereby contributing to global financial stability and the sustained economic growth of the IMF's member countries. The global financial system is now undergoing a series of transitions along the path to financial stability that have led to an uptick in liquidity and emerging market risks. For policymakers, a major challenge is to respond to the increase in market volatility associated with expectations for an eventual withdrawal from unconventional monetary policy in advanced economies. The current report analyzes risks to financial stability associated with the buildup of pockets of leverage in advanced and emerging economies during the extended period of monetary accommodation, and assesses policies to minimize those risks during the transition. The report also examines the potential reasons behind the weak developments in private credit since 2008 in some advanced economies and offers a framework for determining the types of policies that may be best suited to address this issue. Lastly, the report looks at bank funding structures, identifying how they have changed over time and how they affect financial stability. The report notes that the recent reform efforts have potentially different implications for funding structures leading to some tension among them.

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

Individual contributors to the report are Ruchir Agarwal, Sergei Antoshin, Nicolas Arregui, Serkan Arslanalp, Jorge A. Chan-Lau, Yingyuan Chen, Julian Chow, Nehad Chowdhury, Jihad Dagher, Reinout De Bock, Marc Dobler, Johannes Ehrentraud, Martin Edmonds, Xiangming Fang, Brenda González-Hermosillo, David Grigorian, Tryggvi Gudmundsson, Sanjay Hazarika, Anna Ilyina, Heedon Kang, William Kerry, Yitae Kim, Koralai Kirabaeva, Frederic Lambert, Samar Maziad, Rebecca McCaughrin, Peter Lindner, André Meier, Paul Mills, S. Erik Oppers, Nada Oulidi, Hiroko Oura, Evan Papageorgiou, Vladimir Pillonca, Alvaro Piris Chavarri, Jean Portier, Jaume Puig, Narayan Suryakumar, Takahiro Tsuda, Kenichi Ueda, Nico Valckx, Chris Walker, and Mamoru Yanase. Mustafa Jamal, Oksana Khadarina, and Yoon Sook Kim provided analytical support. Juan Rigat, Adriana Rota, and Ramanjeet Singh were responsible for word processing. Eugenio Cerutti, Ali Sharifkhani, and Hui Tong provided database and programming support. Additional input was received from Nicolas Blancher, Ana Carvajal, Karl Driessen, Jennifer Elliott, Michaela Erbenova, Ellen Gaston, Anastasia Guscina, Javier Hamann, Eija Holttinen, Bradley Jones, Emanuel Kopp, Fabiana Melo, Mala Nag, Oana Nedelescu, Guilherme Pedras, Gabriel Presciuttini, Amadou Sy, Hideyuki Tanimoto, Constant Verkoren, and Jianping Zhou. Linda Griffin Kean and Joe Procopio from the Communications Department edited the manuscript and coordinated production of the publication with assistance from Lucy Scott Morales and Linda Long.

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

The report reflects information available up to September 26, 2013.The report benefited from comments and suggestions from staff in other IMF departments, as well as from Executive Directors following their discussion of the Global Financial Stability Report on September 23, 2013. However, the analysis and policy considerations are those of the contributing staff and should not be attributed to the Executive Directors, their national authorities, or the IMF.

EXECUTIVE SUMMARY

The global financial system is undergoing a series of transitions along the path toward greater financial stability. The United States may soon move to less accommodative monetary policies and higher long-term interest rates as its recovery gains ground. After a prolonged period of strong portfolio inflows, emerging markets are facing a transition to more volatile external conditions and higher risk premiums. Some need to address financial and macroeconomic vulnerabilities and bolster resilience, as they shift to a regime in which financial sector growth is more balanced and sustainable. Japan is moving toward the new "Abenomics" policy regime marked by more vigorous monetary easing, coupled with fiscal and structural reforms. The euro area is moving toward a more robust and safer financial sector, including a stronger monetary union with a common framework for risk mitigation, while strengthening financial systems and reducing excessive debt levels. Finally, the global banking system is phasing in stronger regulatory standards. Chapter 1 examines the challenges and risks of each of these transitions.

The primary challenge resulting from these changes relates to managing the side effects and eventual withdrawal of accommodative monetary policy in the United States. Such a transition, including the benefits of a strong U.S. economy, should help limit financial stability risks associated with an extended period of low interest rates. Yet managing a smooth transition could prove challenging, as investors adjust portfolios for a new regime with higher interest rates and greater volatility. The analysis in Chapter 1 highlights the risk that long-term interest rates could rise more sharply than currently anticipated. Structural reductions in market liquidity and leveraged positions in short-term funding markets and the shadow banking system (for instance, in the mortgage real estate investment trust sector) could amplify these rate increases and spill over to global markets.

Financial stability challenges are also prevalent in many emerging market economies. Bond markets are now more sensitive to changes in accommodative monetary policies in advanced economies because foreign investors have crowded into local markets and may withdraw. Emerging market fundamentals have weakened in recent years, after a protracted interval of credit expansion and rising corporate leverage. Managing the risks of the transition to a more balanced and sustainable financial sector, while maintaining robust growth and financial stability, will be a key undertaking confronting policymakers.

As central banks elsewhere consider strategies for eventual exit from unconventional monetary policies, Japan is scaling up monetary stimulus under the Abenomics framework, aiming to pull the economy out of its deflationary rut. Successful implementation of a complete policy package that features fiscal and structural reforms would reinforce domestic financial stability, while likely boosting capital outflows. But substantial risks to financial stability could accompany the program if planned fiscal and structural reforms are not fully implemented. Failure to enact these reforms could lead to a return of deflation and increased bank holdings of government debt, further increasing the already-high sovereign-bank nexus. In a more disorderly scenario, with higher inflation and elevated risk premiums, the risks to both domestic and global financial stability could be greater still, including rapid rises in bond yields and volatility, and sharp increases in outflows.

In the euro area, reforms implemented at the national level and important steps taken toward improving the architecture of the monetary union have helped reduce funding pressures on banks and sovereigns. However, in the stressed economies of Italy, Portugal, and Spain, heavy corporate sector debt loads and financial fragmentation remain challenging. Even if financial fragmentation is reversed over the medium term, this report estimates that a persistent debt overhang would remain, amounting to almost one-fifth of the combined corporate debt of Italy, Portugal, and Spain. Assuming no further improvement in economic and financial conditions which would correspond to a more adverse outcome than the cyclical improvement built into the October 2013 *World Economic Outlook* baseline scenario, some banks in these economies might need to further increase provisioning to address

the potential deterioration in asset quality of corporate loan books. This could absorb a large portion of future bank profits. Recent efforts to assess asset quality and boost provisions and capital have helped to increase the loss-absorption capacity of banks, but further efforts to cleanse bank balance sheets and to move to full banking union are vital. These steps should be complemented by a comprehensive assessment and strategy to address the debt overhang in nonfinancial companies.

A number of policy actions can help promote an orderly move toward greater financial stability:

- Stronger growth in the United States is setting the stage for monetary normalization. Achieving a smooth transition requires policies that manage the effects of increased volatility and portfolio adjustments, while addressing structural liquidity weaknesses and systemic vulnerabilities. A clear and well-timed communication strategy by central bank officials is critical. Compared with previous tightening cycles, the authorities have a bigger toolkit at their disposal. Yet 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. Increased oversight would help reduce related risks of excessive leverage in the shadow banking system and, in particular, in the larger mortgage real estate investment trusts.
- For emerging market economies, the principal transmission channel of external pressures is more likely to be via liquidity strains in bond and foreign exchange markets, rather than through bank funding channels. In addition, the response of foreign investors to changing expectations for U.S. monetary policy will continue to affect local markets. In the event of significant capital outflows, some countries may need to focus on ensuring orderly market functioning, using their policy buffers wisely. Keeping emerging market economies resilient requires increased focus on domestic vulnerabilities as relative growth prospects moderate, U.S. nominal rates rise, and capital flows recede. Policymakers should carefully monitor and contain the rapid growth of corporate leverage. Local bank regulators need to guard against foreign currency funding mismatches affecting bank balance sheets, including through foreign currency borrowing by companies. In addition, establishing sufficient buffers and addressing macroeconomic imbalances will likely prove to be worthwhile steps for cushioning against increased volatility and risk premiums.
- Containing the risks to China's financial system is as important as it is challenging. Broad credit growth needs to be reined in to contain financial stability risks and promote the rebalancing of China's economy away from credit-fueled capital and property investment. It is important that prudential oversight of shadow banking activity be tightened, that incentives for regulatory arbitrage be removed through continued financial liberalization (for example, of deposit rates), and that the widespread belief in implicit guarantees and bailouts of risky corporate loans and saving products be counteracted. Unless credit losses are taken by lenders and savers, the state faces large and unpredictable fiscal costs.
- Japan's bold policies need to be completed, with the authorities following through on fiscal and structural policy commitments, to avoid downside risks. These policies are needed to contain a potential sharp rise in government bond risk premiums if sovereign debt dynamics do not improve. To help mitigate stability risks, market structures also need to be made more resilient (such as through the modification of circuit breakers in derivatives markets) and the risk profile of regional banks addressed.
- In the euro area, further progress in reducing debt overhangs and bolstering bank balance sheets needs to go hand in hand with a strengthened euro area financial architecture and the completion of the banking union agenda. Investors' faith in euro area bank balance sheets needs to be fully restored and credit flows to viable enterprises strengthened: a first step, as planned, is to conduct a thorough, realistic, and transparent balance sheet assessment. Credible capital backstops to meet any identified shortfalls need to be put in place and communicated in advance of the publication of results from the exercise. The corporate debt overhang should be addressed using a more comprehensive approach, including corporate debt cleanups, improvements to corporate bankruptcy frameworks, and active facilitation of nonbank sources of credit. Further monetary support by the European Central Bank and credit support to viable firms by the European Investment Bank are crucial to providing time for the repair of private balance sheets.
- Global bank capitalization remains diverse, because institutions are at different stages of balance sheet repair and operate in different economic and regulatory environments. The key tasks are to improve

the credibility, transparency, and strength of balance sheets, while avoiding undue pressures on banks from uncoordinated national regulatory initiatives and uncertainty. Further efforts are needed to assess the way in which market developments and regulatory initiatives affecting dealer-bank business models may influence the cost and provision of market liquidity. At a minimum, increased surveillance of and vigilance over the effects of trading liquidity pressures will be needed as financial markets move to a regime with higher interest rates and volatility.

If these policy challenges are properly managed, and if reforms are implemented as promised, the transition toward greater financial stability should prove smooth and provide a more robust platform for financial sector activity and economic growth. But a failure to implement the reforms necessary to address the many policy challenges highlighted above could trigger profound spillovers across regions and potentially derail the smooth transition to greater stability.

Chapter 2 looks at efforts by policymakers to revive weak credit growth, which has been seen by many as a primary reason behind the slow economic recovery. The chapter catalogues the policies implemented by various countries and offers a framework for assessing their effectiveness. It argues that policies are most effective if they target the constraints that underlie the weakness in credit. Using several analytical tools, the chapter finds that the constraints in credit markets differ by country and evolve over time, requiring a careful country-by-country assessment. Better data on new lending would also help identify constraints. In many cases, demand- and supply-oriented policies are complementary, but their relative magnitude and sequencing can be important. Moreover, policymakers should be cognizant of the fiscal costs and implications for financial stability of credit-supporting policies. The main risks center on increased credit risk, including a relaxation of underwriting standards and the risk of "evergreening" existing loans. Mitigation of these risks may not be necessary or appropriate while the economic recovery is still weak because it could run counter to the objectives of the credit policies (which are often designed to increase risk taking); still, policymakers will need to continually weigh the near-term benefits against the longer-run costs of policies aimed at boosting credit.

Chapter 3 explores how bank funding structures affect financial stability and whether regulatory reform initiatives are likely to make them more stable, diversified, and resilient. The chapter finds that healthy banks rely more on equity and less on debt—especially short-term wholesale funding that contributed to the global financial crisis—and use deposits as their primary funding source. Various reforms are rightly promoting many of these desirable attributes, but there could be potential trade-offs among them. On the one hand, there are pressures to use more secured funding—which increases asset encumbrance—as well as deposits, to reduce banks' vulnerability to turbulence in wholesale funding markets. On the other hand, bail-in power and depositor preference give better protection to taxpayers and depositors at the expense of unsecured wholesale debt holders. A numerical analysis illustrates the impact on the cost of unsecured debt as the proportion of newly protected creditors rises. Under current conditions and depositor protections (and especially for well-capitalized banks) the increase would be modest; however, if depositor protections were to be expanded substantially, the impact could be quite large. Careful implementation of the reforms can moderate tensions: Basel III and over-the-counter derivative reforms should be implemented as planned, but policymakers should monitor the increased demand for collateral and ensure that enough unencumbered assets are available to permit the meaningful bail-in of unsecured senior creditors.

CHAPTER 1

MAKING THE TRANSITION TO STABILITY

Financial stability risks are in transition. Although prospects for U.S. growth are solidifying, market and liquidity risks have risen. Expectations of reduced monetary accommodation in the United States may cause further global market adjustments and expose areas of financial excess and systemic vulnerability. Emerging markets face tighter financial conditions as they cope with weaker economic outlooks and rising domestic vulnerabilities. In the euro area, further progress has been made toward banking union, but the outlook remains clouded by the unfinished business of restoring bank health and credit transmission and reducing the corporate debt overhang. Japan's bold policies hold hope for reinvigorating growth and ending corrosive debt deflation dynamics, but implementation challenges are large and halfway policies would pose serious downside risks.

Prepared by Peter Dattels and Matthew Jones (team leaders), Sergei Antoshin, Yingyuan Chen, Julian Chow, Nehad Chowdhury, Reinout De Bock, Martin Edmonds, Xiangming Fang, Sanjay Hazarika, Anna Ilyina, William Kerry, Koralai Kirabaeva, Rebecca McCaughrin, André Meier, Paul Mills, Nada Oulidi, Evan Papageorgiou, Vladimir Pillonca, Jean Portier, Jaume Puig, Narayan Suryakumar, and Chris Walker.

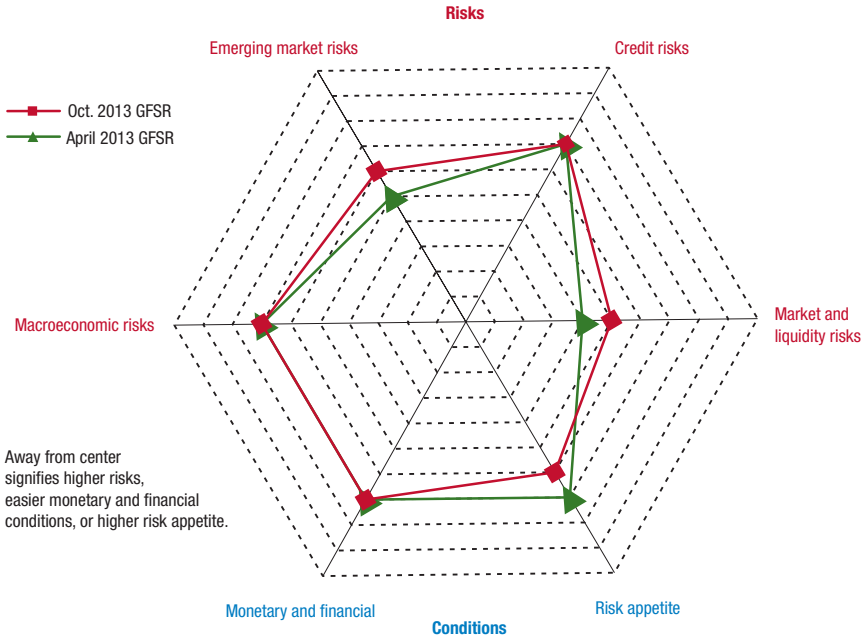
Financial Stability Overview

The Global Financial Stability Map indicates that risks are in transition (Figures 1.1 and 1.2).

Macroeconomic risks remain unchanged overall, with global activity expected to strengthen moderately, though with forecast risks remaining to the downside, as discussed in the October 2013 *World Economic Outlook* (WEO). European recovery has been tepid, and growth in an increasing number of emerging market economies is slowing. At the same time, the U.S. recovery is gaining ground, which is positive for global growth, but is also leading markets to price in an earlier tightening of U.S. financial conditions. Thus, the process of normalization of global asset allocations has begun, pushing up interest rates and risk premiums as markets shift away from a regime of suppressed market volatility and very favorable liquidity conditions. These changes are creating a host of new challenges for financial stability, leading to higher *market and liquidity risks*.

Developments since late May 2013 have brought about a "mini stress test" in the form of a global volatility shock, uncovering some important channels of potential financial

Figure 1.1. Global Financial Stability Map

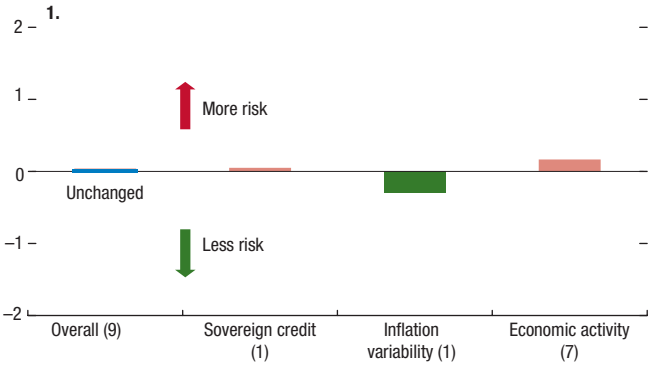


Source: IMF staff estimates.

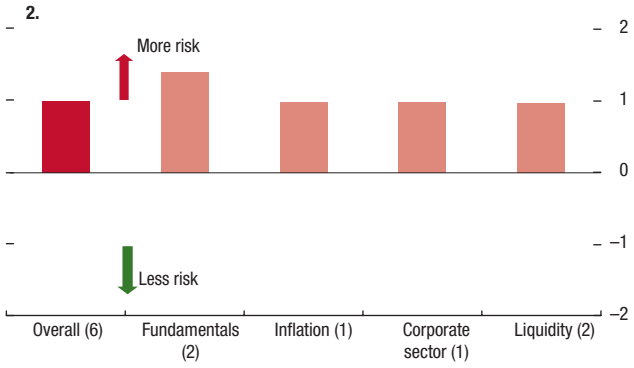
Figure 1.2. Global Financial Stability Map: Assessment of Risks and Conditions

(Notch changes since the April 2013 GFSR)

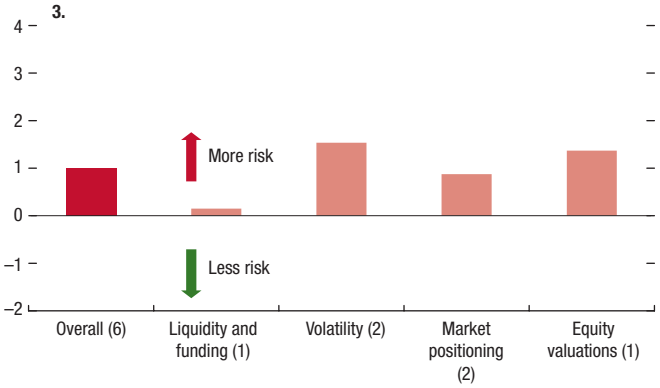
Macroeconomic risks remain unchanged, but global activity has become more uneven and is projected to expand only modestly in 2014.



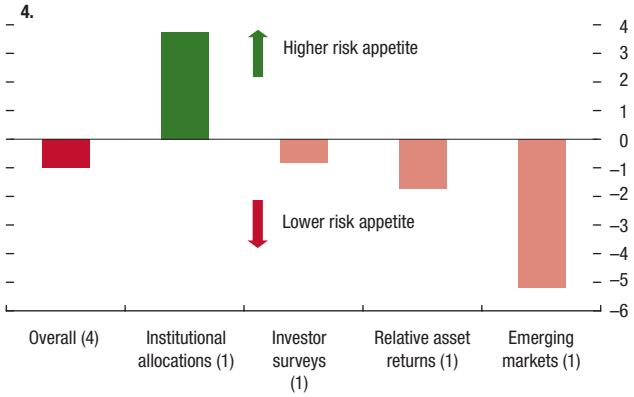
Emerging market risks have increased as the result of weaker growth prospects and rising domestic and external vulnerabilities.



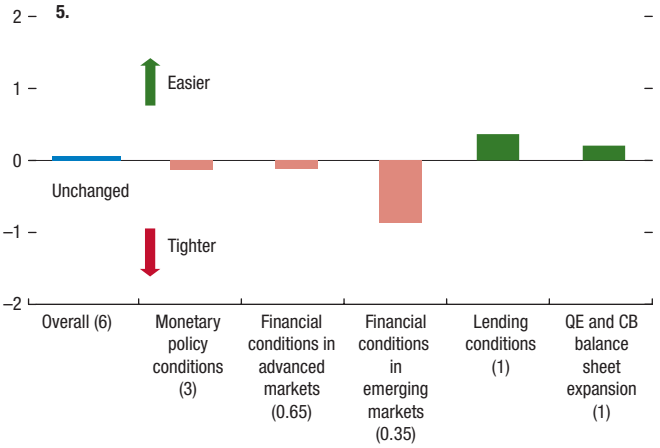
Market and liquidity risks have increased as markets adjust to prospects of reduced monetary accommodation with implications for asset prices.



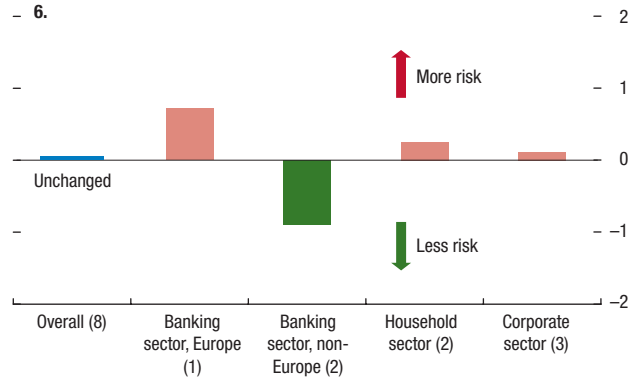
Risk appetite has contracted, resulting in reversals of capital flows to emerging markets.



Monetary and financial conditions remain broadly accommodative, as lending conditions have improved, but emerging market risk premiums have risen.



Credit risks are broadly unchanged, reflecting the uneven progress in balance sheet repair and pressures on euro area banks.

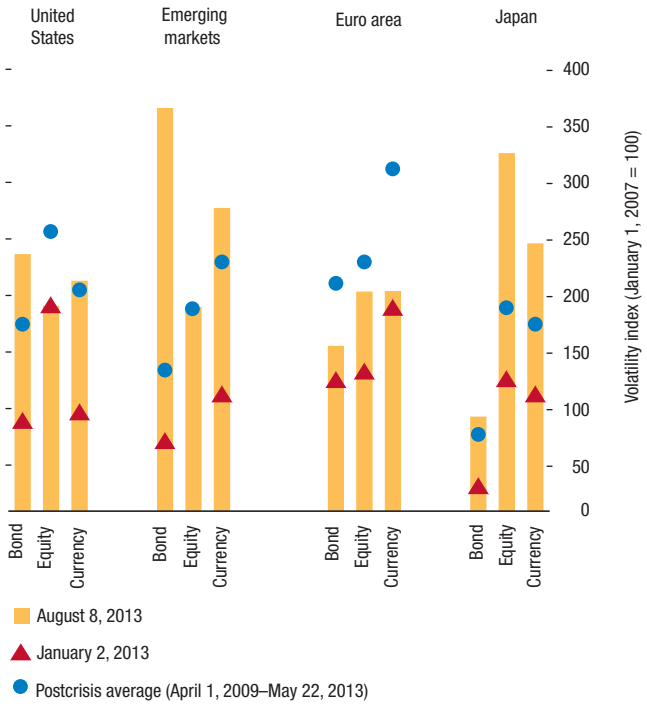


Source: IMF staff estimates.

Note: Changes in risks and conditions are based on a range of indicators, complemented with IMF staff estimates (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 standards, positive values represent a slower pace of tightening or faster easing. CB = central bank; QE = quantitative easing.

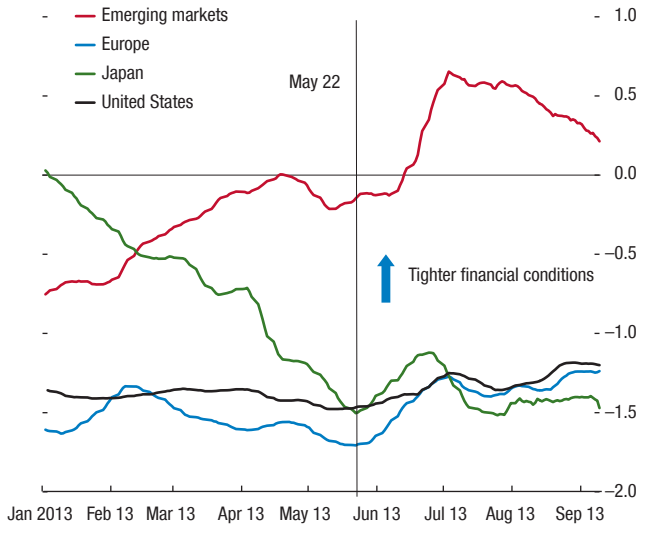
fragility. A substantial increase in volatility occurred, especially through the interest rate channel, as monetary policy expectations reset and strongly affected emerging markets (Figure 1.3). Market conditions have subsequently calmed, but transition challenges remain. At the time of writing, a political standoff in the United States has led to a shutdown of its federal government. The analysis in this report assumes that the shutdown is short, discretionary public spending is approved and executed as assumed in the forecast, and the debt ceiling—which may be reached by mid-October—is raised promptly. There is uncertainty on all three accounts. While the damage to the U.S. economy from a short shutdown is likely to be limited, a longer shutdown could be quite harmful. And, even more importantly, a failure to promptly raise the debt ceiling, leading to a U.S. selective default, could seriously damage the global economy and financial system. Although *monetary and financial conditions* overall remain accommodative, risk premiums in emerging markets have risen, tightening financial conditions in those markets (Figure 1.4). Against this backdrop, *emerging market risks* have increased because of weaker growth prospects coupled with less accommodative external conditions and more worries about domestic and external vulnerabilities. *Risk appetite* has fallen, resulting in some outflows from emerging market funds.

Figure 1.3. Market Volatility Shock
(Index)



Sources: Bloomberg, L.P.; and IMF staff estimates.
Note: The historical volatilities are computed using a rolling 60-day standard deviation of index returns, which are then indexed with January 1, 2007, as the reference point.

Figure 1.4. Global Financial Conditions
(Index; normalized, two-week moving averages)



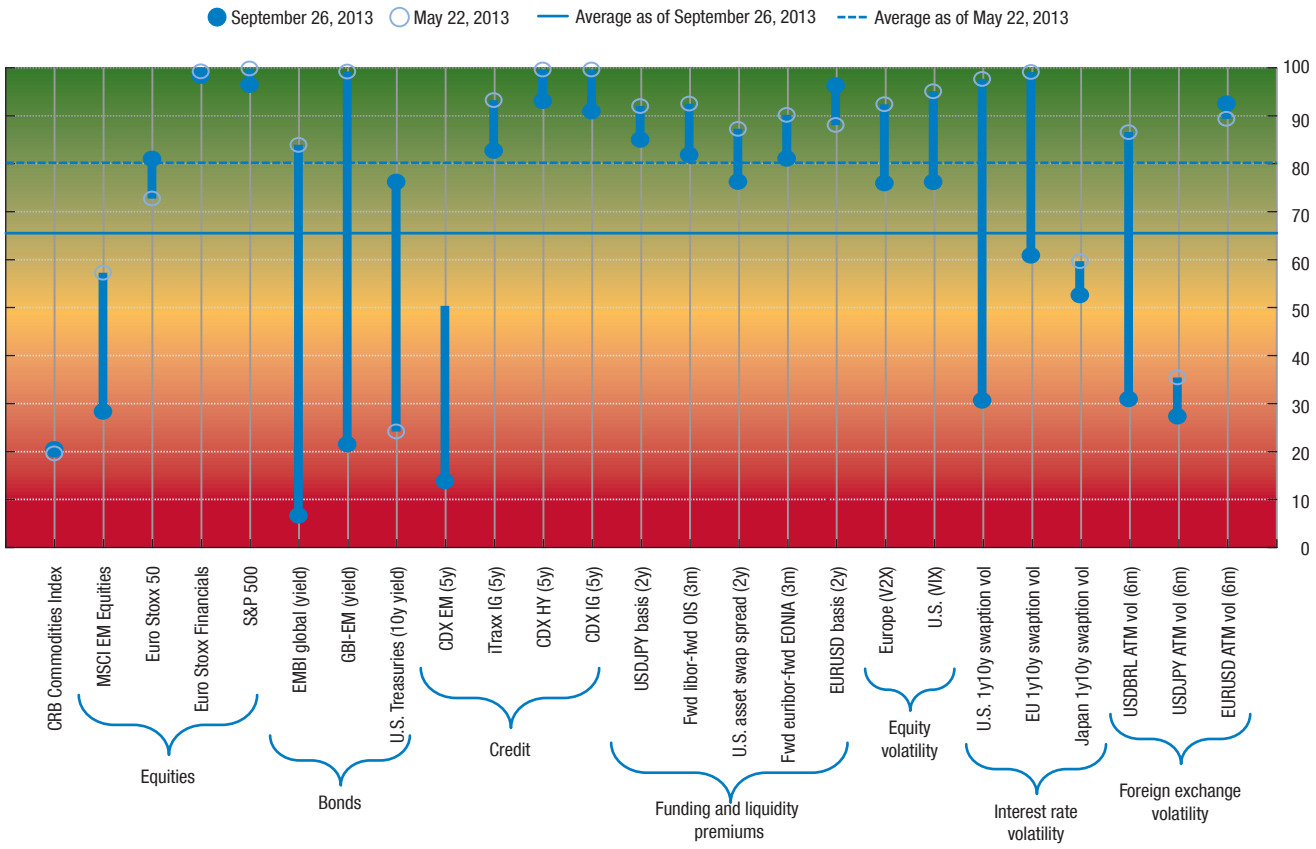
Source: Goldman Sachs Financial Conditions Index.

Credit risks remain broadly unchanged, reflecting insufficient balance sheet repair and slow progress in addressing the lingering risks that materialized as a result of the crisis. The subdued outlook in Europe and challenges in bank asset quality and capital continue to keep credit risks elevated, and this has been compounded by the problems posed by debt-burdened companies, further undermining the prospects of a recovery.

This chapter examines prospects for and risks to global financial stability. The next section asks whether the prospect of tighter financial conditions in the United States will result in a smooth normalization of financial markets and portfolio allocations, or whether markets will become turbulent and financial stability risks will arise. How will emerging markets be affected by changes in advanced economy monetary policies and asset allocations? Do domestic risks in emerging markets themselves pose a threat? Will Japan's bold policies be successful, and what are the downside risks if policy commitments are not met?

The task of addressing legacy risks from the global financial crisis remains unfinished. The third section assesses these risks by focusing on the remaining challenges in the euro area. The analysis suggests that addressing the debt overhang in the nonfinancial corporate sector is critical. If it is not addressed, bank health cannot be restored and the sovereign-banking-corporate nexus will remain unbroken. The fourth section examines developments in systemically important banks and the progress they have made in

Figure 1.5. Market Dashboard
(Percentiles over the past three years)



Sources: Bloomberg, L.P.; and IMF staff estimates.
Note: Each marker corresponds to the percentile of the level of the asset in relation to its three-year history of levels. Fifty corresponds to the median during the period, zero corresponds to the level consistent with the highest risk aversion during the period, and 100 corresponds to the level consistent with the lowest risk aversion during the period. 10y = 10 years; 5y = 5 years; 2y = 2 years; 6m = 6 months; V2X = Dow Jones EURO STOXX 50 Volatility Index; VIX = Chicago Board Options Exchange Market Volatility Index; EM = emerging market; OIS = overnight index swap.

strengthening their balance sheets. The fifth section tackles key policies that can safeguard financial stability.

Challenges Related to Accommodative Monetary Policies Will Test Markets and Policymakers

Before the market correction that began in May 2013, prices of many assets had risen to multi-year highs, underpinned by three key expectations. First, quantitative easing in the United States was expected to be protracted. Second, U.S. economic prospects were expected to catch up to the buoyancy in markets. Third, low yields were expected to persist alongside low volatility and rising asset prices. Starting in May, markets were rattled by shifts in the perceived regime (Figure 1.5). The Federal Reserve signaled that improvements in the U.S. economy could prompt a tapering of its asset purchase program before the end of the year. Emerging markets faced sustained capital outflows for the first time since the Lehman Brothers collapse in September 2008, while evidence of slowing growth mounted. Markets came to question both the upside and the downside risks of Japan's bold set of quantitative and qualitative monetary easing policies, reflected in rising market volatility observed in April and May 2013. Against this backdrop, this section explores the transition challenges from an end to accommodative monetary policies and describes how markets and policymakers could be tested.

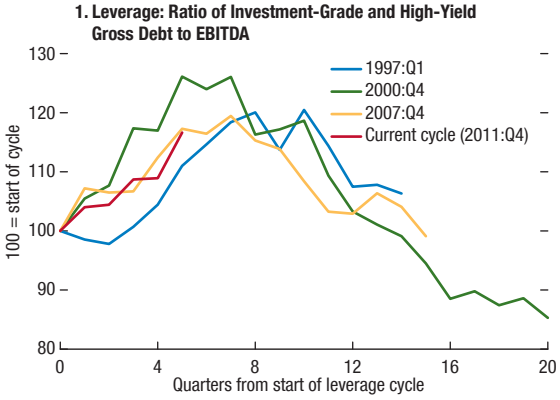
The United States: Uncertainties in Making the Transition to a New Regime

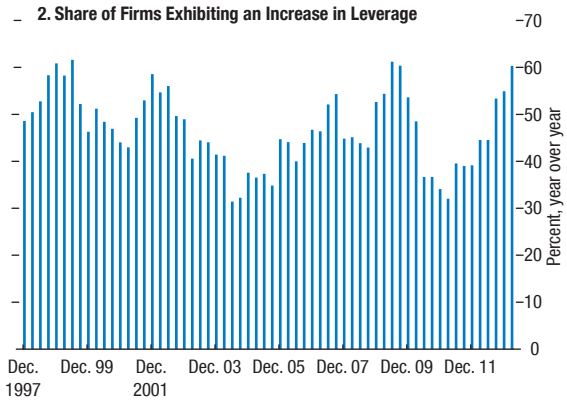
Stronger growth in the United States is setting the stage for a start toward monetary normalization. From a financial stability standpoint, such a transition should help limit risks associated with a prolonged period of low interest rates. Yet managing a smooth transition could prove challenging, with a key risk being the potential for long-term interest rates to overshoot. A

Figure 1.6. U.S. Nonfinancial Firms' Credit Fundamentals

Leverage has risen meaningfully as debt levels have grown and EBITDA gains have slowed.

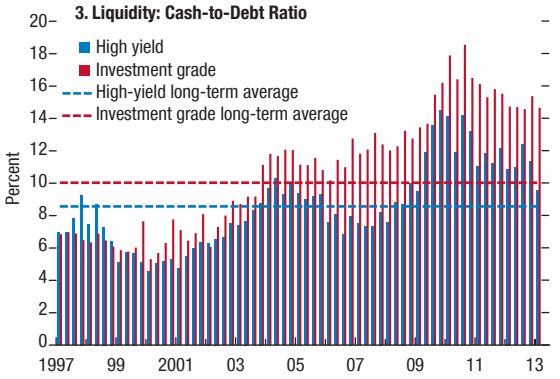
The trend has been broad based, with leverage rising among both low- and high-quality credit.

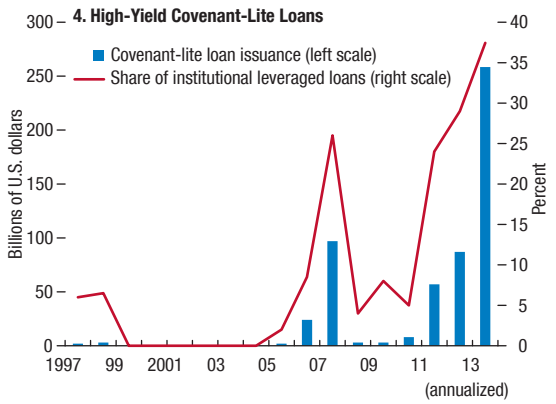




Liquidity conditions are deteriorating...

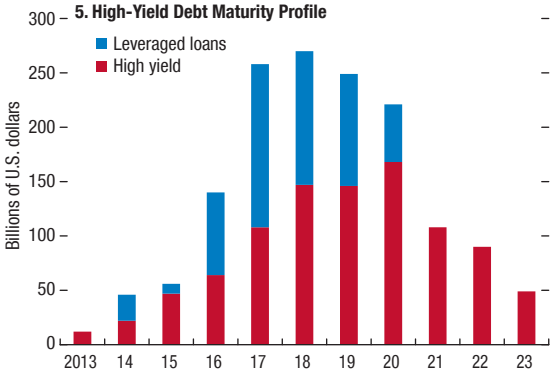
…while underwriting standards continue to weaken.

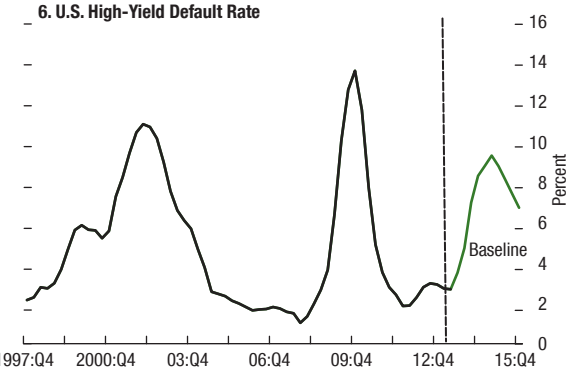




Refinancing risk is not an immediate concern because of low rates and liability management…

…but defaults are still on track to rise owing to past excesses and a turn in the credit cycle.





Sources: Deutsche Bank; Federal Reserve; Moody's; Morgan Stanley; S&P Leveraged Commentary and Data; Thomson Reuters; and IMF staff estimates.
Note: EBITDA = earnings before interest, taxes, depreciation, and amortization.

decline in structural market liquidity, coupled with leveraged funding and mortgage structures, could amplify market movements and lead to systemic financial strains in the United States and across the globe.

The Federal Reserve has indicated that if the economic recovery continues as expected, it would be appropriate to begin scaling back its asset purchase program as a first step toward phasing out monetary stimulus.[1] Gradually making the transition to a higher interest rate regime should be positive for financial stability, because risks associated with low rates and the accumulation of financial excesses will be curtailed. This is especially critical given that some of these risks have continued to build, including the deterioration in corporate credit conditions (Figure 1.6), yield-seeking behavior among pension funds and insurers (see the April 2013 GFSR), and an extension in portfolio duration.[2]

Ideally, the normalization of interest rates and volatility would be orderly and unfold as follows: short-term interest rate expectations rise along a smooth, gentle path, consistent with current market expectations; the term premium compression unwinds gradually; the portfolio adjustment response occurs smoothly, and credit valuations reprice modestly; pockets of balance sheet leverage are unwound at a gradual pace, with limited knock-on effects; market liquidity is sufficient to accommodate these adjustments; and all of these developments occur in the context of an economy gathering strength. The current WEO projections assume that the latest tightening in financial conditions was largely a one-time event and that the actual tapering of purchases will further tighten conditions only modestly.

But a less-benign scenario is a distinct risk. The failure of any one or all of the elements outlined here could lead to a more abrupt, sustained move in long-term interest rates and excess market volatility as prior accommodation is reversed (IMF, 2013c). The shift in short-term interest rate expectations and term premiums could be sharper and the cycle more frontloaded, leading to a rapid tightening in financial conditions and increased portfolio losses, potentially aggravated by reduced market liquidity and forced asset sales (particularly where leverage and maturity mismatches are sizable), with spillover implications for broader global financial conditions.[3] These developments could lead to a bumpier transition and strain financial stability.

Table 1.1. Market-Implied Interest Rate Pricing versus Historical Cycles

Start of Federal Reserve Rate Hiking Cycle	Cycle Length (months)	Total Hikes (basis points)	Total Hike in First Year (basis points)	Average Hike per Month (basis points)
Jul-1958	19	342	246	18
Jan-1962	59	425	150	7
Jun-1967	27	625	200	23
Dec-1971	31	1,031	250	33
Dec-1976	49	1,783	236	36
Apr-1983	17	288	188	17
Dec-1986	30	394	94	13
Jan-1994	14	300	250	21
Mar-2004	28	425	175	15
Median	**28**	**425**	**200**	**18**
Mar-2015	49	381	73	6

Sources: Bloomberg, L.P.; Deutsche Bank; and IMF staff estimates.
Note: March 2015 figures are projections.

Containing long-term rates and market volatility will be a key challenge.

Following the turbulence in May and June 2013, financial markets shifted forward their expectations about the start of the tightening cycle in response to an anticipated scaling back in Federal Reserve asset purchases. Then at its September meeting, the Federal Reserve surprised markets by deciding to delay the start of its tapering process. Nevertheless, interest rate futures markets are still pricing in only a very gradual, modest tightening relative to the historical trend (Table 1.1). Although the actual path could ultimately prove to be sharper and swifter, the Federal Reserve has a number of tools to guide short-term rates.

In contrast, controlling long-term rates is more difficult. Various factors influence term premiums and long-term rates that are collectively more difficult for central banks to contain. To assess the potential trajectory of long-term rates, a term premium model is estimated based on changes in macroeconomic fundamentals, macroeconomic volatility, financial market volatility, market expectations about the future interest rate path, and the size and persistence of the Federal Reserve's asset purchase program.

[1]The Federal Reserve surprised markets in mid-September by voting not to scale back asset purchases at that time, but suggested that if the economy continued to recover as it expected, it would, at subsequent meetings, assess incoming information to determine when to moderate the pace of asset purchases. See IMF U.S. Article IV Consultation Report (IMF, 2013c).

[2]Both high-yield and investment-grade firms continue to relever as debt levels have risen and earnings growth has slowed. The leverage distribution has worsened, suggesting that the cycle is moving toward a later, less-healthy stage. Meanwhile, free cash flow and overall cash balances are diminishing, issuance quality has deteriorated, there is a more persistent willingness to accept weaker covenants, and credit conditions have weakened further.

[3]Box 1.1 in the October 2013 WEO finds that the external consequences of an eventual tightening of U.S. monetary policy are more damaging the faster the pace of the adjustment and the weaker the external policy framework.

The model reveals a substantial and statistically significant effect of quantitative easing policies on long-term rates. The decline in the term premium accounts for roughly half of the compression in 10-year nominal Treasury bond yields since late 2008, when quantitative easing policies were first announced. Decomposing the term premium further into its individual components shows that market expectations about the Federal Reserve's balance sheet (for example, the various asset purchase announcements and forward guidance), the reduction in market volatility, and lower interest rate uncertainty account for almost the entire decline in the term premium (Figure 1.7).[4]

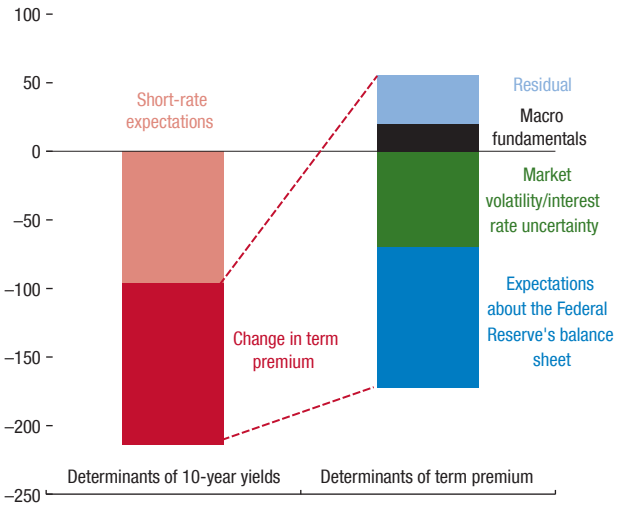
Future shocks to market volatility and uncertainty about asset purchases and forward guidance could have a pronounced impact on the term premium and thus on long-term rates. Figure 1.8 presents two simulation exercises based on different assumptions about volatility and the Federal Reserve's balance sheet evolution (IMF, 2013d):

- The *baseline scenario* assumes a return to trend in financial market volatility from depressed levels and an exit process that is consistent with current Federal Reserve guidance. Under this scenario, the compression in term premiums gradually eases and returns to its precrisis level by 2020.
- The *adverse scenario* reflects the effects of increased bond market volatility and market expectations that could result from a sharper, frontloaded tapering of quantitative easing. This scenario results in a similarly sized adjustment (100 basis points) in long-term rates as the baseline case, but the adjustment is abrupt.

The rise in long-term rates that took place during the May-June episode mostly reflected an increase in term premiums rather than short-rate expectations. That trajectory (represented by the blue dot in Figure 1.8) so far lies above the baseline scenario, but overall term premiums are still at extraordinarily low levels. If the adverse scenario materializes, the Federal Reserve would likely seek to temper such a shock through communication and by fine-tuning policies (for example, adjusting its asset purchase schedule), but its effectiveness may be limited by persistent financial stability risks and difficulty in offsetting sudden, large portfolio shifts and managing volatility shocks. Although long-term rates under the adverse scenario eventually converge with rates under the baseline scenario, the frontloaded nature of the shock would have pervasive effects on financial markets.

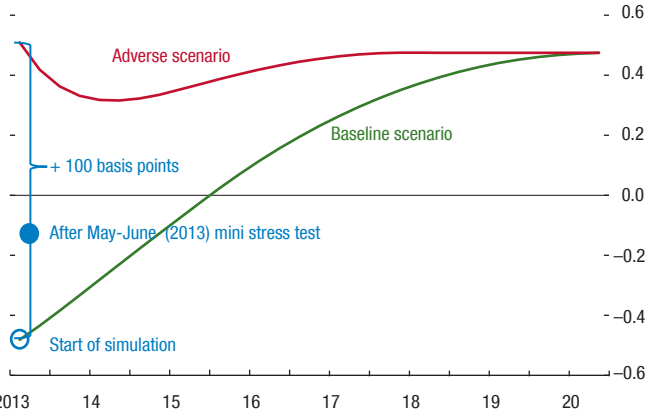
[4]To capture variations in the market's expectation of the size and persistence of the asset purchase program, a measure is constructed following Chung and others (2011). In particular, the measure estimates a present discounted value of the current and expected future securities holdings in excess of its historical normal level as a ratio to potential GDP.

Figure 1.7. Decomposition of Term Premium: Change from September 2008 to March 2013
(Basis points)



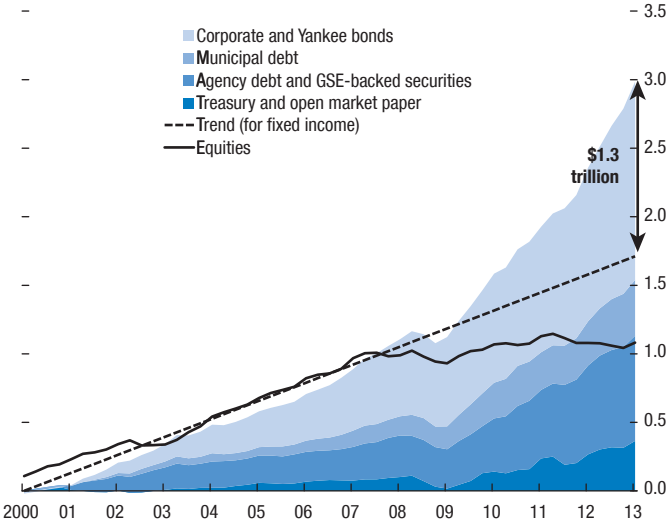
Sources: Bloomberg, L.P.; and IMF staff estimates.

Figure 1.8. Simulated Shock to 10-Year Treasury Term Premium
(Percentage points)



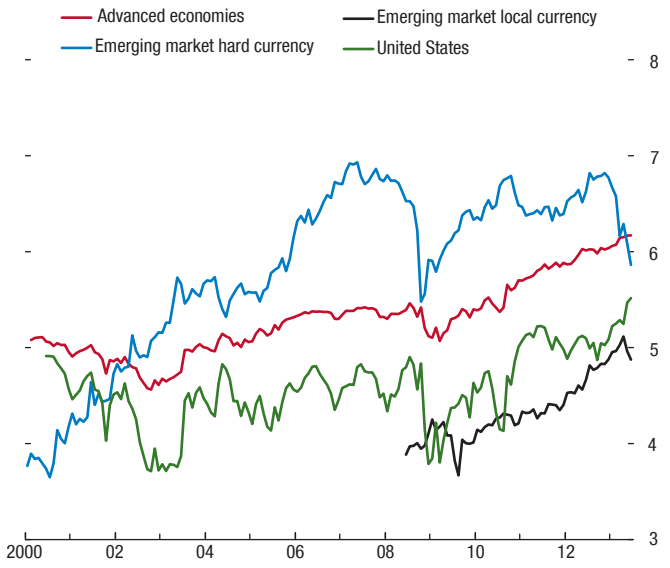
Sources: Bloomberg, L.P.; and IMF staff estimates.

Figure 1.9. U.S. Mutual Fund Cumulative Flows
(Trillions of U.S. dollars)



Sources: Federal Reserve; and IMF staff estimates.
Note: GSE = government-sponsored enterprise.

Figure 1.10. Global Bond Portfolio Duration
(Benchmarks; years)



Sources: Barclays Capital; and IMF staff estimates.

Overextended fixed-income allocations and duration risk are likely to magnify losses.

To illustrate how such a shock would affect financial markets, an instantaneous hike of the same magnitude is applied to major bond portfolios. Recall that as part of the yield-seeking behavior under quantitative easing, there was a broad-based shift into fixed-income assets and an extension in portfolio duration well above the historical norm (Figures 1.9 and 1.10). This increase in duration significantly raises the sensitivity of portfolios to rising interest rates: a 100 basis point increase in interest rates from current levels generates higher aggregate losses on global bond portfolios (5.6 percent or $2.3 trillion) than a similarly sized increase has generated on prevailing portfolios during previous historical tightening episodes (Table 1.2).[5] This is the case for global, U.S., and emerging market bond portfolios. Of course, the impact of such losses depends on the nature of the underlying shock, distribution, time frame, and other conditions. A normalization in response to improved economic conditions and broadly distributed losses would likely be more easily absorbed, whereas losses concentrated in entities with large unhedged positions or asset-liability mismatches would increase instability.

Structural reductions in market liquidity could amplify these effects, leading to an overshooting of interest rates.

It is important to stress that a more probable outcome would be a smooth portfolio rebalancing out of longer-duration, fixed-income assets on the back of a gradual rise in interest rates and repricing of credit risk. However, overshooting may occur as a result of any number of unanticipated events. For instance, some fund managers may seek to adjust portfolios ahead of future monetary policy tightening to avoid crystallizing losses, thereby exacerbating market volatility.

Recent changes in structural market liquidity could also magnify an increase in long-term rates as financial conditions normalize.[6] Securities dealers' inventories of fixed-income instruments have declined since 2007

[5]For instance, during the last three tightening episodes in 1994–95, 1999–2000, and 2004–06, an instantaneous 100 basis point increase would have resulted in an average 4.8 percent loss on U.S. bond portfolios prevailing at the time.

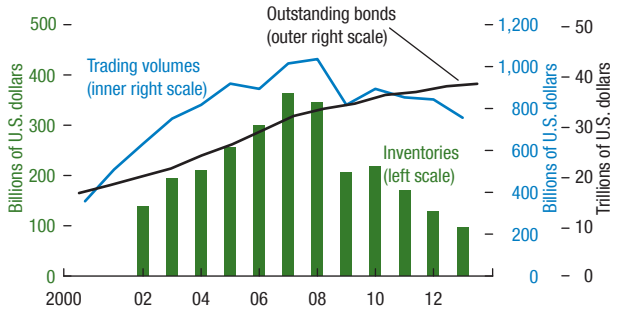
[6]Liquidity risk premiums—defined as the ability to trade in large size without having a significant impact on market prices—are not directly captured in this term premium model.

Table 1.2. Bond Portfolio Interest Rate Sensitivities

	Global Bond Aggregate	U.S. Bond Aggregate	Emerging Market Hard Currency	Emerging Market Local Currency[1]
Duration (years)				
Average for Last Three Tightening Cycles[2]	5.0	4.8	4.0	. . .
July 2013	6.2	5.5	5.9	4.9
Total Market Value (billions of U.S. dollars)				
Average for Last Three Tightening Cycles[2]	13,319	5,833	209	. . .
July 2013	41,541	16,065	1,225	1,634
Impact from 100 Basis Point Increase (billions of U.S. dollars)				
Average for Last Three Tightening Cycles[2]	–664	–281	3	. . .
July 2013	–2,325	–876	–68	–76
Impact from 100 Basis Point Increase (percent)				
Average for Last Three Tightening Cycles[2]	–4.9	–4.8	3.2	. . .
July 2013	–5.6	–5.5	–5.5	–4.6

Sources: Barclays Capital; Bloomberg, L.P.; and IMF staff estimates.
[1]Data are unavailable before July 2008.
[2]Cycles include 1994–95, 1999–2000, and 2004–06.

Figure 1.11. Nongovernment Bond Inventories, Total Trading Volumes, and Outstanding Bonds



Sources: Federal Reserve; Securities Industry and Financial Markets Association; and IMF staff estimates.
Note: Average daily volumes include municipal securities, treasuries, agencies, asset- and mortgage-backed securities, corporate debt, and federal agency securities.

owing to efforts to reduce market leverage and to a shift in funding and trading models. The decline has been accompanied by lower trading volumes even though the outstanding stock of fixed-income tradable instruments has expanded (Figure 1.11). Leaner inventories and tight nongovernment repo financing has led securities dealers to migrate toward more frequently traded issues, resulting in a bifurcation between large, more recently issued bonds and smaller, seasoned credits. Other changes since the crisis have also affected market liquidity, including shifts in the investor base (for example, a shift from more active, leveraged investors to unleveraged, buy-and-hold investors), risk appetite, and trading behavior.[7] Although the postcrisis system has yet to be tested, this shift potentially reduces dealers' ability to act as shock absorbers during market stress.[8] In a higher-volatility environment, inventories are likely to be even lower and the willingness to make markets and intermediate liquidity more pronounced as dealers adjust their value-at-risk frameworks.

Higher interest rates may also reveal weak links in the shadow banking system, exacerbating liquidity and market strains.

Repo and other forms of short-term wholesale funding markets in the United States have been a potential source of systemic stress ever since the crisis.[9] A deep, well-functioning repo market is critical to ensuring sufficient market liquidity in the underlying collateral because repo is the primary market used by market participants for financing positions.

Some progress has been made in reducing financial stability risks surrounding repo markets.[10] In particular, the Financial Stability Board has made policy recommendations to mitigate the risk of fire sales of collateral securities by limiting the buildup of excessive leverage and reducing procyclicality. These recommendations include minimum haircuts, regulation of cash collateral reinvestment, requirements on rehypothecation, and the introduction of central counterparties (which also helps to mitigate contagion effects arising from over-the-counter derivatives markets) (FSB, 2013). Shadow banking liabilities have continued to decline, repo concentration risks have eased, collateral

[7]See Box 2.6 in the October 2012 GFSR.
[8]Some nonbank entities have emerged as agents using their own portfolios to match buyers and sellers, but this has not been sufficient to fill in the gaps left by retrenching broker-dealer intermediation capacity.
[9]See Begalle and others (2013) and Dudley (2013). See Chapter 3 of this report for a discussion of recent changes in bank funding structures.
[10]These efforts include a reduction in excessive reliance on intraday credit, improvement in risk management policies, bolstered capital and liquidity buffers for large banks, diversified funding sources for large financial institutions, and strengthened liquidity requirements and concentration limits for money market mutual funds.

quality has improved, and the volume of intraday credit has decreased.

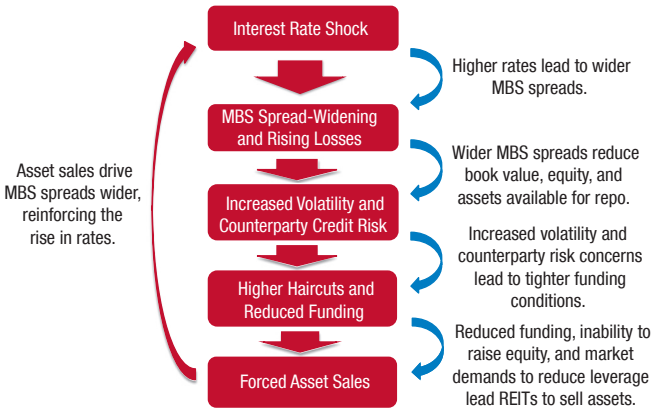
However, short-term secured funding markets are still exposed to potential runs that a rising-rate, higher-volatility environment may reveal, owing to the following vulnerabilities:

- *Asset fire sales:* Fire sales may result either from a borrower default that leads to a liquidation of collateral in a volatile market or in response to preemptive asset sales triggered by the mere risk of default.
- *Flight-prone investor base:* Lenders may cease rolling over repo funding with limited notice.[11]
- *Contagion risks:* Forced liquidations or the inability to unwind illiquid assets could lead to greater pressure on other traditionally more liquid securities and market participants.

Entities in the shadow banking system that use repo markets as a source of funding for longer-term, less-liquid assets are vulnerable to these risks. One example of such entities is mortgage real estate investment trusts (mREITs). Although their sheer size does not signal systemic importance as a sector (assets total about $500 billion), mREITs have grown significantly in recent years and now have a more important role in mortgage-backed security (MBS) markets (see Box 1.1). Furthermore, the mREIT business model layers on other risks that could amplify market dislocations in a rising-rate environment. Specifically, mREITs are leveraged, exposed to volatility shocks (as a result of the prepayment option embedded in their MBS holdings), and highly dependent on short-term repo funding to finance their long-term assets. The combination of these risks increases their vulnerability to a fire sale event (Figure 1.12) in which higher interest rates pressure mortgage rates and MBS spreads to widen and volatility to increase, leading repo lenders to raise margins or reduce funding. This in turn induces mREITs to unwind their holdings in a declining market, thereby triggering a more disorderly adjustment in MBS valuations and exacerbating broader market discontinuities as MBS investors rebalance the hedges they use to manage the interest rate exposure of their portfolios.

A version of this scenario played out during the market correction in May-June 2013. Many mREITs were forced

Figure 1.12. Fire Sale "Risk Spiral"



Source: IMF staff estimates.
Note: MBS = mortgage-backed security; REIT = real estate investment trust.

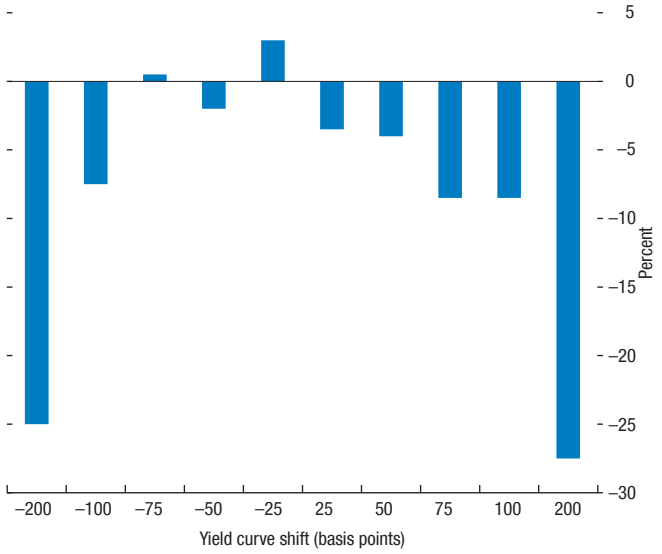
to sell MBSs because higher rates and wider MBS spreads were leading to declining portfolio values, reduced equity cushions, and higher margins. To sustain the level of borrowing relative to their net worth, the largest mREITs unwound $30 billion of MBS over the course of a single week. To put that figure into context, a daily liquidation of more than $4 billion by any MBS investor under *normal* market conditions adversely affects MBS prices (Begalle and others, 2013). These large sales weighed on overall MBS valuations and fueled an increase in primary mortgage rates. Further interest rate increases could lead to a more destabilizing unwinding of positions (Figure 1.13), with higher leverage magnifying losses (Figure 1.14). An instantaneous interest rate shock of 50 basis points or more would lead to portfolio value declines among the top mREITs large enough to generate at least temporary dislocations in the MBS market.[12]

Such a scenario of rapid mREIT deleveraging has important spillover implications. Consistent selling pressure could negatively affect MBS valuations and thus weigh on the balance sheets of other MBS investors (for example, commercial banks, government-sponsored enterprises, the Federal Reserve). Sizable disruptions in secondary mortgage markets against a backdrop of rising mortgage rates could also have macroeconomic implications, jeopardizing the still-

[11]Money market mutual funds, for instance, are important cash providers in the repo market but have limited ability to deter or slow an exit by investors. Reforms made in 2010—as well as the U.S. Securities and Exchange Commission's proposal to require prime funds to adopt floating share prices or impose liquidity fees or restrictions on withdrawals—have significantly reduced the risk of investor flight. But the system has yet to be tested.

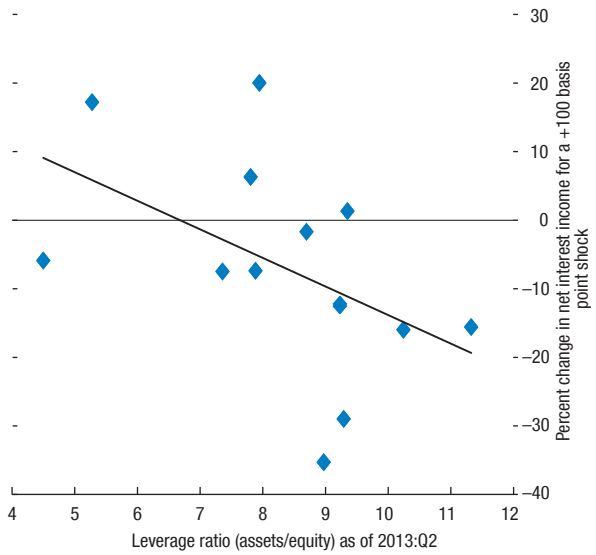
[12]This assumes that declines in mREIT portfolio values lead to forced asset sales of a similar size over a compressed time frame, owing to reduced funding availability, an inability to raise equity, and market pressure to reduce leverage, all of which further magnify valuation declines.

Figure 1.13. Estimated Average Change in Mortgage Real Estate Investment Trust Portfolio Value for Parallel Interest Rate Shifts



Sources: Company filings; and IMF staff estimates.
Note: Includes impact of interest rate hedges.

Figure 1.14. Leveraged Mortgage Real Estate Investment Trusts Are More Vulnerable to Interest Rate Increases



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

fragile housing recovery. For instance, rising mortgage rates and widening MBS spreads have already led to a significant pullback in mortgage refinancing activity.[13] Given the importance of MBS collateral in repo markets, a large enough shock to MBS valuations, combined with a weakening in risk sentiment, could also induce repo lenders to pull back funding or raise rates more broadly (or both), with negative consequences for other leveraged short-term borrowers.[14] Securities dealers are currently net borrowers using MBS repo (their borrowing exceeds their lending by about $185 billion), increasing the risk that repo lines would likely be cut fairly quickly to leveraged investors in the event of a deterioration in MBS valuations. Disruptions to secured funding markets that occurred during the global financial crisis, following the deterioration in credit quality of structured finance markets, are an apt reminder of the ripple effects. Granted, agency MBS markets are deeper, more liquid, and less risky, and mREIT balance sheets are too small to allow counterparty risks to substantially affect the underlying collateral credit risk for a protracted period. However, given that the repo funding of the two largest mREITs is comparable to Lehman Brothers' precrisis repo book, at the very least the mREITs point to a microcosm of fragilities in the shadow banking system that deserve closer monitoring.[15]

Policymakers can take a number of actions to help ensure a smooth transition.

Achieving a smooth transition requires policies that manage the effects of increased volatility and destabilizing portfolio adjustments and that address structural liquidity weaknesses and systemic vulnerabilities in the shadow banking system. This is a major policy challenge that requires a number of actions, as outlined in the following.

- A clear and well-timed *communication strategy* by central bank officials is critical. Compared with previous tightening cycles, the authorities have a broader toolkit at their disposal and have made progress in developing a more refined communica-

[13]The 115 basis point uptick in mortgage rates since May has been accompanied by a 52 percent decline in overall mortgage applications during the same period, mostly reflecting reduced refinancing activity.

[14]MBS collateral represents nearly 40 percent of repo-funded transactions.

[15]The two largest mREITs currently have repo liabilities of about $100 billion to $125 billion each (one-third of which is less than 30 days in maturity), as compared with Lehman's repo book of $150 billion in September 2008.

Box 1.1. Mortgage Real Estate Investment Trusts: Business Model Risks

This box discusses the main institutional weaknesses that expose mortgage real estate investment trusts to risk along a number of dimensions.

Real estate investment trusts (REITs) own, and in most cases operate, income-producing real estate. A subset of these companies, mortgage REITs (mREITs), are involved in lending money to owners of real estate and buying (mostly agency-backed) mortgage-backed securities (MBSs).[1] The mREITs engage in leveraged maturity transformation by relying on short-term repo funding—some of which is channeled indirectly from money market mutual funds via securities dealer intermediaries—to finance their long-term MBSs (Figure 1.1.1).

Although mREITs are not large holders of MBSs on a relative basis (Figure 1.1.2), they have grown in importance since the global financial crisis, and their business model layers on other risks that could amplify market dislocations:

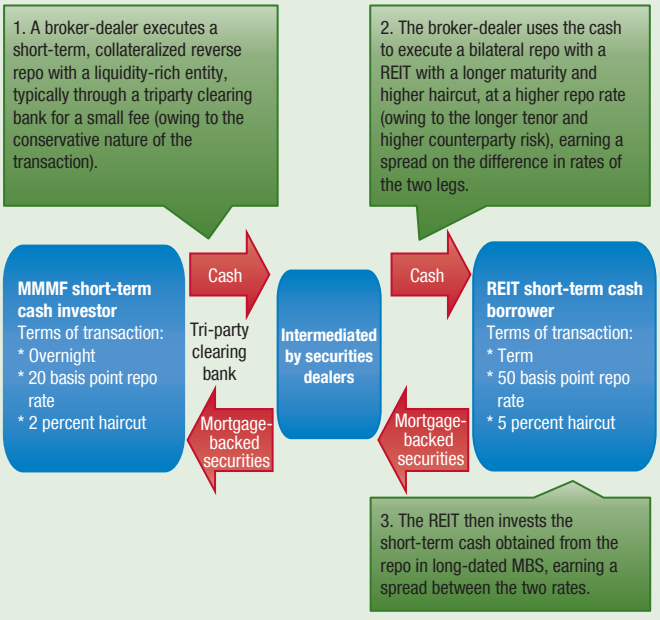
- *Funding and liquidity risk:* Although mREITs have always relied to a certain extent on short-term secured financing, that share mushroomed during the financial crisis when the cost advantage between the secured and unsecured market expanded and the availability of long-term financing dried up (Figure 1.1.3).
- *Refinancing and rollover risk:* Because debt maturities are short, considerable refinancing and rollover risks also arise. Unlike European banks—which when faced with a pullback in repo funding by U.S. money market funds in mid-2011 turned to cross-currency basis swap markets and European Central Bank long-term refinancing operations as a substitute—mREITs have limited funding alternatives. Furthermore, because the bulk of mREIT earnings are required to be paid out to investors, minimal cash flow can be retained for other purposes, resulting in slim liquidity buffers.[2]

This box was prepared by Rebecca McCaughrin.

[1]Agency mREITs represent roughly 85 percent of the REIT sector. Another smaller subset, credit REITs, typically securitize pools of loans and sell the senior tranche, while retaining the subordinate first-loss (credit) tranche.

[2]To maintain their advantageous tax status, REITs are required to pay a large share of their taxable income as dividends.

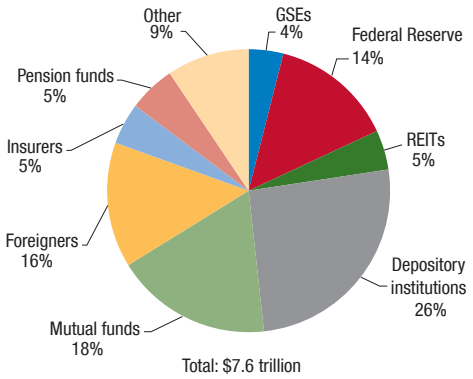
Figure 1.1.1. Example of the Real Estate Investment Trust Maturity Transformation Process



Sources: Company statements; Fitch Ratings; and IMF staff.
Note: MBS = mortgage-backed security; MMMF = money market mutual fund; REIT = real estate investment trust. Transaction terms relate to intermediating securities dealers.

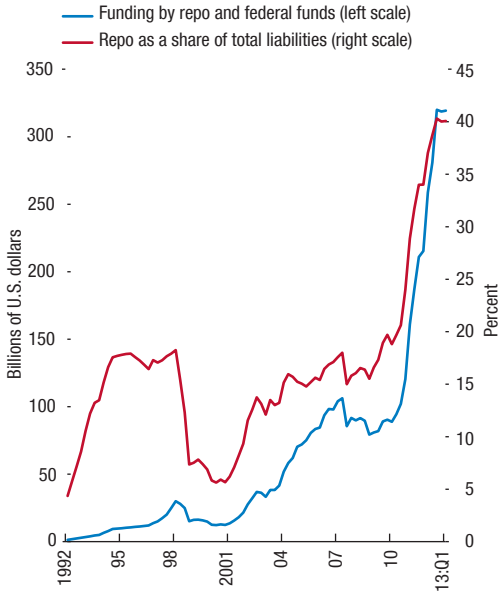
Box 1.1 *(continued)*

Figure 1.1.2. Holdings of Agency Mortgage-Backed Securities



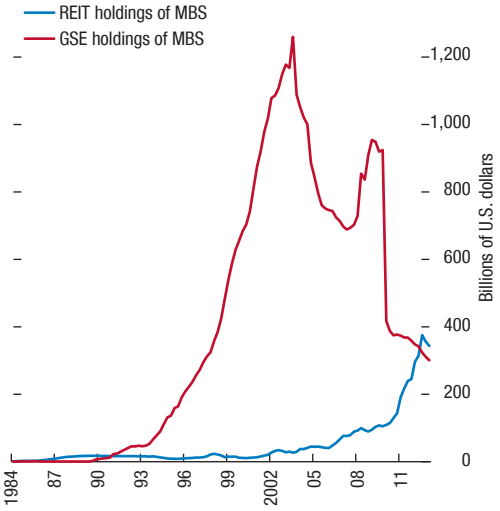
Sources: Federal Reserve; and IMF staff estimates.
Note: Total may differ from 100 percent due to rounding.
GSE = government-sponsored enterprise; REIT = real estate investment trust.

Figure 1.1.3. Real Estate Investment Trust Dependence on Short-Term Funding



Sources: Federal Reserve; and IMF staff estimates.

Figure 1.1.4. REITs' Agency MBS Holdings versus GSEs' MBS Investment Portfolio Holdings



Sources: Federal Reserve; and IMF staff estimates.
Note: GSE = government-sponsored enterprise; MBS = mortgage-backed securities; REIT = real estate investment trust.

- *Maturity mismatch risk:* Some REITs have sought to increase the maturity of their repo-related financing, diversify their repo counterparties, and shift into other (more costly) sources, but most mREITs are still highly dependent on short-term funding to finance long-term assets.[3] This maturity transformation risk is akin to the funding problems that emerged during 2008 in the asset-backed commercial paper market.
- *Convexity risk:* All mREITs are exposed to interest rate and convexity risk. Given the prepayment options embedded in MBSs, the effective duration of MBSs increases as interest rates rise, because higher rates reduce mortgage refinancing activity and slow the rate of prepayments. Generally, mREITs hedge the interest rate risk of their mortgage portfolios through Treasury bills, interest rate swaps, swaptions, and other MBSs, but only partly. In addition to a worsening in the duration mismatch, rising rates result in higher valuation losses on MBS holdings. Given current convexity risk, the average

[3]Among the largest mREITs, about 90 percent of assets are used as collateral in repos, which leaves limited unencumbered assets.

Box 1.1 *(concluded)*

mREIT MBS portfolio value would decline by roughly 10 percent in the event of a 100 basis point parallel interest rate shock.

- *Concentration and correlation risk:* Most mREITs hold fixed-rate agency MBSs, private-label MBSs, and commercial MBSs, and so are sensitive to shocks to mortgage and property markets.[4] (By contrast, the other large investors in MBSs, as shown in Figure 1.1.2, have more diversified portfolios.) Their assets have expanded significantly since the crisis, to the point that mREITs now hold a larger stock of agency MBSs than the government-sponsored entities do in their investment portfolios (Figure 1.1.4). Furthermore, these risks are concentrated in two large institutions.
- *Wrong-way risk:* Because mREITs pledge collateral on the asset side of the balance sheet to fund themselves, they may be simultaneously exposed to pressure to make payments to investors and pressure on the value of assets pledged for financing.
- *Market risk:* Increased capital market volatility tends to reduce access to sources for refinancing and capital.

These risks are interrelated. Higher interest rates exacerbate convexity-related risks, which in turn raise lenders' concerns about the underlying collateral, aggravate short-term funding conditions, and reinforce the maturity transformation risk. Collateral and counterparty correlation risk also raise investors' concerns about the strength of future earnings and dividends, in turn increasing the cost of capital. Figure 1.12 in the main text illustrates how the presence of these risks could lead to a fire sale event.

[4]Regulatory guidelines require mREITs to hold a minimum of 75 percent of agency MBSs.

tion policy. But unexpected large increases in long-term rates, as the May-June episode suggests, cannot be ruled out.

- In the event of adverse shocks, *contingency backstops* need to be in place that reduce the likelihood of cascading forced asset sales. Although a number of steps have been taken to mitigate the risks present in short-term wholesale funding markets, other options should be considered to address the risk of fire sales. Establishing incentives that lengthen the maturity of repo contracts for borrowers in the shadow banking system may help reduce the initial buildup of maturity and liquidity transformation risk. In a severe crisis scenario, a mechanism (such as a resolution authority) that can manage an orderly and appropriately timed unwinding or liquidation of repo collateral may be warranted.[16]
- Policies also need to be focused on *structural vulnerabilities*. In particular, increased oversight of shadow banking entities (including repo market participants and the larger mREITs)—given such entities' inherent vulnerability to prepayment and interest rate risk and susceptibility to short-term funding pressure—would help reduce the risk of a cascading failure of counterparties. A review of repo haircuts and margins would be desirable to limit the degree of leverage and procyclicality inherent in these markets. Greater disclosure by repo market participants and mREITs would also help markets more accurately assess the risks to which these entities are exposed. In addition, the authorities could consider changing the exemption status for certain mREITs, or if warranted, designate the largest mREITs as systemically important entities, subjecting them to greater supervisory oversight.
- Finally, further efforts are needed to assess how market developments and regulatory initiatives affecting dealer-bank business models may affect the cost and provision of market liquidity. At a minimum, *increased surveillance of and vigilance over the effects of trading liquidity pressures* will be needed as financial markets make the transition to a regime with higher interest rates and volatility. In the longer term, securities and market regulators need to ensure that fund managers in illiquid and opaque underlying markets are mindful of the risks of liquidity drying up.[17]

[16]Such a facility would allow a repo cash lender to sell its collateral to a well-capitalized liquidation agent with the ability to manage an orderly sale of the underlying collateral instead of liquidating the collateral received from a failing counterparty in a stressed market. See Acharya and Öncü (2013).

[17]See the recommendations by the International Organization of Securities Commissions in OICV-IOSCO (2012).

Emerging Markets: Riding the Ebbing Tide of Capital Flows

Accommodative monetary policies in advanced economies have encouraged foreign inflows into emerging market bond markets squarely above their long-term trend. This raises the question of whether monetary policy normalization in the United States will result in further turbulence in emerging markets. Although emerging market economies in general now have more buffers than in previous episodes of market volatility, events since May point to new financial stability concerns. The sensitivity of emerging market yields to changes in external conditions has increased as foreigners have crowded into local markets, duration has lengthened, and market liquidity has diminished. Emerging market fundamentals have recently weakened against the backdrop of weakening macroeconomic positions and rising financial leverage.

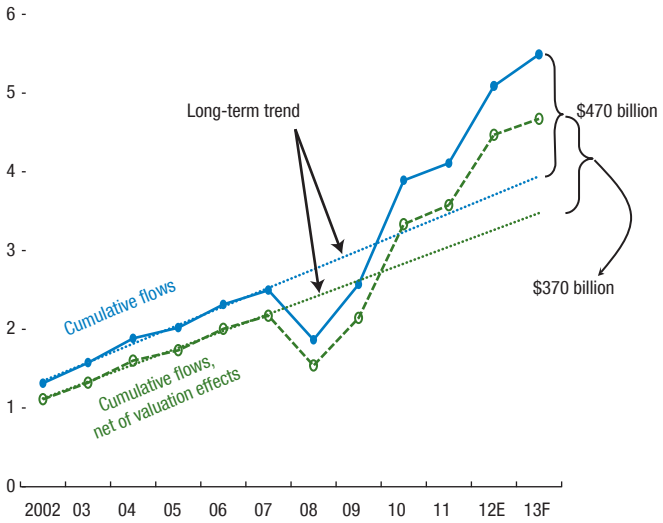
Low growth, low rates, and unconventional monetary policies in advanced economies have boosted inflows to the bond markets of emerging market economies.

Foreign portfolio investment in emerging market bonds has been on an increasing long-term path since 2002, reflecting higher growth differentials and a structural increase of allocations into emerging market assets. But since the pullback during the 2008 global financial crisis, cumulative bond inflows have risen by an estimated $1.1 trillion through 2013, or $0.9 trillion excluding portfolio and currency effects. These cumulative flows represent 5.5 percent of advanced economy nominal GDP (or 4.7 percent in net terms), and puts the 2013 forecast squarely above its long-term structural trend by an estimated $470 billion (or $370 billion in net terms; Figure 1.15).[18]

Foreign inflows into bonds have averaged more than 2 percentage points of recipient-country GDP a year during the previous four years, mainly into higher-yielding, more liquid markets (Figure 1.16). Equity portfolio flows have been less consistent than fixed-income flows since 2009, albeit of the same order of magnitude, and they are more dependent on growth

[18]The 2012 estimate and 2013 forecast of the cumulative fixed-income portfolio flows are extrapolated from the linear trend of the previous three years, taking into consideration the outflows in 2013:Q2–2013:Q3 and assuming continuing outflows in 2013:Q4. They are conservative estimates of the portfolio flow increases when compared with more high frequency portfolio allocation surveys, or the increase in the market capitalization of major bond indices.

Figure 1.15. Above-Trend Bond Flows from Advanced to Emerging Market Economies
(Percent of advanced economies' GDP)



Sources: IMF Consolidated Portfolio Investment Survey (CPIS); JP Morgan; and IMF staff calculations.
Note: E = estimate; F = forecast. The long-term trends were extrapolated from the 2002–07 period to remove the effects of the global financial crisis and unconventional monetary policies. Data for 2012–13 were calculated from the trend of 2009–11 and estimates. Advanced economies = Bermuda, Canada, Cayman Islands, France, Germany, Hong Kong SAR, Italy, Japan, Jersey, Luxembourg, Netherlands, Singapore, Switzerland, United Kingdom, and United States.

expectations than on the effects of unconventional monetary policies in advanced economies.

