Global Financial Stability Report

The Quest for Lasting Stability

April 2012

International Monetary Fund

CONTENTS

Figures

This PDF differs from the printed version in that the following error has been corrected:

The note to Figure 3.4 on page 89 has been corrected from:

Note: Data for government and corporate debt are as of 2011:Q2; supranational debt, covered bonds, and gold, as of end-2010; and U.S. agency debt and securitization, as of 2011:Q3.

To read:

Note: Data for government and corporate debt are as of 2011:Q2; supranational debt and gold, as of end-2011; covered bonds, as of end-2010; and U.S. agency debt and securitization, as of 2011:Q3.

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. Against a background of continuing challenges to global financial stability, the current report highlights how risks have changed over the past six months, traces the sources and channels of financial distress with an emphasis on sovereign vulnerabilities and contagion risks stemming from bank deleveraging, investigates the resilience of emerging markets, examines the implications of recent reforms and sovereign stress for safe assets, and assesses the growing financial costs that longevity risk poses for financial and fiscal institutions.

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

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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 March 30, 2012.

The report benefited from comments and suggestions from staff in other IMF departments, as well as from Executive Directors following their discussion of the GFSR on March 30, 2012. 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.

The following symbols have been used throughout this volume:

. . . to indicate that data are not available;

— to indicate that the figure is zero or less than half the final digit shown, or that the item does not exist;

– between years or months (for example, 2008–09 or January–June) to indicate the years or months covered, including the beginning and ending years or months;

/ between years (for example, 2008/09) to indicate a fiscal or financial year.

"Billion" means a thousand million; "trillion" means a thousand billion.

"Basis points" refer to hundredths of 1 percentage point (for example, 25 basis points is equivalent to 1/4 of 1 percentage point).

"n.a." means not applicable.

Minor discrepancies between constituent figures and totals are due to rounding.

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

The boundaries, colors, denominations, and other information shown on the maps do not imply, on the part of the International Monetary Fund, any judgment on the legal status of any territory or any endorsement or acceptance of such boundaries.

EXECUTIVE SUMMARY

Recent important policy steps have brought some much-needed relief to euro area financial markets. As discussed in Chapters 1 and 2, sovereign spreads have declined, bank funding markets have partly reopened, and equity prices have recovered. Nevertheless, pressures on European banks remain, including from sovereign risks, weak euro area growth, high rollover requirements, and the need to strengthen capital cushions to regain investor trust. Together, these pressures have induced a broader drive to reduce balance sheet size. Analysis in this *Global Financial Stability Report* suggests that large EU-based banks could shrink their combined balance sheet by as much as $2.6 trillion (€2.0 trillion) through end-2013, or almost 7 percent of total assets. Although subject to considerable uncertainty, our estimate is that about one-fourth of this deleveraging could occur through a reduction in lending, with the remainder coming largely from sales of securities and noncore assets. Under the baseline, the impact on euro area credit supply is estimated at about 1.7 percent of present credit outstanding. Some balance sheet reduction by individual banks is necessary because high leverage is no longer supported by either markets or regulators and some activities are no longer viable. But the potential consequences of a synchronized and large-scale deleveraging warrant supervisory efforts to avoid serious damage to asset prices, credit supply, and economic activity in Europe and beyond.

Against this backdrop, European policymakers need to build on recent improvements to implement the agreed reforms swiftly. Avoiding fresh setbacks will be critical, especially on the difficult path ahead, which is fraught with political and implementation risk. The recent decision to combine the European Stability Mechanism with the European Financial Stability Facility is welcome and, along with other recent European efforts, will strengthen the European crisis mechanism and support the IMF's efforts to bolster the global firewall. But to achieve lasting stability and move to a path that inspires confidence, these crisis management policies need to be anchored with a road map of further financial and fiscal integration of the Economic and Monetary Union.

Most emerging markets have policy room to buffer moderate deleveraging forces emanating from the European Union, but their resilience could be tested in a downside scenario, notably in emerging Europe. Elsewhere, the United States and Japan have yet to forge a political consensus for medium-term deficit reduction, perpetuating latent risks to financial stability. Meanwhile, the global financial regulatory framework is being strengthened, but key agreements still need to be concluded, while the transition to this new setting could add to cyclical challenges facing financial institutions.

The financial crisis and concerns about sovereign debt sustainability in some countries have reminded investors that no asset can be viewed as truly risk free. Chapter 3 examines the various roles of safe assets and the effects of different regulatory, policy, and market distortions, and it discusses future pressure points that may arise. It finds that the combination of heightened uncertainty, regulatory reforms, and crisis-related responses from central banks will drive up demand. On the supply side, the number of sovereigns whose debt is considered safe is declining—taking potentially $9 trillion in safe assets out of the market by 2016 (roughly 16 percent of the projected total). These developments will put upward pricing pressures on the remaining assets considered safe. Regulations should be designed flexibly and should be gradually phased in, according to an internationally agreed schedule, to avoid a choppy or uneven path of adjustment to a new price for safe assets.

Chapter 4 highlights the potentially very large financial implications of longevity risk—that is, the risk that people may live longer than expected. The chapter defines the risk, shows its magnitude—amounting to between 25 percent and 50 percent

of 2010 GDP, on average—and provides estimates of its effects on fiscal balance sheets and businesses. More attention to longevity risk is warranted now, given the potential size of these effects on already weakened public and private balance sheets, and because the effective mitigation measures take years

to bear fruit. Governments need to acknowledge their exposure to longevity risk; put in place methods for better risk sharing between governments, private sector pension sponsors, and individuals; and promote the growth of markets for the transfer of longevity risk.

GLOBAL FINANCIAL STABILITY ASSESSMENT

In late 2011, the euro area's banking and government bond markets came under stresses that pushed financial stability risks to a new peak of intensity. Subsequent policy actions eased bank funding strains and helped stabilize sovereign markets, but the risks to global financial stability remain elevated (Figures 1.1 and 1.2). This report calls on policymakers to utilize recent stabilization gains to swiftly implement a comprehensive set of policies to achieve durable stability.

The global economy suffered a major setback in late 2011 as concerns about financial stability in the euro area came to a head. Market stress spread throughout the currency zone, bond yields soared in peripheral economies, and liquidity evaporated as investors grew increasingly concerned about the risk of a disorderly bank failure or sovereign default. These developments dramatically highlighted the risk of adverse, self-fulfilling shifts in market sentiment that could rapidly push fragile sovereigns into a bad equilibrium of rising yields, a funding squeeze for domestic banks, and a worsening economy.

Bold and unprecedented policy actions have brought some much-needed relief:

- The European Central Bank's decision to provide unlimited, collateralized three-year liquidity to banks and to widen the range of eligible collateral has significantly eased bank funding strains and contained the risk of illiquidity-driven bank failures.
- Governments in several countries, notably Italy and Spain, have set in train potentially important reform programs to reduce fiscal deficits, improve

competitiveness, and, in the Spanish case, to further the repair of the domestic financial system.
- Ireland and Portugal have made good progress in implementing their adjustment programs. Greece came to a major agreement to restructure debt held by the private sector, and a successor program has been agreed with the European Commission, the European Central Bank (ECB), and the IMF, and approved by both euro area member states and the IMF.
- Policymakers across most of the European Union have firmed up their commitment to a set of fiscal institutions that will foster fiscal discipline in the future. Governments have committed to enhanced surveillance of intra-euro-area imbalances and divergences in competitiveness. They agreed to pursue structural reforms to reinvigorate growth.
- Meanwhile, euro area banks are in the process of securing stronger capital positions under a European Banking Authority (EBA)-coordinated initiative.

Status of Stability Indicators

As a result of the above actions, sovereign spreads have eased, bank funding markets have partly reopened, and equity prices have rebounded. *Market and liquidity risks* have improved sharply (Figures 1.1 and 1.2), falling below the levels of the September 2011 *Global Financial Stability Report* (GFSR), as immediate concerns of an imminent collapse were averted and official funding relieved refinancing pressures in the banking system.

Against the backdrop of deleveraging pressures and weakening growth, the ECB also cut its policy rate to 1.0 percent in December 2011 and reduced reserve requirements. That, together with fresh policy steps by other central banks—including further balance sheet expansion at the Bank of Japan, the Bank of England, and the U.S. Federal Reserve (Figure 1.3)—has eased global monetary conditions. However, bank lending standards have tightened, and broader financial conditions have deteriorated since the previous GFSR, leaving overall *monetary and financial conditions* unchanged.

Figure 1.1. Global Financial Stability Map
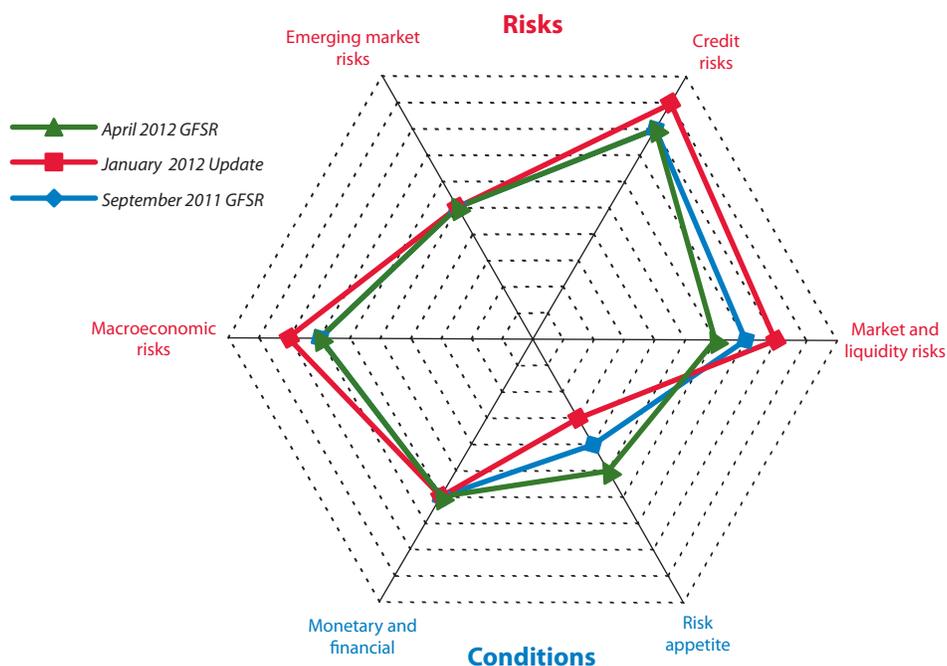
Source: IMF staff estimates.
Note: Away from center signifies higher risks, easier monetary and financial conditions, or higher risk appetite.

The additional liquidity has boosted *risk appetite*, and the price of risk assets has strengthened, reflecting both increased liquidity and declining perceptions of tail risk (Figure 1.4). Bank equities have recovered and default risk has declined sharply. Sovereign financing markets have shown signs of easing from the extremes reached in late 2011, and recent auctions have been mostly well subscribed, supported in part by the ECB's longer-term refinancing operations (LTROs) as banks in some countries appear to have increased holdings of government debt. Nevertheless, bond markets remain fragile and volatile, reflecting the erosion of traditional investor bases and large fiscal financing needs. These issues are explored in Chapter 2.

As a result of the strong policy actions outlined above, *credit risks* have retreated from high levels. However, pressures on European banks remain elevated. Banks are coping with sovereign risks, weak economic growth, high rollover requirements, and the need to strengthen capital cushions to regain investor confidence. Together, these pressures have induced a broad-based drive to reduce the size of bank balance

sheets. Although some deleveraging is both inevitable and desirable, its precise impact depends on the nature, pace, and scale of asset shedding. The EBA explicitly discouraged banks from shedding assets to meet the 9 percent capital target, by requiring that banks cover the shortfall mainly through capital measures. Asset sales would be recognized toward achievement of the EBA target only if they do not lead to a reduced flow of lending to the economy. So far, deleveraging has occurred predominantly through buttressing capital positions and reducing noncore activities, leaving the impact on the rest of the world manageable. It is essential to continue to avoid a synchronized, large-scale, and aggressive trimming of balance sheets that could do serious damage to asset prices, credit supply, and economic activity in Europe and beyond. See Chapter 2 for a detailed analysis of deleveraging and its economic impact.

Reflecting these strains, the World Economic Outlook (WEO) baseline has been revised downward since September 2011, largely because the euro area economy is now expected to suffer a mild recession in

Figure 1.2. Global Financial Stability Map: Assessment of Risks and Conditions
(In notch changes since the September 2011 GFSR)

Macroeconomic risks remained unchanged, as prospects are gradually improving after the global economy suffered a major setback in late 2011.
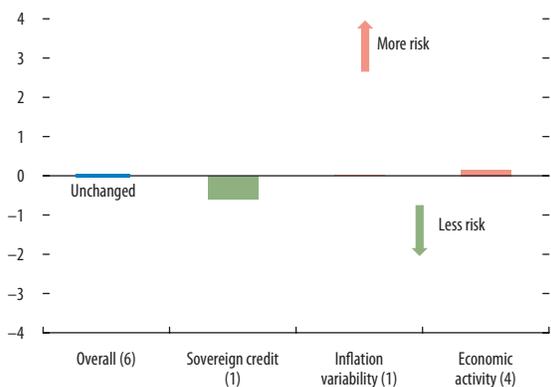
Despite an easier monetary stance, financial and bank lending conditions tightened, leaving *monetary and financial conditions* unchanged.
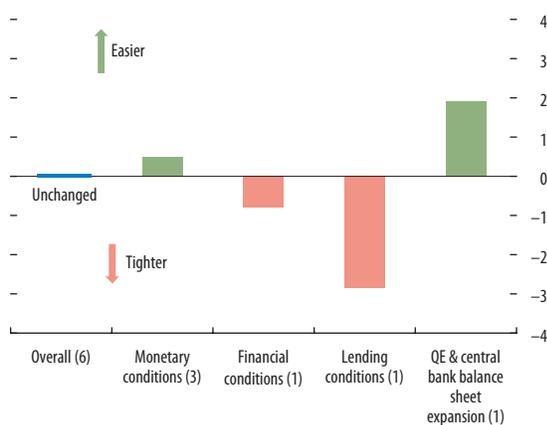
Market and liquidity risks improved after the ECB alleviated funding and market stress by providing three-year liquidity to banks…
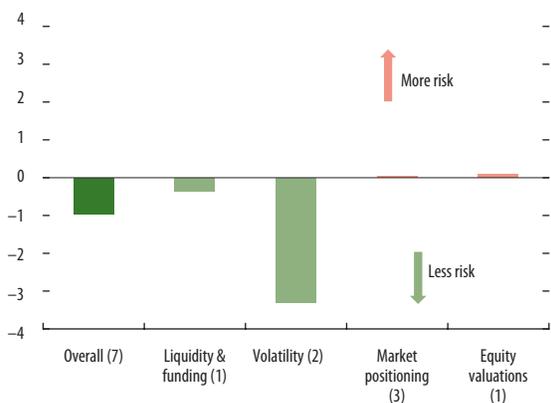
… which, in turn, boosted *risk appetite.*
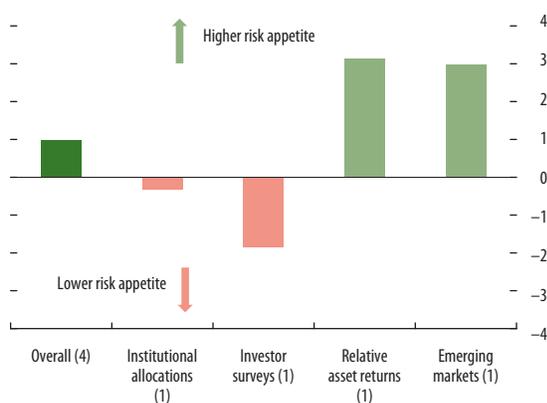
The banking sector showed a slight improvement thanks to policy efforts, but *credit risks* were unchanged overall at high levels.
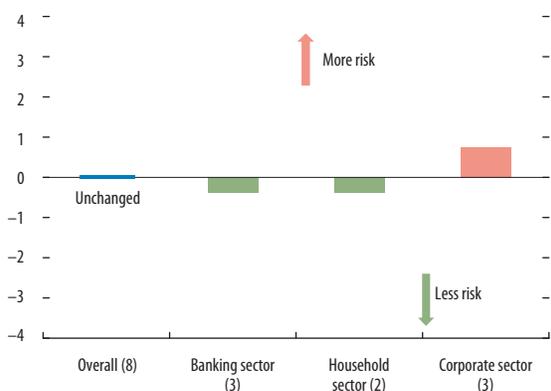
Emerging market risks remained contained, as inflation moderated and corporate spreads declined, despite an increase in sovereign downgrades.
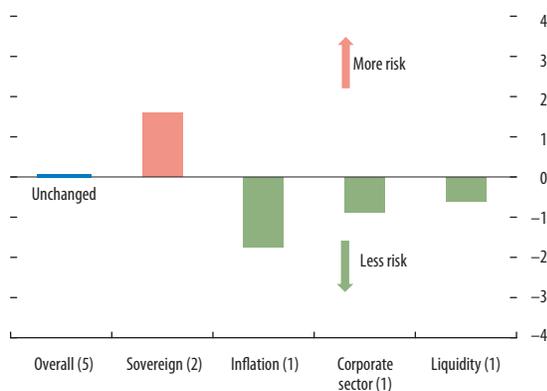
Source: IMF staff estimates.

Note: Changes in risks and conditions are based on a range of indicators, complemented with IMF staff judgment; see Annex 1.1. in the April 2010 GFSR and Dattels and others (2010) for a description of the methodology underlying the Global Financial Stability Map. Numbers in parentheses denote the number of individual indicators within each subcategory of risks and conditions. The "overall" notch change in each panel is the simple average of notch changes in individual indicators in that panel. In the monetary and financial conditions panel, a positive value for lending conditions represents a slower pace of tightening or faster easing, and QE = quantitative easing.

Figure 1.3. Central Bank Balance Sheet Expansion
(In percent of GDP)
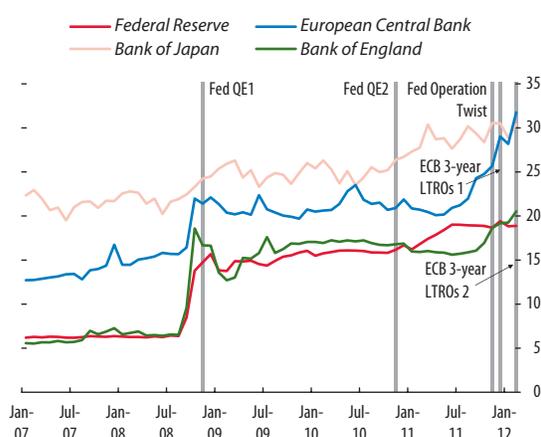
Sources: Bloomberg L.P.; and Haver Analytics.
Note: ECB = European Central Bank; Fed = Federal Reserve; LTROs = longer-term refinancing operations; QE = quantitative easing.

2012. Although downside economic risks have been reduced, financial stability risks stemming from the *macroeconomic* situation remain unchanged. This is because the slowdown in growth in the euro area and the divergence between core and peripheral countries will make dealing with debt burdens more challenging (Figure 1.5). Deleveraging pressures in Europe's banking system risk creating an adverse feedback loop that could have further effects on economic activity.

Emerging markets generally have substantial buffers and policy room to cope with fresh external shocks—as reflected in the unchanged, moderate level of *emerging market risk*. So far, these economies have been well able to manage the deleveraging coming from European banks, but looking ahead, there is a potential for deleveraging to have a global impact on the supply of credit. Although the pressures are likely to be most intense in emerging Europe, a sharp pullback in credit could expose existing external vulnerabilities throughout emerging markets, triggering additional portfolio outflows and upending domestic financial stability. See Chapter 2 for further analysis.

Why is a disorderly process of deleveraging so threatening? The risks to growth and financial stability during the deleveraging process are magnified by the fact that balance sheet repair often extends across several economic sectors (households, corporations, and the public sector). As Table 1.1 shows, strained

public finances are but one aspect of weak balance sheets in advanced economies. Many economies are weighed down by high debt burdens across multiple sectors (Annex 1.1).[1] Indeed, historical experience suggests that balance sheet repair takes time and tends to dampen activity. Countries with large external debts face a particular challenge, as the required rebalancing is hampered by entrenched competitiveness problems and subdued external demand. Policymakers need to coordinate a careful mix of financial, macroeconomic, and structural policies that ensure a smooth deleveraging process, support growth, and facilitate rebalancing. In the euro area, a clear path toward a more integrated and fuller monetary and economic union built on solidarity and strengthened risk-sharing arrangements is essential, as elucidated in Chapter 2.

The Policy Challenges

This section analyzes the risks to global financial stability by comparing three illustrative scenarios for euro area policymaking (Figure 1.6). These scenarios capture the notion of a baseline of *current policies* along with upside potential through a recommended *complete policies* scenario, and downside risks (*weak policies*).

Current Policies Scenario

Under the scenario of *current policies*, systemic risks are averted but strains remain, as policymakers do not capitalize on recent progress to secure further breakthroughs in the areas of national reforms, bank restructuring, and further financial and fiscal integration needed to entrench stability. Consistent with that notion, current forward markets suggest that spreads will persist at relatively elevated levels for weaker sovereigns and banks. Still-fragile confidence implies that foreign investors will not increase their exposures to peripheral bonds, causing the dependence on home institutions to rise.

[1]Annex 1.1 explores how this constellation complicates the process of balance sheet repair, as simultaneous belt tightening in several sectors squeezes economic activity and, in the worst case, may push the economy into "debt deflation"—a downward spiral in prices and economic activity.

Figure 1.4. Asset Price Performance since September 2011 GFSR
(In percent; CDS in basis points; VIX in percentage points and inverted)
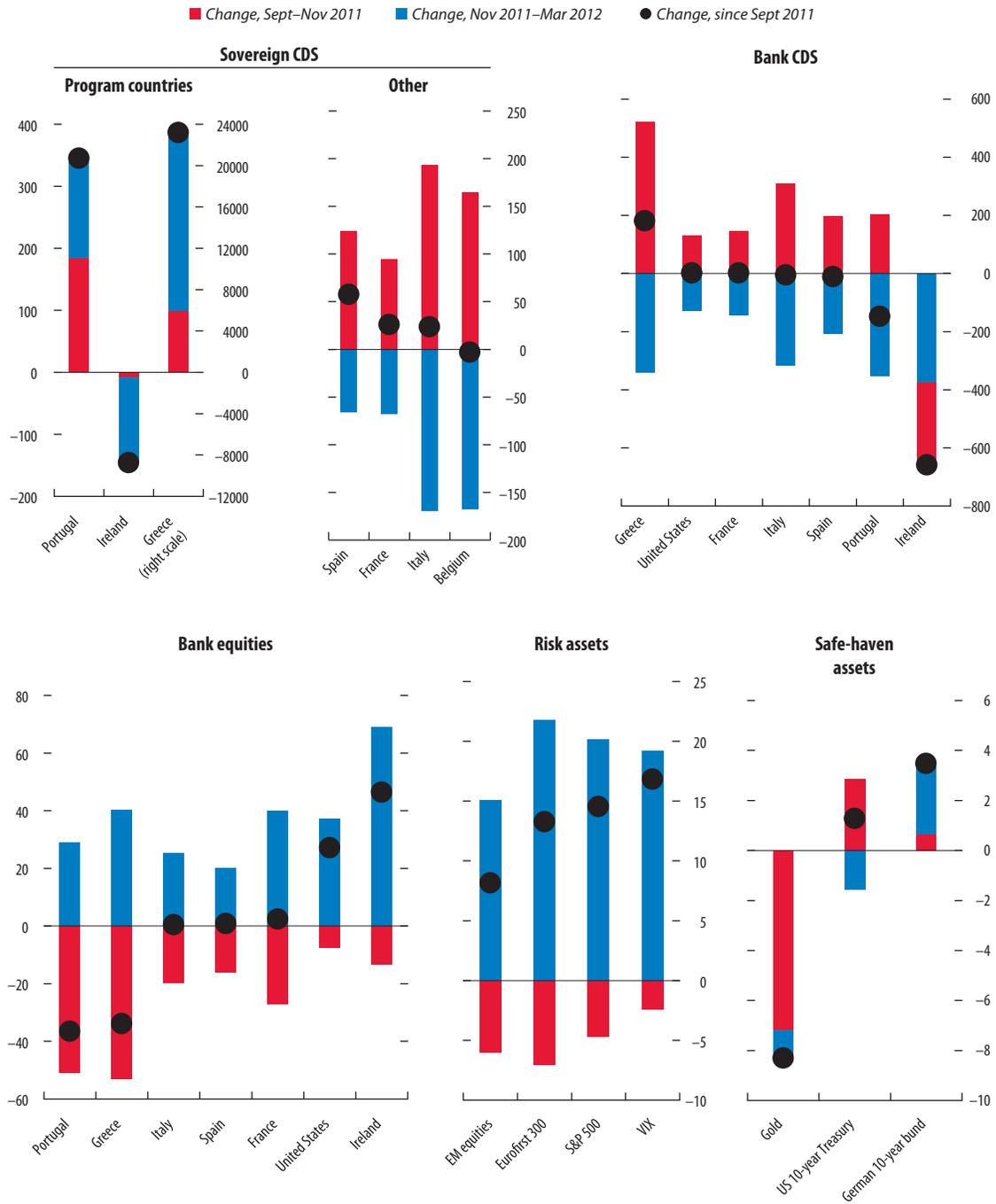
Sources: Bloomberg L.P.; and IMF staff estimates.
Note: CDS = credit default swaps; EM = emerging markets; VIX = implied volatility on S&P 500 index options.

Figure 1.5. WEO Projections of 2012 GDP Growth in Selected Euro Area Countries
(In percent)

Source: IMF, World Economic Outlook (WEO) database.

Figure 1.6. Policy Action to Entrench Stability and Avoid Downside Risks
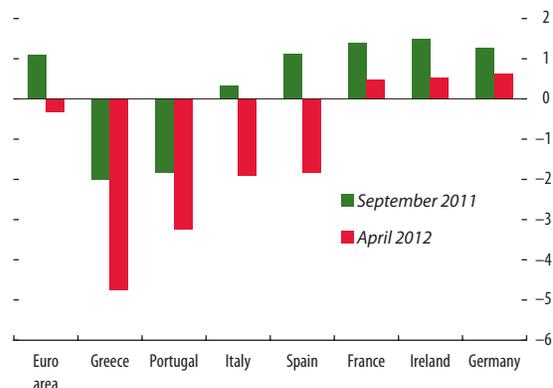
Meanwhile, responsibility for the financial system remains divided along national lines, portending some fragmentation of financial sector activity and policy within the euro area. The overall result allows vulnerabilities to linger, leaves policies subject to considerable implementation risks, and caps the benefits from economic and financial integration.

In this scenario, which is embedded in the current WEO projections for a mild euro area recession in 2012, Europe's banks are likely to face pressures to shed assets due to remaining funding concerns as well as the need to reshape their business and funding models. The analysis in this GFSR suggests that 58 large EU-based banks could shrink their combined balance sheet by as much as $2.6 trillion (€2.0 trillion) through end-2013, or almost 7 percent of total assets (Table 1.2). About a quarter of this deleveraging is projected to occur through a reduction in lending, as most is expected to come largely from sales of securities and noncore assets. The impact on euro area credit supply is equivalent to about 1.7 percent of present credit outstanding. In advanced economies, high-spread euro area countries face the biggest cutbacks in credit. In emerging markets, the impact would be hardest felt in Europe.

The analysis of deleveraging involves a considerable amount of uncertainty since it includes assumptions about the behavior of banks and there are some data gaps. Moreover, the ultimate impact on credit across

countries is subject to many other factors. For example, the ability of local banks and other intermediaries—not included in the simulations—to substitute for EU bank lending is not quantified, and neither is the importance of bank credit to overall credit supply. The methodology, however, gives priority to other actions by banks for reducing balance sheets before cutting back lending to the real economy (see Chapter 2 and Annex 2.1 for further discussion).

Complete Policies Scenario

Policymakers are aware of the need to improve upon the baseline scenario of current policies and shift the situation firmly toward a good equilibrium of moderating funding costs, affordable debt levels, and reduced stress in the banking system. Indeed, the set of policies that are necessary and sufficient to achieve lasting stability, while difficult to enact and implement, remains attainable. Under a *complete policies* scenario, policymakers would further strengthen crisis management, pursue bank restructuring, and commit to a road map for a more financially and fiscally integrated monetary union, with a prudent framework for ex ante risk sharing. Although this is politically challenging, some key elements of the framework have already been put in place, including mechanisms to secure fiscal discipline, coordinate fiscal policies, and strengthen economic governance at the euro area level. What remains is to establish better instruments

Table 1.1. Indebtedness and Leverage in Selected Advanced Economies
(Percent of WEO projections for 2012 GDP except as noted)

	United States	Japan	United Kingdom	Canada	Euro area	Belgium	France	Germany	Greece	Ireland	Italy	Portugal	Spain
General government debt[1]													
Gross	107	236	88	85	90	99	89	79	153	113	123	112	79
Net[2]	84	135	84	35	70	84	83	54	n.a.	103	102	111	67
Primary balance	-6.1	-8.9	-5.3	-3.1	-0.5	0.5	-2.2	1.0	-1.0	-4.4	3.0	0.1	-3.6
Household debt[3]													
Gross	88	74	99	89	70	53	63	59	70	120	51	105	89
Net[4]	-226	-236	-178	-151	-123	-191	-127	-118	-48	-68	-171	-124	-72
Nonfinancial corporate debt													
Gross[3,5]	87	143	118	53	138	178	152	63	75	244	112	154	196
Debt divided by equity (percent)	82	184	86	45	106	53	85	107	264	84	139	144	149
Financial institutions													
Gross debt[3]	87	177	742	60	142	124	169	97	33	691	97	63	109
Leverage of domestic banks[6]	11	23	22	18	23	27	24	28	15	24	19	16	20
Bank claims on public sector[3]	7	79	8	18	n.a.	23	17	21	29	27	32	19	26
External liabilities													
Gross[3,7]	146	66	717	93	191	403	255	219	207	1,717	142	286	221
Net[3,7]	16	-52	11	11	14	-64	9	-33	97	93	23	107	93
Government debt held abroad[8]	30	19	25	17	25	57	56	48	87	66	49	62	28

Sources: Bank for International Settlements (BIS); Bloomberg L.P.; European Union Consolidated Banking Data; U.S. Federal Deposit Insurance Corporation; IMF, International Financial Statistics, Monetary and Financial Statistics, and World Economic Outlook (WEO) databases; BIS–IMF–OECD–World Bank Joint External Debt Hub (JEDH); and IMF staff estimates.

Note: Values in red cells are in the top 25 percent of values for all countries shown for 1990 through 2010 (or longest sample period available); green, bottom 50 percent; yellow, 50th to 75th percentiles. The sample period for bank leverage data starts in 2008.

[1]WEO debt projections for 2012.

[2]Gross debt minus financial assets that are debt instruments.

[3]Most recent data divided by WEO projection for 2012 GDP.

[4]Calculated with flow of funds data on financial assets and liabilities.

[5]Includes intercompany loans and trade credit, which can differ significantly across countries.

[6]Ratio of tangible assets to tangible common equity.

[7]Calculated from assets and liabilities reported in each country's international investment position; includes data on International Financial Services Centers.

[8]Most recent data from JEDH divided by WEO projection for 2012 GDP. JEDH and WEO debt data are incompatible when one set is at market value and the other is nominal.

for risk sharing, both in the short term with respect to crisis management and in the long term with respect to completing the architecture of an effective economic and monetary union (Box 1.1).

What are the policy steps that would bring about this upside scenario of complete policies? The first step is the continued implementation of well-timed fiscal consolidation policies at the national level. It is crucial to cushion the impact of adjustment with other policies geared toward supporting growth. These should include: (1) sufficiently accommodative monetary policy, consistent with the objective of price stability and the recognition that deflationary dynamics, once in train, are particularly difficult to reverse; and (2) structural reforms that raise productivity, strengthen competitiveness, and thereby lay the foundation for stronger, sustained growth and more balanced external accounts in deficit countries. It is also necessary to deliver on the improvements in euro area economic governance that have already been agreed and which will entail significant further efforts to ensure political support for implementation. In addition, this GFSR identifies two short-term priorities for stabilization:

- *A credible firewall* that is large, robust, and flexible enough to stem contagion and facilitate the adjustment process in the highly indebted countries. The recent decision to combine the European Stability Mechanism (ESM) and the European Financial Stability Facility (EFSF) is welcome and, along with other recent European efforts, will strengthen the European crisis mecha-

nism and support the IMF's efforts to bolster the global firewall.

- Further progress on *bank restructuring and resolution* is essential to complement the bank capital and provisioning increases currently under way, backed, if necessary, by the firewall. Banks currently benefit from extraordinary ECB liquidity support, in some cases alongside national funding guarantees. The recent stabilization afforded by this support must be used to advance the necessary restructuring of weak banks and secure an orderly deleveraging process. In addition, regulators should ensure that banks exercise appropriate restraint on dividend and remuneration budgets to preserve capital buffers. To break the pernicious link between sovereigns and banks, the facilities constituting the euro area firewall should also be allowed to inject capital directly into banks if the situation warrants it. In time, a credible effective bail-in regime enabling prompt recapitalization through debt restructuring could be considered.[2]

There are two longer-term reform objectives necessary for sustaining the complete policies scenario. While these objectives are not immediately achievable given the need for time to forge a political consensus, it is important that policymakers recognize and articulate the direction in which the policy framework needs to move. These objectives are:

- *Developing a road map for a complete pan-euro-area financial stability framework.* Monetary union will function properly only if the financial system is dealt with at the euro area level in crucial areas that give rise to externalities and spillovers. This ultimately requires centralized euro area coordination of policies and a common framework in bank supervision and resolution as well as deposit insurance.
- *Progress toward greater fiscal risk sharing*, conditional upon more centralized fiscal governance. As the crisis has demonstrated, individual euro area countries may run into financing difficulties even if their fundamentals are basically sound. Such shocks can ripple rapidly through the entire currency area because of its high degree of interconnectedness.