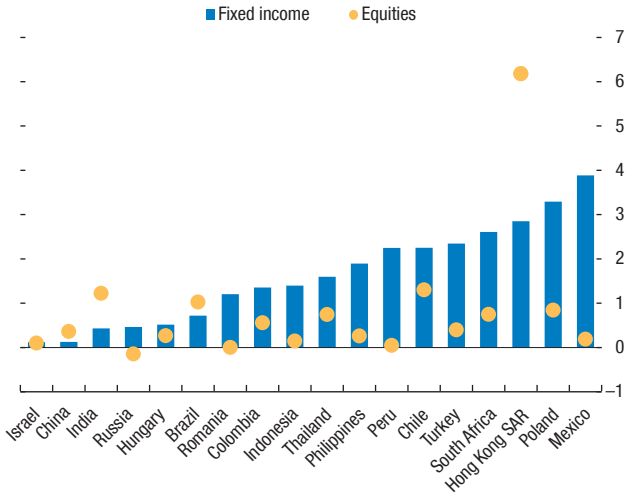
Countries receiving relatively higher bond inflows generally experienced greater yield compression, with 10-year bond yields in Indonesia, Mexico, and the Philippines declining by more than 300 basis points from their long-term average levels through mid-May 2013 (Figure 1.17). As discussed in the April 2013 GFSR, external factors accounted for about two-thirds of the local currency yield compression since 2008, with domestic improvements explaining the smaller share. These conditions have also enabled low-income countries to issue hard currency debt (Box 1.2).

Foreign investors have crowded into local emerging markets but market liquidity has deteriorated, making an exit more difficult.

Yield-sensitive (so-called crossover) investors have much larger positions in emerging markets today than in 2009. A trend that started out with mostly dedicated emerging market funds now includes "global total return bond funds" and other crossover investors attracted by yield and an improvement in credit

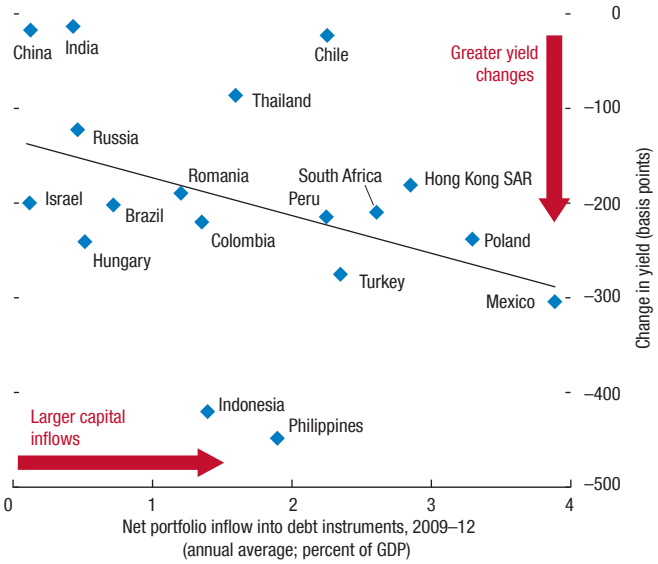
Figure 1.16. Net Portfolio Flows into Fixed-Income Equity Markets by Country, 2009–12

(Annual average; percent of GDP)



Sources: Bloomberg, L.P.; CEIC Data; Haver Analytics; IMF, International Financial Statistics database; and IMF staff calculations.
Note: Data for some countries are not necessarily until 2012 but are instead the latest data available.

Figure 1.17. Impact of Portfolio Flows on Local Currency Bond Yields



Sources: Bloomberg, L.P.; CEIC Data; Haver Analytics; IMF International Financial Statistics database; and IMF staff calculations.
Note: The vertical axis shows the deviation of the mid-May 2013 10-year local government bond yield from its average since 2005.

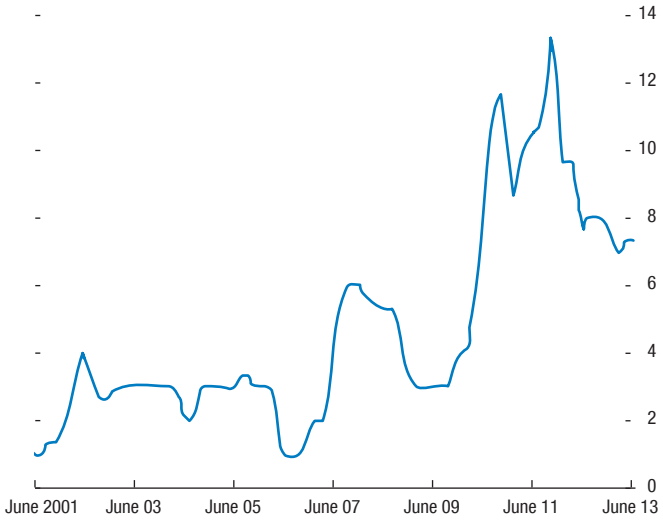
fundamentals (Figure 1.18). At the same time, the benign external environment and search for yield facilitated a lengthening of maturities. Although this is supportive of government debt liability management, the increased duration of bond issues poses greater risks to investors from a rise in interest rates (Figure 1.19).

At the same time that foreign investors have crowded into fixed-income assets, liquidity in several emerging market economy bond markets has declined considerably in recent years (Figure 1.20). Offshore banks have scaled back their market-making activities, increasing reliance on local players for liquidity. Reduced turnover in secondary markets during the last year is particularly evident in Hungary, Indonesia, and Malaysia, where foreign investor holdings now amount to more than 20 times (75 for Indonesia) the average daily trading volume (see Figure 1.20). In turn, during periods of reduced liquidity, the increased foreign exchange hedging activity by foreign institutional investors can weaken local currencies, despite relatively few outflows from domestic assets. This effect has occurred in many countries since May 2013 on expectations of reduced U.S. monetary accommodation.

Furthermore, the domestic investor base in many countries may be unwilling or unable to increase its holdings of fixed-income assets to provide adequate buffers against volatility during protracted sell-offs, as analysis in the Octo-

Figure 1.18. Allocation of Major Bond Funds to Emerging Markets

(Percent)



Source: PIMCO.
Note: Allocation of PIMCO total return fund to emerging market fixed income.

Box 1.2. First-Time Issuers: New Opportunities and Emerging Risks

Hard currency bond issuance by first-time issuers has risen in recent years.[1] Although these issuers do not currently appear to pose systemic risks to the global financial system, in some instances these developments represent a significant rise in external indebtedness, and may heighten stability risks within particular countries.[2] Such countries should issue external debt in the context of a comprehensive medium-term debt management strategy and concurrently deepen local markets to reduce dependence on volatile foreign capital. Debut issuers performed less poorly than their more liquid emerging market counterparts in the ongoing sell-off, but they have not been tested by a more prolonged period of repricing and therefore merit ongoing monitoring.

During the past 10 years, 23 emerging market economies and low-income countries have issued bonds internationally for the first time or have reentered the market after a long hiatus (Figure 1.2.1).[3] The issuers are diverse, both geographically and in terms of income levels, but generally have a sub-investment-grade (BB) rating.

The recent spike in issuance can be explained by demand and supply factors. The search for yield and demand for portfolio diversification have resulted in demand-driven easy financing conditions, despite an ambiguous improvement in fundamentals.[4] Furthermore, rising financing needs, coupled with reduced access to concessional financing, relatively undeveloped domestic markets, and a favorable interest rate environment, have made international bonds an attractive financing alternative.

Despite many similarities in the investor bases of debut issuers and frequent issuers, notable differences are apparent. In recent years, investors in global

The authors of this box are Nehad Chowdhury, Anastasia Guscina, Guilherme Pedras, and Gabriel Presciuttini.

[1]Most of these issuers would be considered frontier markets by bond investors, but for the purpose of this box, the term "first-time" or "debut" is used. For the purpose of this study, we classified as first-time issuers only countries that have issued for the first time since 2004, in amounts of at least $200 million.

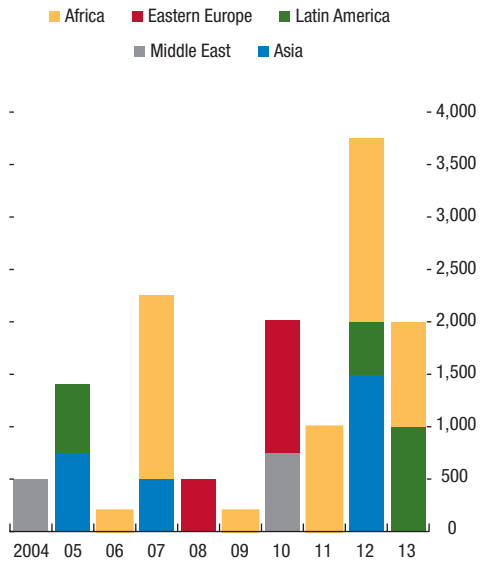
[2]The sum of issuance since 2004 ($14 billion) represents less than 3 percent of the market capitalization of emerging market bonds. The market capitalization of JP Morgan's EMBIG was $579 billion at end-April 2013.

[3]The 23 economies are Albania, Angola, Belarus, Bolivia, Ecuador, Gabon, Georgia, Ghana, Honduras, Jordan, Mongolia, Montenegro, Namibia, Nigeria, Pakistan, Paraguay, Rwanda, Senegal, Seychelles, Sri Lanka, Tanzania, Vietnam, and Zambia.

[4]Real GDP growth in the year of issuance was higher than the average of the previous three years. However, current accounts deteriorated in the year of issuance compared with historical averages, indicating borrowers' need for hard currency.

Figure 1.2.1. International Bond Debut Issuance

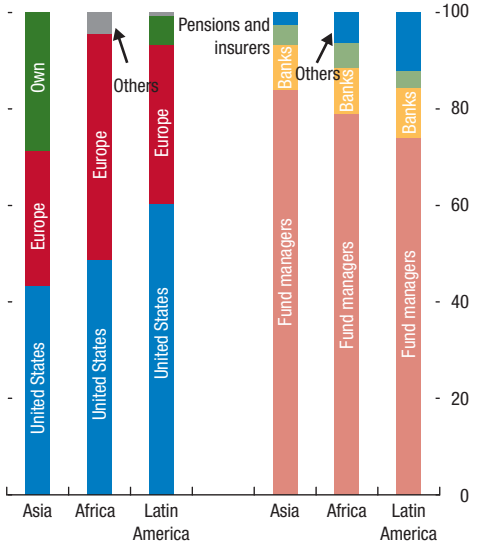
(Millions of U.S. dollars)



Source: Dealogic.

Figure 1.2.2. Investor Base by Region and Type

(Percent)

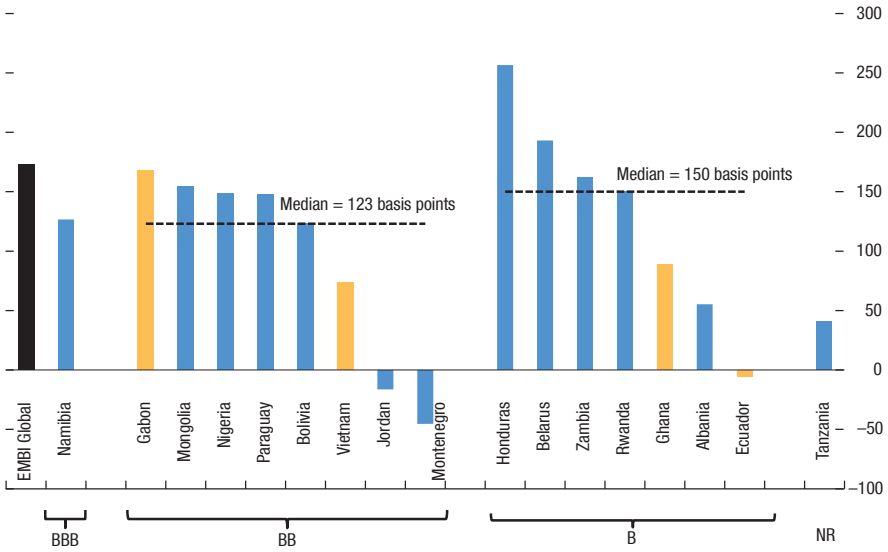


Source: Based on lead-managers information.
Note: Weighted average for deals by Bolivia, Guatemala, Honduras, Mongolia, Nigeria, Paraguay, and Zambia.

Box 1.2 *(continued)*

Figure 1.2.3. Performance of Frontier Markets during Emerging Market Bond Sell-Off

(Yield change in basis points May 1– June 25, 2013)



Sources: Bloomberg, L.P.; and IMF staff estimates.
Note: Yellow bars represent issuances before 2008, and blue bars represent issuances thereafter. Average remaining maturity of the "first wave" is 2.9 years, whereas for the "second wave" it is 7.6 years. EMBI = Emerging Markets Bond Index; NR = not rated.

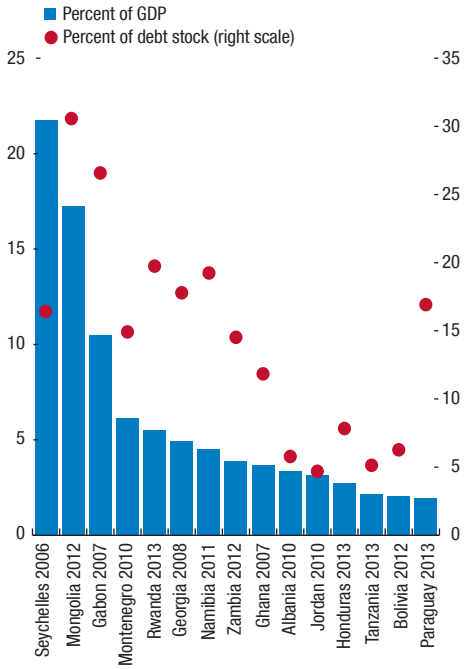
investment-grade credit have crossed over (and are therefore referred to as crossover investors) to purchase investment-grade and relatively liquid emerging market debt (that of Brazil, Mexico, Russia, and others), but have not purchased the mostly lower credit quality debt of debut issuers, and neither have hedge funds. In contrast, the investor base for debut issuers is still dominated by dedicated, real money investors (Figure 1.2.2).

First-time issuers typically access markets at spreads notably wide of the Emerging Markets Bond Index (EMBI). The higher spreads reflect their weaker credit profiles, poorer secondary market liquidity, poorer transparency, and lack of capital market financing track record.[5]

Although debut issuers have not sold off more dramatically than the higher credit quality issuers during the current sell-off (Figure 1.2.3), how they will fare in a more prolonged period of repricing remains to be seen. On average, debut issuers were able to withstand the shock on par with the more liquid issuers because investors across the board, particularly cross-over

[5]According to IMF staff estimates, first-time issuers are borrowing at a spread over EMBI that can only partially be explained by ratings, macroeconomic and institutional characteristics, and fiscal variables.

Figure 1.2.4. Size of Selected Frontier Market International Bond Issuance



Source: Dealogic.

Box 1.2 *(concluded)*

investors and hedge funds, first sold the most-liquid assets. The relative illiquidity of debut issuers' bonds protected them from a more dramatic sell-off in the initial stage. It remains to be seen what would happen in a more sustained sell-off.

Debut issuers should adopt policies that mitigate risks associated with external debt. Some countries have issued bonds in large amounts compared with the size of their economies (Figure 1.2.4) or without a clearly defined use of the proceeds. The unwinding of unconventional monetary policies and increases in interest rates may pose refinancing challenges, especially if accompanied by depreciating exchange rates.[6] Policymakers should tap international markets only in the context of a comprehensive medium-term debt management strategy that makes the trade-off between costs and risks explicit, and at the same time should deepen local markets to reduce dependence on volatile foreign capital.

[6]Exposure to exchange rate depreciation is the most prominent risk, given that many countries' already-significant exposures to currency risk in their portfolios has further increased with the issuance of Eurobonds.

ber 2012 GFSR explained. Accordingly, asset prices may be more vulnerable in Hungary, Indonesia, Mexico, and, to a lesser extent, South Africa, as coverage of foreign investor outflows by local investors is limited (Figure 1.21).[19]

Corporate sector vulnerabilities are on the rise as the leverage cycle advances.

Corporate sector borrowing has surged since the crisis began, facilitated by foreign investors (Figure 1.22). While in general highly rated firms typically raise the most capital, so far in 2013 the credit quality of new issues has deteriorated (Figure 1.23). Indeed, improvements in the overall credit profile of emerging market companies have peaked and are showing signs of deterioration as credit downgrades rise (Figure 1.24). Corporate leverage is also on the rise: net debt to common equity increased to more than 60 percent for Latin American companies in 2012, and it remains elevated for Asian companies (Figure 1.25, panel 1). This trend, together with some slowdown in corporate earnings, has caused interest coverage ratios among Asian corporates to dip to a multiple of three times in 2012, down from a multiple of almost five times in 2010 (Figure 1.25, panel 2). In 2012, corporate defaults reached their highest level since the global financial crisis with 20 credit events amounting to $22 billion (Figure 1.26).

These trends are also evident in China, where slower economic growth has begun to put pressure on domestic firms. Faced with underlying weakness in demand and excess capacity across many industries, corporate earnings have been falling (Figure 1.27, panel 1). This development, along with the rise in corporate leverage in the past few years, explains why interest coverage ratios have progressively weakened (Figure 1.27, panel 2; see also Box 1.1 of the April 2013 GFSR). Sustained pressure on financial positions in the corporate sector would undoubtedly hit banks' loan portfolios, putting at risk the still-intact pattern of strikingly low reported nonperforming loan ratios.

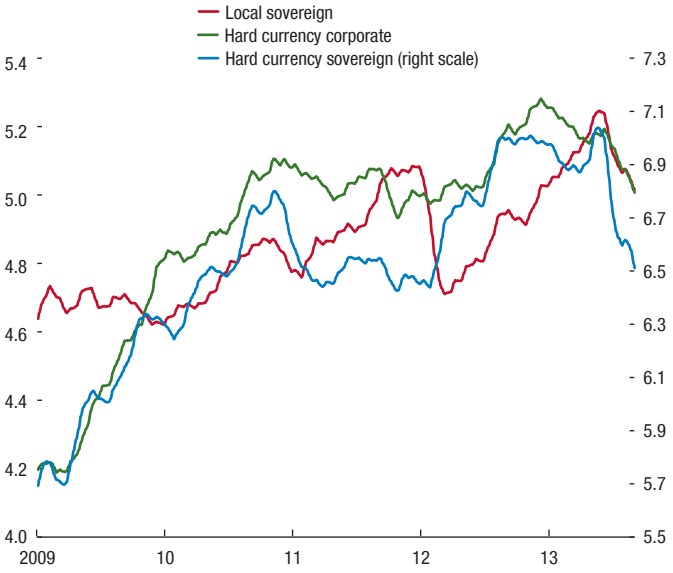
[19]In Poland, the size of the nonbank financial sector may decline relative to the nonresident holdings of local currency bonds following plans to absorb the government bond holdings of the pillar II pension fund assets into general government debt.

Financial vulnerabilities are rising because macroeconomic fundamentals have recently weakened.

The external positions of emerging markets have deteriorated since 2007, partly because of economic weakness in advanced economies, with the exception of those eastern European countries that were previously running exceptionally high deficits. This change in external positions has arguably supported global rebalancing, but has left some economies (especially Asian) that traditionally have large current account surpluses in a weaker external position. Against the backdrop of weak global growth since 2009, many emerging markets pursued countercyclical policies that expanded domestic credit. The long period of rapid credit expansion and easy access to funding has given rise to greater domestic financial vulnerabilities. For example, countries in the shaded areas of Figure 1.28 are faced with increased external and domestic vulnerabilities at a time when many are also finding themselves with shrinking fiscal space (see the October 2013 *Fiscal Monitor*).

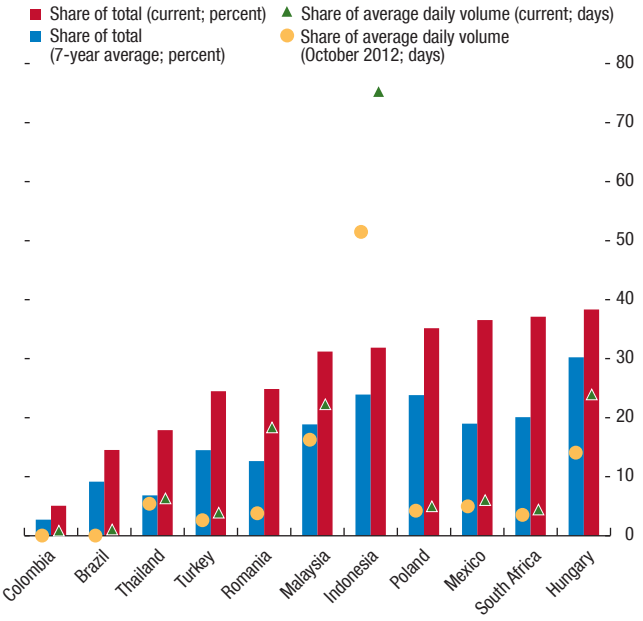
Figure 1.19. Duration of Emerging Market Fixed-Income Indices

(Years; 30-day moving average)



Source: Bank of America Merrill Lynch.

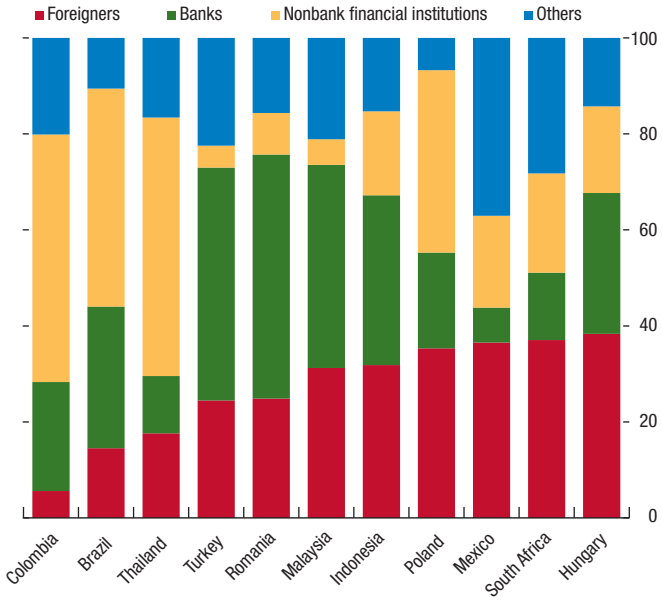
Figure 1.20. Share of Nonresident Holdings of Local Currency Government Debt and Market Liquidity



Sources: Asian Development Bank; national authorities; and IMF staff calculations.

Figure 1.21. Composition of the Holders of Local Currency Government Debt

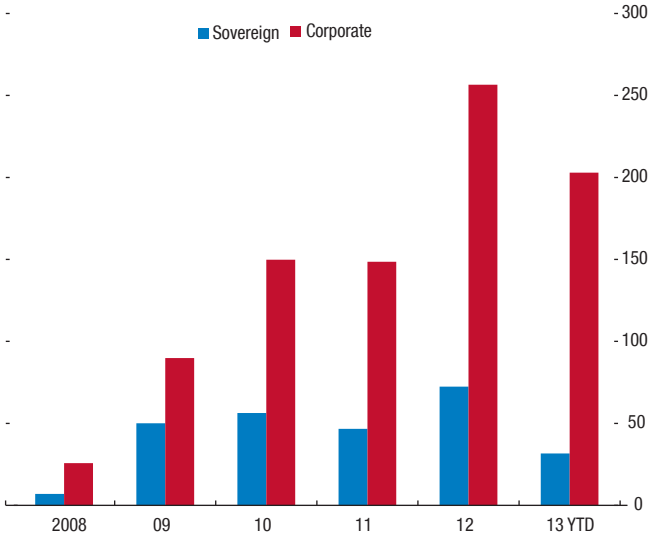
(Percent)



Sources: Asian Development Bank; national authorities; and IMF staff calculations.

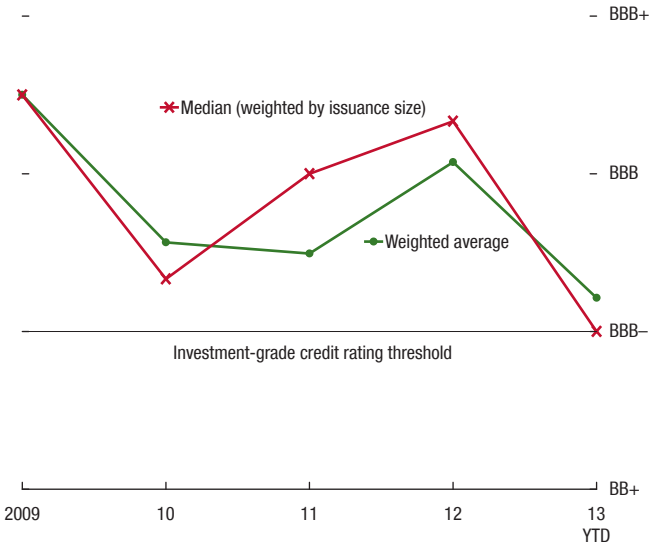
Figure 1.22. Net New Issuance of Emerging Market Bonds

(Billions of U.S. dollars)



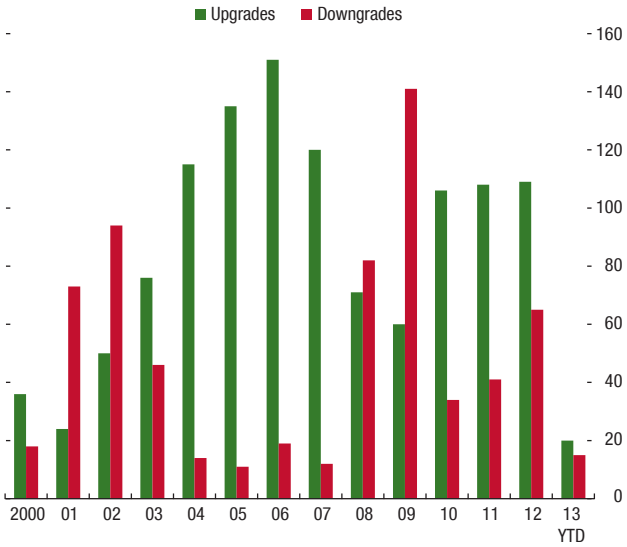
Sources: Bond Radar; and Morgan Stanley.
Note: Data available through August 2013. YTD = year to date.

Figure 1.23. Credit Ratings of Emerging Market Corporate Bond Issues



Sources: Bond Radar; and IMF staff calculations.
Note: Data available through July 2013. YTD = year to date.

Figure 1.24. Corporate Rating Changes in Emerging Markets
(Number of changes)



Source: Fitch Ratings.
Note: Data available through 2013:Q1. YTD = year to date.

Rapid credit growth in the shadow banking system in China remains a key vulnerability.

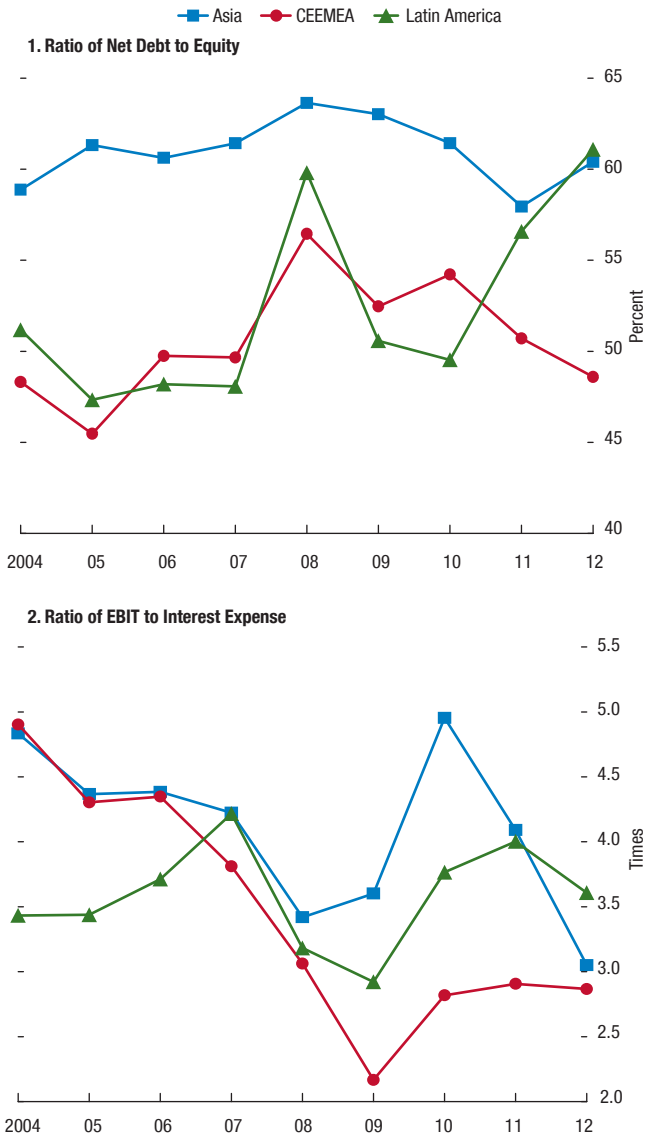
Credit creation in China reaccelerated in early 2013, as broad credit expanded by more than 22 percent (year over year). This level was well below the peak rates of credit growth in 2009–10 but further extends the sharp rise in China's credit-to-GDP ratio to almost 180 percent of GDP (Figure 1.29). It also heightens worries that the rapid credit expansion may foreshadow a marked worsening of asset quality. Rapid disintermediation has pushed the share of bank loans in total new credit down to just above 55 percent in the first half of the year. This trend has helped diversify the financial system and introduce more market-based lending and investment products, but the surge in nonstandard instruments—exemplified by the doubling of trust loans in less than 12 months—also carries considerable risks:

- *Lack of oversight:* Many of the new funding channels are subject to lighter regulation and supervision. Trust companies have faced little regulatory constraint in ramping up their exposure to two sectors that are largely excluded from access to new bank loans: local government financing vehicles and the property sector. Both of these sectors have been important drivers of recent economic activity, but face serious questions about their financial sustainability.
- *Lack of market disclosure:* The new credit instruments lack the central element of market-based intermediation, that is, effective market discipline. The possibility of default is crucial to inducing proper pricing of credit risk. Yet China's financial system features a pervasive perception that alternative saving vehicles, including wealth management products, are effectively guaranteed by issuers. A history of bail-outs has created similar moral hazard in the market for corporate bonds.
- *Ties with the traditional banking system remain too close for comfort:* Although financial innovation superficially reduces their role, China's banks remain deeply involved in many new forms of credit intermediation, although without the safeguards of capital requirements, provisioning, or detailed disclosure. For example, some trust companies rely on banks to both refer borrowers and provide funding.

As the United States approaches exit from unconventional monetary policies, emerging market vulnerabilities have come to the fore.

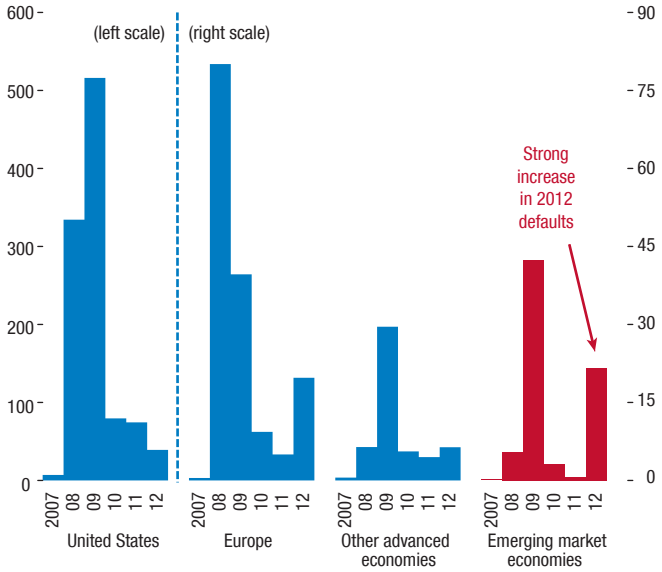
Since Federal Reserve Chairman Ben Bernanke's testimony to Congress on May 22, emerging market assets have come under pressure. Initially, the sell-off was strong in most countries, reflecting the first two key vulnerabilities: (1) yields and risk premiums had

Figure 1.25. Nonfinancial Corporate Balance Sheet Metrics



Sources: Bloomberg, L.P.; and IMF staff calculations.
Note: CEEMEA = central and eastern Europe, Middle East, and Africa; EBIT = earnings before interest and taxes. Computed as the median of all available firm data. Firms with negative net debt were excluded.

Figure 1.26. Sharp Increase in Corporate Debt Defaults
(Billions of U.S. dollars)



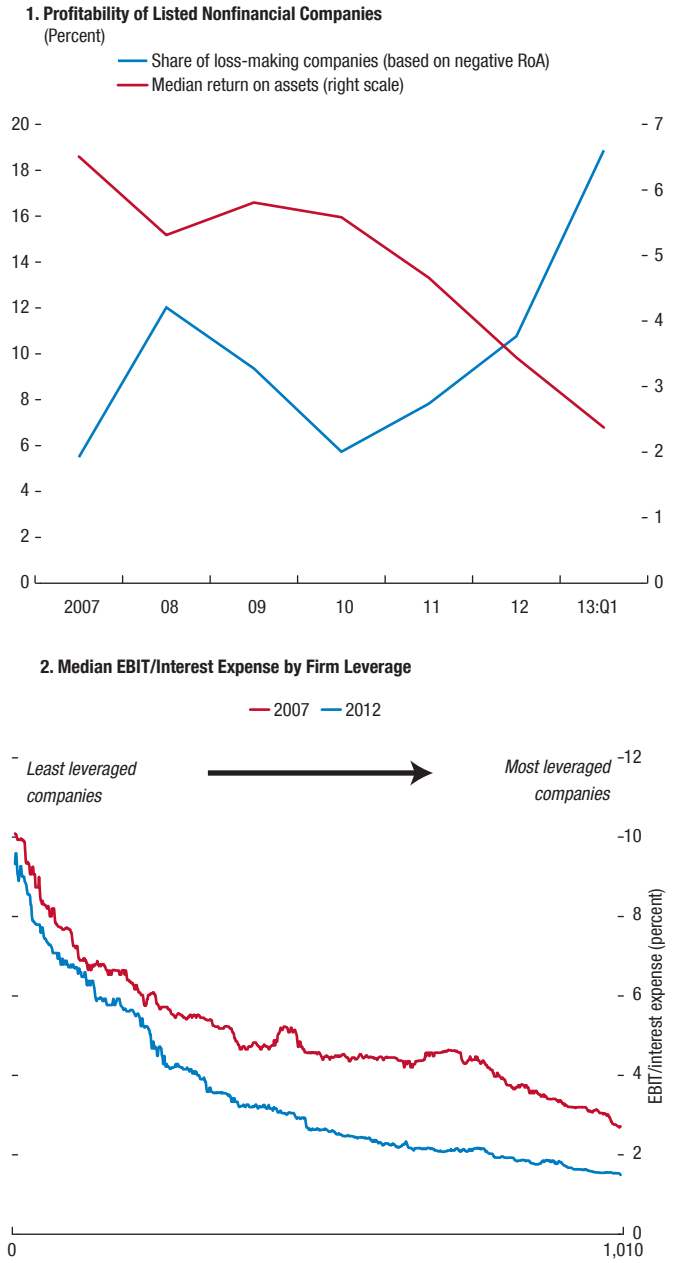
Source: Standard & Poor's.
Note: Other advanced economies = Australia, Canada, Japan, and New Zealand.

become overly compressed and are likely to be repriced further as monetary conditions normalize; and (2) the sensitivity of emerging market yields to changes in external conditions and foreign flows has increased, owing to crowded positions in local markets, lengthening duration, and reduced market liquidity. After June, the sell-off became more concentrated along country fundamentals, highlighting the third key vulnerability, (3) slowing growth and rising domestic financial vulnerabilities.

Currencies and bonds in Brazil, India, Indonesia, South Africa, and Turkey came under intense weakening pressure since May as their current account deficits persist, inflation remains elevated, and monetary policy room seems limited in the face of decelerating growth (Figure 1.30). The perception of good fundamentals and prudent approaches to macroeconomic and fiscal policies, together with robust financial systems, have contributed to resilience. For example, Chile, Mexico, and Poland fared relatively better with their local and hard currency bond spreads over U.S. Treasuries remaining within their long-term range. (See also Box 2.2 in the May 2013 *Western Hemisphere Regional Economic Outlook* about the role of exchange rates in capital outflows.)

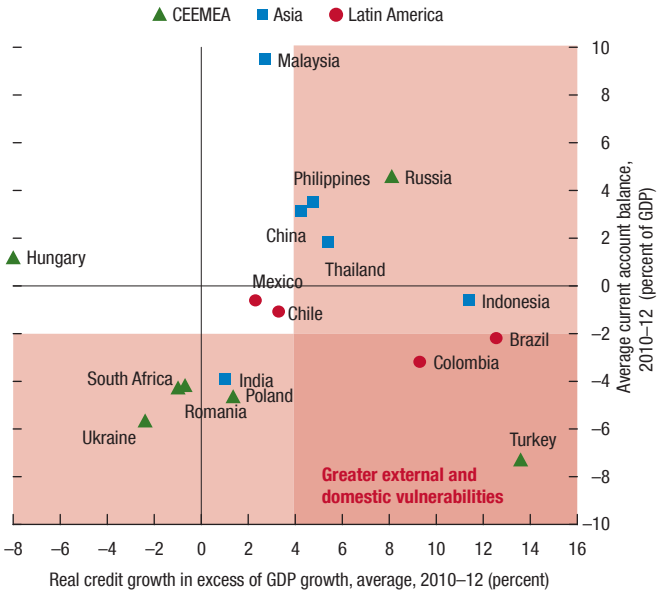
The pattern of volatility in emerging markets continues to be driven by expectations of monetary policy in the United States. Following the Federal Reserve's

Figure 1.27. China: Corporate Sector Fundamentals



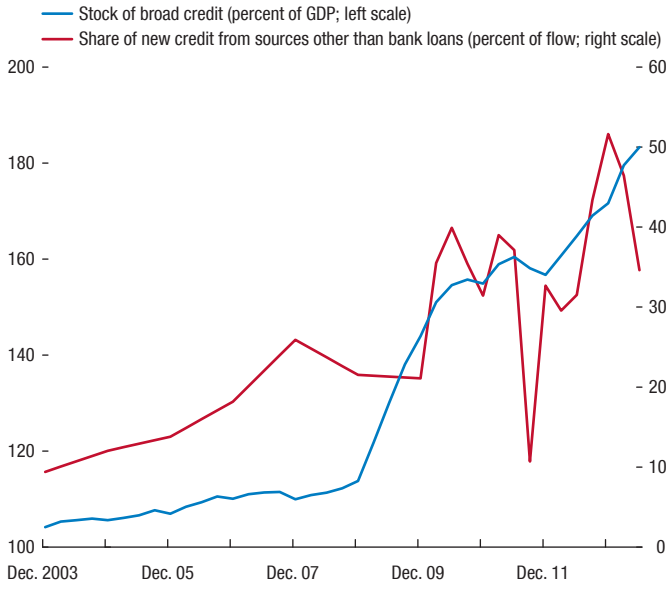
Sources: WIND; and IMF staff calculations.
Note: EBIT = earnings before interest and taxes; firm leverage = total liabilities/total assets; RoA = return on assets. Top panel is computed for a balanced panel of 2,146 companies. Data for 2013:Q1 for the RoA are annualized, but may somewhat overstate the deterioration in performance, as a result of seasonal effects. Bottom panel is computed for a balanced panel of 1,210 nonfinancial companies.

Figure 1.28. External and Domestic Vulnerabilties



Sources: IMF, International Financial Statistics and World Economic Outlook databases.
Note: CEEMEA = central and eastern Europe, Middle East, and Africa.

Figure 1.29. China: Credit Developments

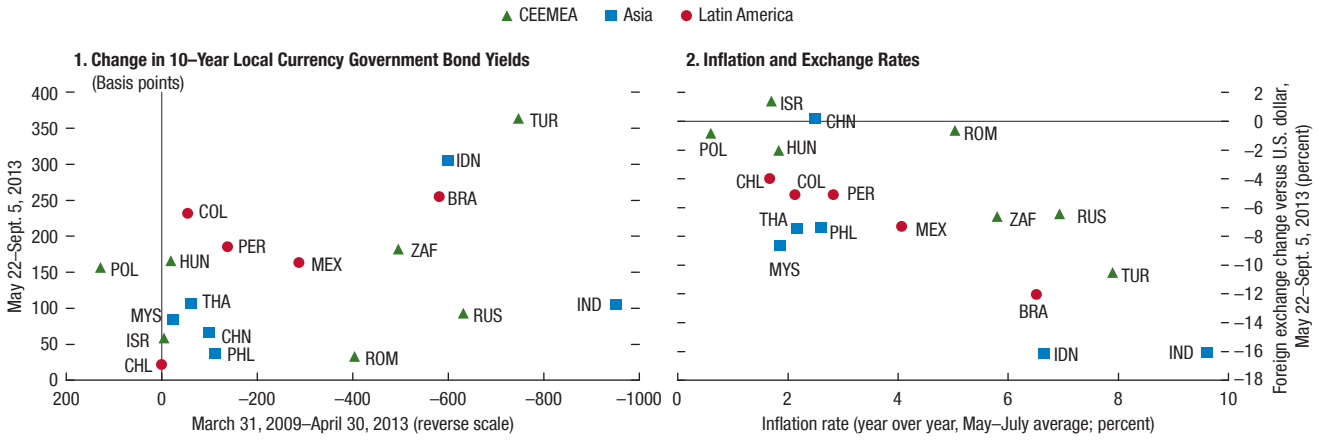


Sources: CEIC data; Haver Analytics; and IMF staff calculations.
Note: Broad credit comprises bank loans, entrusted loans, trust loans, acceptance bills, and corporate bonds.

Figure 1.30. Recent Stress in Emerging Markets

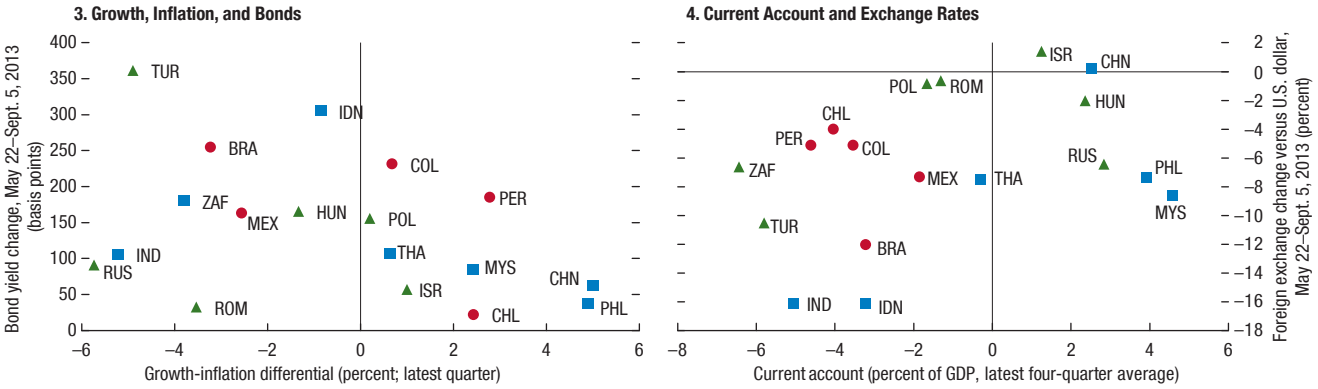
Yields rose the most in the economies that had the greatest declines.

Countries with macroeconomic weaknesses, such as high inflation…

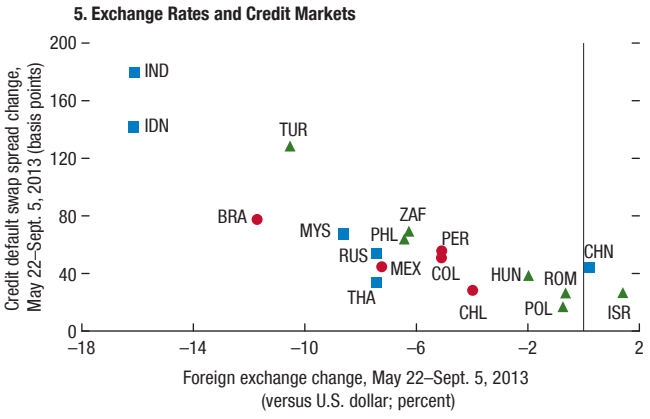


…unfavorable growth and inflation dynamics…

…and external imbalances, underwent the most pressure...



…with potential feedback to credit markets.



Sources: Bloomberg, L.P.; and national authorities.
Note: CEEMEA = central and eastern Europe, Middle East, and Africa; BRA = Brazil; CHL = Chile; CHN = China; COL = Colombia; HUN = Hungary; IDN = Indonesia; IND = India; ISR = Israel; MEX = Mexico; MYS = Malaysia; PER = Peru; PHL = Philippines; POL = Poland; ROM = Romania; RUS = Russia; THA = Thailand; TUR = Turkey; ZAF = South Africa.

decision in September to delay tapering of its asset purchasing program, emerging market bond yields and spreads over U.S. treasuries declined, and currencies reversed some of their earlier declines against the U.S. dollar. Primary issuance of corporate and sovereign bonds picked up significantly, and flows into emerging market debt funds restarted in late September.

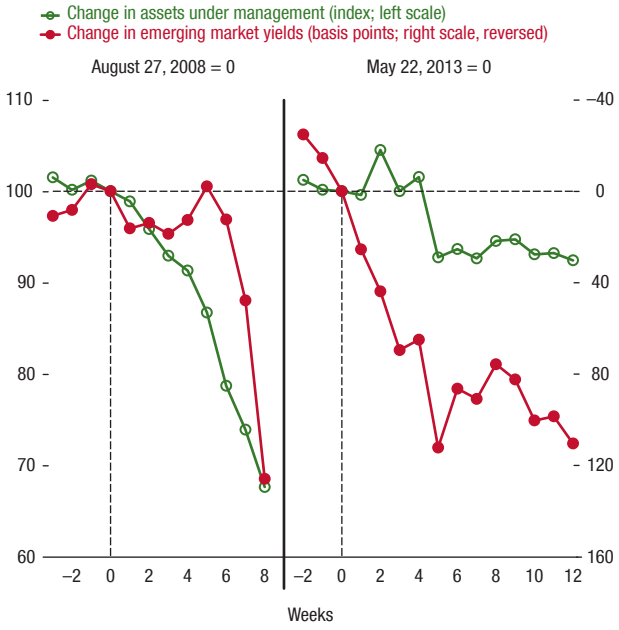
What would happen if flows reversed more sharply in emerging markets?

These factors suggest that emerging markets may have become more vulnerable during the transition to a more challenging external financing environment. In the 12 weeks following the May 22, 2013, reversal of risk sentiment, assets under management for emerging market fixed-income funds fell 7.6 percent (or $19 billion). This pullback was much smaller compared with the one accompanying the systemic financial shock in 2008, when assets under management fell by 36 percent (or $26 billion) during the first round of the asset sell-off in September–October 2008 (Figure 1.31). Yet the impact on local currency bond yields was similar across the two episodes, which suggests that emerging markets are highly vulnerable to sudden outflows that would further strain liquidity conditions.

A pricing model is used to highlight a stress scenario in which 10-year bond yields are explained by domestic and external variables. An external shock consisting of a 30 percent reduction of current foreign holdings of local currency government debt, an increase of 100 basis points in the U.S. treasury note yield, and a 10-percentage point increase in the Chicago Board Options Exchange Market Volatility Index (VIX), and domestic variables along the October 2013 WEO forecasts for 2014 (for debt-to-GDP ratios, real GDP growth and fiscal balances), as well as unchanged monetary policy rates would result in substantial increases in government bond yields in several countries (Figure 1.32). Yields on 10-year bonds in Indonesia, South Africa, and Turkey would increase by more than 150 basis points, all mostly attributable to external factors, while most countries' bond yields would increase by more than the U.S. Treasury note yield change.

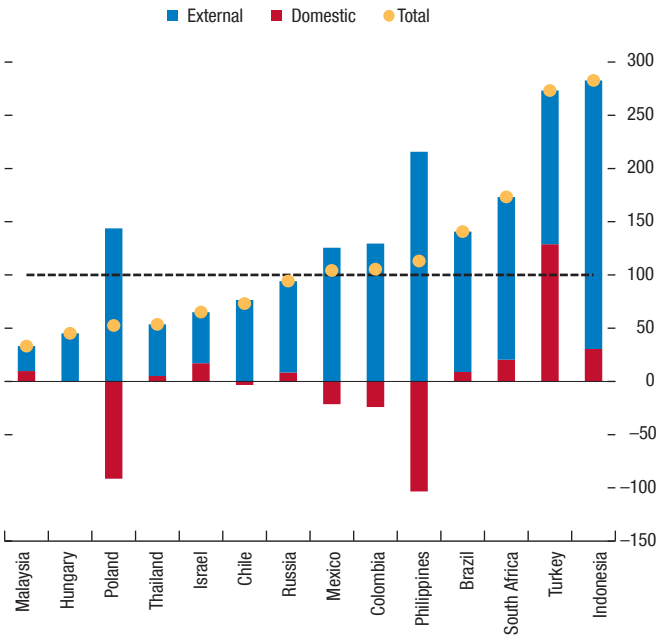
Domestic policies can counteract the rise in term premiums, such as in Colombia, Mexico, and the Philippines, or add to external woes, like in Indonesia, South Africa, and Turkey (red portions of the bars in

Figure 1.31. May 2013 Sell-Off of Emerging Market Bonds versus the Lehman Brothers Episode



Sources: EPFR Global; JP Morgan; and IMF staff calculations.

Figure 1.32. Estimated Impact on Bond Yields from a Reversal of Capital Flows and Other Factors
(Basis points)



Source: IMF staff calculations.
Note: The shock consists of a 100 basis points rise in U.S. Treasury yields, a 30 percent reduction in foreign holdings, and a 10 percentage point rise in the VIX. Values of domestic variables are those used in the October 2013 WEO forecasts for 2014 (for debt-to-GDP ratios, real GDP growth, and fiscal balances), and the policy rate is assumed unchanged.

Figure 1.32).[20] The simulation underscores the need for emerging markets to rebuild resilience and address vulnerabilities. More broadly, the ongoing rise in yields and credit spreads and the depreciation of emerging market currencies could impose further refinancing and default risks on firms with inadequate debt-servicing buffers, although looser domestic monetary policy may offset some of the higher risk premiums.

What actions can emerging market countries take?

The episodes of financial market turmoil in the second and third quarters of 2013 underscore that some emerging market economies need to address macroeconomic imbalances, enhance policy credibility, and rebuild policy space to reduce vulnerabilities as financial conditions normalize. Emerging market economies need to make a transition to a more balanced and sustainable financial sector, while maintaining robust growth and financial stability. These actions will position them to effectively withstand future market turbulence.

In the event of significant capital outflows, and with elevated emerging market contagion risk, policymakers can take various actions to mitigate potential damage. Depending on the extent of outflows and liquidity pressures in market segments, some countries may need to act to ensure orderly market operations, such as using cash balances, reducing the supply of long-term debt, and performing switching auctions to temporarily reduce supply on the long-end of yield curves. Reversing macroprudential tightening measures and/or previous restrictions on capital inflows may also help maintain orderly conditions.

Exchange rates should be allowed to depreciate in response to changing fundamentals but policymakers need to guard against disorderly adjustment. Brazil's announcement of a transparent, but temporary, foreign exchange intervention program to dampen the uncertainty around intraday currency volatility is a step in that direction. In addition, emerging market economies may benefit from establishing swap lines with major central banks to remove liquidity shortages in foreign exchange markets.

[20]The size of the improvement of domestic policies in Poland may be overstated by the decline in the debt-to-GDP ratio owing to the transfer of the government bond holdings of the pillar II pension fund assets to general government debt.

Maintaining central bank credibility is paramount in times of increased risk aversion, so monetary policy recommendations hinge on inflation expectations. Countries with well-anchored inflation and inflation expectations may have more room for policy easing or less tightening to withstand the cyclical growth slowdown. The scope for easing may be very limited in countries with high inflation pressures, which may have to do more to anchor inflation expectations. Brazil, India, and Indonesia have tightened monetary conditions to address inflation pressures.

Policymakers should carefully monitor and contain the rapid growth of corporate leverage. Also, local bank regulators need to guard against foreign currency funding mismatches building up directly on bank balance sheets, or indirectly through foreign currency borrowing by firms.

Containing the risks to China's financial system is as important as it is challenging. As elaborated in the IMF's China 2013 Article IV Staff Report (IMF, 2013b), broad credit growth needs to be reined in to contain financial stability risks and promote the rebalancing of China's economy away from credit-fueled investment. However, a sudden credit squeeze could further decelerate economic activity and trigger serious asset quality problems. The spike in interbank market rates in June 2013 illustrates the risks from policies that are not clearly communicated. Similarly, introducing default risk to the financial system will be critical for sustainable market development, but steps in this direction need to be finely calibrated to avoid causing a full-blown run on new investment products. Against this backdrop, it is important for the following actions to be taken:

- Tighten prudential oversight, especially of shadow banking activity, while removing incentives for regulatory arbitrage through continued financial liberalization (for example, of deposit interest rates);
- Enforce stronger disclosure practices for new financial products, and counteract the current pattern of implicit guarantees and bail-outs; and
- Use on-budget fiscal stimulus toward boosting consumption if economic growth starts falling significantly short of the target.

Japan's Bold Policies

The firing of the monetary arrow of "Abenomics" by the Bank of Japan (BoJ) in April 2013 reverberated through domestic markets and the banking system,

boosting equities but increasing bond volatility.[21] The weakening of the yen before and after the BoJ's action reflected expectations for eventual outflows and substantial spillovers to both emerging market and advanced economies. If the other two reform arrows (fiscal and structural) are effectively deployed, and efforts at pulling the economy out of deflation are successful, major gains to financial stability could occur. But if policy follow-through is inadequate, new risks to domestic and global stability could arise.

What would the success of Abenomics mean for financial stability?

Successful implementation of the full Abenomics policy framework—consisting of the three arrows of monetary stimulus, flexible fiscal policy, and structural reform—would have important benefits for stability. As projected in the "complete Abenomics package" scenario of the October 2013 WEO, effective deployment of all three arrows would raise inflation and inflation expectations toward the BoJ's target of 2 percent and would increase domestic investment and credit demand. Banks would continue to scale back their bond holdings,[22] and the nominal 10-year Japanese government bond (JGB) rate would shift up toward 3 percent. Capital outflows would accelerate, possibly to historically high rates, prompted by a new search for yield and the scarcity of domestic government bonds.

Under the scenario described here, the vulnerability of domestic banks to bond market shocks would likely decline. BoJ purchases during the next two years should reduce the total amount of JGBs available to the market (the current market structure is shown in Table 1.3). Accordingly, if all aspects of Abenomics are successfully implemented, the interest sensitivity of both regional and major banks would be expected to decline sharply as those institutions shift their portfolios toward foreign asset purchases and more domestic lending to meet increased credit demand.[23]

Full implementation of Abenomics would likely lead to an increase in capital outflows to both advanced and emerging market economies (Lam, 2013). Japanese households and institutions already have substantial holdings of foreign assets, totaling ¥542 trillion ($6.2 trillion) at the end of 2012, or 114 percent of GDP (Table 1.4). A return of Japanese flows to peak historical rates could have significantly positive effects for some of the receiving markets and could even compensate for net redemptions prompted by monetary tightening elsewhere.

Flows to emerging markets are likely to be led by individual investors, who are already moving to increase their foreign currency exposures. The willingness of individuals to take on emerging market risk has risen sharply in recent years, supported by the development of new investment products. Among the most popular are currency overlay funds (Figure 1.33), which are structured products that consist of an outright investment in an underlying asset such as domestic equities, compounded with a derivative exposure to a high-yielding emerging market currency. Such funds have continued to receive inflows even during periods of yen strength, and now total more than ¥10 trillion, up from only ¥1 trillion in 2009.[24] Other emerging-market-oriented investments include foreign currency positions held by retail traders, and some broader investment funds that do not feature a specific overlay.

Under a complete Abenomics scenario, outflows to developed markets would also increase, led by conservative investors such as life insurance companies and pension funds. Purchases of developed market assets, largely investment-grade bonds, would take longer to develop, because these conservative institutions often have extensive approval processes for major portfolio reallocations. Japanese purchases of some specific classes of assets, such as higher-grade euro area government bonds, as well as other G7 bonds, could be significant. Japanese banks have already stepped up acquisition of foreign assets (see Table 1.4), both loans and direct investment, in some cases filling in for deleveraging European banks. Major city banks have been especially active on this front, acquiring retail banking operations in developing Asia, Latin America, and the United States. These capital outflows improve financial

[21]"Abenomics" refers to a set of economic policies advocated by Prime Minister Shinzo Abe. The "three arrows" is the symbolic name given to the three foundational pillars of the plan.

[22]Major city banks sold more than ¥15 trillion ($150 billion) in government bonds, about 14 percent of their overall portfolio of JGBs, in April and May 2013, following the BoJ's April 4 policy announcement, and bond market volatility increased sharply.

[23]This analysis, the results of which are presented in Table 1.5, is based on Arslanalp (2013). See also the October 2012 GFSR discussion.

[24]As an overall gauge of the scale of these holdings, Japan's current account surplus is projected to be ¥7 trillion (1.3 percent of GDP) in 2013. The steady-state surplus is somewhat higher, at about 1.7 percent of GDP.

Table 1.3. Structure of the Japanese Government Bond Market

	Stock, end-2012 (trillions of yen)	Share of JGB Market (percent)	Share of Own Assets (percent)
Banks	299	38.1	18.2
City banks	102	13.0	22.0
Regional and Shinkin	43	5.5	16.2
Insurers and Pensions[1]	277	35.3	39.3
Investment Trusts and Households	24	3.1	50.9
Foreign	35	4.5	8.8
Other	57	7.3	. . .
Bank of Japan	91	11.6	54.0
Total	783	100.0	. . .

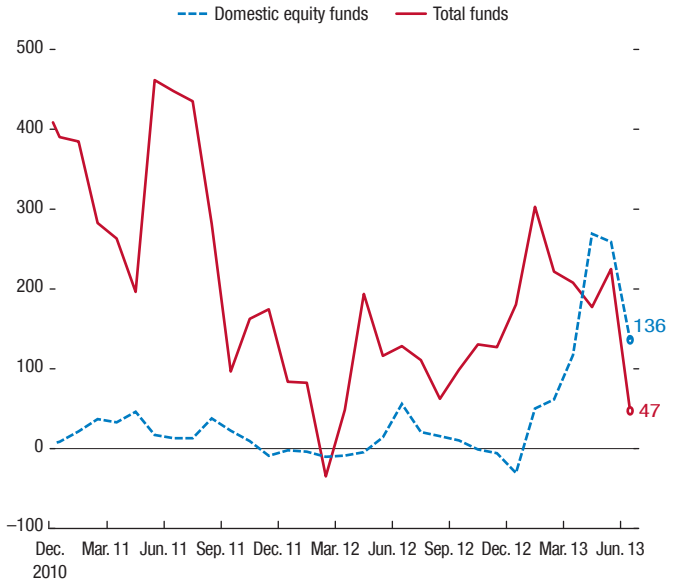
Source: Bank of Japan, Flow of Funds.
[1]Includes Government Pension Investment Fund.
Note: JGB = Japanese government bond.

Table 1.4. Foreign Assets Held by Japanese Investor Groups, end-2012
(Trillions of yen)

	Foreign Assets	Net Purchases in 2012 (Flows)
Banks	145	10.1
Insurers and Pensions	115	0.7
Households	8	2.0
Investment Trusts	57	–1.7
Nonfinancial Corporations	111	17.1
Government[1]	105	–0.5
Total	542	27.7

Source: Bank of Japan, Flow of Funds.
[1]Excludes Government Pension Investment Fund.

Figure 1.33. Japanese Flows into Currency Overlay Funds
(Billions of yen; monthly)



Sources: Bank of Japan; and IMF staff estimates.

stability in Japan through portfolio diversification and frequently in destination markets, where they may compensate for net sales by other investors.

Incomplete implementation of Abenomics would pose risks to banks.

The promising start for Abenomics could still end in disappointment if support from fiscal and structural reforms is not forthcoming. In such a case, described in the October 2013 WEO as an "incomplete" scenario, initial success in raising inflation and inflation expectations could eventually be followed by a decline of inflation below the 2 percent target, and domestic credit demand could falter. Banks may return to their previous course of accumulating government bonds (Table 1.5A), equity prices could dip, and capital outflows subside.

The shift into an incomplete scenario would revive long-standing financial stability concerns about banks' accumulation of government bonds. In this scenario, city banks are projected to initially scale back government bond holdings in response to the BoJ's bond-buying program. But these reductions would eventually be reversed as banks absorb the extra bond issuance needed to sustain economic growth, while domestic loan demand stagnates. The consequence of such a scenario would be rising susceptibility to interest rate shocks (Figure 1.34). Associated risks, such as simultaneous large sales of domestic bonds due to value-at-risk (VaR) "model herding," could persist or even increase.

A "disorderly" scenario with high risk premiums would pose numerous stability and spillover risks.

Failure to deliver on key components of the ambitious reform agenda could also have a more pernicious downside. Market disillusionment could lead to fiscal and inflation concerns, particularly if medium-term fiscal adjustments are not completed and the structural

Table 1.5. Japan Scenarios: Complete, Incomplete, and Disorderly

A. Net JGB Purchases (trillions of yen)				
	Complete	Incomplete	Disorderly	
Banks	–55	–21	–60	
Insurers and Pensions	10	8	8	
Households and Investment Trusts	0	0	0	
Foreigners	12	–3	9	
Bank of Japan	100	100	100	
Ministry of Finance	–67	–84	–57	
B. Medium-Term Outcomes (percent)				
	Complete	Incomplete	Disorderly	
Average Inflation Rate, 2013-17	1.7	1.0	3.6	
Average Growth Rate, 2013-17	1.4	0.9	0.9	
Ten-Year JGB Rate in 2017	3.2	2.9	6.2	
Equity Market Change to 2017	50	–10	–10	
C. Flows to Emerging Markets (trillions of yen)				
Investor Group	Complete	Incomplete	Disorderly	Memo: Stock[1]
Toshin Emerging Market Portfolio	1.8	0.2	3.5	3.6
Toshin Emerging Market Overlay	2.0	1.3	4.0	5.5
Bank FDI	0.5	0.4	0.5	2.8
Bank Portfolio	0.4	0.4	0.4	1.8
Bank Loans	1.0	–0.1	1.0	19.1
Corporate FDI	1.3	1.3	2.6	13.0
Total	**7.0**	**3.5**	**12.0**	**45.7**

Source: IMF staff estimates.

Note: For complete scenario, outflow in each is maximum historical, except Toshin overlay. For disorderly scenario, outflow is twice maximum historical for Toshin and corporates; maximum historical for banks. EU = European Union; FDI = foreign direct investment; JGB = Japanese government bond.

[1]Stock of foreign assets at end of 2012.

reform arrow is never fired. In this "disorderly" alternative to the incomplete scenario (Table 1.5B), calculated using the same analytical framework as the other two scenarios, banks would continue to sell government bonds at a faster rate than in the complete scenario, and capital outflows would accelerate to record rates, led by outflows from individual investors. Risks to financial stability would escalate sharply because inflation and risk premiums on government bonds would rise to levels well beyond those experienced in recent decades.

The chances of a large "VaR shock" could increase sharply. Although measured VaR spiked during bouts of bond market volatility in April and May 2013, few major banks appear to have hit their VaR limits during this period (Figure 1.35). In part, these limits were not hit because other major assets such as equities were registering gains even as bond prices dropped, so that overall portfolio volatility did not rise as much as it otherwise would have.[25] However, in a disorderly scenario in which prices of most asset classes decline, this dampening effect might not come into play. Joint declines in bond and equity prices could exacerbate portfolio volatility, forcing up the measured VaR, and triggering a wave of selling, which would, in turn, prompt further volatility spikes and price declines.

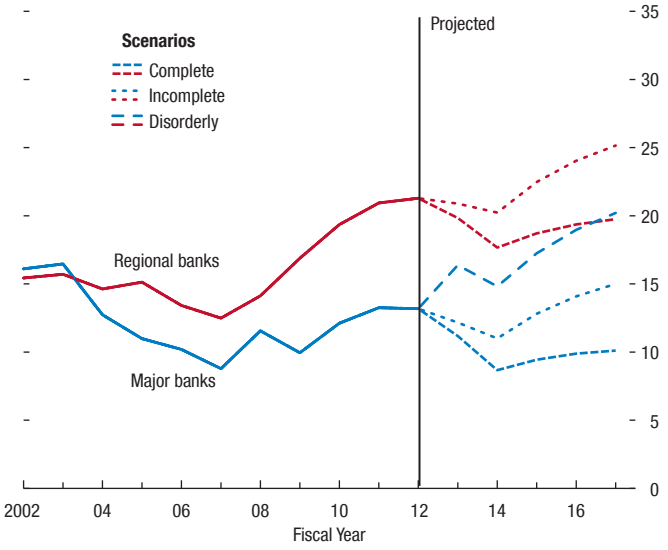
Strains could develop in the banking system. In the disorderly scenario, banks would experience pressure from withdrawals as households scale back bank deposits (now 55 percent of their financial assets) in favor of higher-yielding instruments, such as foreign bonds. A lack of profitable lending opportunities at home would limit revenues, thus squeezing margins and shrinking capital buffers. Further pressure would come from mark-to-market losses on remaining bond holdings, which would reduce the Tier 1 capital ratios of regional banks to 6 percent from 10 percent, and those of major banks to 9 percent from 12 percent.

Weak domestic conditions would likely accelerate outflows to both advanced and emerging markets. With limited opportunities for funneling savings into the domestic stock market or domestic lending, individuals, banks, and companies would be even more inclined to shift capital offshore. The lack of a recent history of substantial inflation in Japan makes it difficult to project outflows in the disorderly case, but given the availability of numerous foreign investment channels through an open financial account, a large increase could be possible at a rate well beyond that of the complete scenario (Table 1.5C). Based on recent flows, the net increase in exposure to emerging market currencies could be considerably more

[25]Rather, bond sales were precipitated by losses to capital, market uncertainty, and a desire to shrink exposures before VaR limits became binding. This stands in contrast to the VaR shock of 2003, when binding internal limits forced fire sales of bonds.

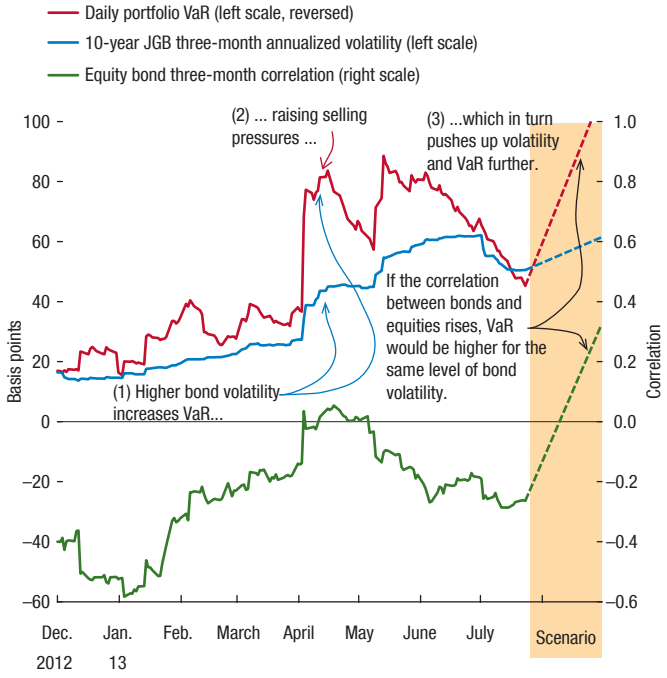
Figure 1.34. Japanese Banks' Sensitivity to an Interest Rate Shock

(Percent of Tier 1 capital; response to a 100 basis point shock)



Sources: Bank of Japan; and IMF staff estimates.

Figure 1.35. Value-at-Risk in the Disorderly Scenario



Source: IMF staff estimates.
Note: JGB = Japanese government bond; VaR = value at risk.

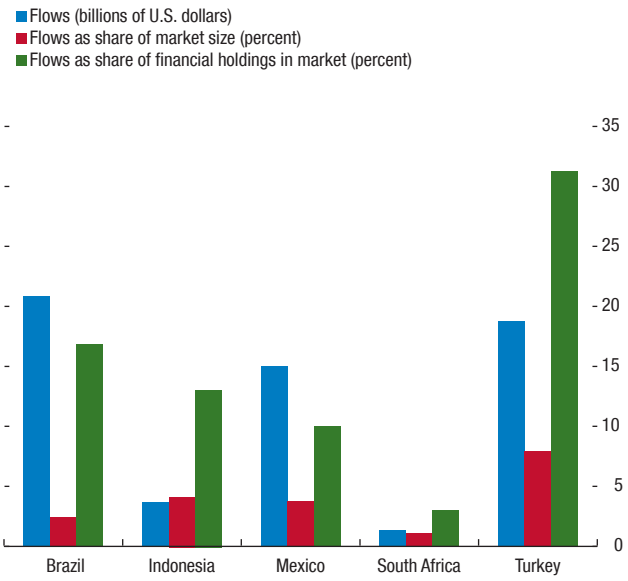
than the ¥7 trillion ($70 billion) a year that represents previous periods of heavy outflows (Table 1.5C and Figure 1.36), even under the assumption that advanced economy assets would make up the bulk of new purchases.[26] Popular targets for recent outflows have included higher-yielding and more liquid currencies, such as the Brazilian real, Mexican peso, Indonesian rupiah, and Turkish lira. As projected in Figure 1.36, annual flows from Japan into these fixed-income markets could be significant, amounting to as much as 8 percent of the overall government bond market and more than 30 percent of foreign holdings in the case of Turkey. Such investments, particularly those employing structured products, can be volatile, raising the prospect of increased volatility for currencies and asset markets in emerging markets.

[26]The largest increase in outflows would be among individual investors, which is the group with the highest average share of foreign assets in emerging markets.

Successful deployment of the three arrows of reform would support domestic financial stability, but incomplete implementation could bring new risks.

The success of the Japanese government's economic revitalization efforts would yield dividends for domestic financial stability, notably by reducing interest rate risks to the banking sector, improving portfolio diversification, and dampening volatility. Beyond the broad policy framework of Abenomics, certain specific changes in market structure would help mitigate risks. Technical adjustments in derivatives markets, including widening tolerance zones for the operation of circuit breakers, could increase the usefulness of available hedging instruments. VaR models could be further adjusted to reduce herding behavior. Regional banks should strengthen their capital bases to take better advantage of the BoJ's increased purchases of JGBs and increase lending to households and corporates. On the external front, regulators need to be conscious of the potential for risky structured products, such as currency overlay funds, to generate sudden price movements, large losses on household balance sheets, and spillovers to other markets.

Figure 1.36. Projected Flows to Selected Emerging Markets in the Disorderly Scenario



Sources: Haver Analytics; and IMF staff estimates.

The Euro Area Banking, Corporate, and Sovereign Nexus

Policy actions at the euro area and national levels have reinforced a collective commitment to the euro. This renewed commitment has helped ease the severe market stresses that had been weighing on sovereigns and banks. While funding conditions have improved, financial fragmentation persists, allowing the adverse feedback loop between banks, corporates, and sovereigns to continue in stressed economies.[27] *While there has been progress on bank repair, weak banks have been reinforcing the problems of weak corporates, while weak corporates have been exacerbating the pressures on weak banks. As a result, interest rates on corporate loans have remained elevated. Taking steps to reverse financial fragmentation will help reduce interest rates in stressed economies, but will not be sufficient to resolve the corporate debt overhang. Therefore, it is essential that efforts to repair bank balance sheets and to move to full banking union be complemented by a comprehensive assessment and strategy to address the problem of debt overhang in the nonfinancial sector. Further monetary support by the European Central Bank (ECB) and credit support to viable firms by the European Investment Bank are crucial to provide time for the repair of private balance sheets.*

The ECB's Outright Monetary Transactions (OMT) framework has increased confidence that policymakers will avoid tail risks. Initial progress has also been made on banking union, including through the Single Supervisory Mechanism, political agreements on the European Stability Mechanism framework for direct bank recapitalization, and the Bank Recovery and Resolution Directive. This progress has helped ease the severe market pressures that had been weighing down on weaker sovereigns and banks, stabilize bank deposits, staunch capital flight, and narrow Target2 imbalances.[28]

Weak banks have been reinforcing the problems of weak corporates.

Nonetheless, financial fragmentation within the euro area has persisted,[29] reinforcing an adverse feedback loop between weak banks, corporates, and sovereigns in stressed economies and entrenching divergence in financial and economic conditions (Figure 1.37). As a result of this feedback loop, along with weak demand for credit, bank lending to stressed economies continues to contract, as discussed in more detail in Chapter 2 (Figure 1.38). Weak banks have been exacerbating the problems of weak corporates because institutions with thin buffers have been tightening credit conditions for corporates by rationing credit and increasing the interest rates on new loans (Figure 1.39). Evidence from individual banks suggests that even within stressed economies in the euro area, weaker banks are more likely to cut back lending (Figure 1.40).[30]

Sovereign risks have abated, but sovereign spreads remain differentiated within the euro area (Figure 1.41). Furthermore, spreads widened somewhat during the recent period of market volatility, though in most cases they are now tighter than they were at the

[27]The term "stressed economies" generally includes Cyprus, Greece, Ireland, Italy, Portugal, Spain, and Slovenia, though in some parts of the section it may refer to a subset of these economies.

[28]Target2, the main payment system within the European Monetary Union, works through the individual national central banks (NCBs) of each of the euro area countries. The settlement of cross-border payment flows between euro area countries in Target2 results in claims and liabilities for each NCB. The Target2 balance for an NCB is the net of these claims and liabilities.

[29]Foreign claims of core euro area banks on stressed economy sovereigns, banks, and the nonfinancial private sector are at 40, 38, and 26 percent of their June 2011 peaks, respectively.

[30]This is consistent with the Bank of Italy's April 2013 *Financial Stability Report,* which presents evidence that in 2012 the growth of lending to firms was positive for banks with stronger capital ratios and lower funding gaps.

time of the April 2013 GFSR. As discussed in previous GFSRs, as well as IMF (2013a), divergence in sovereign spreads has raised funding costs for banks in stressed economies, putting further upward pressure on lending rates. Second-tier and small banks in stressed economies have been facing the greatest wholesale funding strains, and it is these banks that tend to be the main providers of credit to small and medium enterprises (SMEs) (see ECB, 2013b, pp. 67–68).

Weak corporates have exacerbated the pressures at weak banks.

At the same time, weak corporates have exacerbated the problems of weak banks. Corporate leverage increased in stressed economies during the boom years, especially in Portugal and Spain, in contrast to the core euro area (Figure 1.42).[31] This is particularly the case for SMEs, which tend to have higher leverage than do larger firms (Figure 1.43). Overall, more than three-quarters of corporate debt in Portugal and Spain and about half of corporate debt in Italy is owed by companies with debt-to-assets ratios at or above 40 percent (Figure 1.44).[32]

High to moderate leverage has interacted with weak profitability to create debt-servicing difficulties for companies, particularly because sovereign and banking stress along with other factors that contributed to financial fragmentation have raised corporate funding costs in stressed economies.[33] Overall, almost 50 percent of debt in Portugal, 40 percent of debt in Spain, and 30 percent of debt in Italy is owed by firms with an interest coverage ratio of less than 1 (Figure 1.45).[34] These firms would be unable to service their debts in the medium term unless they make adjustments such as reducing debt, operating costs, or capital expenditures.

These debt-servicing pressures—along with a weak economic environment—have led to an increase in nonperforming loans, worsening the quality of the assets on bank balance sheets (Figure 1.46). Banks have raised

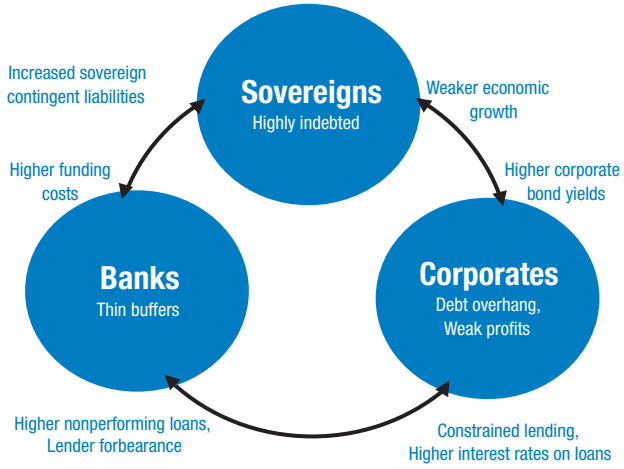
[31]ECB (2013a) also discusses the accumulation of corporate debt in the euro area. IMF (2013a) also looks at constraints to growth and credit posed by the negative feedback loop between high private debt and the weak financial sector.

[32]A debt-to-assets ratio of 30 percent usually corresponds to a Ba credit rating, and a 35 percent debt-to-assets ratio usually corresponds to a B credit rating.

[33]See also Chapter 2.

[34]Interest coverage ratio (ICR) is defined as earnings before interest and taxes (EBIT) divided by interest expense. Interest revenues or financial revenues are included in the calculation of earnings (and thus partly offset interest expense).

Figure 1.37. Bank-Corporate-Sovereign Nexus



Source: IMF staff.

interest rates in response to the increased riskiness of corporate loans, starting the cycle again. Figure 1.47 shows that bank interest rates tend to be higher in economies in which corporate risks are higher, as proxied by Moody's expected default frequencies of publicly traded firms. Furthermore, greater debt-servicing difficulties at SMEs are reflected in higher interest rates on small bank loans.

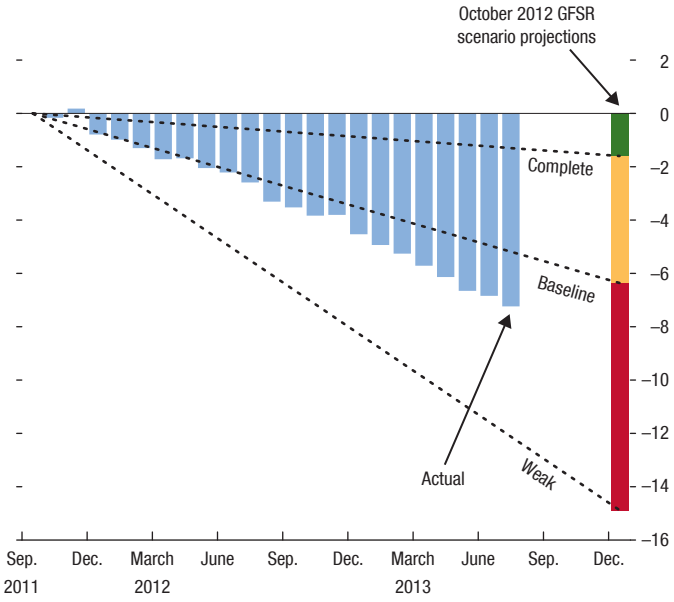
Banks with weak balance sheets will be less able and willing to recognize losses and so will become more likely to forbear on loans. Although some forbearance may help ease pressures on individual borrowers, widespread forbearance poses the risk that banks will devote scarce resources to unhealthy corporates, crowding out lending to healthier and more productive firms.