Table 1.2. Impact of European Bank Deleveraging under Three Policy Scenarios, through End-2013

Scenario	Change in Bank Assets[1]		Change in Euro Area Supply of Bank Credit[2] (in percent)	Change in Euro Area GDP[3] (in percent)
	Trillions of U.S. dollars	Percent		
Complete policies	−2.2	−6	−0.6	0.6
Current policies	−2.6	−7	−1.7	–
Weak policies	−3.8	−10	−4.4	−1.4

Source: IMF staff estimates.

Note: The methodology and detailed results are presented in Chapter 2, Annex 2.1.

[1]For a sample of 58 banks based in European Union countries.

[2]Domestic and direct cross-border credit, relative to level in 2011:Q3.

[3]Change from 2011 level of GDP relative to the current policies scenario.

[2]See Zhou and others (2012) for a detailed discussion on bail-in.

Box 1.1. Addressing the Euro Area Crisis and Moving Toward a More Integrated Union

European policymakers have outlined important elements of a comprehensive strategy to deal with the crisis. To safeguard the financial stability of the euro area, they aim to enhance existing crisis mechanisms and improve economic governance at the euro area and national levels; and they call for strong national efforts to consolidate public finances, restore sound lending, and improve growth prospects. To meet its objective, however, this strategy needs to be further strengthened during its implementation, and a clear vision of a more integrated Economic and Monetary Union (EMU) must be spelled out.

Recent Policy Initiatives

Since the September 2011 GSFR, further important steps have been taken to address the euro area crisis:

- *National adjustment programs.* All euro area countries facing market pressures or vulnerabilities have undertaken further fiscal adjustment, combined with reforms to boost growth. To gain fiscal credibility, euro area countries have committed to enshrine fiscal discipline in their national fiscal frameworks.
- *Agreement on support for Greece.* Conditions have been clarified for restoring the fiscal sustainability of Greece, including through private sector burden sharing and the provision of additional official support.
- *Enhancement of crisis management facilities.* The establishment of the permanent crisis management mechanism, the European Stability Mechanism, has been brought forward, and its flexibility has been improved.
- *Strengthening of bank capital.* The European Banking Authority (EBA) has required banks to increase capital positions, including buffers to deal with sovereign risks, while national authorities have granted additional funding guarantees for bank debt. The EBA explicitly discouraged banks from shedding assets to meet the 9 percent capital target, by requiring that banks cover the shortfall mainly through capital measures. Asset sales may be recognized toward achievement of the EBA target only if they do not lead to a reduced flow of lending to the economy.

Note: Prepared by Alasdair Scott.

- *Improvement in governance.* EU members adopted the so called "six pack" of reforms to strengthen governance and excessive deficit procedures, and most EU members have signed the Fiscal Compact, which reinforces previous commitments under the Stability and Growth Pact and adds structural balance rules ("debt brakes") at the national level to prevent fiscal imbalances. Procedures were also adopted to coordinate and monitor fiscal policy (European Semester) and to identify and redress imbalances.
- *European Central Bank support.* The ECB lowered its policy rate, cut reserve requirements, intervened in poorly functioning intermediation markets via the Securities Market Program, and provided exceptional liquidity support for banks through a new program of three-year collateralized refinancing under broadened criteria for eligible collateral.

Strengthening the Crisis Strategy

With growth at a premium, it is essential that policies be directed to support demand as much as possible. Given downside risks to inflation, monetary conditions will need to remain highly accommodative, and further easing may need to be considered. Fiscal consolidation needs to take place over the medium term but must proceed in a manner consistent with supporting growth in the short term. Although a number of countries have no choice but to make up-front fiscal adjustments, others can afford to allow automatic stabilizers to operate fully along their consolidation paths or to slow adjustment.

A strong euro area firewall is necessary to arrest contagion and minimize the risks of an escalation of the crisis. The recent decision by euro area policymakers to raise the effective lending capacity of the European Stability Mechanism (through accelerated buildup of capital and temporary backstopping by the European Financial Stability Facility) marks an important step in this direction.

The banking system needs further strengthening. Funding risk requires continued attention through ample liquidity provision by the ECB, but additional loss-absorbing capital is also needed, in line with EBA requirements. Public support may be necessary for banks that have difficulty obtaining new

Box 1.1 *(continued)*

capital from private sources. And to avoid having such support raise concerns about sovereign debt sustainability, common resources from the euro area crisis management facilities should be used to inject capital directly into such banks.

Bank restructuring must be accelerated. With large liquidity support and sovereign funding guarantees providing breathing space, banks now should adjust their business models to rely less on wholesale funding and deal with legacy assets.

Supporting a Better-Integrated EMU

The crisis has amply demonstrated the interconnectedness of the financial systems of all members of the currency union and the vicious feedback loop between banks and sovereigns. Nonetheless, for an effective monetary union, deeper integration is required. To this effect, the monetary union must be

supported with a pan-euro-area approach to bank supervision, deposit insurance, and resolution, with centralized funding for insurance and resolution.

Ultimately, for an effective monetary union, fiscal arrangements will need to be redesigned to accomplish ex ante fiscal risk sharing. A number of proposals have been made to support this, such as eurobonds (see Chapter 2, Box 2.6) and a debt redemption fund. Without ex ante risk sharing, countries will continue to face very different financing conditions and remain prone to having liquidity crises turn into solvency concerns.

Implementing these changes will take political determination and time, but a credible commitment to a truly integrated EMU would have immediate benefits. It would result in significant improvements in funding conditions and prevent stresses from becoming a self-fulfilling prophecy.

Providing some ex ante risk-sharing mechanism would avoid self-fulfilling dislocations of financial markets and could even help enforce fiscal discipline via conditional access to central funding.

If implemented, these policy steps could lead to a sharp tightening in sovereign spreads, a gradual rebuilding of the investor base, and a consequent improvement in banking sector conditions. Under this scenario, the impact from bank deleveraging would reduce credit supply by approximately 0.6 percent, which is less than under the *current policies scenario*, and GDP would be 0.6 percent above the baseline after two years.

Weak Policies Scenario

In a more adverse scenario of *weak policies*, conditions could deteriorate to the point of reviving acute market tension. This scenario could be triggered because the implementation of the policies under the *current policies* falls short of what has been agreed, national policies falter, political solidarity underpinning euro area reforms fragments, or shocks overwhelm the firewalls. Under this scenario, credit spreads rise sharply again, pushing several sovereigns toward a bad equilibrium of

prohibitive funding costs, worsening debt dynamics, and risks of illiquidity or financial repression. Further stresses in the banking system could force banks to accelerate the deleveraging drive. As a result, EU banks could shed an additional $1.2 trillion in assets above the baseline by end-2013, or a further 3 percent of assets. This retrenchment could reduce euro area credit supply by 4.4 percent and GDP by a further 1.4 percent from the baseline after two years.

Such large-scale deleveraging under the downside scenario would have consequences well beyond the euro area. The fire sale of bank assets could have a significant impact on asset prices and market liquidity. Through derivatives markets, stress could be transmitted to U.S. banks, even though their direct exposures to European banks and sovereigns are relatively low. Moreover, a global retrenchment of credit could expose the external vulnerabilities of some emerging market economies, trigger additional portfolio outflows, and hurt their domestic financial stability. While many emerging markets have substantial buffers and policy room to cope with external shocks, the weak policy scenario would have far-reaching negative repercussions, especially in emerging Europe.

Other Challenges

Medium-term public and private debt challenges are by no means confined to the euro area. In fact, the high fiscal deficits facing Japan and the United States pose a latent risk to financial stability, especially since there has been little progress to date in laying out strategies to address the problem, in contrast to what is happening in Europe. Both countries require credible multiyear plans for deficit reduction that protect short-term growth but reassure financial markets that debt will return to a sustainable trajectory over the medium term.

In the United States, more-aggressive policies to alleviate households' mortgage debt burden—in particular through write-downs of underwater mortgages and expanded access to refinancing—would reduce foreclosures and thereby support the housing sector and the broader economy. The administration has recently taken steps in this direction by announcing new proposals and actions to support the housing market. The proposals include a significant strengthening of the Home Affordable Mortgage Program (HAMP), and calls on Congress to broaden access to refinancing for mortgages backed by government-sponsored enterprises (GSEs) as well as non-GSE mortgages, allowing a larger share of borrowers to refinance their mortgages at the current low interest rates. A workable plan for reform of the GSEs and the restoration of private mortgage supply are important in the longer term. In the meantime, however, U.S. mortgage supply remains almost entirely dependent on GSE mortgage insurance (along with the Federal Housing Administration). Hence, the authorities face a difficult balancing act between reducing the still-central role of the GSEs

in the mortgage market and fostering the recovery of the housing market. In that regard, the recent pilot initiative to convert foreclosed properties held by the GSEs into rental units is welcome, but more is needed to satisfactorily address this important issue.

Policymakers in emerging markets should stand ready to use their existing policy space to cushion negative external shocks. A key challenge will be to control potential spillovers from the euro area into emerging Europe and other exposed economies, notably by averting excessive retrenchment by European Union parent banks. So far the impact of the deleveraging process on emerging markets has been manageable and well managed, but risks and challenges remain. Countercyclical policies, along with the creative deployment of targeted facilities and instruments, can be effective in sustaining growth in the face of a major external shock. The scope for easing credit policy is limited, as many emerging markets are already in the advanced stages of the credit cycle. Easing credit further would, therefore, add to domestic financial vulnerabilities, given that sustained periods of above-trend credit expansion tend to foreshadow higher nonperforming loan rates down the road.

Long-lasting stability of the financial system will be supported by progress in implementing the G20 regulatory reform agenda. Priorities for G20 reform include the Basel III framework, policy measures for globally systemic financial institutions, resolution frameworks, and over-the-counter derivatives market reforms. Policy efforts to control the systemic risk from derivatives markets need to be further advanced, and oversight of the shadow banking system must be strengthened.

Annex 1.1. Why Is Deleveraging so Challenging?

High debt burdens across multiple sectors continue to weigh down many advanced economies . . .

The continued volatility in euro area financial markets has kept the spotlight on sovereign debt burdens.[3] In many countries, however, high public debt is but one aspect of strained balance sheets in the broader economy. Across the euro area, these strains can be traced to a convergence process that induced many private and public borrowers to ramp up debt during the first decade of the monetary union. Unprecedented low interest rates and ample credit supply, including from foreign lenders, fueled lending booms often centered on real estate. Rising asset prices flattered net asset positions, boosted economic performance, and concealed an erosion of competitiveness, allowing households, firms, and sovereigns to borrow and spend freely—until the tide turned (Figure 1.7).

Credit-fueled booms were not limited to the euro area. Rather, lax lending standards and the secular fall in real interest rates caused sharp increases in household debt in several other countries, notably the United Kingdom and United States. When the credit cycle went into reverse, economies were left with severe threats to financial stability: borrower net worth declined and cash flows shrank, inflicting large losses on lenders that were themselves overleveraged and reliant on fragile funding structures.

Although the most acute phase of the crisis may have passed, high debt burdens persist as a dangerous chronic condition. To be sure, countries differ significantly in their individual debt problems. Ireland and Spain are examples of a private debt overhang weighing down the sovereign, whereas in Italy and Japan high public debt is balanced by strong household balance sheets. Weak external positions further compound the challenges facing Greece, Ireland, Portugal, and Spain (see Table 1.1 and Figure 1.8).

Note: Prepared by André Meier.
[3]See Chapter 2. For an in-depth analysis of household sector deleveraging, see Chapter 3 of the April 2012 *World Economic Outlook*.

Figure 1.7. External Positions and Gross Debt in Selected Euro Area Countries

The current crisis in several euro area countries was preceded by a sharp weakening in their external positions ...

Change in Real Effective Exchange Rate and International Investment Position, 1998–2010
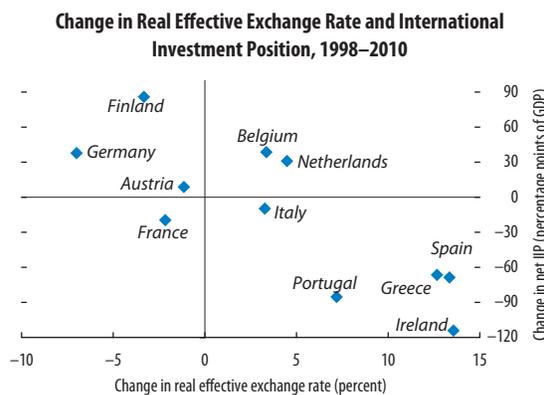
... as low interest rates and easy credit led to lending and asset price booms that left behind heavy debt burdens.

Gross Debt across Sectors, 1998 and 2010
(In percent of GDP)
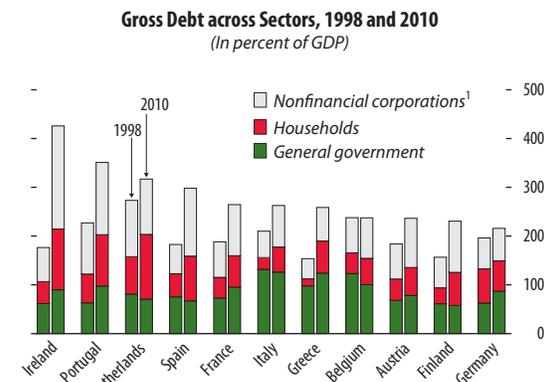
Sources: (Top panel): Haver Analytics; and IMF, International Financial Statistics and World Economic Outlook databases. (Bottom panel) Eurostat; Haver Analytics; and IMF staff estimates.
Note: IIP = international investment position. For Ireland, IIP data exclude International Financial Services Center.
[1]Consolidated basis.

Aggregate data inevitably convey only a partial sense of financial vulnerabilities in the cross-section of households or companies. There also are no firm general limits on how much debt any given sector or entity can sustain. Indeed, Figure 1.9 shows high household debt levels in several countries that have not suffered a crisis, such as Australia and Norway. Nonetheless, highly indebted agents face a continuous risk of reaching hard credit constraints that leave no choice but

Figure 1.8. Debt Burdens in Selected Advanced Economies, 2011
(Percent of GDP)
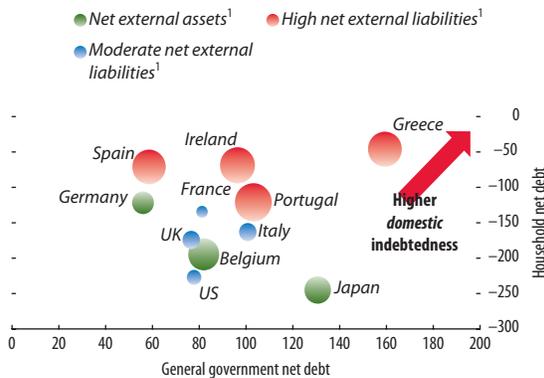
Sources: Eurostat; Haver Analytics; IMF , International Financial Statistics and World Economic Outlook databases; national statistics offices; and IMF staff estimates.
Note: IIP = international investment position. Data for household net financial debt are as of end-September 2011; negative value indicates positive net financial assets. Government net debt is as of end-2011. Net external position is the net international investment position at end-2010 (for Ireland, excluding International Financial Services Center).
[1]In the figure, the larger the circles, the larger the net external assets or liabilities.

Figure 1.9. Household Net Financial Assets and Gross Debt, End-September 2011
(Percent of GDP)
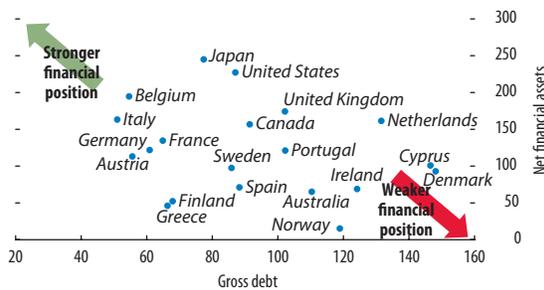
Sources: Eurostat; Haver Analytics; and IMF staff estimates.
Note: Net financial assets is gross financial assets (hence, excluding houses and other nonfinancial assets) less gross debt. Data for gross debt are as of end-March 2011 for Austria, France, and Ireland; and as of end-December 2010 for Cyprus and Finland. Data for net financial assets are as of end-March 2011 for Cyprus; for Norway they are as of end-June 2011 and are scaled by mainland GDP.

to reduce debt. In other cases, stretched borrowers will resolve to deleverage even before they are forced to do so by market pressures.

. . . foreshadowing a difficult period of deleveraging . . .

This deleveraging process offers a path to healthier financial positions over the medium term but poses significant challenges during the transition.

First, deleveraging in the household or government sector weighs on growth insofar as it entails an extended period of spending below revenue levels.[4] During this period, overall growth must be underpinned by stronger spending in other sectors. Yet, a smooth "handover" is difficult when several domestic sectors are under strain simultaneously. Foreign demand also may not provide an immediate offset, as external rebalancing often requires improvements in competitiveness that take time. Moreover, many large economies are currently weighed down by high debt, leaving few sources of robust external demand.

Second, simultaneous belt tightening across sectors may reinforce financial vulnerabilities. Recessionary tendencies generate asset quality problems, which may worsen financial sector health and lead to further tightening of credit conditions. Meanwhile, weak income growth and real depreciation of the exchange rate, both of which are necessary to restore competitiveness, also increase the real debt burden. In the worst case, downward price dynamics might become entrenched, tipping the economy into debt deflation.

. . . which historical experience suggests is likely to be a drawn-out process . . .

The experience from three historical deleveraging episodes in advanced economies—Finland, Japan, and Sweden—underscores the drawn-out nature of debt cycles (Table 1.3). In each case, household debt as a share of GDP took between 6 and 10 years to reach a bottom that was 10 to 35 percent below peak levels. GDP growth during the intervening years tended to be weak relative to the preceding period.

[4]Deleveraging in the corporate and banking sectors can be achieved somewhat more easily, at least in principle, through injection of fresh equity. While this requires outlays from the household or (as a backstop) government sector, it remedies excessive leverage more quickly and smoothly than a long period of balance sheet shrinkage. In practice, however, capital injections may be difficult to arrange in sufficient size when equity valuations are weak. Thus, historical experience suggests that corporate deleveraging also tends to be a lengthy process that depresses investment spending and labor income; see Ruscher and Wolff (2012). For a detailed analysis of bank deleveraging challenges today, see Chapter 2.

Table 1.3. Three Past Episodes of Household Deleveraging Associated with a Banking Crisis

Characteristic	Finland	Japan	Sweden
Banking crisis period[1]	1991–94	1992–97	1991–94
Deleveraging period (peak to trough in ratio of gross household debt to GDP)	1991–97	1999–2007	1988–98
Change in ratio of gross household debt to GDP (percentage points of GDP)			
During 8 years preceding deleveraging period	16.8	16.4	12.2
During deleveraging period	−16.2	−8.3	−19.1
Average annual growth of real GDP (percent)			
During 8 years preceding banking crisis period	3.1	4.9	2.6
During deleveraging period	2.1	1.5	1.6

Sources: Eurostat; national authorities; and IMF staff estimates.

[1]Reinhart and Rogoff (2008).

Figure 1.10. Two Household Credit Cycles: 1980s and 2000s
(Gross household debt, in percent of GDP)
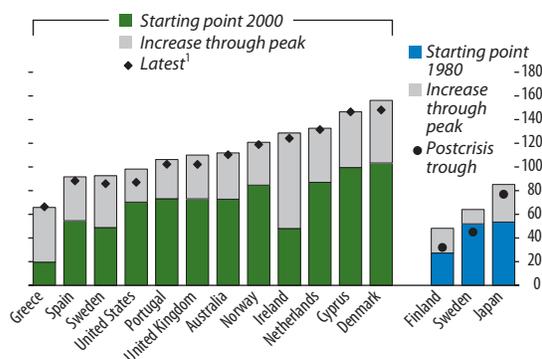
Sources: Eurostat; Haver Analytics; national statistics offices; and IMF staff estimates.
[1]As of end-September 2011 except for Cyprus (end-December 2010) and Ireland (end-March 2011).

Parallels with today's situation should not be overstated, as conditions are specific to each case. For instance, no country has suffered as extreme a swing in real estate prices and corporate leverage as Japan did in the 1980s and 1990s. On the other hand, the historical credit booms listed in Table 1.3 are eclipsed by the scale of debt creation in many advanced economies since 2000 (Figure 1.10). With household debt at significantly higher levels today than during the historical reference episodes, deleveraging has barely started in most countries (with the notable exception of the United States).

. . . putting the onus on policies to ensure a smooth and successful repair of balance sheets.

Together, these challenges impose great responsibility on policymakers—in the countries concerned, but also beyond, especially within the common currency area. To prevent a self-defeating deleveraging cycle, some combination of the following policies will be critical:

- *Accommodative monetary policy*, which lowers borrowers' debt service costs, supports asset prices, promotes dissaving by financially stronger households, and averts a possible slide into deflation.
- *Targeted financial policies* to ensure continued credit supply for viable borrowers.
- *Fiscal support* to aggregate demand in countries whose public finances are in relatively good health and not subject to market pressures.
- *Structural reform* to increase potential growth through better-functioning product and factor markets.
- *Redistribution* from financially strong to financially weak agents, including through targeted debt relief (e.g., private sector involvement for Greece, mortgage write-downs for overindebted households—Annex 2.3).

A more detailed discussion of policy priorities is provided in Chapter 2.

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Zhou, Jianping, Virginia Rutledge, Wouter Bossu, Marc Dobler, Nadege Jassaud, and Michael Moore, 2012, "From Bail-Out to Bail-In: Mandatory Debt Restructuring of Systemic Financial Institutions," IMF Staff Discussion Note 12/03 (Washington: International Monetary Fund).

SOVEREIGNS, BANKS, AND EMERGING MARKETS: DETAILED ANALYSIS AND POLICIES

The Sovereign Debt Crisis—Shifting From a Bad to a Good Equilibrium

Stresses in euro area government bond markets escalated in late 2011 as investors grew increasingly concerned about the risk of a disorderly bank or sovereign default. Subsequent policy actions, notably the European Central Bank's (ECB's) provision of collateralized three-year liquidity to banks, have relieved acute stress. Yet sovereign bond markets remain fragile under the weight of strained fiscal positions and an ongoing loss of demand from traditional investors. Financing public debt could still prove challenging for some euro area countries. A lasting recovery in market confidence will take time, during which domestic policy efforts need to be bolstered by stronger external support, notably an enhanced financial firewall.

The euro area crisis reached a point of intense stress in late 2011.

Concerns about a possible chain reaction of bank failures and sovereign defaults intensified in late 2011. Credit default swap spreads rose to new highs; even sovereigns with relatively strong public finances (including Austria, Finland, and the Netherlands) were hit by illiquid market conditions (Figure 2.1). In the absence of credible funding backstops for vulnerable countries, a steady stream of negative

news—the need for higher write-downs on Greek sovereign bonds under the envisaged private sector involvement agreement, fresh political turmoil in Greece and Italy, and acute funding pressures for euro area banks—undermined already fragile investor confidence. The episode underscored the risk that adverse self-fulfilling shifts in market sentiment could rapidly push fragile sovereigns into a bad equilibrium of rising yields, a funding squeeze for domestic banks, and a worsening economy.

Indeed, government bond yields and volatilities for several vulnerable sovereigns rose to precarious levels (Figure 2.2), while inverted yield curves suggested acute concern about default risk. Banks that were holding Spanish and Italian government bonds in their trading portfolio faced significant mark-to-market losses, as valuations tumbled. Some institutions responded to increasing market and regulatory scrutiny of their government bond holdings by trimming exposures, thereby adding to selling pressures. Meanwhile, market makers contributed to the collapse in trading volumes as they were forced to reduce their activity because of risk limits (Figure 2.3). Haircuts on Italian government bonds used as collateral in repo (repurchase agreement) markets were increased several times, further reducing the incentive to hold such bonds. These factors combined to forcefully roil sovereign bond markets in late 2011.

Traditional bond investors took fright from rising credit risk, fresh rating downgrades, and unprecedented market volatility.

Foreign banks have been divesting from the sovereign debt of the stressed euro area periphery since 2010, starting with Greece (2010:Q1), followed by Portugal and Italy (2010:Q2), and then Ireland and Spain (2010:Q3) (Figure 2.4). Amid the increased market turmoil, foreign institutional investors continued to shed exposure to these countries in 2011 (Figure 2.5). In the third quarter of 2011, foreign

Figure 2.1. Credit Default Swap Spreads in Selected Euro Area Government Bond Markets

Average sovereign CDS spreads in basis points: ■ Less than 150 ■ 150–200 ■ 200–400 ■ More than 400

April 2010
(Percent of total debt of €6.2 trillion)[1]

November 2011
(Percent of total debt of €6.9 trillion)[2]

February 2012
(Percent of total debt of €6.9 trillion)[2]
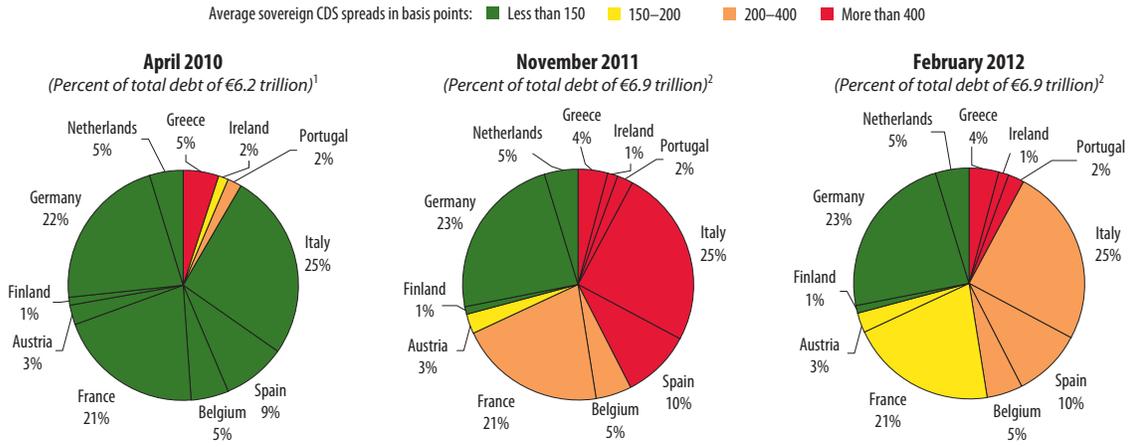
Sources: Bank for International Settlements; Bloomberg L.P.; and IMF staff estimates.
Note: Percentages for countries are their share of euro area government debt for period indicated.
[1]As of 2010:Q1.
[2]As of 2011:Q2.

Figure 2.2. Ten-Year Government Bond Yields and Trading Ranges, Selected Euro Area Countries, 2011–12

- ● January 2011
- ◆ July 2011
- ▲ December 2011
- ■ Latest (mid-March 2012)

Germany
France
Belgium
Spain
Italy

Yield (percent)

Trading range (basis points)
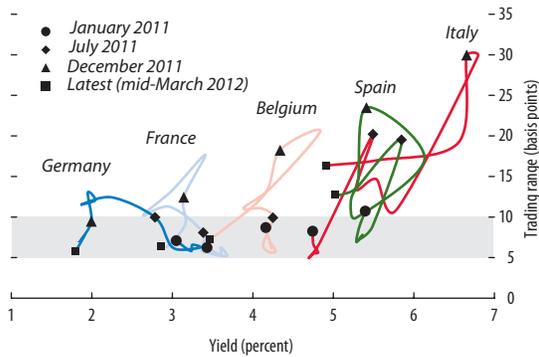
Source: Bloomberg L.P.
Note: Data are monthly averages.

Figure 2.3. Daily Trading Volume of Italian Sovereign Bonds
(In billions of euros)

10-day moving average
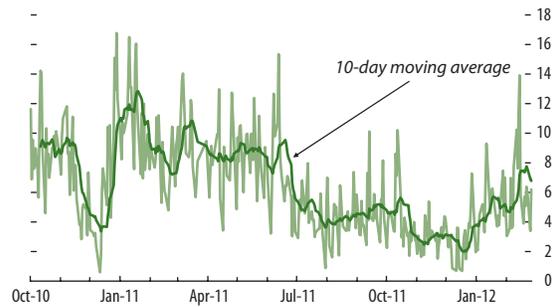
Source: MTS Data.
Note: Bonds are BTP (Buoni del Tesoro Poliennali)—multiyear Treasury bonds with maturities of 3 to 30 years. Includes purchases and sales.

Figure 2.4. Changes in the Sovereign Investor Base
(In billions of euros)
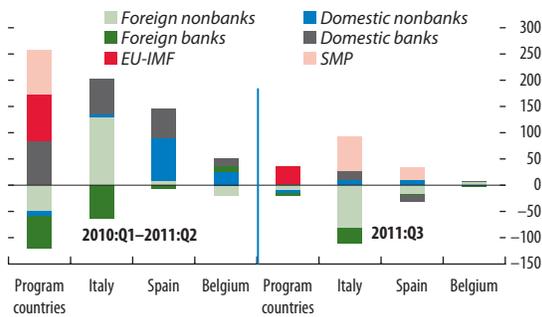
Sources: Bank for International Settlements; European Central Bank; Eurostat; IMF International Financial Statistics database; IMF-World Bank Quarterly External Debt Statistics; and IMF staff estimates.

Note: Program countries are Greece, Ireland, and Portugal. SMP = ECB's Securities Markets Program. EU-IMF = joint EU and IMF euro area support programs. SMP data are estimates.

Figure 2.5. Custodial Holdings of Selected Euro Area Sovereign Bonds, 2011
(Cumulative flows, in billions of euros)
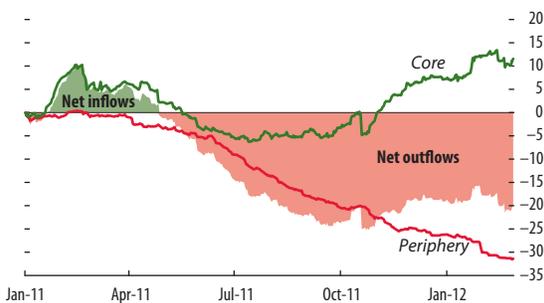
Sources: BNY Mellon iFlow^SM; and IMF staff estimates.

Note: Core = Austria, Belgium, Finland, France, Germany, and Netherlands. Periphery = Greece, Ireland, Italy, Portugal, and Spain.

banks made large withdrawals from Italy (Figure 2.6) that coincided with the heightened stress in Italian and Spanish sovereign debt markets. These outflows were largely offset by the ECB's Securities Markets Program (SMP) and by domestic purchases.

The erosion of the foreign investor base can be attributed to several distinct factors:

• *Rising credit risk and market volatility* deterred investors that seek steady, low-risk returns, such as central banks, insurance companies, and pension funds. Risk-adjusted returns in sovereign debt markets in Italy and Portugal deteriorated significantly in 2011 because of higher volatility and weak bond prices, particularly in comparison with other OECD sovereign issuers (Figure 2.7). The sudden emergence of high and volatile credit risk premiums also scared off hedge funds and other asset managers used to trading pure interest rate risk. Their withdrawal from the market further heightened problems of illiquidity and large price fluctuations, underscoring the self-reinforcing nature of the bond market rout.

• *Rating downgrades and exclusion from benchmarks.* Several large buy-and-hold investors have begun to change benchmarks for their sovereign bond portfolios, removing countries that are perceived to be subject to greater credit risk or more volatile

Figure 2.6. Cumulative Change in Foreign Bank Holdings of Sovereign Debt of Selected Euro Area Countries, 2010:Q1–2011:Q3
(In billions of euros)
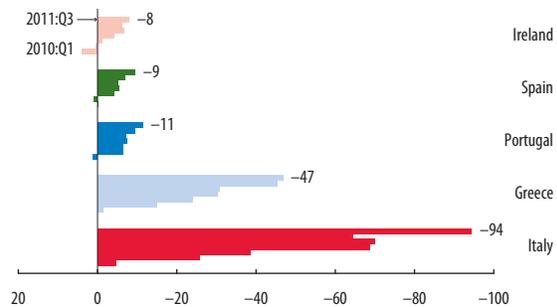
Sources: Bank for International Settlements; Eurostat; and IMF staff estimates.

Note: Cumulative change is shown for seven successive quarters, from 2010:Q1 through 2011:Q3.

Figure 2.7. Returns and Volatility of U.S. and European Sovereign Bonds, 2011
(In percent)

Figure 2.8. Ten-Year Peripheral Euro Area Government Bond Spreads over AAA Core
(Spread in percent)

Source: Bloomberg L.P.
Note: LCH = LCH Clearnet.
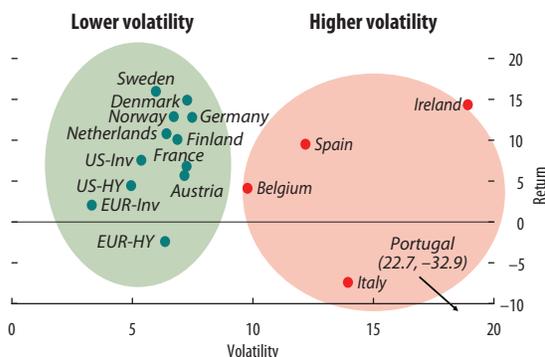
Sources: Bank of America Merrill Lynch; and IMF staff estimates.
Note: EUR = European. HY = high yield. Inv = investment grade.

returns. Sovereign downgrades can also trigger selling by benchmark-oriented investors.[1]

- *Increased haircuts on repo transactions.* The sharp rise in yields has also reduced the collateral value of peripheral bonds. Under the rules of LCH Clearnet, margin requirements are raised once the spread on 10-year bonds relative to core issuers exceeds 450 basis points.[2] This happened successively to Greece (in May 2010), Ireland (November 2010), and Portugal (April 2011). Spanish and Italian spreads hit the threshold in November 2011 but since then have fallen back below it (Figure 2.8).

Fresh policy actions, especially by the ECB, relieved acute pressures by early 2012.

In response to these intense pressures, the new governments in Italy and Spain announced important policy measures to bring down fiscal deficits and address structural weaknesses in their economies. Moreover, euro area policymakers reached agreement on expanding the lending capacity of the European Financial Stability Facility (EFSF), brought forward the effective date of the European Stability Mechanism (ESM), and adopted a "fiscal compact" that aims to contain the emergence of

excessive deficits in the future.[3] Although the longer-term value of the agreed compact is clear, investors generally saw its short-term benefits as limited, except to the extent that it might allow the ECB to step up its purchases of government bonds (Figure 2.9).

Central bank actions in late 2011 proved more effective in turning around investor sentiment. First, on November 30, the Federal Reserve agreed to reduce the cost of its swap lines with major central banks, including the ECB, making it cheaper for euro area banks to meet their need for short-term dollar funding. On December 8, the ECB announced that it would cut its policy rate by 25 basis points, to 1.0 percent, and reduce bank reserve requirements from 2 percent to 1 percent. Even more important, the ECB also announced that it would offer unlimited amounts of collateralized loans to euro area banks through three-year longer-term refinancing operations (LTROs) and expand the pool of collateral eligible for those transactions. The first such operation, launched on December 21, attracted bids from 523 banks for a total of €489 billion. It was followed by a second round of LTROs on February 29, which provided an additional €529 billion to 800 banks and covered a substantial part of near-term funding needs. The three-year ECB loans

[1]One case in point is the sharp underperformance of Portugal's bonds after their recent removal from the Citigroup World Government Bond Index.
[2]The rules for LCH Clearnet S.A. are different for Italian bonds.

[3]In March, euro area policymakers followed up on their earlier commitment to review the overall ESM/EFSF envelope, by agreeing to temporarily combine both facilities so as to ensure a fresh lending capacity of €500 billion even before ESM capital is fully paid in.

Figure 2.9. ECB Purchases of Government Bonds under Its SMP
(Cumulative, in billions of euros)
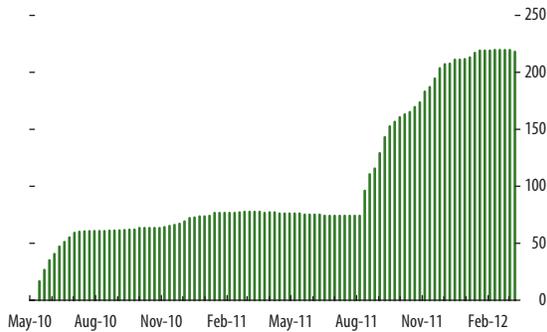
Sources: Bloomberg L.P.; and European Central Bank.
Note: Weekly data. SMP = Securities Markets Program.

progressively came to be viewed as a crucial measure to curb the tail risk of disastrous bank failures.

Reflecting the improved sentiment, default risk premiums on bank debt eased markedly, and equity valuations recovered. In addition, the cheap longer-term funds led some banks, notably in Italy and Spain, to buy short-dated government paper, reaping the significant spread between bond yields and the ECB policy rate (Figure 2.10). The ECB's acceptance of Italian banks' government-guaranteed bonds issued to themselves as collateral also contributed to alleviate immediate pressures. The combined effect of lower tail risk perceptions and some "carry-trading" in peripheral euro area bonds, plus growing speculative flows and short-covering by institutional investors, caused yield curves to shift downward markedly beginning in late November. This was initially led by the short end of the yield curve but later extended to longer maturities (Figure 2.11). At this stage, however, there is still great uncertainty as to whether these developments will have durable effects on the stability of the investor base, and, of late, there has been some retrenchment and increased market volatility.

Nonetheless, as the policy response to the crisis has so far failed to restore confidence, many sovereigns remain in a zone of vulnerability.

Despite this welcome improvement in market sentiment, the fundamental challenges facing euro area

Figure 2.10. ECB Lending and Bank Holdings of Euro Area Sovereign Bonds, December 2011–January 2012
(In billions of euros)
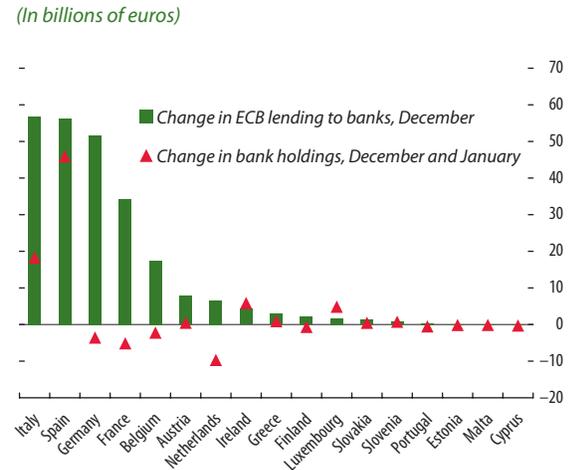
Source: European Central Bank.

Figure 2.11. Yields on Government Bonds of Italy and Spain, November 2011 and March 2012
(In percent)
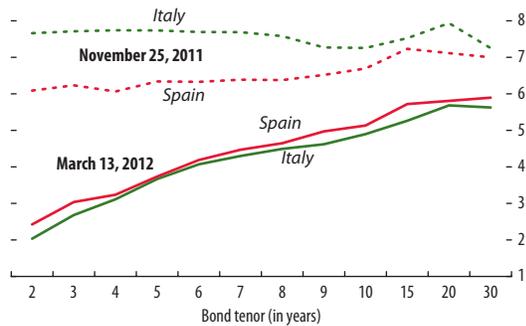
Source: Bloomberg L.P.

sovereigns—as well as those in several other advanced economies—remain significant. Public finances remain under strain, reflecting various combinations of high primary deficits, weak growth, and large debt stocks. Many countries, notably in the euro area, have embarked on the process of fiscal consolidation to reach safer positions, but this effort will take many years. In the meanwhile, sovereigns remain exposed to sudden shifts in investor perceptions that can tilt the balance from a good equilibrium—which features low funding costs and affordable debt—to a bad equilibrium—where funding becomes very costly or even unavailable, reviving default risk.[4]

The policy response to the unfolding crisis in the euro area has been unprecedented in its breadth and scope. Yet, the key question remains whether enough has been done to entrench stability. To address this question, we analyze sovereign risks in terms of funding costs, debt servicing ability, and investor base dynamics under a baseline scenario and under upside and downside shocks. The baseline corresponds to the "current policies" scenario detailed in Chapter 1 and, in essence, extrapolates trends on the basis of current market conditions. Similarly to the analysis in the April 2011 GFSR, we project debt and interest payments assuming market forward interest rates and country-specific issuance strategies to be in line with historical patterns.[5] The scenarios can be explored through standardized sensitivity tests that compare vulnerabilities across countries. To this end, we consider upside and downside scenarios corresponding to the "complete policies" and "weak policies" scenarios in Chapter 1. In the complete policies setting, spreads over German yields are halved from 2013. In the weak policies situation, yields rise by one standard deviation across the board starting in 2013. The results are illustrated in Figure 2.12.

Within the euro area, Italy is facing a particular challenge as high current debt levels interact negatively with elevated marginal funding costs (Table 2.1). Even under the complete policies scenario, the average interest rate on Italy's public debt rises somewhat by 2016,

[4]See the April 2012 *Fiscal Monitor* for further analysis.

[5]Projections are made using *World Economic Outlook* (WEO) inputs for primary deficits, real growth, and inflation. Debt service projections are based on Bloomberg data (made consistent with WEO aggregates). Interest rates are forecast on the basis of market data as of March 13, 2012. IMF program countries are excluded from the projections.

Figure 2.12. Projections for Government Debt and Average Interest Rate in Selected Advanced Economies, 2011–16
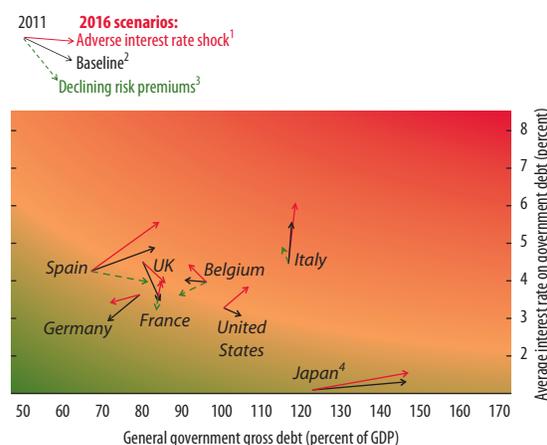
Sources: Bloomberg L.P.; IMF, World Economic Outlook (WEO) database; and IMF staff calculations.

[1]Assumes a permanent increase in interest rates by one standard deviation (computed for the 2002–11 period) across the curve, starting in 2013. The size of the assumed country-specific interest rate shock, averaged over all bond maturities under consideration, is (in basis points), for Belgium, 85; France, 88; Germany, 95; Italy, 93; Japan, 34; Spain, 98; United Kingdom, 102; United States, 114.

[2]Based on WEO projections for primary balance and GDP, combined with market interest rate structure as of March 13, 2012. The computations use a large set of forward rates for each country; the following five-year bond yields are given here to provide a snapshot of market conditions on the cutoff date: Belgium, 2.11%; France, 1.72%; Germany, 0.80%; Italy, 3.67%; Japan, 0.30%; Spain, 3.74%; United Kingdom, 1.05%; United States, 0.98%. Projections do not take into account "below the line" financing operations that could also affect debt dynamics.

[3]Assumes a permanent reduction in spreads over German bunds by 50 percent, starting in 2013. Shown for selected countries only. As an illustration, the spread of five-year government bonds over German bunds on the cutoff date was (in basis points), for Belgium, 131; France, 92; Italy, 287; Spain, 293.

[4]Calculations for Japan based on net debt.

to about 4.6 percent. But it would climb to 5.3 percent if current yield levels are maintained, as assumed under the current policies scenario, and exceed 5.7 percent under the increase in marginal funding costs assumed under the weak policies scenario. Spain's debt dynamics are also challenging, though for different reasons: the country starts from relatively low levels of indebtedness, but unlike Italy continues to run sizable primary deficits, which push up debt levels even if interest rates remain contained.

Many other countries also require moderate funding costs to keep their public finances on an even keel. In particular, Japan and the United States continue to benefit from very low interest rates despite rapidly growing debt stocks which, even under the baseline, are making them more vulnerable. This observation underscores that fiscal challenges are by no means confined to the euro area. But whereas market pressures have led

Table 2.1. Sovereign Debt: Market and Vulnerability Indicators
(Percent of 2012 GDP except as noted)

| | Fiscal and Debt Fundamentals | | | Financing Needs[1] Gross general government debt maturing plus budget deficit | | External Funding General government debt held abroad[6] | Banking System Linkages Domestic depository institutions' claims on general government[7] | | BIS reporting banks' consolidated international claims on public sector[8] | Sovereign Credit[2] | | Sovereign CDS |
	Gross general government debt, 2012[3]	Net general government debt, 2012[4]	Primary balance, 2012[5]	2012	2013		Percent of 2012 GDP	Percent of depository institutions' consolidated assets		Rating (notches above speculative)	Outlook as of Feb. 1, 2012	Five-year as of end-2011 (basis points)
Australia	24.0	9.5	-2.0	4.9	3.6	10.6	2.5	1.4	2.6	10	Stable	83
Austria	73.9	54.1	-0.9	8.6	8.7	59.2	15.3	4.7	11.4	9	Stable	186
Belgium	99.1	84.2	0.5	19.3	19.5	56.5	23.1	7.3	13.5	7	Negative	311
Canada	84.7	35.4	-3.1	16.1	17.8	16.7	17.8	10.1	3.0	10	Stable	n.a.
Czech Republic	43.9	n.a.	-2.2	12.5	12.6	12.4	17.0	14.3	4.4	6	Stable	174
Denmark	51.3	8.4	-5.5	13.6	11.3	22.8	14.9	3.4	6.9	10	Stable	135
Finland	51.6	-57.1	-2.0	8.6	8.0	44.2	6.3	1.9	12.2	10	Stable	78
France	89.0	83.2	-2.2	18.2	19.5	56.3	16.9	4.1	7.2	9	Stable	220
Germany	78.9	54.1	1.0	8.9	8.5	48.3	21.2	6.7	10.0	10	Stable	102
Greece	153.2	n.a.	-1.0	. . .	. . .	87.5	28.7	12.4	15.7	-8	Negative	8786
Ireland	113.1	102.9	-4.4	15.3	14.7	65.7	26.8	3.3	4.8	2	Negative	724
Italy	123.4	102.3	3.0	28.7	23.9	48.8	32.0	12.4	9.6	4	Negative	484
Japan	235.8	135.2	-8.9	59.1	59.5	19.2	79.3	24.6	1.8	7	Negative	143
Korea	32.9	31.5	1.6	0.9	0.4	4.5	5.2	3.8	3.5	5	Stable	161
Netherlands	70.1	36.0	-3.2	14.9	16.4	40.4	13.3	3.4	7.8	10	Stable	119
New Zealand	36.0	11.5	-3.8	8.8	11.7	22.4	7.3	4.2	3.7	8	Negative	94
Norway	49.6	-173.7	11.9	-10.1	-6.7	22.3	n.a.	n.a.	6.2	10	Stable	45
Portugal	112.4	110.9	0.1	26.7	19.7	61.5	19.3	5.6	9.6	0	Negative	1082
Slovak Republic	47.1	n.a.	-2.7	11.7	13.6	16.8	16.7	20.7	9.1	5	Stable	300
Slovenia	52.5	n.a.	-3.0	7.9	7.4	29.9	13.7	9.3	8.9	5	Negative	400
Spain	79.0	67.0	-3.6	20.9	21.5	28.4	26.5	7.7	5.9	5	Negative	380
Sweden	35.5	-20.1	-1.1	4.5	1.9	14.7	6.6	2.5	4.2	10	Stable	78
United Kingdom	88.4	84.2	-5.3	14.8	13.9	24.8	8.5	n.a.	2.8	10	Stable	98
United States	106.6	83.7	-6.1	25.8	26.2	29.7	7.1	5.1	3.6	9	Negative	49

Sources: Bank for International Settlements (BIS); Bloomberg L.P.; IMF, International Financial Statistics, Monetary and Financial Statistics, and World Economic Outlook (WEO) databases; BIS-IMF-OECD-World Bank Joint External Debt Hub (JEDH); and IMF staff estimates.

Note: Based on projections in the April 2012 *World Economic Outlook*, which also summarizes the policy assumptions. CDS = credit default swaps.

[1]As a percent of WEO projection of GDP for the year indicated.

[2]Rating as notches above speculative grade is the average of long-term foreign currency debt ratings by Fitch, Moody's, and Standard & Poor's rating agencies, rounded down; outlook is based on the most negative of the three agencies' ratings.

[3]All liabilities that require the government to make future payments of interest and/or principal to the creditors, including SDRs, currency and deposits, debt securities, loans, insurance, pensions and standardized guarantee schemes, and other accounts payable.

[4]Gross debt minus financial assets that are debt instruments; the financial assets are monetary gold and SDRs, currency and deposits, debt securities, loans, insurance, pensions and standardized guarantee schemes, and other accounts receivable.

[5]Primary net lending/borrowing balance for general government. Data for Korea are for central government.

[6]Most recent data from JEDH divided by WEO projection of 2012 GDP. JEDH and WEO debt data are incompatible when one set is at market value and the other is nominal. Data for New Zealand are from Reserve Bank of New Zealand.

[7]Claims exclude those of the central bank on general government. For the United Kingdom, claims are on the public sector. Data are for fourth quarter of 2011 or latest available.

[8]On an immediate borrower basis as of September 2011.

euro area countries to at least adopt a proactive stance in laying out the necessary plans for medium-term fiscal adjustment, Japan and the United States have yet to take that crucial step to safeguard investor confidence (see Annex 2.2). Given the size and importance of both countries' debt markets, this vulnerability remains a latent risk to global stability.

The debt service capacity of countries can be further illuminated by their individual fiscal histories. Italy, for instance, has lived with above-average interest burdens for a long time. To elucidate this aspect, Figure 2.13 shows current and projected interest burdens of selected countries under the three scenarios in relation to their historical experience. Indeed, Italy's projected interest burden in 2016 remains well within the range of past experience; during the 1990s, interest burdens were significantly higher than projected even under the weak policies scenario. It is worth cautioning, however, that those high real interest bills of the 1990s were perhaps made more tolerable by the prospect of qualification for the euro and the associated convergence of interest rates to a lower euro area level. In fact, since the inception of the monetary union (striped area in Figure 2.13), Italy has not had to bear as high an interest burden as is projected for 2016, even in the baseline scenario, and neither has Spain. Thus, there is no denying the worsening headwinds from rising interest rates on sovereign debt for most countries shown in Figure 2.13.

Domestic investors are expected to provide the bulk of gross financing needs in Germany, Italy, and Spain in 2012, but foreign investors still hold a significant portion of outstanding debt stocks (Figure 2.14), despite a steady decline for some countries since 2010. Would domestic investors be able to replace foreign investors if they continued to reduce their share of the outstanding stock? This question can be examined using our three scenarios. Consistent with the nature of the scenarios, we assume a progressively higher reliance on domestic investors the more policies fall short of the comprehensive reform package recommended in this report (see assumptions in Table 2.2).

The additional sovereign bonds that domestic investors would need to purchase to cover the funding needs (under both the complete and current policies scenarios), as well as replace foreign investors (under weak policies) could be quite large (Table 2.3).

Figure 2.13. Scenarios for Ratio of Real Government Interest Expenditure to GDP, Selected Advanced Economies
(In percent)
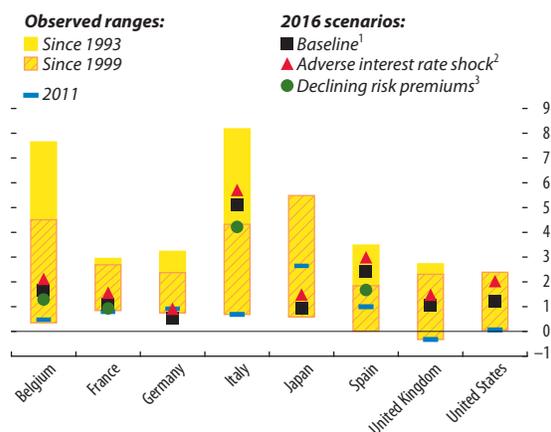
Sources: Bloomberg L.P.; IMF, World Economic Outlook (WEO) database; and IMF staff estimates.
Note: Data are for real interest expenditures on general government debt. The real rate is the nominal rate less inflation in the consumer price index. Data constraints limit the U.S. historical range to 2001–11.
[1]Based on WEO and market interest rates as of March 13, 2012.
[2]Permanent increase in interest rates by one standard deviation across the curve, starting in 2013.
[3]Permanent 50 percent decline in interest rate spreads relative to bunds, starting in 2013.

Figure 2.14. Foreign Investor Share of Total Sovereign Debt, 2009–11, Selected Euro Area Economies
(In percent)
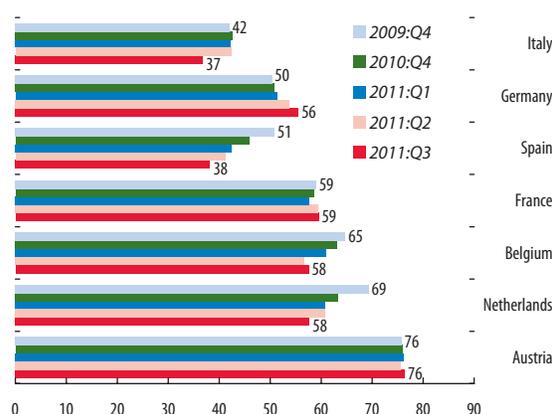
Sources: Eurostat; IMF-World Bank Quarterly External Debt Statiistics; and IMF staff estimates.

Table 2.2. Share of Foreign Investors in Gross Refinancing Needs of Selected Euro Area Sovereigns under Three Policy Scenarios
(In percent)

	Complete Policies[1]	Current Policies[2]	Weak Policies[3]
Austria	75.7	76.4	77.1
Belgium	64.7	57.5	50.3
France	59.0	59.5	60.0
Germany	50.5	55.5	60.6
Italy	42.0	36.8	31.7
Netherlands	69.3	57.7	46.1
Spain	50.8	38.1	25.5

Source: IMF staff estimates.

[1]Refinancing share equals end-2009 share of total debt stock.

[2]Refinancing share equals end-2011 share of total debt stock.

[3]Refinancing share declines by same amount as decrease from end-2009 to 2011:Q3.

 If domestic banks absorbed this additional sovereign debt, it would raise the proportion of their balance sheet devoted to government bonds by as much as 9½ percent of assets (in the case of Italy under the weak policies scenario, Table 2.3). While this may be manageable, the strains placed on domestic investors would be magnified if yields were to rise sharply again and financial institutions suffered fresh losses on their existing holdings.[6] Given these considerations, the increases in domestic funding outlined in these scenarios will require either a significant increase in home bias on the part of domestic investors or some form of financial repression on the part of policymakers. Neither of these two developments would be innocuous, underscoring the importance of decisive steps to restore the confidence of investors that a strong and flexible firewall can

[6]This additional stress is not incorporated in the scenarios presented above.

be deployed to prevent a repeat of the downward spiral toward a bad equilibrium. The recent decision by euro area policymakers to raise the effective lending capacity of the ESM (through accelerated buildup of capital and temporary backstopping by the EFSF) marks an important step in the right direction.

 Overall, the situation in several euro area sovereign bond markets has improved in recent months but still remains fragile. This has allowed a number of sovereigns to prefund a large share of rollover needs for 2012. The governments of Italy and Spain now finance themselves in the market at lower yields than at the end of 2011, so their marginal funding costs do not pose immediate threats to debt sustainability. However, current fragilities leave bond markets prone to renewed turmoil: negative news or sudden changes in sentiment could quickly drive up yields and further erode the investor base as expectations shift toward a bad equilibrium.

 Countries currently facing market pressures therefore need to sustain their resolve to rectify fiscal imbalances that weigh on investor confidence. Across the rest of the euro area, these efforts should be matched by a more resounding message of cohesion and support. Key to assuaging market fears is a sufficiently large financing backstop for countries that are fundamentally solvent but could be threatened by temporary swings of confidence in funding markets.

Bank Deleveraging—Why, What, by How Much, and Where?

Banks have been under pressure to deleverage since the outbreak of the subprime crisis. Pressures on European banks escalated at the end of 2011 as sovereign stress increased and many private funding

Table 2.3. Amount of Additional Funding from Domestic Investors Required by Selected Euro Area Sovereigns under Three Policy Scenarios, 2012

	Billions of Euros			Percentage of Domestic Bank Assets		
	Complete policies	Current policies	Weak policies	Complete policies	Current policies	Weak policies
Austria	7	7	7	0.8	0.8	0.8
Belgium	24	29	34	4.1	4.9	5.8
France	146	144	144	2.4	2.3	2.3
Germany	148	133	118	2.0	1.8	1.6
Italy	205	223	241	8.1	8.8	9.5
Netherlands	30	41	52	1.3	1.7	2.2
Spain	107	135	162	3.1	3.9	4.6

Source: IMF staff estimates.

channels closed. The ECB's provision of longer-term funding has substantially eased the strains, but banks still face the need to raise capital or reduce assets by scaling back credit or cutting business lines. Some of these adjustments are healthy since high leverage is no longer supported—by either markets or regulators—and some activities are no longer viable. However, there is a risk that a large-scale reduction in European bank assets might have serious negative repercussions for the real economy and financial markets in the euro area and beyond.

European bank leverage and reliance on wholesale funding remains high.

Advanced economy banks have been under pressure to reduce leverage since the outbreak of the subprime crisis, as many institutions had entered the crisis with thin capital cushions and a heavy reliance on wholesale funding. However, progress has varied in this adjustment process. While institutions in the United States have reduced their leverage and reliance on wholesale funding, EU banks—in aggregate—remain more reliant on wholesale funding and, though leverage has been reduced, levels remain elevated (Figures 2.15 and 2.16). This has left the European banking system more exposed to structural and cyclical deleveraging pressures.

Bank funding strains intensified toward the end of last year.

Toward the end of last year, market pressures on banks intensified significantly as the euro area debt crisis continued to spread and spill over to the banking system.[7] Escalating investor concerns were reflected in weak bank equity prices—as discussed in Box 2.1 and as shown in Figure 2.17—and soaring credit default swap spreads for banks in countries with the most affected sovereigns (Figure 2.18).

Wholesale bank funding markets became particularly strained. Unsecured funding channels closed for many weaker European banks. This was most evident in U.S. dollar funding markets, where U.S.

[7]See the September 2011 GFSR for an analysis of sovereign spillovers on the euro area banking system.

Figure 2.15. Bank Leverage
(Adjusted tangible assets to Tier 1 common capital)
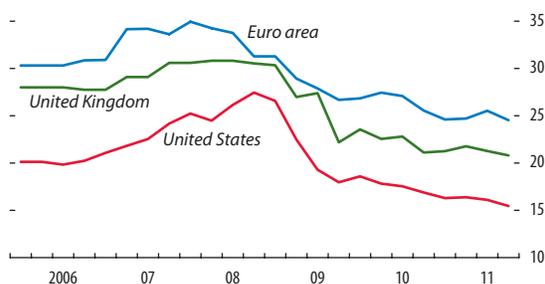
Sources: SNL Financial; and IMF staff estimates.
Note: Tangible assets are adjusted by subtracting derivatives liabilities from tangible assets of European banks. However, some accounting differences may remain. Based on large banks in each economy.

Figure 2.16. Bank Loan-to-Deposit Ratios
(In percent)
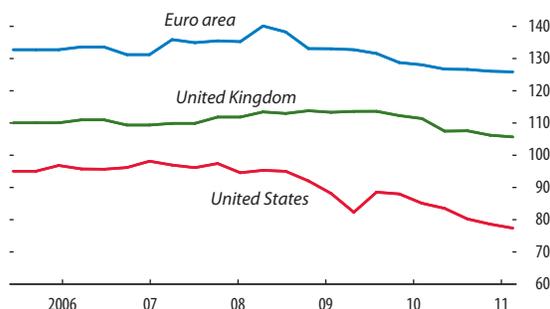
Sources: SNL Financial; and IMF staff estimates.
Note: Based on large banks in each economy.

Figure 2.17. Bank Price-to-Tangible Book Value
(Ratio)
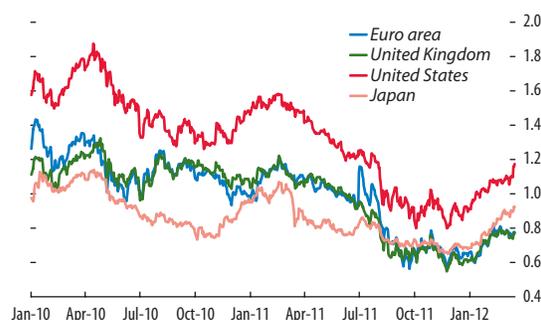
Sources: Bloomberg L.P.; and IMF staff estimates.

Box 2.1. What Explains the Performance of European Bank Equities?

An econometric analysis indicates that the weak performance of European bank shares during the financial crisis has been largely due to macro factors, but the strength of individual bank balance sheets has also affected share price performance. The analysis suggests that sovereign stress in the European periphery, and economic growth prospects in the wider euro area, have had pronounced and roughly equal impacts on bank share prices. Higher equity buffers and capital ratios are positively related to equity performance during the second phase of the crisis, vindicating policymakers' efforts to strengthen bank capitalization.

The study is based on a monthly sample of 37 major European banks over the period 2006–11. Panel and simple ordinary least-squares regressions are employed to study the co-movement between bank equity excess returns and measures of sovereign risk, economic activity, market volatility, and funding market conditions.[1] The analysis also incorpo-

Note: Prepared by Jorge Chan-Lau, Estelle Xue Liu, and Jochen Schmittmann.

[1] The sovereign risk variable is constructed as the arithmetic average of the five-year CDS spreads of Belgium, Greece,

rates bank-specific variables including Tier 1 capital ratios, leverage, the loan-to-deposit ratio, and the ratio of short-term to total liabilities (Table 2.1.1).[2]

The role of macro variables in explaining bank performance is shown by the pooled cross-sectional regressions for the periods 2006–08 and 2009–11, presented in columns (1) and (2) of Table 2.1.1. The first period includes the U.S. subprime mortgage crisis and the collapse of Lehman Brothers; the second covers the European sovereign debt crisis. The model—containing only macro variables in this version—provides a

Ireland, Italy, Portugal, and Spain. Expectations of economic activity are measured by the manufacturing sector purchasing managers' index (PMI), and market volatility is measured by the VIX. Funding market conditions are proxied by two factors: the three-month Euribor-EONIA spread (Euribor-OIS spread) and the option-adjusted spreads (OAS) for Eurobonds issued by global banks. The former is used as an indicator for short-term funding stress, while the latter is used as a measure of long-term funding conditions. All variables are expressed in logarithmic form as changes from the previous month.

[2] The results are robust to variations in the measurement of the variables. For example, similar results are obtained if the loan-to-deposit ratio is replaced by the wholesale funding ratio.

Table 2.1.1. Determinants of Bank Equity Returns

Variable	(1) 2006–08	(2) 2009–11	(3) 2006–08	(4) 2009–11
Change				
Sovereign stress	−0.181***	−0.250***	−0.181***	−0.249***
	(0.017)	(0.033)	(0.017)	(0.031)
European PMI	1.010***	1.946***	0.934***	1.788***
	(0.102)	(0.210)	(0.103)	(0.198)
U.S. PMI	0.215**	−0.805***	0.206**	−0.691***
	(0.091)	(0.186)	(0.092)	(0.174)
VIX	−0.073***	0.023	−0.068***	0.002
	(0.016)	(0.035)	(0.016)	(0.033)
Euribor-OIS spread	0.018***	−0.043**	0.017**	−0.053***
	(0.007)	(0.021)	(0.007)	(0.020)
Euro–bank bond spread	0.037	−0.211***	0.039	−0.197***
	(0.038)	(0.066)	(0.039)	(0.061)
Short-term liabilities/total liabilities			0.005	0.020
			(0.018)	(0.037)
Equity/assets			0.216***	0.294**
			(0.059)	(0.116)
Loans/deposits			0.004	−0.006
			(0.006)	(0.010)
Tier 1 capital/RWA			−0.089	0.475**
			(0.155)	(0.220)
Constant	−0.002	−0.030***	−0.013	−0.068**
	(0.003)	(0.006)	(0.020)	(0.032)
Number of observations	1,207	1,155	1,122	1,120
R-squared	0.362	0.282	0.367	0.313

Note: Standard errors are in parentheses. *** = $p < 0.01$; ** = $p < 0.05$; * = $p < 0.1$. Euribor = euro interbank offered rate. OIS = overnight indexed swap. PMI = purchasing managers' index. RWA = risk-weighted assets. VIX = Chicago Board Options Exchange Market Volatility Index.

Box 2.1. *(continued)*

good fit, explaining 36 percent of the variation in the earlier period, and 28 percent in the latter.

The analysis shows that bank returns are negatively related to sovereign risk, and positively related to changes in euro area activity as measured by the purchasing managers' index (PMI). The estimated elasticity of returns with respect to sovereign risk (0.25) was much lower than that for the PMI (about 2), but given the higher volatility of the sovereign stress measure over the period in question, both variables had roughly the same impact on returns. Over the course of the euro area crisis, the sensitivity of banks to sovereign stress and euro area economic conditions increased.

Of less importance in explaining banks' returns are market volatility (VIX) and funding measures. Market volatility was significantly related to bank returns only in the earlier (2006–08) period, reflecting the dominance of sovereign stress and economic growth prospects in the latter period. Short-term and long-term funding conditions were negatively related to banks' excess returns during the euro area crisis period, reflecting funding stresses.

The regressions presented in columns (3) and (4) of Table 2.1.1 provide empirical support for the beneficial effects of stronger bank capitalization on returns. Banks with lower leverage (equity/assets) did better over the entire sample period, and banks

with higher Tier 1 capital outperformed other sample banks during the European sovereign crisis.[3] During 2009–11, a 1 percentage point increment in a bank's Tier 1 capital ratio was associated with a premium of about 0.5 percent in monthly excess stock returns.

Banks located in Belgium, Greece, and Ireland were particularly sensitive to changes in economic conditions. The co-movement of bank performance with sovereign risk was strongest in Belgium and Greece and significant for other euro area countries except Ireland. In the case of Ireland, the large guarantees the government gave to its banking sector precipitated the country's sovereign debt crisis, inducing a negative correlation between bank returns and sovereign performance for a period.

Market volatility in the euro area was significant only for banks in France and Germany. Using a larger sample that included banks in Japan, the United Kingdom, and the United States, the study found that British and American banks exhibited sensitivities to European sovereign risk and economic conditions of a magnitude similar to that for core European banks. Japanese banks were least sensitive to European factors, but the coefficients are significant nonetheless.