In addition, firms facing higher debt-servicing costs—caused by high leverage and remaining fragmentation—have been forced to adjust their businesses, as discussed in the April 2013 GFSR. In 2012, dividend payments were reduced sharply by Spanish and Italian companies, and large international firms have been selling foreign assets.[35] In addition, publicly traded firms in Portugal and Spain reduced capital expenditures by over 15 percent (Figure 1.48). Although deleveraging is needed, excessive cutbacks in capital expenditure—especially amid remaining fragmentation—may further undermine economic growth prospects.

[35]The need to preserve or obtain investment-grade credit ratings to maintain or gain access to capital markets is a critical driver of deleveraging efforts by large companies in stressed euro area economies. This is especially the case because rating agencies have tightened requirements for the ratio of debt to EBITDA (earnings before interest, taxes, depreciation, and amortization) during the euro area crisis.

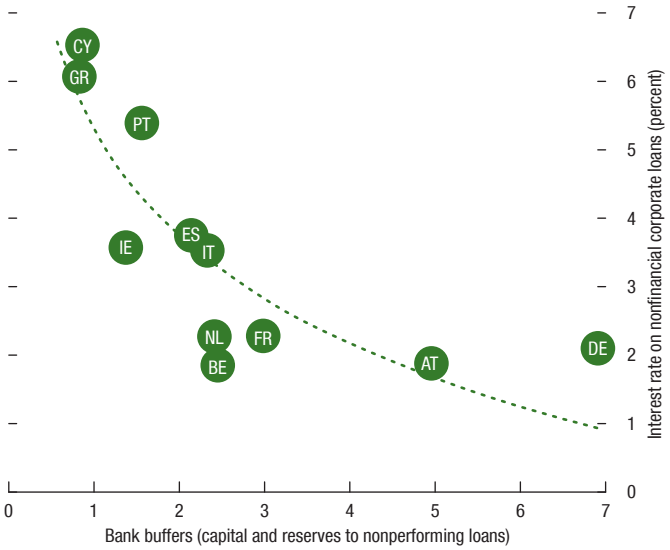
Figure 1.38. Stressed Euro Area Economy Bank Credit

(Percent change, cumulative since September 2011)



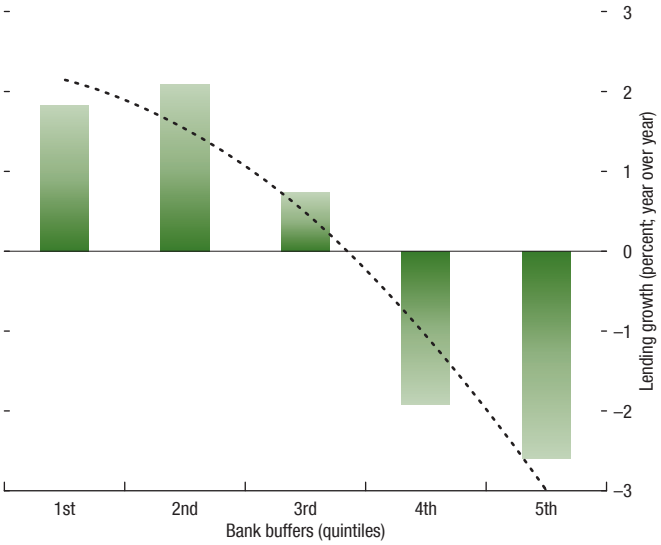
Sources: Haver Analytics; and IMF staff estimates.
Note: Euro area lending by banks located in Ireland, Italy, Portugal, and Spain, adjusted for securitizations.

Figure 1.39. Bank Buffers and Interest Rates on Corporate Loans



Sources: European Central Bank (ECB); ECB Consolidated Banking Data; IMF Financial Soundness Indicators; and IMF staff estimates.
Note: Differences in definitions of nonperforming loans complicate comparisons across economies. Italian nonperforming loans have been adjusted to make them more comparable with other economies, following Barisitz (2013). German nonperforming loans are estimated using ECB Consolidated Banking Data. Figure shows data as of July 2013 or latest data available. AT = Austria; BE = Belgium; CY = Cyprus; DE = Germany; ES = Spain; FR = France; GR = Greece; IE = Ireland; IT = Italy; NL = Netherlands; PT = Portugal.

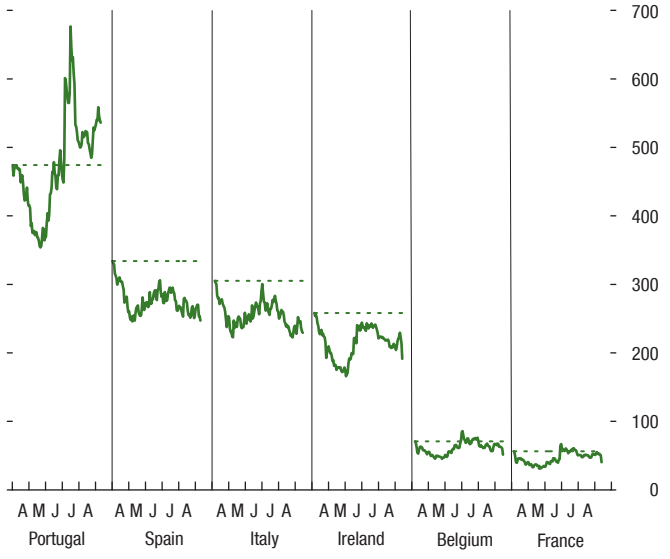
Figure 1.40. Individual Bank Buffers and Lending in Stressed Economies, 2013:Q1



Sources: SNL Financial; and IMF staff calculations.
Note: The figure shows average lending growth for the individual banks in each quintile. The figure is based on consolidated data for a sample of almost 70 banks headquartered in Cyprus, Greece, Ireland, Italy, Portugal, Slovenia, and Spain. Bank buffers are defined as the ratio of core Tier 1 capital and loan loss reserves to impaired loans. The figure uses 2013:Q1 or latest available data.

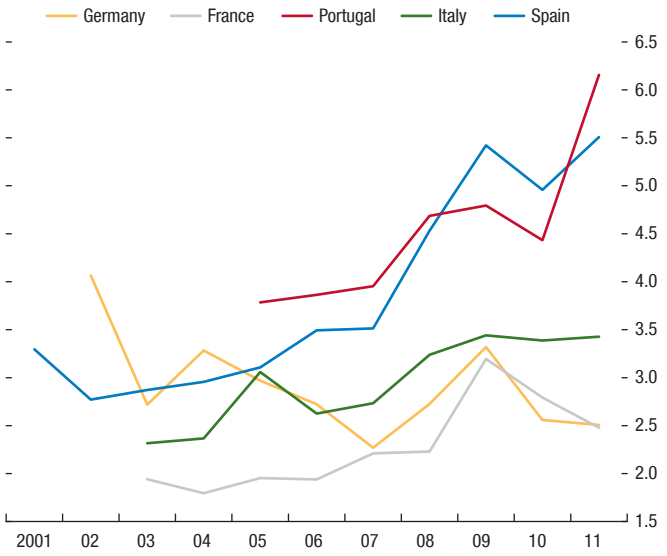
Figure 1.41. Euro Area Sovereign Spreads, April–August 2013

(Five-year spreads to German bunds; basis points)



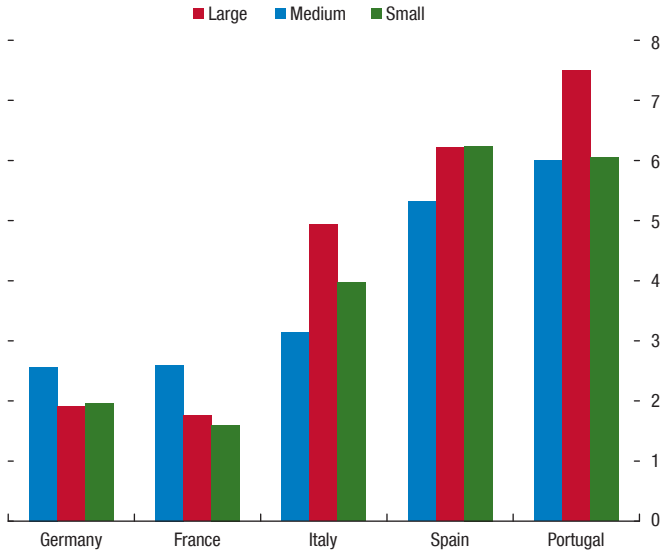
Sources: Bloomberg, L.P.; and IMF staff calculations.
Note: AMJJA = April, May, June, July, August. Dotted line represents April 2013 level.

Figure 1.42. Leverage Ratios
(Debt to EBITDA)



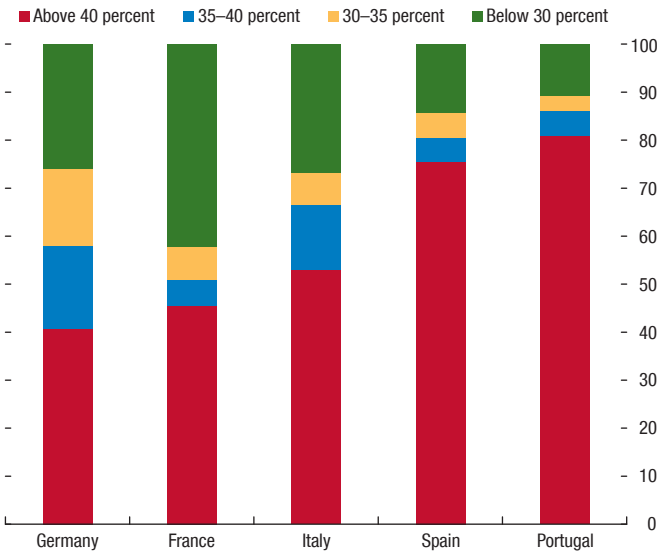
Sources: Amadeus database; and IMF staff estimates.
Note: EBITDA = earnings before interest, taxes, depreciation, and amortization.

Figure 1.43. Leverage Ratios by Firm Size, 2011
(Debt to EBITDA)



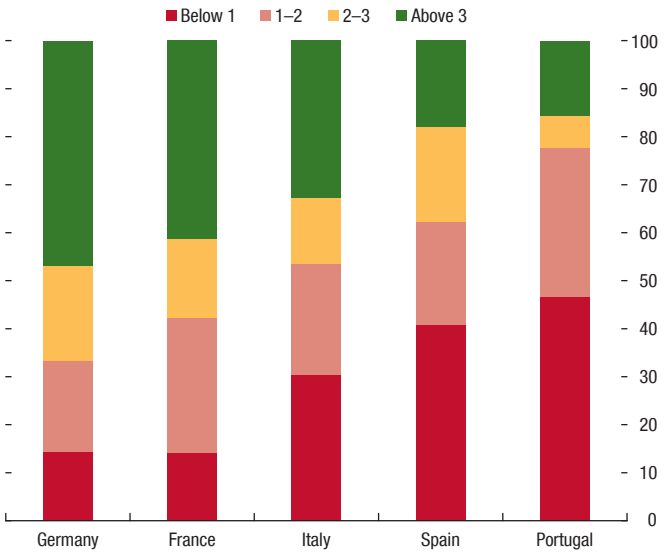
Sources: Amadeus database; and IMF staff estimates.
Note: EBITDA = earnings before interest, taxes, depreciation, and amortization.

Figure 1.44. Share of Debt at Firms with Various Debt-to-Assets Ratios, 2011
(Percent of total debt)



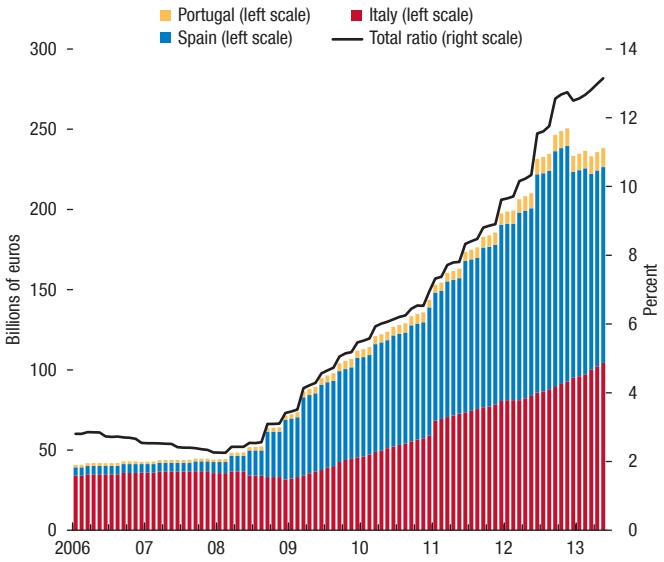
Sources: Amadeus database; and IMF staff estimates.

Figure 1.45. Share of Debt at Firms with Various Interest Coverage Ratios, 2011
(Percent of total debt)



Sources: Amadeus database; and IMF staff estimates.

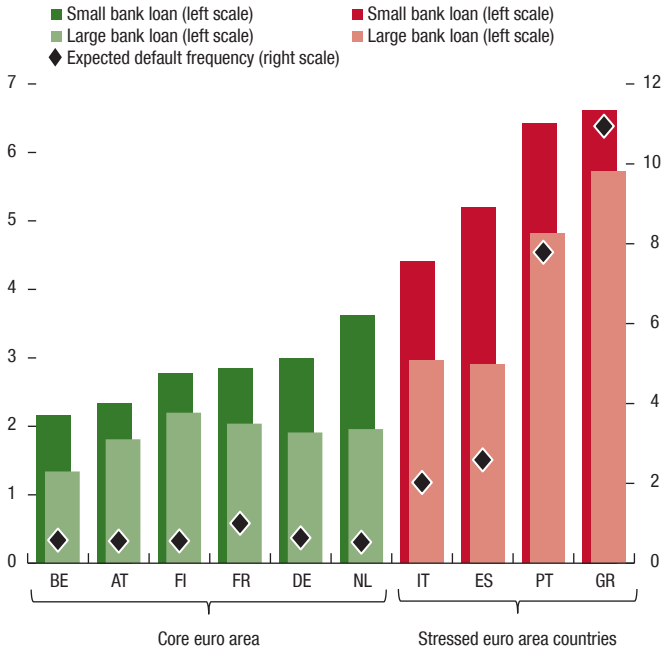
Figure 1.46. Nonperforming Corporate Loans



Sources: National central banks; and IMF staff calculations.
Note: Differences in definitions complicate the comparison of nonperforming loans across economies. Data for Italy show bad loans only.

Figure 1.47. Corporate Expected Default Frequencies and Bank Loan Interest Rates

(Percent; July 2013)



Sources: Bloomberg, L.P.; European Central Bank; Moody's Credit Edge; and IMF staff calculations.
Note: Small loans have a value of €1 million or less. Expected default frequencies (one year) are the average of the 25th, 50th, and 75th percentiles; the sample comprises publicly traded firms. AT = Austria; BE = Belgium; DE = Germany; ES = Spain; FR = France; GR = Greece; FI = Finland; IT = Italy; NL = Netherlands; PT = Portugal.

How has the bank-corporate-sovereign nexus affected interest rates on corporate loans?

In general, banks should price loans so that the interest rate is greater than the sum of their funding costs, required return on equity backing the loan, and a credit margin. In stressed economies of the euro area, these three components of interest rates have been affected by several factors: (1) higher sovereign risk, (2) bank balance sheet health, (3) corporate riskiness, and (4) the economic and policy environment, as illustrated in Figure 1.49.

The importance of these factors is assessed econometrically using monthly data over 2003–13 for France, Italy, and Spain for interest rates on small loans, many of which are extended to SMEs.[36] The results suggest, as expected, that sovereign stress and banking system weaknesses have been the key driving forces behind higher interest rates on small loans in Italy and Spain, particularly from mid-2011 onward (Figure 1.50). Corporate credit risk is also a significant factor in higher lending rates in Italy and Spain (see Annex 1.1 for details).

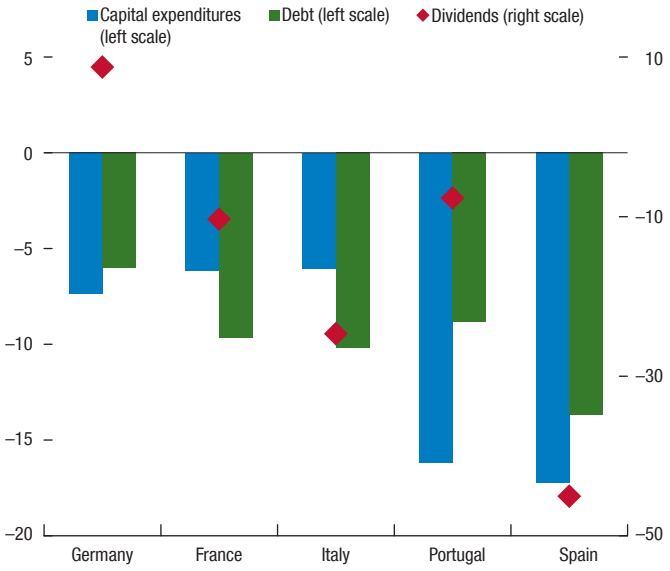
These findings are broadly consistent with recent studies, including the ones on Portugal.[37]

Conversely, the pass-through of the ECB's easy monetary policy stance has provided some downward pressure on bank lending rates. Yet monetary policy has been insufficient to offset other pressures that have driven up interest rates on loans to SMEs. In addition, deep and prolonged recessions in Italy and Spain have depressed the demand for loans from nonfinancial corporates.

[36]The analysis is based on a vector error correction model, which includes money market rates, sovereign stress, and banking and business cycle variables as endogenous variables that determine equilibrium lending rates, as well as a number of exogenous variables, including corporate credit risk. (See Annex 1.1 for details.)

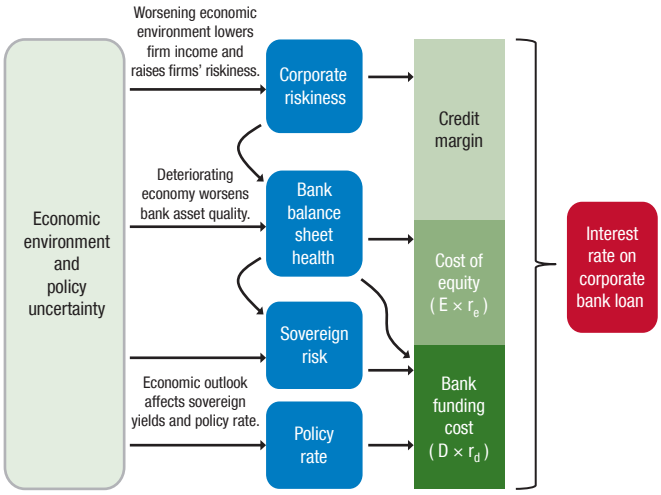
[37]IMF (2013a) concludes that "funding costs, credit risk, and leverage have become important determinants of lending rates since the onset of the crisis, particularly for stressed countries, and that these factors appear to be more relevant for small loans, typically associated with SMEs." A recent study by the Bank of Portugal (Santos, 2013) using data on new loans to nonfinancial firms found that the firm-level z-score indicator (which captures the firm's credit risk) and bank deposit rates are significantly and positively related to the level of interest rates (after controlling for several loan-, firm-, and bank-specific characteristics). Furthermore, IMF (2013e) identifies sovereign debt crisis and bank funding pressures as the key determinants of the higher lending rates in Portugal, together with weak domestic conditions and profitability in the context of overleveraged private sector balance sheets.

Figure 1.48. Listed Firms: Changes in Debt, Capital Expenditures, and Dividends
(Percent; end-2011 to end-2012)



Sources: Worldscope; and IMF staff estimates.

Figure 1.49. Factors Affecting Bank Interest Rates on Corporate Loans



Source: IMF staff.
Note: E = proportion of equity backing the loan; r_e = required rate of return on equity; D = proportion of wholesale funding and deposits backing the loan; r_d = marginal bank funding cost. This simplified loan pricing equation abstracts from tax rates and other expenses or benefits related to the loan.

The factor decompositions in Figure 1.50 suggest that sovereign and banking stresses have played an important role in keeping the lending rates elevated in Italy and Spain.[38] Spanish bank stress had been simmering since early 2010, a longer period than in Italy, where the sovereign crisis did not escalate until mid-2011. Figure 1.50 also shows that the contributions of sovereign and banking stress have declined since the establishment of the ECB's OMT framework and because of the reform progress at the national level.[39] In contrast, in France, sovereign and banking stress have played virtually no role in determining interest rates on corporate loans with lending rates driven primarily by monetary policy.

This framework can be used to estimate the impact of financial fragmentation—the contribution of sovereign and banking stress—on bank lending rates. If the influence of sovereign and bank stress (the red bars in Figure 1.50) is removed, the current interest rate on new small loans would be about 100 basis points lower in Italy and 160 basis points lower in Spain. As with any model, these point estimates are only indicative. That said, if lending rates were to decline to the levels consistent with their precrisis spreads over 7-year swap rates (see Figure 1.50), they would be about 150 and 200 basis points lower in Italy and Spain, respectively.

Can the corporate debt overhang be resolved by removing financial fragmentation?

To assess the scale of the current corporate debt overhang—measured as the share of corporate sector debt with an interest coverage ratio (ICR) of less than 1—a detailed data set covering more than 3 million individual companies is used (see Annex 1.2 for more details).[40] The current debt overhang is estimated to

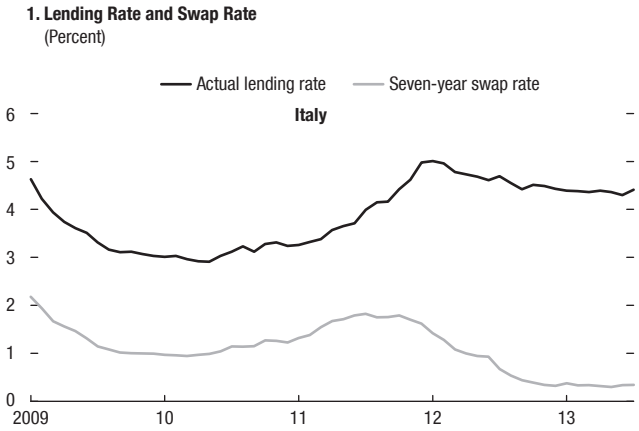
[38]See also Chapter 2. A high degree of interdependence between sovereign and banking risks means that any separation of their respective contributions is bound to be imprecise and dependent on the specific way in which these risks are measured (see Annex 1.1 for details).

[39]In the case of Spain, progress on the restructuring of the banking sector has been an important factor in the improvement of financial conditions.

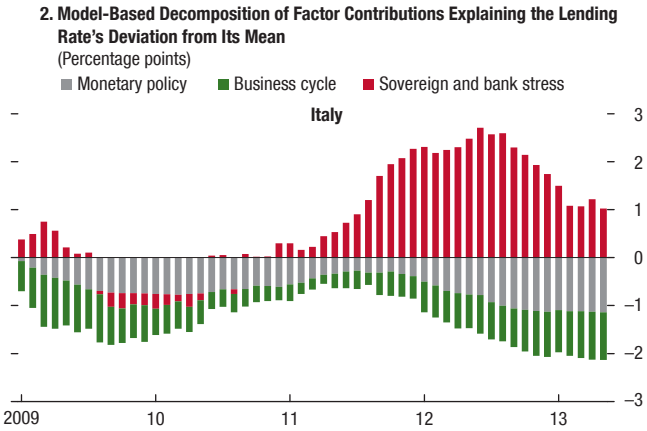
[40]ICRs for 2013 are estimated based on a regression of corporate profitability (EBIT over assets) on GDP growth estimates and actual interest rates on corporate loans (see Annex 1.2). In the case of Portugal, the estimated ICRs are adjusted using actual 2012 data by sector/size provided by the Bank of Portugal. Debt is assumed to be constant at 2011 levels throughout the projection period of the exercise. This assumption may overstate the extent of debt overhang estimated for 2013 in the three economies. The available data for Spain show a significant decline in corporate debt levels in 2012. However, data on reduction in assets are not available, and these are necessary to estimate the effect on profitability and, consequently, the debt overhang. In addition, price effects of asset sales have to be taken into account, as price discounts that are likely to be incurred by SMEs and firms under deleveraging pressures would hurt profitability.

Figure 1.50. Interest Rates on Small Bank Loans and Model-Based Factor Decomposition

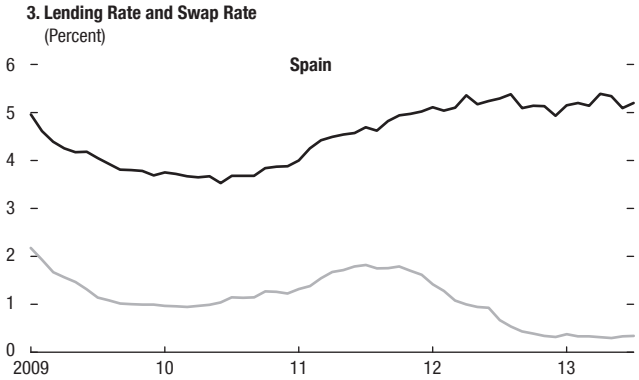
Italian lending rates on small loans have remained elevated despite a significant decline in swap rates…



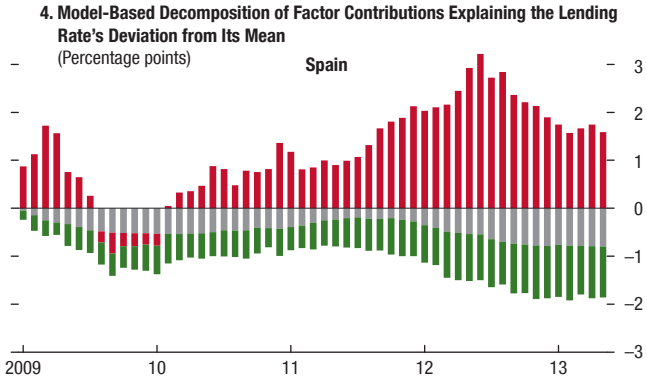
…reflecting elevated banking stress and residual sovereign pressures.



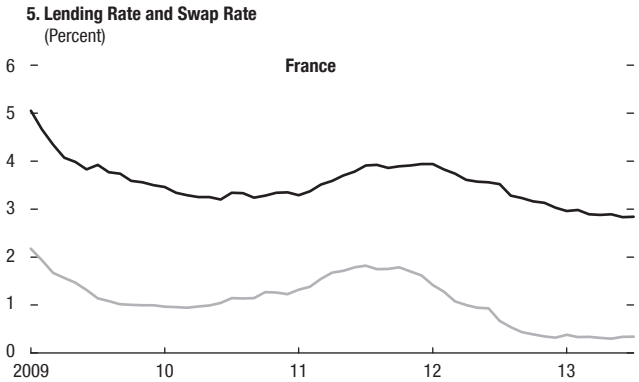
In Spain, the spread between the interest rate on small loans and the swap rate has also widened well beyond its historical norm…



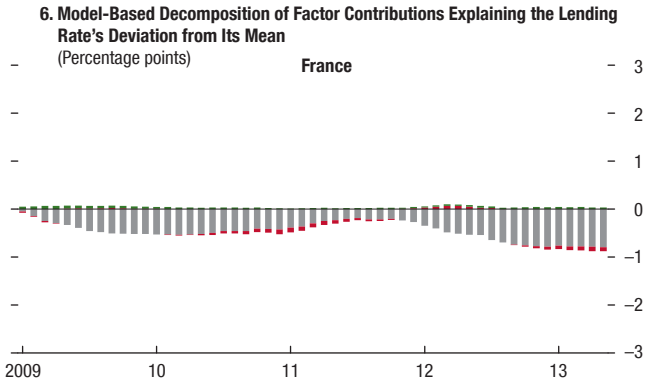
…predominantly due to persistent banking strains…



…while in France, it remained constant.



In France, the transmission from monetary policy is the dominant factor keeping lending rates low.



Source: IMF staff estimates.

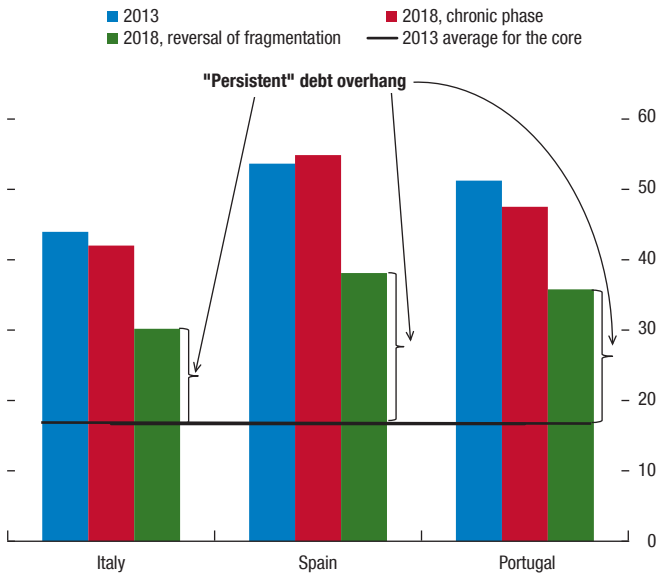
be large, amounting to between 45 and 55 percent in the stressed economies of the euro area in 2013 (Figure 1.51). To gauge the scale of the debt overhang on a forward-looking basis, two scenarios are used:

- *Chronic-phase scenario.* This scenario assumes that bank lending rates rise further as stalled delivery on policy commitments leads to persistent financial fragmentation and as credit margins increase, following a deterioration in the economic outlook under the October 2013 WEO alternative baseline scenario.
- *Reversal-of-fragmentation scenario.* This scenario assumes that sovereign and banking risks abate as further progress is made toward banking and fiscal union, leading to a decline in corporate funding costs (in line with the results shown in Figure 1.50). Growth in stressed economies recovers along the lines of the October 2013 WEO baseline scenario, which assumes an improvement in competitiveness on the back of continued implementation of national reforms.

Under the chronic-phase scenario, the size of the debt overhang remains broadly unchanged from current high levels, and corporates fail to escape the debt overhang trap even in the medium term, further suppressing prospects for economic recovery (see Figure 1.51). Under the reversal-of-fragmentation scenario, the debt overhang is reduced substantially as corporate profitability benefits from economic recovery underpinned by structural reforms and favorable financing conditions. However, even when economic growth picks up and financial fragmentation is reversed, a sizable portion of firms in stressed economies remains financially vulnerable. Hence, a more comprehensive approach to address this "persistent" debt overhang, amounting to almost one-fifth of total corporate debt in these three countries, will be required to support the flow of credit to healthier companies needed for sustained economic recovery.[41]

[41]The "persistent" debt overhang is the share of debt in the stressed economies owed by financially vulnerable firms (those with an ICR of less than one) under the reversal-of-fragmentation scenario, in excess of the equivalent share of debt in the core euro area economies. The core euro area is chosen as a benchmark because the debt-at-risk levels in the core have been relatively stable before and throughout the crisis (see Annex 1.2) and under the reversal-of-fragmentation scenario, corporates in the stressed economies and the core euro area will face similar financial conditions. The cross-country differences in the industrial structure per se should not lead to divergent levels of debt-at-risk across countries with similar economic and financial conditions.

Figure 1.51. Corporate Debt Overhang
(Debt of firms with an interest coverage ratio < 1 as a percentage of total debt)



Sources: Amadeus database; and IMF staff estimates.

The systemic nature of the debt overhang in Italy, Portugal, and Spain is further underscored by the fact that corporate sector strains are not limited to just the sectors that experienced credit booms (construction and real estate in Spain and Portugal). Estimated probabilities of default (PDs) suggest that stresses are also high in the cyclical and manufacturing sectors in the stressed economies (Figure 1.52).[42] In addition, strains at SMEs are greater relative to those at large corporates in Italy, Portugal, and Spain, and also in France, because large corporates benefit from stronger fundamentals and financing conditions.

What are the implications of the corporate debt overhang for banks?

This GFSR examines the corporate exposures of banks in Portugal, Spain, and Italy, as these are systemically important economies where the corporate debt overhang is sizable and where firm-level data are sufficiently comprehensive to carry out this type of exercise. This analysis provides an illustration of the potential magnitude of corporate risks for banking systems, thus making the strong case that the ECB's upcoming bank balance sheet assessment should, among other

[42]See Annex 1.2 for details.

Figure 1.52. Distribution of Estimated Corporate Sector Probabilities of Default
(2011, over the next two years; based on interest coverage ratios of nonfinancial firms)

	Large			Small and medium enterprises		
	Construction	Manufacturing	Cyclicals	Construction	Manufacturing	Cyclicals
Germany	1	1	1	1	1	2
France	1	2	1	3	4	3
Italy	2	3	1	3	3	3
Spain	2	2	2	4	4	4
Portugal	3	2	4	4	4	4

Source: IMF staff estimates.
Note: The numbers indicate quartiles for the distributions of probabilities of default (PDs) across countries, sectors, and firm sizes. Segment-specific PDs are weighted averages of firm-specific PDs. Manufacturing includes manufacturing, utilities, and information technology. Cyclicals include wholesale and retail trade and all services.

things, focus on corporate exposures.[43] It is important to note, however, that to properly assess potential bank losses, a detailed bank-by-bank asset quality review and stress test is required, which is a different and a more precise exercise than the one presented in this report. The forthcoming bank balance sheet assessment and stress tests provide a golden opportunity to carry out a comprehensive and transparent evaluation across euro area banks that could help restore investor confidence in the quality of their balance sheets.

The analysis in this report aims to assess the impact of corporate strains on banks in the stressed economies from the corporate sector balance sheet perspective. It maps corporate vulnerability indicators (such as ICRs) into historical default rates to estimate firm-level probabilities of default (PDs). The country-level PDs are then calculated as weighted averages of the firm-level PDs.[44] Finally, the bank losses by country are estimated as the product of the country-level PDs, an assumed loss given default (LGD) rate, and the stock of corporate loans in the banking system. The potential losses for banks operating in Italy, Portugal, and Spain are estimated for 2014–15 based on projected corporate sector vulnerability indicators as of 2013 (Figure 1.53). A range of potential losses is estimated using a standard Basel LGD of 45 percent as the mid-point and a 10 percentage point variation around it to capture uncertainties about collateral valuations and recoveries.[45] Because the LGD assumptions are exogenous and the same for all countries, they may not capture some country-specific circumstances, including ongoing bank restructuring processes.

Assuming no further improvement in economic and financial conditions—which would correspond to a *more adverse outcome* than the cyclical improvement built into the October 2013 WEO baseline—some banks in the stressed economies could face sizable potential losses on their corporate exposures. Figure 1.53 presents estimates of potential losses over the next two years for the banking systems in Portugal, Spain, and Italy and compares them with banks' estimated total loss-absorption capacity, which includes current provisions for corporate loans, future pre-provision earnings, and capital buffers (green bars in Figure 1.53).[46]

Based on this indicative exercise for the more adverse outcome and under the 45 percent LGD assumption, the Spanish banking system could face an estimated €104 billion of gross losses on corporate exposures, but this is fully covered by existing provisions. Following several asset quality reviews and stress tests, Spanish banks have significantly increased provisions, especially on construction and real estate exposures. In the case of Italy, the estimated gross losses on corporate exposures could amount to €125 billion, which exceeds existing provisions by €53 billion. As Figure 1.53 illustrates, these estimated net losses (€53 billion) are covered by operating profits without eroding existing capital buffers, under the 45 percent LGD

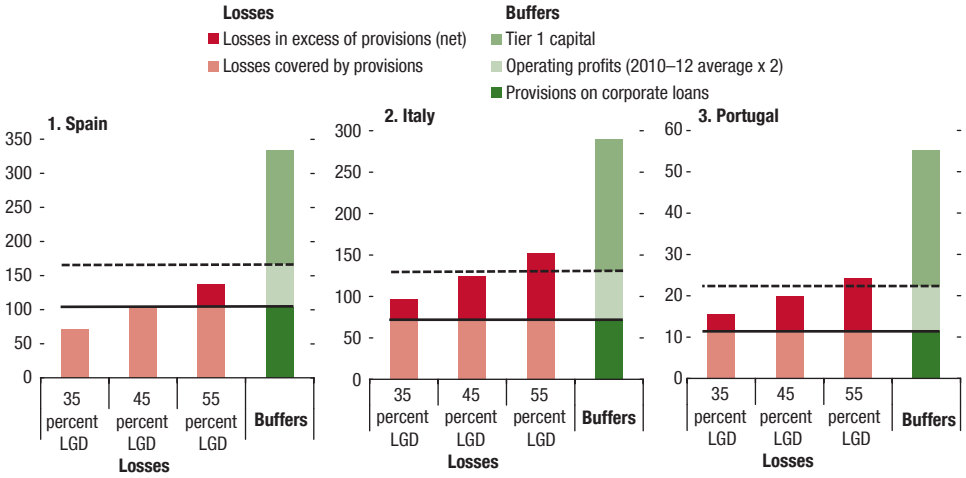
[43]The upcoming balance sheet review by the ECB will cover a wider range of assets, including those in other euro area countries and stemming from other types of exposures.

[44]In the absence of more precise bank-level information on corporate loan portfolios, ICRs are mapped into PDs by (1) assigning implied credit ratings to companies in the sample based on average ICRs by credit rating for companies rated by Moody's and (2) assigning PDs to each implied rating based on historical default rates of companies rated by Moody's (see Annex 1.2 for more details).

[45]In the case of Spain, the stress test carried out by Oliver Wyman has reduced uncertainty about collateral valuations.

[46]Spain's operating profits include domestic operating profits and foreign net profits (after provisions and taxes abroad), while provisions refer to business in Spain only.

Figure 1.53. Potential Losses on Corporate Loans and Banking System Buffers
(For the next two years, based on projected corporate vulnerability indicators as of 2013; billions of euros)



Sources: Amadeus database; Financial Soundness Indicators database; national central banks; and IMF staff estimates.
Note: LGD = loss given default. Spanish potential losses are adjusted for transfers to SAREB, the Spanish asset management company that took over the bad debt of restructured banks during the global financial crisis. Spanish operating profits include domestic operating profits and foreign net profits (after provisions and taxes abroad). Spanish provisions include about €4 billion of dynamic provisions.

assumption. For Portugal, the estimated gross losses on corporate exposures could be €20 billion, or €8 billon in excess of existing provisions. As Figure 1.53 illustrates, these estimated net losses (€8 billion) could be covered by operating profits without eroding existing capital buffers, under the 45 percent LGD assumption.[47]

Despite recent efforts to assess asset quality and boost provisions, this analysis suggests that some banks in the stressed economies might need to further increase provisioning to address the potential deterioration of asset quality on their corporate loan books, which could absorb a large portion of future bank profits.[48] Recently increased capital provides additional loss-absorption capacity, if needed.[49] Further measures, such as cuts in operating costs and reductions in dividends, will also help improve profitability and/or boost capital. However, as mentioned previously, provisioning and/or capital needs can only be ascertained precisely through a bank-by-bank asset quality review that looks into individual bank loan portfolios and takes into account provisions and capital held by each bank.

Specifically, the analysis in this report differs from the standard bank solvency stress tests in several important respects: (1) it considers gross corporate sector exposures of a banking system, including both performing and nonperforming loans (and hence, both expected and unexpected losses), whereas bank stress tests tend to focus on performing loans (unexpected losses); (2) it relies on PDs derived from the detailed firm-level data on corporate sector vulnerabilities using the same methodology for all economies, whereas solvency stress tests typically use country-specific PDs based on national historical default rates and models, as well as country-specific LGDs; and (3) it does not rely on bank-specific data and is not suitable for assessing bank capital needs (see Annex 1.2 for more details). Hence, the main goal of this exercise is to illustrate the potential scale of the asset quality issues in banks' corporate exposures for the forthcoming bank balance-sheet review to focus on.

[47]Buffers on domestic corporate exposures may be overestimated because provisions (including generic provisions), operating profits, and Tier 1 capital data are available only on a consolidated basis at the system level. Also, some of the losses may be borne by the household sector, as some SMEs may be able to draw on their owners' personal wealth.

[48]The central bank of Portugal has conducted three in-depth asset quality reviews with support from external consultants, including a detailed review of construction and real estate exposures (39 percent of the corporate sector), as well as a recent review of large exposures and collateral valuations (49 percent of total assets). Both reviews identified some shortfalls that were subsequently addressed. Similarly, the central bank of Italy has evaluated provisioning in selected banks (see Box 1.4 for more details).

[49]In some cases, banks are also able to provision against future losses. Core Tier 1 ratios of several banks in countries with IMF programs are comfortably above the hurdle rates set under the baseline and stress test scenarios on a forward-looking basis, according to banks' medium-term funding and capital plans. In general, implementation of forward-looking provisioning rules is, however, being undermined by the stalled attempts to adopt forward-looking impairment loss recognition in accounting standards.

What needs to be done to address bank weaknesses and the bank-sovereign negative feedback loop?

Investors' faith in euro area banks' balance sheets must be fully restored:

- A first step will be to conduct a comprehensive and rigorous bank balance sheet assessment and stress test, with involvement of independent, third-party auditors, as planned by the ECB.
- For the exercise to be credible, the sources of additional capital should be identified ahead of time, if shortfalls are found and private funds are insufficient. These funds need to be sufficiently large to accommodate the limited ability of some sovereigns to take on more debt. Adequate backstops are also important to avoid putting pressure on banks to scale back their balance sheets ahead of the assessment.
- Determination to resolve nonviable institutions will be critical to restoring the financial system to long-term health and to improving credit supply, especially to SMEs.

The banking union must be completed:

- Completion entails expediting reforms already under way, such as implementing the legislation for the Single Supervisory Mechanism and reaching final agreement on the Bank Resolution and Recovery Directive.
- The process should also involve the introduction of a strong Single Resolution Mechanism that ensures the swift restructuring or winding-up of banks while limiting the overall cost to taxpayers and establishing clear rules for investors. The euro area bank resolution process, as proposed in the draft Bank Resolution and Recovery Directive, will help weaken the bank-sovereign link. However, in the current environment, the limited scope and "negative leverage" entailed in European Stability Mechanism direct bank recapitalization places the burden of raising capital firmly back on bank shareholders and creditors or on the sovereign (even if financed upfront by European Stability Mechanism loans), or on both, and thus may not provide sufficient backstop should substantial capital shortfalls be found in economies with weak sovereign balance sheets.

What needs to be done to address the corporate sector debt overhang?

Measures to deal with the overhang should include the following:

- Expediting improvements to corporate bankruptcy frameworks in stressed economies to allow for swifter court processes, to provide clarity of collateral ownership and the exercising of rights over security, and to encourage out-of-court debt resolutions and write-offs, as recently done in Portugal.[50]
- Taking a more comprehensive approach to corporate debt cleanup. Where warranted, measures could include establishing a special asset management company to restructure corporate loans or providing incentives to banks to aggressively provision for nonperforming loans through tax or capital rules. Provisioned loans could then be written down or sold at a discount to specialist third parties.
- Actively facilitating nonbank sources of corporate credit. Steps could be taken to emulate France in developing a domestic corporate medium-term note market that has maintained positive net supply to domestic companies in recent years (e.g., through the maintenance of a domestic SME credit register by the central bank). Similarly, life insurers and pension funds could be encouraged to hold longer-term corporate loans or bonds if the authorities were to give them capital or regulatory relief for mitigating reinvestment risk.[51]

Further monetary support by the ECB is crucial to provide time for the repair of private balance sheets. Additional unconventional measures—including ensuring term funding for weak but solvent banks, or targeting credit-easing measures to SMEs—would be in line with the recent strengthening of the ECB's collateral framework and would help reduce fragmentation and prevent a more severe contraction in credit, while further conventional easing through lower policy rates would support demand across the euro area. At the same time, recent initiatives by the European Investment Bank and the European Commission to increase lending to SMEs could complement these efforts.

Global Banking Challenges: Profitability, Asset Quality, and Leverage

Global bank capitalization remains divergent because institutions are at different stages of balance sheet repair and operate in different economic and regulatory environments. Asset quality and profitability

[50]See Chapter 2.

[51]Solvency II proposals currently provide limited capital benefits for holding longer-maturity assets against long-term liabilities.

pressures at some euro area banks have reduced their ability to increase capital levels through retained earnings. Some institutions may, therefore, need to further cut back their balance sheets or raise capital to meet higher capital standards. The way in which this adjustment will take place has implications for the financial system and the real economy and has to be monitored. The key tasks are to improve credibility, transparency, and the strength of balance sheets, while avoiding undue pressures on banks from uncoordinated national regulatory initiatives and uncertainty.

Bank capitalization remains divergent.

Bank capital ratios—for this section's sample of institutions from jurisdictions with systemically important financial sectors—remain diverse.[52] Tier 1 capital ratios reported at end-2012 ranged from 5 to 21 percent, with the asset-weighted average standing just under 13 percent (Figure 1.54). Although these ratios are above the current regulatory minimum, full implementation of the Basel III standards will raise both the quantity and the quality of capital that banks have to hold to meet these standards.[53]

As Basel III capital standards became effective in 2013, many banks began reporting their capital ratios on a Basel III basis.[54] Based on the latest available information and IMF staff estimates for sample banks, fully loaded Basel III Tier 1 capital ratios are more than 2 percentage points lower than Tier 1 ratios reported at end-2012, on average (see Figure 1.54). Based on these estimates, banks from advanced economies tend to have slightly higher fully loaded Basel III Tier 1 ratios (more than 10 percent, on average) than do banks headquartered in emerging market economies (over 9 percent, on average).

In addition to risk-weighted capital ratios, investors are increasingly using unweighted leverage ratios to assess bank capitalization. This is partly in anticipation of new rules: the Basel Committee on Banking Supervision has finalized its leverage ratio proposal, and the United States has proposed new leverage standards.[55] But it also reflects lingering concerns about the consistency of approaches used by banks in different jurisdictions for calculating risk-weights, an issue that is being examined by the Basel Committee and by the European Banking Authority.[56] Because the data on netting and off-balance-sheet positions, which are needed to calculate the Basel III leverage ratio, are not published by all banks, investors often use tangible leverage ratios—such as the ratio of tangible equity to tangible assets—to gauge the relative strength of banks (Figure 1.55).

For some banks, these simple tangible leverage ratios and Tier 1 ratios appear to give conflicting signals about the strength of bank balance sheets. This tension is illustrated in Figure 1.56, which shows a number of banks in either the bottom-right or top-left quadrants of the figure; these quadrants are where the two ratios give different signals about bank balance sheet strength.

This apparent conflict reflects, in part, differences in business models and regulatory environments. The "universal banking" model, which tends to be used more in Europe, will naturally lead to a larger balance sheet when compared with a bank with the originate-to-distribute model, more commonly used in North America. The conflicting signals also highlight the importance of restoring investor confidence in the accuracy and consistency of bank risk weights. This also suggests that risk-weighted capital ratios should be supplemented by leverage ratios, as proposed in the Basel III framework.

[52]The analysis in this section is based on a sample of 113 large banks headquartered in jurisdictions with systemically important financial sectors (see IMF, 2010), plus two European banks headquartered in other countries that are considered systemically important for the region. Large banks in the following economies are included: advanced Asia-Pacific (Australia, Hong Kong SAR, Japan, Korea, Singapore); emerging Asia (China and India); emerging Europe (Russia and Turkey); euro area (Austria, Belgium, France, Germany, Ireland, Italy, Netherlands, Spain); Latin America (Brazil and Mexico); North America (Canada and United States); and other advanced Europe (Denmark, Norway, Sweden, Switzerland, United Kingdom).

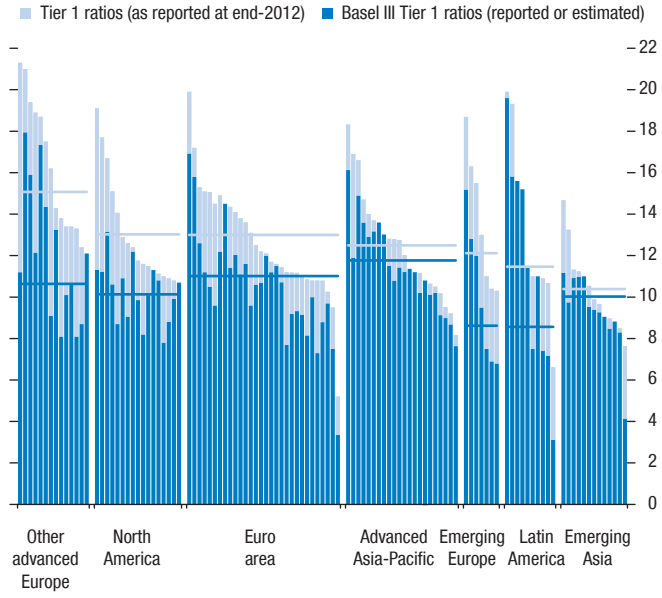
[53]See Box 1.3 for a comparison of regulatory requirements in selected jurisdictions.

[54]As of June 2013, 38 percent of sample banks had published their fully loaded Basel III Tier 1 capital ratios and another 17 percent of sample banks had published their core Tier 1 ratios. The September 2013 Basel III Monitoring Report, which uses detailed information that is not always publicly available, found that Basel III Tier 1 ratios for a group of large internationally active banks were around 3 percentage points lower than current Tier 1 ratios, based on December 2012 data. The report is available at http://www.bis.org/publ/bcbs262.htm.

[55]The Basel III leverage ratio began parallel run with the Basel II leverage ratio in January 2013 (see Box 1.3).

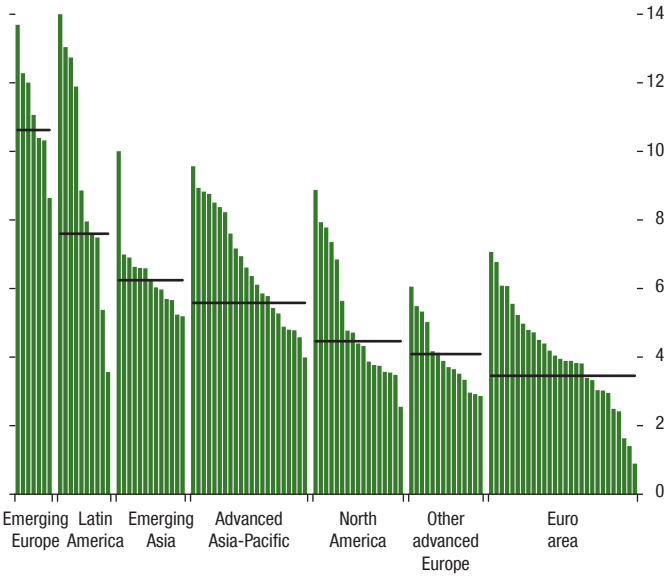
[56]Details of the Basel Committee's Regulatory Consistency Assessment Program can be found at http://www.bis.org/publ/bcbs216.htm; the European Banking Authority's work on this issue is available at http://www.eba.europa.eu/risk-analysis-and-data/review-of-consistency-of-risk-weighted-assets.

Figure 1.54. Large Bank Tier 1 Ratios
(Percent)



Sources: Bloomberg, L.P.; company reports; and IMF staff estimates.
Note: The fully loaded Basel III Tier 1 ratios are either values reported by banks (June 2013 or latest available) or are estimated by adjusting the Basel III core Tier 1 ratios (or the Tier 1 ratios reported according to current regulatory standards) by the average gap between the ratios reported by banks in the same region. The horizontal lines show the asset-weighted average ratios for the banks in each region. See footnote in text for makeup of regions.

Figure 1.55. Large Bank Tangible Leverage Ratios, 2012:Q4
(Percent)



Sources: Bloomberg, L.P.; company reports; Federal Deposit Insurance Corporation; and IMF staff estimates.
Note: The tangible leverage ratio is the ratio of adjusted tangible equity to adjusted tangible assets. The adjustment is made by subtracting goodwill, other intangibles, and deferred tax assets. For U.S. banks, these numbers also include adjustments for accounting differences in derivatives netting, in line with the methodology used in Hoenig (2013). However, some differences in accounting definitions may remain. The horizontal lines show the asset-weighted average ratio for the banks in each region. See footnote in text for makeup of regions.

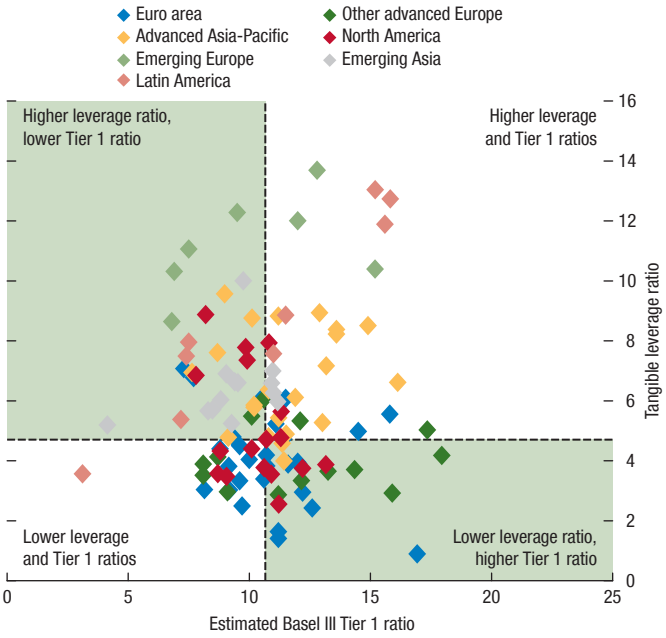
Asset quality pressures at some banks are affecting their profitability.

Bank profitability is now generally lower than it was before the onset of the global financial crisis, but this is likely the result of some unwinding of unsustainable levels of pre-crisis profitability. In emerging market economies, large banks are able to generate higher profits from their assets (return on assets of about 1.4 percent) than are large banks in advanced economies (return on assets of about 0.4 percent), on average (Figure 1.57). Revenues, especially net interest income, are significantly higher for banks in emerging Europe and Latin America than for banks in advanced economies, although loan loss provisions and expenses tend to be larger as well.

Among advanced economy banks, European institutions—and euro area banks, in particular—currently have the weakest profitability. Euro area banks have faced the combined pressures of increased funding costs, falling operating incomes, and rising loan loss provisions. The latter reflects deteriorating asset quality from the weak cyclical positions of these economies, exacerbated by the corporate debt overhang in stressed economies of the euro area. Some euro area banks—including Dutch, Irish, as well as Spanish banks—face challenges from their exposures to household debt. Recent IMF Financial Sector Assessment Program (FSAP) assessments of a number of European economies also found that continuing deterioration of credit quality weighs heavily on banks' already-thin profitability (see Box 1.4).

Concerns about bank asset quality are further compounded by uncertainty about the extent and nature of lender forbearance. Although the ECB's upcoming euro area asset quality review should help resolve some of these concerns, some supervisors are acting preemptively. The Italian central bank recently carried out a review of asset quality; the Bank of Spain is conducting an assessment of restructured loan classification; the Dutch central bank is reviewing commercial real estate lending; and U.K. authorities completed their asset

Figure 1.56. Large Bank Tier 1 Capital and Tangible Leverage Ratios
(Percent)



Sources: Bloomberg, L.P.; and IMF staff calculations.
Note: See Figure 1.54 for details on the estimated Basel III Tier 1 ratio and Figure 1.55 for details on the tangible leverage ratio. The dotted lines show asset-weighted average ratios. See footnote in text for makeup of regions.

quality review in June 2013 by publishing bank-by-bank capital shortfalls.[57]

The link between weak profitability and asset quality is reflected in market valuations of institutions. Figure 1.58 shows that market capitalization as a percentage of assets—a market indicator of the effect of asset quality on bank capital—tends to be lower for banks with weak profitability.

Asset quality and earnings pressures will affect some banks' ability to increase their capitalization.

Weak profitability makes it more difficult for banks to raise their capitalization organically through retained earnings. This effect can be illustrated through a forward-looking exercise that projects bank capitalization in 2018 using analysts' forecasts of bank net income, assuming that balance sheets are unchanged. The objective of this exercise is to see how many institutions will likely not be able to reach these targets through retained earnings alone and therefore would

[57]For more information on the U.K. exercise, please see www.bankofengland.co.uk/publications/Pages/news/2013/081.aspx.

Figure 1.57. Bank Profitability Comparison
(Percent of total assets)

Sources: Bloomberg, L.P.; Federal Deposit Insurance Corporation; and IMF staff calculations.
Note: Shows the unweighted average for large banks in each region. Total assets of U.S. banks have been adjusted for netting of derivatives. See footnote in text for the countries in each region.

have to make further adjustments, that is, shrink their balance sheets, reduce risk-weighted assets, or raise capital. Projected bank capital levels are tested against two targets: an 11 percent target for the Basel III Tier 1 capital ratios and a 4 percent target for tangible leverage ratios. Although these two targets are not minimum regulatory requirements, they represent ratios that institutions may seek to reach given regulatory and market expectations.[58]

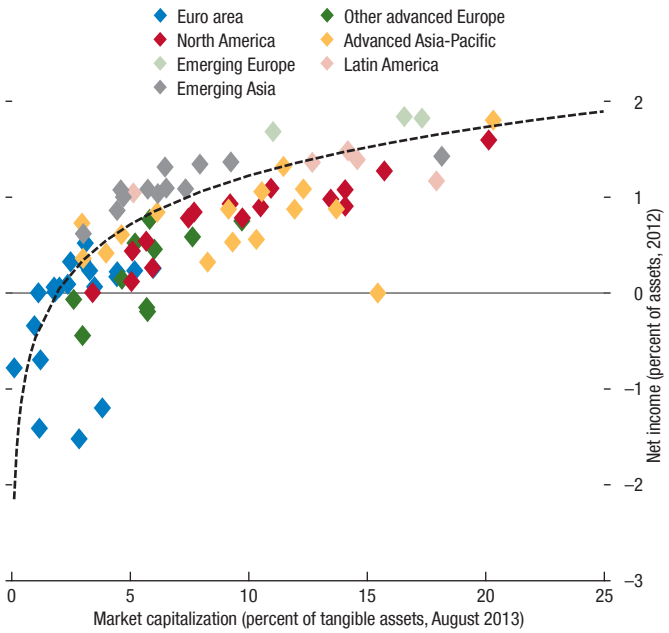
This projection exercise reveals that most banks in the sample already have, or should have, an estimated Basel III capital ratio of 11 percent (a tangible leverage ratio of 4 percent) by 2018 (Figure 1.59). However, around 4 percent of banks may not be able to meet these targets organically through retained earnings. Most of these institutions are in the euro area.

European banks have been deleveraging in response to market and regulatory concerns about capital levels, and may continue to do so.

Banks that are unable to meet capital ratio targets organically through retained earnings will need to either raise fresh equity in markets or cut back balance sheets. Indeed, a combination of market and regulatory concerns about bank capitalization has already led to an increase in capital levels at EU banks.[59] At the same time, large EU banks have continued to shrink their balance sheets, in aggregate. Over the period 2011:Q3–2013:Q2, large EU banks reduced their assets by a total of $2.5 trillion on a gross basis—which includes only those banks that cut back assets—and by $2.1 trillion on a net basis (Table 1.6).[60] These cutbacks in assets are currently running at a similar pace to the baseline scenario in the October 2012 GFSR. About 40 percent of the reduction by the banks in the EU as a whole was through a cutback in loans, with the remainder through scaling back noncore exposures and sales of some parts of their businesses.

Banks have been reducing their risk-weighted assets at a faster speed and have already cut back risk-weighted assets more than was envisaged in the October 2012 GFSR baseline scenario (see Table 1.6). As discussed in the April 2013 GFSR, banks have been concentrating on derisking their balance sheets by reducing capital-intensive businesses, holding greater proportions of assets with lower risk weights (such as government bonds), and optimizing risk-weight models. The capital ratio projection exercise previously discussed suggests that some banks will need to continue raising equity or cutting back balance sheets as they endeavor to repair and strengthen their balance sheets.

Figure 1.58. Bank Profitability and Market Valuation of Assets



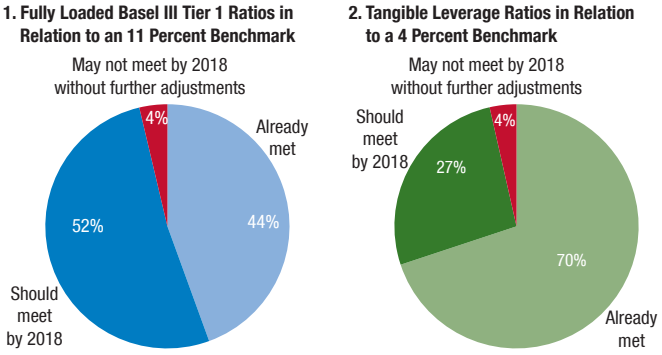
Sources: Bloomberg, L.P.; and IMF staff estimates.
Note: Assets of U.S. banks have been adjusted for netting of derivatives. See footnote in text for the countries in each region.

[58]Because the Basel III standards have not been universally adopted, identifying a common benchmark that banks across more than 20 jurisdictions may strive to achieve is not straightforward. Some regulators may actually set more ambitious and/or different targets for their banks than the Basel III minimum requirements described in Box 1.3. For example, (1) the U.K. Prudential Regulatory Authority has asked banks to meet a Basel III 7 percent common equity Tier 1 ratio by end-2013, ahead of the Basel III timetable, after implementing additional deductions from capital for potential losses and expected conduct-related costs, as well as using higher risk weights for certain exposures; (2) the United Kingdom's 3 percent leverage ratio has similarly been set in more tightly defined terms than in Basel III; and (3) the United States has proposed its own leverage ratio minimum of 4 percent. Furthermore, some banks may seek to have capital ratios that are above regulatory minimums and so other institutions could be under pressure to catch up with their peers.

[59]EBA (2012) provides the results of their capital exercise, which resulted in an increase in capital levels at the banks included in the exercise.

[60]Adjustment is also occurring on the liabilities side of the balance sheet, although generally more slowly (see Chapter 3).

Figure 1.59. Large Bank Capitalization



Sources: Bloomberg, L.P.; company reports; and IMF staff estimates.
Note: For the categories "Should meet by 2018" and "May not meet by 2018 without further adjustments," the test is to allow banks to reach the target by retaining all of their net income (but without reducing their risk-weighted assets or raising new equity), where future average annual income is based on consensus analysts' forecasts. See Figures 1.54 and 1.55 for details of the estimated Basel III and tangible leverage ratios. Totals may not equal 100 percent due to rounding.

The transition to a stronger banking system requires further policy effort.

Banks in advanced economies continue to face profitability and asset quality pressures against a weak economic backdrop. These pressures keep banks focused on rationalizing their business models and balance sheets. However, bank balance sheet repair has yet to be completed. Although European banks have made significant progress on derisking and deleveraging their balance sheets, more needs to be done to improve earnings prospects and investor perceptions. Further deleveraging will need to be monitored to ensure that it occurs in an orderly manner and does not create adverse spillovers to the financial system and the real economy. In particular, it is important for the upcoming balance sheet review in the euro area to encourage banks to adjust in a "healthy" manner (for example through disposal of nonperforming assets and by raising capital) to avoid putting undue pressure on the real economy.

Credibility and transparency of balance sheets need to be shored up. Finalizing work on risk weights, harmonizing definitions of key financial indicators (such as nonperforming loans) used in different jurisdictions, completing accounting convergence, and introducing forward-looking provisioning will all help in that regard. Restoring investor faith in risk weights will also help ensure that risk-weighted capital ratios remain the main capital benchmark, with leverage ratios having a supplementary backstop function, as envisaged in the Basel III framework.

Finally, regulatory uncertainty and unintended consequences from multiple uncoordinated national regulatory initiatives should be minimized. National structural measures for banks (such as the Volcker, Vickers, and Liikanen proposals, as well as others) are another potential challenge, if implemented differently across jurisdictions, and could have unintended consequences on markets.[61]

[61]As discussed in the April 2013 GFSR and Viñals and others (2013).

Table 1.6. European Union Bank Deleveraging

	Change in Balance Sheet						
	Actual Change 2011:Q3–2013:Q2 (trillions of U.S. dollars)		October 2012 GFSR Scenarios 2011:Q3–2013:Q4 (trillions of U.S. dollars)			Progress against GFSR Baseline (percent)	
	Gross	Net	Complete	Baseline	Weak	Gross/Baseline	Assuming Smooth Adjustment
Tangible Assets (minus derivatives and cash)	–2.5	–2.1	–2.3	–2.8	–4.5	88	78
Risk-Weighted Assets	–1.3	–1.2	–0.8	–1.0	–1.9	126	78

Sources: SNL Financial; and IMF staff estimates.
Note: For a sample of 58 large European Union banks (see the April 2012 GFSR for a description of the sample). Gross shows the results for banks in the sample that cut back balance sheets. Net shows the change for all banks in the sample. The figures are rounded to the nearest 0.1 trillion.

Box 1.3. Financial Regulatory Reform Update

Although progress in global regulatory reform has been achieved over the past six months, there are a number of areas where further coordinated efforts are needed. While many of the reform initiatives are under way, gaps remain. Focus on timely and consistent implementation of agreed measures will remain a high priority. Priorities include strengthening prudential supervision through such measures as securing resources and independence of supervisors, restoring confidence in bank balance sheets, developing and implementing effective domestic and cross-border resolution regimes; facilitating implementation of over-the-counter (OTC) derivatives reforms through further cross-border coordination; and enhancing monitoring of shadow banking.

Progress on Basel III continues with 25 of the 27 Basel Committee on Banking Supervision member jurisdictions having issued the final set of Basel III capital regulations.[1] Two main jurisdictions—the United States and the EU—published their final Basel III regulations in the first week of July 2013

The authors of this box are Ana Carvajal, Marc Dobler, Ellen Gaston, Eija Holttinen, Fabiana Melo, Mala Nag, Oana Nedelescu, Nobuyasu Sugimoto, and Mamoru Yanase.

[1]For details, see the August 2013 BCBS progress report on Basel III implementation (www.bis.org/publ/bcbs260.pdf).

Table 1.3.1. Comparison of Bank Regulations across Jurisdictions

Regulation	Basel Minimum Standard	United States	European Union
		Capital	
Quality of Capital	Common equity to compose CET1, conservation and countercyclical buffers, and G-SIB surcharge Full compliance by 2018	Common equity to compose CET1, conservation and countercyclical buffers; no G-SIB surcharge (separately treated) Full compliance by 2018	Common equity to compose CET1, conservation and countercyclical buffers, and G-SIB surcharge Full compliance by 2018
Quantity of Capital	CET1 4.5% Conservation buffer 2.5% Countercyclical buffer 2.5%	CET1 4.5% Conservation buffer 2.5% Countercyclical buffer 2.5%	CET1 4.5% Conservation buffer 2.5% Countercyclical buffer 2.5%
G-SIB Buffer	Surcharge 1.0–3.5%	Not part of U.S. Basel III	Surcharge 1.0–3.5%
Leverage Ratio	BCBS has set minimum requirement at 3% for leverage ratio to complement risk-based capital ratio.	U.S. has revised its existing leverage ratio to require 4% (minimum) for all banking organizations. Supplementary ratio (BCBS format) was adopted at 3% (minimum) for internationally active banking organizations. Enhanced supplementary ratio has been proposed for bank holding companies (with over $700 bn in assets or $10 trn in assets under custody) at 5%. Further, insured depository subsidiaries of these firms will have to meet 6% leverage ratio to be well capitalized under the prompt corrective action regime.	EU is expected to adopt leverage ratio within Basel III proposed framework. CRR/CRDIV includes the calculation and reporting of a leverage ratio but does not yet establish it as a pillar 1 requirement.
		Liquidity	
Liquidity Supervision		U.S. Dodd-Frank Act, Section 165, requires banks with assets of more than $50 billion to hold liquidity buffers of highly liquid assets; this is broadly consistent with the objective of Basel III liquidity ratios.	The EU plans to adopt LCR and Net Stable Funding Ratio. LCR implementation phased in beginning in January 2015 at 60%, with full compliance by 2019. EU member states are to carry out supervision and monitor reporting of LCR compliance progress.
Liquidity Coverage Ratio	BCBS has identified the list of eligible Level 1 and Level 2 assets to constitute High Quality Liquid Assets. BCBS has proposed phase-in period starting in January 2015 and lasting through 2019.	No proposals.	The EU has outlined outflows and inflows in Capital Requirements Regulation. Further refinements to come from EBA on regulatory standards and to be adopted by the European Commission.
Net Stable Funding Ratio	BCBS intends to review NSFR. The objective is to ensure that banks maintain stable asset-liability profiles over a one-year horizon.	No proposals but expected at later date.	EU plans to adopt NSFR once the BCBS has finalized it.

Source: IMF staff.

Note: BCBS = Basel Committee on Banking Supervision; CET1 = common equity Tier 1; EU = European Union; G-SIB = global systemically important bank; LCR = Liquidity Coverage Ratio; NSFR = Net Stable Funding Ratio. U.S. leverage ratio is defined as Tier 1 capital over on-balance-sheet assets, whereas the U.S. supplementary leverage ratio is defined as Tier 1 capital over total leverage exposure, which includes both on-balance-sheet and certain off-balance-sheet exposures.

Box 1.3. *(continued)*

(Table 1.3.1). The BCBS is assessing the quality of implementation of its members through "Level 2" assessments of its Regulatory Consistency Assessment Program (RCAP).[2]

The BCBS is assessing the consistency of regulatory outcomes of its capital standards ("Level 3"). Preliminary findings focusing on the application of risk weights by advanced approaches in the banking and trading books indicate discrepancies due to national supervisory action and variations in accepted modeling practices. The findings from this analysis will feed into further policy recommendations and guidance to harmonize risk-weighting approaches. A fundamental review is under way regarding the standardized approaches to regulatory capital for market, credit, and operational risks.

The first of two liquidity standards—the Liquidity Coverage Ratio—was agreed on in January 2013. With implementation scheduled to start in January 2015, the final standards include a broadened definition of High Quality Liquid Assets and a phase-in period. Discussions are ongoing regarding design and calibration of the second liquidity standard—the Net Stable Funding ratio.

In June 2013, the BCBS issued a consultative document on the revised Basel III leverage ratio framework and disclosure requirements.[3] The numerator of the leverage ratio is Tier 1 capital of the risk-based capital framework and the denominator is the sum of balance sheet exposures, derivatives exposures, securities financing transaction exposures, and other off-balance-sheet exposures. The minimum requirement in the transition period is 3 percent. Adjustments to the definition and calibration of the leverage ratio will be made by 2017 based on the results of the parallel run consultations, with a view to migrating to a Pillar 1 treatment on January 1, 2018.

"Structural measures" that would impose business model restrictions on banks are still under discussion. The so-called Volcker Rule has not yet been implemented in the United States, but the recommendations from the Vickers report in the United Kingdom have become part of U.K. banking law, and a draft German banking law setting some restrictions is also in progress. The French legislature passed its version of structural regulation in the summer of 2013. Appropriately designed and judiciously implemented, these policies can work in tandem with traditional prudential regulatory and bank resolution tools to enhance financial stability. Nevertheless, given their potentially significant costs, which can permeate the global economy, the implications of these measures for other jurisdictions should be weighed in.

Efforts are pending to develop effective domestic and cross-border resolution regimes, and implementation remains challenging. Many countries are in the process of upgrading their legislation to reflect the *Key Attributes of Effective Resolution Regimes for Financial Institutions (Key Attributes).*[4] An assessment methodology to evaluate country compliance has been published and pilot assessments are being planned. Implementation of the *Key Attributes* will require capacity-building and resources, as well as strengthened and more systematic cooperation among relevant authorities both within and across borders. The Financial Stability Board (FSB) is leading efforts to offer more specific guidance on operationalizing recovery and resolution plans and on the resolution of financial market infrastructure and insurers.

The International Association of Insurance Supervisors (IAIS) has agreed on a methodology for identifying globally systemically important insurers (G-SIIs) and on policy measures for G-SIIs focused on shielding traditional insurance activities from designated non-traditional and non-insurance (NTNI) activities. Based on the assessment methodology, the FSB and national authorities, in consultation with the IAIS, identified an initial list of G-SIIs in July 2013. The policy measures that will apply to G-SIIs include the development and implementation of systemic risk management plans, recovery and resolution planning requirements under the *Key Attributes,* enhanced group-wide supervision, and higher loss absorbency capital requirements. The IAIS is also developing a straightforward group-wide capital requirement that will serve as a foundation for higher loss absorbency requirements.

The International Accounting Standards Board (IASB) and the U.S. Financial Accounting Standards Board (FASB) are continuing to work on the convergence of financial reporting standards, but progress has been slow. All four convergence projects (Financial Instruments, Revenue Recognition, Insurance Contracts, and Leases), which started after the global financial crisis, are at various stages of discussion. Convergence between the two proposed models for asset impairment loss recognition remains challenging.

International standard setting on OTC derivatives reforms is almost complete but implementation chal-

[2]Details of the Regulatory Consistency Assessment Program can be found at www.bis.org/publ/bcbs216.htm.

[3]See www.bis.org/press/p130626.htm.

[4]See www.financialstabilityboard.org/publications/r_111104cc.htm.

Box 1.3. *(concluded)*

lenges remain. Important policy developments include the September 2013 publication of the BCBS-IOSCO final report on margin requirements for non-centrally cleared derivatives. In June 2013, the BCBS proposed final capital requirements for banks' exposures to central counterparties (CCPs) to replace the current interim rules. New policy work streams have also been launched, focusing on recovery and resolution of Financial Market Infrastructures and conducting a feasibility study on aggregating OTC derivatives data reported to trade repositories. While most of the larger jurisdictions are finalizing their OTC derivatives frameworks, key implementation issues remain outstanding, in particular in relation to the treatment of cross-border activities. The recent set of understandings between the United States and the EU on the establishment of a mutual reliance framework to regulate the cross-border activities of swap dealers and the broader understandings reached by the major OTC derivatives regulators could pave the way for much needed progress.

Data constraints remain a key challenge for proper monitoring and supervision of shadow banking at the global level. The FSB will address data constraints by developing standards for data collection on securities financing markets and information-sharing processes for shadow banking entities in 2014. In the policy arena, some progress has been made with the adoption by the IOSCO of principles for money market funds and with the proposals by BCBS to limit large exposures to shadow banking entities and to introduce risk-sensitive capital requirements on equity investment. In addition, the FSB has published documents setting out (1) an overall approach to address financial stability concerns associated with shadow banking entities and (2) a policy framework for addressing shadow banking risks in securities lending and repos.

Box 1.4. Recent Financial Sector Assessment Program Mission Findings

Recent IMF Financial Sector Assessment Program (FSAP) missions to a number of European countries determined that financial sectors have largely stabilized since the peak of the global financial crisis, but challenges remain as continuing deterioration of credit quality weighs heavily on banks' already-thin profitability.[1] Substantial amounts of euro area public debt on banks' and insurers' balance sheets still bear considerable risks. Central recommendations common to all of these FSAPs include the strengthening of capital buffers, further cleanup of balance sheets, and derisking of activities.

During the recent crisis, the *Austrian financial system* benefited from limited exposures to sovereign and other market risks and relatively favorable domestic macroeconomic conditions. Stress test results indicate that, under adverse medium-term scenarios, virtually all Austrian banks, including all internationally active institutions, would meet regulatory capital requirements (taking into account Basel III implementation). However, stronger capital buffers appear desirable to address concerns about risks in the southeastern and central European region and to repay government capital. Some banks should also further strengthen their foreign currency funding structures.

The FSAP found that, despite effective bank supervision practices, some governance improvements should be pursued in both the financial market authority and the industry, and certain supervisory powers could be enhanced. A special bank resolution regime is needed in Austria to provide a wide range of tools and powers to resolve failing banks in an orderly and least-cost manner. The existing fragmented system of deposit guarantee schemes should be replaced with a unified, prefunded, and publicly administered scheme.

The *Belgian financial sector* has become smaller, less complex, and less leveraged. Its ongoing transformation, however, involves significant downside risks from low profitability and weak macroeconomic prospects. Structurally high costs for banks are compounded by increased competition, diminished earning capacity, and the impact of regulatory reforms. The links between banks, insurers, and the Belgian sovereign have intensified against the backdrop of large public debt. The government's limited fiscal capacity makes it important to guard against inaction and supervisory forbearance.

A prolonged period of low interest rates would create vulnerabilities for banks and life insurers, while a

The authors of this box are Javier Hamann and Emanuel Kopp.

[1]FSAPs assess the stability of the financial system as a whole and not that of individual institutions. They are intended to help countries identify key sources of systemic risk in the financial sector and implement policies to enhance its resilience to shocks and contagion.

Box 1.4 *(concluded)*

downturn in housing prices would further exacerbate bank capital pressures. Stress tests revealed that initial capital levels are solid in aggregate, but several banks would experience significant deterioration of profitability under stress, inducing solvency pressures. The FSAP mission recommended strengthening banks' capital buffers. Insurers meet the requirements of the current solvency regime, but vulnerabilities are apparent, which means that supervisors must remain vigilant and contingency plans need to be put in place under the new recovery and resolution framework. Although the new regulatory structure is functioning well, more intensive and intrusive supervision is needed. Compliance with international standards for regulation and supervision of banks and insurers is generally high, but national resolution and deposit insurance frameworks need to be strengthened, and positive changes to supervisory practices need to be sustained.

The *Italian financial sector* has shown resilience in the face of a severe and prolonged recession. Continuing weaknesses in the real economy and the link between the financial sector and the sovereign remain key risks. If these risks materialize, the impact on banks could be significant, albeit cushioned by their own capital buffers and the availability of European Central Bank liquidity.

The FSAP concluded that targeted financial sector action should be taken to shore up the defenses of Italian banks. Increasing provisions, improving bank efficiency and profitability, developing a market to dispose of impaired assets, and strengthening capital and funding plans, where needed, can make important contributions. Some of these steps have already been initiated by the Bank of Italy.

The *financial sector in Poland* emerged unscathed from the crisis. Banks have been profitable and hold relatively high levels of core Tier 1 capital. Vulnerabilities lie in euro area interconnectedness and exposure to foreign exchange risk. Stress tests suggest, however, that these vulnerabilities are unlikely to become systemic.

The FSAP stressed that persistent nonperforming loans and the cyclical deterioration in credit quality need to be addressed. Furthermore, tax disincentives, income accrual practices, and obstacles to out-of-court restructurings need to be removed, and improvements in restructuring, accounting practices, and the insolvency framework would be helpful. To prevent a further rise in nonperforming loans, care should be taken with ongoing regulatory revisions, including the removal of uniform debt-to-income thresholds, tightening of loan-to-value ratios, and currency matching of income and borrowing.

Poland was found to be broadly compliant with core principles in the regulation and supervision of banks, insurance companies, and deposit insurance schemes. However, the supervisor needs greater powers, independence, and resources, and legislation to introduce a systemic risk board needs to be accelerated. Rebalancing the financial system toward capital market development is also important.

Making the Transition to Stability

The global financial system is undergoing a series of transitions along the path toward greater financial stability. The United States may soon move to less accommodative monetary policies and higher sustained long-term interest rates as its recovery gains ground. After a prolonged period of strong portfolio inflows, emerging markets are facing a transition to more volatile external conditions and higher risk premiums. Some need to address financial and macroeconomic vulnerabilities and bolster resilience as they progress to a regime in which financial sector growth is more balanced and sustainable. Japan is moving toward the new Abenomics policy regime marked by more vigorous monetary easing coupled with fiscal and structural reforms. The euro area is moving toward a stronger monetary union with a common framework for risk mitigation while strengthening financial systems and reducing excessive debt levels. Finally, the global banking system is phasing in stronger regulatory standards. A number of policy actions can help promote an orderly passage to greater financial stability, as summarized in Table 1.7.