[3]Panel regressions with bank fixed effects yield very similar results except for the Tier 1 capital ratio, which becomes insignificant.

Figure 2.18. Bank Five-Year Credit Default Swap Spreads
(In basis points)
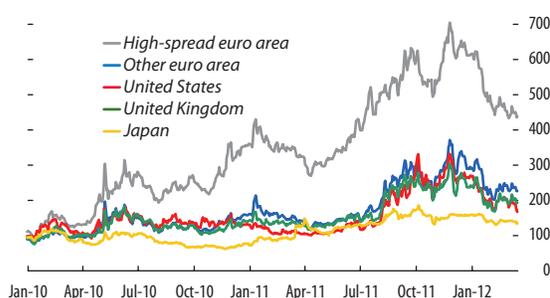
Sources: Bloomberg L.P.; and IMF staff estimates.
Note: High-spread countries are Belgium, Greece, Ireland, Italy, Portugal, and Spain.

prime money market funds sharply reduced their exposure to euro area banks and stopped lending to banks from high-spread euro area countries altogether (Figure 2.19).[8] But strains also appeared in other short-term markets, with counterparties only willing to lend at high rates and at increasingly short maturities. Bank term debt issuance was also impaired through the second half of the year (Figure 2.20).

At the same time, customer deposits—including from nonresidents—fell in banks domiciled in Greece, Ireland, Italy, and Spain (Figure 2.21). This contrasts with increases in deposits in France and Germany. Although the situation appears to have

[8]The high-spread euro area countries are the same as those used in the April and September 2011 GFSRs (Belgium, Greece, Ireland, Italy, Portugal, and Spain).

Figure 2.21. Cumulative Euro Area Deposit Flows, 2011–12
(In billions of euros)

Source: Haver Analytics.
Note: Other includes Austria, Belgium, Finland, Luxembourg, Netherlands, and Portugal.

Figure 2.19. U.S. Prime Money Market Fund Exposures to Banks
(In percent of total assets)
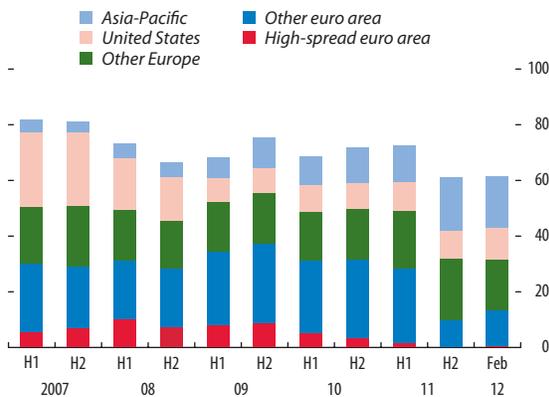
Source: Fitch.
Note: High-spread countries are Belgium, Greece, Ireland, Italy, Portugal, and Spain.

Figure 2.20. Bank Debt Issuance
(In billions of U.S. dollars)

Sources: Dealogic; and IMF staff estimates.
Note: High-spread countries are Belgium, Greece, Ireland, Italy, Portugal, and Spain.

stabilized at the end of 2011, there is a risk that outflows could resume in 2012 if depositors' perceptions change.

The ECB's longer-term refinancing operations prevented a systemic collapse and reduced funding strains, but conditions are still far from normal.

The ECB's decision in December to provide unlimited collateralized loans for up to three years afforded much-needed relief for banks (see Annex 2.4). Since the end of 2011, credit default swap spreads have narrowed by about 180 basis points for banks in high-spread euro area countries. Short-term funding costs have also fallen, with the euro LIBOR-OIS spread about 50 basis points lower. There are also signs that bank funding market conditions are easing, as term debt issuance has risen above the levels of 2011:H2 (Figure 2.20) and U.S. money market fund exposures to core euro area banks have stabilized (Figure 2.19). But market conditions are still far from normal, with indicators of bank credit risk persisting at high levels and with a number of institutions still relying heavily on central bank liquidity support (Figure 2.22). Furthermore, economic conditions have continued to weaken. The difficult economic backdrop will likely lead to lower bank earnings and a deterioration of banks'

Figure 2.22. ECB Liquidity Facilities and Interbank Market Spreads
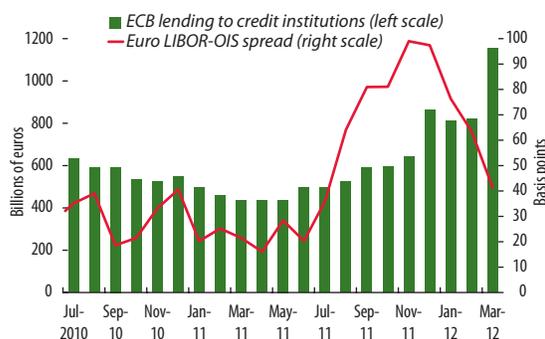
Sources: Bloomberg L.P.; and Haver Analytics.
Note: LIBOR = London interbank offered rate; OIS = overnight indexed swap.

asset quality, potentially creating an adverse feedback loop through higher provisioning and capital needs, which could further add to deleveraging pressures.

Against this backdrop, European bank deleveraging appears to have accelerated in the second half of 2011.

Reflecting these market pressures, European bank deleveraging appears to have begun in earnest in the second half of 2011, with some of the asset reductions taking place under official restructuring plans. Euro area bank credit growth to the nonfinancial private sector has also slowed, particularly in high-spread countries where loan growth rates have been diverging from those in other euro area countries (Figure 2.23), though the most recent data show some stabilization in growth rates. Although credit growth may reflect both demand and supply factors, euro area survey results show that banks have tightened their lending standards in response to balance sheet constraints, with cyclical factors also playing a role (Figure 2.24).

In addition, European banks sold assets in some non-EU markets as part of their efforts to rebalance their balance sheets during the third quarter of 2011 (Figure 2.25). High-spread euro area banks, in particular, reduced their private sector claims on Latin America and on advanced countries outside the EU. Banks in other euro area countries scaled back their claims on borrowers in advanced economies outside the EU and in some emerging market economies.

Figure 2.23. Credit Growth to the Nonfinancial Private Sector
(In percent, seasonally adjusted three-month change, annualized)
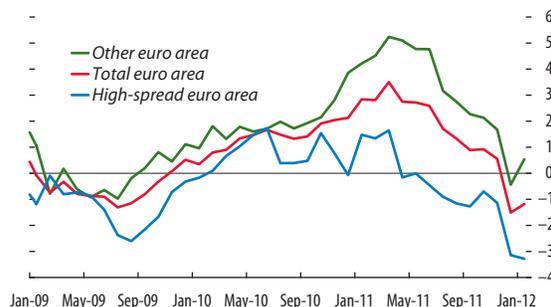
Sources: Haver Analytics; and IMF staff estimates.
Note: High-spread countries are Belgium, Greece, Ireland, Italy, Portugal, and Spain.

Figure 2.24. Contributions to Euro Area Bank Lending Conditions for Companies
(Net percentage balance)
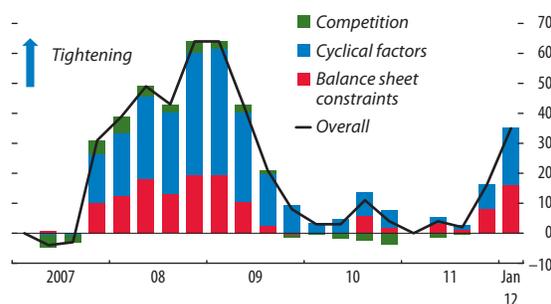
Sources: Haver Analytics; and IMF staff estimates.
Note: The bars show the average proportion of respondents citing the different factors. Balance sheet constraints include capital, access to financing, and liquidity position. Cyclical factors include general economic activity, industry outlook, and collateral needs. The sum of the bars has been adjusted to equal the corresponding overall value.

Figure 2.25. Change in Banks' Foreign Private Sector Claims, 2011:Q3
(In billions of U.S. dollars)
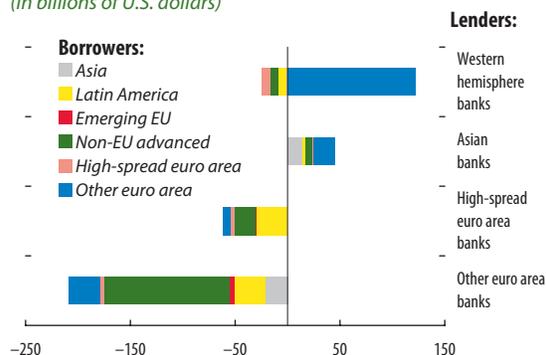
Sources: Bank for International Settlements; and IMF staff estimates.
Note: Data are for BIS reporting banks. Claims on euro area and emerging EU countries are corrected for variation in the dollar-euro exchange rate. High-spread countries are Belgium, Greece, Ireland, Italy, Portugal, and Spain.

The deleveraging trend is likely to continue and broaden.

Looking ahead, many European banks have announced medium-term business plans with reductions in assets amounting to about $2.0 trillion in total. The size of planned asset reduction tends to be larger for universal banks, institutions that had been taken over by national authorities, and banks that are highly reliant on wholesale and less stable sources of funding (Box 2.2). There are several structural drivers shaping the evolution of European bank balance sheets.

- First, a number of European banks have not yet completed the clean-up of their balance sheets and shedding of legacy assets. Institutions that received government support are required under EU law to sell parts of their business to minimize competitive distortions. Other banks are facing additional national requirements that may lead them to cut back certain activities (for example, the ring-fencing to separate commercial and investment banking activities in the United Kingdom).
- Second, banks are seeking to be better capitalized. Some institutions are raising their capital buffers following the European Banking Authority (EBA) recapitalization exercise. Banks are also reacting to the so-called Basel 2.5 rules, which came into effect early this year, and have reinforced incentives to accelerate the disposal of legacy assets and to reconsider the scale of banks' investment banking activities.
- Third, institutions are seeking to reduce their reliance on less stable (short-term, wholesale) sources of funding. This is, in part, a reaction to the seizing-up of wholesale markets in the aftermath of the Lehman Brothers collapse as well as regulatory norms under Basel III. In Europe, it also reflects increases in the cost of private wholesale funding.

There is a risk that a large-scale reduction in assets by European banks could lead to a credit crunch.

These structural changes are healthy as they will lead, over time, to a stronger and more resilient banking system. However, there is a risk that large, simultaneous asset reduction by a number of

European banks could have an adverse impact on the economy and the financial system. In general, deleveraging can be accomplished through increases in capital or a fall in assets, with the exact mix depending on a bank's starting position and on macro-financial conditions. For example, under adverse conditions, banks may find it more difficult to generate capital and therefore could choose to adjust their balance sheets through asset shrinkage. In what follows, the term "deleveraging" will be used to refer to a reduction in assets after taking into account changes in levels of capital.

The potential scale of European bank deleveraging is assessed through simulations of the balance sheet adjustment for a sample of 58 large EU banks, using the same scenarios presented in Chapter 1.[9] The scenarios run from the end of September 2011 to the end of December 2013. In the exercise, bank deleveraging is driven by both structural and cyclical forces. The *structural* forces are: (1) the need to adjust banks' business models (as reflected in the business plans announced by banks), (2) the need to further strengthen capitalization, and (3) the drive to reduce reliance on less stable (short-term, wholesale) sources of funding. The *cyclical* factors include financial conditions—in sovereign and bank funding markets—and the state of the economy, which affects banks' retained earnings. This scenario approach is consistent with the EBA exercise, but takes a broader view of bank deleveraging, as discussed in Box 2.3.

How do banks deleverage?

For each bank, the target amount of asset reduction is determined given its initial condition, projected capital generation, as well as cyclical and structural factors described above. The asset reduction is then implemented according to banks' business plans, if such information is available, or through an assumed deleveraging strategy (see Annex 2.1 for details). This assumed deleveraging strategy is such that not all deleveraging occurs through a reduction in customer lending. Banks first consider selling securities and cutting back part of their interbank exposures before

[9]See Annex 2.1 for more details on the methodology and the list of banks.

Box 2.2. European Banks' Business Plans

Of the 58 EU-based banks that are the focus of the GFSR deleveraging exercise, 24 have announced detailed plans (available on their websites) to sell about $2.0 trillion over the next two years (2011–13) (Figure 2.2.1). These banks are among the largest globally and have tremendous cross-border and cross-business line reach. The banks' business plans are addressing a number of weaknesses that the financial crisis exposed in banks' business models and risk management practices, including (1) excessive reliance on wholesale funding, in particular short-term and cross-currency; (2) weaknesses in market risk measurement and management, especially credit trading and counterparty risk; and (3) low levels of capital and

profitability. The following list details the areas that are most affected:

- *Trading within investment banking*. Banks with large investment banking arms are cutting back sharply on trading activities, in particular proprietary trading, nonstandardized derivatives, distressed sovereign exposures, repurchase agreements, and AAA-rated securitized and structured products. These activities have become less profitable and require more capital and liquidity buffers under Basel 2.5 and Basel III. In addition, many banks see this as a way to quickly reduce wholesale funding needs, especially in U.S. dollars.
- *Corporate banking*. Banks are scaling back parts of corporate banking, such as interbank lending,

Figure 2.2.1. EU Banks with Announced Changes to Business Strategy

Source: Company websites; and IMF staff estimates.
[1]Includes interbank lending and commercial real estate loans; and working capital, project, and specialized finance, including leasing, equipment, trade, and commodities finance.
[2]Includes companies that specialize in car, aircraft, shipping, leasing, project, and structured finance; investment banks; and municipal bond agencies.
[3]All EU and non-EU countries in eastern Europe, including Poland, Russia, and Turkey.
[4]Has received government financial support.

Box 2.2. *(continued)*

syndicate loans, factoring, and leasing as well as commodities, project, and trade finance. These activities are wholesale-funding intensive and will require more capital and liquidity under Basel III. One typical example is the decision by some French banks to run off certain businesses in the areas of aviation, commodity, and equipment leasing finance.

- *Retail banking*. A number of banks plan to scale back retail banking through run-offs or loan sales (e.g., commercial real estate), sale of distressed assets (e.g., downgraded structured products), or even sale of bank branches or credit businesses (e.g., the sale of ING Direct to Capital One in 2012:Q1).
- *Nonbank and shadow bank assets*. Universal banks have started selling nonbank finan-

cial companies, including in insurance, asset management, securities, finance, and real estate investment. For about 65 percent of the transactions, buyers are regulated financial institutions, such as other commercial banks or insurance companies. Private equity companies and investment companies have bought mainly project loans, structured and distressed assets, real estate management companies, financial services companies, and some investment and private asset management banks (e.g., the sale of Dexia's Bank International and of KBC's KBL to the Qatar investor group Precision). For the largest-value sales, buyers have come largely from the United States and Japan.

they start scaling back their loan portfolio. This assumption reflects: (1) what has happened to date, as a number of European banks have already been selling dollar-denominated securities; (2) banks' publicly announced business plans; and (3) banks' likely reaction to the increase in risk weights under Basel 2.5.

When banks consider reducing their loan books, some home or regional bias is assumed, with institutions expected to consider curtailing their foreign loan books before cutting domestic credit. This bias is visible, to some extent, in the evolution of banks' foreign claims during 2011:Q3 as shown in Figure 2.25. The recently launched "Vienna 2.0" initiative, which aims at establishing mechanisms to avoid disorderly deleveraging in emerging Europe, also suggests that concerns about home bias in the behavior of European banks are real.[10] Finally, in its December 2011 press release on the 2011 EU Capital Exercise, the EBA recommended that bank recapitalization plans should not "lead to significant constraints on the credit flow to the EU real economy."

By how much and where?

In the *current policies* scenario, aggregate leverage of the sample banks falls from 29 to 23, with the majority of this decline achieved through retained earnings and the capital raised as part of the EBA exercise (Figure 2.26). The remainder comes through a $2.6 trillion (€2.0 trillion) reduction in assets, or about a 7 percent decline in total balance sheet size.[11] About one-quarter of the fall in assets occurs through a reduction in loans, with the remainder due to sales of subsidiaries, noncore assets (for example, insurance and asset management arms of banking groups), and securities. The end-2011 results available so far reveal that banks in the sample reduced assets by almost $580 billion in the last quarter of the year.

The variations in the scale of bank deleveraging across scenarios are mainly driven by differences in the extent of cyclical pressures. Under the *complete policies* scenario—where cyclical pressures ease—assets are cut back by $2.2 trillion, mostly reflecting banks' own business plans. By contrast, in

[10]See "Statement at the Conclusion of the European Bank Coordination 'Vienna 2.0' Initiative's Full Forum," IMF Press Release No. 12/80, March 13, 2012, www.imf.org/external/np/sec/pr/2012/pr1280.htm.

[11]This figure may not account for some recent asset sales. The methodology used may also differ from ongoing restructuring programs in certain countries.

Box 2.3. A Comparison of the GFSR Approach with the European Banking Authority's Bank Capital Strengthening Exercise

On December 8, 2011, the European Banking Authority (EBA) recommended a higher core Tier 1 capital (CT1) target of 9 percent and the creation of temporary capital buffers, to be attained by June 30, 2012, to strengthen bank balance sheets (EBA, 2011).[1] The EBA subsequently published an overview of the capital plans that banks had submitted to regulators (EBA, 2012). These plans, in aggregate, more than cover the capital shortfall identified by the EBA. Direct capital measures account for the majority of the plans, with the remainder comprising changes to bank risk weight models, asset disposals, and reductions in lending—mostly corresponding to actions taken under EU State Aid rules.

The December EBA recommendations as well as the bank deleveraging analysis in this GFSR suggest that capital generation is the key factor in strengthening bank balance sheets (as illustrated in Figure 2.26 through the fall in the leverage ratio). Both the EBA and the GFSR analysis also assume that most of the needed cutback in bank assets will come through asset sales rather than through lending.

However, the GFSR analysis suggests that banks will reduce assets by $2.6 trillion (in the *current*

Note: Prepared by William Kerry.
[1]Core Tier 1 capital is a subset of Tier 1 capital consisting predominantly of common shares and retained earnings.

policies scenario)—a much larger amount than implied by the bank capital plans submitted to the EBA. This distinction arises because the GFSR analysis is fundamentally different from the EBA capital exercise in a number of ways.

- First, the purpose of the EBA exercise is to increase bank capital positions; hence, it is based on a single capital target. The GFSR exercise, however, is driven by a range of structural and cyclical factors. The structural factors include changes to bank business plans (which imply a $2.0 trillion reduction in bank assets, according to the public announcements made by banks); maintaining a 9 percent CT1 capital position; and reducing reliance on less-stable wholesale funding. The cyclical factors include strains in bank funding markets and different degrees of sovereign stress. Indeed, the GFSR analysis finds that the capital target has a limited role in driving bank asset reductions (Figure 2.28).
- Second, the analysis in the GFSR has a *different time frame*, running up to the end of 2013, whereas the EBA exercise concludes in June 2012.
- Third, the results are for a *different set of banks*. Only institutions found by the EBA exercise to have capital shortfalls submitted plans. In contrast, the GFSR exercise applies to all banks in the sample.

Figure 2.26. Contributions to Reduction in Aggregate Bank Leverage Ratio, Current Policies Scenario
(Total assets to core Tier 1 capital)
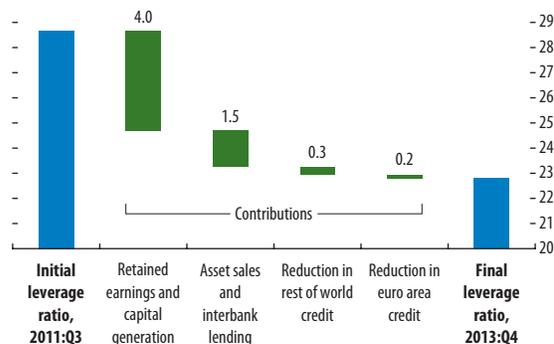
Source: IMF staff estimates.
Note: For a sample of 58 large EU banks. For details, see Annex 2.1.

the *weak policies* scenario—where cyclical pressures are stronger—banks reduce assets by $3.8 trillion (Figure 2.27). As cyclical pressures intensify, the impact on EU credit rises disproportionately. This is because with stronger cyclical headwinds, more banks need to work their way further down the deleveraging pecking order when reducing their balance sheets, and so EU and domestic credit is curtailed more.

The influence of cyclical and structural forces can also be assessed by calculating the incremental contribution of these factors in the three scenarios. Figure 2.28 shows that banks' business plans are a key determinant of the scale of deleveraging.[12] The

[12]As indicated in the figure, the influences are additive: The green bar shows the amount of asset reduction when banks face

Figure 2.27. Contributions to Aggregate Reduction in Bank Assets, Three Policy Scenarios
(In trillions of U.S. dollars)

Source: IMF staff estimates.
Note: For a sample of 58 large EU banks. For details, see Annex 2.1.

Figure 2.28. Factor Contributions to Aggregate Reduction in Bank Assets, Three Policy Scenarios
(In trillions of U.S. dollars)
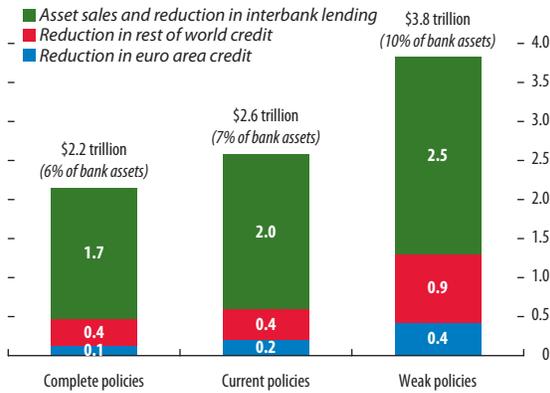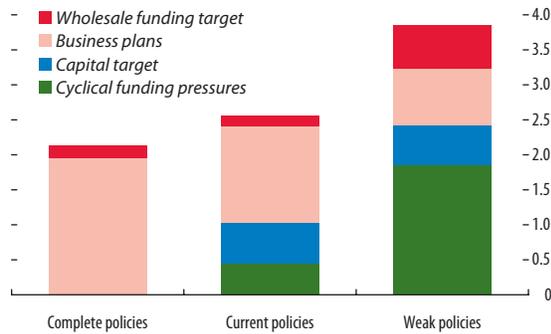
Source: IMF staff estimates.
Note: Marginal contribution of each factor for a sample of 58 large EU banks. For details, see Annex 2.1.

cyclical factors—such as funding pressures—play a much greater role in the *weak policies* scenario than in the other two scenarios. In the *current* and *weak policies* scenarios it is assumed that there are no further LTROs and that the level of other central bank lending remains constant. But if funding conditions deteriorate significantly, central banks are likely to lend more. Although this would alleviate pressures in the short term, large-scale increases in official liquidity support are not ultimately sustainable, as discussed in the September 2011 GFSR.

Across all three scenarios, sample banks cut back lending—in percent of total credit—most significantly in countries in emerging Europe (Figure 2.29). There are also cutbacks in lending in advanced economies—mainly in the European Union and the United States—and in Latin America. Lending to emerging Asia is less affected than to other emerging market regions.

The analysis of deleveraging involves a considerable amount of uncertainty since it includes assumptions about the behavior of banks and is affected by some data gaps. Moreover, the ultimate impact on credit across countries is subject to many other factors. The methodology, however, gives priority to

Figure 2.29. Reduction in Supply of Credit by Sample Banks, Three Policy Scenarios
(In percent of total bank credit)
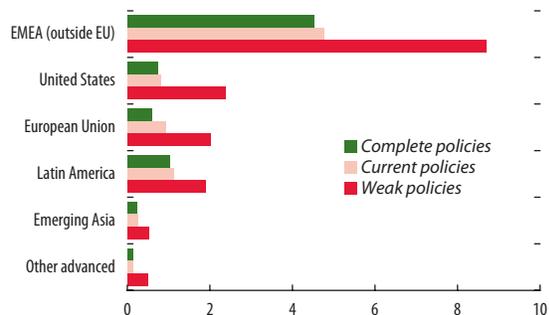
Source: IMF staff estimates.
Note: Total bank credit includes domestic and direct cross-border credit supplied by banks in each region. EMEA = Europe, Middle East, and Africa. Sample = 58 large EU banks. For details, see Annex 2.1.

cyclical funding shortages only; the sum of the blue and green bars shows the amount of asset reduction when banks face both capital constraints and cyclical funding shortages, and so on.

other actions by banks for reducing balance sheets before cutting back lending to the real economy. For example: (1) the assumed deleveraging strategy favors sales of assets ahead of cutbacks in lending and thus cushions the effect on credit in all scenarios; moreover, because of the assumed home bias, advanced EU and domestic markets are relatively more protected; (2) foreign lending is protected by the assumption that lending by foreign subsidiaries of sample banks cannot be reduced below the level of local deposits; (3) it is assumed that banks will not take any losses on asset sales, as elaborated below (see Annex 2.1 for details). Figure 2.30 shows the relative importance of financial assets that can be sold to mitigate the impact of deleveraging on bank lending at the different banks in the sample.

What is the impact on credit?

The results for the sample of banks are used to estimate the total impact on euro area credit supply in order to assess potential aggregate effects on the economy. In most cases, this is done by extrapolating the reduction in credit by banks in the sample to banks outside the sample on a country-by-country basis. However, in some cases, where there is clear empirical evidence of diverging credit trends between sample banks and out-of-sample banks, this has been taken into account. The approach suggests a shock to euro area credit supply of 1.7 percent over two years under

the *current policies* scenario (Figure 2.31). The credit supply shocks are greater in high-spread euro area countries, with other euro area countries relatively less affected. That said, the decline in credit—after taking into account the second-round effects (from asset sales) on banks and the feedback effects from deterioration in the economy—could be more sizable and could increase if cyclical pressures rose.

The ultimate impact of a simulated pullback in credit by EU banks will depend on a number of country-specific circumstances. First, it will depend on the ability of local banks and other intermediaries to substitute for potentially lower lending by EU banks (for example, local banks may increase lending in response to a decline in competition from EU banks, as is discussed elsewhere in this section). Second, it will also depend on the relative importance of banks as suppliers of credit in the economy (for example, in countries where capital markets play an important role as a source of funding, such as the United States, the impact on the overall supply of credit will be more muted). Finally, the net effect of the credit supply (which is modeled here) on interest rates and on the real economy will depend on the demand for credit.

How does this compare to past financial crises?

The simulated shocks to euro area credit supply are well within the range of past episodes of deleveraging

Figure 2.30. European Banks: Composition of Assets, 2010
(In percent of assets)
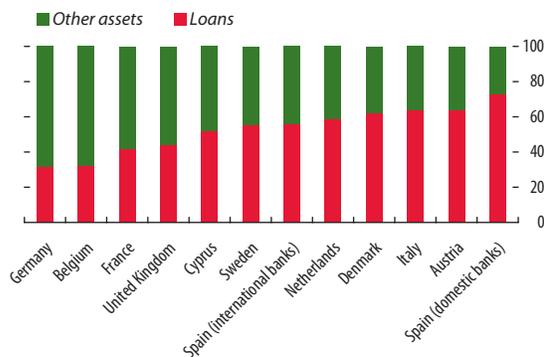
Sources: European Banking Authority; SNL Financial; and IMF staff estimates.
Note: Other assets are loans to other financial institutions, securities, noncore assets, and other financial assets. For a sample of 58 large EU banks.

Figure 2.31. Reduction in Supply of Credit, by Banking System, Current Policies Scenario
(In percent of total bank credit)
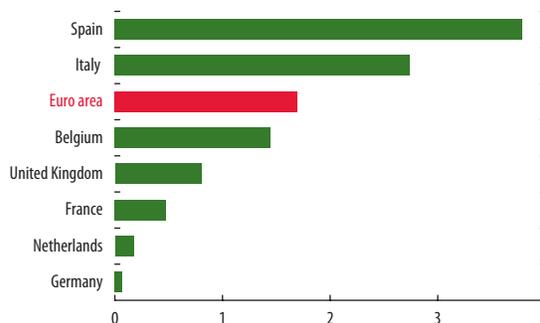
Source: IMF staff estimates.
Note: Data are an extrapolation of results from a sample of banks to the entire banking system. Total bank credit includes domestic and direct cross-border credit supplied by banks in each country.

Figure 2.32. Euro Area Credit Supply Shock: Three Scenarios Relative to Historical Episodes
(Index: Ratio of peak credit to GDP = 100)
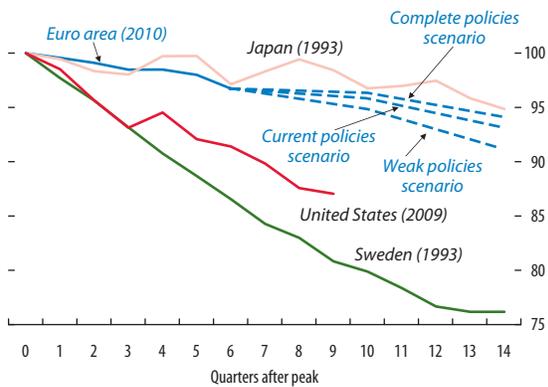
Source: IMF, International Financial Statistics and World Economic Outlook (WEO) databases; and IMF staff estimates.
Note: Year given in curve labels is the year of the peak quarter. The scenario lines show simulated paths for the euro area based on an extrapolation of the results from sample banks to the banking system; these lines are drawn using the WEO baseline GDP forecast.

Figure 2.33. United States: Nonfinancial Corporate Borrowing and Return on Assets
(In percent)
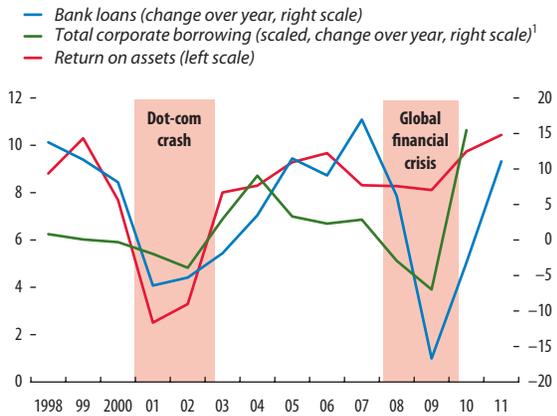
Sources: Federal Reserve; Haver Analytics; IMF, Corporate Vulnerability Utility database; and IMF staff estimates.
[1]Annual borrowing scaled down by a factor of 20.

(Figure 2.32). Specifically, the implied decline in the credit-to-GDP ratio under all three scenarios sits between the relatively moderate experience in Japan in the 1990s and the more pronounced credit contraction in the United States in the earlier part of the financial crisis. However, the cutback in credit under the *weak policies* scenario approaches that seen in the United States.

What is the impact on growth?

The impact of these credit supply shocks on economic activity is assessed using the IMF Global Economy Model.[13] The credit shocks implied by the *current policies* scenario are incorporated in the World Economic Outlook (WEO) baseline. The credit shocks in the *complete policies* scenario imply that euro area real GDP would be 0.6 percent above the baseline after two years, consistent with assumptions under the WEO upside scenario. The *weak policies* scenario, in turn, suggests that euro area real GDP would be 1.4 percent lower than the baseline at the end of 2013. This is one of the key elements in one of the WEO downside scenarios.

The looming cutbacks in credit could test the resilience of Europe's corporate sector.

Although the effects of European bank deleveraging are likely to be felt far and wide, experience from earlier stages of the financial crisis suggests that credit to Europe's corporate sector is likely to prove a particular pressure point. As banks began to tighten lending standards in 2007–08, all firms suffered. Yet, U.S. firms generally showed greater resilience to the credit shock than did their European counterparts, as their return on assets fell by less and rebounded to precrisis levels by 2011 (Figure 2.33). In comparison, the return on assets for both core and peripheral euro area firms was hit harder in 2009 and has yet to return to precrisis levels (Figure 2.34).

Euro area firms are particularly vulnerable to reduction in bank credit because of their greater reliance on banks for funding and often limited ability to adjust labor costs, at least compared with their U.S. peers (Figure 2.35).[14] Because domestic banks

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[13]The Global Economy Model was presented in the July 2008 special issue of *IMF Staff Papers*, Vol. 55, No. 2.

[14]In the World Economic Forum's competitiveness ranking of 142 countries in 2011, Spain (119), Portugal (122), Italy (123), and Greece (126) are included in the bottom 16 percent of countries for labor market efficiency. Those four countries are also ranked well below core euro area countries in goods market efficiency (WEF, 2011, pp. 20–21). See also the European Commission's *Quarterly Report on the Euro Area*, December 2010 and

Figure 2.34. Euro Area: Nonfinancial Corporate Borrowing and Return on Assets
(In percent)

Regional return on assets (left scale)
— *Euro area*
— *Core[1]*
— *Periphery[2]*
— *Bank loans (change over year, right scale)*
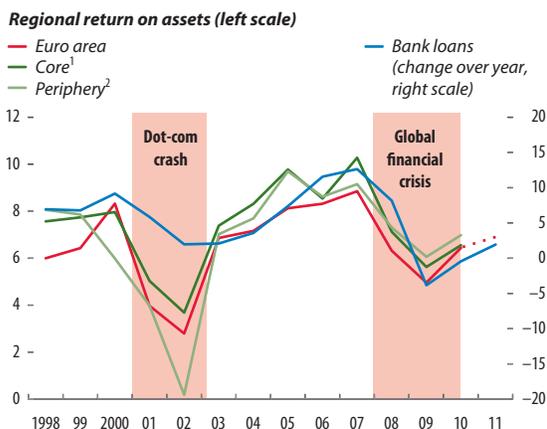
Sources: European Central Bank; Eurostat; Haver Analytics; IMF, Corporate Vulnerability Utility database; and IMF staff estimates.
[1]Core = Austria, Belgium, Finland, France, Germany, and Netherlands.
[2]Periphery = Greece, Ireland, Italy, Portugal, and Spain.

Figure 2.35. Reliance on Bank Financing by Nonfinancial Corporations
(In percent)
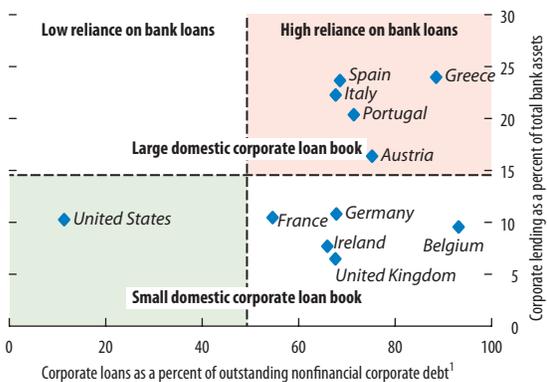
Sources: European Central Bank; Eurostat; Federal Reserve; Haver analytics; and IMF staff estimates.

Figure 2.36. Change in Nonfinancial Corporate Debt, 2000–10
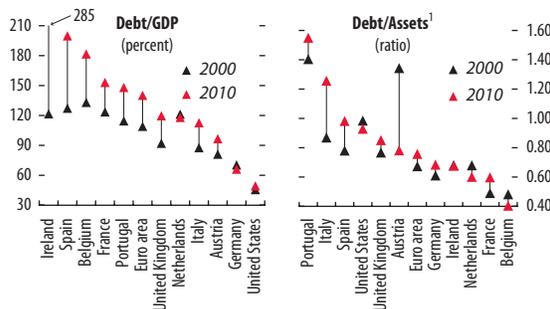
Sources: European Central Bank; Eurostat; and Haver Analytics.
Note: Data are as of year-end. Total nonfinancial corporate debt is calculated as sum of loans, securities other than shares, and other accounts payable. GDP is annualized, and seasonally and working-day adjusted.
[1]Assets are Financial Assets, as published by the European Central Bank.

in peripheral economies are facing the greatest deleveraging pressures and have disproportionately large corporate loan portfolios, the potential impact on corporate financing may be especially pronounced there. Small and medium-sized enterprises (SMEs) are likely to be most affected. Even where credit is maintained, corporate borrowers could face elevated borrowing costs, as loan margins are on average 100 basis points higher across the rating spectrum since 2007.[15]

High debt burdens and weak profitability weigh on enterprises, suggesting further credit downgrades and lower bank asset quality.

In some cases, strains arising from reduced credit supply are compounded by weaknesses in the corporate sector. Some peripheral euro area nonfinancial firms, for instance, feature comparatively high levels of debt and leverage (Figure 2.36). Servicing high debt levels with deteriorating earnings will leave some companies increasingly fragile in the face of a protracted downturn in the business cycle.

Declining interest coverage ratios indicate the strained borrowing capacity and higher solvency

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July 2011, http://ec.europa.eu/economy_finance/publications /qr_euro_area/index_en.htm.
[15]Based on Dealogic data for corporate syndicated loan issuance in Europe, Japan, and the United States.

Figure 2.37. Nonfinancial Corporations: Interest Coverage Ratio and Implied Ratings
(Ratio, left scale, in percent)
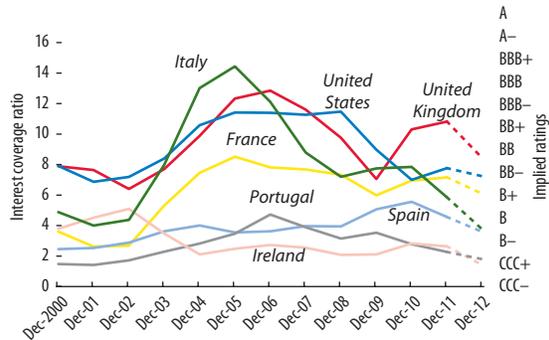
Sources: Bloomberg L.P.; and IMF staff estimates.
Note: Dashed lines are projections. Interest coverage ratio is earnings before interest and taxes divided by interest expense. The implied ratings are from a sample of more than 800 U.S. firms that constitute the benchmark high-grade and high-yield corporate bond indices.

Figure 2.38. Corporate Credit Quality in Western Europe, 2007–12
(In percent)

Source: Moody's KMV.
Note: EDF = expected default frequency. EDF is a market-based credit measure that represents the probability that a firm will default within one year. The dotted lines show implied credit ratings associated with particular EDFs. Western Europe comprises the euro area, Denmark, Norway, Sweden, Switzerland, and the United Kingdom.

risks for these firms.[16] Assuming a credit crunch of the magnitude that would ensue under a severe downturn, large corporations could see their interest coverage ratios fall (Figure 2.37).[17] In turn, the deterioration in corporate credit quality would further weaken bank asset quality (Figure 2.38).

Potential spillovers through asset and derivatives markets could be significant.

While potential negative spillovers from the asset sales are not quantified here, their importance has to be acknowledged. A number of banks seeking to sell assets at scale simultaneously could lead to a fall in asset prices, which may—in turn—induce mark-to-market losses for other investors hold-

[16]The interest coverage ratio is defined as the ratio of EBIT (earnings before interest and taxes) to interest expenses.
[17]We use a sample of publicly traded nonfinancial corporations that are constituents of major stock indices in the respective countries. For example, for the United States we use all the nonfinancial members of the S&P 500 stock index for estimating the market-capitalization-weighted interest coverage ratio for the corporate sector.
Assuming that (1) firms face a credit crunch in 2012 similar to that seen in 2008–09, (2) EBIT falls by a magnitude similar to that in 2008–09 for the respective countries, and (3) interest expense remains stable, we estimate the change in interest coverage ratios for a sample of publicly traded firms in the given countries and map these levels to their respective implied ratings.

ing similar assets. There is also a risk of an adverse dynamic developing between asset market and funding market liquidity. Poor liquidity in asset markets would mean that greater discounts need to be taken on sales of assets. The subsequent fall in bank capital would mean that banks need to reduce balance sheets further, which could entail further asset sales or a cutback in interbank lending. The latter would generate funding shortages for other banks, that would then need to sell assets or reduce interbank lending themselves, reinforcing the adverse dynamic.

Derivatives markets could also transmit shocks affecting European banks and sovereigns to U.S. banks through both direct and indirect channels. Indirect channels, which have affected U.S. banks the most during the current crisis, arise from the interaction between counterparty risk, reliance on market funding, and the use of hedging strategies. Direct channels arise from potential losses to U.S. banks' holdings of derivative claims on European counterparties. Data disclosures are not sufficient to assess the exposures adequately, a factor that has contributed to the volatility of CDS spreads and equity prices of U.S. banks (see Box 2.4 for details). Even though net exposures might be small, large gross positions expose banks to large swings in the market value of their derivatives holdings, making them vulnerable to margin calls and raising the

Box 2.4. How Derivatives Markets Link U.S. Banks and European Counterparties

Shocks affecting European banks and sovereigns are transmitted and amplified to U.S. banks by derivatives markets through indirect and direct channels. The indirect channels arise from feedback loops generated by the interactions among counterparty risk, market funding, and the use of hedging strategies. These indirect channels have affected U.S. banks the most during the current crisis, with stresses feeding back and forth between them and European counterparties. Direct channels arise from potential losses to U.S. banks' holdings of derivatives claims on European counterparties. These holdings appear small on a net basis, but

Note: Prepared by Jorge A. Chan-Lau.

data disclosures are not sufficient to assess the exposures adequately, which has contributed to the volatility of CDS spreads and equity prices of U.S. banks.

Derivatives markets increase the interconnections among banks, sovereigns, and other markets and institutions, contributing to the transmission and amplification of shocks. As shown in Figure 2.4.1, a negative European sovereign risk shock could trigger a negative feedback loop affecting European banks, U.S. banks, and other markets and institutions.

A negative feedback loop could start with a widening of European sovereign yields owing to an increase in sovereign risk. European banks holding European government debt suffer mark-to-market losses, and

Figure 2.4.1. Market Linkages

H. Higher funding costs and shorter tenors; reduced exposures; loss of market access; widening CDS spreads

Other markets and institutions

G. Proxy hedging in other markets; less capital for derivatives market-making; tightening of credit limits

C. Increased counterparty risk

U.S. banks

F. Higher funding costs and shorter tenors; reduced exposures; loss of market access

C. Increased counterparty risk

D. CVA hedging drives sovereign CDS and sovereign bond yields up

E. Counterparty risk prompts margin calls, higher collateral requirements; contract novation concentrates risk on fewer dealers

European banks

European sovereigns

A. Mark-to-market losses on sovereign bond holdings; reduced ability to support banks

B. Increase in contingent liabilities to governments; reduced demand for additional purchases of government bonds

Note: CDS = credit default swaps. CVA = credit valuation adjustment.

Box 2.4. *(continued)*

the deterioration of their balance sheet increases their default risk (Figure 2.4.1, link A), leading to higher funding costs (link F). If the European bank has entered into derivatives contracts with a U.S. bank, it would be forced to post higher collateral (link E). Because derivatives markets are opaque, counterparties to the U.S. bank may have difficulties assessing its real exposure to the European bank. Thus, the U.S. bank could face higher funding costs and experience a widening of its CDS spreads on the market perception that its default risk has increased due to its exposure to the European bank (link H). The U.S. bank may reduce its exposure by assigning the derivatives contract to a different derivatives dealer in exchange for a fee—that is, by novating the contract (link E). Novation could concentrate risk among fewer dealers and thereby increase systemic risk in the derivatives market. The U.S. bank can also choose to hedge the risk of the European bank with market instruments, such as CDS protection or long put options purchased from other banks and institutions (link G).[1]

The potential of negative feedback loops to affect U.S. banks is real, as illustrated by events in the second half of 2011. As concerns about the solvency and liquidity of European banks mounted, the spotlight turned to U.S. broker-dealers. Market participants erred on the side of caution by reducing or hedging their exposures to U.S. broker-dealers. As a result, the price of default protection for U.S. broker-dealers widened faster than that of European banks in September 2011, demonstrating how interconnectedness could rapidly evolve into systemic risk (Figure 2.4.2).

Furthermore, spillovers flow in both directions, as U.S. bank actions could negatively affect European counterparties. Credit risk in derivatives contracts is managed by requiring the counterparty to post collateral, but sovereigns are not required to do so.[2]

[1]For details, see for example Blundell-Wignall (2012) and Chan-Lau (2008).
[2]When a bank enters a derivatives contract with a counterparty, it is exposed to credit risk arising from the failure of the latter to perform on the contract. The credit valuation adjustment (CVA) is the market value of the credit risk in the derivatives contract (Canabarro and Duffie, 2003; Pykhtin and Zhu, 2007).

Figure 2.4.2. Relative Price of Default Protection for Selected U.S. Banks and European Banking Sector
(January 3, 2011 = 100)

- Goldman Sachs
- Morgan Stanley
- Bank of America Merrill Lynch
- Citigroup
- JPMorgan
- European banks
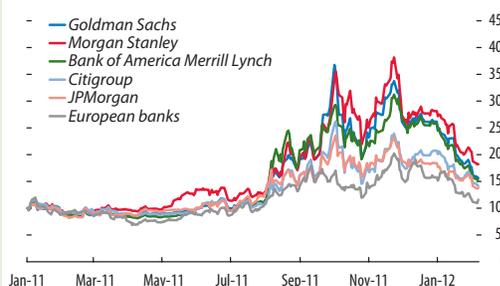
Sources: Bloomberg L.P.; and IMF staff estimates.

When dealing with sovereigns, banks hedge the credit risk by purchasing sovereign CDS protection, contributing to widening CDS spreads that lead to further rounds of hedging—a cycle referred to as the CVA feedback loop or CDS doom loop. For example, a fixed-rate receiver 10-year euro swap with Italy would have cost a dealer bank a CVA charge of 20 basis points in August 2010 but more than eight times as much, about 170 basis points, in November 2011, at the height of the European sovereign debt crisis (Figure 2.4.3). Similarly, the CVA increased sharply, to 130 basis points if the counterparty was Spain, and 60 basis points for France. The rapid increase of the CVA charges required a substantial increase in protection buying, which contributed to higher European sovereign CDS spreads. In addition, CVA desks also hedge by trading swaptions, leading to increased volatility in the swaption market.[3]

The stress episodes experienced in 2011:H2 suggest that data on direct derivatives exposures may underestimate the impact of spillovers from derivatives markets on U.S. banks. At end-2011:Q3, direct European derivatives exposures, measured on a fair-value basis and excluding credit derivatives, were small,

[3]Reportedly, the European Capital Requirement Regulation (CRR) and Directive (CRD) will not require banks to hold capital against CVA generated by trades with nonfinancial counterparties, which could help break the CDS doom loop (Cameron, 2012).

Box 2.4. *(continued)*

Figure 2.4.3. CVA on 10-Year Euro Swaps with a Sovereign Counterparty: France, Italy, and Spain
(In basis points)

Italy

Spain

France

Dec-10   Mar-11   Jun-11   Sep-11   Dec-11   Mar-12
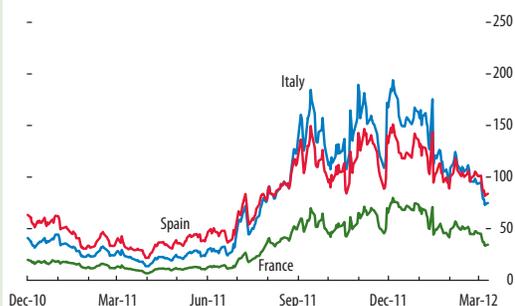
Sources: Bloomberg L.P.; and IMF staff estimates.
Note: CVA = credit valuation adjustments.

Figure 2.4.4. Derivatives Exposures of U.S. Banks to Selected Euro Area Countries, All Counterparties
(In percent of Tier 1 capital)

■ December 2010
■ March 2011
■ June 2011
■ September 2011

Germany   France   Greece, Ireland, and Portugal   Italy   Spain   United Kingdom

Source: U.S. Federal Financial Institutions Examination Council.

amounting to 34 percent of the Tier 1 capital of U.S. banks, and concentrated mainly on Germany, France, and the United Kingdom (Figure 2.4.4).[4] Exposure

[4]Fair-value exposures do not account for mitigating factors such as netting and the use of collateral; and they neglect potential future exposure, which could be important. Data consistency may be affected by the different reporting criteria used across banks. Credit derivatives and guarantees reported in the lending survey of the U.S. Federal Financial Institutions Examination Council are on a notional basis, which prevents use of the data for risk assessment.

to any single individual country did not exceed 10 percent of Tier 1 capital, and total exposure to peripheral countries was about 5 percent. Because official data on net credit derivatives exposures is not available, the best guidance is offered by data released in the banks' quarterly and annual reports, which suggest low exposures. The two stress episodes described above, however, illustrate that direct exposures are not all that matters and that substantial data gaps remain.

potential for destabilizing fire sales of assets, a risk further compounded by the current scarcity of collateral. Since derivatives market making is concentrated among few broker-dealers, there is the potential for a failure cascade once a dealer fails.

Among the 19 U.S. bank holding companies (BHCs) that participated in the Federal Reserve's early 2012 stress test, six were BHCs with large trading, private equity, and derivatives activities; for those six, the stress scenario was augmented with a global financial market shock that included a severe recession and financial market turmoil in Europe (BGFRS, 2012b). While it is difficult to single out the incremental impact of the assumed strains in Europe, the overall results of the stress tests suggest general resilience of the U.S. banks' capital structure to severe negative shocks.

Emerging Markets—Still Resilient?

Emerging markets have deftly navigated the financial shocks and economic spillovers from advanced economies. The impact of European bank deleveraging has been manageable so far, but there is a risk of a further pullback of bank credit and cross-border lending. Emerging Europe appears most vulnerable in this respect, although banks elsewhere are likely to step in and fill the gap, at least under the current policies scenario. Meanwhile, portfolio flows to emerging markets remain prone to sudden swings in global sentiment; they have rebounded sharply this year but could reverse again in a weak policies scenario. While emerging markets generally have substantial buffers and adequate policy room, homegrown vulnerabilities

in some economies could magnify the impact of external shocks.

Emerging markets have generally fared better than the advanced economies over the course of the global financial crisis, maintaining positive growth rates, good macroeconomic fundamentals, and financial stability. Most have shown resilience in the face of deleveraging pressures. Their relative strength has underpinned a secular trend of capital inflows, albeit one interrupted by occasional sharp reversals whenever global risk aversion spikes. This section assesses the vulnerability of emerging markets to fresh spillovers from Europe, takes account of their homegrown vulnerabilities, and measures these risks against their policy buffers.

Overall, emerging markets are likely to continue doing well, but their resilience could be tested under a *weak policies* scenario that would accelerate European bank deleveraging and might prompt fresh portfolio outflows. Countries in emerging Europe are particularly exposed in this regard. Meanwhile, most emerging markets have policy space to counter adverse shocks, although the scope for easing credit policy is more limited where economies are already in the advanced stages of the credit cycle.

How big are the headwinds from euro area bank deleveraging?

The size of potential spillovers from the wave of deleveraging by euro area banks is illustrated under our policy scenarios. The impact is likely to differ significantly across regions, with larger effects expected in emerging Europe than in Asia or Latin America (see previous section—Figure 2.29). If the current episode were to follow the pattern of the post-Lehman crisis—when euro area banks reduced their credit to emerging markets by a cumulative 20 percent through end-2009—the deleveraging drive could run for several quarters, bottoming out in mid-2012 (Figure 2.39).

There are, however, two key differences with the Lehman episode. First, deleveraging pressures today are largely confined to euro area banks. Other banks are therefore in a better position to step in and cushion the impact on overall credit provision, at least

Figure 2.39. Euro Area Bank Deleveraging in Emerging Markets, 2008 and 2011
(Cross-border claims of BIS reporting banks, peak = 100)
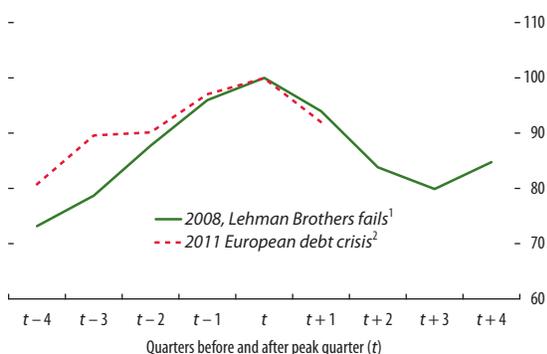
Sources: Bank for International Settlements (BIS), Consolidated Banking Statistics; and IMF staff estimates.
[1]Peak = 2008:Q2.
[2]Peak = 2011:Q2.

under the *current policies* scenario. Looking at developments during 2011:H2, it is true that the cutbacks in emerging market exposures were broad-based, as the negative impact of the euro area crisis on global bank funding costs, growth, and risk appetite affected banks in general. Yet, non-euro-area banks reduced credit to emerging markets more gradually (contracting by 2 percent in the third quarter) than to their euro area peers (a contraction of 8 percent), and after a rapid earlier expansion through mid-2011 (Figure 2.40). Moreover, the recent stabilization of markets has reportedly allowed local and regional banks in Asia and Latin America to step in where voids have been left by European banks in some lending segments (Figure 2.41). By contrast, a smooth handover would appear more challenging in emerging Europe, given the large market share of euro area banks. The potential downside risks in a *weak policies* scenario are explored below.

A second important difference from 2008–09 is that some of the factors driving the current deleveraging trend are structural in nature and thus likely to persist for a longer period. As detailed in the section on bank deleveraging, euro area banks are under regulatory and market pressures to move to a more robust funding model with less reliance on wholesale markets. This shift could permanently reduce their presence in countries where they lack a deposit base. This is especially true for euro area banks' business

Figure 2.40. Deleveraging in Emerging Markets by Selected Advanced Economy and EM Local Banks, 2011:Q3
(Cross-border claims of BIS reporting banks)
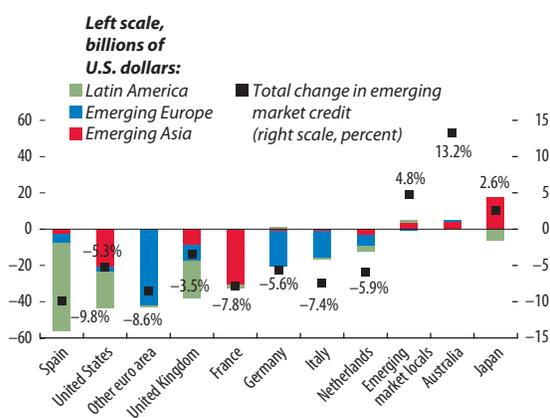
Sources: Bank for International Settlements (BIS), Consolidated Banking Statistics; and IMF staff estimates.

Note: Emerging Asia includes East Asia (excluding Japan) and South Asia. Emerging market (EM) local banks are BIS reporting banks in Brazil, Chile, Mexico, Panama, Taiwan Province of China, and Turkey.

Figure 2.41. Emerging Market Credit Cycle for Euro Area Banks and Other Banks, 2010–11
(Index, peak = 100)
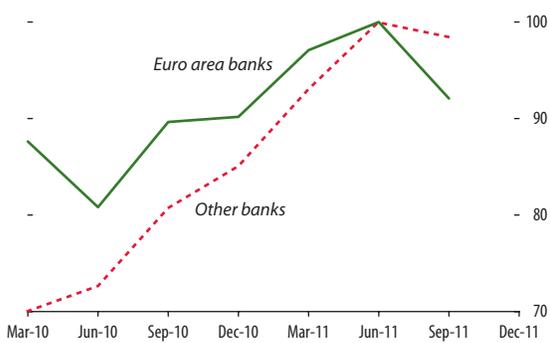
Sources: Bank for International Settlements, Consolidated Banking Statistics; and IMF staff estimates.

in Asia, whereas operations in emerging Europe and Latin America tend to involve large deposit franchises.

The recent experience also shows that pressures may be concentrated in specialty finance lines (Figure 2.42). Project finance and longer-term structured credit in fields such as aircraft and shipping appear particularly vulnerable owing to special characteristics, including long maturities, heavy use of syndication, and dependence on term dollar funding. During the recent episode of market stress, new lending in these segments fell sharply across emerging markets as longer-term dollar funding markets came under significant pressure. Euro area banks, now faced with deleveraging pressures, have traditionally played leading roles in these markets, although their share has been falling steadily since the 2008–09 crisis. Under the *current policies scenario*, such adjustments are likely to proceed in a smooth and orderly fashion. However, the recent episode also suggests that market strains could reemerge quickly under a *weak policies* scenario.

In comparison with longer-term structured and project finance, short-term trade finance proved remarkably resilient during the latest episode of market stress. Euro area banks are also notable lenders in this segment, but where they curtailed exposures, banks from other regions were able to step in with relative ease, reflecting the standardized form, short maturity, and comparatively low credit risk of trade finance. Euro area banks reportedly maintained trade

Figure 2.42. Long-Term Specialty Finance in Emerging Markets
(In billions of U.S. dollars, 12-month moving average)
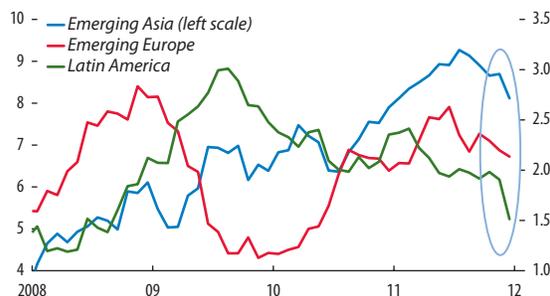
Sources: Dealogic; and IMF staff estimates.

Note: Covers medium-term and structured finance and project finance. Emerging Asia includes East Asia (excluding Japan) and South Asia. Oval covers recent period of market stress.

credit for established clients but otherwise pursued a restrictive credit policy. Overall, trade finance appears to have repriced somewhat, reflecting the rise in U.S. dollar funding costs and some tightening in the aggregate supply of credit.

Among emerging markets, emerging Europe is the most vulnerable to euro area bank deleveraging.

Emerging Europe has by far the largest economic exposure to a slowdown in euro area economic activity, the strongest banking links to the euro area, and the largest gross external financing needs. At the same time, potential policy buffers, such as international reserves or fiscal space, are smaller than in Asia or Latin America, and in many instances more limited than they were in 2008.

As sovereign and bank funding strains in the euro area intensified during the second half of 2011, parent banks' cross-border financing of operations in emerging Europe declined (Figure 2.43). Looking ahead, parent banks will likely grow their loan books in the region very modestly owing to funding and capital pressures, implying that overall credit growth in more vulnerable countries may be flat or negative. Credit standards have tightened considerably, while counterparty concerns have spilled over from the euro area; the resulting unsecured interbank rates are unusually high relative to policy rates and feed into higher lending rates for clients.

Figure 2.43. Emerging Europe: Cross-Border Bank Flows and Foreign Exchange Funding Costs

— BIS cross-border flows as share of GDP, unweighted regional average (left scale)
— Spread on dollar-euro one-year basis swap (right scale)
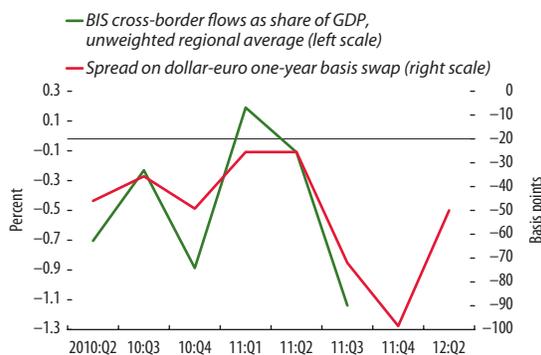
Sources: Bank for International Settlements (BIS); Bloomberg L.P.; and IMF staff estimates.
Note: Sample includes Bulgaria, Croatia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Turkey, and Ukraine.

Figure 2.44. Reduction in Supply of Credit by Sample Banks to Emerging Europe: Current and Weak Policies Scenarios
(In percent of total domestic private credit)
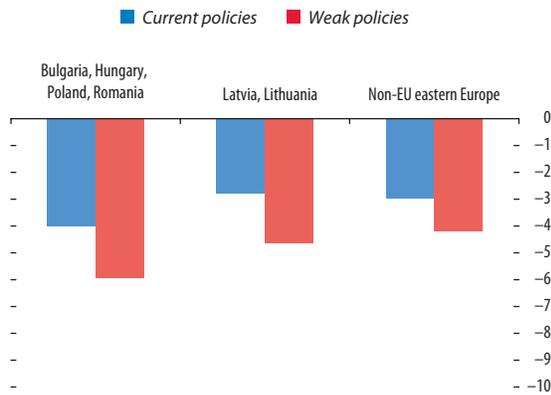
Source: IMF staff estimates.
Note: For a sample of 58 large EU banks.

Under the *current policies* scenario, deleveraging by EU banks in the sample would amount to about 4 percent of total private credit in emerging EU member countries in the period 2012–13, with a smaller impact in the Baltic countries, where Nordic parent banks are under less pressure to deleverage (Figure 2.44). EU bank deleveraging would have a more modest impact of about 3 percent on domestic credit in non-EU countries in the region, such as Russia and Turkey.[18] Credit segments most at risk of deleveraging include loans to municipalities and SMEs, as these loans generate less cross-sales and fee-based revenue. Some parent banks are also looking to sell certain operations in the region, although this process has so far been hindered by a scarcity of willing buyers.

A re-intensification of strains in the euro area could have a severe impact on emerging European banking systems, foreign exchange funding, and sovereign debt markets.

Under the *weak* policies scenario, deleveraging by EU banks would have a more severe impact on lending

[18]However, the estimated impact on non-EU countries in emerging Europe is biased downward by the fact that the sample does not include Greek banks, which have a significant presence in non-EU countries in the Balkans.

by banks in emerging Europe. With parent banks assumed to prioritize domestic lending while shoring up the capital base, repatriation flows could become significant. In this scenario, deleveraging by EU banks in the sample would amount to approximately 6 percent of total private credit in emerging EU member countries over the period 2012–13, whereas the impact in non-EU countries in the region would amount to about 4 percent of total private credit. In southeastern Europe, where Greek banks have a large market share in many countries, spillover and contagion risks need to be closely monitored, with contingency plans in place to contain any potential shocks to confidence in local banking systems.

In many countries in emerging Europe, foreign currency loans have risen as a share of GDP since the start of the global financial crisis (Figure 2.45). When such shares are large, private sector balance sheets are vulnerable to currency depreciation, limiting the scope for monetary policy to mitigate potential negative shocks emanating from the euro area. In central Europe, where banks are dependent on foreign exchange swap markets to fund their hard-currency loan portfolios, a sharp global risk retrenchment could cause the private foreign exchange swap market to dry up again, potentially creating dislocations in currency and local interest rate markets, pressuring central bank reserves, and triggering a wave of accelerated deleveraging. In Turkey, where a large current account deficit has increasingly been financed by short-term cross-border bank flows (Table 2.4), and where the stock of international

Figure 2.46. Emerging Europe: Reserve Coverage of Short-Term External Debt, Selected Countries, 2007 and 2011
(In percent)
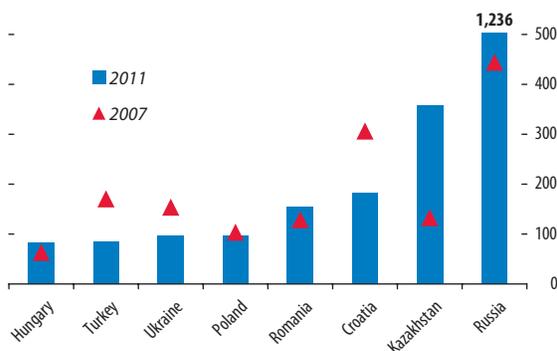
Sources: IMF, World Economic Outlook database.

reserves is relatively limited (Figure 2.46), a change in the willingness of global banks to roll over loans could trigger currency depreciation and a potentially rapid adjustment of domestic imbalances.

Across the region, the share of local currency government debt held by foreign investors has grown rapidly over the past few years. The domestic investor base—including banks as well as pension and insurance funds—has strengthened in some countries. However, in a downside scenario, domestic investors may not be able to smoothly absorb the supply resulting from a widespread foreign retrenchment. In many countries, recurring current account deficits entail the need for continued capital inflows. Given elevated government financing needs in many countries in emerging Europe, funding gaps could emerge if investor sentiment deteriorated markedly (Figure 2.47). This is a particular concern in Hungary, where parent banks are retrenching, the share of foreign holdings in the local government debt market is at historic highs, and foreign investor confidence in the economic policy framework has weakened.

In turn, developments across emerging Europe could add to strains in western Europe.

Potential dislocations in sovereign debt markets in emerging Europe could present a systemic risk to Austrian banks and, more indirectly via counterparty risk, to the rest of western Europe's

Figure 2.45. Loans Denominated in Foreign Currency as a Share of GDP, Selected Countries in Emerging Europe, 2007 and 2011
(In percent)

Source: IMF staff estimates.

Table 2.4. Capital Flow, Banking, and Policy Indicators in Selected Emerging and Other Markets

	Vulnerability of External Sector (percent of WEO projection of 2012 reserves)					Banking System Cross-Border Financing Vulnerability — Liabilities to BIS reporting banks		Vulnerability of Real Economy to Euro Area	Fiscal Policy Room[1]		Monetary Policy Room[2]		Position in the Credit Cycle[3]
	Current account deficit in 2012[4]	External refinancing needs in 2012[5]	Short-term liabilities to BIS reporting banks	Debt portfolio liabilities[6]	Equity portfolio liabilities[6]	Percent of total credit[7]	Percent of 2012 GDP	Exports to euro area (percent of 2010 GDP)	Gross public debt (percent of GDP)	Adjustment of primary balance (percent of GDP) in 2011–20 to achieve debt target in 2030[8,9]	2012 inflation target (percent)[10]	WEO projection of 2012 CPI inflation (percent)	Growth of private credit since Dec. 2008 (percent of 2012 GDP)
Europe													
Croatia	−2.7	144	119	57	6	78	96	10.2	52	...	...	2.5	6.9
Hungary	−6.1	154	60	108	36	52	67	41.9	76	5.3	3.0/4.0	5.0	−0.8
Kazakhstan	−24.1	37	13	43	7	16	8	10.2	15	−6.1	6.0–8.0[11]	6.4	6.6
Poland	27.5	135	40	110	29	28	28	19.0	56	4.4	2.5/3.5	3.2	12.5
Romania	16.4	100	64	12	4	61	44	16.5	35	1.8	3.0/4.0	3.6	4.4
Russia	−17.3	31	13	9	47	16	8	9.0	11	−2.4	5.0–6.0[12]	6.2	13.2
Turkey	82.0	164	96	70	75	23	18	5.0	37	−1.8	5.0/7.0	8.6	23.4
Ukraine	37.8	181	28	61	10	14	13	5.4	38	−0.1	...	9.6	2.4
Africa and Middle East													
Egypt	45.6	33	79	75	23	...	8	3.2	79	...	...	10.8	1.6
Israel	2.4	...	18	47	75	5	9	5.5	73	0.8	1.0–3.0[11]	2.3	10.8
Lebanon	17.4	175	11	...	...	6	14	1.8	135	...	...	4.5	30.5
Nigeria	−42.3	...	12	23	20	...	3	8.2	19	−3.7	...	11.0	11.7
South Africa	54.0	88	35	91	303	9	9	4.2	40	2.5	3.0–6.0[13]	5.5	7.0
Asia													
China	−6.7	14	10	0	6	5	6	3.9	23	−0.2	...	3.5	52.1
India	17.8	33	44	11	46	11	12	2.0	66	7.9	...	8.5	16.2
Indonesia	2.9	37	41	48	73	18	9	2.0	24	0.6	4.5/5.5	7.5	9.4
Korea	−8.1	...	43	58	82	16	19	3.8	30	...	3.0/4.0	3.2	11.0
Malaysia	−24.4	24	28	48	51	14	22	7.4	55	5.3	...	2.7	27.7
Philippines	−3.8	20	18	35	12	18	12	3.3	40	−0.5	4.0/5.0	4.2	6.6
Taiwan Province of China	−8.6	...	19	...	...	...	22	...	43	...	...	...	...
Thailand	−4.7	22	9	8	36	7	10	4.5	43	1.8	0.5–3.0[12]	5.5	25.3
Vietnam	12.7	34	37	...	...	...	15	8.4	46	...	...	2.7	...