The shift from prolonged periods of monetary accommodation poses challenges.

Experience suggests that transitions from monetary accommodation can give rise to financial stability risks. As Figure 1.60 illustrates, during the period of Great Moderation, benign monetary and financial conditions drove investors to adopt similar investment strategies, leading to a rise in correlation of asset prices and a

Table 1.7. Policy Recommendations

Reducing the market impact of monetary policy transition	• Carefully communicate the Federal Reserve's quantitative easing asset-purchasing intentions to minimize interest rate volatility. • Increase oversight of mutual fund, mortgage real estate investment trust, and exchange-traded fund liquidity terms for investors and management practices. • Develop a contingency leverage unwinding facility in the United States to act as a circuit-breaker in markets that heavily use repo funding. • In Japan, deliver on structural reforms and medium-term fiscal consolidation in addition to monetary stimulus to contain fiscal risk premiums in government bond yields. • Monitor Japanese regional bank exposures to interest rate risks. • Pursue reforms in Japanese bond and derivatives markets to manage rate volatility.
Tackling emerging market vulnerabilities	• Address underlying macroeconomic vulnerabilities through credible fiscal or regulatory reforms. • Prepare for and manage the reversal of capital inflows by ensuring orderly market operations and establishing swap lines with major central banks. • Restore policy buffers where needed, including through tighter monetary policy if inflation or currency vulnerabilities warrant. • Focus surveillance on domestic bank exposure to vulnerable corporates, especially liquidity and currency mismatches. • In China, rein in total credit growth, notably via the shadow banking system, by gradually liberalizing deposit rates and addressing moral hazard concerns. • Enhance supervision and disclosure in the Chinese nonbank financial system, including insurers and trust funds.
Addressing legacy balance sheet issues	• Restore investor confidence in euro area bank balance sheets with a credible balance sheet assessment and stress test, with clearly identified capital backstops. • Address euro area financial fragmentation through speedy implementation of the Single Supervisory Mechanism and the Single Resolution Mechanism with a commitment to cross-border deposit insurance. • Resolve the corporate debt overhang in stressed economies through a more systematic approach, including improved insolvency and debt workout arrangements, while fostering nonbank sources of corporate credit. • Provide time to repair private balance sheets through further European Central Bank monetary support and European Investment Bank credit support to viable firms.
Improving regulation and market liquidity	• Continue progress on strengthening regulatory frameworks and monitor progress toward achieving goals of higher capital standards. • Minimize regulatory uncertainty and unintended consequences on markets from national structural measures for banks (e.g., Volcker, Vickers, and Liikanen proposals). • Finish work on risk weights, complete accounting convergence, and introduce forward-looking provisioning to improve the credibility and transparency of bank balance sheets. • Assess the impact of regulatory and transaction tax proposals on market liquidity and rebalance where necessary, while clarifying issues that have increased uncertainty surrounding market liquidity and funding providers. • Increase focus on the implications of lower market liquidity and higher volatility through enhanced stress testing of bank's mark-to-market books and repo-funded nonbank intermediaries.

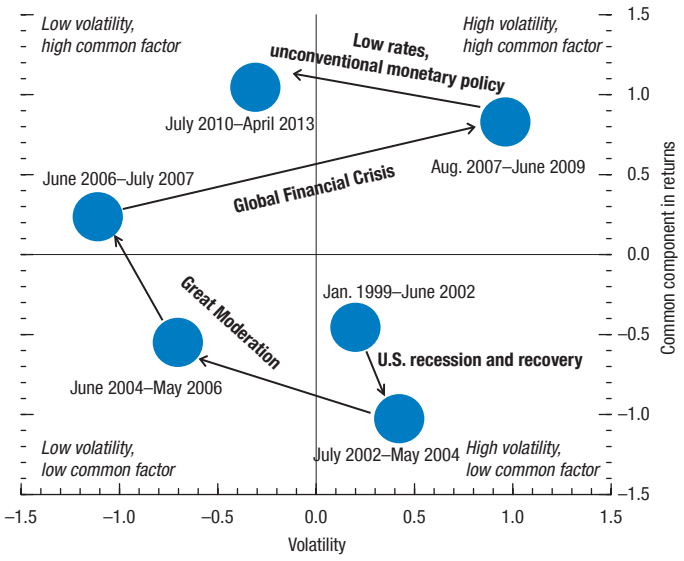
decline in volatility. Arguably, those strategies resulted in excesses that led to the global financial crisis. In its wake, crisis measures and monetary accommodation have suppressed volatility, while the sensitivity of asset prices to central bank monetary policy remains high.

Policymakers and markets need to prepare for structurally higher market volatility because the probable withdrawal of the Federal Reserve's quantitative easing stimulus and tighter regulatory constraints on financial intermediaries mean that market liquidity is likely to be further curtailed. Indeed, the rise in global rates and volatility since May 2013—prompted first by uncertainty over Bank of Japan policy implementation and then by concerns about the Federal Reserve tapering its quantitative easing—precipitated a volatility spike in global bond markets, prompting turbulence in a number of important emerging markets.

Achieving a smooth transition requires policies that carefully manage portfolio adjustments while addressing structural liquidity weaknesses and systemic vulnerabilities. Policymakers can take a number of actions to reduce the impact of elevated market volatility. These include clarity of communication about the parameters for the withdrawal of monetary stimulus, and regulatory scrutiny

Figure 1.60. Normalization of Monetary Policy: Smooth or Turbulent?

(Standard deviations from mean)



Source: IMF staff estimates.
Note: Common factor refers to the principal component that explains the largest possible variation in asset returns, based on the historical daily data (1994–2013) for advanced and emerging market economies.

of the liquidity offered to investors in funds exposed to illiquid assets, especially when repo-funded, to mitigate spikes in asset correlations and volatility. Indeed, authorities may need to develop contingency backstops to reduce the likelihood of cascading forced asset sales.

The transition to higher rates and volatility puts a premium on addressing legacy balance sheet problems.

The rise in nominal global rates and volatility will make the refinancing of stretched corporate and bank balance sheets more costly and difficult. The analysis of the euro area corporate debt overhang in this GFSR shows that unless steps are taken to break the feedback loop between weak banks and corporates, a long period of weak asset quality and a drag on economic activity are probable risks. Hence, further progress in reducing debt overhangs and strengthening bank balance sheets remains urgent, especially in the stressed economies of the euro area. To succeed, investors' faith in euro area bank balance sheets must be restored (through the planned asset quality review and resulting recapitalization, if necessary) and banking union completed to fully reverse financial fragmentation. Otherwise, the euro area risks entering a lengthy, chronic phase of low growth and balance sheet strains.

Keeping emerging markets resilient calls for an increased focus on addressing domestic vulnerabilities.

Emerging markets are now encountering a less benign external environment. The fundamental drivers of recent capital flows to emerging markets are weakening as relative growth prospects moderate, U.S. nominal rates rise, and volatility picks up. These inflows have been intermediated primarily through sovereign and corporate bond markets, rather than through domestic banks engaged in cross-currency credit intermediation. Therefore, the principal transmission channel of volatility is likely to be through liquidity strains on sovereigns and leveraged corporates with immediate borrowing and refinancing needs, rather than through bank funding channels. Consequently, emerging market investors are likely to focus more on country-specific factors and institutional robustness in evaluating risk-return tradeoffs, with the increasing likelihood that the portfolio capital inflows of recent years will be partly reversed, at least in the near term.

In the event of significant capital outflows, some countries may need to focus on ensuring orderly market functioning, using their policy buffers wisely. Keeping emerging market economies resilient calls for an increased focus on domestic vulnerabilities. Policymakers should carefully monitor and contain the rapid growth of corporate leverage. Local bank regulators need to guard against foreign currency funding mismatches building up directly on bank balance sheets, or indirectly through unhedged foreign currency borrowing by corporates.

Annex 1.1. Exploring the Factors Driving Bank Interest Rates on Corporate Loans

Objectives and Analytical Approach

This exercise aims to explain the dynamics of bank interest rates on corporate loans in the euro area economies in relation to their fundamental determinants. The starting point, building on previous research, is the notion that the interest rate on corporate loans is a function of the monetary policy stance, which influences banks' funding costs via money market rates; the business cycle, which affects the demand for loans and asset quality; and stress in the banking sector, which determines banks' ability to finance themselves, borrow, and extend credit (see also ECB, 2009; IMF, 2013a). The analysis also includes sovereign stress, given the importance of feedback effects between sovereign and bank stresses, and a measure of corporate credit risk.

The main building block of this analysis is the (cointegrating) equilibrium that links the long-term dynamics of the following five variables:[62]

- The *lending rate* on new corporate loans (r_t^{nfc}) of less than €1 million in France, Italy, and Spain; many of these loans are extended to small and medium enterprises (SMEs).
- The *monetary policy* stance, as captured by the seven-year swap rate (r_t^{7swp}). The seven-year swap rate was found to significantly outperform shorter-dated maturities and other money market rates. For example, a recent study by the ECB concluded that "through its influence on expectations on future monetary policy actions, changes in monetary policy stance will often also have a strong impact on longer-term market rates, such as long-term government bond yields and swap rates, by moving the yield curve" (ECB, 2009, p. 97).
- *Sovereign stress*, as proxied by the deviations of asset swap spreads (10-year sovereign bond yields minus swap rate of the same maturity) from their time-varying trend (dev_t^{aswp}).[63] This spread was used as a proxy for sovereign credit risk because it behaves similarly to the sovereign bond yield spreads, but is not biased by episodes of flight to quality that tend to drive down German yields and exert an upward bias on sovereign spreads measured against German bunds.
- *Bank health*, as proxied by the banking system price-to-book ratio (pbk_t). A healthier banking system will have a higher average price-to-book ratio, which captures the perceived health and expected future profitability of banks, enabling them to borrow and lend more cheaply. The higher price-to-book ratio outperformed alternative measures of bank balance sheet strength (such as bank equity prices and credit default swap spreads) in diagnostic tests.
- The state of the *business cycle*, as captured by the industrial production index (ip_t). When the level of output declines, economic uncertainty rises, profits come under pressure, and demand for corporate loans typically falls. Consistent with other studies (ECB, 2009) and bank lending surveys, one would expect weaker loan demand from firms and households to put downward pressure on bank lending rates, especially during the deep and extended recessions seen in Italy and Spain.

Furthermore, a number of exogenous variables are included, notably a *corporate credit risk* variable based on Moody's KMV expected rates of default. This variable was added exogenously because its time-series properties did not make it amenable to inclusion in the cointegrating vector. Other variables included exogenously are contemporaneous changes in euro overnight index average (EONIA) rates, and changes in economic policy uncertainty (see Bloom, 2009).

By exploiting the vector error correction model's (VECM) long-term cointegrating relationship, the analysis determines the "equilibrium" levels of lending rates under the current state of financial fragmentation. Subsequently, by setting banking and sovereign stresses to zero in the cointegrating vector, a hypothetical shadow rate is constructed that captures the notion of no fragmentation. The construction of this latter no-fragmentation proxy is what differentiates this analysis from previous studies. The cointegrating relationship can be expressed in terms of the key variable of interest, the corporate lending rate r_t^{nfc}:[64]

$$r_t^{nfc} = \psi_1 + \beta_1 r_t^{7swp} + \beta_2 dev_t^{aswp} + \beta_3 pbk_t + \beta_4 ip_t + \xi_t. \quad (1.1.1)$$

The author of this annex is Vladimir Pillonca.

[62]Cointegration tests were performed using the Johansen methodology (see Johansen, 2009).

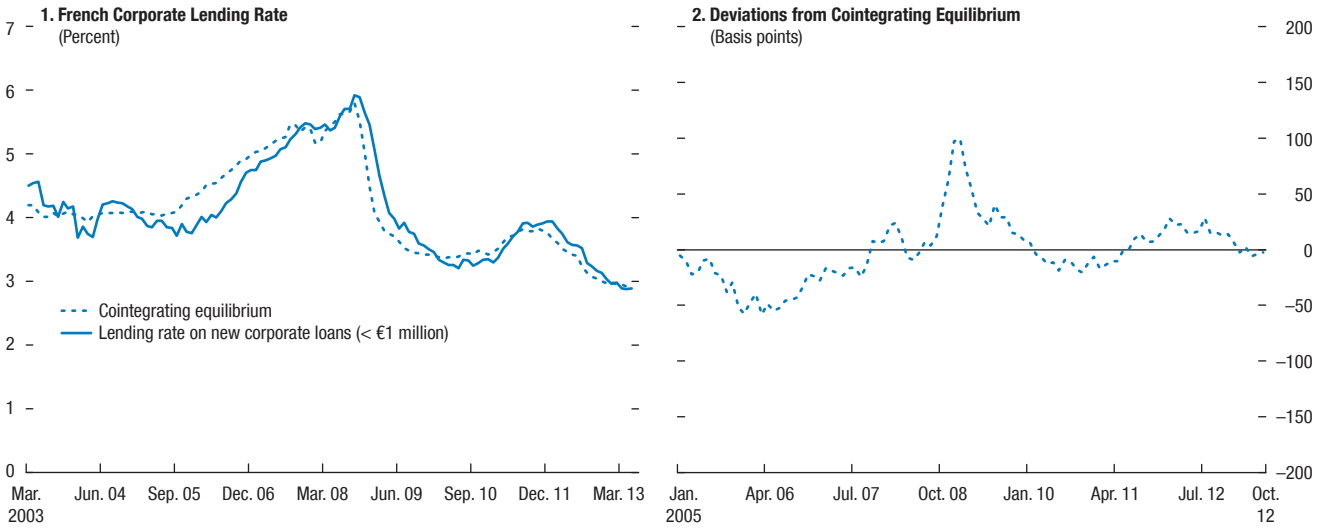
[63]The fixed-rate arm of an interest rate swap captures a highly liquid risk-free rate needed to compute bond spreads, as an alternative to German bund yields. The time-varying trend was estimated with a Christiano-Fitzgerald asymmetric bandpass (Christiano and Fitzgerald, 1999), which allowed the extraction of a signal of sovereign stress that was not overly collinear with the other variables in the system.

[64]As is standard practice, the coefficient on the variable of interest is normalized to unity.

Figure 1.61. France: Deviations from Cointegrating Equilibrium

The French corporate lending rate has not deviated sharply from its cointegrating equilibrium.

The deviations from equilibrium tend to be corrected over time.



Source: IMF staff estimates.

The beta coefficients (β_1, β_2, β_3, β_4) define the cointegrating relationship, and ψ_1 is a constant. These five variables are individually nonstationary, but are jointly stationary, and thus share a common stochastic trend. The ξ_t term can be thought of as a deviation from equilibrium, the expected value of which is zero.[65] The economic interpretation is that these variables share a common equilibrium driven by a small set of factors; econometrically, this is a "state from which there is no endogenous tendency to deviate" (see Amisano and Giannini, 1997).

Most of the time, however, the cointegrating vector will not be exactly in equilibrium. Figure 1.61 shows that the actual corporate lending rate on small loans in France has been fairly close to equilibrium.

Since 2007, there have been a large number of shocks to sovereign, banking, and monetary variables; therefore, the deviations from equilibrium have been large and persistent. Figure 1.62 shows that the actual interest rates on small loans in Italy and Spain are currently more than 100 basis points higher than what their cointegrating equilibrium relationship would suggest. These can be interpreted as short-term deviations from equilibrium that are corrected over time as the variables dynamically adjust toward their cointegrating equilibrium.[66] Although these deviations reflect relatively small shocks for France, they point toward much larger and more persistent shocks for Italy and Spain.

Data and Estimation

The models for France, Italy, and Spain were estimated using monthly data for 2003–13 (about 120 observations).[67] The estimation was carried out in two steps. In the first step, the cointegrating relationships were estimated following the Johansen methodology.[68] In the second step, the error correction terms from the estimated cointegrating relationships were constructed to enable the estimation of a vector autoregression in first differences (with the error correction terms as regressors). The final specification was obtained by starting out with a large number of variables proxying the key determinants of bank lending rates (the mon-

[65]This measure captures the short-term deviation of the actual lending rate from the equilibrium lending rate, as characterized by the full sample (2003–13) parameter estimates of the cointegrating vector, conditional on the current level of the endogenous variables.

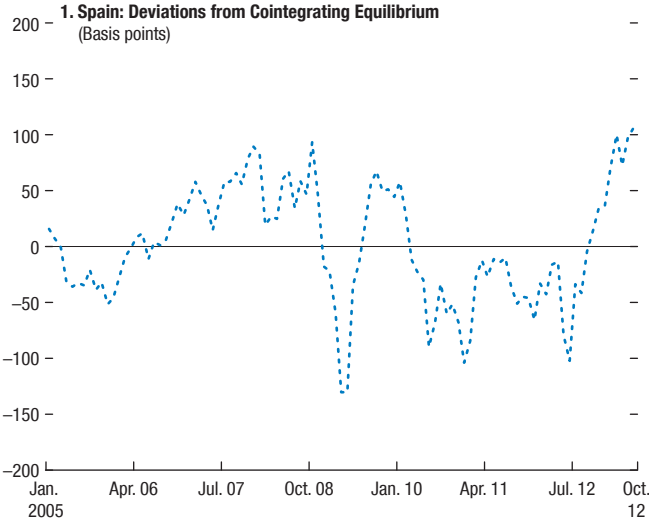
[66]The difference between the current lending rate and the no-fragmentation proxy reflects these deviations in addition to the steady-state contributions of sovereign and banking stresses (estimated at 100 basis points for Italy and 160 basis points for Spain).

[67]Lending rates on new small loans are from the ECB; swap, money market rates, and sovereign yields are from Bloomberg, L.P.; price-to-book ratios and other equity variables are from MSCI; and industrial production data are from national statistical offices.

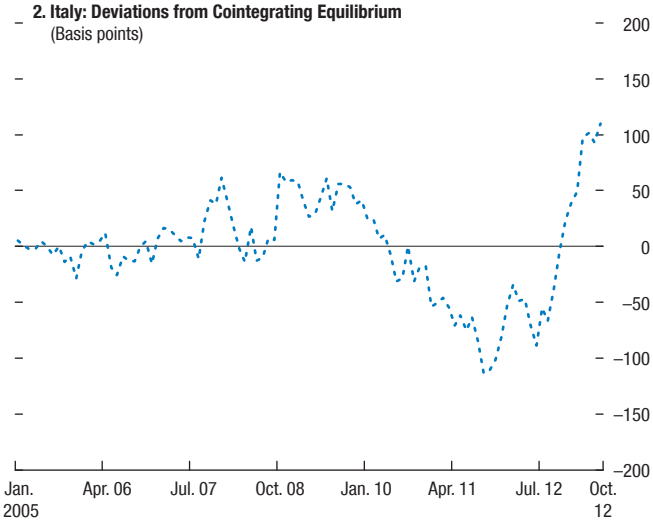
[68]Unrestricted rank and maximum eigenvalue cointegration tests were performed (see Johansen, 2009).

Figure 1.62. Spain and Italy: Deviations from the Cointegrating Equilibrium

Corporate lending rates for both Italy and Spain are above their cointegrating equilibrium levels…



…signaling that lending rates are too high relative to their fundamental determinants.



Source: IMF staff estimates.

etary policy, sovereign stress, bank health, and business cycle), then narrowing them down to the "best" proxies using general-to-specific modeling and extensive diagnostic testing.[69]

Model Estimates

Table 1.8 shows the coefficients of the cointegrating vector for each country estimated for 2003–13 (the same model was also estimated for the crisis period, but the results are not shown because the sample period is short and volatile).

The key findings follow:

- The first factor, the seven-year swap rate, captures the pass-through of *monetary policy* to lending rates. It is highly statistically significant and has the expected sign. In Italy and France, a 100 basis point policy rate cut translates into a decline of 57 basis points in the corporate lending rate and a decline of 40 basis points in Spain.
- The second factor is *sovereign stress*. This factor is significant for Spain and Italy, but not for France.
- The third factor is *bank health*, as captured by the price-to-book ratio of the banking system.[70] A healthier banking system will have a higher price-to-book ratio, which, in turn, enables banks to lend more cheaply. Negative and statistically significant coefficients for Italy and Spain confirm these dynamics are at play. In contrast, the bank health coefficient for France is not statistically significant, reflecting considerably lower banking and sovereign pressures.
- The fourth factor is the state of the *business cycle*, as captured by the industrial production index. As found in other studies, the coefficient results indicate that weaker loan demand from firms has put downward pressure on lending rates. This parameter is not significant for France, highlighting the lack of sensitivity of lending rates to the state of the business cycle, especially compared with Italy and Spain.
- Finally, the sensitivity of lending rates to the *corporate credit risk* factor and the statistical significance of this coefficient have increased during the crisis in all three countries, although the size of the coefficients are significantly larger for Italy and Spain.

[69]Akaike Information Criteria (AIC), Schwarz-Bayes Criteria (SBC), recursive stability tests, and analysis of residual behavior, among others.

[70]Alternative measures of bank health, such as bank equity prices and credit default swap spreads, produced similar results.

Table 1.8. Determinants of Bank Interest Rates on New Small Loans

(Loans of <€1 million)

	Italy	France	Spain
	Full Sample 2003–13	Full Sample 2003–13	Full Sample 2003–13
Endogenous Cointegrating Factors			
1. Monetary Policy Stance	0.5689***	0.5669***	0.3965***
2. Sovereign Stress	0.0074***	0.004	0.0042***
3. Bank Health	–1.0061***	0.490	–2.5011***
4. Business Cycle	6.4442***	–0.074	5.6004***
Exogenous Factor			
5. Corporate Credit Risk	0.0117**	0.0004***	0.0460**
R-squared	0.79	0.58	0.69

Source: IMF staff.

1. Seven-year swap rate.

2. Deviation of asset swap spreads (10-year sovereign bond yields minus swap rate of the same maturity) from their trend. The trend is time-varying and is estimated with a Christiano-Fitzgerald (1999) asymmetric band pass.

3. Bank price-to-book ratio, log.

4. Industrial production, log.

5. The rate of change of the difference between the 90th percentile and the mean of the corporate sector expected default frequency distribution, at the country level.

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

Annex 1.2. Euro Area Corporate Debt Overhang and Implications for Bank Asset Quality

Objectives and Analytical Approach

The challenges posed by the debt overhang for large publicly traded firms in stressed euro area economies were analyzed in the April 2013 GFSR.[71] In this GFSR, the analysis of debt overhang is extended to the broader corporate sector, particularly to the small and medium enterprise (SME) segment. Because smaller firms in stressed euro area economies tend to have higher leverage and lower profitability than larger firms, and also face tighter financing constraints and fewer deleveraging options, the focus is on firms' debt-servicing capacity. The capacity to service debt can be gauged by looking at a firm's interest coverage ratio (ICR).[72] The size of the debt overhang in the broader corporate sector is defined as the share of total debt outstanding owed by firms with ICRs of less than 1; this concept is often referred to as debt-at-risk. An ICR of less than 1 means that a firm is unable to service its debt without making some adjustments, such as reducing operating costs, or drawing down its cash reserves, or even borrowing more. The analysis of corporate debt overhang concludes by drawing the implications for bank asset quality.

Data

The analysis is based on firm-level annual data from the Bureau van Dijk's Amadeus database. The sample includes more than 3 million nonfinancial firms, both publicly traded and private, from France, Germany, Italy, Portugal, and Spain (see Table 1.9). In these economies, Amadeus's coverage approaches 100 percent of available coverage from public and official sources.[73] Coverage of the SME segment is especially good in Italy, Portugal, and Spain. Although coverage of the SME segment is considerably smaller in Germany, Amadeus still captures two-thirds of corporate sector assets.

Table 1.9. Amadeus Database, 2011

	Number of Firms (thousands)	Total Assets	
		Billions of Euros	Percent of Total[1]
France	866	3,398	43
Germany	145	3,389	66
Italy	1,035	3,194	100
Portugal	352	361	52
Spain	818	2,199	67

Sources: Amadeus; national central banks; and IMF staff estimates.
[1]Percent of financial and nonfinancial assets of the entire corporate sector, based on central bank flows of funds data; and IMF staff estimates.

Leverage, Profitability, and Debt-at-Risk

Debt-at-risk in stressed euro area economies has increased since 2001 and tends to be larger in the SME sector (Figure 1.63, panels 1 and 2). SMEs have higher debt-at-risk because of a combination of high leverage and weak profitability:

- *Leverage*—as measured by the debt-to-EBITDA ratio—increased sharply in stressed euro area economies and is now much higher than in the core, especially in Portugal and Spain, and among SMEs (Figure 1.63, panels 3 and 4).
- These firms entered the crisis with weak *profitability* (Figure 1.63, panel 5). In contrast to the core economies, in stressed economies, SMEs tend to have much weaker profitability than large firms have (panel 6).

Higher lending rates caused by financial fragmentation in the euro area have contributed to the higher debt-at-risk among corporates and SMEs in stressed euro area economies (Figure 1.64).

Analysis of Corporate Debt Overhang

The "Chronic-Phase" and "Reversal-of-Fragmentation" Scenarios

To assess debt-at-risk on a forward-looking basis, ICRs are forecast under a "chronic-phase" scenario and a "reversal-of-fragmentation" scenario.

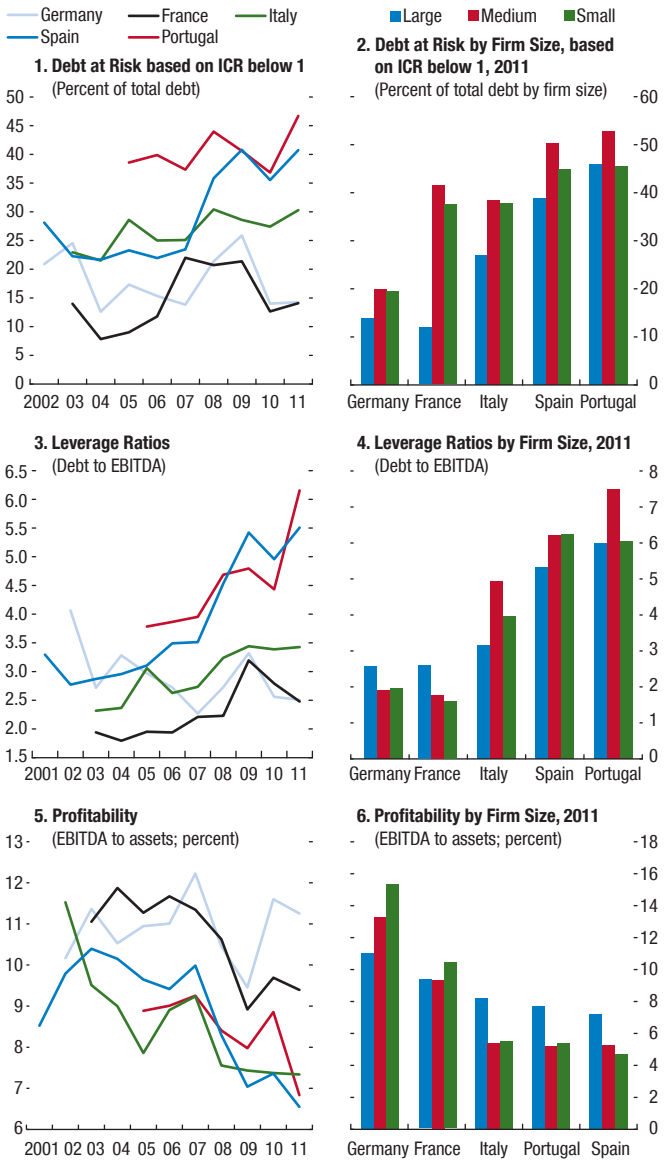
The authors of this annex are Sergei Antoshin, Xiangming Fang, and Jaume Puig.

[71]The analysis in the April 2013 GFSR focused on debt repayment capacity. The debt overhang was defined as debt owed by firms that are unable to generate sufficient cash flows to repay debt (i.e., to reduce debt to sustainable levels in the medium term). The main conclusion was that the deleveraging required to bring the stock of debt down to sustainable levels could be a significant drag on growth.

[72]The interest coverage ratio (ICR) is defined as earnings before interest and taxes (EBIT) divided by interest expense. Interest revenues or financial revenues are included in the calculation of earnings (and thus partly offset interest expense). Given that the focus of the analysis is on firms' medium-term prospects, the concept of EBIT—rather than EBITDA—is used because it allows the analysis to assess whether a firm is economically viable. In some cases, rating agencies and analysts may use EBITDA when the focus is on a firm's short-term cash position.

[73]Variations in coverage across countries reflect mostly the stringency of filing requirements at local registries and associated penalties for failure to comply.

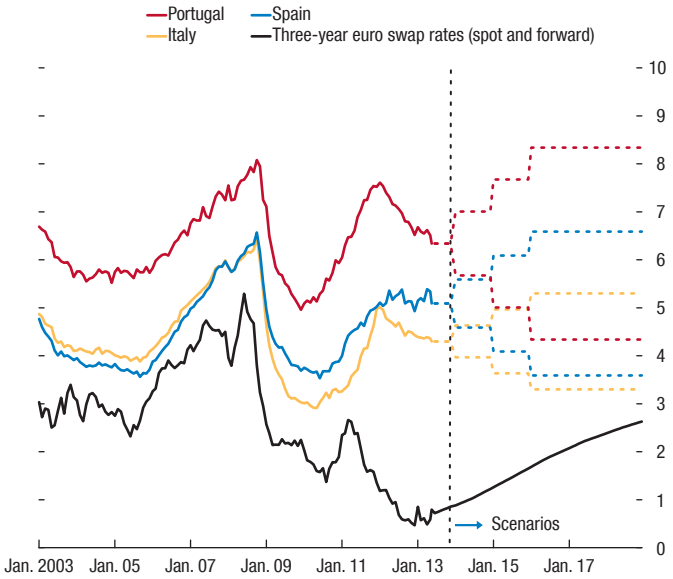
Figure 1.63. Leverage, Profitability, and Debt at Risk



Sources: Amadeus database; and IMF staff estimates.
Note: EBITDA = earnings before interest, taxes, depreciation, and amortization.
ICR = interest coverage ratio.

Figure 1.64. Bank Lending Rates to Small and Medium Enterprises

(Percent)



Sources: Haver Analytics; and IMF staff estimates.

Earnings before interest and taxes (EBIT) are projected using GDP growth forecasts. Time-series regressions specific to country, sector, and firm size are estimated, as are country-specific panel regressions, where corporate profitability (EBIT over assets), is regressed on GDP growth. GDP growth projections under the October 2013 *World Economic Outlook* baseline and alternative scenarios are used in the reversal-of-fragmentation and chronic-phase scenarios, respectively.

Interest rates on corporate debt are also projected under the chronic-phase and reversal-of-fragmentation scenarios. The symmetric shocks are calibrated based on the econometric exercise presented in Annex 1.1.[74] This is broadly consistent with a return of SME lending spreads over swaps to precrisis levels under the reversal-of-fragmentation scenario (see Figure 1.64). The shock for large companies is assumed to be half that for SMEs, also in line with a return to precrisis lending spreads.

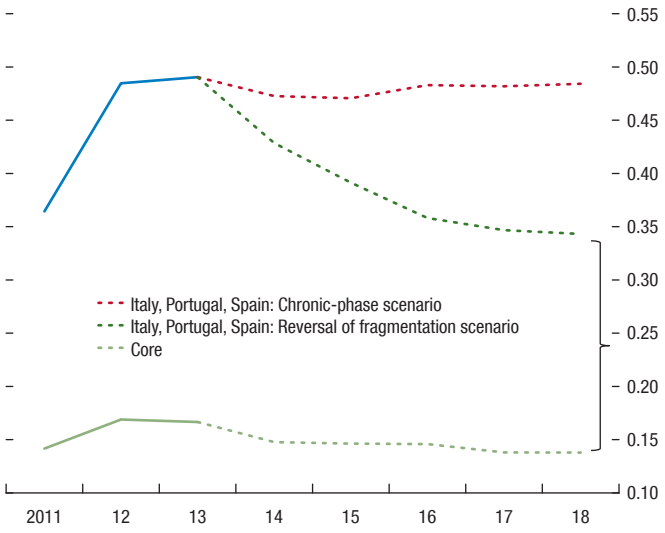
[74]The exercise described in Annex 1.1 finds that removing fragmentation would result in a reduction of lending rates to small and medium enterprises (SMEs) of about 100 basis points in Italy and 160 basis points in Spain. We assume that the effect on lending rates to SMEs in Portugal would be about 200 basis points. The reduction in lending rates under the reversal-of-fragmentation scenario is assumed to be phased in during 2014–16 as gradual progress is made toward banking and fiscal union. A symmetric shock is assumed under the chronic-phase scenario.

"Persistent" Debt Overhang

The debt overhang declines significantly as growth recovers and financing costs decline under the reversal-of-fragmentation scenario.[75] Sensitivity analysis shows that the debt overhang declines by about 5 percentage points, on average, if fragmentation is reduced by 100 basis points or growth improves by 3 percentage points.

The reversal-of-fragmentation scenario provides a basis for assessing the size of the *"persistent" corporate debt overhang*. This persistent debt overhang is defined as the share of debt in stressed euro area economies that is owed by firms with an ICR of less than 1 under the reversal-of-fragmentation scenario, in excess of the equivalent share in the core. Firms in stressed economies and in the core are expected to face similar financial conditions under the reversal-of-fragmentation scenario, but even under these benign financing conditions, and the assumed recovery in profitability in line with the projected economic recovery, a sizable persistent debt overhang of almost one-fifth of total corporate debt remains in stressed economies (indicated by the bracket in Figure 1.65).

Figure 1.65. Projected Corporate Debt Overhang in Italy, Portugal, and Spain
(Based on ICR < 1; share of total debt)



Sources: Amadeus database; and IMF staff estimates.
Note: ICR = interest coverage ratio.

Assessing Implications for Bank Asset Quality

Finally, this GFSR illustrates the implications of corporate sector stresses for bank asset quality by estimating potential bank losses on corporate exposures (assuming no improvement in corporate fundamentals over the next two years) and comparing them with bank buffers to gauge the extent to which these asset quality problems might not have yet been dealt with.

Compared to the standard bank solvency stress tests, the GFSR analysis provides a complementary (yet, less precise) perspective on the problem of corporate stress and its implications for bank asset quality. While standard bank solvency stress tests typically rely on granular information on the individual bank exposures to different types of borrowers, the GFSR analysis considers *aggregate* banking system exposures, and hence cannot yield any insights about individual banks. On the other hand, the GFSR analysis uses very detailed nonfinancial firm-level data to assess the extent of potential credit quality deterioration on corporate exposures of the entire banking system. In addition, the GFSR analysis has the advantages of using a consistent approach across firms and countries, and providing an up-to-date assessment of corporate sector stress and its implications for banks (see Box 1.5 for more details).

Assuming that corporate fundamentals remain unchanged, the potential losses during 2014–15 arising from the corporate exposures of the banking system are assessed as follows:

- ICRs as of 2013 are extrapolated using the latest data available, with estimates of EBIT based on the 2011 firm-level data from Amadeus and October 2013 *World Economic Outlook* GDP growth and the estimates of interest expense based on actual lending rates.[76]
- The firm-level ICRs are mapped into the probabilities of default (PDs) by (1) assigning implied credit ratings to companies in the sample based on average ICRs by credit rating for companies rated by Moody's, and (2) assigning PDs over the next two years to each implied rating based on historical

[75]The analysis assumes that balance sheets remain static in the forecast period. Aggregate data for 2012 show that corporate debt declined in Spain, and credit data suggests that the decline in debt is greater in weaker companies. However, the lack of data on the asset side and on the effect of asset sales on the income statement prevents this study from taking deleveraging into account.

[76]The EBIT projections use the same empirical relationships between profitability and GDP growth as the ones discussed in the section on "Analysis of Corporate Debt Overhang" in this Annex. In the case of Portugal, the estimated ICRs are adjusted using actual 2012 data (available to date) by sector/size that were provided by the Bank of Portugal.

default rates of companies rated by Moody's. Aggregate PDs on corporate debt owed to banks are estimated at the country level as the average of PDs of individual firms weighted by the share of each firm's debt in aggregate country debt.[77] This mapping of corporate credit scores into implied ratings and PDs is a standard approach used by rating agencies and banks. The estimation of PDs is robust to the use of alternative corporate vulnerability indicators (other than ICRs), such as profitability and leverage ratios (Figure 1.66), and to the use of historical default rates from other rating agencies (Table 1.10). Generally, PDs based on ICRs and on Moody's historical default rates tend to be lower than those based on other vulnerability indicators and rating agencies.

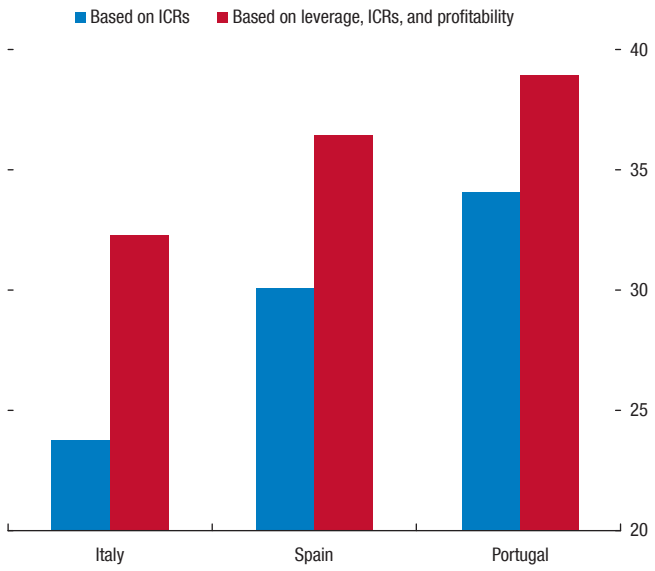
- Loss rates at the country level are obtained by multiplying estimated aggregate PDs by loss given default (LGD) ratios. A range of 10 percentage points around the standard Basel LGD ratio of 45 percent is used to estimate a range of potential loss rates (to reflect uncertainties about collateral valuations). Potential bank losses from corporate exposures at the aggregate country level are obtained by applying these aggregate loss rates to the stock of loans extended to nonfinancial corporates by monetary financial institutions in each country.[78]
- The estimated potential losses are related to existing buffers, including provisions on corporate loans, operating profits, and Tier 1 capital[79] (see Figure 1.53 in the main text of the chapter).

[77]Fifty percent of debt of large corporates and all debt of SMEs is assumed to be owed to banks.

[78]For Spain, potential losses on bank loans are adjusted for the loans transferred to SAREB (Spain's asset management company) in December 2012 and February 2013.

[79]Buffers on domestic corporate exposures may be overestimated because provisions, operating profits, and core Tier 1 capital data are available only on a consolidated basis at the system level. Provisions on corporate loans are estimated by applying the share of corporate loans in nonperforming loans to the stock of total provisions, including general provisions.

Figure 1.66. Probabilities of Default in the Corporate Sector
(Percent as of 2011; over the next two years)



Sources: Amadeus database; and IMF staff estimates.
Note: ICR = interest coverage ratio.

The key parameters used in the GFSR analysis, such as PDs and LGD ratios, appear to be broadly in line with those used in available stress testing exercises that consider the entire stock of loans. For example, using the same approach as described previously to estimate three-year PDs at the end of 2011 yields an estimated aggregate PD for Spain that falls within the range of the parameters used in the Oliver Wyman stress tests published in 2012 (Table 1.11); the same is true for the LGD assumptions.

Table 1.10. Mapping of Corporate Vulnerability Indicators to Probabilities of Default

Corporate Vulnerability Indicators[1,2]				Cumulative Default Rates[3]					
				Moody's		Standard & Poor's		Fitch	
ICR	Profitability	Leverage	Implied Rating	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2
27.0	21.1	0.6	Aaa/AAA	0.0	0.0	0.0	0.0	0.0	0.0
14.7	13.5	1.5	Aa/AA	0.0	0.1	0.0	0.0	0.0	0.0
9.3	12.0	2.0	A/A	0.1	0.2	0.1	0.2	0.1	0.2
5.2	9.9	2.6	Baa/BBB	0.2	0.5	0.2	0.6	0.2	0.7
3.4	9.3	3.2	Ba/BB	1.1	3.1	0.9	3.0	1.1	2.8
1.6	7.3	4.8	B/B	4.1	9.6	4.5	10.0	2.0	4.8
0.5	3.2	7.6	Caa-C/CCC-C	16.4	27.9	26.8	36.0	24.9	31.9

Sources: Fitch; Moody's; Standard and Poor's; and IMF staff estimates.
[1]ICR is defined as EBIT/interest expense; profitability is defined as EBIT/average assets; leverage is defined as Debt/EBITDA.
[2]The probabilities of default are extrapolated beyond those corresponding to the implied rating C for firms with weaker vulnerability indicators.
[3]Based on 1970–2012 for Moody's, 1981–2011 for S&P, and 1990–2012 for Fitch.
Note: EBITDA = earnings before interest, taxes, depreciation, and amortization; ICR = interest coverage ratio.

Table 1.11. Comparison of the GFSR Analysis with Oliver Wyman's Stress Tests for Spain

	PD Baseline	PD Adverse	LGD Baseline	LGD Adverse
Oliver Wyman, as of 2011 (for 2012–14)				
Real Estate Developers	0.61	0.88	0.39	0.47
Large Corporates	0.09	0.17	0.47	0.49
Small and Medium Enterprises	0.21	0.35	0.40	0.42
Total Corporate Sector	**0.29**	**0.45**	**0.42**	**0.46**
GFSR, as of 2011 (for 2012–14)	**0.37**		**0.45**	

Sources: Bank of Spain; IMF staff estimates.
Note: LGD = loss given default; PD = probability of default.

Box 1.5. The GFSR Analysis of Corporate Credit Quality versus Bank Stress Tests

The methodological approach used in this GFSR to assess potential losses on corporate exposures of the banking systems can be compared with standard stress tests that are carried out in the context of Financial Sector Assessment Programs, by looking at the main elements of the analysis:

Exposures

- Standard bank solvency stress tests focus mainly on additional losses on performing loans and, in some cases, capture the impact on existing nonperforming loans (NPLs) through, for instance, adjusting loss given default (LGD) rates in the stress scenario. The analysis is based on granular, bank-level data on loan exposures. In some cases, the adequacy of provisions against the existing stock of NPLs is assessed as well.
- The GFSR analysis considers the entire stock of loans, sidestepping the issue of banks' classification of exposures as performing or nonperforming and any cross-country differences in NPL definitions. The analysis considers aggregate corporate loan exposures of all banks operating in a given country.

Probabilities of Default

- In a standard bank solvency stress test, PD is typically defined as the one-year probability that a performing loan becomes nonperforming (actual default rates from the central credit registry provided by central banks are commonly used; forward-looking PDs are also often tied to specific macroeconomic assumptions).
- In the GFSR analysis, the PDs are estimated at the firm level (not at the loan level) and are obtained by mapping current corporate vulnerability indicators into PDs through implied credit ratings for individual companies.

Loss Given Default Rates

- The LGD rate used in many standard stress tests are typically provided by supervisory authorities, who may use different methodologies to estimate aggregate LGDs (e.g., coverage ratios, LGDs estimated from collateral valuation models, and so forth).
- The GFSR analysis uses the *Basel LGD ratio of 45 percent* (and a range of ±10 percentage points around the 45 percent level to reflect uncertainties about collateral valuation).

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CHAPTER 2

ASSESSING POLICIES TO REVIVE CREDIT MARKETS

SUMMARY

Policymakers in economies hit hard by the global financial crisis have been concerned about weak growth in credit, considered a main factor in the slow economic recovery. Many countries with near-zero or negative credit growth for a number of years sense that the strategy of very accommodative macroeconomic policies has been insufficient in reviving credit activity. Authorities have therefore implemented a host of policies to target credit creation (which are documented in an appendix to the chapter).[1]

Effectively targeting these policies requires identifying the factors that underlie the weakness in credit. In credit markets, these factors center around the buildup of excessive debt in households and firms, reducing their credit demand, as well as excessive leverage (or a shortage of capital) in banks, restricting their ability or willingness to provide additional loans. The government could also usefully alleviate a shortage of collateral (perhaps resulting from large declines in asset values), which could constrain credit activity.

To address such a technically challenging exercise, this chapter takes a stepwise approach. The first step is an attempt to identify the constraints to credit through the use of lending surveys—trying to disentangle whether banks are unwilling to lend (on the supply side) or whether firms or households are reluctant to borrow (on the demand side). This distinction helps narrow down the set of policies to consider, which differ depending on the side of the market that faces the major constraint. A more challenging second step—which is hampered by the lack of sufficient data for many countries—is to identify the individual factors that are constraining credit, specifically what makes banks unwilling to lend or households and firms reluctant to borrow.

Using this approach for several countries that have sufficient data, the analysis finds that the constraints in credit markets differ by country and evolve over time. This reinforces the importance of a careful country-by-country assessment and the need for better data on new lending. In many cases, demand- and supply-oriented policies will be complementary, but their relative magnitude and sequencing will be important. For example, relieving excessive debt in firms will help only if the banking sector is adequately capitalized. Policymakers should also recognize the limits of credit policies and not attempt to do too much. Because many policies will take time to have an impact, assessment of their effectiveness and the need for additional measures should not be rushed.

When credit policies work well to support credit growth and an economic recovery, financial stability is enhanced, but policymakers should also be cognizant of longer-term potential risks to financial stability. The main risks center on increased credit risk, including a relaxation of underwriting standards and the risk of "evergreening" existing loans. Mitigation of these risks may not be necessary or appropriate while the economic recovery is still weak, as it could run counter to the objectives of the credit policies (which are often designed to increase risk taking); still, policymakers will need to continually weigh the near-term benefits against the longer-run costs of policies aimed to boost credit.

[1]Appendix 2.1 is available online on the GFSR page at both www.imf.org and http://elibrary.imf.org.

Introduction

This chapter examines possible reasons behind the weakness in private credit in many countries since 2008, and it offers a framework for assessing the various policies that have been implemented to revive credit markets. These policies were put in place in the wake of a sharp decline in lending growth in most advanced economies and some emerging markets (Figure 2.1). Total credit to the private sector showed sluggish growth, while credit extended by domestic banks declined for advanced economies.

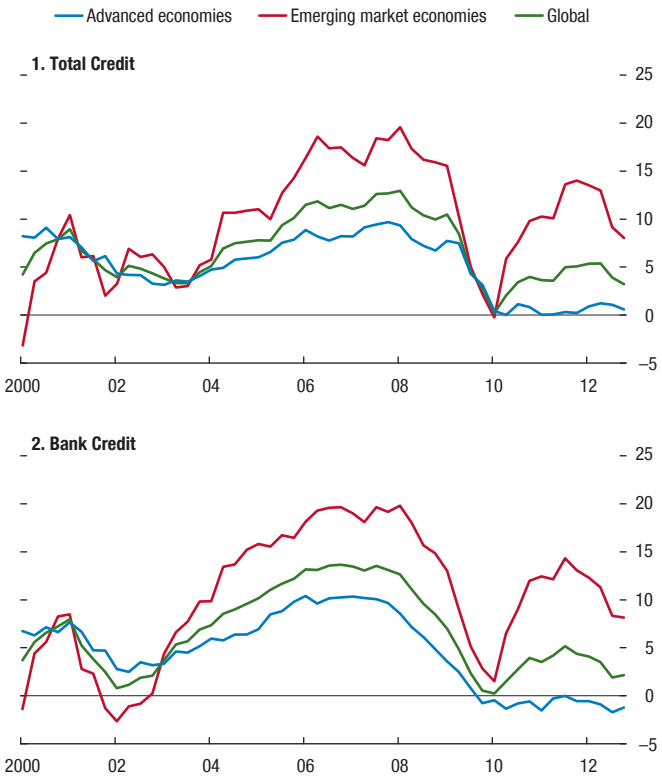
Policymakers want to support credit markets because the decline in lending is seen to be a primary factor in the slow recovery. Well-functioning credit markets make major contributions to growth and macroeconomic stability, and restarting credit plays an important role in economic recovery after a downturn. Recent studies show that creditless recoveries are typically slower than those with more robust credit growth, at least for the first few years, especially after recessions that feature large declines in asset prices, a characteristic of this financial crisis.[2]

Credit-supporting policies are most effective if they target the constraints that underlie the weakness in credit. Policymakers are sensing that the exceptionally accommodative macroeconomic policies implemented since the crisis have been insufficient and that additional measures targeting credit creation could further underpin the recovery. To target such policies effectively, policymakers must determine the factors that constrain lending activity. This chapter provides a framework for this purpose.[3]

In the past, a clear case for government intervention emerged only when there were market failures or externalities, but this crisis showed that such developments in credit markets can be prevalent, amplifying upturns and downturns. This is leading to some rethinking that the role of government policies, particularly macroprudential policies, may be larger than previously considered. In addition to exacerbating the current crisis, these amplifying tendencies appear also to be present in upswings, as the current crisis was in part precipitated by excessive credit creation during the preceding boom. Therefore, policymakers need also to mitigate excessive credit creation during economic upswings, which would lower the risk of similar future crises, and thus in turn obviate the need for credit-supporting policies.

Although well-designed credit policies can support credit intermediation and a more robust economic recovery, the choice of policies should also take into account direct or indirect fiscal costs and unintended consequences for financial stability. Although many policies have been implemented in a range of countries, which helped to keep financial instability from worsening and the supply of credit from slipping

Figure 2.1. Real Credit Growth
(Percent; year over year)



Sources: Bank for International Settlements (BIS); and IMF staff estimates.
Note: Unweighted average of real credit growth rates across countries. Total credit includes private sector borrowing (loans and debt instruments) from domestic banks and all other sources ("other credit"), such as other domestic nonbanks and foreign lenders (see BIS, 2013). Advanced economies include Australia, Austria, Belgium, Canada (not included in panel 2), Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Korea, Luxembourg (from 2004:Q1), Netherlands, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, United Kingdom, and United States; emerging market economies include Argentina, Brazil, China, Hungary, Indonesia, India, Malaysia, Mexico, Poland, Russia, South Africa, Thailand, and Turkey. Global consists of advanced and emerging market economies identified above.

The authors of this chapter are S. Erik Oppers (team leader), Nicolas Arregui, Johannes Ehrentraud, Frederic Lambert, and Kenichi Ueda. Research support was provided by Yoon Sook Kim. Fabian Valencia shared data and methodology.

[2]The importance of credit in supporting economic recovery has been discussed at length in the literature. See Table 2.7 for a summary of these studies, under the heading "Creditless Recovery."

[3]Focusing on these potential constraints to credit (rather than simply its weakness) could also prevent policymakers from doing too much. In some cases, it may be that an expansion of credit is not desirable; deleveraging by firms or households may in fact be important to pave the way for more sustainable economic growth.

even further, there is not always a clearly favorable cost-benefit nexus. In particular, policymakers should be mindful of possible consequences for financial stability in the medium term, especially if new credit is extended without adequate attention to the risks involved (including if credit is extended by nonbanks). In addition, these policies may have fiscal costs, and policymakers should make sure that initiatives are as cost-effective as possible.

In connection with recent efforts to revive credit markets, the chapter addresses the following questions:

- Which countries have seen weak credit growth recently, and what are the potential causes?
- What policies have been put in place in various countries to support credit?
- Have the policies targeted the constraints that underlie the weakness in credit?
- What, if anything, can policymakers do to make credit policies more effective?

The analysis confirms that constraints in credit markets differ by country, and policies to support credit should be based on a country-specific analysis of the constraints that government policy may alleviate. As expected, higher bank funding costs and lower bank capital have reduced the ability of banks to supply loans, and high debt levels in firms and households (along with lower GDP growth forecasts) have lowered credit demand (and affected credit supply). These factors are present to different degrees in different countries. Policymakers should be mindful of interactions with other policies, including regulatory measures, direct and contingent costs to the government, and potential longer-term financial stability implications. If appropriate, prudential measures to mitigate such stability risks should be put in place.

Recent Developments in Credit Markets

Where Has Credit Growth Been Weak?

To find where credit growth has been weak, a simple rule can be applied. A transparent operational rule used in the literature defines weak credit growth as negative average real credit growth over a certain period.[4] To identify where credit is currently still weak several years into the crisis, this rule is applied to a number of countries, using data from the Bank for International Settlements (BIS) and other sources. A separate determination is made for particular segments of credit markets when disaggregated data are available.

Many advanced economies have experienced weak bank credit growth (Table 2.1), including the United Kingdom and the United States, as have many euro area countries (including Austria, Belgium, Germany, Greece, Ireland, Italy, Portugal, and Spain).[5] Interestingly,

Table 2.1. Identifying Countries with Weak Credit Growth, BIS Data

	Bank Credit to Private Sector	Total Credit to Private Sector	Total Credit to Households	Total Credit to Nonfinancial Corporations
Advanced Economies				
Australia				
Austria	Weak		Weak	
Belgium	Weak			
Canada	. . .			
Czech Republic				
Denmark	Weak	Weak	Weak	Weak
Finland				
France				
Germany	Weak	Weak	Weak	Weak
Greece	Weak	Weak	Weak	Weak
Ireland	Weak	Weak	Weak	
Italy	Weak	Weak	Weak	Weak
Japan		Weak	Weak	Weak
Korea				
Luxembourg	Weak			
Netherlands		Weak	Weak	Weak
Norway	Weak			
Portugal	Weak	Weak	Weak	Weak
Singapore				
Spain	Weak	Weak	Weak	Weak
Sweden				
Switzerland				
United Kingdom	Weak	Weak	Weak	Weak
United States	Weak	Weak	Weak	
Emerging Market Economies				
Argentina			. . .	. . .
Brazil			. . .	. . .
China				
Hungary	Weak	Weak	Weak	Weak
India				
Indonesia				
Malaysia			. . .	. . .
Mexico				
Poland				
Russia			. . .	. . .
South Africa				
Thailand				
Turkey				

Sources: Bank for International Settlements (BIS); De Nederlandsche Bank; Instituto Nacional de Estadistica y Censos (INDEC); IMF, *World Economic Outlook;* Banca d'Italia; and IMF staff estimates.

Note: Weak credit is identified if the average year-over-year credit growth (deflated by consumer price index inflation; official wage index inflation for Argentina) is negative over a two-year window (2011:Q1–2012:Q4). Growth rates are computed using stocks in local currency and not adjusted for exchange rate variations. Cells are blank if this criterion is not met. Cells with ". . ." indicate that the data are not available, except for bank credit in Canada, which is ignored because of a break in the series. Total credit includes private sector borrowing (loans and debt instruments) from domestic banks and from all other sources ("other credit"), such as domestic nonbanks and foreign lenders (see BIS, 2013).

[4]For instance, Abiad, Dell'Ariccia, and Li (2011) and Sugawara and Zalduendo (2013) use negative average credit growth over recovery periods to identify creditless recoveries.

[5]The selection of countries is mostly unchanged if only the last year of credit is considered. The Netherlands would join the group of countries with weak bank credit growth, and the United States and Luxembourg would drop from the list. Austria, Belgium,

Table 2.2. Identifying Countries with Weak Credit Growth, Other Data Sources

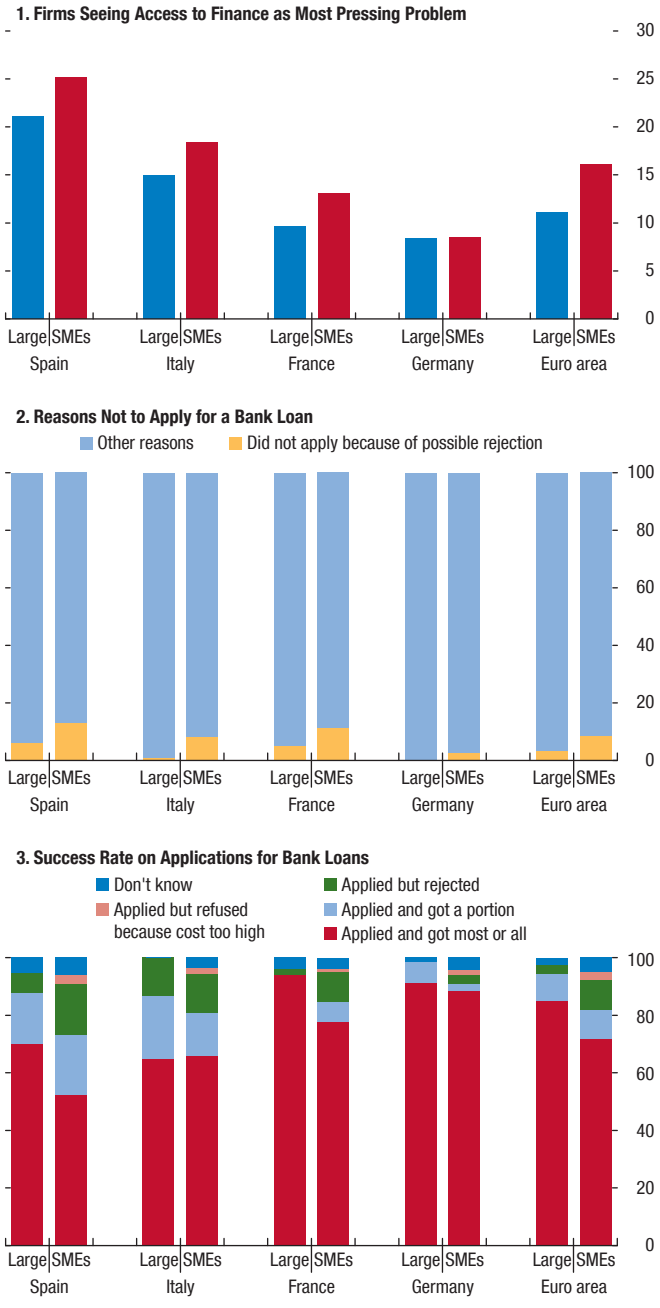
	Bank Credit to Private Sector
Albania	
Belarus	Weak
Bosnia and Herzegovina	
Bulgaria	Weak
Croatia	Weak
Estonia	Weak
Iceland	Weak
Kosovo	
Latvia	Weak
Lithuania	Weak
FYR Macedonia	
Moldova	
Montenegro	Weak
Romania	
Serbia	
Slovak Republic	
Slovenia	Weak
Ukraine	

Sources: European Central Bank; IMF, *International Financial Statistics* and *World Economic Outlook;* Haver Analytics; and IMF staff estimates.
Note: Weak credit is identified if the average year-over-year credit growth (deflated by consumer price index inflation) is negative over a two-year window (2011:Q1–2012:Q4). Growth rates are computed using stocks in local currency and not adjusted for exchange rate variations. Column is blank if this criterion is not met.

Ireland and the United States show weak credit growth (from all sources) to households but not to nonfinancial corporations.[6,7] In addition, data from non-BIS sources indicate that many countries in central, eastern, and southeastern Europe, including Bulgaria, Croatia, Slovenia, and the Baltic countries, have also recently seen weak bank credit growth (Table 2.2).

Survey data indicate particular challenges faced by small and medium enterprises (SMEs) as they attempt to access credit. The most recent European Central Bank (ECB) Survey on the Access to Finance of SMEs in the euro area (SAFE) (ECB, 2013) shows that SMEs tend to report access to finance as their most pressing problem more often than do large companies (Figure 2.2). Also, their loan applications were less successful than those of large corporations. In addition, the survey showed that SMEs were discouraged more often than larger firms from applying for a loan because of the anticipation of rejection. A reluctance to apply may also be a result of the higher lending rates they

Figure 2.2. Perceived Obstacles in Access to Finance
(Percent of respondents)



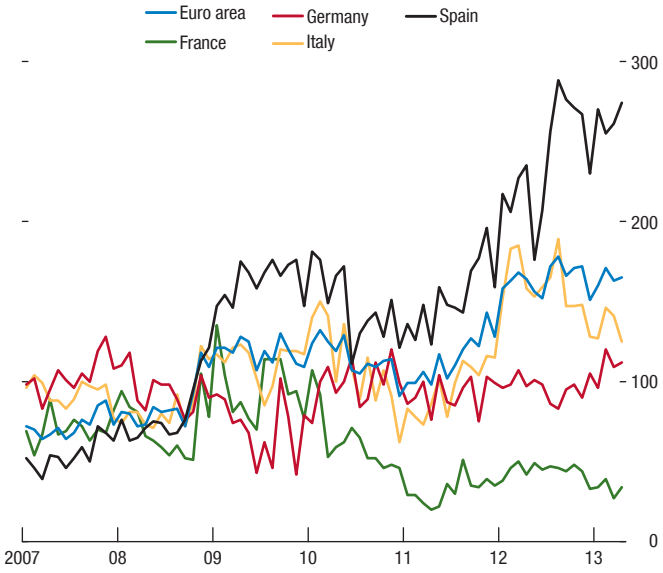
Source: European Central Bank (2013).
Note: SMEs = small and medium enterprises. The distinction between large corporations and SMEs is available only for the countries shown.

Luxembourg, and Norway had mildly negative bank credit growth and actually had positive average real credit growth if other sources of credit (in addition to banks) are included.

[6]Ireland showed negative real growth of credit to nonfinancial corporations in the last quarter of 2012.

[7]Alternative definitions of weak credit growth could be based on either real credit or a ratio of credit to GDP significantly below trend. Most of the countries selected with this chapter's basic rule are also selected by at least one of these additional criteria. These definitions are the converse of methodologies in the literature that identify credit booms, including Borio and Lowe (2002); Mendoza and Terrones (2008); Borio and Drehmann (2009); and Drehmann, Borio, and Tsatsaronis (2011).

Figure 2.3. Interest Rate Spread between Loans to SMEs and to Larger Firms
(Basis points)



Sources: European Central Bank; and IMF staff estimates.
Note: SMEs = small and medium enterprises. Spread is calculated as the difference between the lending rate for loans of less than €1 million and loans greater than €1 million.

face relative to other corporations (see Chapter 1 and Figure 2.3).

What Factors May Be Constraining Credit?

Theoretically, credit markets suffer from potential difficulties that may be amplified in recessions (Annex 2.1). Some major factors that may constrain credit include the following:

- *Collateral constraints:* To secure a loan, a borrower must often post collateral (an asset), because there is an information asymmetry: the lender does not know the borrower's repayment behavior. A drop in the value of collateral as a result of asset price declines (in real estate or stock markets, for example) shrinks the loan that can be obtained with that collateral, tightening credit demand as well as supply—indeed, the amount of collateral required by banks may also rise if bankers forecast further declines in its value. Lower collateral prices also lower the amounts banks will lend to each other in interbank markets, restricting bank funding and again tightening credit supply.
- *Debt overhang:* Excessively indebted firms may not pursue otherwise profitable business opportunities and may strive to bring down their leverage, lowering credit demand. Similarly, highly indebted households may choose not to take out loans, but rather focus on paying off their loans. Banks may also find highly indebted borrowers less creditworthy. Debt overhang in banks can also affect credit supply: highly leveraged banks may have difficulty obtaining funding and thus lack the liquidity to make additional loans.

In most credit cycles, government intervention to mitigate the factors constraining credit is generally not necessary and may ultimately spur too much credit activity, but when various amplification mechanisms are at play, such as in the current cycle, government intervention has a clearer role. In the past, the difficulties mentioned previously could be overcome by the private sector, but they may persist in times of crisis, amplifying the downturn. For example, in the current crisis, declining asset prices restricted credit, worsening the recession, which led to further downward pressure on asset prices. In such situations, the government can implement various policies (detailed below) to ease credit constraints and break the downward spiral.

This chapter investigates the role of these factors in detail, but on the face of it, evidence is growing that they have contributed to the weakness in credit in recent years. Indebtedness of households and firms rose markedly in the run-up to the crisis, potentially contributing to a problem of debt overhang for borrowers in some countries (Figure 2.4). Also, the major asset price declines seen globally in 2008 and 2009 depressed the value of large classes of collateral (Figures 2.5 and 2.6). A later section investigates the extent to which these developments played a role in recent years (and perhaps still do) in restricting credit demand and supply.

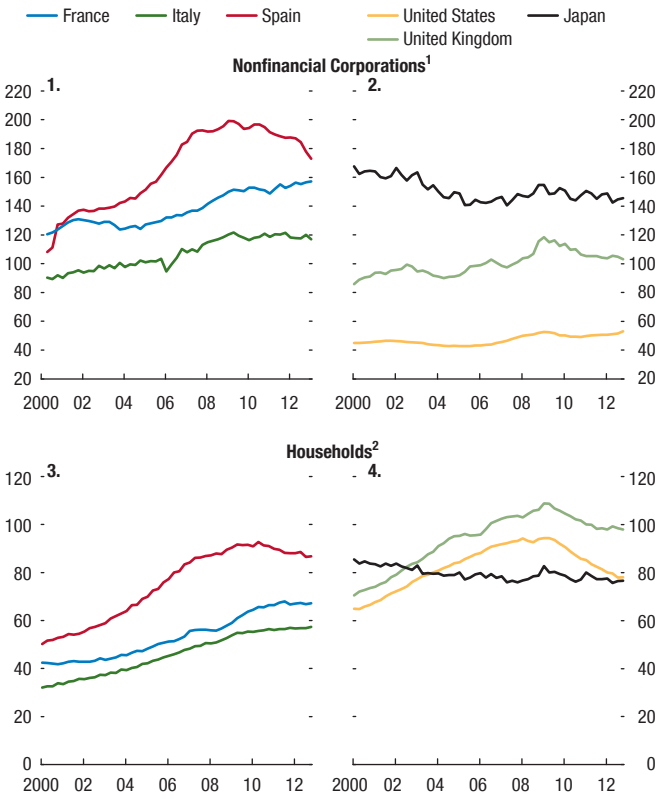
What Policies Have Been Implemented to Support Credit?

Policymakers have sought to boost economic activity by implementing policies to support credit growth. Appendix 2.1 provides an inventory of the policies adopted in the major economies that have experienced weakness in private credit growth.[8] The goal of these

[8]This appendix is only available online at www.imf.org/External/Pubs/FT/GFSR/2013/02/index.htm. This inventory includes the group of countries covered in Tables 2.1 and 2.2, most European countries (except, notably, the financial centers Luxembourg and Switzerland), along with Japan, the United States, and some G20 countries that showed a marked deceleration of credit growth even though the simple rule in this analysis did not identify them as having weak credit (Australia, India, Korea, and South Africa).

Figure 2.4. Corporate and Household Debt Outstanding

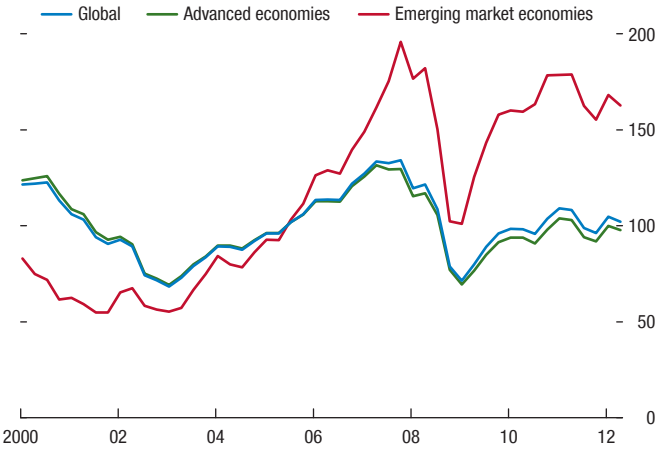
(Percent of GDP)



Source: Haver Analytics.
Note: Seasonally adjusted GDP.
[1]Corporate debt includes securities other than shares (excluding financial derivatives for the United Kingdom), loans, and other accounts payable on a nonconsolidated basis. Consolidated debt levels are significantly lower for some countries, especially those in which intercompany loans represent a large share of nonfinancial corporate debt. This calls for caution when doing cross-country comparisons.
[2]Including nonprofit institutions serving households.

Figure 2.5. Stock Price Index

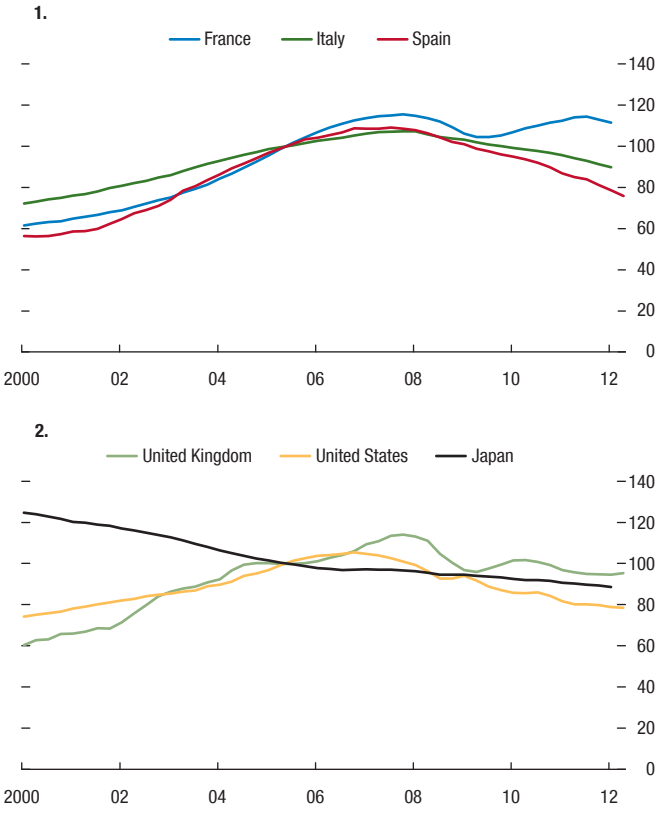
(2005 = 100)



Source: Morgan Stanley Capital International.
Note: Global comprises advanced and emerging market economies.

Figure 2.6. Real House Price Index

(2005 = 100)



Sources: Organization for Economic Cooperation and Development; and IMF, *International Financial Statistics*.
Note: Deflated by consumer price inflation.

policies includes addressing the restrictions mentioned in the previous section (mainly by alleviating debt overhang) and easing various other constraints to free up the supply of credit.

Policies aimed at alleviating balance sheet problems include the following:

- *Corporate debt restructuring:* To ease the debt overhang in the corporate sector, which has depressed loan demand, many governments have taken a leading role in corporate debt restructuring through state-owned banks and through asset management companies that took over the assets of distressed banks. In some countries, corporate bankruptcy rules were modified and speedier out-of-court resolution programs were introduced.

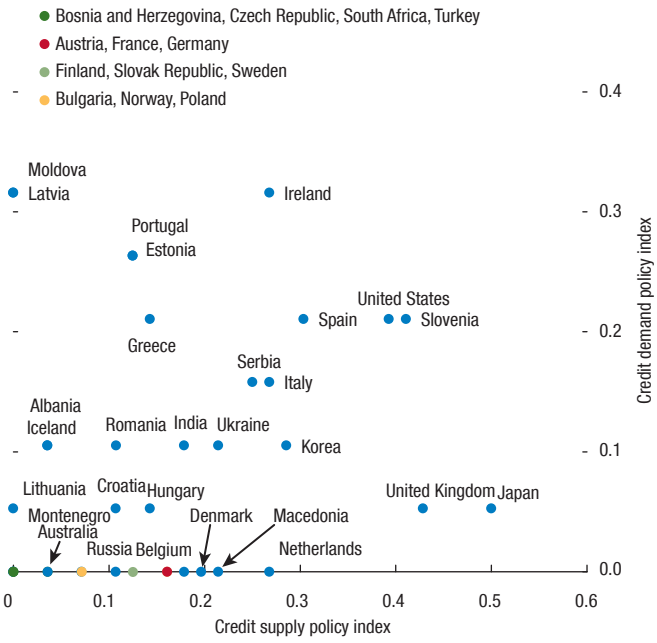
- *Household debt restructuring:* Applying strategies similar to those used in corporate debt restructuring, some governments have sought to ease household debt overhang by implementing household debt restructuring programs, most importantly for "underwater" mortgages (that is, the loan balance is higher than the home value). In some countries, personal bankruptcy rules were modified, and out-of-court resolution programs were implemented.
- *Bank restructuring:* In the recent past, many governments have recapitalized banks (both directly and through incentives for private investors), implemented programs to purchase distressed bank assets, and provided guarantees for existing bank assets.[9] Many countries increased the coverage of deposit insurance to avoid deposit drains, which threatened to force banks to shrink their loan books.

Other policies fall into several broad categories:

- *Monetary policies:* Central banks have expanded their monetary policy toolkits to enhance the demand and supply of credit in addition to using traditional tools such as changes in the policy rate. For example, the ECB's "fixed-rate full allotment" policy (in which banks' bids for liquidity from the central bank are fully satisfied), as well as its long-term (three-year) refinancing operations, were aimed in part at supporting credit. Many central banks have eased collateral constraints for banks, in part by accepting a wide range of private assets. Some have adopted policies of direct credit easing through purchases of corporate bonds, mortgage bonds, and other private sector assets. A few central banks have engaged in indirect credit easing by making available special lending facilities to promote bank lending.
- *Fiscal programs:* Many national treasuries have sought to promote expansion of corporate and mortgage loans through direct extension of loans and through subsidies or guarantee programs for new loans. These programs have often been implemented through state-owned or state-sponsored institutions.
- *Financial regulations:* Prudential regulators have instituted measures designed to ease bank balance sheet restrictions that have made banks unwilling or unable to extend new loans. In some countries (particularly in the European Union), regulators have relaxed capital requirements for loans to SMEs. Some countries have implicitly or explicitly allowed forbearance on recognition of nonperforming loans.
- *Capital market measures:* To promote the diversification of financing options for firms, several governments have made efforts to lower barriers to corporate bond issuance for SMEs and to promote securitization markets for SME loans and household debt (Box 2.1).

[9]See further discussions on restructuring programs in Landier and Ueda (2009) for banks, Laeven and Laryea (2009) for households, and Laryea (2010) for firms.

Figure 2.7. Relative Number of Credit Supply and Demand Policies Currently in Place



Source: IMF staff estimates.
Note: The indices are computed by dividing the number of policy measures currently in place to support the supply of or demand for credit in each country by the total number of possible measures in the list of all policy measures in Appendix Table 2.1 (excluding "stress test," "coverage enhancement of deposit insurance," "other policies to enhance credit supply," and "other policies to mitigate debt overhang"). EU-wide fiscal programs (e.g., through the European Investment Bank and the European Bank for Reconstruction and Development) are counted with half weights for the European Union member countries that do not have national fiscal programs.

Most countries have relied on a variety of policies to support both credit demand and credit supply, recognizing that these are often complementary. Figure 2.7 and Table 2.3 list the various credit-supporting policies implemented in 42 countries. The policies are limited to those directly targeting credit market constraints and do not include more general fiscal and monetary policies (including quantitative easing—that is, direct purchases of government bonds) that have also underpinned credit activity. In addition, the indices in Figure 2.7 refer only to the number of different measures currently in place; they do not account for the size of the programs or their effectiveness. Despite this somewhat narrow scope, the data yield the following main conclusions:

Box 2.1. Policies to Diversify Credit Options for Small and Medium Enterprises in Europe

This box explores options for diversifying credit creation for small and medium enterprises (SMEs), which have traditionally been constrained in their credit channels.

Options for access to credit are much more restricted for SMEs than for larger firms. Larger companies have benefited from historically low costs of funding and ample liquidity through a variety of credit channels. Conversely, SMEs have virtually no access to bond markets and continue to face higher interest rates and restricted access to bank credit. Although the availability and conditions of external financing appear to have improved in the last year or so—including for bank loans, bank overdrafts, and trade credit—these improvements have been less obvious for SMEs than for larger companies. In a recent survey by the European Central Bank, for example, "access to finance" was the second most important concern mentioned by SMEs, on average, throughout the euro area, although the magnitude of the concern differed by country—38 percent of SMEs in Greece reported this as their biggest concern, 25 percent in Spain, and 24 percent in Ireland, while only 8 percent of SMEs in Germany and Austria viewed access to finance as a primary issue (ECB, 2013).

SMEs were also hit harder by the crisis. There is evidence (Iyer and others, 2013) that the magnitude of the reduction in credit supply was significantly higher for firms that (1) are smaller (as measured by both total assets and number of employees); (2) are younger (as measured by the age of incorporation); and (3) have weaker banking relationships (as measured by the volume of their bank credit before the crisis). Regulation may also play a role. Some studies (OECD, 2012; Angelkort and Stuwe, 2011) suggest that Basel III implementation could lead banks to reduce their lending to SMEs. This problem is likely to be larger in countries with bank-based financial systems and less-developed financial markets.

Improving the availability of credit to the corporate sector in general, and SMEs in particular, is essential to supporting the economic recovery. The following policy measures may help achieve this goal.

- *Advancing the securitization agenda, including by:*
  - *Developing primary and secondary markets for securitization of SME loans:* Of the total euro area securitized bond market of €1 trillion at the end of 2012, only some €140 billion was backed by SME loans. This contrasts with the much larger stock of bank loans to SMEs, which is estimated to be approximately €1.5 trillion.
  - *Addressing the asymmetric treatment of securitized assets vis-à-vis other assets with similar risk characteristics:* Currently, securitized assets are often treated less favorably by investors and central banks. For example, the haircut imposed by the ECB on asset-backed securities is 16 percent, much more than on other assets of similar risk—such as covered bonds with a similar rating—that are also accepted in liquidity facilities and direct purchases. Aside from the differences in the legal frameworks governing securitized assets and covered bonds, there are important inconsistencies in capital charges that provide incentives for covered bond issuance and bank cross-holdings of covered bonds, at the expense of securitizations with the same credit rating and duration risk (Jones and others, forthcoming).
  - *Introducing government guarantees for SME securitizations (covering credit and sovereign risk):* Guarantees could encourage private investment in these securities by offsetting some of the informational asymmetries and SME credit risk, especially from investors that can only buy securities with certain minimum credit ratings. The effect on lender incentives and the fiscal cost of these guarantees should be appropriately recognized (see the main text).
  - *Including SME loans in the collateral pool for covered bonds:* Currently, only mortgage, municipal, ship, and aircraft loans are eligible collateral for covered bond issuance; extending eligibility to SME loans will improve their attractiveness.
  - *Improving risk evaluation for SME securities by regulating and standardizing information disclosure:* More uniform information disclosure would reduce investors' uncertainty about the quality of SME securities and thus would tend to reduce SMEs' cost of bond and commercial paper issuance.
- *Encouraging development of factoring of SME receivables:* By facilitating the sale of account receivables, SMEs can finance working capital. If this form of financing is underdeveloped, then better credit information and quality of credit bureau data will improve assessment of borrowers' ability to pay.
- *Encouraging companies to lend to each other:* Larger companies could provide financing to their smaller suppliers (for example, via faster payment cycles).

The authors of this box are David Grigorian, Peter Lindner, and Samar Maziad.

Box 2.1 *(continued)*

- *Paving the way (including through appropriate regulation) for market-based credit guarantee programs and the development of small-bond markets:* Government-backed partial credit guarantee and mutual guarantee programs (similar to microfinance) could support expanded credit to SMEs (Honohan, 2010; Columba, Gambacorta, and Mistrulli, 2010). Italy's introduction of fiscal incentives for the issuance of minibonds by unlisted firms in 2012 provides an example.
- *Tax incentives for banks that expand credit to SMEs:* These incentives could take the form of lower tax rates on earnings from SME lending. However, any tax subsidies should be carefully designed so as not to encourage excessive risk taking by banks or weaken loan underwriting standards, or create opportunities for tax avoidance, which will be very hard to reverse later. Also in this case, the effect on lender incentives and the fiscal cost of these guarantees should be appropriately and transparently recognized.
- *Facilitating establishment of "direct lending" funds targeting SMEs that have difficulty getting other types of financing:* These funds could include direct financing by distressed-debt firms, private equity firms, venture capital firms, hedge funds, and business development corporations.