Table 2.4. Capital Flow, Banking, and Policy Indicators in Selected Emerging and Other Markets (*continued*)

	Vulnerability of External Sector (percent of WEO projection of 2012 reserves)					Banking System Cross-Border Financing Vulnerability		Vulnerability of Real Economy to Euro Area	Fiscal Policy Room[1]		Monetary Policy Room[2]		Position in the Credit Cycle[3]
						Liabilities to BIS reporting banks							Growth of private credit since Dec. 2008 (percent of 2012 GDP)
	Current account deficit in 2012[4]	External refinancing needs in 2012[5]	Short-term liabilities to BIS reporting banks	Debt portfolio liabilities[6]	Equity portfolio liabilities[6]	Percent of total credit[7]	Percent of 2012 GDP	Exports to euro area (percent of 2010 GDP)	Gross public debt (percent of GDP)	Adjustment of primary balance (percent of GDP) in 2011–20 to achieve debt target in 2030[8,9]	2012 inflation target (percent)[10]	WEO projection of 2012 CPI inflation (percent)	
Latin America													
Brazil	17.4	29	27	61	85	7	10	1.7	64	–1.6	4.5/6.5	5.0	29.7
Chile	11.6	100	63	59	41	26	20	5.3	11	0.5	3.0/4.0	3.2	13.6
Colombia	33.5	56	35	82	12	8	5	1.4	34	–0.8	3.0/4.0	3.1	11.4
Mexico	5.2	39	30	87	85	16	10	1.2	43	1.3	3.0/4.0	3.6	4.5
Peru	7.6	19	32	19	40	. . .	18	3.4	22	–2.4	2.0/3.0	2.6	7.1
Venezuela	–76.7	153	13	89	1	5	4	0.7	52	. . .	. . .	33.4	7.0

Sources: Bank for International Settlements (BIS); Consensus Economics; Haver Analytics; IMF, Direction of Trade, International Financial Statistics, Monetary and Financial Statistics, and World Economic Outlook (WEO) databases; BIS-IMF–OECD–World Bank Joint External Debt Hub (JEDH); and IMF staff estimates.

Note: Values for 2012 GDP are WEO projections. JEDH and WEO debt data are incompatible when one set is at market value and the other is nominal.

[1]Values in both columns are red if debt-to-GDP ratio is above 40 percent and adjustment of primary balance is positive.

[2]Red if WEO forecast for 2012 inflation is either greater than 9 percent or above upper bound of inflation target for 2012.

[3]Values in red cells are in the top 25 percent of values in column; green, bottom 25 percent; yellow, 25th to 75th percentiles.

[4]WEO projection of the 2012 current account deficit.

[5]An IMF staff estimate of short-term debt at initial maturity at end-2011 plus amortization of medium- and long-term government debt during 2012.

[6]Calculated from country's international investment position (IIP).

[7]Total credit is credit to the private sector plus total public debt.

[8]The higher the indicated primary balance adjustment, the greater the degree of fiscal tightening needed to reduce the debt-to-GDP ratio to 40 percent in 2030, and thus the less available fiscal space. If the debt ratio is already less than 40 percent, the indicated adjustment is that required to stabilize debt at the end-2012 level by 2030. For methodology, see April 2012 *Fiscal Monitor*, Statistical Table 10.

[9]The required adjustment is computed in terms of the cyclically adjusted primary balance, defined as the cyclically adjusted balance (CAB) plus gross interest expenditure. For Chile and Peru, structural balances are used instead of CABs.

[10]Based on headline CPI data except as noted. Range (x–y) indicates no explicit target except as noted. For inflation targeters (x/y), first number is the midpoint of the target range, and the second is the upper bound.

[11]Target range with no explicit midpoint or upper bound.

[12]Has a target range with no explicit midpoint or upper bound. For 2012, also has a core inflation target of 4.5–5.5 percent.

[13]Core inflation; target range but no midpoint.

Figure 2.47. Emerging Europe: Sovereign Gross Financing Needs, Selected Countries, 2012
(In percent of GDP)

Source: IMF staff estimates.

Figure 2.48. Net Flows into Emerging Market Funds, 2011–12
(In billions of U.S. dollars, cumulative from January 1, 2011)

Source: EPFR Global.

banking system.[19] For example, Austria and Belgium have systemically important financial institutions with significant exposure to Hungarian sovereign debt.

The volatility of capital flows to emerging markets has increased, while the direction is highly uncertain.

Portfolio and other capital flows to emerging markets have rebounded strongly in 2012, reversing much of the sharp decline during the second half of 2011, when strains in Europe escalated (Figure 2.48). At the time, emerging market authorities responded to the turbulence by selling some foreign currency reserves in a bid to smooth exchange rate moves. Local bond markets generally experienced less selling pressures, although in some cases, notably Indonesia, the authorities intervened heavily in local bond markets to cushion the withdrawal of foreign investors. Providing further stimulus, several emerging market central banks—such as those in Brazil, Chile, Indonesia, the Philippines, Romania, and Thailand—reduced their policy rates as growth forecasts were marked down.

The recent stabilization of euro area financial markets has prompted a rebound in capital flows to emerging markets. With reduced concern about

[19]Western Europe refers to the euro area plus Denmark, Iceland, Norway, Sweden, Switzerland, and the United Kingdom.

tail risks in Europe, investors have refocused on some of the structural advantages of emerging markets, including superior growth prospects and stronger public and private balance sheets. The renewed optimism has helped prompt some equity markets—notably in Brazil, India, and Turkey—to rally since end-2011, while dollar funding pressures have eased and bond issuance has rebounded (Figure 2.49). As discussed in previous GFSRs, the effect of expansionary monetary and liquidity policies in advanced economies, coupled with the relative attractiveness of emerging markets, could lead to a further resurgence in capital flows that could strain the capacity of local markets and build up new vulnerabilities over time. In response to heavy inflows, the first line of defense is an appropriate use of macroeconomic policies. Macroprudential tools, and in some cases the careful use of capital flow measures, can play a supporting role. However, emerging market policymakers face a two-way risk and must also be prepared for the possibility of sudden outflows, as discussed below.

Under the *complete policies* scenario the volatility of capital flows would be reduced as the accompanying reduction in downside risks emanating from the euro zone would lead to more predictable patterns in flows. Furthermore, as monetary and liquidity policies normalize, this could also lead to a more balanced pattern of flows. The reverse is true under the *weak policies* scenario.

Figure 2.49. Performance of Emerging Market Assets, 2011–12
(Indices)

Source: Bloomberg L.P.
[1]MSCI emerging markets index in local currency.
[2]JPMorgan emerging market currency index (against U.S. dollar).
[3]Fisher-Gartman index capturing global risk sentiment.

A reversal of capital flows could amplify the negative effects of bank deleveraging.

Emerging market resilience to capital flow reversals withstood the test of the Lehman crisis and the recent episode of market stress. Many countries, particularly in Asia and Latin America, have higher stocks of reserves today than they held at the onset of the Lehman crisis in 2008. However, another sustained period of capital outflows—as might occur in the *weak policies* scenario—could put severe strains on countries that have received large inflows and accumulated high short-term external debt (Table 2.4). Heavy capital inflows to emerging markets in 2009–11, and greater involvement of foreign investors in local markets, have also increased the amount of potential "hot money" that might depart suddenly in the face of a severe shock.

The impact of sudden outflows on credit and GDP growth in emerging markets could be considerable. An econometric model presented in Box 2.5 shows that if total net inflows received by emerging markets in the period 2009–11 were reversed over a single quarter—as happened during the Lehman crisis—credit growth would fall by 2 to 4 percent, and GDP growth would decline by 1.5 to 2 percent on average. For a country like Brazil, which received a large amount of foreign capital during this period, the impact on growth could be on the order of 2 percentage points, even though the stock of reserves is sufficient to cover short- and medium-term financing needs.

Homemade vulnerabilities remain, particularly in domestic credit markets.

Many emerging markets have homemade vulnerabilities, including high fiscal deficits (e.g., Hungary and India), high external deficits (e.g., Turkey and Ukraine), credit-quality concerns, and political uncertainty (notably in parts of the Middle East). These vulnerabilities exacerbate the potential susceptibility of these emerging markets to external shocks. Table 2.4 provides some summary statistics for major emerging market and other countries on vulnerabilities, to external shocks in particular, as well as measures of policy space to buffer negative shocks. Among regions, emerging Europe registers the greatest strains.

Many emerging markets are in the advanced stages of the credit cycle. As detailed in the September 2011 GFSR, banking systems can be more vulnerable to increases in nonperforming loans in the wake of a rapid credit expansion and therefore less able to withstand externally generated shocks. In many cases, a policy response involving a fresh expansion of credit may add to domestic financial stress.

Credit conditions in China warrant special attention in light of the country's considerable size and systemic importance to the global economy. Property and credit markets represent potential vulnerabilities in an environment of decelerating—although still brisk—growth. In part because of administrative measures intended to prevent or deflate property bubbles, house prices in most Chinese cities have been moving down in recent months. Housing affordability is still stretched, and many market participants are concerned that price declines might accelerate, putting pressure on property developers, local governments relying on land sales for revenue, and other exposed sectors (Figures 2.50 and 2.51). With real estate investment accounting for 13 percent of economic output and about 20 percent of bank loans, difficulties in the property sector could have important effects on the quality of bank assets.

China is already at an advanced stage of the credit cycle. As a consequence of effective stimulus measures adopted in response to the global financial crisis, overall credit in China grew at the average annual rate of more than 25 percent in 2009–10, bringing the overall credit-to-GDP ratio above

Box 2.5. What Happens in Emerging Markets if Recent Bank and Portfolio Inflows Reverse?

A substantial amount of foreign portfolio and bank-related capital has been flowing into a number of emerging market economies since 2009. A reversal of these flows as a consequence of financial deleveraging or waning risk appetite could place the financial sectors of many of those economies under substantial pressure. Research indicates that under the shock of a flow reversal, growth prospects would deteriorate and currencies would weaken vis-à-vis the U.S. dollar. Bank lending to the private sector would contract significantly, and the asset quality of banks' balance sheets would deteriorate.

Large amounts of foreign bank-related and portfolio capital have been flowing into emerging markets since gross capital flows collapsed in late 2008 (Figure 2.5.1).[1] Although net capital flows to emerging markets have not been excessively strong by historical standards, there have been unusually high portfolio flows into certain countries (Figure 2.5.2), reflecting the desire of real money investors, including central banks and sovereign wealth funds, to increase exposure to emerging markets.[2] Flows into local currency bond markets have been especially strong since early 2009, in part because of wide interest rate differentials between emerging market and advanced economies.

Research suggests that the financial sector in emerging markets could be particularly exposed to a sudden reversal of bank-related and portfolio flows (De Bock and Demyanets, 2012). These flows are more closely correlated with developments in emerging market banking sectors than are other flow measures, such as foreign direct investment or net capital flows. If portfolio inflows come to a sudden stop, the fall in asset prices would decrease the net worth of firms and negatively affect bank balance sheets, diminishing an economy's capacity to generate credit.

Note: Prepared by Reinout De Bock.
[1]Foreign portfolio and bank-related flows correspond to (1) foreign portfolio inflows (debt and equity) and (2) investment liabilities associated with foreign banks from the "other investment" category in the IMF's *International Financial Statistics*.
[2]Chapter 1 of the September 2011 GFSR discusses these trends in detail.

Figure 2.5.1. Bank and Portfolio Flows to Emerging Markets, 1995–2011
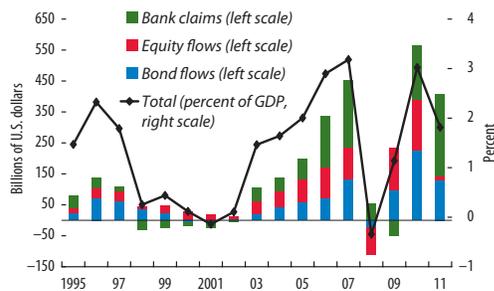
Sources: Haver Analytics; IMF, International Financial Statistics and World Economic Outlook databases; and IMF staff estimates.
Note: Portfolio and bank-related liabilities for 27 emerging markets. Values for 2011 are estimates.

Figure 2.5.2. Foreign Bank and Portfolio Flows, Selected Emerging Market Economies, 2009–11
(In percent of GDP for the given year)
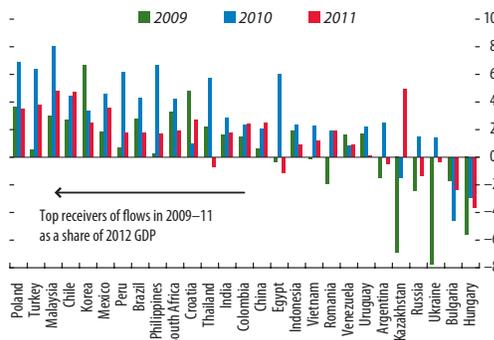
Sources: Haver Analytics; IMF, International Financial Statistics and World Economic Outlook (WEO) databases; and IMF staff estimates.
Note: GDP values for 2012 are WEO projections. Some 2011 values are estimates.

According to our econometric analysis, an abrupt reversal of foreign bank and portfolio flows is associated with a sharp contraction of credit and deterioration in loan quality, which potentially would force banks to recapitalize. Growth prospects deteriorate and currency valuations come under pressure. The depreciation pressure on currencies has clear policy implications, as it typically leads to substantial foreign exchange intervention and reserve loss. Debt denominated in foreign currency is harder to service

Box 2.5. *(continued)*

when the domestic currency weakens. Banks are also exposed to credit risk on foreign currency denominated loans to firms that themselves are not hedged against depreciation.

Figure 2.5.3 shows estimates of the first-year response of credit, asset quality, GDP, and the nominal exchange rate to a sudden reversal of the portfolio and bank-related inflows observed in 2009–11 (scaled by World Economic Outlook forecasts for 2012 GDP). The simulation is based on a fixed effects, structural panel, vector autoregression (VAR) model with nonperforming loan ratio, growth rate of private credit (as a percent of GDP), portfolio and bank flows (percent of GDP), GDP growth, and the change in the U.S. dollar exchange rate, as described in De Bock and Demyanets (2012). The shock is calculated versus the VAR model prediction based on 2010 values. The results indicate that growth risks to a reversal of flows are currently most elevated in Hungary, Poland, and Turkey. Credit as a share of GDP would contract strongly in Hungary, Korea, Malaysia, and Poland. Currencies would also be hit significantly, with an annual depreciation of up to 15 percent vis-à-vis the U.S. dollar.

Figure 2.5.3. What Happens If the Bank and Portfolio Inflows of 2009–11 Reverse?
(First-year change, in percentage points)
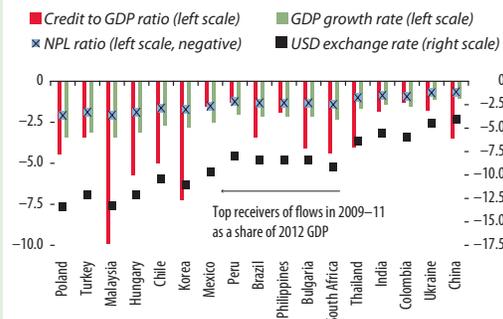
Sources: Bankscope; Haver Analytics; IMF, International Financial Statistics and World Economic Outlook databases; and IMF staff estimates.
Note: Shown are annual responses if the foreign portfolio and bank flows observed in 2009–11 reverse (calculated relative to a vector autoregression model prediction based on 2010 values). Bulgaria, Hungary, and Ukraine had outflows for the period 2009–11, which are assumed to continue at the same pace. For further details, see the box text and De Bock and Demyanets (2012). NPL = nonperforming loan.

Figure 2.50. Changes in Residential Property Prices and Sales in China, 2011–12
(In percent)
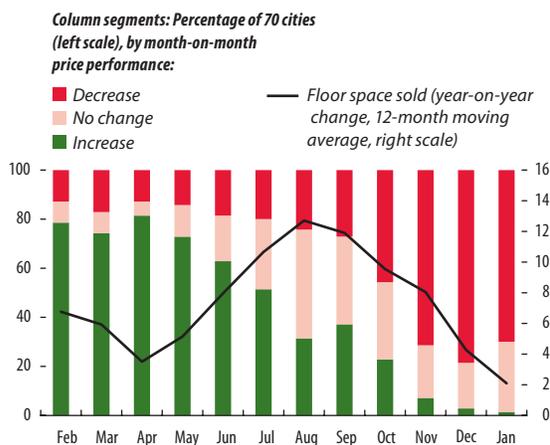
Sources: CEIC Data; and IMF staff estimates.
Note: Price data are for 70 cities in mainland China; sales data are national.

Figure 2.51. Ratio of House Price to Annual Household Income for Selected Cities, 2011
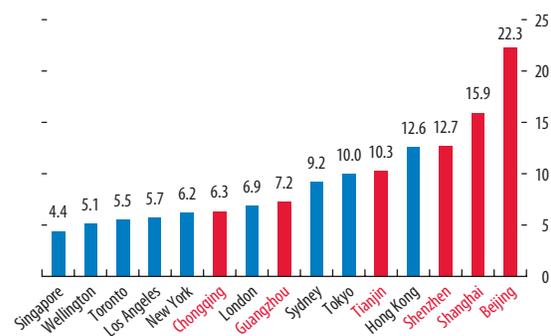
Sources: CEIC Data; 8th Annual Demographia International Housing Affordability Survey; national statistical offices; and IMF staff estimates.
Note: Data for cities in mainland China (in red), Tokyo, and Singapore are calculated as the price of a 70 square meter home divided by average annual pretax household income; data for other cities are the median house price divided by median pretax household income, as reported by Demographia.

150 percent. Stress tests by the Chinese authorities (conducted in the context of the recent Financial Sector Assessment Program with the IMF and World Bank) suggest that, in a tail risk scenario with weak growth and plunging house prices, nonperforming loan rates could rise as high as 8 percent (Figure 2.52). While China clearly possesses the fiscal resources to recapitalize domestic banks facing difficulties, incipient problems with credit quality would likely deter the authorities from repeating the 2008–09 strategy of rapid domestic credit expansion.

Similar concerns apply to Brazil, which experienced average annual credit growth rates of about 20 percent during the 2008–11 period, raising credit in relation to GDP (Figure 2.53). Rapid growth in directed credit from the state-run development bank (BNDES) helped to limit the impact of the Lehman shock on the economy in 2009. But the continued expansion of public and private bank balance sheets has already led to rising nonperforming loan rates, particularly in the household sector. Under these circumstances, the scope for using the credit channel to counter negative shocks may be limited.

Many emerging markets have built buffers that can withstand a moderate shock from Europe, but policy space needs to be used wisely and, under larger shocks, may prove to be inadequate.

Emerging markets inevitably remain exposed to volatility, including external shocks through trade and financial channels. Yet in many cases, they have sufficient foreign exchange buffers and policy space—monetary, fiscal, and credit—to counter a range of financial and economic shocks such as those envisaged under the *current policies* scenario. The experience of 2008 in emerging economies as diverse as Brazil, China, Korea, and Russia was that the countercyclical use of available policy space, along with the creative deployment of targeted facilities and instruments, can be effective in sustaining growth in the face of a major external shock. However, in some cases—notably in eastern Europe—policy room is more limited today, while the potential shock could be larger than in 2008, especially under the *weak policies* scenario.

Figure 2.52. China: Projected Nonperforming Loan Rates under Adverse Macroeconomic Scenarios
(In percent of total loans at end-2009)
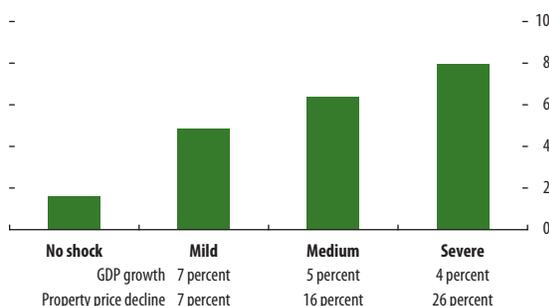
Source: IMF, Financial System Stability Assessment for the People's Republic of China.

Figure 2.53. Annual Change in Private Credit, 2009–11
(Percent of WEO projection of 2012 GDP)
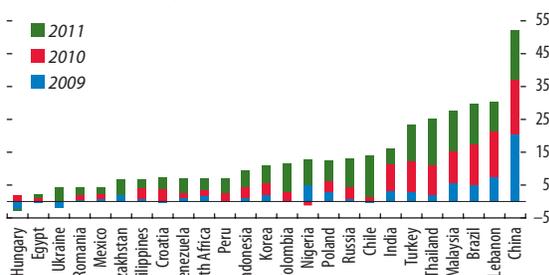
Sources: Haver Analytics; IMF, International Financial Statistics and World Economic Outlook (WEO) databases; national authorities; and IMF staff estimates.

The Quest for Lasting Stability

Developments in the euro area remain the key risk to global financial stability. Recent important policy steps have brought some much-needed relief to financial markets, as sovereign spreads have eased, bank funding markets have reopened, and equity prices have rebounded. However, new setbacks could still occur. The path ahead has significant political and implementation risks, and policies need to be further strengthened to secure and entrench financial stability. Policymakers should therefore build on recently agreed reforms and complete the policy agenda. Policymakers also need to coordinate a careful mix of financial, macroeconomic, and structural policies to ensure a smooth deleveraging process that puts the financial system in a good position to support the economy. This should be accompanied by further steps toward financial and fiscal integration to prevent creeping financial market fragmentation in the euro area and reap the full benefits of a financially stable monetary union. The challenges facing other key advanced economies remain largely unchanged since the last GFSR. In particular, both Japan and the United States have yet to forge a political consensus for medium-term deficit reduction, which is crucial to secure debt sustainability and preserve market confidence. Most emerging markets, in turn, are well positioned to buffer moderate deleveraging forces emanating from the euro area, but their resilience could be tested in a downside scenario, most notably in emerging Europe. Meanwhile, progress is being made in strengthening the global regulatory framework, but agreements in key areas still need to be concluded and implemented.

Recent policy action has provided a much-needed reprieve, but euro area sovereign bond markets remain vulnerable.

The euro area crisis remains the main risk to global financial stability, requiring further policy action to preclude highly adverse outcomes and to shift the dynamics firmly toward a situation of lasting stability. To be sure, euro area policymakers have continued over the past few months to take crucial

and unprecedented steps to overcome the crisis, as detailed in Chapter 1, Box 1.1.

Reflecting this progress, sovereign risk premiums have eased from their late-2011 peaks, banks have started tapping the senior debt market again, and equities have rebounded. Nonetheless, the situation in several euro area sovereign bond markets is still precarious. Current fragilities leave sovereign bond markets exposed to the risk of renewed turmoil: negative news or sudden changes in sentiment could quickly drive up yields again and further weaken the investor base if expectations shift back toward a bad equilibrium. The close link between sovereigns and banks could amplify the resulting threat to financial stability. Such shocks cannot be completely ruled out even if the countries concerned fulfill their policy reform commitments. Indeed, strains in euro area sovereign bond markets remain elevated; these reflect not only specific country weaknesses but also broader investor concerns about cohesion in the euro area, as policies still remain somewhat short of the oft-pledged "whatever it takes" to shore up confidence.

Disorderly European bank deleveraging could have serious consequences for growth in the region and beyond.

Faced with high sovereign risk, a weaker growth environment, and a legacy of insufficient capital cushions and imbalanced funding models, many major European banks have announced substantial plans to reduce their balance sheets. The drivers of this process are both cyclical (owing to current market stresses and weak growth) and structural (reflecting high initial leverage, the need to adapt business plans, and impending regulatory changes). In many cases, the envisaged adjustments are both inevitable and desirable. Their overall macrofinancial impact depends, however, on the nature, pace, and scale of the deleveraging process. Thus, a synchronized, large-scale, and aggressive shedding of bank assets could have severe consequences for the real economy in the euro area and beyond. Under the current policies scenario, this GFSR estimates total balance sheet shrinkage of some $2.6 trillion (€2.0 trillion) over the next two years,

which represents about 7 percent of bank assets. The impact of bank deleveraging is global, although it will likely be strongest in the periphery of the euro area and in emerging Europe.

Current dynamics also portend a risk of some retrenchment behind national borders and fragmentation of euro area financial markets.

In many respects, the difficulties facing the euro area mirror the fundamental challenge of reconciling sovereignty with membership in a currency union. Euro area members have surrendered control over monetary policy, fostering a close integration of financial markets. At the same time, countries are reluctant to cede competence over other policy areas that have a bearing on the stability of those integrated financial markets. Now that the euro area crisis has exposed the deficiencies of the existing institutional framework, the consequence is a painful and haphazard process of reform under market pressure.

The dynamics of the current crisis may already be causing some tendency toward financial retrenchment behind national borders and fragmentation within the common currency area. For instance, the investor base for government bonds in many countries is becoming more domestic again; banks are making disproportionately large cuts to their cross-border exposures as they retrench; and some nonfinancial corporations are again considering cash flows and balance sheet positions on a country-by-country basis.

These centrifugal tendencies have been balanced by increasing public sector efforts to shore up the monetary union, notably through official loans and scaled-up ECB operations. However, the ECB's policy response, while necessary and effective, also reverses some elements of integration. Collateral rules for monetary operations are now differentiated by country, and the financial risks associated with the provision of liquidity under certain types of collateral are now excluded from the usual loss-sharing framework.

If such temporary forces were collectively to become entrenched, they could dilute the essential benefits of the common currency and weaken sup-

port for the euro. Forging political agreement on the comprehensive set of reforms outlined in the complete policies scenario and moving toward greater integration is, of course, difficult and will require concessions from both sides: those wary of mutualizing risks, and those loath to make further transfers of national sovereignty. Box 2.6 explores the benefits and drawbacks of various proposals for ex ante risk sharing through common eurobond issuance as part of a fuller fiscal union. Without more progress in crucial areas, including more centrally articulated frameworks for crisis prevention, management, and resolution, euro area authorities will find it difficult to deliver on their promise of a stability and growth union.

Urgent steps are being taken to match policy reform efforts in vulnerable member countries with a powerful financing backstop to curtail the risk of a "run" on solvent euro area sovereigns.

Countries currently facing market pressures must sustain their resolve to rectify fiscal, structural, and external imbalances that weigh on investor confidence. Across the rest of the euro area, these efforts should be matched by a more resounding message of solidarity, cohesion, and support. Key to assuaging market fears is a credible firewall that is large, robust, and flexible enough to stem contagion and facilitate the adjustment process in the highly indebted countries. Any lasting solution also needs to tie the availability of financial support to continued policy progress. But a well-designed package of financing assurances and reform could likely garner enough credibility to ensure affordable market funding conditions, with official facilities acting only as contingent credit lines.

The recent decision by euro area policymakers to raise the effective lending capacity of the ESM (through accelerated buildup of capital and temporary backstopping by the EFSF) will strengthen the European crisis mechanism and support the IMF's efforts to bolster the global firewall. The crisis facilities should also have the flexibility to take direct stakes in banks and assist the restructuring of financial institutions where necessary. This will help stem the adverse feedback loop between domestic banking and sovereign risks in the euro area.

Box 2.6. Eurobonds and the Future of the Economic and Monetary Union

When the Economic and Monetary Union (EMU) was set up, it was recognized that an efficient monetary union would require deep economic and financial integration. Some argued that, for the EMU to work well, it would eventually require political and fiscal union. However, the choice at its inception was to focus on economic and financial integration and on disciplining fiscal policy rather than on creating a fiscal union. The crisis has shown that fiscal disciplining mechanisms failed, that economic integration remains limited, and that financial integration causes difficulties if national authorities remain ultimately responsible for their financial systems.

Market pressure is now forcing fiscal integration, albeit ex post. The recently established crisis management facilities (EFSF, EFSM, and ESM)[1] and the use of the European Central Bank balance sheet to support sovereign bond markets implicitly mutualize some of the fiscal risks in the EMU. Countries that are cut off from private funding at rates deemed to be sustainable have conditional access to official funding at better rates. In essence, EFSF/EFSM/ESM bonds are a form of euro bonds, although perhaps not the most efficient one. Worries about moral hazard are being addressed by applying strict conditionality.

Ex ante fiscal risk sharing is essential for an effectively functioning monetary union, but it will require a strengthening of economic governance. Waiting for a crisis to develop in part of the monetary union before supporting member countries is not an efficient use of economic resources. Invariably, economic dislocations in one country affect the rest of the monetary union, creating contagion and leading to divergence rather than convergence in economic and financial conditions, detracting from the benefits of membership (Figure 2.6.1). Mechanisms to share risk vary from access to common bond issuance to a full-fledged fiscal union with a large federal budget, but they have one thing in common: the surrender of a considerable degree of national fiscal autonomy. In this spirit, the recently adopted Fiscal Compact

Note: Prepared by Esther Perez Ruiz.
[1]European Financial Stability Facility, European Financial Stabilisation Mechanism, and European Stability Mechanism.

Figure 2.6.1. Spillovers of Distress among Sovereigns, Banks, and the Real Economy
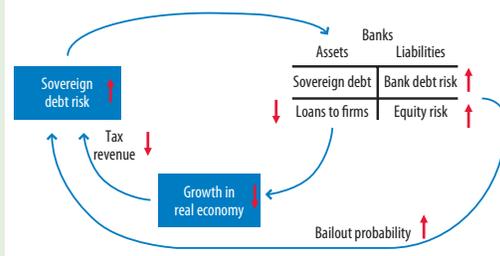
goes some way toward improving fiscal governance, though a further strengthening of the role of euro area institutions will be essential.

Eurobonds, which provide for common sovereign borrowing with joint and several liability, can be a useful tool for fiscal risk sharing. As such they provide important benefits by helping to prevent crises and insure against contagion:

Risk sharing and resilience to shocks. Joint issuance can prevent sharp increases in borrowing costs due to country-specific shocks or market tremors, thereby providing an implicit transfer from countries not affected by such events. As a result, sovereign yields are less sensitive to swings in risk aversion and multiple equilibria.

Breaking the banking-sovereign feedback loop. At present, financing conditions of the sovereign determine those of the rest of the economy because of national responsibility for financial systems. Moreover, banks and sovereigns are linked in a vicious loop in which their respective weaknesses reinforce each other. During the crisis, banks' stocks plunged in countries where sovereign debt was perceived as riskier, leading to expectations of a public bailout and further increasing the perceived risk in government bonds. Conversely, where banks were weak, their bailout caused difficulties for the sovereign. By allowing banks to switch from country-specific to euro area risk, eurobonds would help reduce the close ties between banks and the risks of individual sovereigns.

Providing a liquidity premium. By trading in a unified sovereign bond market much larger than the market for any single sovereign, eurobonds would deliver a substantial liquidity gain.

Box 2.6. *(continued)*

Existing eurobond proposals promise to deliver to different degrees along these dimensions:

- Under *full eurobonds* (Boonstra, 2005, 2010), all euro area sovereign financing would be raised through common bonds. A joint agency would issue the common bond and distribute the proceeds. Full eurobonds would deliver the highest benefits in terms of lower borrowing costs for distressed sovereigns and improved resilience of the financial system. At the same time, full eurobonds would have the strongest distributional impact among participating members, posing high risks of moral hazard.

- *Partial eurobonds*, in the spirit of the "blue bond" proposal (Delpla and Weizsäcker, 2010), would convert national debt up to a certain share of GDP into eurobonds (the blue bond), with the rest to be issued nationally (the red bond). The safe bond would protect states from an acute funding crisis, while intensified market pressures on the national tranche would provide market discipline, limiting the risk of moral hazard. It would be difficult, however, to preserve the credibility of the ceiling once the blue bond allocation is exhausted. Financial stability benefits of partial eurobonds would be commensurate with the size of the safe component—ranging from 60 percent of GDP in the blue and red proposal to 10 percent of GDP in the eurobills proposal (Hellwig and Philippon, 2011). The wide range illustrates the difficulties in calibrating the strict limit that separates liquidity from solvency issues.

- The *pooling proposal* (Brunnermeier and others, 2011) would limit risk sharing while preserving liquidity benefits. Under this proposal, sovereign bonds would continue to be issued separately, leaving sovereigns subject to market discipline; but a synthetic security would be created with a safe tranche and a risky tranche. The safe tranche would help delink sovereign and banking risks.

A move toward eurobonds faces some political economy obstacles. While it is relatively straightforward to see how eurobonds can operate in a new steady state combined with a different governance structure, it is not obvious how one can move there from the current situation. Some proposals that address the political economy dimension are those of the German Council of Economic Experts (2011) and of Hellwig and Philippon (2011). Meant to be implemented on an experimental basis, both proposals preserve the political status quo and are compatible with current EU Treaty no-bailout provisions. The proposal of the German Council aims to reduce debt overhang by granting a joint guarantee for debt *above* 60 percent of GDP. The approach would have certain similarities to bonds issued by the EFSF, but financing would be an instrument available to all countries outside any crisis context. To ensure sufficient creditworthiness, some additional collateral would be provided by countries.