The relative effectiveness of these policies in providing credit to SMEs and their attendant costs would need to be evaluated on a country-by-country basis. The authorities should ensure that these measures are sufficiently targeted to address the root causes of lack of credit to SMEs. They must also minimize moral hazard and financial stability risk by ensuring adequate risk management practices are in place and requiring banks to hold a portion of securitized SME-backed assets on their balance sheets to be sure they have a sufficient financial interest in monitoring the loans.

- Figure 2.7 suggests that some countries have chosen to target only one side of the market, usually focusing more on policies to boost credit supply. However, countries that have not used targeted demand-side policies—including the core euro area and the Nordic countries—have still relied to a considerable extent on more general fiscal and monetary policies to support credit demand.
- Emerging market economies in central and eastern Europe have implemented relatively fewer policies to support credit, perhaps because some have less monetary and fiscal policy room. Some institutions (including the European Investment Bank and the European Bank for Reconstruction and Development) are providing support for credit supply policies in several of these countries.

Are Current Policies on Target?

Given limited policy resources, policymakers should target the constraints on the demand or the supply of credit that can be effectively addressed by government intervention. To facilitate the usefulness, timing, and sequencing of the various policies, it is helpful to identify the factors that underlie credit demand and credit supply. Depending on how these factors influence lending activity, one or more could be the target of government policies.

This chapter takes a stepwise approach to identifying underlying constraints affecting credit markets. As a first step to target policies, it proposes to distinguish between demand and supply constraints, which can be useful to narrow the policy options that may be effective. Moreover, if the sensitivity of supply or demand to interest rates can be determined, policymakers may be able to discern which policies are likely to be most effective in increasing credit volume. In a more challenging second step, the chapter attempts to identify the specific factors that may constrain credit demand or supply. In countries for which sufficient data are available for this second step, results from such an analysis could further narrow the set of credit-supporting policies that are likely to be most effective. Last, the chapter uses other information gleaned from country-specific sources to add to the overall assessment.

The analytical results should be interpreted with caution. The factors that determine credit supply and demand are technically difficult to identify. The analysis is further complicated by a lack of appropriate data, even in the advanced economies considered here. Still, this exercise provides a useful framework for assessing the appropriate targeting of policies and offers a tentative and preliminary assessment of their effectiveness for countries where sufficient data were available. Further refinement of this framework would be useful, and would greatly be facilitated by the availability of

Table 2.3. Credit Policies Implemented since 2007

	Enhancing Credit Supply					Supporting Credit Demand	
	Monetary Policy[1]	Fiscal Programs on Credit	Supportive Financial Regulation[2]	Capital Market Measures	Bank Restructuring[3]	Corporate Debt Restructuring	Household Debt Restructuring
Euro Area							
Austria	Y				Y		
Belgium	Y	Y		Y	Y		
Estonia	Y					Y	Y
Finland	Y						
France	Y			Y	Y		
Germany	Y	Y			Y		
Greece	Y	Y			Y	Y	Y
Ireland	Y	Y			Y	Y	Y
Italy	Y	Y	Y	Y	Y	Y	Y
Netherlands	Y	Y		Y	Y		
Portugal	Y	Y			Y	Y	Y
Slovak Republic	Y						
Slovenia	Y	Y	Y		Y	Y	Y
Spain	Y	Y		Y	Y	Y	Y
Other Advanced Europe							
Denmark	Y	Y			Y		
Iceland		Y			Y	Y	Y
Norway	Y	Y					
Sweden	Y						
United Kingdom	Y	Y		Y	Y		Y
Non-European Countries							
Australia	Y						
India	Y	Y	Y	Y	Y	Y	
Japan	Y	Y	Y	Y	Y	Y	
Korea	Y	Y	Y	Y	Y	Y	Y
South Africa							
United States	Y	Y		Y	Y	Y	Y
Non-Euro-Area Central, Eastern, and Southeastern Europe							
Albania			Y			Y	Y
Bosnia and Herzegovina					Y		
Bulgaria			Y				
Croatia	Y	Y	Y			Y	
Czech Republic							
Hungary	Y	Y					Y
Latvia					Y	Y	Y
Lithuania		Y					Y
FYR Macedonia	Y	Y	Y				
Moldova	Y					Y	Y
Montenegro		Y					
Poland		Y					
Romania		Y	Y			Y	
Russia	Y	Y	Y		Y		
Serbia	Y	Y	Y		Y	Y	
Turkey							
Ukraine	Y	Y			Y	Y	

Source: IMF staff.

Note: This table lists the various types of policies countries have implemented since 2007, based on Appendix Table 2.1, without consideration of the scope, duration, or effectiveness of those policies. "Stress test" and "coverage enhancement of deposit insurance" are excluded from the policies supporting credit demand. EU-wide fiscal programs (e.g., through the European Investment Bank and the European Bank for Reconstruction and Development) are not included although they are available for firms in the EU member countries (and in some non-EU European countries).

[1]Monetary policy measures that may ease constraints to credit supply, such as direct and indirect credit easing as well as widening of collateral eligibility for private sector assets (see also Appendix Table 2.1).

[2]Measures include a reduction in risk weights for small and medium enterprise loans when calculating banks' capital adequacy ratios, forbearance of nonperforming loans, and countercyclical macroprudential regulations. In the United Kingdom, the authorities have recently relaxed liquidity requirements for banks.

[3]This category includes ad hoc public assistance to banks that may not have been initiated to counter undercapitalization (in or out of crisis situations) but were intended to improve credit supply. For India, the "Y" includes an ongoing government contribution to the equity capital of banks that is a consequence of the partial government ownership of banks, for which the relevant statute does not allow their ownership stake to go below 51 percent. Such contributions are a regular feature of the Indian banking system.

expanded and more detailed data (beyond the imperfect proxies that are used in this analysis) that could more clearly identify the constraints to credit demand and supply.

Disentangling Credit Supply and Demand

Data from bank lending surveys can help distinguish between demand and supply factors that underlie credit developments. Identifying supply and demand shocks typically requires an exogenous source of demand and supply variation (Ashcraft, 2005), an exogenous instrument (Peek and Rosengren, 2000), or matched borrower-bank data (Jiménez, Ongena, Peydró, and Saurina, 2012). In the absence of such data, the analysis here relies on answers to bank lending surveys conducted by central banks in the euro area and the United States.[10] For these surveys, bank loan officers are asked for their views about the various factors affecting credit demand and credit supply using questions on credit demand conditions and changes in lending standards. Although the survey responses are qualitative (for example, credit is assessed as having "tightened considerably or somewhat," "eased considerably or somewhat," or "no change"), they can be assigned a numerical value to obtain a quantitative index. The approach in this chapter assumes that the responses from loan officers in the bank lending surveys are good proxies for unobserved demand and supply.[11]

The approach determines how much credit growth can be attributed to demand or supply factors (Annex 2.2). Demand factors are proxied by the fraction of banks reporting in the survey that they observed an increase in demand for loans minus the fraction that observed a decrease. Supply factors are proxied by a measure of lending standards from which the influence of factors that are not related to bank balance sheets is statistically removed. These factors should be removed because lending standards reported in surveys may not reflect "pure" shifts in credit supply but instead may respond to changes in factors such as borrowers' credit worthiness, the economic outlook, and uncertainty, which also affect loan demand conditions. After cleansing the raw data to arrive at a better measure of "pure" supply factors, credit growth can be decomposed into demand and supply influences. These influences are computed using the estimated coefficients from a regression of credit growth on the demand index and the adjusted lending standards (Table 2.4).[12]

Table 2.4. Determinants of Credit Growth

	Euro Area Corporate Loans	Euro Area Mortgage Loans	United States Commercial and Industrial Loans
Credit Growth ($t-1$)	0.511***	0.331**	0.628***
	(0.134)	(0.138)	(0.112)
ΣDemand Index ($t-i$)	0.030**	0.014**	0.009
	(0.013)	(0.007)	(0.125)
ΣPure Supply Index ($t-i$)	–0.040**	–0.052**	–0.126**
	(0.011)	(0.021)	(0.062)

Source: IMF staff estimates.

Note: Regressions include a lag of the dependent variable and four lags of the demand indicator and the "pure" supply indicator (see Annex 2.2) as well as seasonal dummies. For the euro area, Arellano and Bond (1991) regressions with robust standard errors are in parentheses. The euro area estimation covers 2003:Q1–2013:Q1 and includes Austria, France, Germany, Italy, Luxembourg, the Netherlands, Portugal, and Spain. For the United States, an ordinary least squares regression is estimated for the period 1999:Q1–2013:Q1. ** and *** denote significance at the 5 and 1 percent levels, respectively.

The results of this decomposition show that both demand and supply factors are important in explaining credit developments in both the euro area and the United States but that their relative influence varies over time.

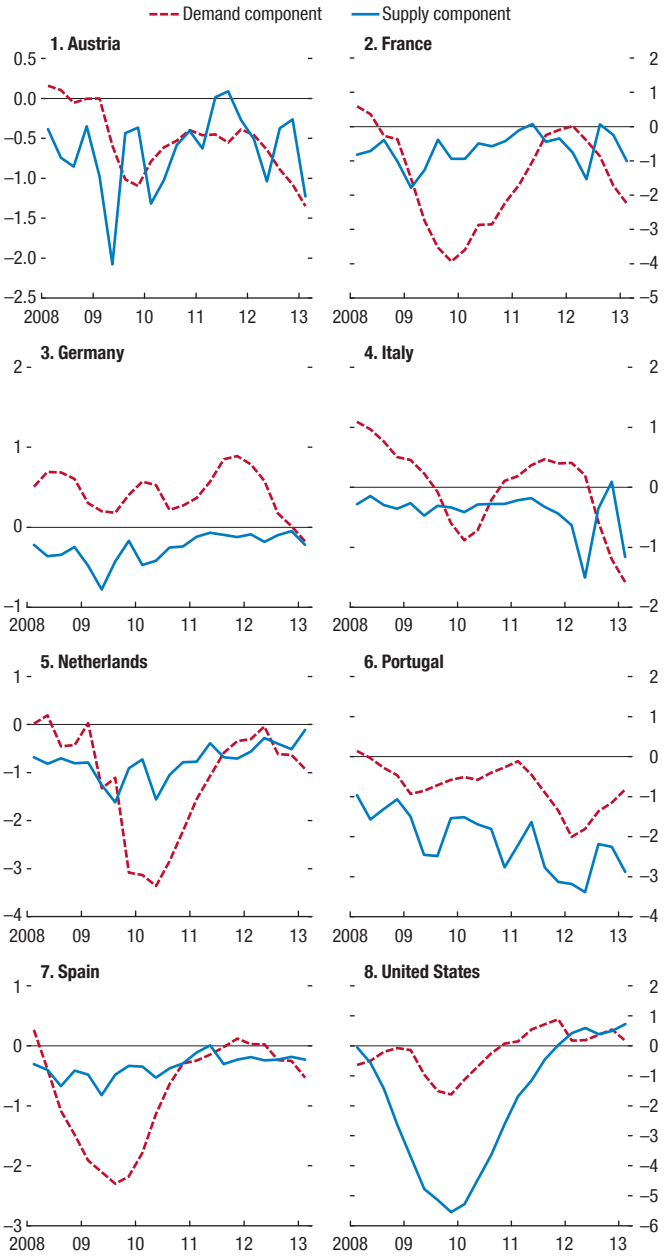
- *Corporate credit* (Figure 2.8): Demand factors had a negative effect in late 2009 in Austria, France, the Netherlands, and Spain. Most countries saw deteriorating demand conditions in the most recent period, including Germany, where demand conditions had been relatively favorable since the start of the crisis. Supply factors have had a negative effect throughout the period in most countries (with particularly strong negative effects in Portugal), but eased in most euro

[10]In the euro area, the ECB conducts the quarterly Bank Lending Survey (www.ecb.europa.eu/stats/money/surveys/lend/html/index.en.html), and in the United States, the Federal Reserve conducts the quarterly Senior Loan Officer Opinion Survey on Bank Lending Practices (www.federalreserve.gov/boarddocs/snloansurvey). Data series that are long enough for this analysis are available for Austria, France, Germany, Italy, Luxembourg, the Netherlands, Portugal, Spain, and the United States. The surveys include questions such as, "How has the demand for loans changed at your bank over the past three months?" and "How have your bank's credit standards changed over the past three months?"

[11]Although this analysis provides useful insight, it still suffers from potential bias. For example, reporting bias is a concern: surveyed banks may try to please their supervisors and fail to report true credit supply conditions. Despite this problem, an emerging literature makes use of survey data to shed light on the determinants of credit growth, and there is evidence that it contains useful information. For example, Lown and Morgan (2006) and De Bondt and others (2010) show that the surveys have predictive power for output and credit growth in the United States and in the euro area, respectively.

[12]Unfortunately, the reasons provided in the survey as explanations for changes in demand do not allow for a straightforward classification between supply and demand factors as is the case for the supply questions and hence cannot be used to perform the same technique to "cleanse" the data as done for the supply side.

Figure 2.8. Decomposing Credit Growth: Corporate Loans



Sources: European Central Bank, Bank Lending Survey; Federal Reserve, Senior Loan Officer Survey; and IMF staff calculations.
Note: Demand and supply components are constructed using the estimates in Table 2.4. The demand component is the fitted values constructed recursively using the lags for the demand index and setting the "pure" supply index to zero. The supply component is constructed analogously.

area countries in the first half of 2012, likely as a result of the long-term refinancing operations of the ECB. More recently, demand constraints appear to outweigh supply constraints in France.

- *Mortgage credit*[13] (Figure 2.9): The negative effect of demand factors in 2009 and 2010 on mortgage credit in a number of countries was more moderate than on corporate loans, and demand recovered in 2011 and 2012 before turning down again more recently (except in Austria and Germany). Most countries saw a double-dip in supply constraints, with a temporary relaxation around 2010. However, most recently (and in contrast to developments for corporate loans), supply constraints for mortgage loans eased in 2013 in a number of countries, most markedly in France, Italy, and Portugal.

Identifying Factors Constraining Credit

This section offers a more detailed set of tools to identify the factors constraining credit by estimating the underlying determinants of credit demand and credit supply. Two approaches are employed: (1) an estimation of the country-specific structural determinants of bank credit supply and demand; and (2) a firm-level panel estimation of factors that affect manufacturing firms' borrowing. Both approaches focus on credit to firms.

Evidence from a structural model of bank lending

This approach estimates supply and demand equations for aggregate bank lending for major countries that have had weak credit growth.[14] The exercise has extensive data requirements and presents challenging econometric issues (Box 2.2). As a result, reliable results were obtained only for corporate loans in France, Japan, Spain, and the United Kingdom.[15]

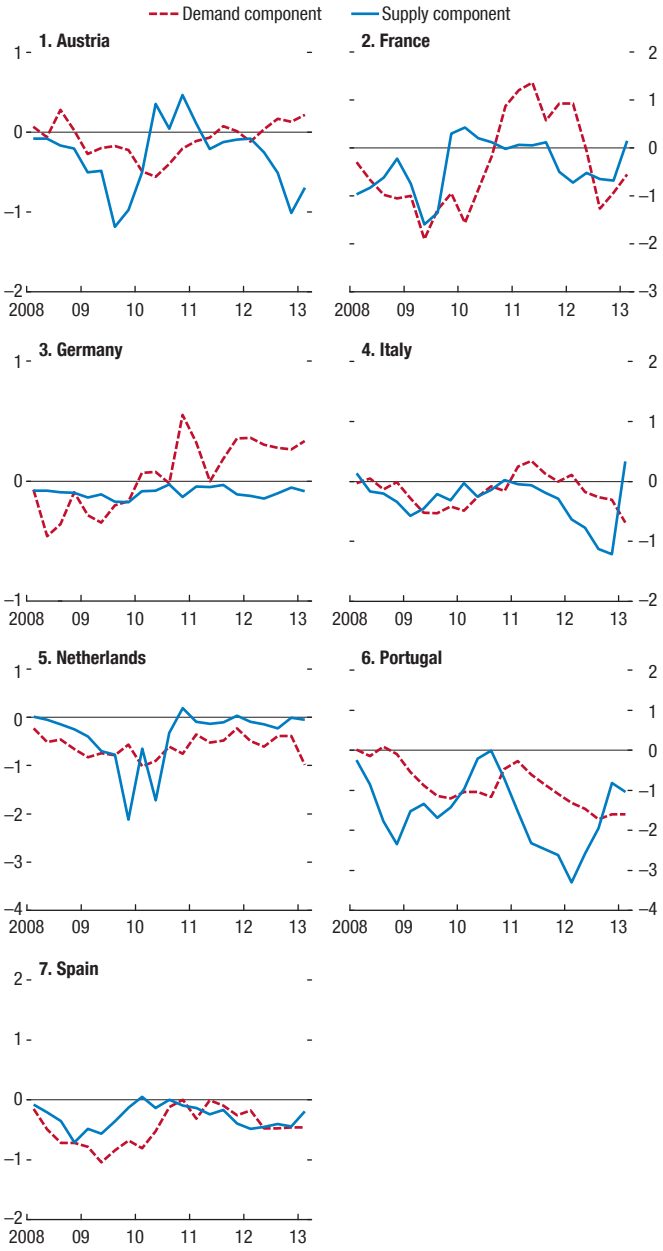
Because shifts in demand and supply cannot be observed directly, the analysis uses "shifters" that are meant to affect only one, but not the other, side of the market, thus allowing demand and supply to be

[13]The analysis of mortgage lending does not include the United States because of a break in the mortgage lending standards series in 2007 and because the Senior Loan Officer Survey does not include questions regarding the reasons for tightening or easing lending standards for mortgages.

[14]See Annex 2.3 for details of the model's design.

[15]France and Japan were included in the estimation, although bank credit growth to the private sector (nonfinancial corporations and households alike) was not identified as weak according to Table 2.1. Still, bank credit in Japan was identified as weak until the third quarter of 2012, and bank credit to nonfinancial firms in France (ECB data) declined in the last quarters of 2012. In addition, both countries implemented credit-supporting policies.

Figure 2.9. Decomposing Credit Growth: Mortgage Loans



Sources: European Central Bank, Bank Lending Survey; and IMF staff calculations.
Note: Demand and supply components are constructed using the estimates in Table 2.4. The demand component is the fitted values constructed recursively using the lags for the demand index and setting the "pure" supply index to zero. The supply component is constructed analogously.

identified separately. This econometric technique is commonly used but is difficult to implement because it requires accurately identifying variables associated with either demand or supply, but not with both. The variables chosen that affect only supply (thereby tracing out and identifying the demand curve) include the cost of bank funding and basic balance sheet variables (the bank's capital-to-asset ratio).[16] On the demand side, the variables include the rate of capacity utilization and a proxy for the availability of market financing.[17]

The supply and demand equations include several variables to capture more directly some of the market constraints previously discussed. In particular, the nonfinancial firms' debt-to-equity ratio aims to capture the effect of debt overhang on credit demand (and serves as an indicator of credit risk from the viewpoint of banks on the supply side). Although the growth of the stock market index is correlated with the value of firms' collateral (a supply-side constraint), it may also increase firms' preference for equity financing (affecting credit demand). The presumed relationships and reasons for choosing the specific variables are discussed in Annex 2.3.

The estimated supply and demand equations for bank credit are well identified overall. For all countries, one or more of the demand and supply shifters is significant in the regression, identifying the demand and supply equations for these countries (Table 2.5). On the supply side, lower funding costs (proxied by deposit rates) tend to increase the supply of bank loans. The amount of capital a bank holds relative to its total assets yields a counterintuitive negative sign in France and Spain. These results should probably not be given too much weight, because they may reflect an inaccurate proxy for bank capital, a scaling down of lending by banks that are building up their capital buffers, or ongoing major bank restructuring in Spain.[18] Additional results (see below) show a positive relationship between bank capital and lending by banks. On the demand side, in most cases, capacity utilization has the expected positive effect on firms' demand for loans,

[16]Unfortunately, a better proxy—regulatory capital—is not available.

[17]Although finding one shifter each for the supply and demand side is theoretically enough to identify the model empirically, the potential endogeneity of some shifters complicates proper identification.

[18]Despite the increase in system-level capitalization (including injection of public capital), lending continues to contract, which may reflect in part the deleveraging requirements imposed on banks that receive government aid.

Box 2.2. Challenges in the Structural Estimation of Credit Supply and Demand

This box draws attention to some limitations related to the estimation of a structural model of supply and demand for bank lending, and discusses attempts to overcome them.

Data measurement issues

Measurement issues affect both the dependent and the explanatory variables and constrain the estimation of the determinants of credit supply and demand.

- Because of a lack of data on new bank loans gross of repayments, the analysis uses as the dependent variable net transaction flows or the changes in the stock of bank loans. This underestimates the actual volume of new loans, because repayments will offset some new loans.
- Among the explanatory variables, bank-specific variables, such as the capital-to-asset ratio, are derived from monetary and financial statistics usually provided by central banks. They do not correspond to regulatory ratios and may not accurately capture the constraints weighing on banks' ability to lend. Many variables were considered in the supply equation as alternatives or in addition to the capital ratio of banks, in particular the price-to-book ratio, changes in the level of capital, the deposit-to-total-liabilities ratio (to capture the extent of funding constraints), the ratio of nonperforming loans to total loans (as a proxy for the quality of bank assets), the stock market index for the financial sector, and banks' z-score. Few came out as statistically significant to allow for a proper identification of the demand curve. One reason for this lack of significance could be heterogeneity of the banking sector, with weaker banks behaving very differently from stronger ones, masked by the averages.

Identification challenges

Endogeneity issues complicate the proper identification of the supply and demand equations. For example,

- Most variables in the analysis are more or less jointly determined. For instance, future GDP (and therefore GDP forecasts) depend on the amount of credit granted by banks today. To alleviate the resulting endogeneity, most regressors are lagged by one period.
- Potential endogeneity is a major challenge for finding variables that can separately identify credit supply and demand (which the chapter calls "shifters"). A number of criteria were used to decide whether the model was properly identified: (1) at least one of the shifters in each equation is statistically significant at the 5 percent level, and the shifters on each side are jointly significant; and (2) the coefficients on the lending rates in both the supply and demand equations are of the expected sign, so that the resulting supply curve has a positive slope and the demand curve has a downward slope. A Hausman test based on the comparison of the two-stage and three-stage least squares estimators was further used to verify the exogeneity of shifters.

Potential structural breaks

With the exception of the United Kingdom, the sample period considered in the analysis covers both the precrisis and crisis periods, raising the question of whether the relationships in the estimation have changed over time and are robust to changes in the sample period. For example,

- Restricting the sample to the period before or after 2008 prevents a proper identification of the model in most cases because of the resulting large reduction in the number of observations. The estimation therefore assumes that the coefficients do not change over the full sample period. Alternative specifications (not reported) allowed some coefficients to change before and after September 2008 by including a dummy variable for the period after September 2008 and interaction terms between that dummy and some variables in the model, such as the lending rate or the capital ratio of banks. In most cases, the coefficients on the interaction terms were not statistically significant.

The author of this box is Frederic Lambert.

Table 2.5. Structural Determinants of the Supply and Demand of Bank Lending to Firms in Selected Countries

	Expected Signs	France	Spain	United Kingdom	Japan
Supply Equation					
Lending Rate	+	2,082.0***	5,962.4***	7,296.1***	2,957.2
GDP Forecasts	+	462.5	1,993.3***	2,534.1**	106.8
Standard Deviation of GDP Forecasts	–	–5,879.6	3,300.1	6,752.2	496.9
Inflation	–	666.5	541.8	–587.7	511.8*
Growth of Stock Market Index	+	–5,121.1	–1,753.6	–9,427.0	–3,309.6
Lagged NFCs' Debt-to-Equity Ratio	–	–176.4***	–41.9	240.8*	–3.9
Lagged NFCs' Profitability	+	–444.4	–1,979.9***	1,242.7	2,621.3**
Corporate Spread (investment grade)	–	n.a.	n.a.	n.a.	68.1***
Constant		38,351.8***	80,127.5***	–87,380.5**	–12,031.7**
Supply Shifters					
Deposit Rate	–	–16,850.2**	–28,978.5***	–11,077.6**	–6,314.8**
Lagged Banks' Capital Ratio	+	–2,183.3**	–923.1**	642.9	604.1
Bank CDS Spread	–	n.a.	n.a.	2.8	n.a.
F Statistics for Supply Shifters		4.780	23.348	6.147	4.371
P Value		0.092	0.000	0.105	0.112
Demand Equation					
Lending Rate	–	–2,009.0	–2,012.1***	–228.1	–1,573.2
GDP Forecasts	+	1,318.3	3,009.8***	1,026.1	152.7
Standard Deviation of GDP Forecasts	–	–3,405.0	6,501.2*	8,024.9	514.1
Inflation	+	1,613.5*	1,042.9**	–2,251.7	491.2*
Growth of Stock Market Index	–	–5,312.6	799.5	–11,785.1	–3,307.7*
Lagged NFCs' Debt-to-Equity Ratio	–	–207.0***	–48.4	195.6	–5.7
Lagged NFCs' Profitability	–	–150.5	–805.8***	475.1	975.2
Corporate Spread (investment grade)	+	n.a.	n.a.	n.a.	37.7***
Constant		19,447.3	30,449.0*	–94,991.7**	–7,645.0*
Demand Shifters					
Lagged Capacity Utilization	+	319.4*	233.4	866.5**	34.4*
Market Financing (average over past year)	–	–1,539.3**	–13,084.5***	–103.2	279.3**
F Statistics for Demand Shifters		4.482	27.784	6.258	5.590
P Value		0.106	0.000	0.044	0.061
Number of Observations		122	122	53	117
Sample Period		2003:M2–2013:M3	2003:M2–2013:M3	2008:M8–2012:M12	2003:M5–2013:M1

Source: IMF staff estimates.

Note: CDS = credit default swap; NFC = nonfinancial corporation; M = month; n.a. = not applicable. *, **, and *** denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively. The dependent variable is the net flow of bank loans to NFCs. NFCs' profitability is computed as the ratio of NFCs' gross operating surplus to gross value added. NFCs' market financing is the average ratio of NFCs' debt in the form of securities to total debt over the past year.

while the availability of market financing has the opposite effect, as expected. This analysis provides no strong evidence that firms' high current debt or low profitability is holding back the demand for credit, except maybe in France and Spain.[19] Similarly, in contrast to ongoing discussions in some policy circles, the dispersion of growth forecasts (a measure of uncertainty about future growth) does not appear to play a large role for either the supply of or demand for bank loans in this analysis.

Evidence from firm-level data

Additional evidence on specific factors that constrain credit emerges from data on firm indebtedness. These data allow for a richer analysis that takes into account the different characteristics of individual firms. Fairly comprehensive firm-level data are available from corporate balance sheets of exchange-listed firms that show total debt as a share of total assets. The change in the debt-to-asset ratio corresponds to net borrowing; therefore, the determinants of the changes in the corporate debt-to-asset ratio can shed light on the factors that constrain corporate credit.

The analysis uses annual data for 1991–2012 to conduct firm-level panel regressions to explain changes in the debt-to-asset ratio for the manufacturing sectors in France, Italy, Japan, Spain, the United Kingdom, and the United States.[20] Explanatory variables are the following:

- The firm's own debt-to-asset ratio, to capture debt-overhang effects that would constrain the willingness or ability of firms to take on additional debt. It also reflects the riskiness of firms, which would make banks less willing to lend to them;

[19]However, the results from the firm-level regressions show stronger results for firms' current debt levels.

[20]Firm-level balance sheet data are from the IMF Research Department's Corporate Vulnerability Utility, based on Thomson Reuters data. House price data are from the Organization for Economic Cooperation and Development and national sources. Credit includes bank credit and other forms of credit. All explanatory variables are lagged by one period to mitigate possible simultaneity problems.

Table 2.6. Firm-Level Regressions of Changes in Debt-to-Asset Ratio for Manufacturing Firms

	France	Italy	Spain	United Kingdom	Japan	United States
Return on Assets (%)	–0.058	–0.083**	–0.113**	0.018	–0.057***	–0.020***
Debt-to-Asset Ratio (%)	–0.357***	–0.303***	–0.313***	–0.395***	–0.234***	–0.371***
Average Banking Sector Liability-to-Asset Ratio (%)	0.031	–0.294***	–0.765***	0.019	0.213***	–0.558***
Real Household Consumption Growth Rate (%)	0.314***	0.167*	0.120	0.264***	–0.256***	0.212***
House Price Index (2010 = 100)	0.001	0.004	0.072***	0.016*	0.037***	–0.002
Observations	4,613	1,621	961	7,819	30,581	33,358
Number of Firms	393	146	74	693	1,929	2,739
F Statistic *P* Value	0.00	0.00	0.00	0.00	0.00	0.00
R Squared	0.17	0.15	0.17	0.20	0.12	0.18

Sources: IMF, *International Financial Statistics* and Research Department, Corporate Vulnerability Utility, based on Thomson Reuters data; national sources; Organization for Economic Cooperation and Development; and IMF staff estimates.

Note: Firm-level panel estimation is conducted with firm-fixed effects for each country using 1991–2012 data for the manufacturing sector. The dependent variable is the change in the debt-to-asset ratio (%). The manufacturing sector is defined as Division D of the Standard Industrial Classification (SIC), and the banking sector is defined as SIC 2-digit codes 60 (banks) and 61 (credit institutions) as well as four-digit code 6712 (bank holding companies). The coverage of firms is incomplete in 2012. All the explanatory variables are lagged by one period. *, **, and *** denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively, based on robust standard errors clustered at the firm level.

- The firm's return on assets, to capture the ability of firms to fund investment projects internally as well as their creditworthiness;[21]
- The average liability-to-asset ratio of the banking sector in each country, to capture banks' balance sheet constraints to making additional loans (a higher ratio implies a more leveraged bank);
- Real household consumption growth, to capture consumer demand, a major driver of economic growth; and
- Real house prices, as a proxy for the value of loan collateral.[22]

The regression results show that the factors constraining corporate credit growth vary by country, but higher corporate debt levels, lower bank capital, and collateral constraints can play a role (Table 2.6).[23] Corporate debt levels matter for credit to manufacturing firms in all countries investigated: firms with higher debt levels (an indication of possible debt overhang) tend to take on less additional debt. Credit to firms in Italy, Spain, and the United States is also affected by the liability-to-asset ratio in banks: higher ratios (corresponding to higher leverage and lower bank equity) are associated with lower debt in firms, suggesting that weaker banks lend less to firms. In Japan, Spain, and the United Kingdom, the results suggest that higher collateral values make it easier for firms to take on more debt. Finally, higher consumption growth is supportive of credit growth in most countries, except in Spain and Japan.

Figure 2.10 shows the importance of each factor in explaining recent deviations of corporate credit growth from each country's average during 1992–2013. Credit has been restricted by bank capital in Spain (and in Italy most recently) and by debt overhang in Italy and Spain. Tepid consumer demand has slowed credit growth in France and Italy and also in the United Kingdom and the United States at the beginning of the crisis. Low real estate prices have been an important factor constraining credit in Japan.

Are Credit Policies on Target? Some Examples

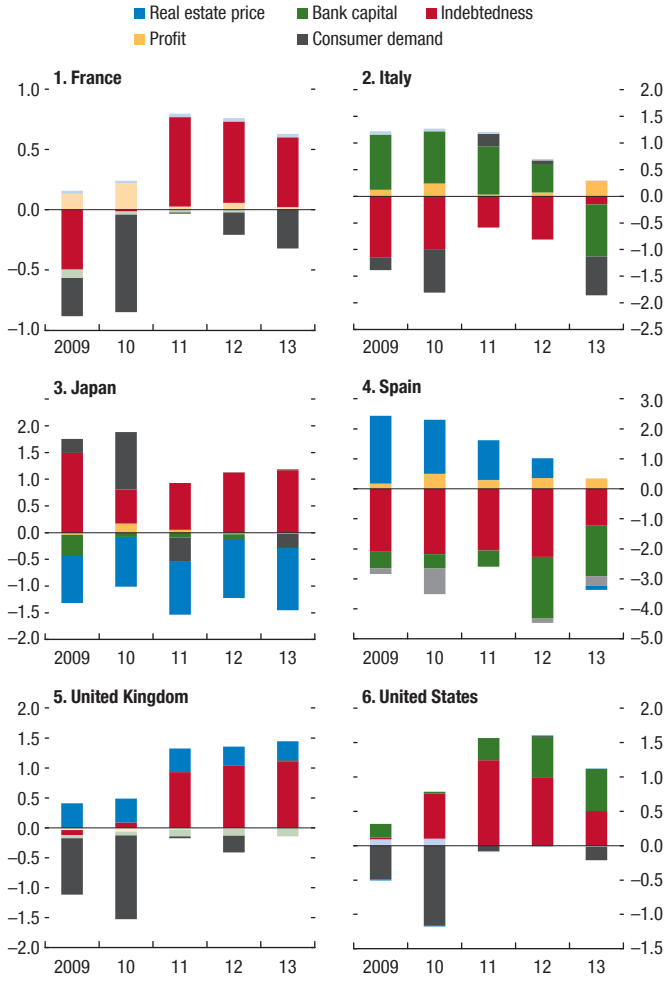
The results from the analyses in the previous sections can be used to evaluate whether specific policies implemented in countries with weak credit growth are effectively targeting the specific factors that constrain credit growth (Figure 2.11). The analysis using bank lending surveys provides a first indication of the relative importance of supply and demand factors. The structural model and the firm-level analysis identify the specific factors that may constrain credit and how their influence has changed over time. The estimated demand and supply equations shed light on the potential effectiveness of specific policies on credit volume, which depends on the relative sensitivity of demand and supply to changes in the lending rate. For example, if credit demand appears relatively insensitive to changes in the interest rate (its coefficient is close to zero or not significantly different from zero), government measures aiming to increase the supply of loans would lower the lending rate but would likely not lead to a substantial increase in the demand. If the objective

[21]A drawback of this approach is that it does not distinguish between supply and demand. Here it is assumed that low profitability means firms would demand more external financing through loans. However, persistent low profitability may also cause banks to see the firm as less creditworthy, restricting supply. This latter effect is, however, partially absorbed by firm-fixed effects.

[22]The land price index is used for Japan.

[23]The sample includes only exchange-listed firms, which may bias downward the role of some constraints for firms with less easy access to finance, such as SMEs.

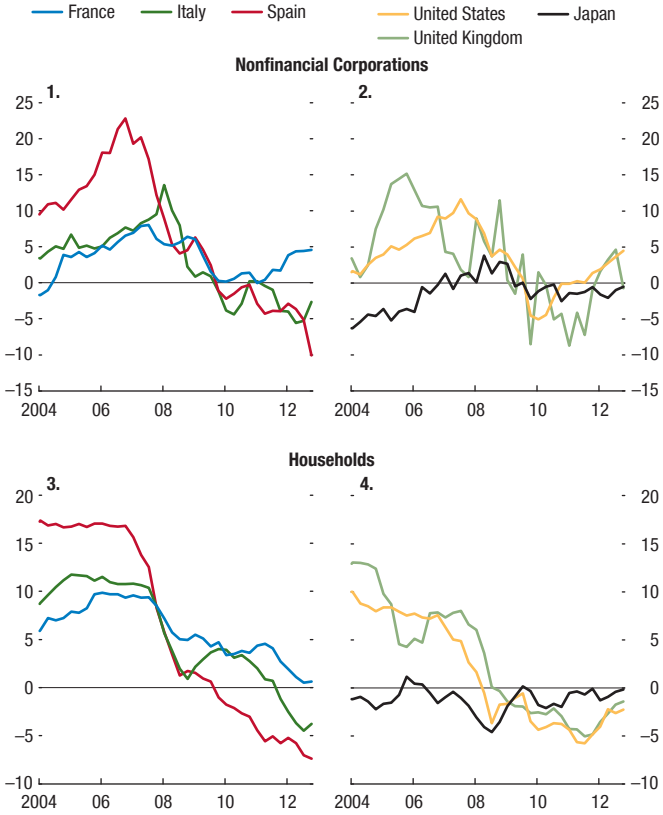
Figure 2.10. Decomposition of Change in Debt-to-Asset Ratios for Firms



Sources: IMF, *International Financial Statistics,* and Research Department, Corporate Vulnerability Utility, based on Thomson Reuters data; national sources; Organization for Economic Cooperation and Development; and IMF staff estimates.
Note: The components add up to the deviation of the predicted change in the debt-to-asset ratio in each year from the average change in the debt-to-asset ratio over the period 1992–2013. A positive (negative) value means that the factor contributes to a positive (negative) change in the debt-to-asset ratio. Light colors indicate insignificant factors.

Figure 2.11. Real Total Credit Growth, by Borrowing Sector

(Percent; year over year)



Sources: Bank for International Settlements; and IMF staff estimates.
Note: Total credit includes private sector borrowing (loans and debt instruments) from domestic banks and all other sources ("other credit"), such as other domestic nonbanks and foreign lenders (see BIS, 2013).

of policy is to increase the volume of lending, measures that address demand-side frictions—corporate debt overhang, for example—would be more effective.

A preliminary assessment of policies for the major countries follows. This assessment is preliminary because policies take some time to make an impact, and a number of policies have been implemented only relatively recently. In addition, as indicated previously, the technical analysis contains various weaknesses, so some of the assessment is based on the previous analyses of others (including from within the IMF and outside). Clearly, the empirical work would benefit from further refinement, including by using more detailed data that could more effectively identify the constraints to credit, but it was not available for the research in this chapter. For a more explicit analysis of funding costs in several European countries and their potential effect on lending, see Chapter 1.

France

For France, the results from the bank lending survey, the firm-level analysis, and the credit model show a substantial negative effect from demand factors. Supply factors appear to play a lesser role, perhaps in part because of the extensive supply-oriented policies that were implemented. The French government helped ease credit supply by setting up state-sponsored agencies to undertake refinancing operations and recapitalize banks. As a euro area member, France also benefited from the ECB's efforts to support the supply of credit (including the widening of collateral eligibility). The firm-level analysis identifies weak consumption growth as a major factor in weak credit. This relationship likely reflects the strong role that household consumption has played in sustaining growth in the precrisis period, and the adverse impact of uncertainty and rising unemployment on consumption in the latter period. By contrast, debt overhang in households does not appear to be an impediment to consumption and credit growth, as discussed in the 2013 IMF Article IV Staff Report for France (IMF, 2013c). Therefore, further policy actions, if needed, could usefully focus on creating conditions for stronger growth and employment, rather than on boosting credit directly.

Italy

The Italian government has adopted a wide range of policies, particularly to ease the corporate debt overhang and help households adjust during a period of large fiscal consolidation, but the most important factor restraining credit currently appears to be the capital position of banks. On the demand side, corporate and personal bankruptcy laws were amended to speed up restructuring procedures. A temporary moratorium on debt-service payments was implemented for both corporate and household debt, although this action may have created other distortions because banks did not have to classify these loans as nonperforming. To address supply constraints, the Italian government provided guarantees for corporate and mortgage loans and launched an initiative to promote the development of a corporate bond market. Some measures were taken in 2009 to support the recapitalization of the banking sector and one bank received additional support this year.[24] Finally, Italy has also benefited from the ECB's policies supporting credit supply. Bank lending survey results point to a large role for bank balance sheet constraints in the tightening of lending standards at the beginning of 2012 and again more recently. The firm-level analysis confirms that low bank capital has played an important role most recently. It also shows that debt overhang in firms may also play a role in restricting credit to firms. Other authors have confirmed the importance of bank capitalization, including Del Giovane, Eramo, and Nobili (2011), who use confidential bank-level data in their analysis. Albertazzi and Marchetti (2010) present evidence, based on bank-firm matched data, that low bank capitalization and scarce liquidity dampened lending following the collapse of Lehman Brothers. Also, Zoli (2013) finds that funding costs of banks with lower capital ratios are more sensitive to changes in sovereign spreads. These various analyses would suggest that measures that encourage banks to increase their capital would be useful. In particular, further provisioning and write-offs could be encouraged by increasing tax deductibility of loan loss provisions and by expediting judicial process of corporate and household debt restructuring.

Spain

Debt overhang in banks, firms, and households is the key factor constraining credit volume in Spain. The bank lending survey shows that Spain saw a substantial tightening of credit supply in 2009. The firm-level analysis suggests that this tightening was in part due to constraints on bank capitalization. The decomposition of interest rates in Chapter 1 (see Figure 1.50) also suggests that the financial position of banks and sovereign stress have contributed to higher interest rates (and therefore lower loan volumes). Corporate debt overhang also played a role, restricting credit demand. Jiménez and others (2012) underline the importance of supply constraints for Spain using bank-firm matched loan-level data and provide evidence that banks' capital and liquidity ratios matter for their ability to extend loans to firms. To ease these constraints, the government has helped guide a major restructuring of the banking sector, including through a significant recapitalization program (see IMF, 2013e and 2013f). Also, Spanish state-sponsored institutions have been providing direct loans to firms and guarantees for corporate

[24]While direct capital injections were not undertaken to a large extent, the Italian government encouraged the issuance of special bank bonds (Tremonti bonds), which were purchased by the government. These bonds are used as regulatory capital with special terms that allow banks to forgo the payment of interest if they are unprofitable.

loans. In addition, the government has been taking steps to promote SME bond and equity financing and to address debt overhang in firms and households, including through resolution programs for heavily indebted households and amendments to bankruptcy rules. In view of the analysis in this chapter, further useful steps to ease credit constraints could include additional reforms to ensure efficient and timely resolution of corporate and household debt (see IMF, 2013g), as well as reforms to further ease bank funding costs, such as additional steps toward a full banking union (see the discussion in Chapter 1).

Japan

The firm-level analysis suggests that declining collateral values have been a particular constraint to credit intermediation in Japan. Policies in Japan since 2008 have largely focused on credit support measures to SMEs, including public credit guarantees and credit subsidies and direct credit provision by public financial institutions. Many of these measures had already been put in place in the early 2000s when Japan experienced a slowdown and a banking crisis. As noted in Japan's 2012 Financial Sector Assessment Program Update (IMF, 2012b), although these credit policies have largely sheltered incumbent firms from a tightening of financing conditions and have prevented widespread SME bankruptcies, reliance on public credit guarantees in SME lending tends to weaken banks' incentives to undertake rigorous credit assessments and reduces incentives for restructuring, and entails fiscal costs that may begin to outweigh benefits. In addition to the measures specifically geared toward SMEs, the Bank of Japan also established several lending facilities at low interest rates to encourage bank lending and lending toward growth sectors. Further measures would be useful, including (1) phasing out the full-value credit guarantees; (2) increasing the availability of risk capital for start-ups through asset-based lending; and (3) implementing a structural reform of lending practices based on fixed-asset collateral.

United Kingdom

The U.K. authorities adopted a number of measures to boost credit, but their effectiveness has yet to be demonstrated. This could be due to the relatively short period during which they have been in place. The Bank of England widened collateral eligibility and purchased limited amounts of corporate bonds and commercial paper. The Treasury provided temporary guarantees for bank assets to mitigate banks' funding problems (through the Credit Guarantee Scheme and Asset Protection Scheme). The Bank of England and the Treasury jointly implemented a Funding for Lending Scheme in mid-2012 (expanded in April 2013) to lower funding costs and to provide incentives for new lending. Although these measures appear to have helped ease funding conditions and some lending rates, it is less clear that credit volumes have increased as a result. This in part reflects still-ongoing deleveraging by major banks with weak asset quality or insufficient capital buffers. However, preliminary econometric results in this chapter suggest that the demand for additional loans is relatively insensitive to changes in lending rates. If this were to be confirmed through additional, more detailed analysis (including over a longer time period), then policies that support credit demand may be more effective in boosting credit volumes.[25]

United States

The constraints that the U.S. corporate loan market witnessed in the early stages of the crisis appear to have dissipated. The analysis of lending surveys shows that the United States saw a substantial tightening of corporate lending standards as a result of credit supply constraints and the weaker economic outlook in 2008 and 2009. Both supply and demand factors have improved since then, and total credit growth to nonfinancial corporations has turned positive. The improving housing market may improve access to finance for SMEs given that they often use housing as collateral (IMF, 2013i). Large purchases of mortgage-backed securities by the Federal Reserve, combined with mortgage securitization through government-sponsored enterprises, have helped alleviate supply-side constraints in the mortgage market (Box 2.3). However, the still-negative growth rate of credit to households (driven by housing debt) may call for further measures. Some demand-side policies have been implemented: to ease household debt overhang, loan modification programs were introduced in 2009, and subsidies and tax incentives were provided to

[25]Credit supply and demand equations for the United Kingdom were estimated for the post-2008 period only. Empirical analysis by Aiyar, Calomiris, and Wieladek (2012) on the precrisis period with confidential bank-by-bank data finds that the lending behavior of banks was sensitive to changes in capital requirements. The 2013 IMF Article IV Staff Report for the United Kingdom (IMF, 2013h) also suggests the need for strengthening banks' balance sheets and capital buffers as a prerequisite for a durable credit recovery.

Box 2.3. The Effect of the Liquidity Crisis on Mortgage Lending

This box examines the credit supply impact resulting from the exposure of U.S. banks to market liquidity risk through wholesale funding, based on Dagher and Kazimov (2012).

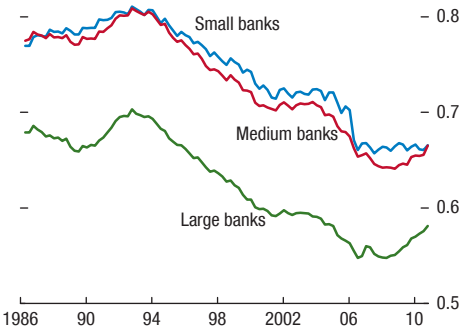
In the two decades leading up to the global financial crisis, U.S. banks reduced their reliance on traditional retail deposits, as shown by a drop in their average ratio of core deposits to assets (Figure 2.3.1).[1] Banks have increased their flexibility by moving away from traditional deposits and into market (or "wholesale") funding, but they are now more vulnerable to swings in market funding, as became apparent when wholesale funding liquidity dried up in the third quarter of 2007. The empirical literature on this topic provides evidence that banks that relied more on short-term wholesale funding reduced their lending more during the crisis than other banks. However, this literature has relied only on aggregate data, which makes the task of disentangling demand and supply effects very challenging.

Dagher and Kazimov (2012) make use of loan-level data on mortgage applications available through the Home Mortgage Disclosure Act, combined with bank financial data from the Reports of Condition and Income collected by the Federal Deposit Insurance Corporation. The data allow for an analysis of banks' decisions to reject loan applications while controlling for a host of applicant, bank, and geographical characteristics. Bank characteristics include the ratio of core deposits to assets, size, liquidity, leverage, and banks' reliance on securitization. By focusing on a homogeneous category of credit and studying bank decisions rather than the volume of credit, this approach greatly reduces the potential for demand factors to confound the supply effects. The regression compares the effect of bank characteristics on the decision to reject a loan in 2008 with the crisis year (2007) and with the pre-crisis years 2005 and 2006.

The results show that banks with a higher reliance on core deposits in 2007 increased their rejection rate less during the crisis.[2] The analysis also shows that the relative reduction in credit by wholesale-funded banks was more severe for so-called jumbo loans, which cannot be sold to government-sponsored enterprises (GSEs). This suggests that the reduction in lending was likely associated with liquidity challenges in banks. Indeed, the regressions indicate that banks that relied more on securitization through GSEs continued to lend more because such securitization offered a stable source of liquidity for mortgage financing for banks.

Therefore, the results indirectly suggest that the Federal Reserve's purchases of mortgage-backed securities, to the extent that they contributed to improving the liquidity of mortgage loans, helped ease supply constraints in mortgage lending.

Figure 2.3.1. U.S. Banks' Core Deposits-to-Assets Ratio



Sources: Federal Financial Institutions Examination Council, *Consolidated Reports of Condition and Income*; and IMF staff estimates.
Note: Computed as the ratio of demand deposits plus fully insured time deposits to total assets. Small, medium, and large banks are designated according to total assets for lower third, middle third, and top third, respectively.

The author of this box is Jihad Dagher.

[1]The core deposit ratio is a commonly used measure of the extent to which banks rely on traditional insured deposits as a source of funding. It is computed as the ratio of transaction deposits plus fully insured time deposits to total assets.

[2]Specifically, a 1 standard deviation (14 percentage point) increase in the core-deposit-to-asset ratio is associated with a 3.7 percentage point relative decrease in the rejection rate.

encourage banks to restructure debt instead of pursuing foreclosure.

Other countries

Data limitations and econometric challenges prevented a similar analysis in this chapter for other countries, but the general analytical framework can be used elsewhere. The use of better data (including supervisory data connecting individual banks to borrowers) could reveal the factors underlying weak credit developments on a country-by-country basis and pinpoint the policies that would most effectively revive credit activity.[26] In most cases, measures to stimulate loan demand and loan supply will both work; however, their respective effectiveness will depend on the relative sensitivity of credit demand and supply to changes in interest rates and on the other factors that underlie these curves.

Designing Effective Policies for Reviving Credit Markets

Appropriate policies to boost credit activity differ by country. The analysis shows that the causes of slow credit growth differ by country, even for countries that are closely linked (as in the euro area), and may be connected to specific factors that affect the demand for credit (the profitability of firms, their capacity utilization, or debt overhang), or to "pure" credit supply factors (the cost of funds for banks or the level of bank capital), or to both (GDP growth or economic uncertainty). The set of policies that are likely to be effective will differ too and should be identified using a thorough analysis of the underlying constraints in the particular country. Such policies may also target sectors that face particular credit challenges, such as SMEs (see Box 2.4 for policies in Korea). In that context, it may be particularly helpful to promote diversification away from bank credit to increase the options for finance (see Box 2.1). Evidence from previous crises also indicates that swift and comprehensive policy action leads to better outcomes (as in the Nordic countries in the early 1990s; see Box 2.5).

In many cases, demand- and supply-oriented policies are complementary, but the relative magnitude and sequencing of those policies is important. For example, the restructuring of household and corporate debt may negatively affect bank balance sheets. Hence, to restart credit, the restructuring of this debt must go hand in hand with more general repair of banks' balance sheets. Sometimes credit policies can be reinforcing. For example, policies to boost aggregate demand may be expected to boost the demand for credit, but the resulting improved economic outlook may also strengthen banks' balance sheets and relax credit supply constraints. Sequencing is also important: policies to ease credit supply constraints may be appropriate initially, but once they take hold, credit demand may become the constraining factor and additional policy measures may be necessary to boost credit demand. Finally, policymakers should attempt to determine whether constraints are temporary or require a more permanent form of intervention. Most obviously, emergency measures implemented in times of crisis to counter acute market distortions may not be warranted during more tranquil times and should be only temporary.

Credit policies can usefully underpin financial stability by preventing a deeper downturn than otherwise and by sustaining an economic recovery, but as with the use of unconventional monetary policy, policymakers should also recognize the limitations of credit policies. Most policies will be effective only to the extent that they can target underlying constraints to credit demand or supply. Ill-targeted measures may have adverse or conflicting effects. For example, the direct provision of credit by government-sponsored institutions can lead to a suboptimal allocation of capital and significant credit risk if loans are awarded on a noncommercial basis. Also, for countries in which the deleveraging process in banks is seen as an essential element for bringing the financial sector back to health, policymakers may need to accept a period of slower credit growth or a decline in credit. Finally, because policies take time to have an impact, there should be no rush to judgment as to their effectiveness and the need for additional measures.

The potential effectiveness of policies in the near term should be balanced with potential risks to financial stability in the longer run. If multiple policies to enhance credit would be effective, relatively more effort should be placed on those policies likely to have the least detrimental effect on medium-term financial stability. Risks fall into several broad categories:

- *Credit risk:* Policymakers should keep in mind that some policies, while potentially effective in supporting credit, may provide adverse incentives that

[26]Such data are typically confidential and were not available for the analysis in this chapter.

Box 2.4. Policy Measures to Finance Small and Medium Enterprises during Crises: The Case of Korea

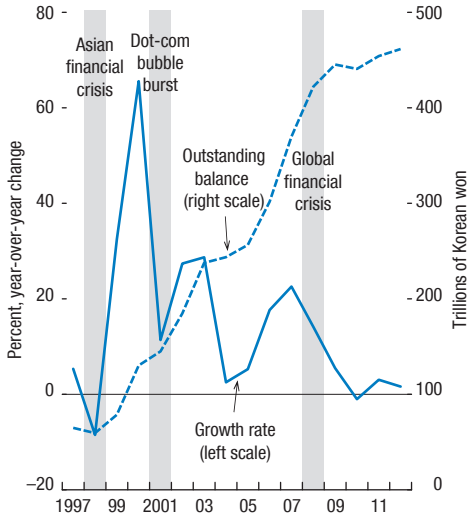
This box demonstrates how Korean authorities responded to crisis-related shocks forcefully and promptly to contain a possible credit crunch for small and medium enterprises (SMEs).

SMEs have been important contributors to economic output, employment, and balanced regional development in Korea. SMEs represented 99.9 percent of the total number of firms and 86.9 percent of the total labor force in 2011. They contributed 48 percent to GDP in 2011 and 69.8 percent of new job creation during 2008–10. More than half of SMEs are located outside the Seoul metropolitan area, contributing to regional economic development.

An economic crisis often constrains financial access for SMEs, but lending to SMEs continued to grow during economic crises in Korea (Figure 2.4.1).[1] Financial crises have a negative impact on SMEs' profitability and creditworthiness in many countries. Financial intermediaries typically tighten credit conditions, thus worsening SMEs' access to finance (OECD, 2013). In contrast, SME loans in Korea recorded positive growth in the year following crises.[2]

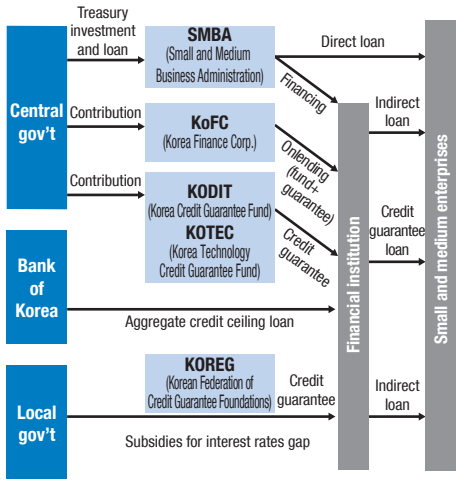
During the Asian crisis, the Korean authorities responded with a host of financial support programs for SMEs (Figure 2.4.2). First, the authorities ramped up existing credit guarantee programs by more than 90 percent on an annual basis (Figure 2.4.3), through the Korea Credit Guarantee Fund (KODIT), the Korea Technology Credit Guarantee Fund (KOTEC), and the Korean Federation of Credit Guarantee Foundations (KOREG).[3] Second, the Bank of Korea raised its aggregate credit ceiling and decreased preferential interest rates on loans by commercial banks to SMEs to provide an additional incentive for SME lending

Figure 2.4.1. Outstanding Balance and Growth of SME Loans



Sources: Financial Supervisory Services; and IMF staff calculations.
Note: SME = small and medium enterprise.

Figure 2.4.2. Financial Support Programs for SMEs



Sources: Yi (2012); and IMF staff modifications.

The authors of this box are Heedon Kang and Yitae Kim.

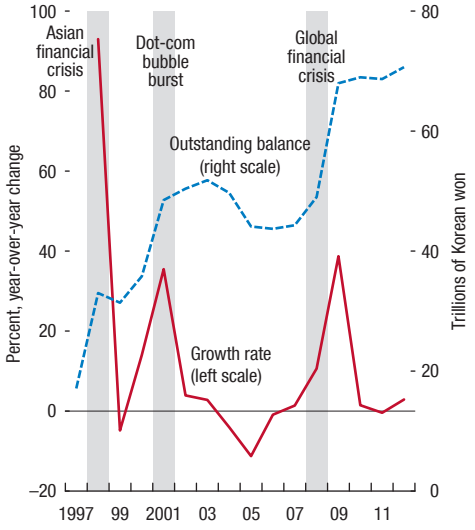
[1]Korea was affected by the 1997–98 Asian financial crisis, the bursting of the dot-com bubble in 2001, the credit card crisis in 2003, and the global financial crisis. The credit card crisis related mainly to household financial conditions, but the other three crises significantly affected the business environment for SMEs.

[2]Bank financing remains the most important source of external financing for SMEs (83.3 percent) in Korea, followed by public lending (10.6 percent). Equity and bond financing accounted for 1.1 percent and 3.2 percent, respectively, in 2011.

[3]The funds facilitate loans by extending credit guarantees to SMEs that lack tangible collateral but have good growth potential. Three agencies support different types of SMEs: the KODIT provides guarantees mostly for non-information-technology-oriented start-ups and exporting SMEs; the KOTEC focuses on information-technology-oriented SMEs; and the KOREG supports regional SMEs.

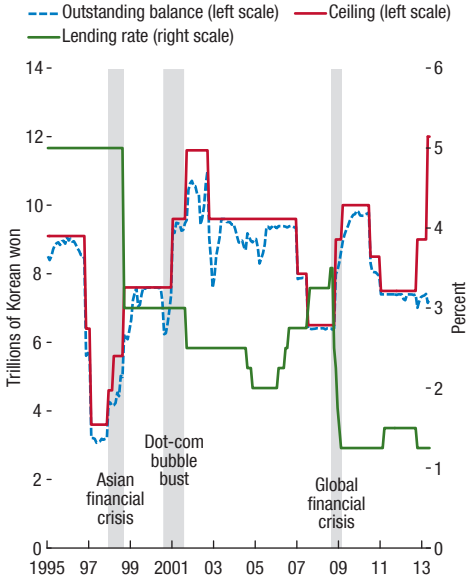
Box 2.4 *(continued)*

Figure 2.4.3. Outstanding Balance and Growth of Credit Guarantees for SME Loans



Sources: Korea Technology Credit Guarantee Fund (KOTEC); Korea Credit Guarantee Fund (KODIT); Korean Federation of Credit Guarantee Foundations (KOREG); and IMF staff calculations.
Note: SME = small and medium enterprise.

Figure 2.4.4. Aggregate Credit Ceiling Loans



Source: Bank of Korea.

(Figure 2.4.4).[4] Third, the Small and Medium Business Administration increased its policy lending to SMEs by more than 60 percent.

A successful experience during the Asian crisis led the authorities to repeat prompt policy responses in later crises.[5] The quick recovery in Korea after the Asian crisis is generally attributed in large part to accommodating macroeconomic policies, a favorable external environment, and a recovery in exports supported by sharp depreciation of the Korean won. However, specific policies to support SMEs also contributed, and so the authorities were quick to implement similar policy measures when the dot-com bubble burst in 2001 and when the global financial crisis erupted in 2008.

The policy measures were instrumental in the prevention of many disorderly SME bankruptcies, which helped stem job losses. Although SMEs were financially stressed and many went bankrupt at the outset of the Asian financial crisis, the number of bankruptcies started to fall dramatically in 1999 (Figure 2.4.5); during later crises, these policies successfully prevented the bankruptcy of solvent SMEs with temporary liquidity shortages. Job losses also reversed quickly in 1999 and did not occur during other crises (Figure 2.4.6).[6] Empirical studies show that supportive programs had strong profit-enhancing effects, especially for innovative start-up SMEs, whose market access is limited despite their higher growth potential (Kang and Jeong, 2006; Kim, 2005).[7]

Although such policy measures can be seen as effective in easing access to finance for SMEs, they can give rise to unintended consequences, such as missed opportunities for restructuring and high fiscal costs. SME financing support programs can undermine

[4]Aggregate credit ceiling loans (ACCLs) are extended by the Bank of Korea to commercial banks based on their SME loan performance, up to a ceiling set by the Monetary Policy Committee. The lending rates on ACCLs are kept lower than the policy rate to encourage banks to lend to SMEs.

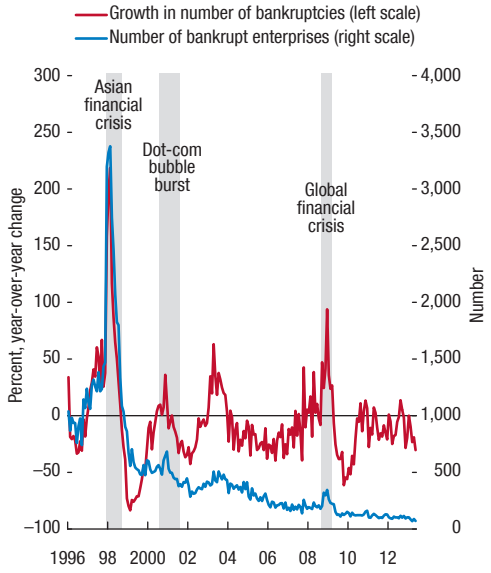
[5]The Korea Finance Corporation was established in October 2009; one of its purposes is to assist SMEs by supplying funds to financial institutions for onlending.

[6]Bankruptcy data disaggregated by enterprise size are not available.

[7]The Bank of Korea enhanced its support for commercial bank loans to innovative start-up SMEs by increasing the ACCL ceiling by 3 trillion won and lowering preferential interest rates from 1.25 percent to 0.5 percent. The Korea New Exchange (KONEX), a new stock market for SMEs, opened July 1, 2013.

Box 2.4 *(concluded)*

Figure 2.4.5. Number and Growth of Bankrupt Enterprises



Sources: Bank of Korea; and IMF staff calculations.

Figure 2.4.6. Growth in Number of Employees

(Percent; year-over-year change)

Sources: Bank of Korea; and IMF staff calculations.

creative destruction of nonviable SMEs. Despite the authorities' strong commitment to reducing the programs' scale, in the wake of the Asian financial crisis there has been an underlying upward trend. This trend is particularly strong in the credit guarantee program, suggesting that political economy considerations may have played a role, which has resulted in a buildup in government contingent liabilities. Nevertheless, the policies so far have aided credit provision to SMEs and supported the Korean economy.

raise financial stability risks, most importantly by affecting credit risk in banks. For example, an attempt to encourage lending to SMEs by changing prudential rules (such as reducing prudential risk weights) could jeopardize financial stability if the resulting risk weights do not appropriately account for the risks embedded in those exposures. Some policies have tolerated or encouraged forbearance on loan payments by distressed firms, which could lead to the practice of "evergreening," whereby banks delay or fail to recognize loans as nonperforming.[27] Government guarantees of loans also affect lender incentives because they may lead banks to relax their screening and monitoring of borrowers. In addition to increasing risks in banks, these incentive effects may lead to a misallocation of capital.

- *Liquidity risk:* Central bank provision of ample liquidity to banks, in part to encourage credit extension, may weaken liquidity management and discourage repair of private bank funding markets, leaving banks overly reliant on central bank funding.
- *Market risk:* Authorities have directly intervened in credit markets to lower interest rates and ease financing conditions.[28] Although appropriate for boosting growth in the current environment, when

[27]For risks associated with recent unconventional monetary policies (including the possibility of evergreening), see Chapter 3 of the April 2013 GFSR.

[28]As an additional risk, low interest rates tend to reduce interest margins, lowering bank profitability.

Box 2.5. Lessons from the Nordic Banking Crises

This box discusses the policy responses of the Nordic authorities to the financial crises of the late 1980s and early 1990s, noting the importance of taking decisive action to avert a lengthy recovery of credit growth.

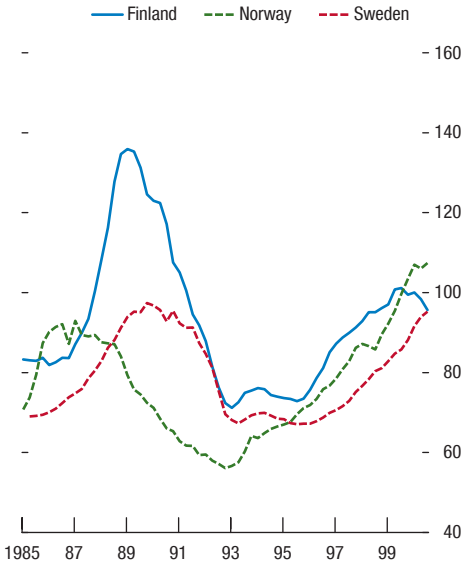
Banking crises struck Norway in 1988 and Finland and Sweden in 1991. Although the episodes varied, each was precipitated by significant financial liberalization and procyclical macroeconomic policies, which triggered rapid credit growth, asset price inflation, and elevated private sector indebtedness (Figures 2.5.1 and 2.5.2). Corrections to real estate prices, rising bankruptcies, and credit losses followed various external shocks (for example, oil price declines, the collapse of the Soviet Union, and the European Exchange Rate Mechanism crisis).[1]

Sufficient macroprudential measures were absent in the run-up to the crises. This was in contrast to Denmark, which successfully avoided a crisis. While financial liberalization also began earlier, Danish banks were better capitalized, in part due to favorable tax treatment of provisions and stricter requirements. Inadequate regulation of large exposures also allowed substantial risks to accumulate in the other Nordic financial systems.

Once the crisis hit, responses varied:

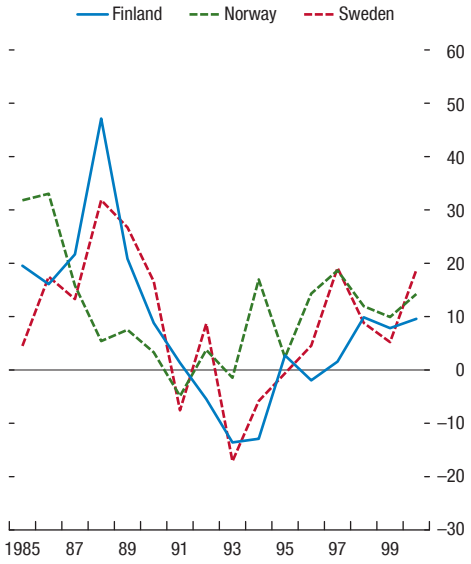
- In *Norway*, an independent fund was established to provide capital when losses threatened to deplete capital at two of the four largest banks. The government eventually took ownership of both, alongside the largest bank.
- In *Finland*, following the takeover of the failed central savings bank, Skopbank, a fund was established to inject capital into the banking system together with blanket guarantees.
- In *Sweden*, one of the two largest banks that failed to meet regulatory capital requirements, Nordbanken, was merged with another bankrupt bank and subsequently broken up into a "bad" and "good" bank. Government capital was injected into the failed banks and to fund the "bad" bank. Blanket guarantees were also issued.

Figure 2.5.1. Real House Price Index in the Nordic Countries
(Quarterly index; historical average = 100)



Source: IMF staff calculations.
Note: Historical average refers to the average price computed over the period 1980 to 2012.

Figure 2.5.2. Lending Growth by Banks
(Percent)



Source: Organization for Economic Cooperation and Development.

The author of this box is Ruchir Agarwal.

[1]Average loan loss provisions over 1990–93 came to 3.4 percent of total loans for Finland, 2.7 percent of total loans for Norway, and 4.8 percent of total loans for Sweden. See Drees and Pazarbasioglu (1998) for a comprehensive treatment of the Nordic banking crisis.

Box 2.5 *(continued)*

Conditional government support and government takeover were a critical part of the resolution. The Nordic governments protected taxpayers by wiping out most of the incumbent shareholders and forcing banks to write down losses before injecting funds. In Finland and Sweden, "bad" assets were transferred to asset management companies that operated independently and with limited regulatory constraints, while the "good" banks focused on core banking tasks, facilitating credit within the system. Unlike the Finnish and Swedish governments, the Norwegian government did not extend its role as "owner of last resort" by guaranteeing bank liabilities and setting up a "bad bank" to deal with nonperforming loans. Since then, each government has maintained a portion of bank ownership.[2]

Decisive policy actions with little political uncertainty were crucial. While lending contracted in the region, a serious credit crunch was avoided. Credit recovered by the mid-1990s due to sound institutions that enabled orderly restructuring and strong governments with the trust of the public to act in their best interest.

[2]Nordbanken eventually grew through regional mergers into the pan-Nordic bank, Nordea, in which the Swedish government's stake was 13 percent until July 2013, when it was reduced to 7.1 percent. The Norwegian government maintained a stake of 34 percent in Norwegian bank DNB as of December 2012. In addition, Solidium Oy, set up initially to manage Skopbank's industrial holdings and still fully owned by the Finnish government, retains a 3 percent share in Nordea through its holdings of the Sampo group.

central banks exit from their intervention, interest rates will eventually rise. If such a rise is more abrupt than expected (as in the adverse scenario in Chapter 1), banks may face substantial capital losses on holdings of fixed-rate securities. In addition, interest rate increases could lead to losses in the loan book as banks pass on their higher cost of funds to borrowers (through, say, variable-rate loans), who may struggle to make higher loan payments.

- *Risk of moral hazard:* Government financial support carries the chance that financial institutions will take more risks than they otherwise would, anticipating that the government will again intervene and bail them out if they face trouble. Policy design should take into account such "moral hazard" and build in incentives for beneficiaries of government intervention to behave prudently so as not to jeopardize public funds. Recent efforts to introduce such incentives are ongoing (FSB, 2011; IMF, 2012c).

Mitigation of these risks may not be necessary or appropriate while the economy is still weak, as it could run counter to the objectives of the credit policies; still, policymakers will need to remain cognizant of these potential risks. In principle, the appropriate supervisory response to increased risks is to put prudential measures in place for mitigation, including enhanced credit risk management, adequate loss provisions, and robust liquidity and capital requirements. However, some credit-enhancing policies are in fact designed to increase risk taking by lenders—for example, changing risk weights for loans to certain sectors. Offsetting prudential measures would undo the effects the policy is trying to achieve. Other policies also serve to enhance financial stability, either directly—for example, by improving the financial position of banks—or indirectly—for example, by improving confidence—so that the extreme downside risks that were present in the crisis are ameliorated. Still, in some cases, there could be tension between supporting credit and raising financial stability risks. If, in such circumstances, the authorities choose to promote credit, then it would suggest that increased credit risk in banks is accepted as part of the cost of credit-supporting policies. Nevertheless, policymakers need to continually weigh the near-term benefits against the longer-run costs of policies aimed at boosting credit.

Credit-enhancing policies raise similar issues of a possible trade-off between objectives in the context of the broader agenda for financial reform. This important and ambitious policy agenda includes more robust capital and liquidity standards for banks under Basel III, enhanced monitoring for shadow banks and other nonbank financial intermediaries, and implementation of macroprudential frameworks. The goals of this

broader policy agenda are to improve the quality and quantity of capital, foster better liquidity management and more accurate asset valuation, and develop and implement more effective macroprudential tools. Overall, these measures should make banks stronger and thus help sustain their role in credit markets in the medium term. Still, in the short term, some regulatory changes may restrain bank lending; for example, enhanced capital requirements may make it more difficult for banks to increase lending. Therefore, putting offsetting measures in place until these short-term constraints are eased may be useful; for example, authorities may wish to urge banks to raise capital so that enhanced capital requirements do not lead to less lending by banks.

In addition to financial stability risks, the potential fiscal costs of policies should be considered.[29] Some measures may raise credit activity but may impose a substantial fiscal cost, including in the form of contingent liabilities. Costs can include potential losses on assets purchased by the central bank, loan losses in state-sponsored institutions engaged in direct lending to firms and households, and the carrying cost (interest) on funds used to recapitalize banks, among others. Contingent liabilities could include expanded deposit insurance and loan guarantees given by the public sector. Some policies, such as adjustments in basic regulation or legal changes, do not incur substantial direct fiscal costs.

[29]See IMF (2010) for estimates of the fiscal costs associated with financial sector support measures during the 2008 crisis for G20 countries.

Better data are crucial for improving the analysis of factors underlying weak credit. The investigation in this chapter was hampered significantly by a dearth of appropriate data, even for the major advanced economies. Policymakers should aim to expand the scope of available data, in particular information that would allow for identification of factors that may constrain loan demand and loan supply. For example, access to disaggregated loan data with information on borrowers and lenders would facilitate the examination of shifts in the supply of credit by effectively controlling for demand, as that data would allow matching of data from borrowers applying for loans at multiple banks. Data from credit registries could be useful in this regard. In addition, more extensive use of lending surveys with better-directed questions would allow for improved analysis. These recommendations are important also for policymakers in emerging markets, who could then apply the framework developed in this chapter.

In sum, measures to stimulate private credit should be designed with care. Policies to boost lending in the short term can be beneficial, but can also carry costs and potential risks to future financial stability if poorly designed or targeted. For prudent policymaking in this area, authorities should (1) identify the constraints to loan demand or supply that can be addressed with government intervention; (2) align the policies with the identified constraints; (3) be mindful of interactions with other policies, including regulatory measures; (4) keep in mind direct and contingent costs of these policies to the government; (5) assess potential longer-term financial stability implications of such policies; and (6) if warranted, establish appropriate prudential measures to mitigate such stability risks.

Annex 2.1. Previous Findings in the Literature on Credit Constraints

Economic theory suggests that financial intermediation suffers from potential intrinsic difficulties in the efficient allocation of scarce credit. Two important difficulties involve (1) a maturity mismatch between long-term borrowers and short-term creditors, and (2) an informational asymmetry between creditors and borrowers. Informational asymmetries occur when a borrower's misbehavior is not observed (moral hazard); when borrowers' risk types are not observed (adverse selection); or when information can be obtained but with some costs (costly state verification). The literature has shown that, despite these market failures, efficient allocation of credit can still be achieved, and permanent government intervention is not necessary (Townsend, 1979; Prescott and Townsend, 1984a, 1984b; Bisin and Gottardi, 2006; Allen and Gale, 2004).[30]

However, in recessions, these market failures may amplify credit contractions. The financial amplification mechanisms and their key factors described below have been confirmed empirically for past major recessions. Preliminary evidence also suggests that these mechanisms are at work in the current recession (see Table 2.7, under the heading *Identifying Amplification Frictions*).

- *Collateral constraints:* Requiring collateral (an asset) from a borrower to secure a loan is appropriate behavior by a lender to help mitigate informational asymmetry. Using collateral to obtain a loan eases the borrower's liquidity constraint (a form of maturity mismatch), because liquidity is obtained from a less liquid asset. A drop in the value of collateral as a result of asset price declines (in stock or bond markets, for example) shrinks the loan that can be obtained with that collateral, tightening credit supply. A similar mechanism affects interbank markets: lower collateral prices would lower the amount banks will lend to each other in interbank markets, restricting bank funding and again tightening credit supply. On a macroeconomic level, this may further lower asset prices (Kiyotaki and Moore, 1997; Gertler and Karadi, 2012; Geanakoplos, 2010). Moreover, when households face tightened collateral constraints, they may increase precautionary saving (by lowering consumption). Although more saving eases credit supply constraints, lower consumption dampens credit demand. These mechanisms may slow economic recovery (Guerrieri and Lorenzoni, 2011).
- *Debt overhang:* Debt overhang can affect credit demand and credit supply. Highly indebted firms may not pursue otherwise profitable business opportunities (Myers, 1977), thus lowering credit demand. Similarly, more highly indebted households may choose not to take out loans, even though doing so could increase their overall current and future well-being. Thus, an economy-wide debt overhang can slow growth and deflate asset prices (Adrian and Shin, 2013), negatively affecting collateral values (and thus further constraining credit creation). Debt overhang can also affect credit supply when the overhang is in banks: highly leveraged banks may have difficulty obtaining funding (for example, in the interbank markets) and thus lack the liquidity to make additional loans.
- *Relationship banking:* Informational asymmetry can ease when banks and their borrowers have ongoing business relationships, which allow banks to know their customers and keep borrowers from misbehaving in order to obtain loans in the future (Townsend, 1982; Sharpe, 1990; Rajan, 1992). However, in a severe recession, many of those relationships may disappear because of the actual (or potential) bankruptcies of banks and firms. Banks respond by raising the risk premium they charge on loans, in essence tightening the supply of credit.

During normal times, the government's role in mitigating intrinsic market failures is limited. The government cannot acquire better information on borrowers or change maturity preferences. Still, structural policies can be pursued to increase information flows (for example, by instituting or improving a credit registry or enhancing accounting standards and public disclosures) or to promote alternatives to bank credit, such as a corporate bond market or securitization.

But when market failures amplify severe downturns, government intervention has a clearer role. In such situations, the government can use its credit rating, generally higher than that of the private sector, to ease credit constraints. For example, a central bank could lend directly to firms (Gertler and Karadi, 2012), thus taking over the financial intermediation role. It

The author of this annex is Kenichi Ueda.

[30]Exceptions are government intervention through deposit insurance and microprudential regulation. The former prevents bank runs that may result from maturity mismatches and the latter prevents excessive risk taking by banks, including as a result of deposit insurance.

Table 2.7. Previous Findings in the Literature

Category/Paper	Country/Region	Year	Methodology	Data	Key Findings
Creditless Recovery					
Calvo, Izquierdo, and Talvi (2006)	31 emerging markets	1980–2004	Descriptive charts	Country-level data	Quick recovery is often observed without credit.
Claessens, Kose, and Terrones (2012)	44 countries	1960–2010	Regression of duration of recession	Country-level data	Creditless recovery is slower, in particular after asset price bust.
Abiad, Dell'Ariccia, and Li (2011)	48 countries	1964–2004	Panel regression	Industry-level data	Creditless recovery is slower, especially for industries relying on external finance.
Sugawara and Zalduendo (2013)	96 countries	1965–2011	Probit regression (takes value of 1 for creditless recovery)	Country-level data	Creditless recovery is not rare, 25 percent of all episodes. About half occurred in 2009–10. Creditless recovery is slower but only during the first two years.
Identifying Amplification Frictions					
Collateral Constraints					
Gan (2007a)	Japan	1994–98	Natural experiment, panel regression	Bank-firm matched micro data, loan level	Firm's collateral (land) value matters for investment (0.08 elasticity) and loan amounts.
Jermann and Quadrini (2012)	United States	1984–2010	Structural estimation, dynamic stochastic general equilibrium	Flow of funds	Estimates key parameter values of DSGE model with financial frictions (i.e., stochastic collateral constraint). Finds importance of stochastic collateral constraint to explain actual data.
Guerrieri and Lorenzoni (2011)	United States	2000–10	Calibration, dynamic stochastic general equilibrium	County-level data	Households' collateral constraints can explain low interest rates and slow recovery during recession with credit crunch because households increase precautionary savings after loss of borrowing capacity.
Fraser (2012)	United Kingdom	2001–09	Panel regression	SME firm-level data	Compared with precrisis, in 2007–09, more SMEs are asked for collateral when applying for loans. The ratio of loan amount to collateral value has declined. Higher margins and fees are paid. Yet more loan applications are rejected.
Debt Overhang					
Hennessy (2004)	United States	1992–95	Structural estimation, investment theory	Firms with bond ratings	Corporate debt overhang is confirmed.
Gan (2007b)	Japan	1994–98	Natural experiment, panel regression	Bank-firm matched micro data, loan level	Banks' exposure to real estate (i.e., nonperforming loans) affects new lending.
Jiménez and others (2012)	Spain	2002–10	Panel regression	Bank-firm matched micro data, loan level	Banks' capital ratio and liquidity ratio matter for loan provision to firms.
Donovan and Schnure (2011)	United States	2007–09	Panel regression	County-level data	Inefficient lock-in effect may arise: Underwater households cannot move, so labor market mismatch could worsen. Household movements indeed declined within a county, but out-of-county migration was not affected much, suggesting effects on the labor market were small.
Lee, Sameen, and Martin (2013)	United Kingdom	2007–12	Panel regression	SME firm-level data	Innovative small firms find it harder to access finance than other small firms.
Kalemli-Ozcan, Kamil, and Villegas-Sanchez (2010)	Six Latin American countries	1990–2005	Panel regression/crisis event study	Firm-level data	In a twin (currency and banking) crisis, exporters should demand credit to take advantage of improved competitiveness, but they suffer from collateral constraints and banking sector distress. Similar exporters with higher foreign ownership have much larger investment, confirming importance of bank liquidity/capital channel.
Relationship Banking					
Petersen and Rajan (1994)	United States	1988–89	Panel regression	U.S. SMEs firm-level data	Bank relationship is important for quantity of firm-level credit.
Peek and Rosengren (2000)	United States	1990s	Natural experiment	U.S. state-level activity data and Japanese bank-level data	State-level real activities are affected by distressed Japanese banks through their branches.
Ashcraft (2005)	United States	1988, 1992	Natural experiment	U.S. county-level activity data	County-level real activities are affected by sudden bankruptcy of banks.
Karaivanov and others (2010)	Spain	2000–06	Structural estimation, general equilibrium model with moral hazard	Bank-firm matched micro data	Moral hazard is not a problem in bank-firm relationship but explains data well for firms that do not rely on banks but on trade credit.
Ongena, Peydró, and van Horen (2013)	Eastern Europe	2008–09	Natural experiment, cross-section regression	Bank-firm matched micro data	Firms that had relationship with western European banks suffered more.
Albertazzi and Marchetti (2010)	Italy	Six months post Lehman	Natural experiment, cross-section regression	Bank-firm matched micro data	Low bank capitalization and scarce liquidity matter. While larger low-capital banks reallocated loans away from riskier firms, smaller low-capital banks seem to "evergreen" loans.
Caballero, Hoshi, and Kashyap (2008)	Japan	1993–2002	Panel regression	Firm-level regression/theoretical exposition	With subsidized loans, unviable firms (zombies) survive. Banks have incentives to evergreen loans, e.g., to circumvent the capital ratio requirement with regulatory forbearance. Increase in the number of zombies depresses investment and employment growth and lowers productivity.