The euro area must coordinate national macroeconomic policies to ensure an orderly process of deleveraging and rebalancing.

Looming in the background of current market strains is the problem of large-scale imbalances across the euro area—persistently high deficits in some parts mirrored by persistent surpluses elsewhere—that were built up over the previous decade. A sudden stop in flows from savers to borrowers is now imposing harsh retrenchment costs on households and governments in several countries, often reinforced by simultaneous deleveraging in the banking system. Together, these forces could have a contractionary or even a deflationary impact that is self-defeating.

It is thus crucial to cushion the impact of adjustment with other policies geared toward supporting growth. These should include: (1) sufficiently accommodative monetary policy, consistent with the objective of price stability and the recognition that deflationary dynamics, once in train, are particularly difficult to reverse; (2) a sufficiently gradual withdrawal of fiscal support in countries not subject to market pressures; and (3) structural reforms that raise productivity, strengthen competitiveness, and thereby lay the foundation for stronger, sustained growth and more balanced external accounts.

These efforts need to be supported by financial policies aimed at ensuring an orderly deleveraging of the euro area banking system. Although lasting stabilization of government bond markets will go a long way toward

easing the pressures currently weighing on banks, additional targeted measures are needed, including:

- the restructuring of viable banks and the resolution of nonviable banks, whose continued existence allows problems to fester and weighs on the performance of the entire sector;
- funding support for viable banks under pressure through a centralized program of funding guarantees; and
- close macroprudential oversight by the European Systemic Risk Board (ESRB) and EBA along with national authorities to assess the aggregate impact of deleveraging and to alleviate pressure points.

Moreover, with an eye toward implementation of Basel III, supervisors need to ensure that credit institutions maintain adequate capital and liquidity positions beyond the horizon of the current EBA recapitalization exercise, notably by exercising adequate restraint on dividend and remuneration policies and monitoring the quality of instruments qualified as own funds.

These efforts should be set in the context of a move toward a more integrated currency union.

Steps are already under way to strengthen policy discipline and improve economic governance of the euro area. It is critical that future macroeconomic and financial imbalances be addressed and contained in a much more timely fashion. Enforcing a stricter fiscal framework is only one necessary element in that endeavor, as has been rightly recognized in the comprehensive reach of the EU's "six pack" legislation. A key role accrues, in particular, to proactive and countercyclical macroprudential policy, coordinated at the central level via the ESRB, that addresses the buildup of financial imbalances in a timely manner.

Over time, a move toward greater ex ante risk sharing will also be indispensible for a well-functioning monetary union. To this end, the euro area's financial system needs to be dealt with at the euro area level in all aspects that are crucial to financial stability, including supervision, deposit insurance, resolution, and backstopping with a mechanism for ex ante burden sharing. Greater fiscal risk sharing, conditional on more centralized fiscal governance,

is equally desirable to prevent individual euro area countries from running into financing difficulties even if their fundamentals are otherwise sound. Committing to both now is essential to break the pernicious link between banks and sovereigns, preserve the benefits of a highly integrated monetary union, and secure the prospect of lasting financial stability.

Important medium-term debt challenges are also looming in other key advanced economies, notably Japan and the United States.

Risks to financial stability are currently concentrated in Europe, but they are not confined there. The fiscal policy challenges facing Japan and the United States easily rival those anywhere in the euro area, yet there is much less progress to date in laying out strategies to address those challenges. Both Japan and the United States require credible multiyear plans of deficit reduction which protect short-term growth but reassure financial markets that debt will return to a sustainable trajectory over the medium term.

In the United States, mortgage debt burdens need to be made sustainable through programs to facilitate principal write-downs (Annex 2.3). The first steps along this path, notably the recent agreement between banks, regulators, and state attorneys general as well as legislation in the Senate, are welcome but insufficient. Targeted reduction of mortgage principal for homeowners with heavy debt burdens would best be encouraged through the passage of legislation permitting mortgage "cramdowns" in personal bankruptcy proceedings. On public debt, American policymakers need to adopt all reasonable means of bringing down deficits in the medium term; these include reform of entitlements and higher revenue through removing unwarranted tax breaks and simplifying marginal rates. Credible measures that deliver and anchor savings in the medium term will help create space for accommodating growth *today*—by allowing a more gradual pace of consolidation.

Derivatives markets could be a channel through which shocks affecting European banks and sovereigns are transmitted to U.S. banks (see Box 2.4 for details). While U.S. banks' net derivatives exposures to European counterparties are small, their large

gross positions are subject to large swings in market value, making the banks vulnerable to margin calls. The potential for destabilizing fire sales of assets is high, since quality collateral is scarce; and with derivatives market making concentrated among few broker-dealers, there is the potential for a failure cascade if a dealer experiences difficulties. The risks are partly offset by the capital buffers of U.S. banks, which a recent Federal Reserve stress test deemed adequate to withstand a global recession and adverse financial conditions (BGFRS, 2012a).

In Japan, policymakers need to take action to ensure the long-run sustainability of the sovereign debt market. Domestic banks have long held large portfolios of government bonds, and they increased those holdings over the past six months as many Japanese investors shifted out of foreign assets. This has compressed yields on government bonds over this period but has increased the longer-term risk of a large price adjustment that could impair bank capital. To reduce this risk, fiscal reform measures—including an increase in the consumption tax—are needed, as are financial reforms to reduce the vulnerability of banks' bond portfolios. A further priority for financial reform is action—already under way—to increase disclosure and monitoring of investment trusts that have recently served as a major conduit of household investment into complex and risky structured products.

Policymakers in emerging markets should stand ready to use their existing policy space to cushion negative external shocks.

For most emerging market economies so far, the deleveraging process that has been related to the actions of EU banks has been manageable. The authorities in these countries should stand ready to provide countercyclical support to their domestic economies within the available policy space identified in Table 2.4. In some cases, notably emerging Europe, this space is less than in 2008. Generally, however, the experience of 2008 shows that countercyclical policies, along with the creative deployment of targeted facilities and instruments, can be effective in sustaining growth in the face of a major external shock.

The scope for easing credit policy in particular is limited, as many emerging markets are already in the advanced stages of the credit cycle, as detailed in the September 2011 GFSR. Easing credit further would, therefore, add to domestic financial vulnerabilities, given that sustained periods of above-trend credit expansion tend to foreshadow higher nonperforming loan rates down the road.

A key challenge will be to control spillovers from the euro area into emerging Europe and elsewhere, notably by averting excessive retrenchment by EU parent banks.

Given existing vulnerabilities in some countries in emerging Europe, a major policy priority should be to ensure that deleveraging in this region does not become disorderly. Parent banks remain strategically committed to the region, but given increasing obstacles to cross-border capital movements and higher funding costs, their business model has seen some of its advantages reduced. To protect banking systems from pressures in the euro area, home and host regulators need to coordinate regulatory regimes to avert excessive home bias. Home regulators must avoid unilateral measures that threaten to accelerate deleveraging, while host regulators need to avoid an uncoordinated race to ring-fence liquidity and capital within national borders to the detriment of other countries. The "Vienna Initiative," which had helped avoid disorderly disengagement of western banks from central and eastern Europe in the crisis of 2008–09, also provides a useful platform to guard against undue home bias. "Vienna 2.0" was launched in January 2012 primarily with a view to stepping up such coordination and cooperation between home and host country supervisors.

Long-lasting stability of the financial system will be supported by progress in implementing the G20 regulatory reform agenda.

Long-lasting stability of the financial system will be supported by progress in implementing the G20 regulatory reform agenda. Priorities for G20 reform include the Basel III framework, policy measures for global systemically important financial institutions, resolution frameworks, and reforms to OTC

derivatives markets. Policy efforts to control the systemic risk from derivatives markets need to be further advanced, and oversight of the shadow banking system should be strengthened (see Box 2.7).

The regulatory reform agenda in the United States remains a work in progress, and while the Dodd-Frank Act is expected to come into force in 2012, much uncertainty remains over its final provisions (see discussion in Box 2.7 on the Volcker Rule). It is essential to move ahead expeditiously in all key areas of financial reform. In particular, the designation of systemically important financial institutions has to be pursued; the migration of risks into the shadow banking system has to be closely monitored; and a proactive approach to surveillance of systemic risk has to be firmly grounded in the Financial Stability Oversight Council. Furthermore, the current juncture calls also for a proactive monitoring of the potential spillovers from Europe. The ongoing Federal Reserve stress tests and the recent call by the Securities and Exchange Commission to broaden the disclosure of European exposures are welcome steps to improve understanding of these spillovers.

In Europe, important progress has been made on the regulatory reform agenda, but more remains to be done. The European Commission proposal for EU-wide legislation (Capital Requirements Regulation/Capital Requirements Directive IV) to implement Basel III is a significant step toward improving regulatory standards. The proposal aims to achieve a common standard, implementing the Basel III requirements with maximum harmonization. Given prevailing balance sheet uncertainties—and in the absence of a common institutional framework, including EU-wide resolution arrangements and a fully unified fiscal backstop—higher standards are needed, and there should be adequate flexibility for prudential policies at the national level while duly taking into account cross-border spillovers and home-host coordination requirements. Furthermore, as the legislation is finalized, there should be an unequivocal commitment to implement the leverage ratio and net stable funding ratio in 2018, as agreed under Basel III.

Policy efforts to control the systemic risk from derivatives markets need to be further advanced, with special emphasis on ensuring consistency among the regulatory regimes across jurisdictions and close cooperation among supervisors. The proposed arrangements—such as central counterparties (CCPs)—are intended to improve price transparency in the market and facilitate better risk management but, to be effective, they require strong operational controls, appropriate collateral requirements, and sufficient capital. Because of the global nature of the derivatives market, supervising CCPs will require close cross-border coordination among national supervisors and regulators.

Box 2.7. Update on Regulatory Reforms

Progress has been made in the regulatory reform agenda since the September 2011 GFSR, but the work is not yet complete, and important implementation challenges remain (Figure 2.7.1). It is critical that the international community remain focused on consistent, timely, and high-quality implementation of the G20 regulatory initiatives. Strong multilateral commitment is key to ensuring the credibility of the reform agenda and avoiding regulatory arbitrage.

Implementation will be closely monitored and supported, not least through the Coordination Framework for Implementation Monitoring, newly developed through the Financial Stability Board (FSB), which aims at fostering discipline and transparency regarding individual countries' progress. Priority areas include the Basel III capital and liquidity framework, policy measures for global systemically important financial institutions (G-SIFIs), domestic and cross-border resolution frameworks, over-the-counter (OTC) derivatives market reforms, and data gaps.

Basel III

Implementation of the Basel III capital and liquidity framework is under way in several jurisdictions. Australian authorities have completed the first round of consultations on Basel III, while in the EU the Capital Requirements Directive IV (CRDIV) and associated Capital Requirements Regulation draft legislative proposals were issued in July 2011 for European Council and European Parliament action. The EU text assists the member states in meeting the Basel III deadline, though some elements of the initial proposal were not in full conformity with the agreed-upon Basel norms. In addition, the European Commission has launched a new high-level Expert Group to examine structural aspects of the EU's banking sector. Its final report to the Commission is due by end-summer 2012. The Basel Committee on Banking Supervision (BCBS) is monitoring implementation progress through its Standards Implementation Group. Assessing consistency of implementation will be challenging, but it is critical to ensuring that Basel III achieves the desired improvement in the resilience of the global financial system.

Note: Prepared by Ana Carvajal, Michaela Erbenova, Eija Holttinen, and Katharine Seal.

Figure 2.7.1. G20 Regulatory Reform Agenda: Key Elements and Status

→ Agreed (international guidelines)
or accomplished (national implementation)
→ Work in progress
→ Insufficient progress
→ Nothing available to implement

International guidelines		National implementation
	Bank capital and liquidity	
	SIFI framework	
	Shadow banking	
	OTC derivatives	
	Credit ratings	
	Data initiatives	

Note: OTC = over-the-counter; SIFI = systemically important financial institutions.

G-SIFIs

The policy measures to address G-SIFIs, discussed in the September 2011 GSFR, have now been published (BCBS, 2011). These include the methodology to identify global systemically important banks (G-SIBs) and the details of additional loss absorbency capital requirement to be met with common equity: 1 percent to 2.5 percent of risk-weighted assets, with a potential ("empty bucket") supplemental capital charge of 3.5 percent to discourage any increase in systemic importance. The initial list of 29 G-SIBs has been published. The list will be revised annually and the methodology reviewed periodically. Implementation of the revised G-SIB standards will be phased in from 2016 and apply to the designated G-SIBs in 2014.

SIFI policy work through 2012 will focus on applying the SIFI framework to domestic systemically important banks and to systemically important nonbank financial entities. National implementation of the G-SIFI requirements, including progress on the resolution regimes, will be evaluated by a newly created Peer Review Council.

Resolution Regimes

Implementation of effective domestic and cross-border resolution regimes is a key component of the reform agenda. Following the July 2011 consultation,

Box 2.7. *(continued)*

the FSB in November released standards for effective resolution regimes (FSB, 2011c). It requires jurisdictions to have resolution authorities with a broad range of powers to resolve G-SIFIs (including nonbanks), to reduce impediments to cross-border cooperation, and to ensure that recovery and resolution plans and crisis management groups are in place, at least for banking groups that have been designated as G-SIFIs. Material progress has been achieved by many jurisdictions, including establishing cross-border crisis management groups. Full implementation, however, will depend on strong political commitment, as it will require legislation to, among other things, enhance cross-border cooperation and information sharing and extend the range and scope of resolution powers for financial groups in home and host jurisdictions.

Protecting Retail Banking

Further work is needed before rules and proposals aimed at limiting the scope of large banking groups can be implemented—in the United States, the "Volcker rule"; and in the United Kingdom, the proposals of the Independent Commission on Banking (ICB).

The Volcker rule (section 619 of the Dodd-Frank Act) bans proprietary trading and investments in private equity and hedge funds by U.S. banks, their domestic and overseas affiliates and bank holding companies, and by U.S.-based operations of foreign banks. The affected banks will be able to provide other services, including underwriting, market making, and risk-mitigating hedging activities. A narrow set of securities—debt issued by U.S. federal, state, and municipal governments, government-sponsored enterprises, and federal agencies—remains exempt from the ban on proprietary trading, but non-U.S. government bonds are not exempt. Non-U.S. banks can continue to engage in business activities prohibited by the rule so long as it is conducted outside the United States and does not involve engagement of U.S. residents and personnel. The Volcker rule presents several issues that need careful consideration to ensure a level playing field and avoid unintended consequences. In particular, potential implications for market liquidity and pricing of non-U.S. sovereign debt as well as for the activities of non-U.S. entities need to be further analyzed.

Measures should be taken to avoid potential adverse implications, including clarification of the scope and coverage of the rules.

In the United Kingdom, the recommendations of the ICB were released in September 2011. If adopted by the U.K. authorities and if permitted under CRDIV, the proposals would require strict ring-fencing of retail banking to separate it from both global wholesale banking and investment banking for all banks in the United Kingdom; and a minimum level of capital and "bail-inable" debt for ring-fenced banks and G-SIBs of between 10.5 percent and 20 percent of risk-weighted assets, depending on their size and systemic importance. The ICB responded to industry feedback by allowing flexibility on both the timing (with a long phase-in period) and the ring fence (wholesale services for nonfinancial corporations in the European Economic Area can be included in the ring-fenced entity). Separation of retail from investment banking operations will undoubtedly make it easier to resolve the retail bank. However, without accompanying measures for tighter regulation, intensive supervision, and progress on cross-border resolution arrangements, ring-fencing will not be sufficient to ensure the financial stability of the banking groups.

Shadow Banking

Further progress has been achieved in establishing a broad framework for monitoring shadow banking. As broadly defined in an agreement issued in April 2011 (FSB, 2011a), shadow banking consists of all bank-like credit intermediation conducted outside of the banking sector that could give rise to regulatory arbitrage or systemic risk; the bank-like activities include maturity transformation, liquidity transformation, leverage, and risk transfer. Using this broad definition, the FSB's Shadow Banking Task Force in October 2011 set out high-level principles for effective monitoring and a process for mapping shadow banking using a common template for data collection (FSB, 2011d).

Through that report the FSB also committed to conduct annual shadow banking monitoring exercises to assess global trends and risks. The first monitoring exercise will take place in 2012, with

Box 2.7. *(continued)*

the results scheduled to be reported to the G20 in the fall. The October report also set out general principles for the regulation of shadow banking and identified five additional work streams: (1) banks' interactions with shadow banking entities (report due July 2012), (2) money market funds (due July 2012), (3) other shadow banking entities (due September 2012), (4) securitization (due July 2012), and (5) securities lending and repurchase agreements (due end-2012).

OTC Derivatives

The OTC derivatives reform program adopted in 2009 at the G20 Leaders' Pittsburgh Summit has been progressing very slowly. Achieving a sufficient degree of transparency and safety in derivatives markets is crucial for avoiding the destabilizing effects they evidenced in the first years of the crisis. The international standard-setting bodies have intensified work on developing policy and standards in this area: Reports were issued in quick succession in early 2012 by the International Organization of Securities Commissions (IOSCO) on requirements for trading (IOSCO, 2012a) and clearing (IOSCO, 2012b) and, with the Committee on Payment and Settlement Systems, the reporting of derivatives data (CPSS and IOSCO, 2012). In October 2011, the FSB said it would step up its own coordination of international policy work, and it subsequently established a senior-level coordination group.

Several FSB member jurisdictions have reached important legislative and regulatory milestones regarding OTC derivatives: in the European Union, the European Market Infrastructure Regulation (EMIR), approved in early 2012; in the United States, various rules aimed at implementing the Dodd-Frank Act; in Japan, the Financial Instruments Exchange Act (FIEA), revised in May 2010; and in Singapore, the Monetary Authority's consultation paper on the regulation of OTC derivatives (MAS, 2012). The EMIR, the revised FIEA, and the Dodd-Frank Act set out strong measures to improve the transparency, resilience, and regulatory oversight of the OTC derivatives markets; the measures include regulations for a clearing obligation for eligible OTC derivatives with provisions to reduce

counterparty credit risk and operational risk for bilaterally cleared OTC derivatives; common rules for central counterparties; and a reporting requirement for OTC derivatives. Both the EMIR and Dodd-Frank provisions are expected to come into force during 2012, although there may be delays in the preparation of implementing measures. In parallel to national implementation, it is essential to ensure sufficient consistency among the various regimes to avoid overlaps, gaps, and conflicts that can be harmful to the achievement of the G20 goals.

Data Gaps

Addressing data and information gaps is necessary to improve the understanding of the global financial architecture and enable better monitoring of emerging risks and vulnerabilities that might threaten financial stability. Work to identify the data gaps and develop common data templates for G-SIBs is under way; key decisions on data requirements are due this year.

Credit Rating Agencies

Improving the regulatory oversight, governance, and transparency of credit rating agencies remains an important priority. The FSB called for reduced regulatory reliance on credit ratings in October 2010, but little progress has been made on this front. Developing alternative credit risk metrics that are objective and verifiable remains a challenge.

Summary

With many important policy goals in initial stages of implementation, the momentum of reform and the coherence of agreed policies must be sustained as implementation progresses. In particular, strong political commitment is essential to strengthen supervision while extending its scope to previously uncovered areas; to develop effective resolution regimes, including for cross-border firms; and to continue to address systemic risk across all financial sectors. The international financial institutions must remain vigilant and steadfast in their support for consistent and timely implementation.

Annex 2.1. Methodology for the EU Bank Deleveraging Exercise

The aim of the EU bank deleveraging exercise conducted for this GFSR was to assess the potential scale of asset reduction at EU banks and the potential impact on lending to the private sector, after taking into account banks' capital generation. The exercise used the balance sheet and profit data of 58 large EU banks included in the 2011 recapitalization exercise of the European Banking Authority (EBA).[20] The scale of deleveraging is assessed by simulating the balance sheet adjustments of the sample banks needed to achieve certain structural targets under three scenarios with varying amounts of cyclical pressure, such as sovereign stress and bank funding strains.

Dataset

The analysis relies on the detailed balance sheet data of the banks in the sample. The main balance sheet items—for both the assets and liabilities side of the balance sheet—plus data on profits and losses come from SNL Financial. Those data are supplemented with a geographic breakdown of loan portfolios and government bond holdings from the 2011 EBA stress test.[21]

For each bank, the total loans provided to a given country or region are divided into direct cross-border lending and lending by the bank's subsidiaries that are incorporated in that country or region. Data on individual subsidiaries in OECD countries and emerging markets are from Bankscope and bank regulators. Cross border lending is estimated as the difference between EBA total exposure of a sample bank to a given country and total loans of its subsidiaries in this country. Table 2.5 shows the key balance sheet items that are used in this exercise. Data on the level of core Tier 1 capital and risk-weighted assets are from the December 2012 EBA recapitalization exercise.[22]

Note: Prepared by Sergei Antoshin, Eugenio Cerutti, Jeanne Gobat, Anna Ilyina, and William Kerry.

[20]The banks are listed at the end of the annex.

[21]If EBA geographical breakdowns for a country or region were not reported for a bank despite its having operations in those areas, the breakdowns were obtained from bank-level data.

[22]Core Tier 1 capital is a subset of Tier 1 capital made up mainly of common shares and retained earnings.

Table 2.5. Selected Bank Balance Sheet Items

Assets	Funding Liabilities
1. Cash and equivalents	**1. Customer deposits**
2. Interbank loans	**2. Interbank deposits**
3. Securities	**3. Short-term debt**
Nongovernment securities Government bonds *Of which,* Issued by country 1 Issued by country 2 . . . etc. Other financial assets	*Of which,* Held by U.S. money market funds
4. Customer loans	**4. Term debt**
In country 1 *Of which* **Direct cross-border loans** **Subsidiaries loans** Residential mortgages Other consumer credit Commercial loans Other credit *In country 2* . . . etc.	*Of which,* Covered bonds Senior unsecured Subordinated debt

Framework

Scenarios

Three scenarios—underpinned by assumptions about the policy response to the euro area crisis—are considered.

- In the *current policies* scenario, sovereign spreads remain elevated and funding market pressures persist. Some banks are unable to roll over some of their term funding or are unable to access short-term U.S. dollar funding. A few institutions face a continuation of deposit outflows—although they are cushioned by the impact of the ECB's December and February three-year LTROs. Bank profits also remain under some pressure. The scenario also includes a trend toward a progressive increase in home bias within the euro area, characterized by diminished cross-border flows and increasing financial fragmentation along national lines.

- In the *complete policies* scenario, policymakers fully implement a comprehensive solution to the euro area debt crisis. This leads to a sharp tightening in sovereign spreads, a pronounced easing of funding market pressures, an increase in bank capital from private or public sources as funding markets fully open, and greater bank profits through a lowering of loan losses.

- In contrast, sovereign spreads increase in the *weak policies* scenario, and funding pressures intensify, overwhelming the two LTROs. Banks are unable to roll over a greater portion of debt coming due; they face further pressures in short-term markets and increased deposit outflows. Loan losses mount, reducing bank profitability. Markets also force banks to compress the time over which they reach structural targets, which amplifies deleveraging forces.

In each scenario, bank deleveraging is driven by a combination of structural targets and cyclical factors.

Structural Targets

The *structural* targets in this exercise reflect the key structural forces that are likely to shape banks' balance sheets over the medium term. These targets include : (1) stronger capitalization, modeled through a 9 percent core Tier 1 ratio; (2) lower reliance on less-stable (short-term, wholesale) sources of funding, proxied with an estimated net stable funding ratio (NSFR); and (3) other adjustments in banks' business models to adapt to the new regulatory and market environment (proxied by announced bank business plans).

The 9 percent core Tier 1 capital target. The target is based on the data published by the EBA for its recapitalization exercise that are consistent with Basel 2.5 methodology. Information on bank capital raising, liability management, and risk-weighted optimization has been used where available.

The NSFR. This target is estimated in line with the methodology used in Chapter 2 of the April 2011 GFSR. The NSFR is defined as a bank's available stable funding (ASF) divided by its required stable funding (RSF). In the scenarios, banks target

an NSFR of 100 percent. The NSFR sets the proportion of long-term assets that should be funded by long-term, stable funding. The NSFR calculation is underpinned by a number of assumptions, including on the weights used for each of the components, which are set to broadly reflect the liquidity of banks' balance sheets (Table 2.6).

Bank business plans. Plans were collected from various sources, including banks' annual reports and presentations to investors (see Box 2.2).

The simulations cover September 2011 to December 2013, though banks are allowed varying time horizons to meet the structural targets. The core Tier 1 target is to be met in 2012 (in line with the EBA schedule), the restructuring plans in 2013, and the NSFR in 2018. For announced bank plans that extend beyond 2013, the exercise includes, pro rata, only the portion up to 2013. For the NSFR target, banks are assumed to adjust linearly, that is, 2/7 of the total required adjustment takes place during 2012–13 in the *current policies* and *complete policies* scenarios. This adjustment is accelerated in the *weak policies* scenario.

Cyclical Factors

Assumptions vary across the scenarios regarding two key cyclical factors: (1) bank funding conditions, and (2) bank capital generation. The latter incorporates retained earnings, which are a function of the degree of sovereign stress, macroeconomic conditions, and bank capital raising.

Funding pressures. These vary in the three scenarios through differing assumptions about strains in funding markets. Table 2.7 presents the weighted average rollover rates for banks in the scenarios for

Table 2.6. Weights Used in Calculation of the Net Stable Funding Ratio

Available Stable Funding	Weight	Required Stable Funding	Weight
Equity	1.00	Cash	0.00
Demand deposits	0.80	Customer loans	0.75
Savings and term deposits	0.85	Residential mortgages	1.00
Interbank deposits	0.00	Corporate loans	0.85
Repurchase agreements	0.00	Interbank loans	0.00
Short-term debt	0.00	Trading and AFS securities	0.20
Trading liabilities	0.00	Held to maturity	1.00
Other term debt maturing in 1 year or less	0.85	Net derivative assets	1.00
Term debt maturing in more than 1 year	1.00	Other assets	1.00
Other reserves	1.00	Reserves for NPL	1.00

Note: Weights for items in italics are IMF staff judgments. AFS = available for sale. NPL = nonperforming loans.

Table 2.7. Average Rollover Rates for Bank Funding under Three Policy Scenarios
(In percent)

Scenario	Customer Deposits	Interbank Deposits and Repurchase Agreeements	Short-Term U.S. Dollar Funding	Other Short-Term Funding	Unsecured Term Funding (due 2012–13)	Covered Bonds (due 2012–13)
Complete policies	100	100	100	100	100	100
Current policies	99	100	85	100	70	100
Weak policies	95	95	50	95	40	98

Source: IMF staff estimates.

both wholesale and deposit funding. The average rollover rates in the current policies scenario have been informed by prevailing market conditions. The rollover rates applied in the scenarios vary across the banks in the sample. These funding strains are netted off against increases in bank capital over the two years, as well as against net liquidity from the December and February three-year LTROs used by banks to offset maturing debt. This netting also accounts for banks repaying the LTROs funding.

Bank capital generation. Profits and losses are based on a model that links retained earnings to macroeconomic conditions. Using dynamic panel models for various components of the income statement, we forecasted retained earnings on the basis of GDP growth.

In the *complete policies* scenario, profits are increased through an easing in sovereign pressures as gains are recorded on holdings of government bonds. Conversely, in the *weak policies* scenario, profits are adversely affected by the rise in sovereign stress. Mark-to-market gains and losses are calculated according to the evolution of sovereign spreads in the euro area countries between the spot rates in 2011:Q3 and the forward rates for 2013:Q4, calculated as of March 2012. The mark-to-market gains and losses are computed for sovereign and interbank exposures and are also channeled through the loan book as additional gains and losses on other private sector exposures (as described in Chapter 1 of the September 2011 GFSR).

In all three scenarios, the level of capital increases not only through retained earnings, but also through capital raising and liability management exercises that have occurred this year or are planned over the scenario horizon (Figure 2.54). In the *complete policies* scenario, banks are also able to raise capital to meet the core Tier 1 ratio target. The three scenarios

Figure 2.54. Capital Generation under Three Policy Scenarios
(In billions of U.S. dollars)
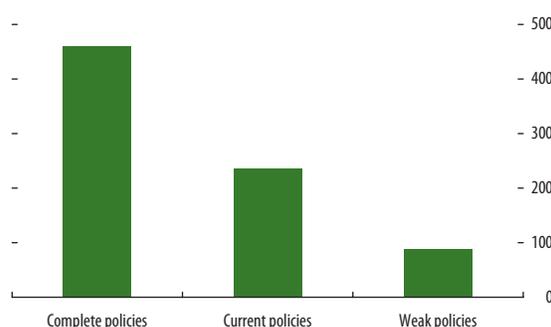
Source: IMF staff estimates.
Note: For a sample of 58 large EU banks.

also account for risk weight optimization when information is available.

Amount of Deleveraging

Banks can strengthen their capital ratios by raising equity, retaining more earnings, or conducting liability management exercises (the green boxes in Figure 2.55). Similarly, banks can improve their structural funding ratios by shifting toward more stable sources of funding, such as deposits and more long-term wholesale funding. In an environment in which such measures are difficult or costly, banks may opt to reduce assets in order to achieve their structural targets.

Negative cyclical factors, such as bank funding conditions and sovereign stress, can lead to further deleveraging pressures (for example, some banks may be forced to scale back their activities because of the high cost of U.S. dollar funding or their inability to roll it over). If positive, cyclical factors can reduce deleveraging pressures.

For each sample bank, the total *required deleveraging* (asset reduction, after taking into account banks

Figure 2.55. How Can Banks Improve Capital and Liquidity Ratios?
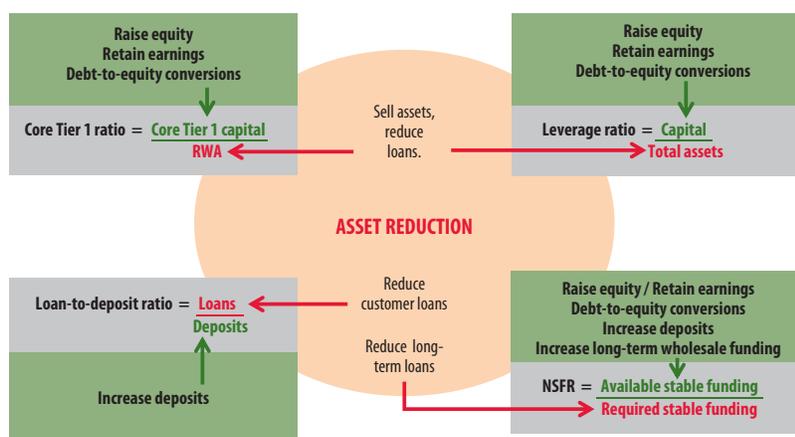
Source: IMF.
Note: NSFR = net stable funding ratio.

capital generation) is determined by comparing the amounts and time frame of required deleveraging to achieve each of the structural targets (described above), as well as to close a (potential) funding gap.

The deleveraging is then implemented according to a bank-specific business plan, if such plan is available, or through a generic deleveraging strategy.

Deleveraging Strategy

In the absence of detailed information on restructuring plans, banks are assumed to follow a generic deleveraging strategy. Under that strategy, banks are assumed to reduce assets according to a predetermined *pecking order* (Table 2.8) in which they consider selling nongovernment securities and foreign government securities before turning to loans. With regard to the loan portfolio, the deleveraging strategy is assumed to have a built-in home or regional bias. This means that loan books are first reduced outside the advanced EU economies, then in advanced EU economies (outside the home country), and finally in the home country. Within each of these country "buckets", the deleveraging order depends on risk weights—higher risk weight exposures are reduced before lower risk weight exposures (Table 2.8). The latter means that banks seek to achieve their capital targets through minimal reduction in total assets. Furthermore, the strategy is designed to protect

consumer lending in general and domestic lending in particular, as it forces banks to reduce other assets first.

The deleveraging strategy is based on observed bank behavior. The assumed pecking order for securities and commercial banking activities reflects what has happened to date—with a number of European banks scaling back their noncore and dollar-funded activities and banks publicly announcing their business plans—as well as banks' likely reaction to the increase in risk weights under Basel 2.5. The regional or home bias is visible, to some extent, in the evolution of banks' private sector foreign claims during 2011:Q3 (see Figure 2.25).

To ensure that banks continue to hold a minimum level of liquid assets for microprudential purposes, it is assumed that securities and interbank loans are reduced in proportion to total assets. In addition, to ensure that there are no discounts or premiums on asset sales (and hence, no second-round effects on other banks), the cutbacks in securities and interbank claims are capped as a percentage of exposures for each bank (Table 2.8). Thus, banks with large investment banking activities have more room to reduce assets before getting to the loan portfolios.

Finally, when deciding on the reduction of foreign loan books, banks take into account their funding

Table 2.8. Bank Deleveraging Strategy

Pecking Order—Highest to Lowest Priority	Action
1. Nongovernment securities	Reduce in proportion to total assets up to 10 percent of nongovernment securities
2. Foreign government bonds	Reduce up to 10 percent of foreign government bonds
3. Interbank loans	Reduce in proportion to total assets up to 10 percent of total interbank loans
4. Noncore assets	Sell up to 100 percent of noncore assets

5. Customer loans[1]
  5.1. Cross-border loans outside advanced EU economies
  5.2. Subsidiaries' loans outside advanced EU economies
  5.3. Cross-border loans to advanced EU economies (outside home country)
  5.4. Subsidiaries' loans in advanced EU economies (outside home country)
	Roll off maturing loans, but only up to the point at which the rolloff amount is less than or equal to loans minus deposits. For cross-border loans, this calculation is performed at the parent bank level. For subsidiaries' loans, the calculation is performed at the subsidiary level.[2]

5.5. Domestic loans	Roll off maturing loans

[1]The order in which country exposures are considered within each of the categories is based on risk weights computed using the Basel II standardized approach. Higher risk-weight exposures are reduced first.