(Continued)

Table 2.7. Previous Findings in the Literature *(continued)*

Category/Paper	Country/Region	Year	Methodology	Data	Key Findings
Alternative Credit Sources					
Klapper, Laeven, and Rajan (2012)	Global Fortune 500	2005	OLS	Transaction-level data	Trade credit is widely used in the world.
Chari, Christiano, and Kehoe (2008)	United States	2001–08	Descriptive charts	Flow of funds	Bank credit lines are used well during episodes of sudden malfunctioning of security market.
Ivashina and Scharfstein (2010)	United States	2000–08	Descriptive charts	Various micro data	New loans dwindled about 80 percent from the peak in 2008:Q4, but credit line drawdowns increased. Given bank funding strains, credit line drawdowns further constrained banks from making new loans.
Chari (forthcoming)	United States	1952–2012	Descriptive charts	Flow of funds	Total available funds seem sufficient to cover investment, but aggregate data may provide misleading picture of true financing needs.
Carbó-Valverde, Rodríguez-Fernández, and Udell (2012)	Spain	1994–2008	Demand/supply disequilibrium MLE	SME firm-level data	SMEs' use of trade credit increased after onset of crisis.
Jiménez and others (2011)	Spain	1999–2009	Panel regression	Bank-firm matched micro data, loan level	Securitization of real estate loans did not affect credit for nonreal-estate firms in general but increased credit for first-time borrowers.
Deutsche Bundesbank (2012)	Germany	1991–2010	Descriptive charts	Country-level data	German firms became less reliant on bank lending.
Credit Supply and Demand					
IMF, GFSR (2011–13)	Europe	2008–13	Descriptive charts	Country-level data	Abnormally low credit supply and high risk premium were observed.
IMF (2013b)	21 CESEE countries	2001–11	Panel regression	Bank-level data	In the credit slowdown during 2008–11, macroeconomic conditions played a particularly large role in 2009. In 2010 and 2011, however, the large factor was banks' own weakened fundamentals and their more conservative way of responding to these fundamentals.
IMF (2013a)	18 OECD countries	1980–2009	Aggregate country panel regression	Country-level data	High levels of sovereign, corporate, and household debt are detrimental to growth.
IMF (2012a)	Ireland	2002–12	Panel regression	Country-level data/bank lending survey	Weak lending is mostly demand driven (3 to 4 bps increase in quarterly lending growth with one unit increase in demand factor in the survey), although supply factors play a role in mortgage lending and pockets of SME lending.
IMF (2013d)	Portugal	2007–12	Descriptive charts	Country-level data	Firms' rapid deleveraging is mainly voluntary, driving deleveraging by banks. However, according to the INE Investment Survey, credit conditions have tightened significantly in some segments.
OECD (2013)	OECD countries	2007–12	Descriptive charts/statistics	Country-level data	Overall, SME access to finance in 2011 and early 2012 was tight but appears stabilized. Still, conditions vary widely across countries.
Zoli (2013)	Italy	2006–12	VAR/system of equations	Country-level data	News on sovereign crisis affects Italian banks' CDS and bond spreads. Banks with lower capital ratios and higher nonperforming loans show more sensitivity. In turn, corporate loan rates are affected by sovereign risks, with 30 to 40 percent pass-through. Both demand and supply factors from bank lending surveys explain quarterly credit growth significantly.
Lam and Shin (2012)	Japan	2000–12	Descriptive charts	Various country level data	Credit growth is low, especially for SMEs. A reason appears to be the existence of many unviable SMEs, partly as the result of credit support policies.
Lown and Morgan (2006)	United States	1968–84 1990–2000	VAR	Country-level data/bank lending survey	Bank lending standards (U.S. Senior Loan Officer Opinion Survey) are found to be important in explaining actual loan amount and real output.
Gilchrist and Zakrajsek (2012)	United States	1973–2010	VAR	Country-level data	Constructs a better credit spread index based on corporate bond spread: the excess bond premium. This time-varying premium explains most of GDP growth.
Hempell and Sørensen (2010)	Euro area	2003–09	Panel regression	Country-level data/bank lending survey	Bank loan growth is explained by both supply and demand factors covered by the Bank Lending Survey. The credit supply factor is stronger in the crisis period in quarterly growth rate of bank lending to firms (2 bps vs. 1 bp beforehand). Demand factor is about 1 bp.
Hristov, Hülsewig, and Wollmershäuser (2012)	Euro area	2003–10	VAR	Country-level data	Uses sign restrictions to identify aggregate supply and demand and loan supply shocks. Loan supply shocks are found to be significant. The loan supply shock was quite large in 2008:Q4, but is close to zero by 2010:Q2. Heterogeneity among countries has also been reduced.

(Continued)

Table 2.7. Previous Findings in the Literature *(concluded)*

Category/Paper	Country/Region	Year	Methodology	Data	Key Findings
Ciccarelli, Maddaloni, and Peydró (2013)	Euro area	2002–11	VAR	Country-level data/bank lending survey	Uses bank lending survey outcomes as credit supply and demand shocks. Monetary transmission is affected through the credit channel only in distressed countries. The transmission stems from impaired bank balance sheets for 2008–09 (only) and from weak credit demand for 2008–11. The former effect is also smaller, implying monetary policy was effective for the former but not for the latter.
Beer and Waschiczek (2012)	Austria	2002–11	Bayesian model averaging	Country-level data/bank lending survey	Loan amounts are mostly demand driven (about 90 percent) and credit supply plays a negligible role.
Del Giovane, Eramo, and Nobili (2011)	Italy	2002–09	Panel regression	Bank lending survey/bank-level data	Both credit supply and demand play a role. For 2007–09, the credit supply factor lowered loan amounts 2.3 to 3.1 percent, of which one-quarter is attributed to banks' weak capital positions and the other to increased perception of borrowers' credit risk.
Blaes (2011)	Germany	2003–10	Panel regression	Bank lending survey/bank-level data	Bank lending has been both supply and demand driven, even in the crisis period. At the peak between 2009:Q3 and 2010:Q1, credit supply factors in bank lending surveys explain 35 to 40 percent of bank lending, equivalent to about a 0.5 percent dampening of quarterly loan growth.
Lacroix and Montornès (2010)	France	2003–10	OLS	Country-level data/bank lending survey	Bank lending is explained by both supply and demand factors in the bank lending survey. For business loans, each factor contributes about half of the loan growth deviation from the sample mean during the crisis period. However, from 2008:Q2 to 2009:Q2, supply factors were stronger, but demand factors became stronger since.
Bassett and others (2012)	United States	1992–2011	VAR/panel regression	Country-level/loan level data/ bank lending survey	Constructs a cleaner credit supply measure: a lending survey component that is unexplained by macro and bank-level factors. Credit supply effects become larger than when using only the bank lending survey.
Bank of England (2013)	United Kingdom	2007–13	Descriptive charts	Country-level/bank lending survey	The overall availability of credit to the corporate sector has increased recently. However, demand remained mixed, likely due to a lack of confidence among firms. As for households, the amount of new secured credit increased significantly recently.
Amiti and Weinstein (2013)	Japan	1990–2010	Decomposition of loan movements	Bank-firm matched micro data	Loan movements are decomposed into bank, firm, industry, and common shocks. The bank supply shocks explain 40 percent of aggregate loan and investment fluctuations.

Source: IMF staff.

Note: bp = basis point; CDS = credit default swap; CESEE = central, eastern, and southeastern Europe; DSGE = dynamic stochastic general equilibrium; INE = Instituto Nacional de Estatística; MLE = maximum likelihood estimation; OECD = Organization for Economic Cooperation and Development; OLS = ordinary least squares; SMEs = small and medium enterprises; VAR = vector autoregression.

can also loosen collateral rules to ease the liquidity constraints that result from declines in collateral values. Treasuries can use their superior credit status similarly, for example, by extending subsidized loans via state-sponsored institutions. In addition, governments can remedy debt overhang by facilitating debt restructuring—for example, through bank recapitalization, purchases of nonperforming assets, or reforms of laws related to bankruptcy. These government interventions also help preserve relationships between banks and clients, easing another potential market failure.

The market itself may also find ways to ease credit constraints. In some countries, credit from alternative sources has likely mitigated increased market friction during the recent recession (see Table 2.7, under the heading *Alternative Credit Sources*). For example, when the money and corporate bond markets did not function well after the collapse of Lehman Brothers, it appears that existing bank credit lines were used more intensively in the United States, although perhaps by crowding out new loans (Chari, Christiano, and Kehoe, 2008; Ivashina and Scharfstein, 2010). In another example, credit-constrained SMEs in Spain increased their use of trade credit (Carbó-Valverde, Rodríguez-Fernández, and Udell, 2012).

Previous studies have also looked at credit market developments in various countries (see Table 2.7, under the heading *Credit Supply and Demand*). Some studies have found that credit supply appeared to constrain credit growth in many countries, in particular during late 2008 and 2009 (Hempell and Sørensen, 2010; Del Giovane, Eramo, and Nobili, 2011). Others also found low credit demand from 2008 to date in a number of (mostly advanced) economies (Ciccarelli, Maddaloni, and Peydró, 2013).

Annex 2.2. Determinants of Bank Lending Standards

European Central Bank and Federal Reserve survey results indicate that lending standards for corporate and mortgage loans tightened considerably in late 2008 for most countries (Figures 2.12 and 2.13). Conditions eased during 2010, but during the past two years some European countries experienced a second round of tightening in lending standards. In the United States, corporate lending standards have not seen further strains since 2008–09.

The surveys ask loan officers for the reasons behind tightened lending standards, which allows the construction of a variable that reflects mostly supply constraints. Responses on the tightness of lending conditions may not necessarily reflect "pure" constraints on the supply of credit, such as bank liquidity and capital. The responses could also reflect effects on the standards from changes in borrowers' creditworthiness, the economic outlook, economic uncertainty, and the like. Aside from potentially affecting the willingness of banks to make loans, these factors are also related to loan demand conditions. The influence of these factors can be statistically removed from the lending standards variable (following Valencia, 2012) to obtain a measure of lending standards that more closely reflects the ability of banks to supply credit—that is, connected to bank balance sheet constraints.

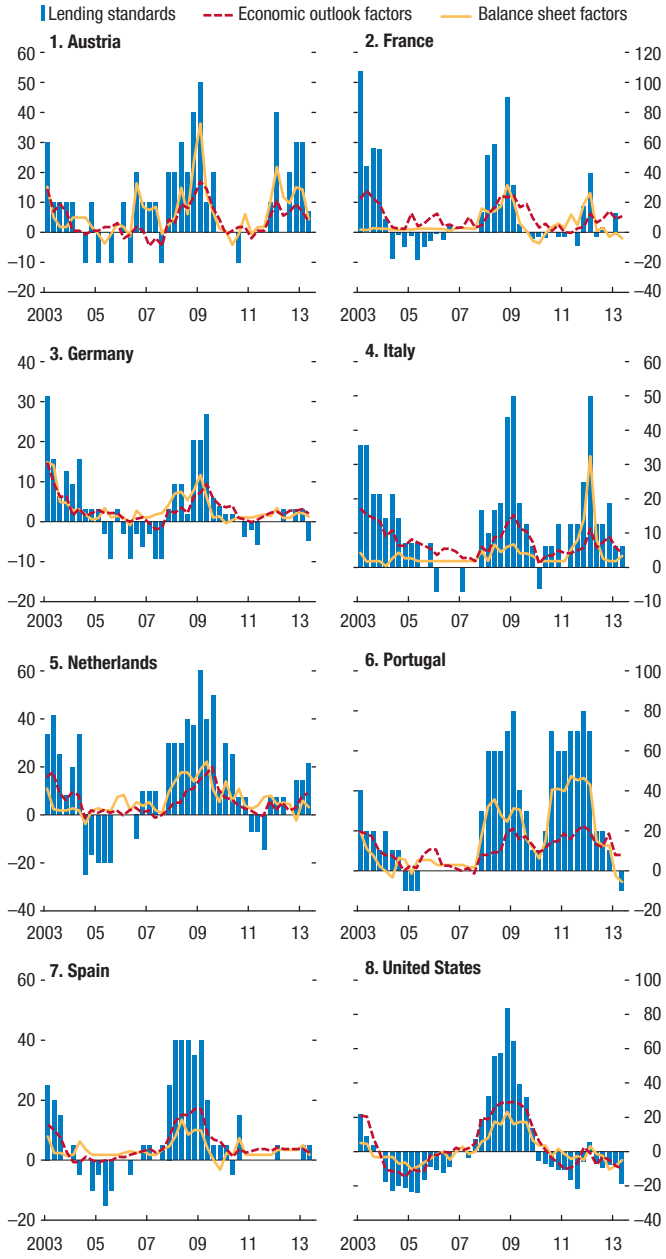
To find the determinants of bank lending standards, a regression is run with the overall credit standards index as a dependent variable and the reasons for tightening as explanatory variables. The results for the euro area are shown in Table 2.8.[31] The sample includes Austria, France, Germany, Italy, Luxembourg, the Netherlands, Portugal, and Spain. Regressions are also run in which the real GDP forecast and stock market volatility are included instead of answers related to the economic environment, as more direct proxies for the latter. This specification corresponds to the second and fifth columns in Table 2.8, for corporate and mortgage loans, respectively.[32] Balance sheet constraints (capital

The author of this annex is Nicolas Arregui.

[31]The specifications for corporate and mortgage loans differ because the available options included in the surveys to justify the tightening or easing in lending standards for corporate and mortgage loans differ.

[32]We also include a specification augmented with the expected behavior of demand taken from the survey because banks may change lending standards based on an expected change in demand behavior. The variable is not significant.

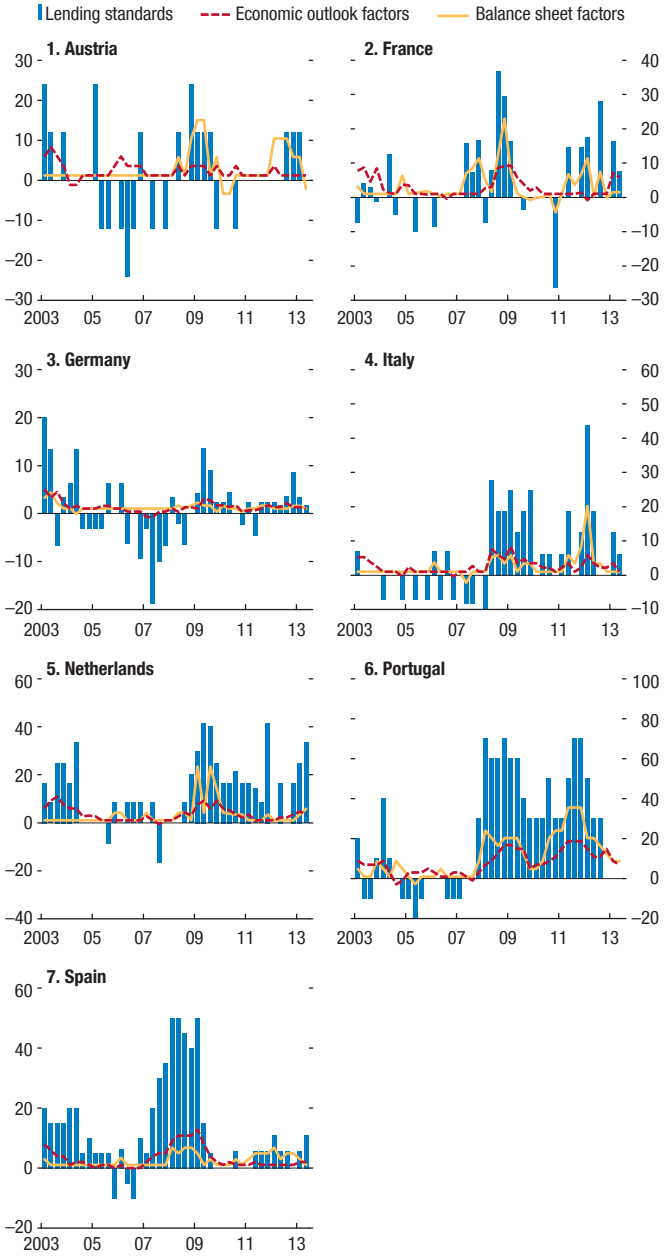
Figure 2.12. Decomposing Lending Standards: Corporate Loans



Sources: European Central Bank, Bank Lending Survey; Federal Reserve, Senior Loan Officer Survey; and IMF staff calculations.

Note: Y-axes have different scales. For European countries, lending standards correspond to enterprises and are measured as weighted net percentages. For the United States, lending standards correspond to commercial and industrial loans to large and middle-market firms and are measured as unweighted net percentages. Economic outlook and balance sheet factors are constructed using the first specification in Table 2.8 (Table 2.9 for the United States). Economic outlook factors are the fitted values constructed using the responses to general economic activity and industry and firm outlook (general economic activity for the United States) and setting all other coefficients to zero. Analogously, balance sheet factors are the fitted values constructed using the responses to capital and liquidity position and access to market financing (capital position for the United States).

Figure 2.13. Decomposing Lending Standards: Mortgage Loans



Sources: European Central Bank, Bank Lending Survey; and IMF staff calculations.
Note: Y-axes have different scales. Lending standards correspond to mortgage loans and are measured as weighted net percentages. The results for France are weighted by the share of the outstanding loans issued by each bank in the French Bank Lending Survey sample in the total outstanding loans issued by all the banks in the sample. Economic outlook and balance sheet factors are constructed using the first specification in Table 2.8. Economic outlook factors are the fitted values constructed using the responses to general economic activity and setting all other coefficients to zero. Analogously, balance sheet factors are the fitted values constructed using the responses to cost of funds.

and liquidity position, access to market financing for corporate credit, and cost of funds for mortgage loans) are significant. Competition from other banks turns out to be significant for both types of credit. The general outlook and housing prospects are also significant. Table 2.9 shows the results for the United States. The capital position and economic outlook are significant in this case.

Using the coefficients from the first stage, measures of lending standards are constructed in which the influence of non-balance-sheet factors is removed. Fitted values of the dependent variables are constructed using the coefficients on the balance sheet factors: capital position, market financing, liquidity (for corporate loans), and the cost of funds (for mortgage loans), while all other coefficients are set to zero. The capital position is used for the United States.

Figures 2.12 and 2.13 show the resulting decomposition of lending standards for corporate loans and mortgage loans, respectively, into demand and supply factors for major countries for which long data series are available (with different y-axis scales, as appropriate). In general, the figures show that lending standards are, in fact, affected to a considerable extent by the economic outlook, which also affects loan demand. The supply factors related to bank balance sheet constraints come into play in specific periods during the crisis and its aftermath. For example, for corporate loans, supply factors restricted lending standards at the start of the financial crisis in France, Germany, and the United States and also came into play in early 2012 in France and Italy as financial strains increased in the euro area.[33] For mortgage loans, balance sheet constraints also restricted lending standards at the beginning of the crisis in most European countries shown and again in 2012 in Austria, France, Italy, and Portugal.

The next step is to determine how credit growth is affected by the demand and supply effects measured by the adjusted survey responses. Credit growth is assumed to depend partly on past credit growth (to capture momentum or "persistence" effects) and partly on loan demand and supply conditions as measured

[33]The analysis does not show supply factors playing a significant role in recent years for Spain. Because the survey shows only changes in lending standards, it may be that the level is already quite tight. Alternatively, this may be the result of reporting bias (with banks adjusting their survey responses to downplay funding strains).

Table 2.8. Euro Area: Determinants of Bank Lending Standards

Dependent Variable: Overall Lending Standards, 2003:Q1–13:Q2							
	Corporate Loans				Residential Mortgage Loans		
	(1)	(2)	(3)		(4)	(5)	(6)
Capital Position	0.112	0.308***	0.112	Cost of Funds	0.384***	0.679***	0.363***
	(0.085)	(0.062)	(0.084)		(0.087)	(0.097)	(0.099)
Access to Market Financing	0.317*	0.436***	0.317*	Competition from Other Banks	0.234**	0.217	0.230**
	(0.141)	(0.092)	(0.143)		(0.089)	(0.126)	(0.093)
Liquidity Position	0.243**	0.175	0.243**	Competition from Nonbanks	–0.231	–0.261	–0.237
	(0.093)	(0.102)	(0.090)		(0.177)	(0.243)	(0.163)
Competition from Other Banks	0.179***	0.271**	0.179***	General Economic Activity	0.197***		0.193***
	(0.034)	(0.095)	(0.038)		(0.037)		(0.036)
Competition from Nonbanks	–0.256	–0.357	–0.256	Housing Market Prospects	0.274**		0.260**
	(0.252)	(0.338)	(0.247)		(0.106)		(0.095)
Competition from Market Financing	0.557*	0.775	0.557*				
	(0.263)	(0.425)	(0.252)				
General Economic Activity	0.125*		0.125*				
	(0.062)		(0.062)				
Industry or Firm Outlook	0.128*		0.128				
	(0.061)		(0.068)				
Collateral Risk	0.338		0.338				
	(0.230)		(0.231)				
Stock Market Volatility		0.521***				0.374**	
		(0.131)				(0.134)	
Expected Real GDP Growth		1.663**				1.336	
		(0.542)				(1.748)	
Expected Behavior of Demand			0.001	Expected Behavior of Demand			–0.033
			(0.035)				(0.041)
Observations	336	287	336		336	287	336
R Squared	0.767	0.710	0.767		0.617	0.540	0.619
Number of Countries	8	7	8		8	7	8

Source: IMF staff estimates.

Note: Variables measured as weighted net percentages (share of banks that report a significant or moderate tightening, mutiplied by 1 and 0.5, respectively, minus the share of banks that report a significant or moderate easing, mutiplied by 1 and 0.5, respectively). Sample includes Austria, France, Germany, Italy, Luxembourg, the Netherlands, Portugal, and Spain. Fixed effects regressions with robust standard errors are in parentheses. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

Table 2.9. United States: Determinants of Bank Lending Standards

Dependent Variable: Overall Lending Standards, 1999:Q1–2013:Q2	
	United States Commercial and Industrial Loans
Capital Position	0.601**
	(0.270)
Economic Outlook	0.290***
	(0.085)
Liquidity in Secondary Market	0.049
	(0.161)
Competition from Other Banks	0.039
	(0.031)
Tolerance for Risk	0.036
	(0.093)
Observations	58
R Squared	0.899

Source: IMF staff estimates.

Note: Variables are measured as unweighted net percentages (share of banks reporting a significant or moderate tightening minus the share of banks reporting a significant or moderate easing). Ordinary least squares regressions with robust standard errors are in parentheses. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

by the decomposition of the lending standards variable from the surveys.[34] Formally, the regression

$$Credit\ growth_t = \alpha + \beta Credit\ growth_{t-1} + \gamma_i Demand\ factors_{t-i} + \delta_i Supply\ factors_{t-i} + \varepsilon_t \quad (2.1)$$

is estimated using quarterly data for the period 2003:Q1–2013:Q1 for European countries and 1999:Q1–2013:Q1 for the United States. The subscript i indicates lags of the variables. Several lags could be included, adding more terms to the equation. ε is a random error term.

The coefficients found in the regressions, shown in Table 2.4 in the main text for the euro area and the United States, can be used to calculate how much of the recent evolution in corporate and mortgage credit growth can be explained by demand and supply factors (see Figures 2.8 and 2.9 in the main text). The demand component is the fitted values constructed recursively using the lags for the demand index and setting the "pure" supply index to zero. The supply component is constructed analogously.

[34]Demand factors are measured by the net fraction of banks that report in the survey that they observe an increase in demand for loans.

Annex 2.3. A Model of Bank Lending

A simple model of credit markets consists of two equations: a supply equation for new loans and a demand equation.[35] Both the supply of and demand for bank loans are functions of the lending rate and other variables. In the familiar price-quantity plot (Figure 2.14), the supply curve slopes upward and the demand curve slopes downward: banks will supply more loans if the interest rate is higher, and borrowers will demand fewer loans if the rate is higher. The lending interest rate adjusts to clear the market—that is, to equalize demand and supply.[36] The magnitude of the reduction in the equilibrium quantity of new bank loans associated with an increase in lending rates depends on the sensitivity (or elasticity) of both credit demand and supply to interest rates.

Changes in other determinants of the volume of loans will shift these curves. For example, if banks' funding costs rise, they will tend to supply fewer loans at an unchanged interest rate, so the supply curve will shift left. If the determinants of demand do not change, then the equilibrium interest rate will rise and the volume of loans will fall. Similarly, if the demand for loans contracts (as a result of a reduction in economic activity, for instance), then the demand curve will shift downward. In the new equilibrium, the lending rate will fall, as will the volume of loans.

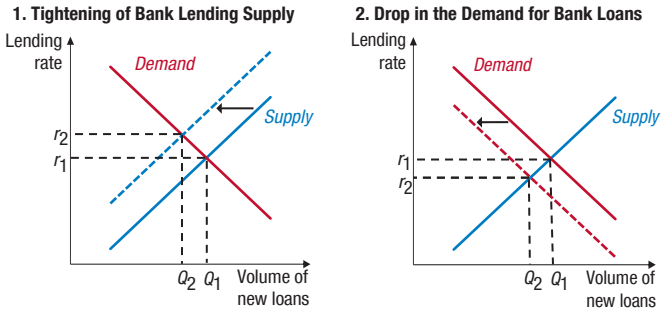
The shifts in the demand and supply curves cannot be observed directly, but if underlying factors can be found that shift one and not the other, the supply and demand equations can be traced out—or "identified"—separately. Those variables are referred to as "shifters" because they move one or the other curve, as in Figure 2.14. Finding shifters is an econometric challenge owing to the many variables that affect both curves, and if both curves shift simultaneously, neither one is identified. The proper identification of the model is further complicated by the potential endogeneity of shifters.

There are several potential shifters for the supply curve. As suggested earlier, the cost of funding for banks (proxied by the deposit rate and by banks' credit default swap spreads)[37] is a shifter—presumably it does not affect the demand for loans by borrowers. The banks' capital-to-total-assets ratio (banking regulations impose certain capital requirements on banks, affecting their ability to lend) is another supply shifter.[38]

Potential demand shifters are also included in the model. The rate of capacity utilization affects firms' decisions to invest and consequently their demand for credit. The availability of other sources of financing, especially market financing, will also determine firms' demand for bank loans, to the extent that debt issuance and bank loans are substitutes from the firm's point of view.[39]

Other variables affecting both the supply of and demand for bank lending are included in both equations. Table 2.5 in the main text includes a column

Figure 2.14. Effects of a Tightening of Lending Supply and a Drop in Lending Demand



Source: IMF staff illustration.

The author of this annex is Frederic Lambert.

[35]Theoretically, repayments of previously granted loans should not be deducted from new loans. However, because data on gross flows of bank loans are not available, the empirical analysis uses net transaction flows or changes in stocks as a proxy for new loans.

[36]Market failures, such as maturity mismatches and informational asymmetries, will add certain surcharges (or premiums) to the risk-free short-term interest rate (for example, a term premium and a risk premium). Equilibrium interest rates contain such premiums.

[37]Credit default swap spreads affect the cost of wholesale funding for banks, but are available only for a few banks in each country (which may not necessarily be representative of that country's entire banking sector) and have been available only for the past few years. These data were used only when the resulting sample reduction did not prevent a proper identification of the model.

[38]The results for Japan, Spain, and the United Kingdom are robust to using the bank price-to-book ratio instead of the capital-to-asset ratio. However, this variable, which is more volatile than the ratio based on accounting data and reflects the condition of listed banks only, does not allow for proper identification of the model in the case of France.

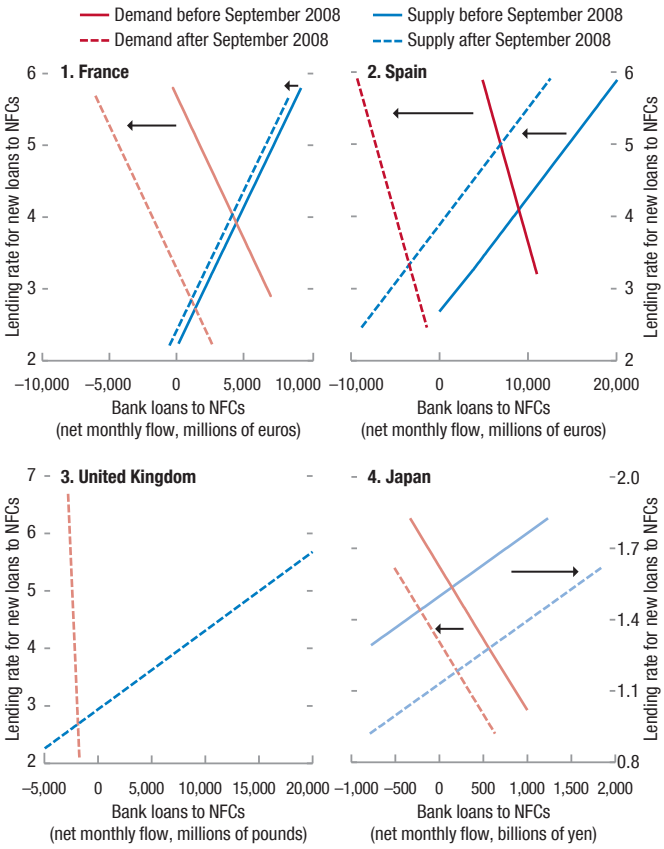
[39]The availability of other financing is proxied by the average outstanding debt securities issued by nonfinancial firms as a share of total nonfinancial corporate debt. It is computed over the previous four quarters to limit the endogeneity bias that may result from firms' recourse to capital market financing in response to a contraction in the supply of bank loans, while still capturing recent progress in the development of corporate bond markets.

with the expected influence (sign) of each variable on either the supply or demand, or both.

- GDP forecasts are expected to be positively related to both loan supply (higher future output implying a greater ability of borrowers to repay) and loan demand (higher expected output encouraging firms to borrow to invest).
- An increase in economic uncertainty (represented by the standard deviation of the GDP forecast) has the opposite effect. Inflation is expected to negatively affect the supply of loans and positively affect demand because it reduces the real value of debt over time.
- Growth in the stock market index (covering financial and nonfinancial firms) is used as a proxy for changes in the value of collateral that firms can use to secure loans; higher collateral value should imply a higher willingness of banks to lend. In addition, higher stock values make it easier for banks to raise new capital for lending. It also makes it easier for firms to raise new capital for investment without having to borrow. The variable should thus be positively associated with the supply of loans but negatively with the demand for loans.
- The debt-to-equity ratio and profitability of firms, along with corporate spreads, are used to capture the quality of the pool of borrowers: higher debt to equity and higher corporate spreads should be associated with reduced lending from banks, while higher firm profitability should increase credit supply. Higher debt may also reduce the demand for additional loans (the debt overhang effect discussed earlier), whereas higher profitability increases the amount of resources available for self-financing, thus limiting the need for bank lending. Higher corporate spreads indicate a higher market funding cost, which should lead firms to prefer bank credit, thereby raising bank credit demand.

The system of two equations is estimated on country-level data by three-stage least squares. The sample period varies depending on the country. The longest period covers a little more than 10 years, from February 2003 to March 2013. All variables are monthly except those relating to debt of nonfinancial corporations, profitability, and capacity utilization, which are quarterly and are linearly interpolated. The lending rate is "instrumented" by all other variables in the system. The potential endogeneity of other regressors is dealt with by lagging some of the variables by one period. Yet endogeneity issues remain. For example,

Figure 2.15. Fitted Supply and Demand Curves for Bank Loans to Firms



Source: IMF staff.
Note: NFC = nonfinancial corporation. The plots show the fitted supply and demand curves before and after the collapse of Lehman Brothers in September 2008, using the coefficients estimated over the full sample period from Table 2.5 and assuming that the explanatory variables equal their means over the two separate periods. Light shades of red and blue indicate that the slope is not statistically significant.

GDP forecasts and changes in the stock market index (which reflect markets' expectations about the future) are likely affected by the ability of firms to get funding to finance their activities.

Because finding appropriate demand and supply shifters at a monthly or quarterly frequency is a challenge, data availability restricted the sample of countries significantly. For some countries, conceptually appropriate demand shifters could be identified, but adequately long time series of sufficient frequency could not be found. Highlighting the technical challenge of identification, even in some cases in which data were available, the shifters were not significant in the regressions or other econometric problems emerged. In the end, results were obtained for France, Japan, Spain, and the United Kingdom.

The plots of the estimated demand and supply curves as functions of the lending rate show how the curves shifted after September 2008 (Figure 2.15). The plots are constructed using the coefficients estimated over the full sample period and the means of the explanatory variables over the two separate periods, as is typically assumed for fitted relationships.[40] Because of a shorter sample period for the United Kingdom, the supply and demand curves are plotted only for the period following the Lehman Brothers bankruptcy (October 2008–December 2012). Because of the way the curves are constructed, the shifts reflect only changes in the average value of the explanatory variables before and after the crisis and not changes in the relationships between the variables. As with all econometric estimations, these curves are estimated with error and should be viewed as purely indicative of the direction of movement.[41]

- The *demand curves* shift downward in France, Japan, and Spain, indicating that the decline in lending was due in large part to a drop in lending demand. For the United Kingdom, data availability restricted the estimation to the postcrisis period.
- The *supply curve* also shifts left in Spain and, to a much lesser extent, in France, suggesting that part of the decline in lending in those countries reflects less willingness or ability of banks to lend. This result broadly confirms the analysis of the survey data. The rightward shift of the supply curve in Japan can be interpreted as reflecting improvement in the Japanese banking sector after 2008 over the earlier part of the sample period (which reflects the aftermath of the Japanese banking crisis from the late 1990s through the early 2000s), along with the effect of credit support policies and the exceptional monetary policy measures announced since 2008.

[40]The analysis assumes that the slopes of both the supply and demand curves have remained the same over the full sample period (the elasticity of supply and demand to interest rates has not changed over time). The results of an alternative specification (not reported) allowing the elasticity to change before and after September 2008 did not contradict this assumption.

[41]In some cases, the coefficient on the lending rate is not significant, so the slope of the curve is particularly uncertain. These curves are shown with lighter shades in Figure 2.15.

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CHAPTER 3

CHANGES IN BANK FUNDING PATTERNS AND FINANCIAL STABILITY RISKS

SUMMARY

Funding structures matter for financial stability. In particular, overreliance by some banks on certain types of wholesale funding—especially by U.S. and European banks—contributed to the global financial crisis. Most banks have recently made their funding structures more resilient by raising their capital adequacy ratios and reducing their dependence on short-term wholesale funding. However, some distressed banks remain vulnerable because their equity capital levels are inadequate and they are highly dependent on central bank funds.

This chapter examines how bank funding structures have changed over time—especially in the run-up to the crisis—and how these structures affect financial stability. The analysis considers banks in a number of advanced and emerging market economies and includes systemically important banks. The analysis shows that healthy banks rely more on equity and less on debt (especially short-term debt) and have more diversified funding structures with lower loan-to-deposit ratios. Adequate capital buffers reduce a bank's probability of default and support financial stability. Therefore, Basel III capital regulations that aim to raise the quantity and quality of capital should continue to be a mainstay of the reform efforts. Basel III liquidity regulations will also play a role by reducing banks' overreliance on short-term wholesale funding, which has proven detrimental to financial stability.

Current reform efforts are aimed at reducing financial instability, but there can be tension among some key regulatory reforms that affect bank funding structures. As this chapter shows, such tension can arise, on the one hand, from pressures to use more secured funding (thereby raising levels of asset encumbrance) as well as deposits and, on the other hand, from bank-resolution initiatives (including the introduction of bail-in powers and the prospects for additional depositor preference) that are designed to reduce the burden on taxpayers while also protecting depositors. A numerical example examines funding costs under various scenarios. The analysis suggests that the effects may not be large under current conditions but that they depend importantly on the share of protected creditors and the size of equity buffers.

Careful implementation of the reform efforts can help mitigate potential trade-offs so as to ensure that the financial stability benefits are realized. In particular, Basel III and over-the-counter (OTC) derivatives reforms should be implemented as planned. However, policymakers will want to monitor the increased demand for collateral (including from new liquidity standards and OTC derivatives reforms) to ensure that there are enough unencumbered assets to meaningfully attract senior unsecured creditors. Going forward, limits on asset encumbrance or minimum proportions of bail-in debt relative to assets may be required so that a sufficiently large proportion of unsecured debt is preserved to absorb losses when bank capital is exhausted as an important protection against future use of taxpayer funds. The introduction of such changes, however, will need to be mindful of funding market conditions to ensure that they are not introduced during periods of funding difficulties.

Introduction

The global financial crisis revealed the risks to financial stability arising from banks' reliance on certain types of wholesale funding.[1] Before the financial crisis, many U.S. and European banks relied on wholesale debt funding to expand asset growth. Since the crisis, these private market funds have diminished in size, whereas collateralized borrowing, including covered bond issuance and central bank funding, has risen (especially in Europe). Counterparty risk has prompted the growing use of secured funding, pushing up the share of assets pledged as collateral for liabilities (termed "asset encumbrance"). At the same time, new regulations are being proposed or implemented that aim to make financial systems safer (including Basel III capital and liquidity regulations and over-the-counter [OTC] derivatives reforms) and to improve bank resolution mechanisms (for example, bail-in powers and depositor preference). This chapter examines funding market developments and the implications of the reform efforts for bank funding structures and their costs.

Against this backdrop, this chapter examines the following questions:

- What determines bank funding structures, and how have they changed?
- How did funding structures relate to banks' stability in the run-up to the crisis? Have bank funding structures changed so as to improve financial stability since the crisis began?
- How will key regulatory initiatives affect bank funding structures? What are the potential tensions among the initiatives, if any?
- Considering the outcomes of various reforms, how will funding costs likely develop?

The analysis shows that banks have diverse, but slow-to-change, funding patterns. Larger banks in advanced economies, excluding Japan, rely more on wholesale funding, whereas those in Japan and most emerging market economies fund themselves primarily with deposits. Also, banks that face higher currency volatility, stronger regulatory frameworks, and stricter disclosure requirements rely less on wholesale funding.

Banks' funding structures affect their stability, and although most banks have improved their funding structures since the crisis began, distressed banks remain vulnerable. More equity and less debt (in particular less short-term debt), lower loan-to-deposit ratios, and more diversified funding structures improve banks' stability. Since the crisis began, banks around the world have raised their capital adequacy ratios, reduced wholesale funding, and in some cases raised more deposits, all of which have improved their stability. However, distressed banks' funding structures have not similarly improved, and they continue to be vulnerable.

There are potential tensions among some regulatory reforms, including regulations designed to increase resilience to short-term liquidity shocks, measures to improve crisis management, and proposals to facilitate bank resolutions without the use of taxpayer support. Increasing banks' equity capital, as intended by Basel III capital regulations, reduces the cost of any type of debt by increasing loss-absorbing buffers before any debt holders face losses, and Basel III liquidity regulations should help maintain liquidity buffers. Both measures should improve financial stability. However, continuing weakness in bank funding markets (particularly in Europe), OTC derivatives reforms, and some aspects of Basel III liquidity regulation may encumber more assets, thereby increasing unsecured bondholders' potential losses. Unsecured bondholders may also face larger losses if (1) a country introduces new depositor preferences for bank closures (in which case some or all retail depositors will be paid ahead of other unsecured creditors), and (2) the bondholders are bailed in when a bank is restructured (that is, they assume more of the losses than do creditors that cannot be bailed in). When the risk of losses rises (including from the fear of being bailed in), the costs of unsecured debt also rise because this class of investors will require higher returns (holding all else constant). To the extent that the possibility of bail-in removes the too-big-to-fail perception for systemically important institutions, some of the implicit funding subsidy that they have received may be removed, potentially raising overall funding costs to more appropriate levels. However, some banks may find it difficult to issue enough senior unsecured debt to ensure this market discipline role, and if holders of this class of debt are less tolerant when bank distress is imminent, then financial instability may ensue. Despite this proviso, overall, the introduction of bail-in powers alongside greater transpar-

The authors of this chapter are Brenda González-Hermosillo and Hiroko Oura (team leaders), along with Jorge Chan-Lau, Tryggvi Gudmundsson, and Nico Valckx. Other contributors include Serkan Arslanalp, Marc Dobler, Alvaro Piris Chavarri, Lev Ratnovski, Takahiro Tsuda, and Mamoru Yanase. Research support was provided by Oksana Khadarina.

[1]See Chapter 2 of the October 2010 *Global Financial Stability Report* (GFSR) for developments in bank funding markets during the global financial crisis. Berkmen and others (2012) and Chapter 4 of the October 2012 GFSR show that banks that funded themselves with nondeposit liabilities fared worse during the financial crisis, and their countries experienced weaker growth outcomes.

ency is likely to make funding costs better reflect the risks of banking and hence enhance financial stability.

A numerical exercise shows that some funding structure configurations (including equity) and the order of creditor seniority can substantially alter the cost of debt—perhaps in unanticipated ways. Capitalization and the riskiness of bank assets have a quantitatively large effect on the cost of bank debt. The share of preferred deposits and liabilities exempted from being bailed in (including secured borrowing) is also an important driver of the cost of unsecured (bail-in) debt, which rises disproportionally more than increases in these other components in the funding structure.

There are two key policy messages from the analysis:

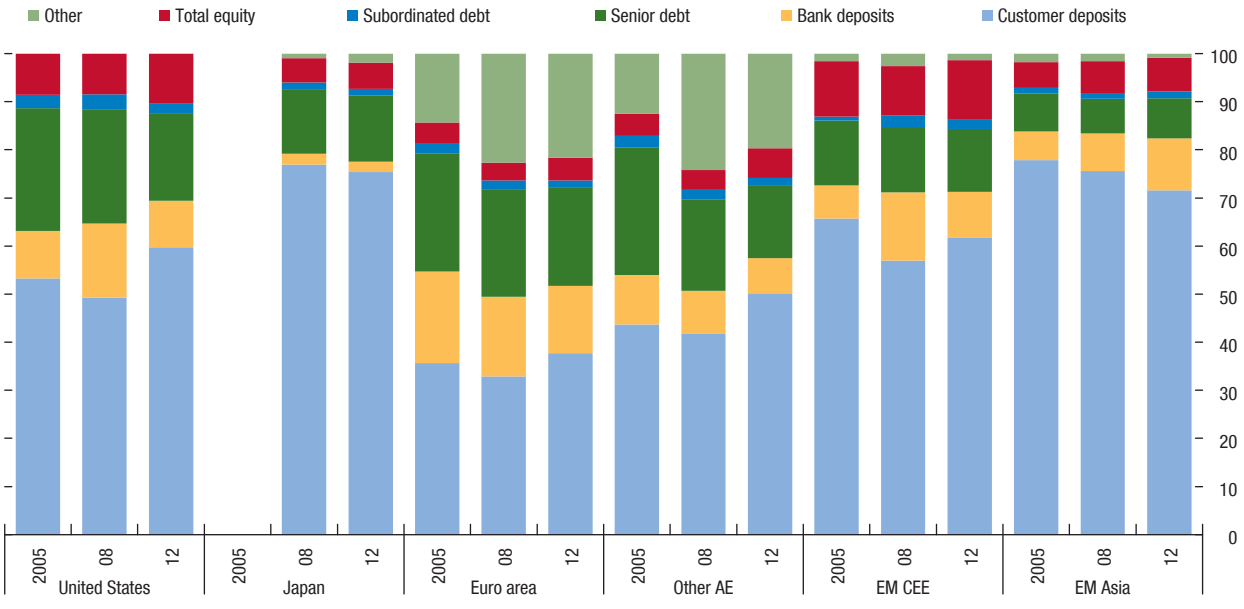
- Funding structures matter for financial stability because a healthy funding structure lowers the probability that a bank will fall into distress. Adequate capital buffers reduce the probability of default and, all else equal, improve the chances that depositors and debt holders are repaid their funds. Hence, Basel III capital regulations aimed at raising the quantity and quality of capital should continue to be the mainstay of the reform effort. The Basel III liquidity regulations will also play a role by reducing the use of short-term wholesale funding—a component of funding that the analysis shows to be detrimental to financial stability.
- Regulatory reforms can affect bank funding structures both positively and negatively, so, these reforms need to be calibrated carefully. Policymakers must be particularly watchful to ensure that the reforms—including OTC derivatives reforms—do not encourage banks to issue or hold certain types of securities that excessively encumber assets. Incentives arising from regulations that may lead to the overuse of secured funding can be contained by introducing a maximum proportion of encumbered assets. To reap the benefits of the resolution reforms, policymakers will need to ensure that the amount of bail-in debt is sufficient to induce these debt holders to exercise market discipline and thereby to encourage safer banking. Hence, a minimum bail-in requirement may be necessary.

Bank Funding Structures: Determinants and Recent Developments

What Determines Bank Funding Structures?

The empirical analysis shows that banks have very diverse funding structures and that, in general, these change only gradually. Modern banks use various forms of funding instruments other than deposits (Box 3.1). These vary substantially across banks and regions (Figures 3.1 and 3.2). Advanced economies, except Japan,

Figure 3.1. Banks' Liability Structures across Major Economies and Regions
(Percent)



Sources: Bank of Japan; SNL Financial; and IMF staff estimates.
Note: "Other" includes financial and accounting liabilities, such as derivatives liabilities, insurance liabilities, noncurrent liabilities, accounts payable and accrued expenses, deferred taxes and tax liabilities, and other provisions. Japan data for 2005 omitted due to data limitations. AE = advanced economies; CEE = central and eastern Europe; EM = emerging market economies. For region coverage, refer to Table 3.2.

Box 3.1. Typology of Bank Funding

Bank funding sources can be distinguished by investor type, instrument type, and priority (Figure 3.1.1).

Customer deposits are the main funding source for banks that have traditional deposit-taking and loan-making business models.

- Deposits payable at par and "on demand" carry the most liquidity risk because of their maturity mismatch with longer-term loans, and they could be subject to runs. However, in practice, retail deposits are relatively stable, particularly if covered by a credible deposit guarantee scheme.
- Other types of deposits can be less stable, including uninsured deposits, foreign currency deposits, deposits collected though Internet banking, and those collected from nonresidents, corporations, money market funds, and high-net-worth individuals.[1]

Wholesale funds are often used for investments in financial assets, including those used in the bank's proprietary trading.

- Assets secured as collateral (and thus "encumbered") are designated for paying secured creditors first. Senior unsecured wholesale funds may rank equal to depositors or below depositors in countries with depositor preference.
- Short-term unsecured funds include some interbank loans, commercial paper (CP), and wholesale certificates of deposit (CDs). These funds can be volatile during times of distress. For example, the cost of interbank loans (for example, the London interbank offered rate) rose dramatically, and the issuance of CP and CDs dropped sharply following the Lehman Brothers failure.
- Short-term secured funds include repurchase agreements (repos), swaps, and asset-backed commercial paper. These were considered safe before the crisis, but suffered a run in its early stages. Reuse of collateral (rehypothecation) also contributed to increasing the interconnectedness among financial institutions that were using repos.
- Long-term funds include bonds and various forms of securitization (including covered bonds and private-label mortgage-backed securities). These instruments are less likely to cause immediate funding difficulties.

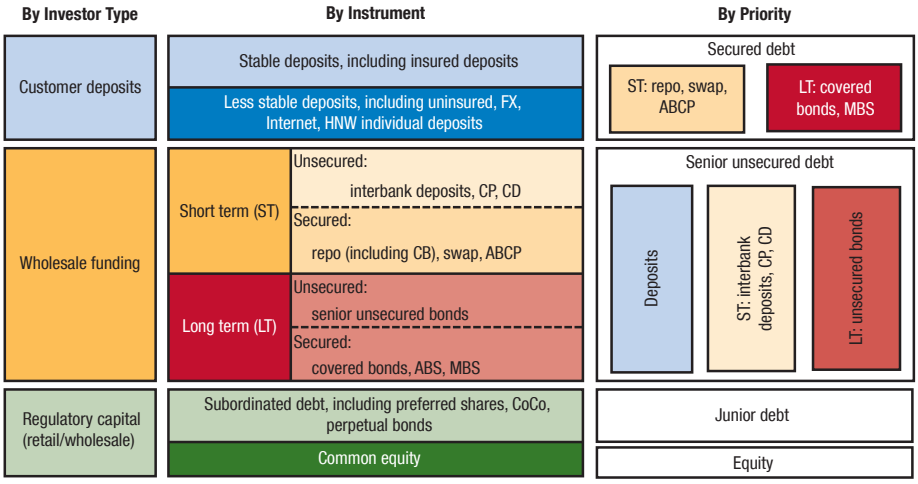
Capital, as defined by Basel III, absorbs incurred losses before any other creditors (see BCBS, 2010a for details).

- Regulatory capital includes common equity and certain types of subordinated debt. The highest quality (that with the highest loss-absorbing capacity) is known as common equity Tier 1 (CET1) capital, which is mostly in the form of common equity. Certain types of subordinated debt, which are paid after other debt holders, also qualify as additional Tier 1 or Tier 2 capital, including contingent convertible debt (CoCos), preferred shares, and perpetual bonds.[2]

[1]Uninsured deposits include those eligible for a deposit guarantee scheme, but exclude covered deposits (for example, retail deposits exceeding the maximum coverage) and ineligible deposits.

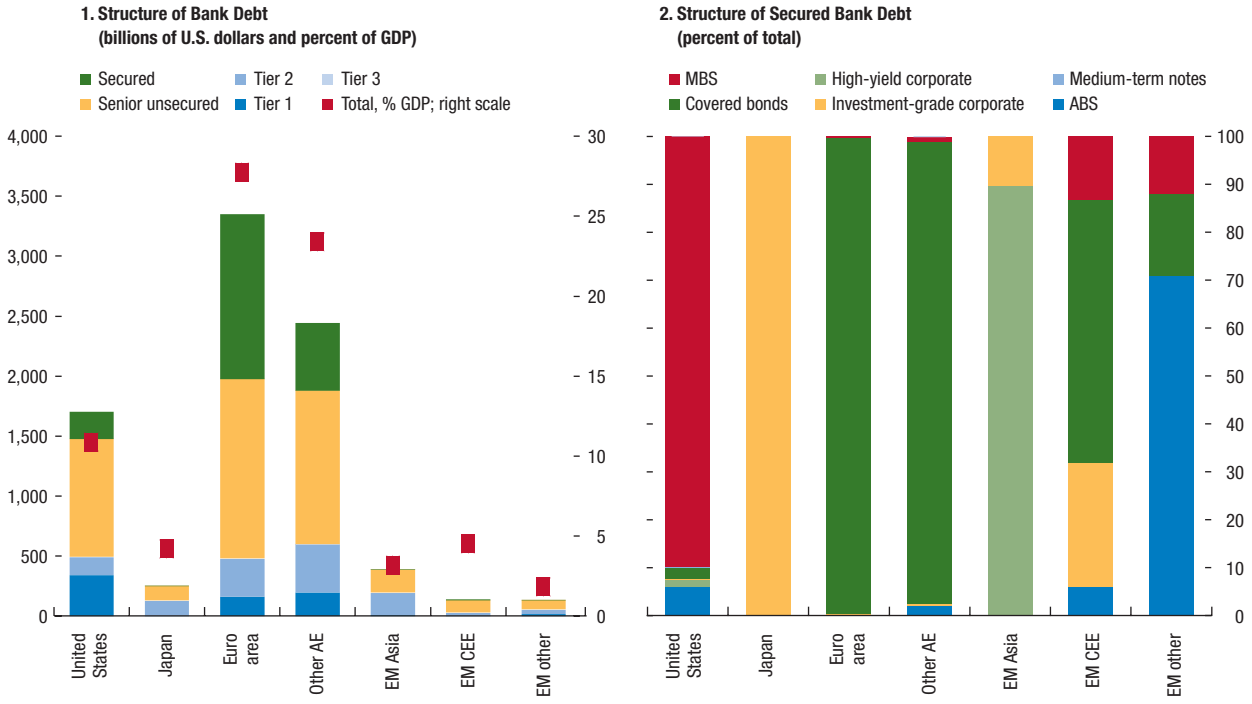
[2]Preferred shares are senior to common equity and usually carry no voting rights, but receive dividends before common equity. CoCos are bonds that would be converted into common equity when the regulatory capital ratio reaches a prespecified threshold. See Pazarbasioglu and others (2011) on the economic rationale for introducing CoCos. See Barclays (2013) for a list of existing CoCos and their structures.

Figure 3.1.1. Breakdown of Bank Liabilities



Source: IMF staff.
Note: ABCP = asset-backed commercial paper; ABS = asset-backed securities; CB = central bank; CD = certificate of deposit; CoCo = contingent convertible; CP = commercial paper; FX = foreign exchange; HNW = high net worth; LT = long term; MBS = mortgage-backed security; ST = short term. The example presented here is for an economy without deposit preference.

Figure 3.2. Banks' Long-Term Wholesale Funding across Major Economies and Regions: Outstanding as of July 31, 2013



Sources: Dealogic; IMF, World Economic Outlook database; and IMF staff calculations.
Note: ABS = asset-backed securities; AE = advanced economies; CEE = central and eastern Europe; EM = emerging market economies; MBS = mortgage-backed securities.

typically rely more on wholesale funding; Japan, by contrast, has an ample retail deposit base. Even for wholesale funding, there is significant variation among banks, with a few (the 90th percentile) using a preponderance of noncore funding (debt as a proportion of equity and deposits—Figures 3.3 and 3.4). Banks in emerging market economies also fund themselves primarily with retail deposits and are much more homogeneous in their use of various funding instruments than advanced economy banks. European banks are the largest issuers of bank bonds, especially covered bonds, both in absolute terms and relative to GDP.[2] Despite some movements in noncore versus core funding instruments, on average, bank funding structures change only gradually over time.

To better understand how banks choose their funding structures and thus how they can be made more resilient, we examine the factors influencing these structures between 1990 and 2012. The composition of the liability structure (equity, nondeposit liabilities, and deposits) as well as the loan-to-deposit ratio (an indication of the need for wholesale funding) are studied for 751 banks, applying a dynamic panel regression with bank-specific fixed effects for a large set of countries (see Annex 3.1 for details).[3] The roles of bank-specific factors are examined along with country-level macroeconomic, financial market, and regulatory and institutional factors. The sample is also split between advanced economies and emerging market economies and across specific periods. Systemically important banks are considered separately.[4]

In line with earlier studies, the empirical evidence suggests that bank funding is affected mainly by bank-specific factors and to a lesser extent by macrofinancial

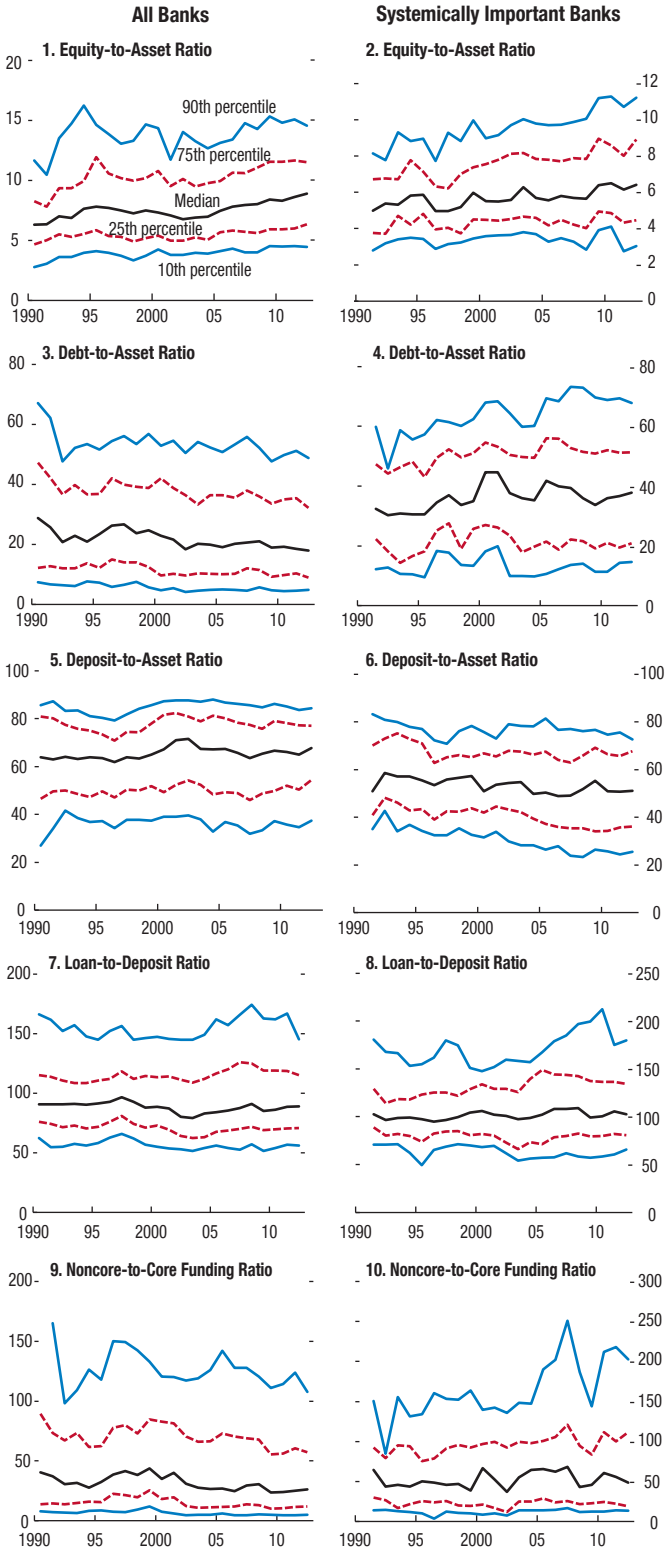
[2]U.S. banks in the SNL Financial sample include only deposit-taking institutions, thus excluding broker dealers and various shadow banks. See Chapter 1 of this report for more information on shadow banks.

[3]Some studies look at different specifications of funding, expressing total liabilities or deposit and nondeposit liabilities as shares of banks' market value (that is, more as indicators or components of market leverage). However, this approach neglects the role of equity as a separate funding instrument. In addition, using market value restricts the analysis to listed banks.

[4]The subsample comprises 27 global and 84 domestic systemically important banks (global systemically important banks—G-SIBs—and domestic systemically important banks—D-SIBs—respectively). The G-SIBs are those chosen by the Financial Stability Board (2012b), and the selection of D-SIBs is based on whether a bank's total assets are close to or exceed 20 percent of GDP.

Figure 3.3. Evolution of Bank Funding Structures, Global and Systemically Important Banks

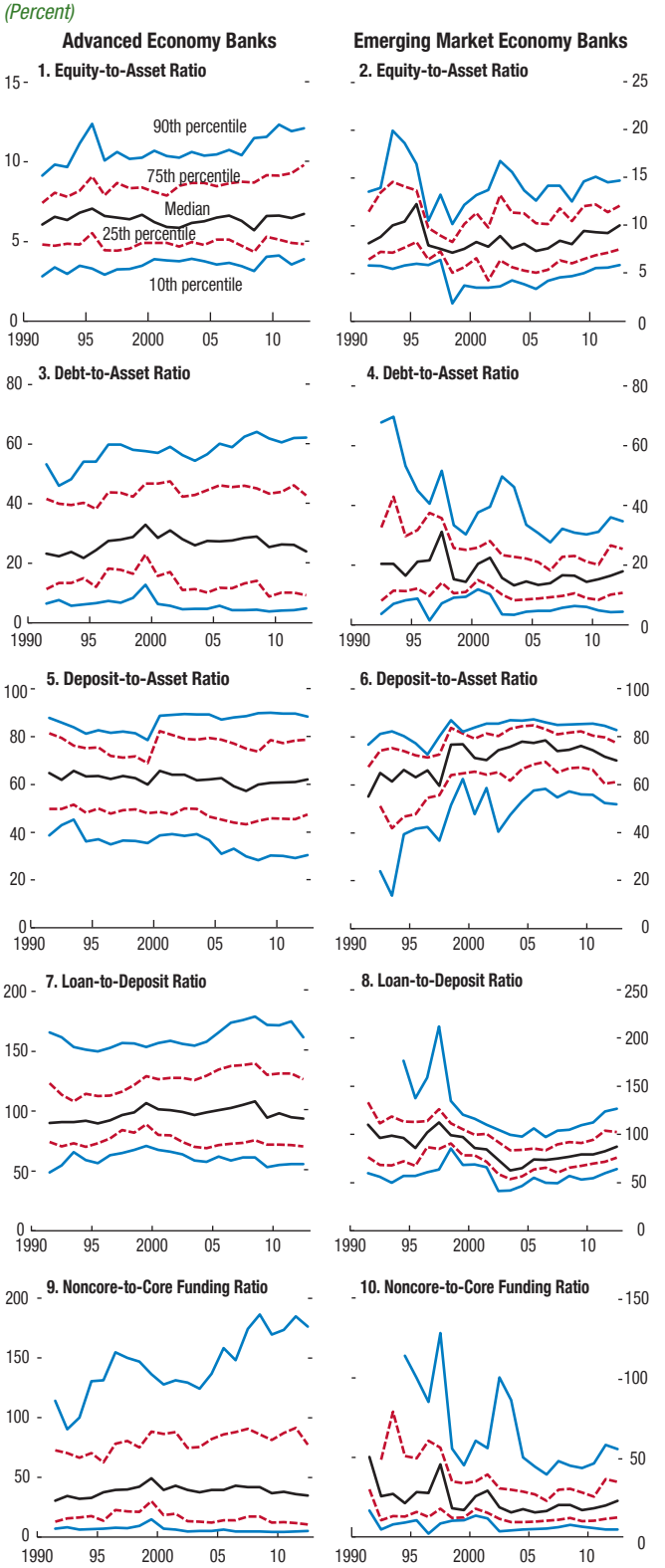
(Percent)



Sources: Bloomberg, L.P.; and IMF staff estimates.
Note: Figures show the median (black line), interquartile range (red dashed lines), and upper and lower decile (blue solid lines) of the distribution of the share of equity, debt, and deposits as percentages of total assets and the loan-to-deposit and noncore-to-core funding ratios (in percent). The latter ratio is defined as debt to equity and deposits.

Figure 3.4. Evolution of Bank Funding Structures, Advanced and Emerging Market Economies

(Percent)



Sources: Bloomberg, L.P.; and IMF staff estimates.
Note: Figures show the median (black line), interquartile range (red dashed lines), and upper and lower decile (blue solid lines) of the distribution of the share of equity, debt, and deposits as percentages of total assets and the loan-to-deposit and noncore-to-core funding ratios (in percent). The latter ratio is defined as debt to equity and deposits.

and market variables.[5] Institutional factors also seem to play a role. The key results are illustrated graphically in Figure 3.5:[6]

- *Bank-level factors matter most, but regulation also plays a role.* Bank-specific fixed effects and past funding structure choices dominate the results. In contrast to previous studies, this analysis finds that proxies for the general regulatory environment (including nonfinancial factors such as the "rule of law") influence bank funding structures.[7,8] On average, over all countries and the entire sample period, countries with higher-quality regulations are associated with banks that have more deposit and less debt funding. Banks in advanced economies with higher disclosure requirements (holding all else constant) tend to have higher deposit-to-asset ratios and lower loan-to-deposit ratios.
- *Capital structures are generally highly persistent, but the speed of adjustment varies across time and countries.* Capital structures appear to be changing, but only slowly. Equity funding tends to adjust faster than debt and deposit funding. However, since 2007, banks have adjusted at a faster and more similar pace across all types of funding.
- *Asset size plays an important role.* Large banks generally take on more debt (perhaps because investors are more familiar with them) and fund using less equity and deposits.
- *More traditional, safer banks depend less on wholesale funding.* Banks with more securities and tangible assets and those that pay dividends rely less on wholesale funding (that is, have lower loan-to-deposit ratios).

[5]Existing studies show that a firm's size and profitability, whether it pays dividends, its cash flow volatility (as a measure of risk), and its "tangibility" matter for bank funding. Tangibility for financial firms (such as banks) refers to the value of securities, cash and funds due from banks, fixed assets, and other tangible assets.

[6]See Gudmundsson and Valckx (forthcoming) for further regional analysis.

[7]Based on the World Bank's Doing Business Indicators of regulatory quality, effectiveness of governance, rule of law, and voice and accountability, two principal components are derived that reflect the level of regulation and disclosure. This interpretation is based on correlations and signs with other legal, regulatory, and institutional characteristics.

[8]This conclusion was based on the large impact of bank fixed effects on the explanatory power of the model (measured by R^2) and on the difference in speed of adjustment (1 minus the coefficient of the lagged dependent variable) in a specification with and without fixed effects, similar to Gropp and Heider (2010). Unlike Gropp and Heider (2010), in this study regulatory factors appear to help explain the variation in funding structures.

Bank Funding before and after the Global Financial Crisis

Focusing on developments just before the crisis, banks, especially in Europe, relied largely on low-cost wholesale funding to expand investments (Box 3.2). U.S. banks rapidly increased interbank loans (unsecured debt and secured repos; Figure 3.6) and issued securitized products, albeit from a lower base than their European counterparts. Japanese banks, however, needed little wholesale funding given their ample deposit base. Emerging market economy banks, especially those in central Europe, saw some erosion of their customer deposits in favor of interbank deposits but maintained higher capital ratios (see Figures 3.1 and 3.7).

The global financial crisis caused substantial stress in wholesale funding markets, forcing banks to adjust their funding models. In particular, many banks had to rely on central bank funding to survive systemic liquidity shortages. For banks that had relied on dollar-based funding, currency swap lines were provided by the Federal Reserve to relieve U.S. dollar liquidity shortages abroad.[9] Banks in all regions recapitalized, often with government support (see Figure 3.7). Financial fragmentation and bank deleveraging have also affected cross-border bank funding patterns. In particular, there was a significant decline in foreigners' investments in bank-issued debt securities located in the stressed euro area countries of Ireland, Italy, Portugal, and Spain, while banks in core euro area countries generally experienced the opposite. Changes appear to be smaller in non-euro-area advanced economies (Box 3.3).

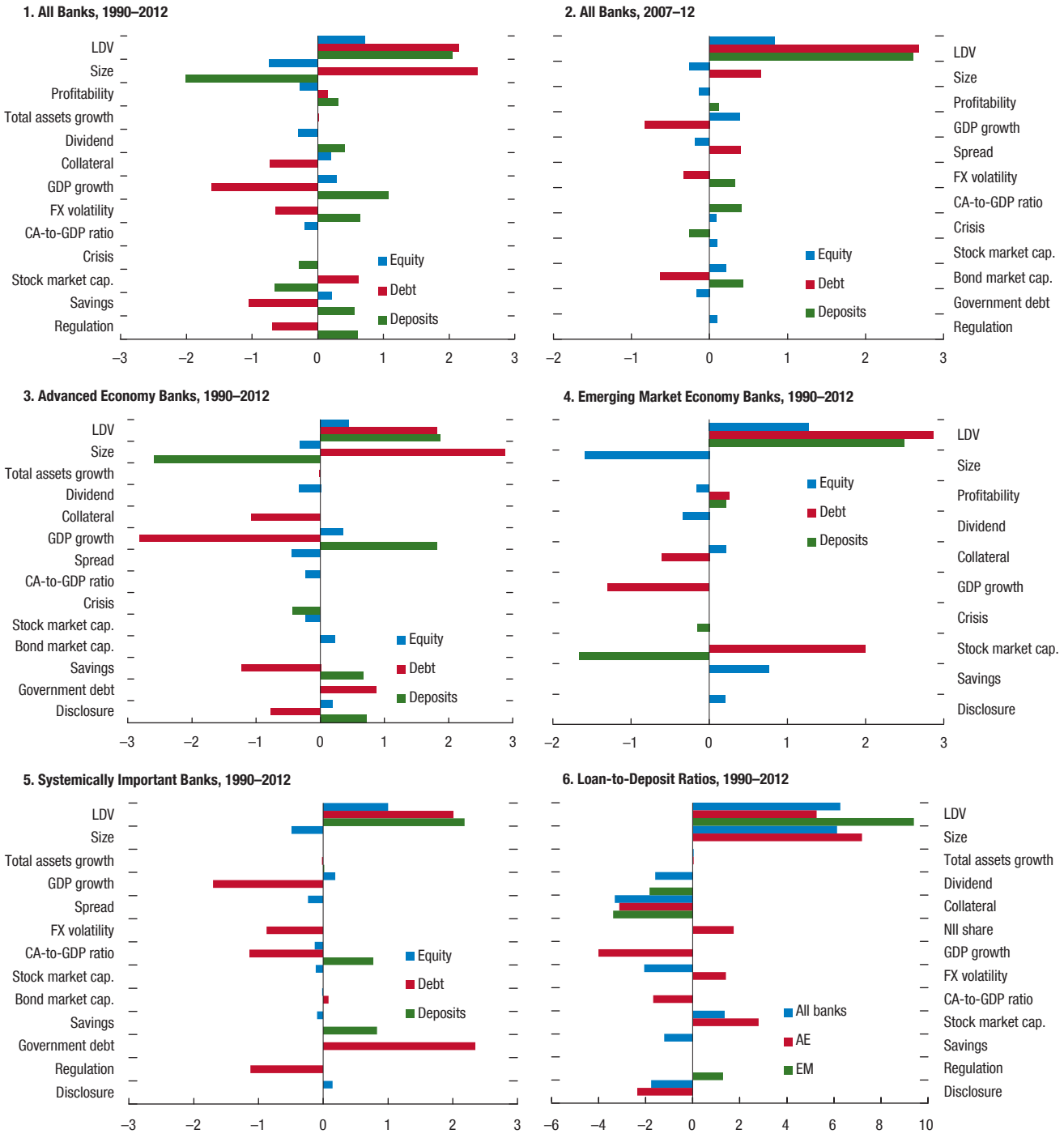
Some diverging regional trends are noteworthy:

- In Europe, for many banks there continues to be limited access to private short-term wholesale and interbank markets. As a substitute, banks have become more reliant on European Central Bank (ECB) funding and on covered bond issuance, which increases asset encumbrance (Figure 3.8), especially during periods of stress (Figure 3.9, panel 1). Notably, about 30 percent of covered bonds issued by European banks are retained by the issuers for potential use as collateral for ECB facilities (Figure 3.9).
- U.S. banks have reduced their reliance on secured (for example, private-label mortgage-backed securities) and unsecured funding, replacing it with deposits and

[9] See Chapter 3 of the April 2013 GFSR on central bank liquidity support since the crisis.

Figure 3.5. Determinants of Bank Funding

(Relative sizes of factors; percentage points)



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

Note: CA = current account; cap. = capitalization; FX = foreign exchange; LDV = lagged-dependent variable; NII share = net interest income in percent of operating income. Regulation and disclosure are the first and second principal component scores, derived from four World Bank indicators of regulatory and institutional quality. See Table 3.3 for further details on factors and their definitions. Figures show the economic relevance of bank characteristics and macrofinancial and regulatory factors on bank funding through equity, deposits, and debt (as a percent of total assets), and on loan-to-deposit ratios (panel 6) based on panel estimations for all banks, advanced economy banks, emerging market economy banks (from developing Asia and central and eastern Europe), and global and domestic systemically important banks. Economic relevance is computed as coefficients multiplied by 1 standard deviation of each variable (averaged across banks). Variables shown are chosen using the general-to-specific selection method, which starts with a general regression model and narrows it down to a model with only significant variables. See Annex 3.1 for further details on data and estimation results.

Box 3.2. What the Crisis Taught Us about Bank Funding

This box summarizes the leading current research on bank funding sources and capital structures, focusing on their role for financial stability. The literature demonstrates that bank wholesale funding does not provide sufficient market discipline and is unstable during crises.

Since the 1990s, banks have increasingly used wholesale funding—repurchase agreements (repos), brokered deposits, interbank loans, and commercial paper—to supplement retail deposits (Feldman and Schmidt, 2001). The precrisis literature generally suggested that this trend was advantageous. Unlike retail depositors, the providers of wholesale funding were thought to be "sophisticated," that is, able to monitor and discipline risky banks (Calomiris and Kahn, 1991; Rochet and Tirole, 1996; Flannery, 1998; Calomiris, 1999) because they were not protected by (explicit) deposit insurance schemes.

Yet the crisis revealed wholesale funding to be a major source of instability. In particular:

- Banks attracted wholesale funds at short maturities because they are cheaper than at longer maturities. Wholesale providers of funding did not adequately monitor banks because they knew they could withdraw at a hint of negative news by not rolling over their funding. During the crisis, collective withdrawals triggered generalized funding disruptions (Huang and Ratnovski, 2011; Brunnermeier and Oehmke, 2013).
- Banks attracted wholesale funding on a secured basis—against the collateral of securitized debt and other assets for repo transactions. Sudden concerns about the quality of collateral led to a freeze of repo funding markets ("a run on repo," as described by Gorton and Metrick, 2012).
- Wholesale funding made the financial system (not just the banking system) more interconnected because both bank and nonbank financial institutions provided liquidity to each other. The interbank market proved to be particularly fragile. During the crisis, banks hoarded liquidity because of perceived credit and liquidity risks (including their own inability to monitor risks) (Heider, Hoerova, and Holthausen, 2009; Farhi and Tirole, 2012).
- Wholesale funding created complex interactions between bank assets and liabilities, such that a fall in asset values could compromise banks' ability to obtain funds. Hence, a funding freeze could lead to asset fire sales to generate liquidity. As an alternative, banks may be encouraged to securitize assets, but may continue to hold them on the balance sheet—instead of selling off the new securities—to pledge them in repos for an additional source of funding (Acharya, Gale, and Yorulmazer, 2011; Brunnermeier and Pedersen, 2009; Shin, 2009a).
- At a macroeconomic level, variations in the value of collateral and margin requested, and other funding market conditions, became a major determinant of bank leverage and banks' ability to extend credit (Geanakoplos, 2009; Adrian and Shin, 2010), creating larger boom and bust cycles.
- Many empirical studies show that the reliance on wholesale funding was a major source of bank vulnerability during the crisis (Huang and Ratnovski, 2009; Shin, 2009b; Demirgüç-Kunt and Huizinga, 2010; Goldsmith-Pinkham and Yorulmazer, 2010; Bologna, 2011; Vazquez and Federico, 2012).

In sum, the literature suggests that bank wholesale funding has become an inherent feature of the modern financial system. It can be explained as a response to financial innovation and a buildup of excess savings in some countries' corporate sectors (so-called cash pools) as well as by increases in official reserves of many emerging market economies. However, the literature highlights that wholesale funding is associated with some problematic properties, specifically a lack of sufficient market discipline and instability in crises. An important conclusion is that any regulation designed to counter potential downside risks to wholesale funding will need to account for potential trade-offs.

The author of this box is Lev Ratnovski.

equity (see Figure 3.6). The share of net repo funding for U.S. banks declined from about 8 percent of total liabilities in 2008 to 2 percent in 2013.

- In Asian and central and eastern European emerging market economies and in Japan, banks have slightly increased wholesale funding since the crisis began while expanding their balance sheets, but these funding categories remain proportionately less than in Europe or the United States. While Japanese banks primarily rely on deposits at home, they are increasingly relying on wholesale funding abroad.

Are Bank Funding Structures Relevant to Financial Stability?

Can funding structures that are likely to improve financial stability be empirically identified? The relationship between bank funding characteristics and bank distress is examined for a broad group of countries from 1990 through 2012 (see Annex 3.1). The characteristics included in the analysis are the stability of the structure (amount of short-term debt subject to rollover risk), diversity (concentration of banks' funding via debt, equity, and deposits), asset-liability mismatches (loan-to-deposit funding gap), and leverage (debt and equity relative to total assets), in line with Le Leslé (2012). Three separate variables are used to check the sensitivity of the funding structures to various definitions of bank distress: a balance sheet measure of risk (low z-scores),[10] an asset-price-based indicator (low price-to-book ratio), and bank equity analysts' rating (buy or sell) recommendations.

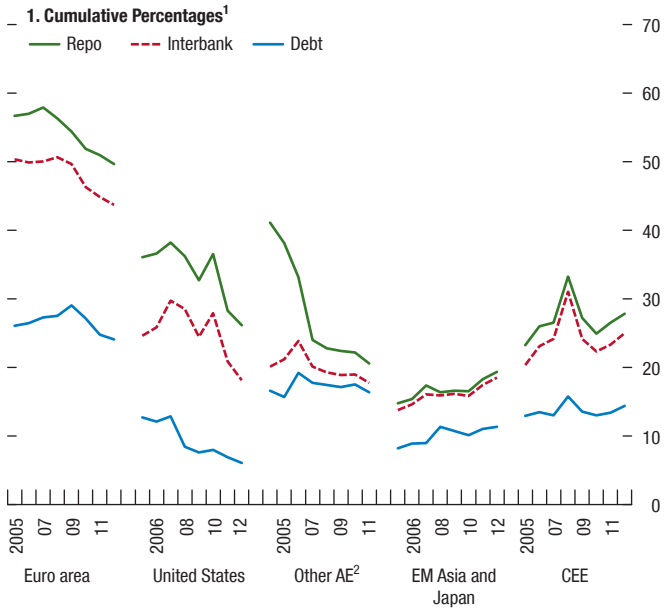
As expected, funding characteristics matter for bank distress (Figure 3.10). The results support the view that overall banking-sector stability requires that funding structures be stable, diversified, and involve less leverage. Limiting the mismatch between loans and deposits, which reduces the need for wholesale funding, is also important—a finding that is in line with the literature on this topic (see Box 3.2).[11] More specifically:

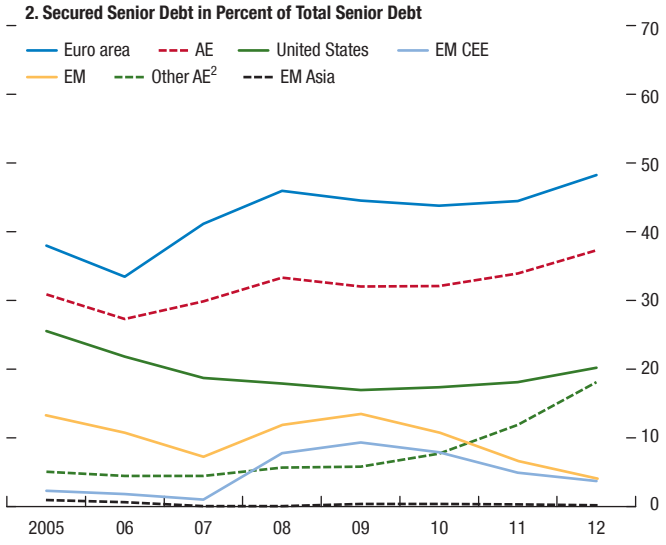
- Better capitalization (a higher equity-to-asset ratio) contributes to bank stability for both advanced

[10]The z-score is defined as the equity-to-asset ratio plus return on assets (ROA), divided by the standard deviation of ROA. It is a measure of the risk-adjusted ROA, and the higher the z-score, the more resilient the bank. Chapter 3 of the April 2013 GFSR also found positive results using z-scores as a measure of bank-level risk.

[11]See Annex 3.1 for additional results and the economic magnitudes of the effects.

Figure 3.6. Wholesale Bank Funding

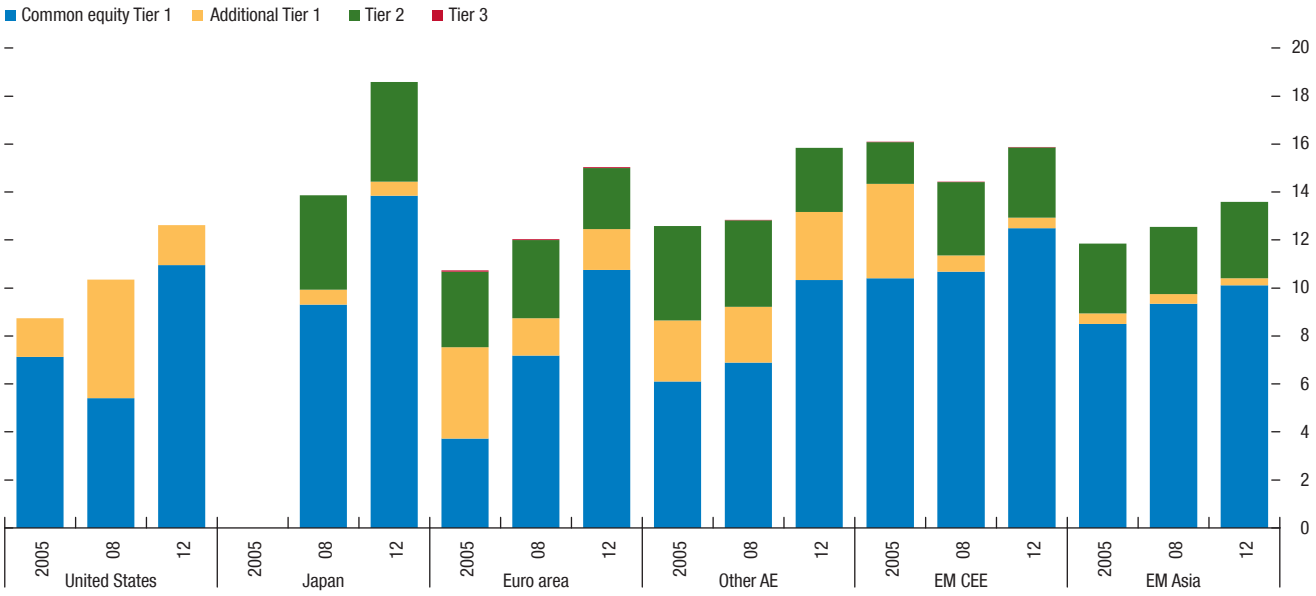




Sources: Dealogic; SNL Financial; and IMF staff estimates.
Note: AE = advanced economies; CEE = central and eastern Europe; EM = emerging market economies.
[1]Debt, interbank liabilities, and repurchase agreements (repos) as cumulative percent of wholesale funding plus customer deposits.
[2]Other AE excludes European Union, Norway, and the United States.

Figure 3.7. Regulatory Capital Ratios across Major Economies and Regions

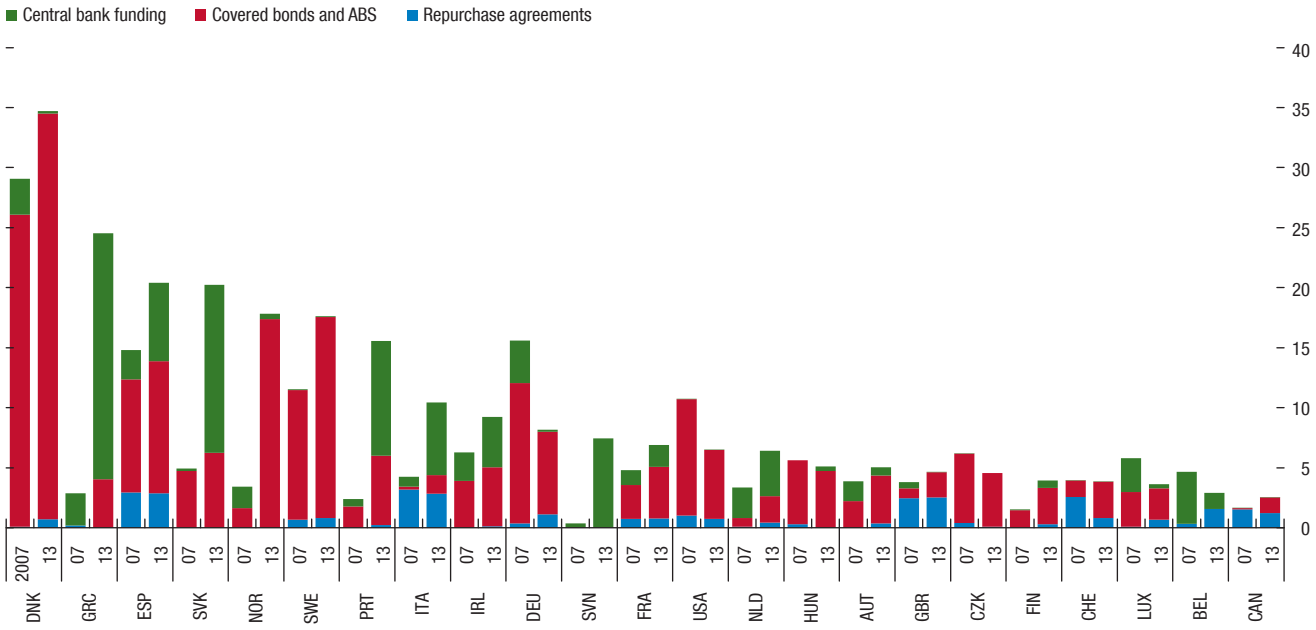
(Percent of risk-weighted assets)



Sources: SNL Financial; and IMF staff estimates.
Note: Japan data for 2005 omitted due to data limitations. AE = advanced economies; CEE = central and eastern Europe; EM = emerging market economies.

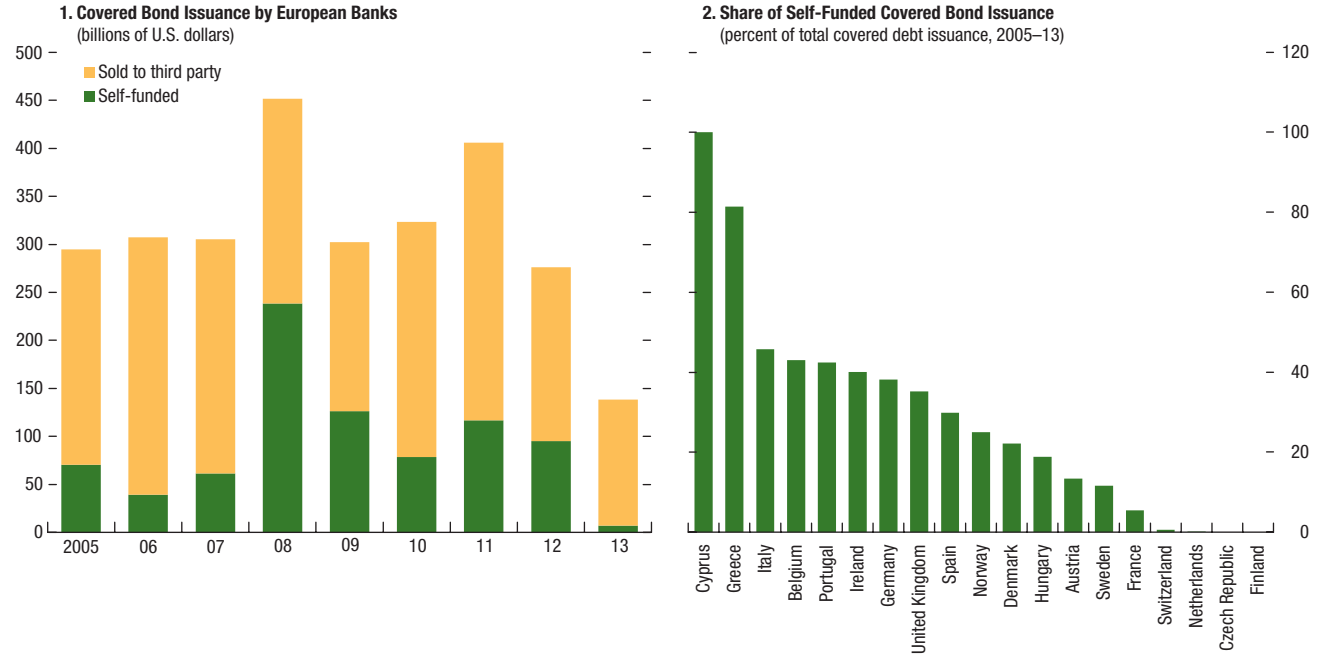
Figure 3.8. Asset Encumbrance: December 2007 and June 2013

(Percent of total bank assets)



Sources: European Central Bank; European Covered Bond Council; Haver Analytics; and IMF staff estimates.
Note: ABS = asset-backed securities; AUT = Austria; BEL = Belgium; CAN = Canada; CHE = Switzerland; CZK = Czech Republic; DEU = Germany; DNK = Denmark; ESP = Spain; FIN = Finland; FRA = France; GBR = United Kingdom; GRC = Greece; HUN = Hungary; IRL = Ireland; ITA = Italy; LUX = Luxembourg; NLD = Netherlands; NOR = Norway; PRT = Portugal; SVK = Slovak Republic; SVN = Slovenia; SWE = Sweden; USA = United States.

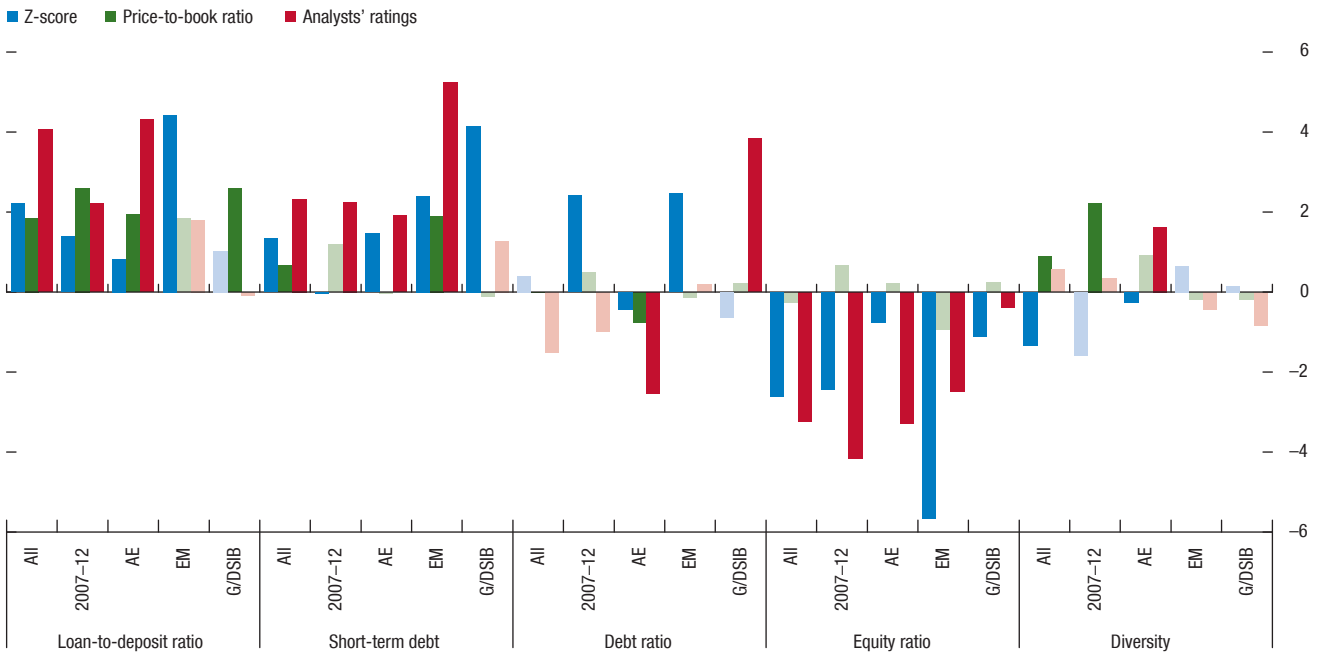
Figure 3.9. Share of Retained Bank-Covered Bonds in Europe



Sources: Dealogic; and IMF staff estimates.
Note: The sample includes public and private sector banks, but excludes agency bonds. For 2013, the data are annualized using data through the end of July.

Figure 3.10. Contribution of Funding Characteristics to Bank Distress

(Relative size of factors; percentage points)



Sources: Bloomberg, L.P.; and IMF staff estimates.
Note: AE = advanced economies; EM = emerging market economies; G/DSIB = global and domestic systemically important banks. Figure shows the economic significance of bank funding characteristics, evaluated at 1 standard deviation away from the variable's mean, on the probability of distress specified under alternative distress models and samples. Bank distress is a dummy variable, defined either as a z-score below 3, price-to-book ratio below 0.5, or average analyst ratings of 2.5 or lower. G/DSIB is a subsample consisting of systemically important banks: G-SIBs are from Financial Stability Board (2012b), and D-SIBs are banks whose assets account for close to or exceed 20 percent of GDP. Lighter-shaded bars denote nonsignificant effects. See Annex 3.1 for further details. The emerging market economy sample contains banks from developing Asia and central and eastern Europe.

Box 3.3. Changes in Cross-Border Bank Funding Sources

Since the global financial crisis began, financial fragmentation and bank deleveraging have affected cross-border bank funding patterns. In particular, foreigners' investments in debt securities of banks located in stressed euro area countries have declined significantly; banks in core euro area countries have generally experienced the opposite. Changes appear to be smaller in non-euro-area advanced economies.[1]

In the euro area, foreign investors can be differentiated between core and stressed economies, reflecting financial segmentation and ongoing bank deleveraging. In 2004, foreign holdings of bank debt securities accounted for 40 percent of the total for France, Germany, and Spain, whereas holdings for Italy were about 10 percent (Figure 3.3.1). The financial fragmentation and bank deleveraging in some stressed euro area countries has led to a decline of foreign holdings for Italy and Spain. This declining path has been associated with steady increases of foreign holdings for France and Germany. This divergent trend has eased since the European Central Bank's announcement of Outright Monetary Transactions in September 2012, which has helped mitigate tail risks.

Despite the high variation in foreign holding patterns across countries outside the euro area, the foreign investor base for bank debt securities has been quite stable (Figure 3.3.2). For instance, Korea has had very low foreign holdings (about 10 percent) relative to the total size of bank debt securities, whereas more than 50 percent of Sweden's bank debt securities have been held by foreigners. Yet in both countries, changes over time have been small, with a modest increase of foreign holdings in recent years.

A similar picture emerges from public disclosures of large U.S. money market funds. Before the global financial crisis, U.S. money market fund allocations to European banks represented about half their total exposure to banks, based on Fitch Ratings' sample of

The authors of this box are Serkan Arslanalp and Takahiro Tsuda.

[1]The estimation methodology is based on Arslanalp and Tsuda (2012). Total debt securities issued by banks are from the Bank for International Settlements (BIS) Debt Securities database, and foreign holdings of those securities are from the IMF-World Bank Quarterly External Debt Statistics. The BIS debt securities statistics include debt securities issued by all financial corporations, not just depository corporations. The foreign share of bank debt may, therefore, be understated in countries in which nonbank financial corporations issue a large amount of debt. Both databases are based on the residency principle in relation to the issuer and holder of debt. The analysis covers selected advanced economies for which long-term data are available. The Fitch sample includes the 10 largest U.S. prime money market funds with total exposure of $654 billion as of the end of April 2013, representing 46 percent of total U.S. prime money market fund assets.

Figure 3.3.1. Euro Area: Foreign Holding of Bank Debt Securities
(Percent of total)

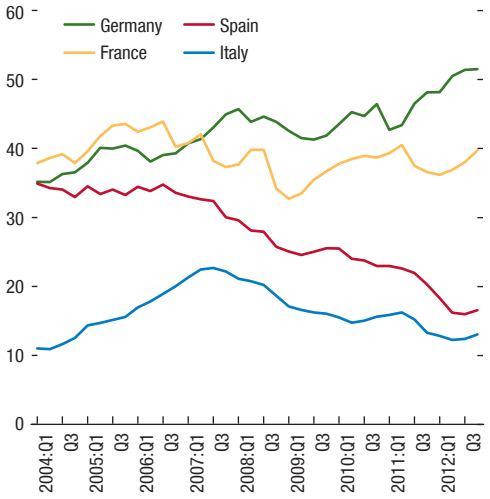
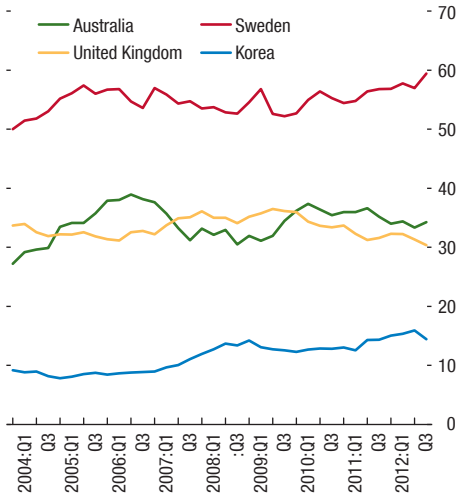


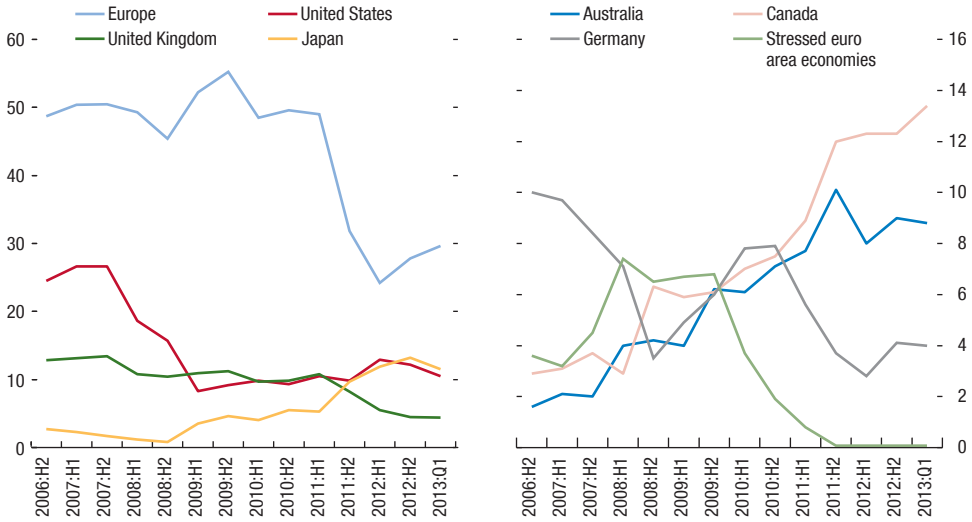
Figure 3.3.2. Non-Euro Area: Foreign Holding of Bank Debt Securities
(Percent of total)



Sources: Bank for International Settlements; IMF/World Bank, Quarterly External Debt Statistics; and IMF staff estimates.

Box 3.3. *(continued)*

Figure 3.3.3. U.S. Money Market Fund Exposure to European and Other Banks
(Percent of total)



Sources: Fitch Ratings; and IMF staff estimates.
Note: Stressed euro area economies include Ireland, Italy, Portugal, and Spain. H = half year; Q = quarter.

U.S. money market funds (Figure 3.3.3). This share declined rapidly starting in 2010, as U.S. money market funds stopped funding banks in Ireland, Italy, Portugal, as well as Spain, and reduced their allocation to core euro area banks, although the latter have rebounded recently. Meanwhile, U.S. money market funds continue to increase allocations to Australian, Canadian, and Japanese banks, which combined represent about one-third of their total exposure to banks.

economy and emerging market economy banks, except for the case in which distress is measured by the price-to-book ratio. For systemically important banks, the effect of better capitalization is much smaller, possibly reflecting their too-big-to-fail status during the sample period.[12]

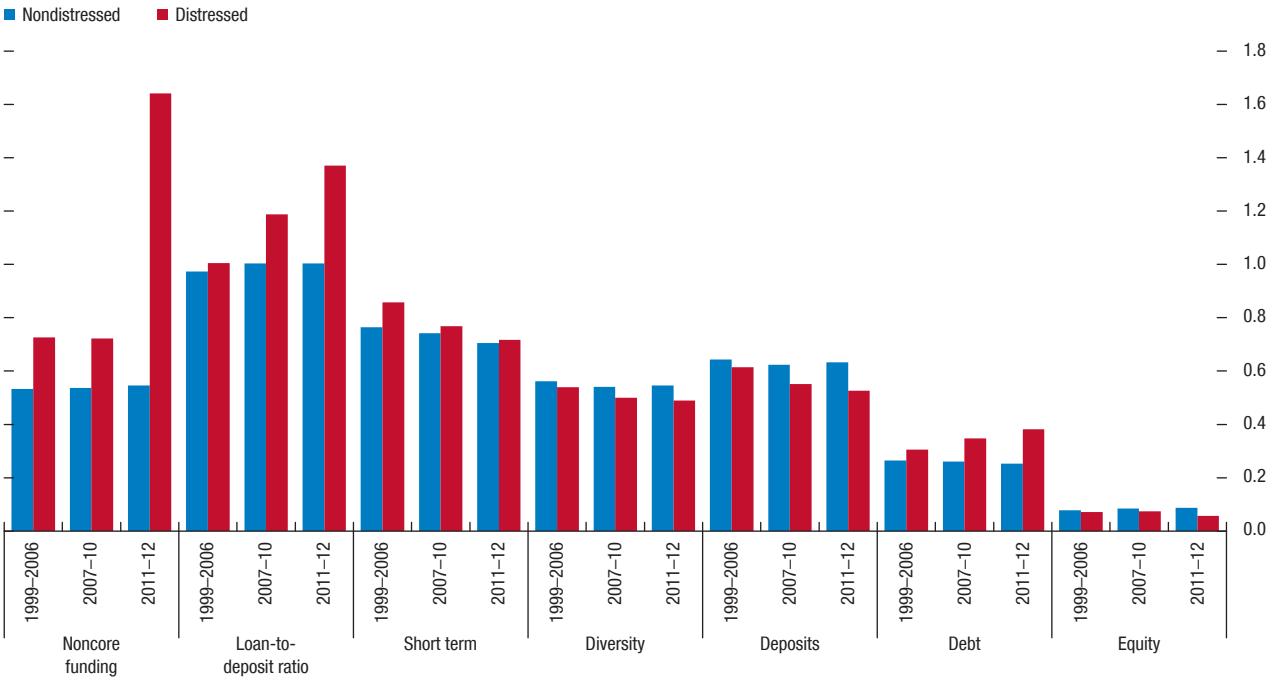
- Debt, in particular short-term debt, harms bank stability. Higher reliance on short-term debt is associated with an increase in bank distress. Higher debt ratios are also correlated with an increase in bank distress, especially in the recent period (2007–12), for emerging market economy banks and for systemically important banks.[13]
- Higher reliance on wholesale funding (a higher loan-to-deposit ratio), is linked to higher bank distress in both advanced economies (under all distress measures) and emerging market economies (using the balance sheet distress measure) during the sample period.[14] However, especially in the absence of cred-

[12]In related research, Bertay, Demirgüç-Kunt, and Huizinga (forthcoming) find that systemically important banks are less profitable and do not have lower risk. Ueda and Weder di Mauro (2012) find that credit ratings of systemically important banks imply a structural subsidy.

[13]For the full period and for advanced economy banks, the results for the analysts' ratings-based measure associate lower distress probabilities with higher debt-to-asset ratios, which likely reflects the (eventually unsustainable) buildup of leverage before the global financial crisis. However, analysts assign lower distress probabilities to systemically important banks with lower debt ratios.

[14]A similar result was found in a country-based panel framework for emerging market economies. No threshold effects, in which other interest-bearing liabilities above a certain level were associated with banking crises, were found in this study. See Chapter 4 of the October 2012 GFSR. Gudmundsson and Valckx (forthcoming) also

Figure 3.11. Evolution of Bank Funding Characteristics
(Ratios)



Sources: Bloomberg, L.P.; and IMF staff estimates.
Note: Distressed banks are those with z-scores that fall in the lowest 10 percent of the distribution (z-scores below 3). Noncore funding is the ratio of debt to customer deposits and equity. Short term is short-term debt plus repurchase agreements (repos) as a percent of total bank debt and repos. Diversity is a Herfindahl index of funding concentration (lower ratio indicating more funding diversity, defined as the squared shares of deposits, debt, and equity). Deposits, debt, and equity are expressed relative to total bank assets. Deposits are total customer deposits. Debt is defined as nondeposit bank liabilities. Equity is total common equity (at book value).

ible deposit insurance programs, panic deposit runs could be destabilizing.

- Higher concentration in funding sources is associated with a higher level of bank distress in some cases, which suggests that banks need to seek a balanced funding mix.

Since the crisis began, most banks have altered their funding structures to make themselves less vulnerable to financial instability, but distressed banks (those with low z-scores) are still subject to unfavorable funding market developments (Figure 3.11).[15]

- Nondistressed banks have improved their funding structures by slightly increasing their capitalization ratios (equity-to-asset ratios) and lowering their debt ratios. Also, their funding sources have become slightly more diversified, and reliance on short-term debt and repos (relative to total borrowings) has fallen, while the loan-to-deposit ratio has remained broadly stable.
- Distressed banks have made some improvements to their funding structures, but most components have changed for the worse. On the positive side, their use of short-term debt and repos has fallen close to the levels for nondistressed banks (perhaps because of an inability to roll over short-term debt), and their funding mix has become more diversified than for nondistressed banks. However, their loan-to-deposit ratios have increased as a result of reduced access to deposits, and debt financing (including recourse to central bank funding through repos) has increased, pushing up their leverage and reducing equity-to-asset ratios considerably.

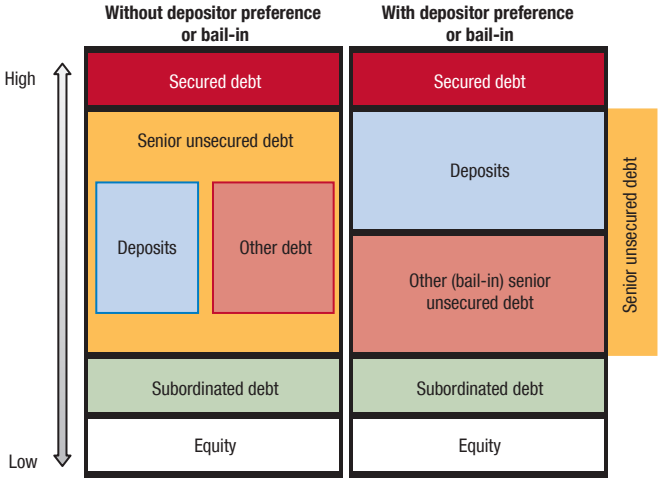
Crisis and the Impact of Regulatory Reforms on the Pricing of Bank Liabilities

The crisis has prompted various regulatory reform proposals, some of which are aimed at directly changing bank funding structures and loss-sharing rules across

analyze the importance of core and noncore funding ratios as in Hahm, Shin, and Shin (2012).

[15]Distressed banks are defined as those with z-scores below 3 (those in the lowest 10 percent of the distribution).

Figure 3.12. Priority of Claims of Bank Liabilities



Source: IMF staff.

various funding instruments. Basel III capital regulations should raise banks' loss-absorbing equity buffers, and the accompanying liquidity regulations should strengthen funding structures against liquidity shocks. OTC derivatives reforms, by requiring collateral to be set aside in bilateral trades and at centralized counterparties, will enhance the safety of these markets but will encumber more assets. Proposals to strengthen resolution frameworks (such as introducing depositor preference and providing bail-in powers) may increase losses for some bank creditors in an effort to protect small depositors and limit the burden on taxpayers in the event of resolution (Figure 3.12 and Annex 3.2).[16]

Policymakers need to be aware of the complex interactions of these reforms—while acknowledging the legacy effects of the crisis—on bank funding structures and costs. In particular, some changes to funding structures (including more equity) combined with reallocation of losses upon bank failure among different debt holders can produce disproportionate changes of funding costs that are not easily anticipated. On the one hand, having more equity (a larger loss-absorbing buffer) makes all debt safer and cheaper. On the other hand, bail-in powers and the introduction of depositor preference—which are being actively discussed in Europe—combined with high levels of asset encumbrance (elevated, in part, as a result of the ongoing crisis) magnify the expected losses that senior unsecured debt holders will suffer in the event of default, which can increase their costs. The overall effect on funding costs is not easily surmised, as not only will the rates associated with each liability type change, but the amounts used of each type will also change. Most likely, systemically important banks that had been able to fund themselves at a lower overall cost than other banks as a result of their implicit too-big-to-fail status will see their cost of funding rise. For other banks, the effects will depend on a combination of factors, as highlighted in the following examples (Box 3.4).

A numerical analysis based on the option-like features of bank funding structures can help shed light on the possible repricing effects of some key aspects of these reforms. This approach, which builds on Merton (1974), allows a holistic analysis by linking the price of debt to the overall composition of funding (including the equity buffer) and to the risks on the bank's balance sheet. At the same time, not all regulatory reforms can be placed into this framework. For example, Basel III liquidity regulation can make a bank safer by changing its asset structure, rather than its liability structure, and by reducing its asset-liability maturity mismatch, which is the main source of liquidity risk. Before discussing the numerical exercise, this section first reviews selected aspects of regulatory reforms and asset encumbrance, providing a sense of their likely effects on funding structures (for more details, see Annex 3.2).

Basel III Capital Regulations: More and Higher-Quality Capital

The Basel III capital regulations promote higher levels of minimum equity capital and improve its quality, making any debt safer and cheaper.[17] Although the minimum total capital requirement is set at the same level as in Basel II—8 percent of risk-weighted assets—the quality of capital in Basel III is higher, requiring 4.5 percent of risk-weighted assets to be of higher-quality capital (common equity Tier 1 [CET1]). In addition, Basel III sets considerably more stringent criteria for what qualifies as CET1, additional Tier 1 capital, and Tier 2 capital. The Basel III framework

[16]Bail-in powers are generally designed to ensure that shareholders and debtors internalize the cost of bank failure rather than being bailed out by taxpayers. See Le Leslé (2012) for the broad impact of these regulatory initiatives on European banks.

[17]The Basel Committee on Banking Supervision (BCBS) issued the details of its global regulatory capital standards in 2010 (BCBS, 2010a). They are expected to be phased in by 2019.

Box 3.4. Bank Funding in Emerging Market Economies and the Impact of Regulatory Reforms

This box summarizes funding structures of emerging market economy banks and provides some indications of how regulatory reforms will affect these banks.

In general, emerging market economy banks have safer funding structures than advanced economy banks. Emerging market economy banks are better capitalized, rely more on deposits and less on debt, and have lower funding gaps (loan-to-deposit ratios), all of which are desirable features for a more resilient bank (Figures 3.4 and 3.10). Even larger banks do not appear to rely excessively on wholesale versus deposit funding (Figure 3.5). Asset encumbrance appears to be limited as well: most of their medium-term debt is either senior unsecured or capital-qualifying debt (Figures 3.2 and 3.6). In some economies, funding from a foreign parent bank—a type of wholesale funding—could be a relevant source of bank funding, although in some cases subsidiaries provide funds to parents.

Current bank funding structures in emerging market economies appear to be less affected by regulatory reforms, although some cross-border effects pose concerns. Emerging market banks seem to be better positioned to satisfy Basel III requirements, on average, than their advanced economy peers. Potential tensions arising in advanced economies (among liquidity regulations, asset encumbrance, depositor preference, and bail-in power) appear less stark as well. However, interactions among home (advanced economies) and host (emerging market economies) jurisdictions will require enhanced cooperation and communication so as to reduce potential cross-border tensions from reforms that aim to strengthen resolution framework and lower financial stability risks.

- Basel III capital and liquidity requirements are expected to be implemented on the same schedule for all Basel Committee on Banking Supervision member jurisdictions, including those in emerging market economies such as Argentina, Brazil, China, India, Indonesia, Mexico, Russia, Saudi Arabia, South Africa, and Turkey, and those in the European Union. Some other emerging market economies in Latin America and Asia have also indicated that they will implement the new regulations. However, in other countries, it could take much longer before they adopt Basel III.
- In general, the already-higher capitalization and greater reliance on deposits should support emerging market economy banks' transition to Basel III. However, there are variations across jurisdictions. For instance, banks in Mexico tend to rely much more on repurchase agreements and other wholesale funding sources than do their Asian peers (CGFS, 2013), which could mean lower liquidity ratios. While some jurisdictions have voiced concern about their limited supply of government securities, which is a major component of high-quality liquid assets in satisfaction of the liquidity coverage ratio, many emerging market economy banks have an even higher share of government securities on their balance sheet than do their advanced economy bank peers, including banks from Saudi Arabia or financial centers such as Hong Kong SAR and Singapore (see Chapter 3 of the April 2012 *Global Financial Stability Report*, although liquidity of these securities could be less than those in advanced economies.
- One area of uncertainty faced by emerging market economy banks is how any funding they receive from their parent banks in advanced economies will be treated. In principle, liquidity regulations are applied at group levels, covering both parent and subsidiary, and it is up to host supervisors to decide whether to additionally apply the regulation on a solo basis to foreign bank subsidiaries in their jurisdiction, which should help to ensure that liquidity buffers are sufficient for the local bank. However, there could be a direct impact on their funding if these banks are borrowing substantially from their parent and their parents need to adjust their own operations to cope with new regulatory requirements, including by deleveraging and by increasing local high-quality liquid assets and deposits.
- The Financial Stability Board (FSB) is encouraging the G20, including the major emerging market economies, to adopt the legal reforms necessary to fully meet the *Key Attributes of Effective Resolution Regimes for Financial Institutions* (FSB, 2011) by the end of 2015. Emerging market economy banks' high share of deposit funding, combined with bail-in powers and deposit preference (if adopted) could potentially push up their cost of issuing unsecured debt. However, low asset encumbrance and relatively high equity capital buffers should help to mitigate any adverse impact on overall funding costs.

The authors of this box are Marc Dobler, Hiroko Oura, and Mamoru Yanase.

Box 3.4. *(continued)*

- Key concerns of policymakers in emerging market economies are (1) how the reforms for global systemically important banks would affect their scale of operations and intermediation costs in host jurisdictions (particularly when the host banking systems are largely foreign-owned); and (2) whether benefits and costs of the reforms would be spread unevenly across home and host jurisdictions, depending on where additional loss-absorbing capacity is held and which jurisdiction is permitted to trigger a bail-in. The FSB is encouraging enhanced cooperation and communication between home and host authorities, including with host authorities who have not been invited to participate in the crisis management groups that have been set up for each global systemically important bank to address these risks.

also adopts a non-risk-sensitive simple leverage ratio that serves as a backstop to the risk-based measures by constraining the buildup of leverage in the banking system. Furthermore, Basel III adds various buffers,[18] which will eventually raise the effective total capital ratio to between 10.5 and 15.5 percent, depending on the applicability of the extra buffers, mostly in CET1.[19] Global systemically important banks are subject to surcharges, given their critical relevance for financial stability. With no change in assets, higher capital buffers should reduce the probability of default, reducing the costs of debt regardless of the remaining funding structure.[20]

Basel III also raises the loss-absorbing capacity of debt that qualifies as additional Tier 1 and Tier 2 capital, better protecting senior debt. In particular, the relevant authority should have discretion to write off or convert these other instruments to common equity if the bank is judged to be nonviable.[21] The objective is to give better incentives for investors to limit banks' risk taking and to increase the private sector contribution in resolving failed banks while reducing fiscal costs.

[18]These include (1) a conservation buffer (additional 2.5 percent of risk-weighted assets with CET1) that triggers supervisory limits on a bank's payouts (for example, dividends) when banks fall into the buffer range; (2) a countercyclical buffer (an additional zero to 2.5 percent of risk-weighted assets with CET1) that is added when supervisors judge that credit growth is leading to an unacceptable buildup in systemic risk; and (3) additional charges on G-SIBs (currently 1 to 2.5 percent of risk-weighted assets with CET1) to ensure they have higher loss-absorbing capacity to reflect risks that they pose to the financial system.

[19]Some view this minimum capital requirement to be insufficiently large (Admati and Hellwig, 2013).

[20]See also the section in this chapter on "Are Bank Funding Structures Relevant to Financial Stability?"

[21]For instance, this would occur if minimum capital requirements are breached and recapitalizing through private markets is not feasible.

Basel III Liquidity Regulations: Longer and More Stable Funding

The systemic liquidity shocks during the global financial crisis promoted globally agreed-upon quantitative liquidity regulations for the first time. The regulations are formulated as the liquidity coverage ratio to improve resilience to short-term liquidity shocks by encouraging banks to hold high-quality liquid assets for such events, and the net stable funding ratio (NSFR) requiring long-term assets to be financed by stable funding (BCBS, 2010b). These regulations aim to reduce liquidity risks arising from maturity mismatches and short-term funding sources and to provide a stronger incentive for banks to shift their funding mixes to include more insured deposits (from individuals and small and medium enterprises) and more longer-term funding (secured or unsecured), which have been shown to be relatively more resilient during the recent crisis.

Most banks are on track to satisfy the liquidity requirements, implying little additional need to modify liability structures. The latest Quantitative Impact Study (QIS) for liquidity coverage ratios (BCBS, 2012) showed that banks in the BCBS member jurisdictions already had a greater than 90 percent liquidity coverage ratio, on average, at the end of 2011, compared with the 100 percent requirement to be achieved by 2019, although European banks lag somewhat.[22] With the 2013 revision to the rule (BCBS, 2013a), the average liquidity coverage ratio for those banks is likely to exceed 100 percent. The latest QIS (as of June 2012) suggests that the average net stable funding ratio had already reached the required 100 percent level (BCBS,

[22]Central bank funding is less likely to affect the liquidity coverage ratio because it reduces both the unencumbered high-quality liquid assets (that is, the numerator of the ratio) and, because of the stability of central bank funding, the amount of funds that can be lost within 30 days (that is, the denominator).

2013b), although the rule is currently under review by the BCBS and has yet to be finalized.

The Impact of the Crisis and Various Reforms on Asset Encumbrance

The more assets are used as collateral (termed "encumbered") to mitigate counterparty risks, the less likely it is that unsecured creditors will receive what they are due in the event of a resolution, thus raising their costs. Encumbered assets are used to back up repayments owed to secured debt holders or the settlement of losses on derivatives contracts (see Table 3.4 in Annex 3.2 for an illustration). Collateral is useful for mitigating counterparty risks, and secured funding (including central bank funding) could be the only available source of market funding during a systemic liquidity crisis. However, higher asset encumbrance reduces the amount that debt holders without collateral will receive if the bank becomes insolvent, and therefore those debt holders will require higher yields to hold this debt. At the same time, other liability holders will be better protected (including those holding secured debt), and their required returns will likely be lower. The overall effect on funding costs will depend on the amounts of various types of funding instruments, the relative funding costs, and the underlying riskiness of the banks' assets (both encumbered and unencumbered), leading to an ambiguous overall effect on funding costs.

Asset encumbrance can be driven by both transient and permanent factors.

- *Transient factors (including crises):* Periods of financial distress can be accompanied by systemic liquidity shortages resulting from the declines in private short-term wholesale funding that occur when participants withdraw due to elevated counterparty credit risk. During such times, central banks provide liquidity to banks against collateral, leading to higher asset encumbrance (see Figure 3.8).[23] Moreover, weaker banks may only be able to tap private markets if they offer secured debt. These increases should dissipate once financial conditions normalize.
- *Regulatory factors:* In contrast, regulatory changes could lead to more permanent changes in asset encumbrance.[24]
  - Some aspects of the Basel III liquidity regulations could encourage covered bond issuance and increase asset encumbrance. For instance, covered bonds qualify as a part of high-quality liquid assets, which would improve the liquidity coverage ratio if a bank holds covered bonds as assets.[25] The ratio for an issuing bank would improve if long-term covered bonds replace shorter-term wholesale funding. Issuing covered bonds can also improve the net stable funding ratio by raising the available amount of long-term stable funding.
  - OTC derivatives reforms will lower counterparty credit risks at the expense of higher encumbrance. The reforms will encourage participants to place collateral either with derivatives counterparties (including dealer banks) or with a formal central counterparty, both of which will receive preferential treatment in the event of resolution. Because activity in this market is dominated by banks, it is expected that the collateral requirements could be quite large, encumbering more assets.

The Impact of Bank Resolution Reforms

Two elements of the current bank resolution reform proposals could especially affect bank funding patterns and costs. These are: (1) depositor preference in liquidation, when bank operations are discontinued; and (2) the bail-in of creditors in resolution, when bank operations are maintained but, possibly, restructured.

Depositor preference gives depositors legal seniority over other senior unsecured creditors when a bank is closed, providing better protection for (small) depositors at the expense of bondholders (see Figure 3.12 and Table 3.4 in Annex 3.2). This preference contrasts with corporate liquidation systems in which all unsecured creditors are ranked equally (that is, *pari passu*), unless contracts state otherwise. Depositor preference can contribute to financial stability by enhancing depositor confidence and reducing contingent liabilities of the

[23]Gorton and Metrick (2012) indicate jumps in the reductions ("haircuts") assigned in the U.S. private repo market. Covered bonds are typically issued with collateral whose value exceeds that of bonds, and this excess is measured by overcollateralization. Rating agencies often set the level of overcollateralization that is necessary to maintain a certain rating. These levels vary significantly across bonds, from less than 10 percent to more than 100 percent.

[24]For a discussion of covered bonds and the degree to which they alter bank incentives, see Jones and others (forthcoming).

[25]Banks are becoming major investors of covered bonds issued by other banks, in part motivated by their preferential treatment in the liquidity coverage ratio framework. However, at the end of 2011, covered bonds amounted to less than 3 percent of high-quality liquid assets.

deposit guarantee scheme. Many countries, including the United States, already have some form of explicit depositor preference, and many provide implicit preferences during a systemic crisis. The international proposal—the Financial Stability Board's *Key Attributes of Effective Resolution Regimes for Financial Institutions* (FSB, 2011)—does not require countries to adopt depositor preference. However, its use may facilitate the use of other resolution tools, such as bail-in.[26] A number of countries, including the European Union as a whole, are actively considering depositor preference. Depositor preference can be "tiered" so that insured deposits are covered first, with the deposit guarantee scheme stepping in to assume the rights of the depositor in liquidation proceedings (called subrogation), and then other deposits that are eligible for the deposit guarantee scheme coverage (but that exceed the insurance limit) are covered before payouts are made to senior unsecured creditors. This tiered structure offers the greatest financial protection for the state (or the deposit guarantee scheme), but also would concentrate potential losses on a smaller group of creditors.

Statutory bail-in aims to hold bank bondholders accountable for the risks they assume by removing the implicit too-big-to-fail subsidy for systemically important institutions and by imposing larger losses on them than on smaller retail creditors. Statutory bail-in grants authorities the power to write down debt or convert debt to equity when a bank is near failure so that these bailed-in debts absorb losses should capital be exhausted (see Zhou and others, 2012).[27] These powers become available when a bank is no longer viable but before it becomes insolvent, ensuring that bank bondholders fully bear the risks they assume.[28] This action should remove bank bondholders' expectations that their investments in systemically important banks will be bailed out by taxpayers. Bank bondholders are typically institutional investors who are assumed to have the capacity to make more informed choices and absorb losses more easily than retail depositors. Therefore, the Financial Stability Board's proposal (FSB, 2011) excludes insured depositors (and secured debt holders) from bail-in, although some countries may exclude additional liabilities, such as short-term debt and interbank funding. These exclusions would increase losses for bail-in debt holders beyond what would have applied when they were ranked equally with all other senior creditors.[29] Hence, to attract bondholders for bail-in debt, their yields would need to rise to reflect the increased prospect of losses (Figure 3.12 and Table 3.4).

For bail-in powers to effectively provide more loss-absorbing capacity, banks would need to maintain a certain amount of bail-in debt, leading to proposals for some quantitative targets. The 2012 European Commission's proposal (EC, 2012) suggests 10 percent of total liabilities (including regulatory capital) as the target. In the United Kingdom, the Vickers report (ICB, 2011) proposes loss-absorbing capacity between 7 and 10 percent of risk-weighted assets (in addition to equity amounting to 10 percent of risk-weighted assets). This level was set to ensure that banks would have enough loss-absorbing capacity to cover losses comparable to those that have materialized in the most recent bank failures.[30,31]

[26]For example, if a resolution authority decides to restructure and revive a bank, forcing general debt holders to forgo some value (that is, bail-in) while protecting insured depositors, the general debt holders can potentially sue the resolution authority, claiming they would have been better off if the bank had been liquidated. Introducing depositor preference for insured depositors would align the recovery amount for general debt holders more closely to the bail-in amount, preventing such a lawsuit.

[27]Statutory bail-in power and bail-in debt should not be confused with contingent convertible capital instruments (CoCos), despite their similarities. CoCos are new bank capital instruments that have contractual clauses indicating they are written off or converted to equity when contractually set criteria are met, such as a decline in the CET ratio to, say, 7 percent (a level that could be set above regulatory minimums). In contrast, statutory bail-in powers give legal rights to a country authority to give a haircut to general debt (such as senior unsecured debt or uninsured deposits, unless explicitly exempt) or convert it to equity when a bank is deemed not viable.

[28]The point at which a resolution authority decides a bank is not viable should be somewhere between breaching the regulatory minimum capital requirement and becoming insolvent, and it should be the same as for other bank resolution tools. The Basel III capital regulations already incorporate such bail-in characteristics with capital-qualifying debt instruments.

[29]However, in the past, resolution authorities have protected some depositors without legal rights. For instance, a failing bank's deposits and some corresponding assets may be transferred to other banks. Therefore, the current yield for senior unsecured debt should already reflect such differential treatment to some degree.

[30]During 2007–10, the Anglo Irish Bank suffered a loss of 39 percent of risk-weighted assets, though all other banks saw losses of less than 16 percent.

[31]This emphasis on "large enough" loss-absorbing capacity contrasts with some of the traditional views that emphasize the role that even a small amount of debt (for example, subordinated debt) can play in motivating such creditors to monitor and discipline banks' activities (Calomiris, 1999; Calomiris and Kahn, 1991). In contrast, Admati and Hellwig (2013) challenge the disciplining role of bank debt and propose that banks should have a higher amount of equity capital (15 percent of unweighted total assets) to absorb losses.

Potential Challenges Posed by the Regulatory Reforms

Strengthening resolution regimes will increase the cost of senior unsecured bonds but will also require a sufficient amount of bail-in debt to provide potential loss absorption.

- Introducing depositor preference would increase unsecured creditor losses in the event of a bank failure by reducing their seniority rank. This provides better protection for retail depositors and small and medium enterprises. Bail-in powers could also impose higher losses on unsecured creditors, increasing the cost of this bail-in debt. The largest effect on funding costs will likely be on systemically important banks because it will lessen the implicit subsidy they have received from their too-big-to-fail status. Some researchers (for example, Ueda and Weder di Mauro, 2012) estimate that the implicit subsidy is worth between 80 and 100 basis points. The exact cost impact of several configurations is explored quantitatively in the following section. The higher cost could drive banks to increase insured deposits and secured funding. It also raises the question of whether traditional investors in bank debt will purchase bail-in debt in the future (see Box 3.5).
- The growing use of deposits in some jurisdictions and the likelihood that uninsured deposits will either be formally preferred or given de facto preferential treatment in a resolution (for instance, via public guarantees to contain a deposit run) may reduce the effectiveness of bail-in powers, without commensurate efforts to ensure that sufficient bail-in debt is issued.

Some reforms encourage asset encumbrance, even though this may be detrimental to resolution processes. Excessive asset encumbrance reduces bail-in debt and makes resolution less effective. When too many assets are encumbered, unsecured creditors (including the deposit guarantee scheme) will incur higher losses in order to honor secured debt contracts and collateral payments. The full extent of asset encumbrance, including central bank funding during a crisis, short-term repos, and covered bonds with overcollateralization, is hard to gauge with current reporting systems. Therefore, some countries are improving the reporting of asset encumbrance or setting limits on encumbrance, for example, by limiting the combined value of assets that can be used to secure covered bonds.[32] However, avoiding higher asset encumbrance is difficult when banks face systemic funding difficulties. Attempts to introduce bail-in rules or limits to asset encumbrance in the middle of a systemic crisis could exacerbate instability. Moveover, limits on asset encumbrance may also make it more difficult to achieve the goal of making OTC derivatives safer. On the other hand, without such limits, a bank may have too few assets to be shared among unsecured creditors (including uninsured depositors and the deposit guarantee scheme) when they face resolution.

Basel III liquidity regulations and the alterations in resolution regimes may push bank funding structures in different directions and will likely drive some intermediation into the shadow banking arena (see Chapter 1). The liquidity regulations encourage (insured) deposit funding that is likely to be protected by depositor preference and from being bailed in, and hence may reduce the proportion of bail-in debt.[33] Banks also may rely on long-term secured debt to reduce maturity mismatches, encumbering more assets. Although the latest Quantitative Impact Study indicates banks are broadly on track to meet the liquidity ratios, European banks—the main issuers of covered bonds—have tended to lag. And in general, banks' ability to acquire funding may become more difficult, leaving room for other nonbank institutions (shadow banks) to collect savings and intermediate credit.

Implications of Regulatory Reforms on Bank Funding Costs: A Numerical Exercise

There have been many attempts to assess the cost implications of bail-in powers, depositor preference, and asset encumbrance, but few of these fully incorporate the changes in the overall funding structure of a bank. So far, the difference between the yield spreads of secured and senior unsecured bank debt has been relatively small compared with the spread against subordinated debt (Figure 3.13). Various market

[32]For example, Australia, Canada, and Singapore set limits on asset encumbrance (with Australia's introduction in October 2011 corresponding to its allowance of covered bond issuance). The Netherlands, Norway, and the United Kingdom took a case-by-case approach that set threshold values for covered bond issues for individual institutions (Houben and Slingenberg, 2013). The European Banking Authority issued a consultation paper (2013) on strengthening reporting and transparency of asset encumbrance.

[33]As an extreme example, suppose a bank funds itself with 90 percent insured deposits and 10 percent equity. This liability structure would be desirable from the perspective of the Basel III liquidity requirements but inconsistent with the desire to have bail-in debt. Of course, enough equity capital would supplant the need for bail-in debt.

Box 3.5. Investor Base for Bail-in Debt and Bank Bond Ratings

Three types of bail-in bonds are potentially available—senior, subordinated, and contingent convertible debt (or CoCos)—with different investor bases. The degree to which traditional buyers of senior bank debt are willing to purchase bail-in debt will largely depend on whether the issuing banks are able to maintain stand-alone investment grade status. CoCos would likely attract investors with higher risk tolerance because of their higher trigger points, compared with senior and subordinated debt. New regulations and accounting standards may also play a role.

Traditionally, the main buyers of senior bank debt have been insurers and pension funds, as well as some mutual funds devoted to investment-grade fixed-income instruments and sovereign wealth funds that have a moderate appetite for credit risk. Event-driven credit arbitrage hedge funds have also participated in this market, but they are more prominent in the subordinated bank debt market.

Investor demand for senior debt critically depends on whether the issuing banks maintain investment-grade ratings. According to a recent investor survey by JPMorgan (Henriques, Bowe, and Finsterbusch, 2013), 34 percent of European bank debt investors say they would reduce their investment in senior unsecured debt if it became a bail-in instrument, while 63 percent of them would maintain it as is. At the same time, survey participants indicated that the most important factor determining their decision would be whether the debt would still carry investor grade ratings. Recent guidelines provided by rating agencies suggest that only issuers with high stand-alone ratings would have investment grade senior bail-in debt. If that is the case, the investor base for senior debt may shrink. Currently, more than 90 percent of the senior unsecured debt issued by banks is investment grade.

CoCos would likely attract investors with higher risk tolerance because of their higher trigger points, compared with senior and subordinated debt. The payoff structures of senior and subordinated debt are similar in the sense that the value of debt is written off or converted to equity (the trigger point) when the resolution process is introduced (for example, when the corresponding capital ratio is between zero and the minimum requirement). By contrast, the trigger for CoCos is usually set at higher levels (closer to the minimum capital requirement), which would, all else equal, result in a higher probability of default, making these securities more attractive to investors with a higher tolerance for credit risk, such as hedge funds or high-yield investment funds. Given the more limited investor base, development of CoCos may be constrained. Total assets under management for event-driven credit arbitrage hedge funds are only $16 billion, although the hedge fund industry has been growing rapidly, with year-over-year growth of 10 percent as of the end of 2012. Barclays (2013) estimates that the European CoCo market currently stands at only about €19 billion, but if interest from investors expands, then this could rise to as much as much as €400 billion, which is equivalent to the size of the existing European bank subordinated debt market.

Some investors may be constrained by regulations even though the current low interest rate environment would otherwise make them likely candidate buyers for bail-in debt. Insurance companies are a good example—two opposite factors influence their appetite (CGFS, 2011). The negative factor includes prospective changes to international regulatory and accounting standards, which can reduce demand for riskier bonds. New mark-to-market rules in international accounting standards are expected to increase the volatility of insurance companies' financial statements, making riskier assets with higher price variation less attractive. The Solvency II Directive in Europe, currently scheduled to be phased in beginning in 2014, will also require assets to be marked to market and more capital to be held against equity-like instruments, structured products, and long-term or low-rated corporate and bank bonds. However, the current low interest rate environment lowers insurers' profits (because many of them continue to offer high guaranteed returns or generous defined-benefit-type products), encouraging them to search for higher-yielding assets, creating potential demand for the riskier bail-in debt.

The authors of this box are Serkan Arslanalp and Takahiro Tsuda.

Figure 3.13. Bank Bond Yield to Maturity at Issuance: Selected Advanced Economies
(Percent)

Sources: Dealogic; and IMF staff estimates.
Note: Weighted average yield using deal volume, through May 2013. Excludes deals without volume or yield-to-maturity data, perpetual bonds, and those in foreign currencies. Sample includes both private and public banks but excludes agency bonds.

estimates indicate the yield of senior unsecured debt could increase by 100 to 300 basis points under bail-in powers. The current spread between existing CoCos and senior debt (about 500 basis points) is viewed by some as a good approximation, although CoCos are part of subordinated debt, which would continue to be ranked below senior bail-in debt (Le Leslé, 2012). Moreover, the estimates typically fail to account for the positive influence of the larger equity buffers that will be required under Basel III.

Depositor Preference and Asset Encumbrance

Depositor preference and asset encumbrance can be analyzed using a similar pricing model, despite their conceptual and legal differences. Both secured debt and preferred deposits have priority over other unsecured bondholders (see Annex 3.3).[34] Based on a stylized liability structure, as in Figure 3.12, bondholders face losses on their debt when the total losses of the bank exceed the sum of all the claims with lower priority (that is, subordinated debt defaults when the losses are larger than the amount of equity). Therefore, changes in the ranking of priority or in the size of each type of debt affect the cost to other bondholders. For convenience, all types of instruments (including secured debt) that are ranked above other creditors are labeled "preferred creditors" in this exercise.

Because the resolution framework reforms are currently being actively debated in Europe, the yield spreads on each type of debt are calculated for a hypothetical bank that has characteristics broadly similar to those of large European banks.[35] In particular, the proportions of equity and subordinated debt to total assets are about 5 percent (see Figure 3.1) and 2 percent, respectively (using only balance sheet assets, not risk-weighted assets). To see the sensitivity of bank funding costs vis-à-vis bank capital levels, we also examine the

[34]To be exact, there are clear differences between having priority claims based on depositor preference and on asset encumbrance. Depositor preference provides legal seniority to deposits over other unsecured creditors. Secured debt holders have priority claim only up to the value of the collateral assets. If collateral value falls short of the face value of secured debt, then the creditors rank equally to other general debt holders for the shortfall amount. See Chan-Lau and Oura (forthcoming) for a fuller analysis of asset encumbrance.

[35]Based on the average capital structure for Royal Bank of Scotland, Commerzbank, DnB NOR, Société Générale, Lloyds, Barclays, HSBC, Banco Bilbao Vizcaya Argentaria, Intesa Sanpaolo, Nordea Bank AB, Danske Bank, Crédit Agricole S.A., and BNP Paribas.

yields when a bank hypothetically maintains two higher equity-to-total asset ratios: 10 percent, at the highest end of possible capital requirements across countries, and 15 percent, an even higher level.[36] The other liabilities are assumed to be funded either by deposits or senior unsecured debt. For large European banks, secured debt and deposits average about 17 percent and 48 percent, respectively (Street, Ineke, and McGrath, 2012).[37] With 24 to 70 percent of the deposits insured in Europe (see Annex 3.2), the exercise assumes that preferred creditors account for 30 to 50 percent of total liabilities.[38] The analysis measures bank riskiness using total asset volatility and considers two levels: 5 percent, close to the current average for global systemically important banks; and 10 percent, the worst case during the global financial crisis.[39] All debts are assumed to have zero coupons with a maturity of five years. The five-year risk-free rate is set at 3 percent.

The spreads across different funding instruments depend mostly on the underlying health and riskiness of bank assets and the share of preferred creditors. Figure 3.14 shows the calculated spreads for all types of debt over the risk-free rate for several underlying situations: (1) alternative proportions of preferred creditors (horizontal axis); (2) equity buffers; and (3) different levels of asset volatility. The figure also shows the yield of senior unsecured debt when it is ranked equally with preferred creditors (labeled as pari passu yields) for comparison. Introducing depositor preference changes the seniority structure and raises senior unsecured debt yields from the pari passu levels to the "senior unsecured" line in Figure 3.14. If preferred creditors represent secured bondholders, then the cost of senior unsecured debt changes (along the line) for different shares of preferred creditors:

- As bank capitalization (the equity-to-asset ratio) declines and asset volatility increases, spreads rise disproportionately, indicating much higher funding costs for riskier and less-capitalized banks. If a bank maintains recent levels of safety (5 percent asset volatility) and is exceptionally well capitalized (15 percent equity-to-asset ratio), even subordinated debt can be issued at a fairly low cost (below 200 basis points over the risk-free rate), and the senior unsecured debt yield rises fewer than 50 basis points regardless of the proportion of preferred creditors (Figure 3.14, panel 6).
- The exercise shows that the share of preferred creditors has a major influence on the spreads of senior unsecured debt (see Figure 3.14).
  (1) Asset encumbrance alone appears less likely to increase the cost of senior unsecured bonds to unbearable levels for European banks (Figure 3.14, panel 4). The share of secured debt, at an aggregate level, is about 25 percent even for Greece (see Figure 3.8). At these levels, the increase in the senior unsecured debt spread (along the "senior unsecured" line in Figure 3.14) is less than 30 basis points. The spread of senior unsecured debt over secure debt (preferred creditors' yield) is about 55 to 75 basis points, comparable to the actual differences for most European banks (see Figure 3.13).
  (2) However, the senior unsecured debt yield spread rises more appreciably with depositor preference. The spread would rise relative to the "senior unsecured pari passu" line and would depend on the share of preferred deposits, which can be much larger than secured debt. For European banks (Figure 3.14, panel 4), the increase is about 30 to 50 basis points when preferential treatment is limited to insured deposits (dark orange section in Figure 3.14) on top of secured debt. But it could range from 50 to 120 basis points when deposits that receive preferential treatment rise from 50 to, say, 65 percent of assets (light orange section).[40] The actual increases critically depend on the size of

[36]A level of 10 percent equity to total assets roughly corresponds to the CET1 requirement with maximum possible buffers and a 0.7 percent ratio between risk-weighted assets and total assets (comparable to the levels in the United States and emerging market economies). It is worth noting that U.S. banks had an equity-to-total-asset ratio of more than 10 percent for the decades before World War II (Miles, Yang, and Marcheggiano, 2012). Although it is not universally endorsed by economists, Admati and Hellwig (2013) propose a 15 percent ratio.

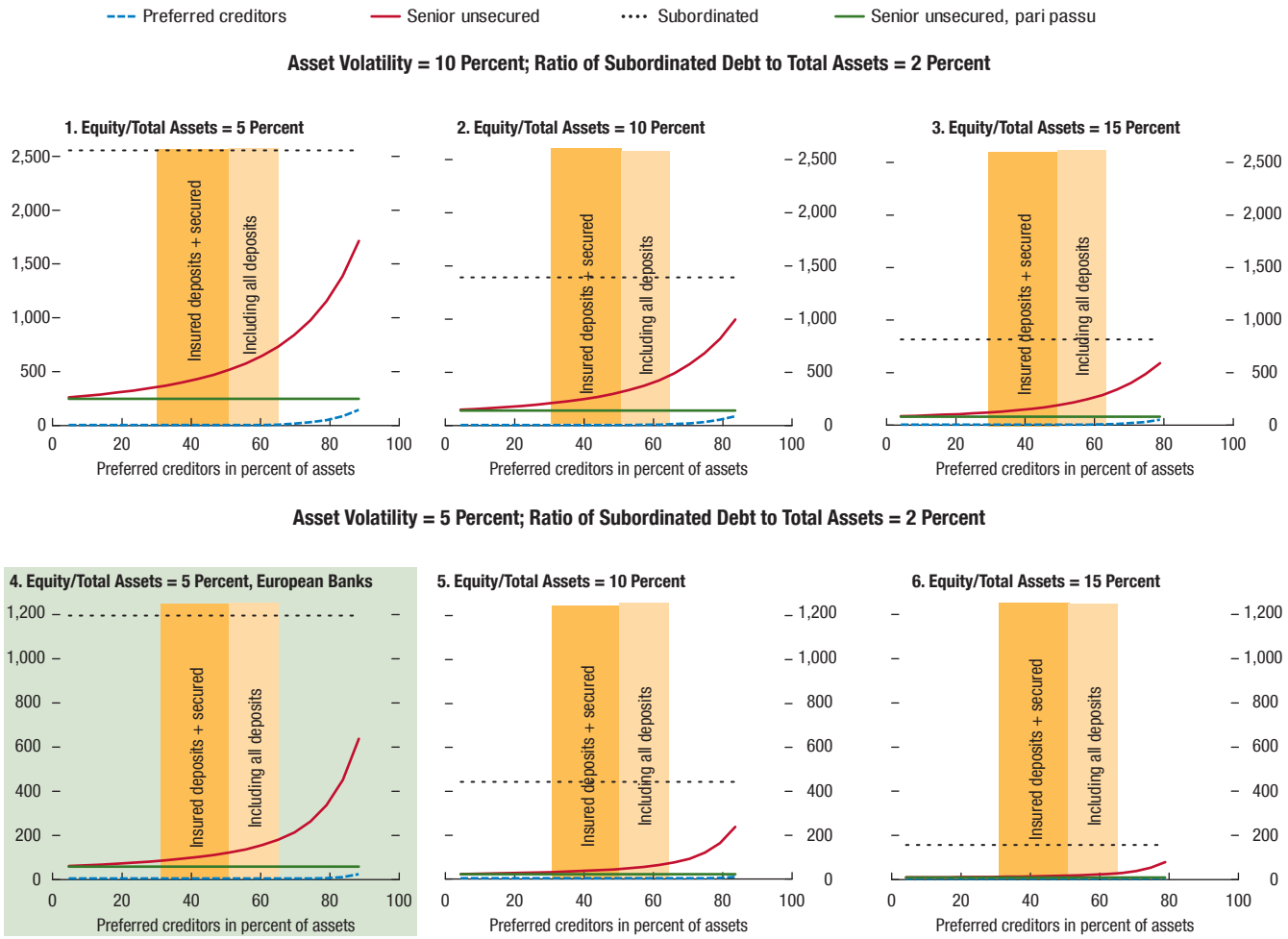
[37]Assuming repos and short sales are net with reverse repos.

[38]These are very rough estimates, applying a range of national aggregate estimates for the share of insured deposits to the average share of deposits in total liabilities among the 13 large European banks. Much larger variations across individual banks could be present.

[39]The 10 percent corresponds to the highest observation across time and across banks using total asset volatility as calculated by Moody's KMV for global systemically important banks (as defined by the Financial Stability Board) from January 2005 through June 2013. The median (across time and banks) is about 4 percent, and the average for May 2013 is 4.2 percent.

[40]Depositor preference should also reduce the cost of deposits from the senior unsecured pari passu debt levels to preferred creditors levels. However, banks might already enjoy low deposit funding costs thanks to a deposit guarantee scheme. In that case, higher seniority benefits the deposit guarantee scheme but not the banks.

Figure 3.14. Debt Pricing under Depositor Preference and Asset Encumbrance
(Spread over risk-free rate; basis points)



Source: IMF staff estimates.
Notes: "Preferred creditors" may include secured debt, preferred deposits, or both. The lines for "senior unsecured" show yield for holders of senior unsecured debt when they have lower priority than "preferred creditors." The lines for "senior unsecured, pari passu" show yields for senior unsecured debt (and for preferred creditors) when it is ranked the same as for preferred creditors.
Assumptions: Equity-to-total-asset ratio for European banks is about 5 percent (Figure 3.1), and the subordinated debt ratio is about 2 to 3 percent. A 10 percent equity-to-asset ratio roughly corresponds to the Basel III CET1 requirement, with maximum possible buffers and 70 percent risk-weighted-assets-to-total-asset ratio (e.g., U.S. and emerging market bank levels). The 15 percent corresponds to the proposal by Admati and Hellwig (2013). The asset volatility assumption is based on the estimate by Moody's KMV for global systemically important banks (January 2005–June 2013), with 10 (4) percent as the highest (median) across time and banks. The average for May 2013 is 4.2 percent. For large European banks, secured debt (assessing repos on a net basis) and deposits average 17 percent and 48 percent of the assets, respectively, and 24 to 70 percent of the deposits are insured (Table 3.5).

preferred deposits and the other parameters in the model.

- Depositor preference or asset encumbrance increases the cost of senior unsecured debt but not to the levels of subordinated debt. The spreads for senior unsecured debt are well below those for subordinated debt even when the share of preferred creditors is as high as 70 percent—the current share of total deposits for banks in Japan and emerging Asia (see Figure 3.1). Senior unsecured debt is likely to remain a distinct asset class from subordinated debt.

Bail-in Powers

The pricing effects of introducing bail-in powers depend on the conditions for initiating a bail-in and the liabilities excluded from being bailed in. This section assumes that the bail-in debt is converted to

equity when the equity-to-asset ratio falls to 5 percent and original equity holders are diluted.[41,42] It is further assumed that banks have three types of liabilities: (1) a liability that is exempted from being bailed in, labeled as "preferred creditors;"[43] (2) bail-in senior unsecured debt; and (3) capital (equity and capital-qualifying subordinated debt combined). Capital buffers of 7 percent, 12 percent, and 17 percent are considered.[44] Other assumptions are the same as in the depositor preference and asset encumbrance cases.

The simple existence of bail-in powers would have a relatively small impact on bail-in bond yield spreads (Figure 3.15):

- The effect of converting bail-in liabilities to equity is small. The "benchmark" yield spread shows the yield spread of senior unsecured debt that is junior to preferred creditors. The difference between the benchmark and bail-in debt yield spreads represents the effects of conversion to equity. For European banks, the difference is small when the exemption is limited to insured deposits and secured debt (dark orange section). When all deposits are exempted (the share of preferred creditors is about 65 percent), bail-in debt costs about 50 basis points more than the benchmark yields (difference between red dashed and red solid lines).
- However, the share of exempt liabilities (namely, preferred creditors) plays a large role similar to that of the depositor preference and asset encumbrance cases. The benchmark yield spreads themselves are already 120 basis points higher than the yield spreads when senior unsecured debt is ranked equally to preferred creditors (pari passu yields), because seniority is given to preferred creditors.

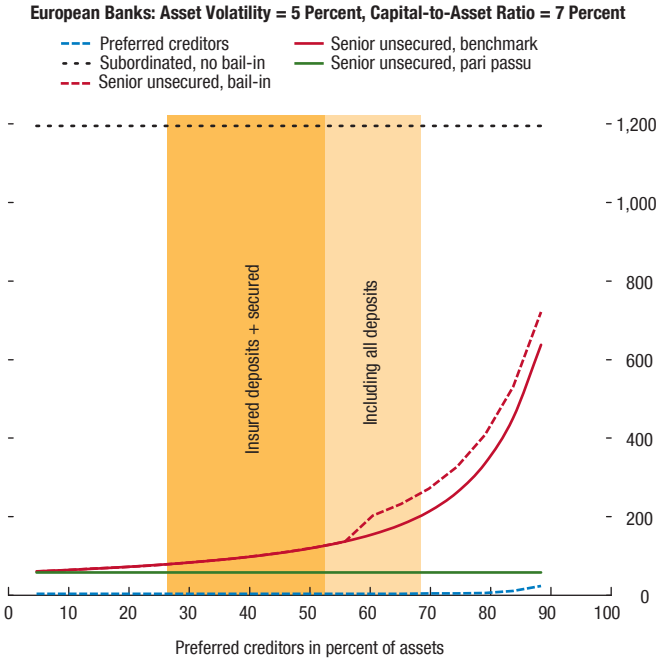
Bank-Specific Estimates

The simulation is applied to four global systemically important banks with distinctive capital structures and risks to gauge whether the model produces realistic outcomes. These represent an investment bank, a global retail bank, a stressed European bank, and a U.S. retail bank (Table 3.1 and Figure 3.16).

- *Senior unsecured debt:* The difference between the simulated yields and the actual yields is consistent across the four banks. For example, the yields are much higher for the stressed European bank than for the U.S. retail bank. Across banks, the actual yields are close to those of bail-in debt, indicating that changes in resolution frameworks may already be priced into current yields (although the current yields could also reflect heightened sovereign risk of the countries in which they are headquartered).

Figure 3.15. Debt Pricing under Bail-in Power
(Spread over risk-free rate; basis points)

The liability side has three instruments: deposits—exempt from bail-in; senior unsecured bail-in debt—converted to equity when the capital-to-asset ratio declines to 5 percent; and capital.



Source: IMF staff estimates.
Note: The "senior unsecured, benchmark" line is the same as the "senior unsecured" line in Figure 3.14 and represents the yield when senior unsecured debt is junior to "preferred creditors," but not subject to bail-in. When "senior unsecured, benchmark" bonds are de facto junior to "preferred creditors" their yield is already higher than that of "preferred creditors" and the yield when the two are ranked equally ("senior unsecured, pari passu"). In addition, applying bail-in power and converting them to equity when the bank becomes unviable will raise their yield from the "senior unsecured, benchmark" line to the "senior unsecured, bail-in" line yield. The equity buffer in this figure corresponds to the sum of equity and subordinated debt in Figure 3.14.
Assumptions: The capital-to-total-asset ratio for European banks is about 7 percent (equity plus subordinated debt). The asset volatility assumption is based on the estimate by Moody's KMV for global systemically important banks (January 2005–June 2013), with 10 (4) percent as the highest (median) across time and banks. The average for May 2013 is 4.2 percent. For large European banks, secured debt (assessing repos on a net basis) and deposits average 17 percent and 48 percent of the assets, respectively, and 24 to 70 percent of the deposits are insured (Table 3.5).

[41]This is a fairly high trigger point: the equity-to-asset ratio for European banks is a little higher than 5 percent (see Figure 3.1).

[42]In practice, there will be uncertainty as to exactly when authorities will exercise their bail-in power. This uncertainty is excluded from this illustrative exercise.

[43]As discussed in Annex 3.2, in reality, some deposits may be considered to be bail-in instruments, while some types of senior unsecured debt (for example, short-term debt) may be exempted.

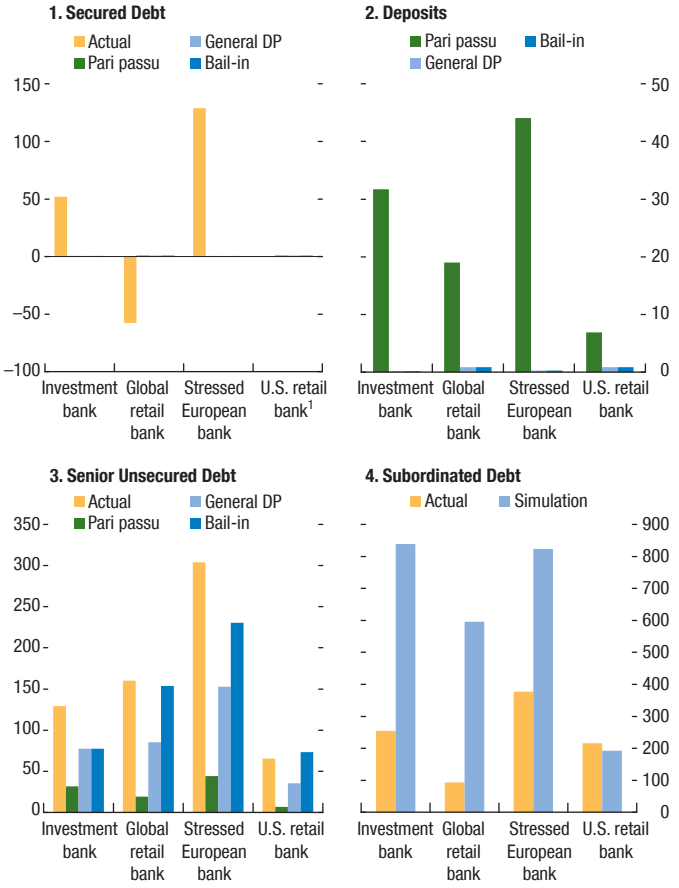
[44]For simplicity, the subordinated debt and equity funding in the previous exercises are combined into capital. Therefore, the capital levels of 7 percent, 12 percent, and 17 percent are considered, respectively combining 5 percent, 10 percent, and 15 percent of equity with 2 percent of subordinated debt.

Table 3.1. Characteristics of Four G-SIBs in Simulation Exercise

	Investment Bank	Global Retail Bank	Stressed European Bank	U.S. Retail Bank
			Percent of Total	
Capital Structure				
Secured Debt	16.0	6.5	22.2	2.5
Deposits	44.7	67.0	49.2	70.5
Senior Unsecured Debt	30.5	18.1	19.1	14.8
Subordinated Debt	3.7	2.5	3.0	1.2
Equity	5.1	5.9	6.4	11.1
			Percent	
Asset Volatility	4.5	3.8	5.1	3.9

Sources: Company annual reports; Moody's KMV; Street and others (2012); and IMF staff estimates.
Note: G-SIBs = global systematically important banks.

Figure 3.16. Simulation Results for Specific Banks
(Yield to maturity for five-year debt; spreads over risk-free rate; basis points)



Sources: Bloomberg, L.P.; and IMF staff estimates.
Note: DP = depositor preference. The pari passu case assumes that all deposits and senior unsecured debt are ranked equally. The general DP case assumes that all depositors (irrespective of sector or insurance coverage) will rank above senior unsecured debt. The bail-in case also assumes that all deposits are exempt from bail-in. Simulated deposit rates exclude effects from deposit insurance. Risk-free rates are proxied by five-year government bond yields for Germany (for euro-denominated debt) and the United States (for dollar-denominated debt). Actual yield to maturity corresponds to August 2013 and is computed as the weighted average of bonds issued in the currency most used by the bank and including all maturities.
[1]No actual data are available.

- *Subordinated debt:* The large equity buffer and low risk of the U.S. retail bank keep its simulated subordinated debt yield at low levels, which is in line with the actual and at much lower levels than for other banks (Figure 3.16, panel 4). However, for other banks, market yields are much lower than simulated yields, which could reflect in part a too-big-to-fail subsidy.
- *Secured debt and deposits:* Depositor preference and bail-in powers can provide strong protections to depositors, reducing the deposit rate to the near-risk-free rate, even without deposit insurance. Simulated secured debt yields are also near risk-free rates, although they are not close to the actual yields, perhaps owing to specific characteristics of the debt that are not well captured in the model.[45]

Funding Structure and Incentives to Make a Bank Safer

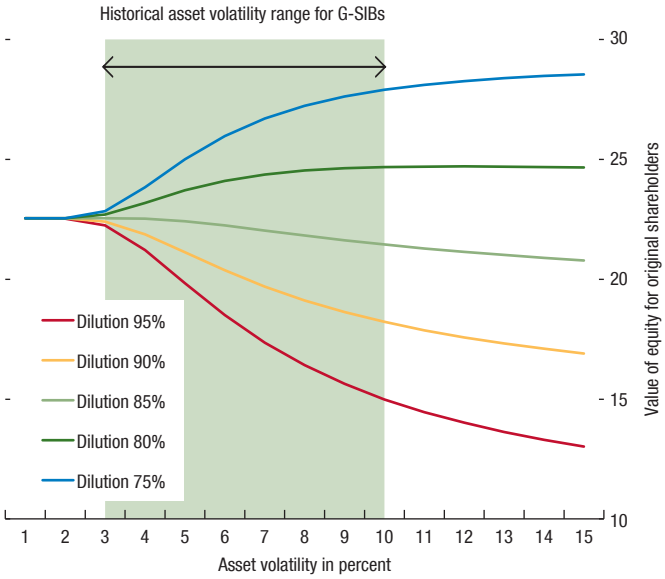
Although difficult to determine for banks as a whole, banks' total funding costs may decline if the reforms are calibrated to provide shareholders with incentives to prefer safer asset portfolios. For instance, bail-in powers that ensure that shareholders are heavily diluted when a bank becomes unviable could be particularly effective for reducing the risk-increasing behavior that shareholders normally exhibit in a limited liability setting. With bail-in powers, the gains from pursuing higher asset volatility for the original shareholders may be offset by the costs that would come from equity dilution. When the cost is sufficiently large, the original shareholders would prefer a safer portfolio with low asset volatility (Figure 3.17).

Summary and Policy Recommendations

The analysis confirms the relevance of bank funding structures for financial stability. Banks have diverse

[45]These characteristics would include the maturity, collateral, and extent of overcollateralization.

Figure 3.17. Equity Value for Original Shareholders under Bail-in Regime Converting Debt to Equity



Source: IMF staff estimates.
Note: G-SIBs = global systematically important banks. Ten percent dilution means bail-in debt holders receive 10 percent of (new) equity after they are converted to shareholders, whereas 90 percent of the new equity is given to original shareholders. Original shareholders' claim is diluted by 10 percent in this case. For simplicity, this exercise assumes two types of liabilities: (bail-in) debt and equity. It is assumed that $100 is initial asset value, $90 is face value of total debt, and 3 percent is the risk-free rate. Debt is converted to equity when asset value declines to $92.

funding patterns that change only slowly. The empirical results suggest that countries in which banks were overly reliant on short-term wholesale funding (primarily larger banks in many advanced economies) were more likely to experience financial instability. They also suggest that banks with more stable, diversified funding structures and those that carry less leverage are less likely to experience distress. Since the start of the global financial crisis, some improvements have been made, with most banks lowering their overexposure to short-term wholesale funding, but the funding structures of some banks, particularly those in distress, have not improved similarly, and they remain vulnerable.

Overall, the reform agenda aims to make financial systems safer by improving the shock resistance of bank funding structures and by forcing bank creditors to assume their contractual obligations. However, the reforms to bank capital and liquidity, to OTC derivatives, and to bank resolution will likely have different and perhaps unintended consequences for some institutions. Specifically, there is a trade-off between, on the one hand, pressuring banks to increase their use of more secured funding (raising levels of asset encumbrance) and insured deposits and, on the other hand, ensuring that some debt holders bear more losses in a resolution through reforms to resolution regimes (bail-in debt and the prospects for additional depositor preference). Altogether, these elements of reform raise the cost of unsecured bail-in debt, in particular. For systemically important banks, the reforms will likely increase the overall cost of funding, particularly by reducing the too-big-to-fail subsidy enjoyed by these financial institutions. Weaker institutions may also experience a larger impact, particularly if they have inadequate amounts of capital. For other banks, the overall impact is ambiguous and will depend on the relative costs and amounts of different funding sources, the level of equity capital, and the underlying riskiness of their assets.

A numerical examination of these potential trade-offs shows that the simulated price impact on unsecured senior debt spreads is relatively small under present conditions, including in euro area countries. But the share of preferred deposits and the level of asset encumbrance are important drivers of the cost of bail-in debt, which rises disproportionately more than when the share of these other liabilities increase in the funding structure. For weaker banks, the increased risk to unsecured bondholders may leave traditional investors unwilling to hold this debt and may make it difficult to issue enough of it to maintain its market-discipline role. In this event, these institutions would need to raise more equity capital and perhaps restructure their operations and alter their funding structures.

However, these potential trade-offs can be managed so as to ensure that the financial stability benefits of the reforms can be realized and hence the current set of reforms should move forward in a deliberate manner, paying close attention to their potential interactions. The following policy recommendations for capital and liquidity rules, asset encumbrance, bail-in powers, and depositor preference will help.

New Basel Capital and Liquidity Regulations

- First and foremost, equity capital plays a quantitatively significant role in reducing the probability of bank failures and in lowering the cost of any type of debt. Capital requirement reforms that raise the amount of common equity should be implemented without delay because more equity supports economic growth and mitigates the effects of other

reforms that may increase the cost of bail-in debt.[46] The positive effects on the cost of debt are disproportionately large if a bank builds its capital buffer beyond Basel III requirements.

- As noted in previous issues of the GFSR, supervisors should continue to implement Basel III liquidity standards as agreed. The new global liquidity standards for the liquidity capital ratio and net stable funding ratio are designed to discourage short-term wholesale funding, and they are unlikely to result in rapid, large-scale changes in banks' funding structures, in part because many banks already satisfy the requirements and their implementation is gradual. Indeed, the standards for the net stable funding ratio have yet to be completed, and early agreement would help lessen uncertainties surrounding its final contours.

Concentration in Funding and Asset Encumbrance

- Although the reforms should continue to be implemented on the current timelines, regulators and policymakers need to monitor the effects of all the policies that increase demand for collateral (including the introduction of the liquidity capital ratio and net stable funding ratio as well as reforms to OTC derivatives) and weigh the resulting asset encumbrance against the resilience to liquidity risk and lower counterparty risks. Limits on encumbrance, for example, on covered bonds, may be one way of ensuring a diversified funding structure and the benefits from other reforms. However, consideration would need to be given to different business models and country circumstances. In particular, the introduction of limits on encumbrance during a period of funding stress may be counterproductive, limiting the ability of banks to obtain necessary funding through the use of, for instance, covered bonds.
- Market discipline and appropriate risk-pricing mechanisms for bank debt can be enhanced by requiring banks to provide regular, standardized public disclosure of their liability structures and asset encumbrance. Appropriately priced liabilities are important for ensuring that good risk- and burden-sharing arrangements exist across all stakeholders.

Bail-in Powers and Depositor Preference

- When the proportion of preferred creditors is too large, a bank may find it difficult to preserve a sufficiently large proportion of unsecured debt to absorb losses if capital is exhausted. In such cases, minimum bail-in debt requirements can be used. By the same token, depositor preference regimes can usefully signal to depositors the likelihood that they will receive their deposits in case of bank distress and thereby prevent runs and support financial stability. To the extent that a deposit guarantee scheme is already in place, a tiered depositor preference structure is desirable—one that prefers insured deposits (and the deposit guarantee scheme that substitutes for such depositors when liquidation takes place, that is, through subrogation) over uninsured deposits and that prefers both over other senior unsecured creditors, as this will help to lower contingent claims on the government.
- To the extent that bail-in powers and depositor preference reduce demand for debt issued by banks regarded as systemically important, market discipline is enhanced because these banks no longer receive a funding advantage. Traditional long-term buyers of senior bank debt—insurers and pension funds—appear to be willing to purchase bail-in debt if the issuing banks are able to maintain stand-alone investment-grade ratings and carry sufficient equity capital buffers. If the debt turns out to be too risky for traditional holders even at higher yields, a different investor base may develop. Regardless, it will be important to ensure that all investors are fully aware of the risks they assume by means of appropriate disclosures of the terms under which they could be bailed in. This calls for greater clarity around the statutory criteria used by resolution authorities for putting a bank into resolution and for applying the bail-in tool, among others. Hence, appropriately balanced with other reforms, bail-in powers and depositor preference can be effective ways to limit government bailouts and enhance financial stability.
- The timing of any introduction of depositor preference or bail-in powers should be carefully considered, taking into account the specific funding structures of banks in each country and their vulnerability to systemic funding shocks. If systemic financial stress is low, depositor preference or bail-in powers could usefully be introduced sooner rather than later, so as to be in place in advance of bank

[46]See Chapter 4 of the October 2012 GFSR for an estimate of the positive implications of higher capital buffers on output growth.

failures. However, in countries in which balance sheet repair and the restructuring of distressed institutions are still under way, the introduction of these measures could inadvertently increase the likelihood of failures. For example, the recent shift in nonresident holdings of bank debt securities in the euro area suggests that the risks may be getting more localized and concentrated in some countries. At the same time, distressed banks rely increasingly on secured funding. Hence, the ongoing risk of a recurrent systemic liquidity crisis highlights the urgency of first dealing with distressed banks, before introducing depositor preference or bail-in powers. Discussions within the EU appear to be focusing on dates far enough in the future to reduce the risk that the introduction will be destabilizing, but only if balance sheet repair and restructuring are accomplished first.

Overall, some bank funding structures are more closely associated with financial stability than others. Many banks in emerging market economies already have safer structures than do their advanced economy counterparts, and some of the reforms discussed above may not be necessary in those economies. Regardless of the funding structure, however, any type of bank debt is safer and less costly when there is adequate equity capital in place. Therefore, policymakers in both advanced and emerging market economies must continue to pay close attention to this component, so that these other reforms can achieve their intended objectives.

Annex 3.1. Data Description and Additional Empirical Results

This annex describes the data sources, contains technical background, and provides key results from the empirical analysis in this chapter.

Data Sources and Coverage

The analysis is based on detailed bank-level balance sheet and market statistics from listed and unlisted banks in advanced and emerging market economies. Table 3.2 reports country and bank coverage statistics. Primary data sources are SNL Financial and Dealogic for the stylized developments in funding patterns. Bloomberg, L.P., is used for the empirical analysis. SNL Financial's annual data coverage starts in 2005 or 2007 for banks outside the United States (somewhat earlier for U.S. banks), while the Bloomberg coverage starts as early as 1990 globally. The analysis ends with data for 2012. The empirical analysis also uses IMF and World Bank macrofinancial time series and governance indicators. The definitions of the variables and data sources are in Table 3.3.

Determinants of Bank Funding Patterns

To answer the question of what drives bank funding structures, the following panel regression model is estimated:

$$Z_{ijt} = \alpha\, BANK_{ijt-1} + \beta\, MACFIN_{jt-1} + \gamma\, REG_{jt} + \delta\, Z_{ijt-1} + \textit{Fixed effects} + \varepsilon_{ijt}, \quad (3.1)$$

in which Z denotes a source of funding (bank equity, debt, or deposits expressed as a fraction of total assets) or the loan-to-deposit ratio. *BANK* is a vector of bank-specific factors, *MACFIN* is a vector of macro-financial factors, *REG* is a vector of institutional and governance indicators, and ε is the model's residual for bank i in country j in year t.[47] The coefficients (or coefficient vectors) to be estimated are α, β, γ, and δ. Separate ordinary-least-squares panel regressions are estimated for each source of funding, with and without cross-section and time-fixed effects, using robust standard errors. Models are estimated in levels because funding variables do not contain unit roots by construction (funding structure shares are bound between zero and 1), but include a lagged dependent variable to account for slow adjustment toward a preferred funding structure.[48,49] The general-to-specific approach is applied to arrive at the final specification for each funding source.

The empirical evidence here indicates that bank funding structures are affected mainly by bank-specific factors, but also by macrofinancial and market variables as well as by the regulatory environment. The

[47]See Table 3.3 and Gudmundsson and Valckx (forthcoming) for a more detailed description of the explanatory variables and expected signs.

[48]To attenuate potential endogeneity, explanatory variables are lagged one period.

[49]Gropp and Heider (2010); Octavia and Brown (2010); Brewer, Kaufman, and Wall (2008); Demirgüç-Kunt and Huizinga (2010); Rauh and Sufi (2010); Lemmon, Roberts, and Zender (2008); and Antoniou, Guney, and Paudyal (2008) also analyzed bank and nonfinancial companies' funding structures, using similar firm-specific variables but different country samples or time periods. See Gudmundsson and Valckx (forthcoming) for a detailed review.

Table 3.2. Country and Bank Coverage Statistics

Bloomberg, L.P. Sample

Advanced Economies

All		Euro Area	Other
Australia	6	Austria	Australia
Austria	7	Belgium	Canada
Belgium	3	Cyprus	Denmark
Canada	7	Finland	Hong Kong SAR
Cyprus	3	France	Japan
Denmark	10	Germany	Norway
Finland	2	Greece	Singapore
France	7	Ireland	Sweden
Germany	6	Italy	Switzerland
Greece	13	Malta	United Kingdom
Hong Kong SAR	7	Netherlands	United States
Ireland	3	Portugal	
Italy	16	Slovenia	
Japan	52	Spain	
Malta	3		
Netherlands	3		
Norway	3		
Portugal	6		
Singapore	3		
Slovenia	5		
Spain	10		
Sweden	4		
Switzerland	9		
United Kingdom	9		
United States	46		
	243		

Emerging Market Economies

All		Asia	CEE
Argentina	6	China	Croatia
China	16	India	Poland
Croatia	5	Indonesia	Russia
India	30	Malaysia	Turkey
Indonesia	29	Philippines	
Malaysia	9	Thailand	
Philippines	14		
Poland	13	Latin America	
Russia	36	Argentina	
Thailand	11		
Turkey	14		
	183		

SNL Financial Sample

Advanced Economies

AE		Euro Area	Other
Australia	16	Austria	Australia
Austria	16	Belgium	Canada
Belgium	11	Cyprus	Czech Republic
Canada	11	Finland	Denmark
Cyprus	4	France	Hong Kong SAR
Czech Republic	6	Germany	Iceland
Denmark	40	Greece	Japan
Finland	5	Ireland	Korea
France	34	Italy	New Zealand
Germany	75	Luxembourg	Norway
Greece	12	Malta	Sweden
Hong Kong SAR	20	Netherlands	Switzerland
Iceland	3	Portugal	Taiwan Province of China
Ireland	13	Slovak Republic	United Kingdom
Italy	56	Slovenia	United States
Japan	42	Spain	
Korea	14		
Luxembourg	14		
Malta	4		
Netherlands	14		
New Zealand	7		
Norway	27		
Portugal	7		
Singapore	4		
Slovak Republic	6		
Slovenia	3		
Spain	55		
Sweden	6		
Switzerland	37		
Taiwan Province of China	21		
United Kingdom	30		
United States	75		
	688		

Emerging Market Economies

EM		Asia	CEE
Bulgaria	8	China	Bulgaria
China	77	India	Croatia
Croatia	14	Indonesia	Hungary
Hungary	8	Malaysia	Lithuania
India	38	Pakistan	Poland
Indonesia	25	Philippines	Romania
Lithuania	5	Thailand	Russia
Malaysia	20	Vietnam	Turkey
Pakistan	4		Ukraine
Philippines	8		
Poland	16		
Romania	9		
Russia	33		
Thailand	14		
Turkey	17		
Ukraine	11		
Vietnam	5		
	312		

Source: IMF staff.

Note: AE = advanced economies; CEE = central and eastern Europe; EM = emerging market economies. Number of banks effectively used in the computations and estimations is indicated after the country's name. Banks are stand-alone legal entities (subsidiaries) within the country in question. SNL Financial data cover both listed and nonlisted banks (top 100 by assets for the United States) which are either operating or acquired/defunct companies from North America, Europe, and the Asia-Pacific region. The Bloomberg sample contains listed and nonlisted banks from western and eastern Europe, developed and developing Asia, and North and Latin America, retrieved using Bloomberg's EQS and PSCR functions.

main results are as follows, focusing on statistically and economically[50] significant variables:

- *Partial adjustment to preferred funding levels:* A 1 standard deviation shock to banks' funding sources can shift funding sources by between 1 and 3 percentage points (5 to 10 percentage points for the loan-to-deposit ratio). The impact is larger since 2007 compared with the precrisis period and for emerging market economy banks relative to advanced economy banks. Also, comparable shocks to equity funding result in smaller adjustments than do debt and deposit shocks.
- *Size:* Larger banks have less equity and more debt (and higher loan-to-deposit ratios). The reduction in equity ratios is proportionately larger for emerging market economy banks (–1.6 percentage points) than for advanced economy banks (–0.3 percentage point) and systemically important banks (–0.5 percentage point).
- *Profitability and securities and tangible assets:* Banks that pay dividends and those with higher profitability have lower equity ratios (–0.3 percentage point for a 1 standard deviation shock to the return on assets). Safer banks, with more securities and tangible assets to total assets, tend to have lower debt ratios (–1 percentage point for every 1 standard deviation increase in "tangibility") and lower loan-to-deposit ratios (about a 3 percentage point impact from a 1 standard deviation shock).
- *Growth and currency volatility:* Banks in countries with (1 standard deviation) higher GDP growth experience about 2 percentage points less debt and higher deposit and equity-to-asset ratios (and 4 percentage point lower loan-to-deposit ratios). Higher currency volatility reduces debt reliance (and

[50]Economic significance is gauged by 1 standard deviation shocks to the explanatory variables, which makes their effects comparable.

Table 3.3. List of Variables Used in the Panel Data Analysis

Variable	Definition	Data Source
Dependent Variables		
Equity/Assets	Total equity divided by total assets	Bloomberg, L.P.
Deposits/Assets	Customer deposits divided by total assets	Bloomberg, L.P.
Debt/Assets	Nondeposit liabilities divided by total assets	Bloomberg, L.P.
Explanatory Variables		
Bank-Specific Variables		
Size	Log of total assets	Bloomberg, L.P.
Profitability	Pretax income divided by total assets	Bloomberg, L.P.
Growth Assets	Annual growth in total assets	Bloomberg, L.P.
Dividend Payer	Dummy that equals 1 if bank pays dividend	Bloomberg, L.P.
Collateral	Securities + interbank assets + fixed assets divided by total assets	Bloomberg, L.P.
Business Model I	Share of net interest income to interest and noninterest income	Bloomberg, L.P.
Business Model II	Loans to total assets	Bloomberg, L.P.
Asset Quality	Loan loss provisions to loans	Bloomberg, L.P.
Macroeconomic and Financial Market Variables		
GDP Growth	Annual growth rate of real GDP	WEO
Inflation	Annual change in the consumer price index	WEO
Interest Spread	Long-term bond yield minus short-term interest rate	WEO, WB
Stock Return	Annual change in the country's main stock market index	Bloomberg, L.P., WB
Bond Market Capitalization	Outstanding volume of nonfinancial corporate bonds to GDP	BIS, WB
Stock Market Capitalization	Outstanding volume of stock market capitalization to GDP	WB
Household Saving Ratio	Household savings to disposable income	WEO, WB
Government Debt	General government gross debt to GDP	WEO
Openness I	Current account surplus or deficit, percent of GDP	WEO
Openness II	Exports plus imports to GDP	WEO
Openness III	External positions of reporting banks vis-à-vis individual countries' banks (difference between all sectors and nonbanks) relative to GDP	BIS Locational Banking Statistics
Foreign Exchange Volatility	Standard deviation of monthly currency rate return against SDR	IFS
Stock Market Volatility	260-day standard deviation of daily stock returns	Bloomberg, L.P.
Banking Crisis Dummy	Dummy variable that equals 1 if the country experiences a systemic banking crisis for the duration of the crisis	Laeven and Valencia (2012)
Regulatory and Institutional Variables		
Government Effectiveness[1]	Perception of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies	WB
Regulatory Quality[1]	The ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development	WB
Rule of Law[1]	The extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence	WB
Accountability and Voice[1]	Perception of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media	WB
Legal Origin	A dummy variable that identifies the legal origin of the company law or commercial code of each country. The five origins are English, French, German, Nordic, and socialist.	La Porta and others (2000)
Bank Funding Structure Variables		
Senior Debt	Principal amounts outstanding on loans, notes payable, bonds, securities sold under repurchase agreements (repos), mortgage-backed bonds, short-term borrowing, mortgage notes and other notes payable, capitalized lease obligations, and other debt instruments not classified as subordinated debt	SNL Financial
Subordinated Debt	Debt in which the creditor's claims to the bank's assets are subordinated to those of other creditors	SNL Financial
Total Equity	Includes par value, paid-in capital, retained earnings, and other adjustments to equity. Minority interest may be included per relevant accounting standards.	SNL Financial
Wholesale Funding Ratio	Interbank borrowing, repo debt, and senior and subordinated debt relative to total debt and customer deposits	SNL Financial
Secured Funding Ratio	Secured senior debt relative to both secured and unsecured senior debt outstanding, aggregated by country	DCM Analytics
Core Tier 1 Capital	Core common capital as defined by regulatory guidelines	SNL Financial
Additional Tier 1 Capital	Tier 1–eligible hybrid capital securities, reserves, and allowances; minority interests; and other Tier 2 capital adjustments as defined by the bank's domestic central bank/regulator	SNL Financial
Tier 2 Capital	Tier 2–eligible hybrid capital securities, reserves, and allowances; minority interests; and other Tier 2 capital adjustments	SNL Financial
Tier 3 Capital	Eligible subordinated debt and other capital adjustments	SNL Financial

Source: IMF staff.

Note: BIS = Bank for International Settlements; IFS = IMF, International Financial Statistics Database; SDR = special drawing right; WB = World Bank; WEO = IMF, World Economic Outlook Database.

[1]Governance indicators are in units of a standard normal distribution, with mean zero, standard deviation of 1, and ranging from approximately –2.5 to 2.5, with higher values corresponding to better governance. Data are taken from the World Bank Doing Business Database.

lowers loan-to-deposit ratios) by about 1 percent (2 percent) in the full sample and for systemically important banks.

- *Savings and deposits:* Banks in countries with (1 standard deviation) higher household savings rates enjoy (between 0.5 and 0.8 percentage point) higher deposit financing and have lower loan-to-deposit ratios.
- *Regulatory factors:* Systematically important banks in countries with high-quality regulatory environments ("Regulation") have more than 1 percent higher deposits. Banks in countries with stronger disclosure have marginally higher equity and deposit ratios and lower loan-to-deposit ratios.

Bank Funding Patterns and Financial Stability

In line with recent studies, we examine whether bank funding structures have an impact on financial stability when combined with other bank characteristics and macrofinancial factors.[51] Using the Bloomberg panel data set described previously, we estimate a (panel/pooled time series) probit model:

$$P\{Distress_{ijt} \mid X_{ijt-1}, Z_{jt-1}\} = F(\beta_{ij}X_{ijt-1} + \beta_j Z_{jt-1}), \quad (3.2)$$

in which P{} is the probability that bank *i* from country *j* will be in distress at time *t*, conditional on bank-specific and country-level characteristics X_{ijt} and Z_{jt}. $F()$ is the standard normal distribution function that transforms a linear combination of the explanatory variables into the [0,1] interval. The estimations use lagged explanatory variables to reduce endogeneity concerns and report robust standard errors. The general-to-specific approach is applied to arrive at the final probit specifications.

Given that the data do not directly provide bank status characteristics (default versus going concern), various 0–1 dummy variables are constructed to characterize banking distress:

- *Balance sheet distress:* Bank z-scores below 3, which corresponds to the lowest decile of the panel series' distributions, are used as an indicator of potential capital shortfall.
- *Bank equity price distress:* Price-to-book ratios below 0.5, which comprises the lowest 7.5 percent of the banks, are used. Stock returns falling by 60 to 90 percent during a given year are also considered and yield broadly similar results.
- *Analysts' ratings:* Bank equity analysts' ratings (on a scale of 1 to 5, with 1 a strong sell and 5 a strong buy) below 2.5, which corresponds to the 10 percent left tail, are used.

The exercise uses five different characteristics of bank funding:

- *Loan-to-deposit ratio:* roughly corresponds to the wholesale funding ratio because it measures the deposit funding gap to be filled by debt (or equity);
- *Funding concentration:* a Herfindahl index of bank funding structure (sum of squared percentages of debt, deposits, and equity), with higher values indicating less diverse funding;
- *Short-term debt funding:* the share of debt expiring within the year, as a share of total bank debt;
- *Banks' debt-to-asset ratios:* the ratio of debt liabilities to total assets; and
- *Banks' equity-to-asset ratios*: the ratio of total equity to total assets.

The assumption is that higher loan-to-deposit ratios, less diverse funding sources, higher reliance on short-term debt funding, and higher leverage will increase banks' probabilities of distress.

Other bank-specific factors and general macroeconomic conditions are controlled for. These include size, asset growth, the loan loss provision ratio, real GDP growth, inflation, the interest rate term spread, as well as the broad stock market return and volatility.

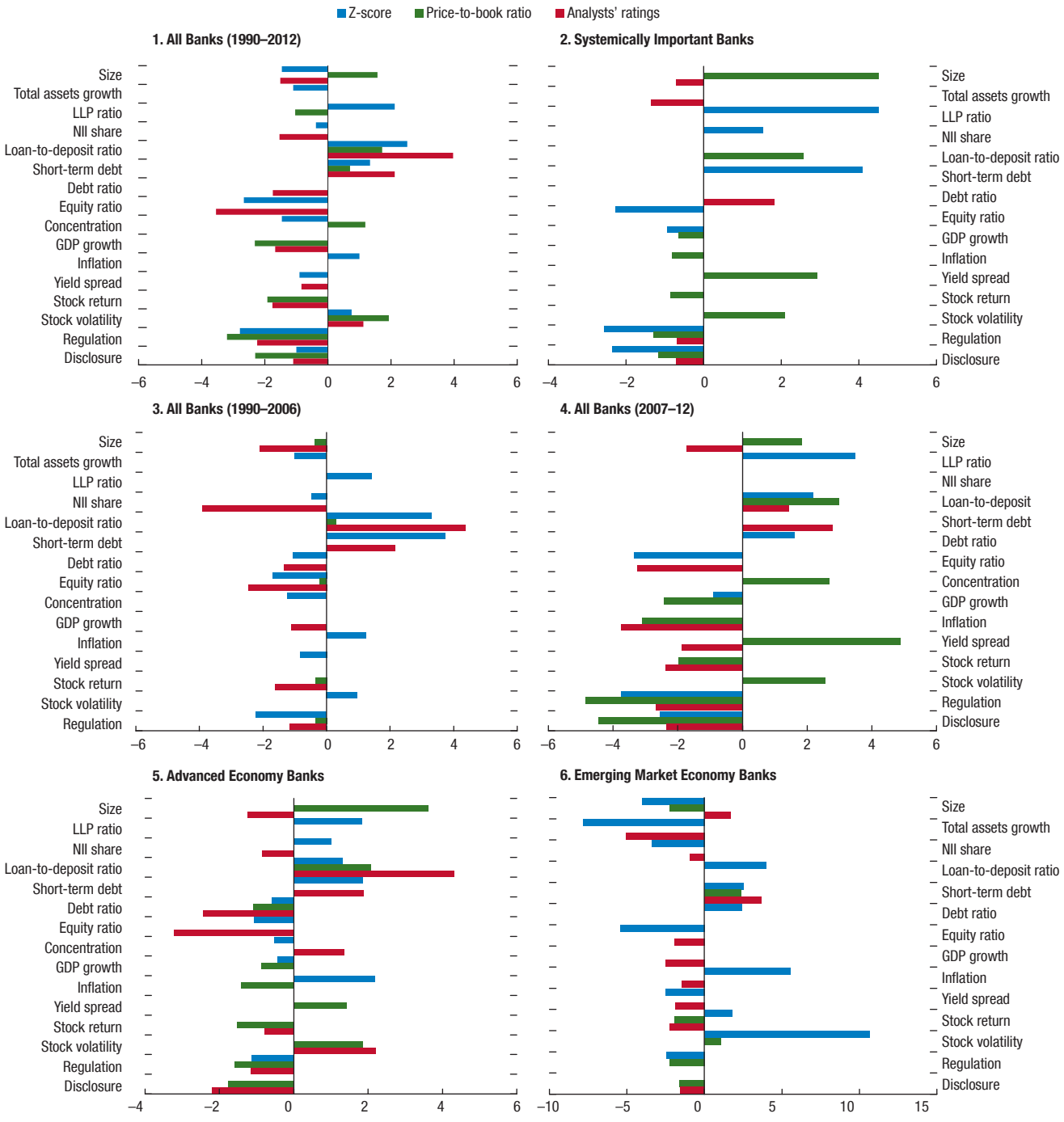
The results suggest that, in addition to bank funding, some other bank characteristics, as well as the macrofinancial and broad regulatory environment, significantly affect banks' distress probabilities (Figure 3.18). Focusing on 1 standard deviation shocks away from the mean, the impact on distress probabilities are as follows:

- *Size:* Bigger advanced economy banks and larger systemically important banks seem 3.6 to 4.5 percent more likely to be under stress (under the price-to-book

[51]Vazquez and Federico (2012) find that European and U.S. banks with higher net stable funding ratios (NSFRs) and equity-to-asset ratios before the 2008–09 crisis had lower crisis failure probabilities. Demirgüç-Kunt and Huizinga (2010) showed that wholesale funding and banks with higher noninterest income experience higher average fragility, for banks from 101 countries. Demirgüç-Kunt, Detragiache, and Merrouche (2010), for 313 banks from 12 countries, and Beltratti and Stulz (2009), for 98 large banks from 20 countries, find that better capitalized banks (and large, more deposit-financed banks) saw smaller stock price declines during the crisis, whereas wholesale funding increased bank fragility. Bologna (2011) and Berger and Bouwman (2013) find that U.S. banks with less stable deposit funding were more likely to fail, controlling for nonperforming loans and capital ratios. Huang and Ratnovski (2009) find that deposit funding contributed to the stability of banks in Canada and 72 other large Organization for Economic Cooperation and Development country banks during the crisis.

Figure 3.18. Contribution of Specific Variables to Bank Distress in Probit Models

(Relative size; percentage points)



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

Note: LLP = loan loss provisions; NII share = net interest income in percent of operating income. Regulation and disclosure are the first and second principal component scores, derived from the four World Bank indicators of regulatory and institutional quality. See Table 3.3 for details on factors and their definitions. Figure shows the economic significance of bank and country characteristics, evaluated at the variable's mean plus 1 standard deviation on the probability of distress specified under alternative distress models and samples. Bank distress is a dummy variable, defined either as a z-score below 3, price-to-book ratio below 0.5, or average analyst ratings of 2.5 or lower. Different probit estimations are performed for the full 1990–2012 sample (all banks), the 2007–12 period, advanced economy banks, and emerging market economy banks. The emerging market economy sample contains banks from developing Asia and central and eastern Europe.

measure), whereas large emerging market economy banks seem 2 to 4 percent less likely to be under stress.

- *Asset growth:* More rapidly growing emerging market economy banks seem less likely to be under stress, by up to 8 percent.
- *Asset quality:* Banks with higher loan loss ratios have up to 4.5 percent higher distress probabilities with the z-score measure (but not using the price-to-book or analysts' ratings distress measures).
- *Retail versus wholesale focus:* Banks with more traditional business (higher net interest income to total income) experience slightly lower distress overall, especially using the analysts' ratings-based distress measure. However, chances of distress for more traditional advanced economy banks and systemically important banks increase by 1 to 1.5 percent using the z-score measure. In the same vein, banks with a more wholesale orientation experience substantially higher distress probabilities, of 4 percent or more, with some measures.
- *Funding structure, debt, and equity:* Increases in short-term debt, or in overall debt ratios for emerging market economy banks and systemically important banks, raise banks' distress probabilities by 1 to 4 percent. Higher equity buffers, however, uniformly lower distress probabilities across all measures, by up to 5.5 percent.
- *GDP growth, yield spreads, and inflation:* Higher growth results mostly in 0.5 to 2.5 percent lower banking sector distress. Similarly, higher yield spreads reduce the likelihood of distress using the z-score and analysts' ratings measures by 1.0 to 2.5 percent (but using the price-to-book measure, higher yield spreads raise distress). Banks in higher-inflation countries are more likely to be in distress according to the z-score measures (+5 percent distress for emerging market economy banks), whereas the price-to-book and analyst ratings measures indicate the reverse, probably reflecting the possibility of hedging against inflation with stocks (up to 4 percent lower distress).
- *Stock return and volatility:* Higher market returns and lower volatility are beneficial to banking stability and are significant across the various specifications, with effects on distress probabilities broadly between 1.0 and 2.5 percent.
- *Regulatory quality and disclosure:* Stronger and better-quality regulatory environments, as well as countries with higher disclosure requirements, reduce banking distress probabilities by between 1 and 5 percent.

Annex 3.2. Regulatory Developments Affecting Bank Funding

This annex summarizes the details of Basel III capital and liquidity regulation and proposals for strengthening resolution framework for financial institutions.

Basel III Capital Regulation

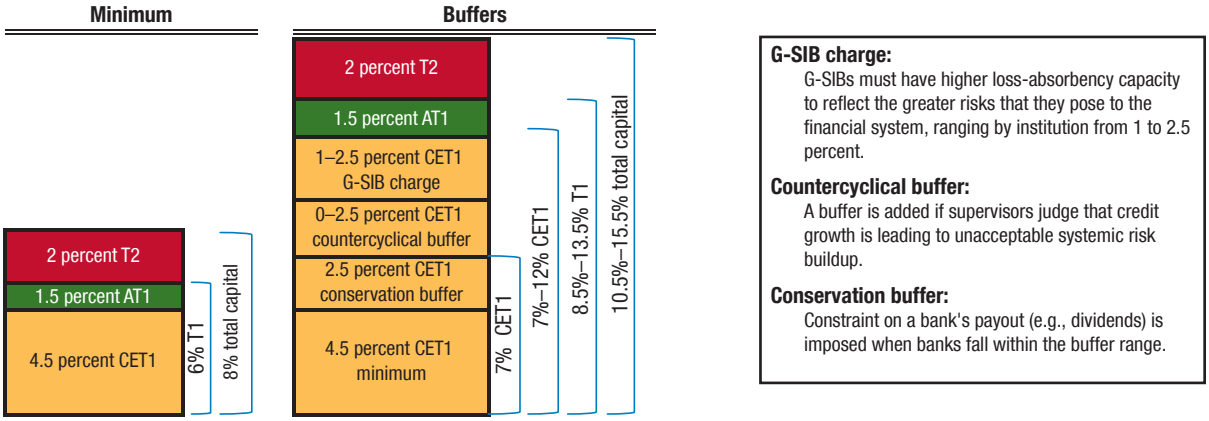
Basel III capital regulations require more and better capital than do Basel II regulations. The majority of the minimum capital requirement should be of the highest quality (common equity). Various buffers are added for macroprudential purposes or to account for the systemic relevance of some institutions (Figure 3.19). Basel III also requires more capital to better cover risks from securitization, the trading book (including proprietary trading), and banks' exposures to derivative counterparties, other financial institutions, and central counterparties (namely, counterparty risks). A non-risk-based leverage ratio will be added to minimum requirements in 2018 and could stem a buildup in leverage caused by off-balance-sheet exposures and repo transactions.

Basel III Liquidity Regulations

The Basel III liquidity regulation includes two quantitative ratios: the liquidity capital ratio (LCR) and the net stable funding ratio (NSFR). The LCR assesses shorter-term (30-day) vulnerability to liquidity shocks, and the NSFR aims to reduce maturity mismatches over one year. Specifically:

- The LCR is defined as the stock of high-quality liquid assets as a proportion of the bank's net cash outflows over a 30-day time period. Banks will be required to maintain a 100 percent LCR when the phase-in period ends in 2019. The size of the net outflow is based on assumed withdrawal rates for short-term liabilities, according to their stability (for example, withdrawal rates are lower for insured retail deposits than for deposits from corporations and nonresidents) and the potential drawdown of contingency facilities. Having more long-term debt (maturities greater than 30 days) is positive for the LCR, because its associated outflow within 30 days is zero.
- The NSFR is defined as a bank's available stable funding (ASF) divided by its required stable funding (RSF) and must be greater than 100 percent. Each

Figure 3.19. Basel III Minimum Capital Requirements and Buffers
(Percent of risk-weighted assets)



Source: IMF staff based on BCBS (2010a).
Note: AT1 = additional Tier 1; CET1 = common equity Tier 1; G-SIB = global systemically important bank; T2 = Tier 2. The G-SIB surcharge, in principle, could be as high as 3.5 percent, but currently no SIBs are charged more than 2.5 percent.

asset category is assigned an RSF "factor," which is lower for liquid assets and higher for illiquid assets. Similarly, ASF factors are assigned to each liability category, and the factors are higher for more stable liabilities (for example, capital, long-term debt with a maturity of more than one year, and insured deposits) and lower for less stable funding (for example, short-term wholesale funding).

Reform Agenda for Resolution Frameworks

Despite an agreement on the broad initiatives for strengthening resolution frameworks, there is not yet full agreement on some specific aspects, including the scope of bail-in, depositor preference, and minimum holdings of bail-in debt. At the global level, the Financial Stability Board's *Key Attributes of Effective Resolution Regimes for Financial Institutions* were agreed to by the G20 in 2011 and cover both bail-in powers for authorities and protection of insured depositors. Many countries are making progress in implementing them, and a date of the end of 2015 has been set.[52] Even before the global initiatives, however, some countries already had bail-in powers or depositor preference (for example, the United States).

Depositor preference provides seniority to some depositors over other senior unsecured debt holders at liquidation (Table 3.4). Liquidation is a form of resolution in which the bank's assets are sold and the values recovered are used to pay creditors in the order of priority. Without depositor preference, insured depositors hold the same seniority as other senior unsecured debt holders; therefore, their recovery ratios (without considering payouts from the deposit guarantee scheme) at the time of a bank failure are the same (examples [A] and [E] in Table 3.4). In a liquidation with depositor preference, and when asset recoveries are insufficient to repay all senior creditors, depositors are paid before senior unsecured debt holders, and their recovery ratios are higher (examples [B] and [F] in Table 3.4). The formal introduction of depositor preference with bail-in powers would help to limit legal challenges and claims for compensation in cases of resolution, even if the bank is not liquidated, making bail-in powers more effective.

There are two main forms of depositor preference. The specifics of existing and proposed forms vary across countries, suggesting that the share of preferred deposits in total liabilities varies substantially (Table 3.5).[53]

[52]At the same time, separate proposals in individual countries or regions have emerged, including the Dodd-Frank Act (Dodd-Frank [2012]) in the United States, which has provisions for bank resolution, and the EU's Recovery and Resolution Directive. The agreement of the European Commission on the directive would, if enacted, introduce depositor preference and phase in bail-in powers in the European Union. In addition to the legislative proposals, recommendations by high-level committees and expert groups such as the U.K.'s Vickers' report (ICB, 2011) and the EU's Liikanen report (High-Level Expert Group on Reforming the Structure of the EU Banking Sector, 2012) also discuss providing bail-in powers to authorities and raising the loss-absorbing capacity of banks.

[53]Several countries have some forms of depositor preference legislation in place, including Argentina, Australia, Austria, Belgium, China, Germany, Greece, Hong Kong SAR, Italy, Latvia, Norway, Portugal, Romania, Russia, Singapore, Spain, Switzerland, the United Kingdom, and the United States.

Table 3.4. Illustration of Creditor Hierarchy and Loss Sharing under Alternative Resolution Tools

Without Asset Encumbrance

	Balance sheet		[A]:Liquidation (+DGS, no DP)[1]		[B]:Liquidation (+DGS and insured DP)[2]		[C]:Bail-out[3]			[D]:Bail-in, with exclusion of insured deposits[4]		
	Assets	Liabilities	Liabilities	Recovery	Liabilities	Recovery	Assets	Liabilities	Recovery	Assets	Liabilities	Recovery
	Remaining value of asset $70	$40 insured deposits	$40 insured deposits (including $9 DGS payment)	100% (78% without DGS)	$40 insured deposits	100%	Remaining value of asset $70	$40 insured deposits	100%	Remaining value of asset $70	$40 insured deposits	100%
		$50 senior unsecured debt	$39 senior unsecured debt	78%	$30 senior unsecured debt	60%		$50 senior unsecured debt	100%		$23 senior unsecured debt	46% + $7 equity
											$7 equity	
	$30 losses on assets	$2 sub. debt	$0 sub. debt	0%	$0 sub. debt	0%	Bail-out subsidy $30	$2 sub. debt	100%		$0 sub. debt	0%
		$8 equity	$0 equity	0%	$0 equity	0%		$8 equity	100%		$0 equity	0%
Bank operations			Discontinued		Discontinued		Continue			Continue		
DGS cost, net			$9	78%	$0	. . .		. . .	. . .		$0	. . .
Taxpayer cost, excluding DGS			$0	. . .	$0	. . .		$30	. . .		$0	. . .
Recovery value calculations												
DGS/insured deposits without DGS			70x(40/[40+50])		. . .			. . .			. . .	
Senior unsecured debt			70x(50/[40+50])		70–40			. . .			70–40–7	
DGS net payment to depositors			40–70x(40/[40+50])		. . .							

Table 3.4. Illustration of Creditor Hierarchy and Loss Sharing under Alternative Resolution Tools *(concluded)*

With Asset Encumbrance[5]

	Balance sheet		[E]:Liquidation (+DGS, no DP)[1]		[F]:Liquidation (+DGS and insured DP)[2]		[G]:Bail-out[3]			[H]:Bail-in, with exclusion of insured deposits and secured debt[4]		
	Assets	Liabilities	Liabilities	Recovery	Liabilities	Recovery	Assets	Liabilities	Recovery	Assets	Liabilities	Recovery
	Remaining value of asset $70	$10 secured	$10 secured	100%	$10 secured	100%	Remaining value of asset $70	$10 secured	100%	Remaining value of asset $70	$10 secured	100%
		$40 insured deposits	$40 insured deposits (including $10 DGS payment)	100% (75% without DGS)	$40 insured deposits	100%		$40 insured deposits	100%		$40 insured deposit	100%
		$40 senior unsecured debt	$30 senior unsecured debt	75%	$20 senior unsecured debt	50%		$40 senior unsecured debt	100%		$13 senior unsecured	30% + $7 equity
											$7 equity	
	$30 losses on assets	$2 sub. debt	$0 sub. debt	0%	$0 sub. debt	0%	Bail out subsidy $30	$2 sub. debt	100%		$0 sub. debt	0%
		$8 equity	$0 equity	0%	$0 equity	0%		$8 equity	100%		$0 equity	0%
Bank operations			Discontinued		Discontinued		Continue			Continue		
DGS cost, net			$10	75%	$0	. . .	. . .		. . .	. . .	$0	. . .
Taxpayer cost, excluding DGS			$0	. . .	$0	. . .	$30		. . .	. . .	$0	. . .
Recovery value calculations												
DGS/insured deposits without DGS			(70–10)x(40/[40+40])		70–10–40		. . .			. . .		
Senior unsecured debt			(70–10)x(50/[40+40])				. . .			70–10–40–7		
DGS net payment to depositors			40–(70–10)x(40/[40+40])				. . .					

Source: IMF staff.

Note: DGS = depositor guarantee scheme; DP = depositor preference. Loss and recovery amounts include rounding errors. Senior unsecured debt includes uninsured deposits.

[1]Liquidation with DGS: Insured-depositor claims are paid in full by the DGS and the DGS "steps into" the rights of the insured depositors in liquidation proceedings. DGS (taking the place of depositors) ranks equally (pari passu) with other senior unsecured creditors.

[2]Liquidation with DGS and DP: Insured-depositor claims are paid in full by the DGS and the DGS "steps into" the rights of the insured depositors in liquidation proceedings. DGS (taking the place of depositors), under DP, ranks above senior unsecured creditors in the proceedings.

[3]Bail-out: In the example, the government is assumed to make good on the losses caused by too-big-to-fail concerns through an asset-protection scheme without charge. The government could instead inject capital (perhaps after writing off subordinated debt and equity) to absorb the losses and add fresh equity buffers, while protecting the payments to senior debt holders, depositors, and secured debt holders.

[4]Bail-in: The bank is rehabilitated with debt restructuring, under the bail-in power given to the country authority. Insured deposits are assumed to be exempt from bail-in, as per the FSB's Key Attributes. (This does not necessarily imply giving DP in liquidation—a country with a bail-in resolution regime may have a liquidation framework with DP, as in cases [A] and [E]). Losses are first absorbed by equity and subordinate debt holders and then by senior unsecured debt holders, whose claims are partly written down and partly converted into new equity. The conversion values are set to achieve a 10 percent capital-to-asset ratio in this example.

[5]Secured debt holders have senior claim on the collateral assets to (insured) deposits and senior unsecured debt and are exempt from bail-in. For simplicity, secured debt is assumed to be fully collateralized. If the remaining value of assets is below $50 in cases [F] and [H], losses are first absorbed by depositors (through the DGS). Secured debt holders experience losses only when the asset value falls below $10.

Table 3.5. Cross-Country Comparison of Covered Deposits, end-2010

	Total Domestic Deposit Base (billions of U.S. dollars)	Covered Deposits (percent of total)	Eligible Deposits (percent of total)
Cyprus[1]	128	24	. . .
Greece[1]	169	63	. . .
France	1,742	67	92
Germany	3,395	. . .	40
Italy	2,050	31	45
Netherlands	1,202	48	59
Spain	1,963	47	65
Switzerland	1,481	24	73
United States	7,888	79	100

Source: Financial Stability Board (2012a).
[1]IMF staff estimates.

- *Insured depositor preference* provides preferential treatment for insured deposits and ranks all other senior unsecured creditors, including uninsured deposits, equally.
- *General depositor preference* gives preference to all deposits of a deposit-taking institution, including to balances higher than the deposit insurance limit over senior unsecured creditors.
- *Tiered depositor preference* prefers insured deposits (and the deposit guarantee scheme through subrogation) over uninsured deposits and prefers both over senior unsecured creditors.

In contrast to depositor preference, bail-in power is applied when a bank failure is resolved while keeping the bank operational (see Table 3.4). Junior stakeholders (subordinated debt and shareholders) are the first to lose their stakes, and if these amounts are not sufficient to restore viability, senior debt holders are then bailed in at the discretion of the resolution authority (Table 3.4, examples [D] and [H]). Secured debt holders and some depositors may be exempt from bail-in; therefore, their recovery amounts are assumed to be higher than those of the senior unsecured debt holders.

Several aspects of bail-in power for bank rehabilitation need to be established in advance. The first is the scope of bail-in debt as discussed in the main text. The second is establishing when this power would be exercised. The power should be applied when a bank becomes unviable, which could be any time after a bank breaches a regulatory capital ratio but before it becomes insolvent, and therefore requires further specificity in legislation. The third is creditor seniority order. Bail-in powers could impose losses on creditors in a different order and of a different magnitude than losses in liquidation. For instance, bailing in senior unsecured debt holders while exempting insured depositors (cases [D] and [H] in Table 3.4) could make senior unsecured debt holders worse off than in liquidation, in which they would be treated equally (cases [A] and [E] in Table 3.4). This outcome could lead to a lawsuit. Formal introduction of depositor preference simultaneously with bail-in power would align the recovery for debt holders in liquidation and restructuring, limiting legal challenges and claims for compensation.

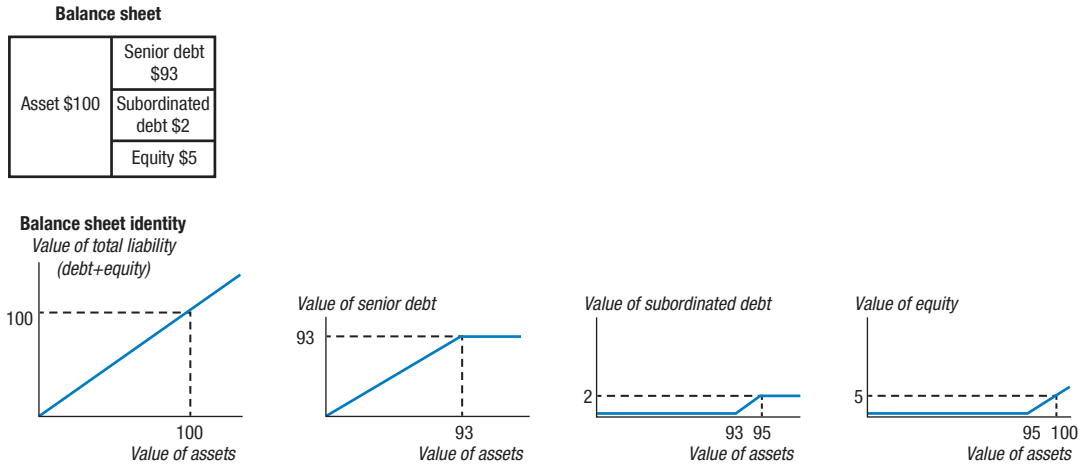
Annex 3.3. Bank Bond Pricing Model

Merton-Style Bond Pricing Framework for Senior and Subordinated Debt and Equity

The price of a bond that may default depends on the value of a bank's assets relative to the face value of the bond and its seniority rank. Consider a bank that issues only three types of liabilities, senior and subordinated debt as well as equity (Figure 3.20). The total liabilities of the bank, excluding equity, are $95. If the asset value is greater than $95, both senior and subordinated debt holders (creditors) recover the full face value of debt and the rest goes to shareholders (for example, if the asset value is $110, shareholders receive $15). But if the value of assets declines below $95, the bank defaults. The recovery after bank failure for debt holders depends on their seniority and the capital structure. For instance, if the asset value becomes $50, senior debt holders receive $50, while subordinated debt creditors and shareholders recover $0. If the asset value is between $93 and $95, senior creditors receive $93, shareholders recover $0, and the rest goes to subordinated creditors.

The contingent nature of the liabilities suggests that a standard option pricing formula can be used to valuate these liabilities. The value of equity is the same as the value of buying a call option—that is, the right to buy the asset at a strike price of $95—on the bank's

Figure 3.20. Pricing of Senior and Subordinated Debt and Equity



Source: IMF staff.
Note: The balance sheet identity implies that the total value of assets should be equal to the total value of liabilities, which is the vertical sum of the values of senior debt, subordinated debt, and equity.

total assets (see Figure 3.20). The value of senior debt over the risk-free asset is represented by the value of selling a put option—the right to sell the asset at the strike price of $93—on the bank's assets.

Once the value of equity and senior debt is calculated, the balance sheet identity determines the value of subordinated debt that sits between senior debt and equity. It is calculated as the difference between total assets and the sum of the equity and senior debt values, because balance sheet identity implies that the value of all types of debt and equity will sum to the value of total assets. In other words, a liability with a seniority ranking between senior debt and equity can be modeled as a combination of purchasing a call option with a strike price of $93 and selling a call option with a strike price of $95 as shown in Figure 3.20. (Options strategists call this a "vertical spread.") This figure represents the potential payoffs to subordinated debt holders at maturity of the option.

The chapter's analysis adopts all the assumptions stated by Merton (1974), including that the asset value follows a geometric Brownian motion. The asset value changes at any given future date are distributed normally.[54] Default is assumed to occur only at maturity—that is, the options are "European."

[54]More complex and realistic processes, including jump-diffusions or distributions with fatter tails, can be accommodated within this framework. The numerical results should be taken as illustrative examples rather than precise estimates; the qualitative analysis, however, is robust.

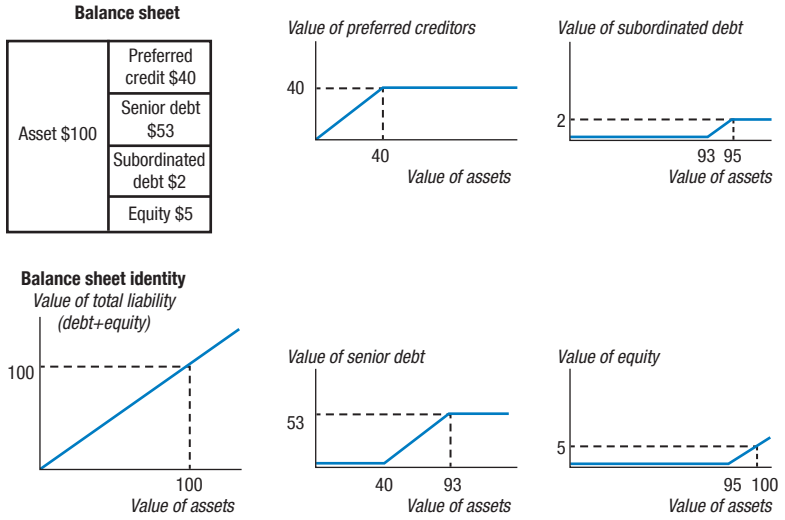
Bond Pricing with Depositor Preference or Asset Encumbrance

Both depositor preference and asset encumbrance (that is, the use of secured debt) in effect create an additional type of liability that is ranked above other senior debt for pricing purposes. The senior debt in Figure 3.20 is now split into a "preferred creditor" status that is senior to all other debt and to both senior debt and subordinated debt in Figure 3.21. "Preferred creditor" debt in this exercise includes every type of debt that will have preferential ranking over other senior debt as a result of depositor preference or asset encumbrance.[55]

The changes in seniority ranking affect the value of liabilities relative to the case without asset encumbrance or depositor preference (see Figure 3.12 for an illustration of the creditor hierarchy). The values of equity and subordinate debt remain the same, because their seniority ranking is unaffected. Figure 3.21 shows

[55]To be precise, secured debt holders have seniority only up to the value of their collateral assets. However, central bank repurchase agreements (mostly short term, with haircuts on the collateral assets) and covered bonds (overcollateralization, which implies the collateral is greater than that needed to ensure payments) are structured such that they are very likely to recover full value of the debt. See Chan-Lau and Oura (forthcoming) for a fuller analysis of asset encumbrance in the situation in which secured creditors have less than full seniority over other creditors. The quantitative impact is small.

Figure 3.21. Pricing of Liabilities with Depositor Preference and Asset Encumbrance



Source: IMF staff.
Note: The balance sheet identity implies that the total value of assets should be equal to the total value of liabilities, which is the vertical sum of the values of preferred credit, senior debt, subordinated debt, and equity.

how different combinations of puts and call options on the asset value of the bank can be used to price the liabilities.

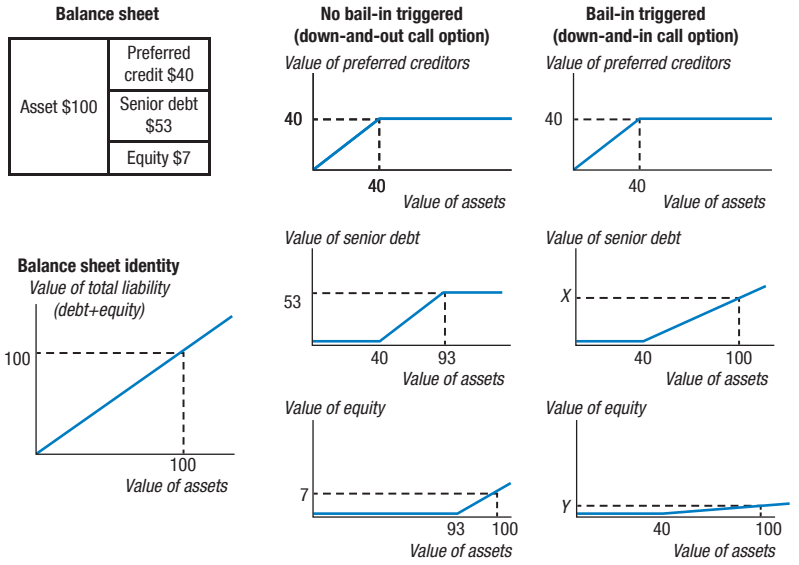
Preferred creditors face losses only when the asset value declines to less than $40. In contrast, senior debt faces losses when the asset value declines to less than $93, which is when the equity and subordinated debt buffers are used up. Moreover, the recovery value of senior debt is also lower than it would be if it were ranked equally with deposits, given that $40 of the assets' value is reserved to first pay off preferred creditors. The probability of default of senior debt remains the same because the bank defaults whenever the asset value is $93 but its recovery value declines, which is reflected in higher yields relative to the case in which senior debt ranks equally with deposits.

Bail-in Debt

When bail-in powers are exercised, all bail-in debt is assumed to be converted to equity when the equity-to-asset ratio calculated using market values falls below a prespecified level, set at 5 percent in this exercise. The recoveries for bail-in debt and equity depend on whether the event is triggered (Figure 3.22). Their values can be expressed as a combination of two barrier options that have closed-form solutions: a down-and-out call option that assigns recovery values provided the bail-in is not triggered and a down-and-in call option for when bail-in is applied.[56] When bail-in is triggered, senior debt holders and existing shareholders are assumed to receive new equity in proportion to the market value of their respective claims at the time of bail-in.

[56]Barrier options are options whose payoffs depend on the strike price and an additional event. A down-and-out (down-and-in) option ceases to exist (becomes activated) if the value of the underlying asset falls below a prespecified value, or barrier value, at some point during the life of an option.

Figure 3.22. Pricing of Liabilities under Bail-in Power



Source: IMF staff.
Note: *X* and *Y* depend on the extent of dilution for existing shareholders when bail-in power is applied. In this exercise, senior debt holders and existing shareholders are assumed to receive new equity in proportion to the market value of their respective claims. Suppose *SenD** and *E** represent the market value of senior debt and equity, respectively, when bail-in kicks in. Senior debt holders receive *SenD**/(*SenD**+*E**) percent of new equity and the rest goes to existing shareholders. The balance sheet identity implies that the total value of assets should be equal to the total value of liabilities, which is the sum of the values of preferred credit, senior debt, subordinated debt, and equity.

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GLOSSARY

Abenomics Refers to the set of policy measures introduced by Japanese Prime Minister Shinzo Abe after the December 2012 elections to boost the domestic economy. The set of policies encompasses three "arrows": monetary stimulus, fiscal flexibility, and structural reforms.

Accommodative policies Central bank policies designed to stimulate economic growth by making borrowing less expensive.

Additional Tier 1 capital The sum of (1) instruments issued by banks that meet the criteria for inclusion in Additional Tier 1 capital (and are not included in Common Equity Tier 1); (2) stock surplus (share premium—the value of paid-in capital that exceeds the shares' nominal value) resulting from the issuance of instruments included in Additional Tier 1 capital; (3) instruments issued by consolidated subsidiaries of the bank and held by third parties that meet the criteria for inclusion in Additional Tier 1 capital and are not included in Common Equity Tier 1; and (4) applicable regulatory adjustments. See *Common Equity Tier 1* and *Tier 1 capital*.

Asset encumbrance An asset is considered encumbered if it has been pledged or may be required to secure or collateralize a transaction from which it cannot be freely withdrawn. The asset may be pledged to reduce the credit risk of the underlying transaction (for example, a "credit enhancement").

Bail in A statutory power to restructure the liabilities of a distressed financial institution by writing down, or converting to equity, its unsecured debt.

Bail-in debt Also frequently called bailin-able debt refers to any liabilities that can be "bailed-in," by being written off, written down, or converted into equity through the application of statutory bail-in powers in a bank resolution.

Balance-sheet constraints In the context of Chapter 2, constraints related to the capital or liquidity position of banks, to their access to market finance or, more generally, to their cost of funds, all of which can make lending by banks more difficult or expensive.

Bank insolvency A bank becomes insolvent when its equity value falls below zero—namely, when the value of its assets falls below the value of its debt. Before becoming insolvent, a bank breaches minimum regulatory capital requirements, which usually leads to a series of actions from the supervisor, including, but not limited to, intensified supervisory monitoring, restrictions on dividend payouts, and instructions to take specific managerial actions.

Bank resolution There are two broad forms of bank resolution. One is a liquidation—namely a "gone concern" resolution, under which a bank ceases to operate and its assets are distributed among creditors according to their seniority. The other is a "going concern" resolution, under which some parts of the bank's operations continue, typically with some financial and operational restructuring. The latter could include purchase and assumption (P&A): a healthy bank purchases the assets and assumes the liabilities of an unhealthy bank, and a bridge bank, authorized to hold the assets and liabilities of an unhealthy bank, continues the bank's operations until it is solvent and is acquired by another entity or until it is liquidated.

Banking union A European Commission policy response to the global financial crisis: establishment of a single supervisory-regulatory framework, harmonized national resolution regimes for credit institutions, and harmonized standards across euro area national deposit insurance programs.

Basel Committee on Banking Supervision (BCBS) A committee of banking supervisory authorities that provides a forum for regular cooperation on banking supervisory matters. The committee develops guidelines and supervisory standards in various areas, including the international standards on capital adequacy, the Core Principles for Effective Banking Supervision, and the Concordat on cross-border banking supervision.

Basel III A comprehensive set of reform measures introduced as a result of the global financial crisis to improve the banking sector's ability to absorb financial and economic shocks, enhance banks' risk management

and governance, and increase transparency and disclosure. These measures revise the existing definition of regulatory capital under the Basel Accord, enhance capital adequacy standards, and introduce minimum liquidity adequacy standards for banks.

CDS spread A credit default swap (CDS) is a credit derivative whose payout is triggered by a "credit event," often a default. The "spread" of a CDS is the annual amount (the "premium") the protection buyer must pay the protection seller over the length of the contract, expressed as a percent of the notional amount.

Collateral Assets pledged or posted to a counterparty to secure an outstanding exposure, derivative contract, or loan.

Common Equity Tier 1 (CET1) The sum of (1) common shares issued by a bank that meet the regulatory criteria for classification as common shares (or the equivalent for non-joint-stock companies); (2) stock surplus (share premium—the value of paid-in capital that exceeds the shares' nominal value) resulting from the issuance of instruments included in CET1; (3) retained earnings; (4) accumulated other comprehensive income and other disclosed reserves; (5) common shares issued by consolidated subsidiaries of the bank and held by third parties (that is, minority interest) that meet the criteria for inclusion in CET1 capital; and (6) applicable regulatory adjustments. See *Tier 1 capital*.

Contingent convertible bonds or CoCos Bonds with principal and coupon payments that are automatically converted into equity or written down, in accordance with their contractual terms, when a predetermined trigger event occurs.

Contingent cost Cost that may or may not materialize, depending on the outcome of a future event.

Corporate spread Difference between the yield on a corporate bond and the yield on a government bond of the same maturity.

Countercyclical Movement of an economic or financial quantity that is opposite to the economic cycle. For example, countercyclical capital buffers are built up during an economic upturn so that they can be drawn down in a downturn.

Credit cycle The expansion and contraction of credit over time.

Credit guarantee A promise to repay the lender if the borrower defaults.

Credit policies Policies implemented to promote credit creation.

Credit registry A database, often maintained by central banks or bank supervisors, with detailed information on loans granted by financial intermediaries. In particular, a credit registry usually contains detailed information about both the borrower and the lender.

Credit risk The risk that a party to a financial contract will incur a financial loss because a counterparty is unable or unwilling to meet its obligations.

Creditless recovery A situation in which economic recovery after a downturn is not associated with corresponding growth in credit.

Currency overlay funds Structured products that feature an outright investment in an underlying asset, such as a domestic stock, compounded with an "overlay" exposure to a (possibly unrelated) currency.

Debt overhang A situation in which excessively indebted borrowers do not act as they would if they had less debt outstanding. For example, corporations might not pursue otherwise profitable business opportunities, or highly indebted households may choose not to invest or consume, but rather pay off their loans.

Debt restructuring A change in the terms of a borrower's outstanding debt, often to the benefit of the borrower.

Deleveraging The reduction of the leverage ratio—the percent of debt on a financial institution's balance sheet.

Deposit preference Preference given to depositors in the creditor hierarchy that gives them a preferential claim over the assets of a failed deposit-taking institution compared with other senior unsecured creditors.

Direct credit easing Direct purchases (or sales) by the central bank in specific credit market segments with impaired functioning.

Duration A measure of the sensitivity of bond prices to interest rate fluctuations, based on the bond's weighted average cash flows.

Earnings before interest, taxes, depreciation, and amortization (EBITDA) A measure of a company's operating cash flow obtained by looking at earnings before the deduction of interest expenses, taxes, depreciation, and amortization. This measure is used to compare companies'

profitability without the accounting and financing effects of various asset and capital structures. This measure may be of particular interest to creditors because it represents a company's income available for interest payments.

Endogeneity In a statistical model, endogeneity may arise when an independent variable (regressor) is correlated with the error term, which makes it difficult to identify causal relationships. Endogeneity may be caused, for example, by omitted variables or simultaneity.

European option An option that may be exercised only on its expiration date.

European Stability Mechanism (ESM) An international organization that assists members of the euro area in financial difficulty to safeguard the financial stability of the euro area. The ESM may raise funds, for example, by issuing bonds and other debt instruments and entering into arrangements with euro area members.

Evergreening Additional loans by banks to stressed borrowers to enable them to repay existing loans or interest. This practice can prevent loans from becoming nonperforming, but it further increases a bank's exposure to a troubled borrower.

Exogenous variable In an econometric model, an explanatory variable is exogenous if it is not correlated with the error term.

Externality Cost or benefit arising from an economic activity that affects not only those engaged in the activity but also those not engaged in the specific activity.

Financial fragmentation A broad retrenchment in cross-border flows and assets so that private capital is invested and held more along national lines. In a currency union such as the euro area, fragmentation can lead to a breakdown in monetary policy transmission across the region's banking and credit markets.

Fire sale A panic condition in which many holders of an asset or class of assets attempt a market sale, thereby driving down the price to extremely low levels. A fire sale may also denote a seller's acceptance of a low price for assets when faced with bankruptcy or other impending distress.

Fitted values Values predicted by a model that has been fitted to a set of data.

Fixed-rate full allotment Under fixed-rate full allotment liquidity provisions, central bank counterparties' bids are fully satisfied (against adequate collateral) at a predetermined price.

Flexible Credit Line (FCL) An IMF credit line for the purpose of crisis prevention and mitigation for countries with very strong economic fundamentals and policy track records.

Forbearance A temporary postponement of loan payments granted by a lender or creditor. Forbearance gives the borrower time to make up overdue payments on a loan.

Foreclosure A lender's seizure of pledged or mortgaged assets, such as a house, usually with the intention of selling them to recover part or all of the amount due from the borrower.

Funding cost Cost at which banks can obtain funds (in the form of equity or debt).

Funding liquidity risk The risk that increases in assets cannot be funded or obligations met as they come due without incurring unacceptable losses. Funding liquidity risk sometimes refers to the risk that solvent counterparties might have difficulty borrowing in the very short term to meet required liability payments.

Global systemically important bank (G-SIB) Large banking institution with global operations with a potential impact on the financial system. The Financial Stability Board (FSB) has tentatively identified 29 global banks as G-SIBs. These banks have been provisionally earmarked for additional loss absorbency, or capital surcharges, ranging from 1 percent to 2.5 percent of the ratio of Common Equity Tier 1 capital to risk-weighted assets.

Government-sponsored enterprise (GSE) A financial institution that provides credit or credit insurance to specific groups or areas of the economy, such as farmers or housing. In the United States, such enterprises are federally chartered and maintain legal and/or financial ties to the government.

Great Moderation Period beginning in the 1980s of substantially reduced macroeconomic volatility in the United States.

Identification In an econometric model, a parameter is said to be identified if it can be consistently estimated from the observed data.

Indirect credit easing The provision of long-term funds to banks by the central bank (instead of through regular weekly operations) specifically so that banks can expand lending to firms and households.

Information asymmetry Situation in which one party in a transaction has more or better information than the other. This imbalance in information can potentially affect the nature of the transaction and lead to a market failure. See *Market failure*.

Instrumental variable (instrument) Alternative variable used in an econometric analysis whose original variable represents either cause or effect. Ideally, an instrumental variable is highly correlated with the original variable so that it behaves like the original variable, but it should have little correlation with the dependent variable to eliminate effects of dependent variable movements.

Insured deposits Deposits insured by deposit guarantee programs. Some types of deposits, such as retail deposits, are eligible for the insurance but are not insured because the amount of the deposit exceeds the maximum insurance coverage.

Interest coverage ratio (ICR) Earnings before interest, taxes, depreciation, and amortization (EBITDA) divided by the interest expense. It measures firms' ability to service their debt.

Jumbo loan In the U.S. mortgage market, a mortgage loan that exceeds a certain legally determined limit and can therefore not be sold by banks and other lenders to government-sponsored enterprises.

Lending standards Internal guidelines or criteria that reflect the conditions under which a bank will grant a loan. These include various nonprice lending terms in a typical bank business loan or line of credit, such as collateral, covenants, and loan limits.

Leverage The proportion of debt to equity (also assets to equity) often expressed as a multiplier, such as 20X, or the capital-to-asset ratio in banking, expressed as a percent. Leverage can be built up by borrowing relative to a fixed amount of capital (on-balance-sheet leverage) or through off-balance-sheet transactions that increase the future exposure of the bank relative to its loss-absorbing capacity. See *Loss-absorbing buffers (or capacity)*.

Leverage ratio A bank's leverage ratio typically refers to Tier 1 capital as a ratio of adjusted assets. Assets are adjusted for intangible assets not included in Tier 1 capital.

Liquidity coverage ratio (LCR) A liquidity standard introduced by Basel III. It is defined as the stock of high-quality liquid assets as a proportion of the bank's "net cash outflows over a 30-day time period." Two types of liquid assets are included, both of which should have high credit quality and low market risk: Level 1 assets should be unlikely to suffer large price changes during periods of distress; Level 2 assets are more likely to suffer price changes and be subject to a haircut and a limit on their quantity in the overall liquidity requirement.

Loan covenants Provisions in a loan agreement binding on the borrower or lender.

Loan loss provision Losses (noncash charge to earnings) that a bank expects as a result of uncollectible or troubled loans and that is used to create a loan loss reserve. Examples include transfers to bad debt reserves (Japan) and amortization of loans (Japan).

Long-term refinancing operation (LTRO) Open market operations conducted by the European Central Bank to provide long-term liquidity to the banking system.

Loss-absorbing buffers (or capacity) Bank liabilities that can be used to absorb losses from assets to maintain the bank's viability. Equity and capital-qualifying debt, recognized under bank capital rules, are important components. Additional debt instruments could also be used to absorb losses without going through a liquidation process, including under statutory bail-in powers.

Macroprudential policies Policies to maintain the safety and soundness of the financial system as a whole (for example, countercyclical capital buffers).

Mark-to-market valuation The act of recording the price or value of a security, portfolio, or account to reflect its current market value rather than its book value.

Market failure Occurs when free markets fail to allocate resources efficiently. Market failures are often associated with asymmetric information (when buyers and sellers do not operate with the same set of information), non-competitive markets (such as monopolies), externalities (see *externality*), or public goods (when the traded good cannot be excluded from others' use).

Market liquidity Ability to trade an asset's large nominal value without significantly altering its market price.

Microprudential policies Supervisory and regulatory policies aimed at maintaining the safety and soundness of individual financial institutions. Examples are capital and liquidity requirements, banks' recovery and resolution

plans, restrictions on executive compensation, limits on dividend distributions, etc.

Model herding Tendency for financial sector players to act together, often as the result of using similar common financial models.

Money market mutual fund (MMMF) An open-ended mutual fund that invests in short-term money market securities, such as U.S. Treasury bills and commercial paper.

Moral hazard A situation in which an agent (an individual or institution) will act less carefully than otherwise because the consequences of a bad outcome will be largely shifted to another party. Often such behavior is present because the other party cannot observe the actions. For example, a financial institution may take excessive risks if it believes that governments will support them during a crisis and that governments cannot observe the risky behavior ex ante to prevent it.

Mortgage-backed security (MBS) A security, backed by pooled mortgages on real estate assets, that derives its cash flows from principal and interest payments on those mortgages. An MBS can be backed by residential mortgages (RMBS) or mortgages on commercial properties (CMBS). A private-label MBS is typically a structured credit product. RMBSs that are issued by a government-sponsored enterprise are not structured (that is, do not have a tiered or tranched payments structures with payment priorities to the different holders).

Mortgage real estate investment trusts (mREIT) Investment vehicles designed for borrowing at short-term rates and investing in long-term mortgage-related securities.

Net stable funding ratio (NSFR) Introduced by Basel III to provide a more sustainable maturity structure of assets and liabilities. The NSFR stipulates that the ratio of a bank's available stable sources of funding to its required stable funding be greater than 100 percent. Each asset category (including off-balance-sheet contingent instruments) is assigned a factor to reflect its potential liquidity characteristics. The NSFR aims to limit overreliance on short-term wholesale funding during times of buoyant market liquidity and to encourage better assessment of liquidity risk across all on- and off-balance-sheet items.

Nonbanks Financial institutions that do not have full banking licenses or are not supervised by a national or international banking regulatory agency. They facilitate bank-related financial services, such as investment, risk pooling, contractual savings, and market brokering, and can include money market mutual funds, investment banks, finance companies, insurance firms, pension funds, hedge funds, currency exchanges, and microfinance organizations.

Nonperforming loan (NPL) A loan for which the contractual payments are delinquent, usually defined as being overdue for more than a certain number of days (for example, more than 30, 60, or 90 days). The NPL ratio is the amount of nonperforming loans as a percent of gross loans.

Originate-to-distribute model A banking model, popular in North America, whereby banks tend to distribute loans, such as mortgages, credit card credits, and corporate loans, that they originate to other investors.

Overcollateralization When issuing covered bonds, issuers usually pledge collateral so that the total value of the collateral exceeds the borrowed amount. The extent of overcollateralization varies significantly across bonds, ranging from a few percent to well over 100 percent. A rating agency will often require a certain degree of overcollateralization for the bond to attain a high rating (for example, AAA).

Quantitative easing (QE) Direct purchases of government bonds by the central bank, usually when the official policy interest rate is at or near the zero lower bound.

Quantitative and qualitative monetary easing (QQME) Policies introduced by the Bank of Japan that involve significantly increasing its holdings of government bonds and other assets through extending the maturity of Japanese government bond purchases. The aim is to achieve a consumer price index stability target of 2 percent year over year as soon as possible.

Pari passu When creditors rank equally in the creditor hierarchy for repayment of their debt from the obligor's assets.

Perpetual bonds Perpetual bonds, also known as perp bonds, are those with no maturity date.

Pillar 1 (of Basel II) One of the three mutually supporting pillars that form the Basel II accord. Pillar 1 sets a minimum capital requirement for all internationally active banks that covers credit risk, operational risk, and market risk.

Pillar 3 (of Basel II) One of the three mutually supporting pillars that form the Basel II accord. Pillar 3 provides disclosure requirements for information regarding regulatory capital ratios.

Preferred creditor An individual or organization that has repayment priority if the debtor declares bankruptcy.

Preferred share A preferred share (or stock) is an equity security that has features not possessed by common stock, including properties of both an equity and bonds and is generally considered a hybrid instrument. It usually has no voting rights, but may carry dividends and may have priority over common stock in the payment of dividends, and may receive cash flows upon liquidation.

Price-to-book ratio Used to compare a firm's stock market value to its book value. It is calculated by dividing the current closing price of the stock by the firm's recent-quarter accounting book value per share.

Primary market The financial market that deals with the issuance of new financial instruments, such as stock and bonds. See also *Secondary market*.

Probability of default (PD) Likelihood of default over a given time horizon.

Prudential measures These comprise micro- and macroprudential policy measures.

Regulatory forbearance A situation in which bank regulators or supervisors allow banks to avoid adhering to established regulations. To temporarily help borrowers, regulators or supervisors may allow banks to avoid recognizing nonperforming loans on their balance sheets or discourage banks from seizing collateral underlying their loans.

Relationship banking A situation in which a bank attempts to cultivate a long-term relationship with their borrowers. Typically, a bank will attempt to accumulate soft (proprietary) information in existing customers in addition to hard (quantifiable, verifiable) information to assess a borrower's creditworthiness. Various products, such as long-term contracts, can help to establish a borrower's long-term commitment to the bank.

Repurchase (repo) transaction A sale of securities coupled with an agreement to repurchase the securities at an agreed price at a future date. This transaction occurs between a cash borrower (or securities lender)—typically a fixed-income securities broker-dealer—and the cash lender (or securities borrower), such as a money market mutual fund or a custodial bank. The securities lender receives cash in return and pledges the legal title of a security as collateral.

Return on assets (RoA) The amount an investor would earn from a firm as a proportion of the total assets. Usually calculated as: (Net income before preferred dividends plus ((interest expense on debt-interest capitalized) multiplied by (1 minus tax rate))) divided by last year's total assets multiplied by 100.

Risk premium The extra expected return on an asset that investors demand in exchange for accepting its higher risk.

Secondary market The financial market in which previously issued financial instruments, such as stock or bonds, are bought and sold. The existence of liquid secondary markets can encourage people to buy in the primary market, as they know they are likely to be able to sell easily should they wish to. See *Primary market*.

Secured creditor Any creditor or lender that takes collateral for the extension of credit, loan, or bond issuance.

Secured funding Funding secured by certain collateral, including repos, asset-backed securities, mortgage-backed securities, and covered bonds. At liquidation, secured debt holders have priority claim up to the value of the pledged collateral over general creditors, including depositors.

Securitization The creation of securities from a reference portfolio of preexisting assets or future receivables that are placed under the legal control of investors through a specially created intermediary: a "special purpose vehicle" (SPV) or "special purpose entity" (SPE). In the case of "synthetic" securitizations, the securities are created from a portfolio of derivative instruments.

Senior creditor A creditor who receives higher priority for the repayment of a debt instrument from the obligor's assets, for example, compared to subordinated or junior creditors.

Shadow banks Nonbank financial intermediaries that provide services similar to traditional commercial banks, but are not regulated or supervised like a bank. These can include hedge funds, money market funds, and structured investment vehicles (SIVs), depending on their investment and funding strategies.

Shifter In the context of Chapter 2, a variable that shifts either the credit supply curve or the demand curve, without affecting the other.

Single supervisory mechanism (SSM) A common banking supervision framework under the aegis of the

European Central Bank for the euro area banks, as proposed by the European Commission in September 2012.

Small and medium enterprises (SMEs) In Europe, these firms are classified based on the number of employees and balance sheet turnover (according to EU law).

Stop-loss sales Sales orders that are executed when a security falls to a prespecified price.

Stress test A process that evaluates an institution's ability to financially withstand adverse macroeconomic and financial situations.

Subordinated debt (or junior debt) This debt instrument receives lower seniority than general debt in the event that a company falls into liquidation or bankruptcy, and it receives payments only after all senior debt holders are paid but before equity holders receive any money.

Swaptions Interest rate instruments that allow investors to take a view on future interest rate volatility, using options to trigger underlying interest rate swap agreements. A 10-year by 10-year swaption allows an investor to buy/sell a 10-year option on an underlying interest rate swaps contract with a 10-year maturity.

Tangible assets (TA) Total assets less intangible assets (such as goodwill and deferred tax assets).

Tangible leverage ratio A measure of financial strength using the ratio of a bank's total liabilities to its shareholder's equity less goodwill and tangible assets. It is not a regulatory requirement.

Term premium The premium in terms of yield that an investor expects to receive for buying longer-dated securities compared to the yield received if short-term securities were to be reinvested as they come due until the maturity of the longer-dated securities.

Tier 1 capital Under Basel III, Tier 1 capital (or going concern capital) comprises Common Equity Tier 1 capital and Additional Tier 1 capital. See *Common Equity Tier 1 capital* and *Additional Tier 1 capital*.

Tier 1 capital ratio This is the ratio of a bank's Tier 1 capital to its total risk-weighted assets (RWA). Under Basel III, banks in member countries are required to meet the minimum Tier 1 capital ratio requirement of 6 percent and Common Equity Tier 1 capital ratio of 4.5 percent by January 1, 2015. See *Tier 1 capital*.

Underwriting The process that a financial institution, such as a bank or insurer, uses to assess the eligibility of a customer to receive a financial product, such as credit or insurance.

Universal banking model Banking system, popular in Europe, whereby banks often provide a range of financial products and services, including both investment and commercial banking, transaction banking, asset gathering, and retail banking.

Unsecured creditor Any creditor or lender that lends money without obtaining prespecified assets as collateral.

Value-at-risk (VaR) An estimate of the loss, over a given horizon, that is statistically unlikely to be exceeded at a given probability level, usually based on the historical returns, covariances, and volatilities of a portfolio of assets.

Vertical (bull) spread An options strategy involving buying a call and selling a put option on the same underlying security with the same expiration date but at different strike prices. In Chapter 3, value of senior debt mirrors a strategy in which the call is purchased at a lower strike price than the put is sold.

Vienna Initiative The European Bank Coordination "Vienna" Initiative (EBCI) was launched in January 2009 to provide a framework for coordinating the crisis management and resolution regime that involved large cross-border banking groups in emerging Europe. The European Bank for Reconstruction and Development, the IMF, the European Commission, and other international financial institutions initiated a process to address possible collective actions for dealing with financial instability. In a series of meetings, the international financial institutions and policymakers from home and host countries' banks met with commercial banks active in emerging Europe to discuss what measures might be needed to reaffirm their presence in the region in general and, more specifically, in countries that were receiving balance of payments support from the international financial institutions.

VIX Chicago Board Options Exchange Volatility Index that measures market expectations of financial volatility over the next 30 days. The VIX is constructed from S&P 500 option prices.

Wholesale funding Bank funding instruments typically issued in money and capital markets, including interbank deposits, commercial paper (CPs), certificates of deposit (CDs), repurchase agreements (repos), swaps, and various kinds of bonds. These are typically purchased by institutional investors, including other banks.