[2]In cases where loan rolloffs are insufficient to meet the deleveraging target, the bank can consider selling subsidiaries before reducing domestic loans, provided that such sale does not lead to a reduction in the bank's capital ratio given bank valuations prevailing in the local market (i.e., the price-to-book ratio of the banking equity index in a given country).

structure—that is, a stock of loans, x percent of which is funded by local deposits, cannot be reduced by more than $(100 - x)$ percent.

Impact on EU Country Credit

Although the exercise is based on a sample of large EU banks, the results shown in Figures 2.32 and 2.33 are extended to the entire banking system so that they can be compared with macroeconomic data. This extension was done as follows:

- Compute the *out-of-sample credit* for each country. Out-of-sample credit in country X = domestic credit in country X – (sample credit in country X – cross-border credit in country X).

- Compute the *impact of out-of-sample banks* on domestic credit in each country using a weighted average of representative sample banks' percentage cut in credit to the level of out-of-sample credit.

- Compute the impact of *out-of-sample banks* on cross-border credit on a borrowing country. Apply the "average sample bank's" percentage reduction in cross-border credit to the level of out-of-sample cross-border credit for the same borrower country or region.

- Compute the final *impact on credit* in each country. Impact on credit in country X = change in sample bank credit (both domestic and cross-border) in country X + change in out-of-sample domestic credit in country X + change in out-of-sample cross-border credit in country X.

Banks Included in the Exercise

Austria
Erste Group Bank AG
Raiffeisen Zentralbank Österreich AG

Belgium
Dexia SA
KBC Group NV

Cyprus
Marfin Popular Bank Public Company Limited
Bank of Cyprus Public Company Limited

Denmark
Danske Bank A/S
Jyske Bank A/S
Sydbank A/S

Finland
OP-Pohjola Group Central Cooperative

France
BNP Paribas SA
Crédit Agricole SA
BPCE
Société Générale SA

Germany
Deutsche Bank AG
Commerzbank AG
Landesbank Baden-Württemberg
Deutsche Zentral-Genossenschaftsbank AG
Bayerische Landesbank
NORD/LB Norddeutsche Landesbank Girozentrale
WestLB AG
HSH Nordbank AG
Landesbank Berlin Holding AG
DekaBank Deutsche Girozentrale
Westdeutsche Genossenschafts-Zentralbank AG

Hungary
OTP Bank Nyrt

Ireland
Allied Irish Banks Plc
Bank of Ireland

Italy
Intesa Sanpaolo SpA
UniCredit SpA
Banca Monte dei Paschi di Siena SpA
Banco Popolare Società Cooperativa
Unione di Banche Italiane SCpA

Luxembourg
Banque et Caisse d'Epargne de l'Etat, Luxembourg

Netherlands
ING Bank N.V.
Rabobank Group
ABN AMRO Group NV
SNS Bank NV

Poland
PKO Bank Polski SA

Portugal
Caixa Geral de Depósitos SA
Banco Comercial Português SA
Banco Espírito Santo SA
Banco BPI SA

Slovenia
Nova Ljubljanska Banka d.d.
Nova Kreditna banka Maribor d.d.

Spain
Banco Santander SA
Banco Bilbao Vizcaya Argentaria SA
BFA BANKIA
Caja de Ahorros y Pensiones de Barcelona
Banco Popular Español SA

Sweden
Nordea Bank AB
Skandinaviska Enskilda Banken AB
Svenska Handelsbanken AB
Swedbank AB

United Kingdom
Royal Bank of Scotland Group Plc
HSBC Holdings Plc
Barclays Plc
Lloyds Banking Group Plc

Annex 2.2. Sovereign Risk in the United States, Japan, and Germany—Signals from the Markets

This annex summarizes financial market indicators used by investors to assess sovereign risk, from January 2009 to the present for the United States (Figure 2.56), Germany (Figure 2.57), and Japan (Figure 2.58). For each country, it also compares current readings with those for a recent crisis period relevant to that country: September 2011 for the United States, January 2010 for Germany, and mid-March to mid-April 2011 for Japan. Although markets can understate or overstate risk, and prices may sometimes reflect short-term technical factors rather than fundamentals, these measures as a group provide a snapshot of broad financial market sentiment regarding the sovereign risk of these countries.

United States

U.S. sovereign risk concerns have eased significantly since the budget crisis of 2011: Investors treated U.S. markets as a safe haven in the midst of the EU crisis, and U.S. assets outperformed most peers globally last year. The relative strength of recent U.S. economic activity reinforced this sanguine view. However, significant risks remain, as medium-term fiscal reforms remain unresolved, and political gridlock persists.

Overall, risk levels have declined since the beginning of September 2011 (Figure 2.56). Fixed income indicators such as cash and forward yield curve spreads have fallen as fears related to the budget crisis subsided, and yields on Treasury inflation-protected securities (TIPS) indicate that investors are not worried about either inflationary or deflationary scenarios at present. The spread between 10-year Treasuries and the bund is higher, but this reflects heavy flight-to-quality buying of bunds in response to the EU crisis rather than a negative view of the United States relative to Germany. In derivatives markets, long- and short-dated CDS spreads have fallen, and the interest rate swap curve has flattened. The dollar has strengthened, and gold has fallen from its peak of last year. Funding markets are calm, Treasury auctions have proceeded smoothly, and liquidity has been good.

Note: Prepared by Sanjay Hazarika and Martin Edmonds.

Nevertheless, significant risks remain. The lack of progress on medium-term fiscal consolidation (especially tax reform and reining in health care and pension costs) is a continuing concern (see Chapter 1, Table 1.1, which compares indebtedness in selected advanced economies; and Table 2.1 for sovereign vulnerability indicators). The Bush-era tax cuts will expire on December 31, and a range of automatic spending cuts are scheduled to kick in, which could derail the economic recovery. Low interest rates and falling unemployment may create a false sense of security and cause partisan gridlock to persist. Elevated long-dated swaption volatilities hint at continued worries about tail risks.

Germany

In November and December 2011, during the height of the euro area turmoil, German markets were a safe haven for investors, and local fixed-income markets outperformed their peers. The ECB's announcement of its three-year LTROs on December 8 led to a recovery in markets for sovereign securities from the periphery of the euro area. But German spreads remain at tight levels, and rates remain very low, indicating that Germany remains a safe haven and that fears about policy persist. However, as investors' attention moves to the future, there is a risk that if Germany broadens its support for the peripheral euro area, it could drive speculation about its own fiscal stability and thus pressure its own markets (see Tables 1.1 and 2.1).

Current market levels present a generally positive picture relative to January 2010 (the pre-EU crisis period), with most sectors indicating lower risk levels (Figure 2.57). Interest rates are generally lower across the board because the market for German government bonds has benefited from large safe haven flows. Derivatives present a more mixed picture: Interest rate swap rates are lower and the swap curve flatter in response to ECB policy, but swaptions volatility remains high in response to market worries about the EU reform package. In addition, German CDS spreads are higher, although they have recovered from the wide levels seen last year, and the euro remains under pressure. However, local funding conditions are nearly back at precrisis levels, and dollar funding has improved.

Figure 2.56. United States: Sovereign Market Indicators, March 2012

◆ September 2011 average

Minimum   Maximum

Indicator

Fixed income
2-to 30-year Treasury spread
10- to 30-year Treasury spread
2–25y5y Treasury forward spread
2–20y10y Treasury forward spread
5- to 30-year TIPS spread
10- to 30-year TIPS spread
2-year Treasury-OIS spread
10-year Treasury-OIS spread
10-year Treasury-bund spread

Derivatives
30-year swap spread
2-to 30-year swap rate curve
10-to 30-year swap rate curve
10y10y swaption volatility
30y30y swaption volatility
1-year CDS spread
5-year CDS spread
1-to 5-year CDS spread

Foreign exchange and commodities
USD Index
EUR/USD
CHF/USD
EUR/USD risk reversal
Gold

Funding markets
1-month Treasury bills
Eurodollar futures
Spot 3-month LIBOR
Forward LIBOR-OIS
Overnight general collateral repo
Overnight effective federal funds rate
7-day commercial paper
30-day agency discount note
3-month EUR/USD basis swap
5-year EUR/USD basis swap

Sources: Bloomberg L.P.; and IMF staff estimates.
Note: For each indicator of sovereign risk, the color of the bar shows its current market value (the average for the month from mid-February to March 13, 2012) in relation to the range of daily readings it took during the *reference period* from January 1, 2009, to the same end date. The reference period roughly covers the transformation of the financial crisis into more of a sovereign credit crisis, and hence the indicators during that period registered a wide range of values for perceptions of sovereign risk. Shades of green signify that the current value is closer to the reference-period level that represented the greatest complacency regarding sovereign risk; shades of red signify a current value closer to the reference-period level representing the greatest alarm. CDS = credit default swaps. LIBOR = London interbank offered rate. OIS = overnight indexed swap. TIPS = Treasury inflation-protected securities.

Figure 2.57. Germany: Sovereign Market Indicators, March 2012

◆ January 2010 average

Minimum ◼◼◼◼◼◼◼◼◼◼◼◼◼◼◼◼◼◼◼◼◼◼◼ Maximum

Indicator

Fixed income
2- to 30-year bund spread
10- to 30-year bund spread
5-year breakeven rate
10-year breakeven rate
2-year bund-OIS spread
10-year bund-OIS spread
10-year bund–U.S. Treasury spread

Derivatives
30-year swap spread
2- to 30-year swap rate curve
10- to 30-year swap rate curve
10y10y swaption volatility
30y30y swaption volatility
1-year CDS spread
5-year CDS spread
1- to 5-year CDS spread

Foreign exchange and commodities
EUR index
EUR/USD
CHF/EUR
EUR/USD risk reversal
Gold

Funding markets
3-month bund bills
Euribor futures
Spot 3-month Euribor
Forward Euribor-OIS
3-month EUR/USD basis swap
5-year EUR/USD basis swap

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

Note: For each indicator of sovereign risk, the color of the bar shows its current market value (the average for the month from mid-February to March 13, 2012) in relation to the range of daily readings it took during the *reference period* from January 1, 2009, to the same end date. The reference period roughly covers the transformation of the financial crisis into more of a sovereign credit crisis, and hence the indicators during that period registered a wide range of values for perceptions of sovereign risk. Shades of green signify that the current value is closer to the reference-period level that represented the greatest complacency regarding sovereign risk; shades of red signify a current value closer to the reference-period level representing the greatest alarm.CDS = credit default swaps. Euribor = euro interbank offered rate. OIS = overnight indexed swap.

Figure 2.58. Japan: Sovereign Market Indicators, March 2012

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

Note: For each indicator of sovereign risk, the color of the bar shows its current market value (the average for the month from mid-February to March 13, 2012) in relation to the range of daily readings it took during the *reference period* from January 1, 2009, to the same end date. The reference period roughly covers the transformation of the financial crisis into more of a sovereign credit crisis, and hence the indicators during that period registered a wide range of values for perceptions of sovereign risk. Shades of green signify that the current value is closer to the reference-period level that represented the greatest complacency regarding sovereign risk; shades of red signify a current value closer to the reference-period level representing the greatest alarm. FRA = forward rate agreement. JGB = Japanese government bonds. LIBOR = London interbank offered rate. OIS = overnight indexed swap.

The primary risk comes from perceptions that euro area stability actions adopted by the EU may raise concerns about the fiscal position of Germany itself. The potential for credit downgrades and a reversal of safe haven flows from Germany out of the euro area altogether (that is, to the United States or Japan) could lead to pressure on German government bonds and related markets.

Japan

Events in Japan over the past year were obviously dominated by its reaction to and recovery from the earthquake. Overall economic performance has yet to recover, and equity markets remain well below the levels seen before the tragedy; but the relatively benign state of fixed-income and derivatives markets suggests that there are few immediate concerns. The key short-term risk is a continued strengthening of the yen, while concern about the overall debt level remains a medium-term risk.

In fixed-income markets, the spread to U.S. Treasuries has declined from the time of the earthquake (mid-March to mid-April 2011), while the Japanese government bond yield curve has flattened (except at the very long end) (Figure 2.58). Derivatives market signals are also generally positive, although CDS spreads have widened along with those of Germany, the United States, and other countries. The yen is a key concern due to its effect on prospects for exporters, as continued yen strength is believed to exacerbate the headwinds caused by the earthquake. From a longer-term perspective, the overall government debt level remains a worry, and Japanese markets remain vulnerable to a sharp rise in bond yields (see Tables 1.2 and 1.3).

Annex 2.3. Developments in U.S. Housing Markets

The depressed U.S. housing market has weighed significantly on the overall economy. Implementation of more-effective housing policies would help reduce foreclosures and hasten the recovery of both the housing market and the broader economy.

Instead of powering the economy as it has done after past recessions, the U.S. housing market has remained depressed since the Great Recession. This persistent weakness reflects the difficulty of adjustment after years of excessive increases in homeownership and home building. The number of excess housing units is currently estimated to be about 2 million, down from 5 million in 2008 because of anemic construction rates over the period.

Beyond its direct effect on GDP, lower residential investment has also affected the overall recovery through the worsening of household balance sheets and the accumulation of mortgage-related losses by banks and other investors.

Downside risks to housing remain elevated in light of a still-unsettled economic outlook and a large shadow inventory of homes.[23] An estimated 3.7 million properties now in the shadow inventory could end up in distress sales within three to four years. Foreclosed properties often sell at a discount of as much as 27 percent (Campbell, Giglio, and Pathak, 2011), and foreclosed properties dampen neighboring prices by 1½ to 2 percent (Hartley, 2011). A recent legal settlement that resolved claims about improper foreclosures and lending abuses could imply more foreclosures in the short run due to an inventory of pending cases. Over the longer term, however, the settlement could lead to a nontrivial reduction in foreclosures through as much as $17 billion in relief for struggling homeowners.[24]

The likelihood of only a slow recovery in the housing market, even under a favorable economic

scenario, warrants policies to prevent a lengthy period of high foreclosure rates and elevated uncertainty on house prices. The existing federally sponsored programs to support the housing market—the Home Mortgage Modification Program (HAMP) and the Home Affordable Refinancing Program (HARP)—have so far had only a muted impact on the foreclosure crisis; but recent actions and proposals could potentially enhance their effectiveness.

The modification program, HAMP, is aimed at reducing delinquent and at-risk homeowners' monthly mortgage payments through modifications of the terms of their home mortgage. It has resulted in only about 0.95 million permanent modifications since its inception in April 2009. The authorities recently announced forthcoming enhancements to the program. Analysts judge that these enhancements could produce about 0.5 to 1 million additional modifications, which would have an appreciable impact on the foreclosure rate.[25] Incentives to lenders to offer principal reductions will be tripled and will be extended to the government-sponsored enterprises (GSEs) Fannie Mae and Freddie Mac, whose participation would make the impact of the program much more significant.

The refinancing program, HARP, is aimed at homeowners whose mortgages have high loan-to-value (LTV) ratios and are guaranteed or owned by the GSEs. The program has generated about 1 million refinancings since April 2009; but an estimated 8 million homeowners in the United States still have underwater mortgages (the market value of the property is less than the outstanding loan balance) at above-market interest rates. While the GSEs made some enhancements to the program in December 2011 to broaden its reach, the new measures appear insufficient to stimulate a large increase in refinancing.

More recently the Obama administration announced a legislative proposal to broaden access to refinancing for both non-GSE and GSE mortgages.[26] If effectively implemented, the expansion could potentially lead to additional refinancings

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Note: Prepared by Jihad Dagher.

[23]The shadow inventory comprises homes not listed for sale that either have mortgages that have been delinquent for more than 60 days or have severely underwater mortgages that are at a high risk of delinquency.

[24]Under the settlement, banks should allocate at least $10 billion toward principal reduction. Depending on how this is allocated between modifying own loans and private-label loans they service, the overall impact could range between $10 billion and $34 billion in principal reduction.

[25]See IMF (2011) for a discussion of the potential impact of expanded modification programs on foreclosures and house prices.

[26]The proposal would refinance non-GSE loans through a streamlined program operated by the Federal Housing Administration and financed through a fee on the largest financial institutions (at an estimated $5–$10 billion in total cost).

of about 5 million loans. That would create about $10 billion in savings on mortgage payments in the first year and potentially stem more than 150 thousand foreclosures; together, those effects could result in appreciable improvement in house prices of between ½ and 1 percent by 2014.[27] However, the proposal in its current form is not expected to be approved by Congress.

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[27]According to Remy, Lucas, and Moore (2011), an expansion of the refinancing program to GSE borrowers could result in about 3 million incremental refinancings. According to a recent Federal Reserve white paper on housing (BGFRS, 2012a), 1–2½ million non-GSE borrowers with high LTV ratios could qualify for refinancing if HARP were to be expanded to the non-GSE universe.

The Federal Housing Finance Agency (the regulator of the GSEs), also aiming to relieve downward pressures on housing, is setting up a program that helps transition foreclosed houses into rental housing, in the hope that this will minimize the negative impact of foreclosures on neighboring properties. This will also help expand the stock of rental housing at a time when demand for rental units is on the rise.

Finally, a further policy that could be considered would be to allow mortgages to be modified in courts ("cramdowns"). Cramdowns would help reduce foreclosures also by inducing voluntary principal reduction by banks (see IMF, 2011).

Annex 2.4. The ECB's LTROs: Keeping the Benefits and Avoiding the Pitfalls

The ECB's recent longer-term refinancing operations (LTROs) stemmed the escalation of market tensions in the euro area and bought valuable time to put in place a more durable stability. The LTROs were effective in removing systemic liquidity and funding pressures, bringing sovereign yields down, and avoiding a potential bank failure. Like any powerful medicine, the LTROs have some drawbacks and side effects, but there is also scope for mitigating these risks. The main risk is a sense of complacency, which could tempt governments to ease the pace and depth of needed fiscal, financial, and structural reforms.

In late 2011, the euro area and the global financial system were facing strong pressures. With interbank funding essentially frozen and sovereign yields widening to record high levels, a full-blown bank crisis was in the making. The consequences could have exceeded those experienced in the aftermath of the Lehman bankruptcy in 2008, threatening to bring capital markets and the international banking system to a halt and raising the specter of a global economic downturn.

The ECB's LTROs helped to prevent the escalation of the crisis and have bought valuable time to establish a more durable stability. In the absence of adequate institutional firewalls and backstops, the ECB stood out as the only institution with the credibility and means to prevent a financial meltdown. By providing €1 trillion in funding to banks, it helped stabilize markets and prevented a systemic crisis by:

- *Easing bank funding pressures and enabling euro area banks to refinance maturing debt.* LTRO funding covers more than 60 percent of banks' debt maturing in 2012 (Figure 2.59). More importantly, as funding pressures have eased, bank funding markets have partly reopened. Euro area banks were able to place €22 billion in senior unsecured debt during January 2012, and even some mid-tier peripheral banks were able to raise funding. The easing of collateral requirements ensured that small

Note: Prepared by Jorge A. Chan-Lau, Tommaso Mancini Griffoli, Mark Stone, Giovanni Dell'Ariccia, Luc Laeven, Alasdair Scott, and Nico Valckx.

Figure 2.59. ECB LTROs and Bank Term Funding
(In billions of euros)
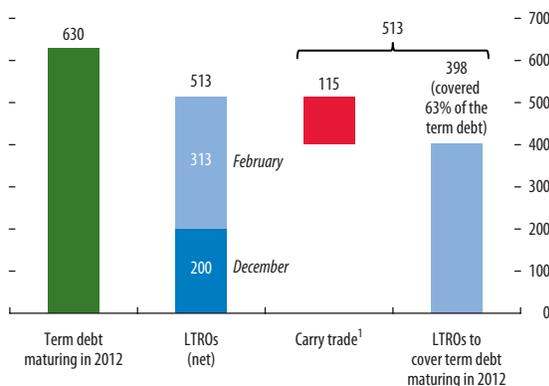
Sources: Dealogic; ECB; and IMF staff estimates.
Note: LTROs = longer-term refinancing operations.
[1]The change in euro area monetary and financial institutions' holdings of government bonds from end-November 2011 to February 2012.

and medium-sized banks could also benefit from access to ECB funding. With funding pressures receding, the risk of a sudden reduction in credit growth hurting the real economy has decreased substantially. Some 800 banks participated in the most recent LTROs, giving cause for optimism that this second round of increased liquidity would find its way into the real economy, particularly for small and medium-sized enterprises.

- *Driving sovereign yields down (Figure 2.60) and reducing the likelihood of generalized bank runs.* Banks in the peripheral euro area, especially Italy and Spain, have used some of the proceeds from the first liquidity injection (reportedly also from the second round of LTROs) to purchase their own domestic sovereign debt, supporting bank earnings and helping to compress yields. Euro area banks' holdings of government securities increased by about €115 billion from end-November 2011 to February 2011 (Figure 2.59), or about one-fifth of the total LTROs over that period.

- *Restoring market confidence by reassuring market participants that the ECB has both the resources and the will to contain the crisis.* Risk assets—equities and corporate credit—rallied following the LTROs allotments.

Like a powerful medicine, the LTROs have side effects and thus are subject to a health warning.

Figure 2.60. Sovereign Bond Yields for Italy and Spain
(In percent)

Italy

November 25, 2011

January 16, 2012

March 13, 2012

Maturity (years)

Spain

November 25, 2011

January 16, 2012

March 13, 2012

Maturity (years)
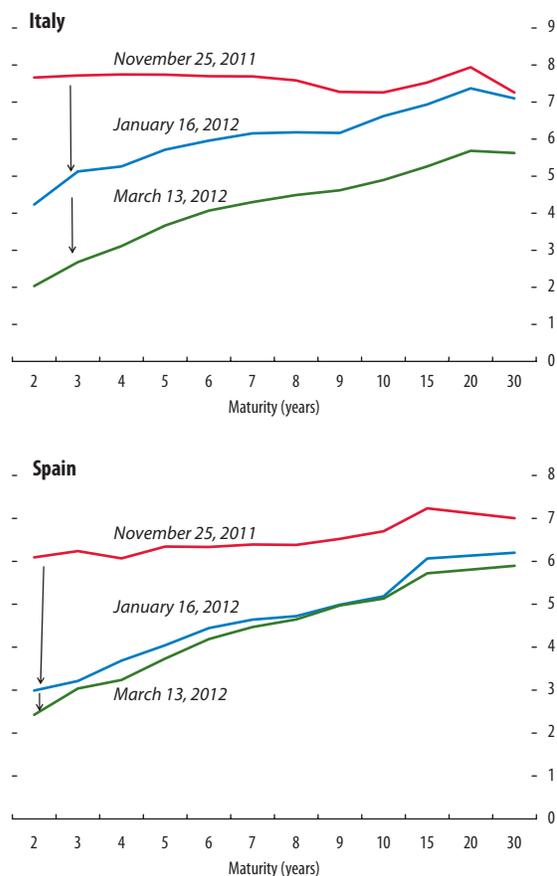
Source: Bloomberg L.P.

The main drawbacks of the LTROs are listed below, along with the possibilities for mitigating them.

• *Reinforcing linkages between banks and sovereigns.* As noted, banks have used LTROs financing (about one-fifth of it) to purchase sovereign bonds (and tending to do so in their own national markets).

As a consequence, exposure to sovereign bonds has increased. This risk would be less of a concern if sovereign yields remained at sustainable levels and bank funding normalized—in other words, in the complete policies scenario discussed in this GFSR.

• *Supporting weak banks that have nonviable business models instead of resolving them.* This effect could undermine credit growth, and ultimately GDP growth, and perpetuate risks to sovereign solvency. But rigorous and detailed supervision and resolution regimes, both at the euro area and national level, should mitigate this risk and ensure that support goes to solvent institutions undergoing liquidity problems. The importance of strengthening supervision and resolution should not be underestimated, as it would facilitate the orderly unwinding of ECB funding when economic and financial conditions normalize.

• *Concerns that the large expansion of the ECB balance sheet will lead to inflation.* However, the relatively large output gap, well-anchored inflationary expectations, and the temporary nature of the LTROs mean that this risk is not material at present; and it is unlikely to be significant for some time, given weak prospects for demand growth in the euro area because of widespread fiscal consolidation and deleveraging. The ECB also has ample fine-tuning instruments available to respond to any emerging inflationary pressures.

Potentially a more serious concern is policy complacency. Any sense of "mission accomplished" could weaken the resolve to undertake reforms necessary to address the underlying causes of the crisis. Policymakers and private sector financial institutions should continue to focus their efforts on strengthening banks' balance sheets to gradually reduce dependence on central bank funding.

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Summary

The financial crisis and the heightened concerns about sovereign debt sustainability in many advanced economies have reinforced the notion that no asset can be viewed as truly safe. Recent rating downgrades of sovereigns previously considered to be virtually riskless have reaffirmed that even highly rated assets are subject to risks. The notion of absolute safety—implicit in credit rating agencies' highest ratings and embedded in prudential regulations and institutional investor mandates—can create a false sense of security, and it did prior to the crisis.

In this context, the chapter examines the various roles of safe assets; the effects of different regulatory, policy, and market distortions; and potential future pressure points that these distortions may create. Safe assets have varied functions in global financial markets, including as a reliable store of value, collateral in repurchase and derivatives markets, key instruments in fulfilling prudential requirements, and pricing benchmarks. In the absence of market distortions, safety is priced efficiently, reflecting sustainable demand-supply dynamics. However, heightened uncertainty, regulatory reforms, and crisis-related responses by central banks are driving up demand. On the supply side, the number of sovereigns whose debt is considered safe has fallen, which could remove some $9 trillion from the supply of safe assets by 2016, or roughly 16 percent of the projected total. Private sector production of safe assets has also declined as poor securitization in the United States has tainted these securities, while some new regulations may impair the ease with which the private sector can produce safe assets.

Demand and supply imbalances in global markets for safe assets are not new. Prior to the crisis, global current account imbalances encouraged safe asset purchases by official reserve managers and some sovereign wealth funds. Now, attention has focused on safe assets' capacity to meet new prudential requirements, increased collateral needs for over-the-counter (OTC) derivatives transactions or their transfer to centralized counterparties, and the increasing use of such assets in central bank operations. The shrinking set of assets perceived as safe, now limited to mostly high-quality sovereign debt, coupled with growing demand, can have negative implications for global financial stability. It will increase the price of safety and compel investors to move down the safety scale as they scramble to obtain scarce assets. Safe asset scarcity could lead to more short-term volatility jumps, herding behavior, and runs on sovereign debt.

To mitigate the risk to financial stability from a potentially bumpy, uneven path to a new price for safety, policy responses should allow for flexibility and be implemented gradually enough to avert sudden changes in what are defined as safe and less-safe assets. In general, policymakers need to strike a balance between the desire to ensure the soundness of financial institutions and the costs associated with a potentially too-rapid acquisition of safe assets to meet this goal. Specifically, careful design of some prudential rules could help increase the differentiation in the safety characteristics of eligible safe assets and would thus decrease the likelihood of cliff effects or runs on individual types of assets. On the supply side, desirable policies include improving fiscal fundamentals in countries subject to concerns about their debt sustainability, encouraging the private production of safe assets—such as well-conceived and regulated covered bond structures and placing securitization on a sounder footing—and building up the capacity of emerging economies to issue their own safe assets. These efforts can help to remove some of the impediments that may inhibit safe asset markets from moving to a new price for "safety."

In the future, there will be rising demand for safe assets, but fewer of them will be available, increasing the price for safety in global markets. In principle, investors evaluate all assets based on their intrinsic characteristics. In the absence of market distortions, asset prices tend to reflect their underlying features, including safety. However, factors external to asset markets—including the required use of specific assets in prudential regulations, collateral practices, and central bank operations—may preclude markets from pricing assets efficiently, distorting the price of safety. Before the onset of the global financial crisis, regulations, macroeconomic policies, and market practices had encouraged the underpricing of safety. Some safety features are more accurately reflected now, but upcoming regulatory and market reforms and central bank crisis management strategies, combined with continued uncertainty and a shrinking supply of assets considered safe, will increase the price of safety beyond what would be the case without such distortions.

The magnitude of the rise in the price of safety is highly uncertain given the broad-based roles of safe assets in global markets and regulations. Safe assets are used as a reliable store of value and aid capital preservation in portfolio construction. They are a key source of liquid, stable collateral in private and central bank repurchase (repo) agreements and in derivatives markets, acting as the "lubricant" or substitute of trust in financial transactions. As key components of prudential regulations, safe assets provide banks with a mechanism for enhancing their capital and liquidity buffers. As benchmarks, safe assets support the pricing of other riskier assets. Finally, safe assets have been a critical component of monetary policy operations. These widely varying roles of safe assets and the differential price effects across markets make it difficult to gauge the overall price of safety.

Assessing future supply-demand imbalances in safe asset markets is also made more complicated by the difference in emphasis that various groups of market participants place on specific safety attri-

butes. From the perspective of conservative investors, for example, safe assets act as a store of value or type of insurance during financial distress. For official reserve managers and stabilization-oriented sovereign wealth funds, the ability to meet short-term contingent liabilities justifies a focus on the low market risk and high liquidity aspects of safety. From the perspective of longer-term investors—such as pension funds and insurance companies—safe assets are those that hold their value over longer horizons. Banks, collectively the largest holder of safe assets, demand safe assets for asset-liability management, for collateral, and for fulfilling their primary dealer and market-making responsibilities.

However, it is clear that market distortions pose increasing challenges to the ability of safe assets to fulfill all their various roles in financial markets. Even before the crisis, the rapid accumulation of foreign reserves and financial market underdevelopment in many emerging economies accounted for supply-demand imbalances in safe asset markets.[1] For banks, the common application of zero percent regulatory risk weights on debt issued by their own sovereigns, irrespective of risks, created perceptions of safety detached from underlying economic risks and contributed to the buildup of demand for such securities.[2] During the crisis, supply-demand imbalances and safe asset market distortions became even more obvious. Large-scale valuation losses on assets perceived as safe, first on AAA-rated tranches of mortgage-backed securities during the crisis, and more recently on some Organization for Economic Cooperation and Development (OECD) government debt, reduced the supply of relatively safe assets. Meanwhile, heightened uncertainty, regulatory reforms—such as new prudential and collateral requirements—and the extraordinary postcrisis responses of central banks in the advanced economies, have been driving up demand for certain categories of safe assets. Hence, safe asset demand is expanding at the same time that the universe of what is considered safe is shrinking.

[1]See Caballero (2010); and Caballero and Krishnamurthy (2009).

[2]For euro area banks, zero percent risk weights can be applied to the debt issued by any euro area sovereign.

The tightening market for safe assets can have considerable implications for global financial stability, including an uneven or disruptive pricing process for safety. As investors scramble to attain scarce safe assets, they may be compelled to move down the safety scale, prompting the average investor to settle for assets that embed higher risks. In an extended period of low interest rates and heightened financial market uncertainty, changes in investors' risk assessment of the safety features of assets could lead to more frequent short-term spikes in volatility and the potential for a buildup of asset bubbles. Although regulatory reforms to make institutions safer are clearly needed, insufficient differentiation across eligible assets to satisfy some regulatory requirements could precipitate unintended cliff effects—sudden drops in the prices—when some safe assets become unsafe and no longer satisfy various regulatory criteria. Moreover, the burden of mispriced safety across types of investors may be uneven. For instance, prudential requirements could lead to stronger pressures in the markets for shorter-maturity safe assets, with greater impact on investors with higher potential allocations at shorter maturities, such as banks.

This chapter examines potential pressure points and distortions in the markets for safe assets and identifies how best to address them.[3] The shortage of safe assets has raised widespread concern in recent months, but no comprehensive, integrated view of the global demand and supply pressures has emerged as of yet. This chapter provides such a view. It first outlines the changes in investor perceptions as a result of the crisis and then identifies key demand and supply pressures. The chapter then outlines the resulting financial stability risks and concludes with potential policy implications.

The Safe Asset Universe
Characteristics of Safe Assets

It is important to recognize that there is no risk-free asset offering absolute safety. In theory, safe assets provide identical real payoffs in each state of

the world.[4] True absolutely safe assets are a desirable part of a portfolio from an investor's perspective, as they provide full protection from credit, market, inflation, currency, and idiosyncratic risks; and they are highly liquid, permitting investors to liquidate positions easily.

However, in practice, all assets are subject to risks which, in an ideal world, should be reflected accurately in asset prices. The notion of absolute safety—implicit, for example, in credit rating agencies' highest ratings and embedded in prudential regulations and institutional investor mandates—can lead to an erroneously high level of perceived safety.[5] In turn, such inaccurate perceptions can expose regulated financial institutions and markets to higher credit and concentration risks. The onset of the global financial crisis revealed considerable underpricing of safety linked to over-reliance on credit ratings, adverse incentives from prudential regulations and private sector practices. The fact that even highly rated assets are not without risks was reaffirmed during the global financial crisis by losses on AAA-rated tranches of mortgage-backed securities and, more recently, by rating downgrades of sovereigns previously considered virtually riskless.

The global financial crisis appropriately prompted greater differentiation in the pricing of asset safety, with safety increasingly viewed in relative terms. Relative safety explains the considerable substitution away from other riskier asset classes into the debt of economies with perceived stronger fundamentals in recent months, including U.S. Treasuries (despite Standard & Poor's 2011 downgrade), German bunds, and Japanese government bonds. Investors' flight to relative safety has accounted for an increasing differentiation in the sovereign debt universe. Yields on some government bonds that ceased to be

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[3]This chapter focuses on structural issues related to safe asset markets. Some short-term issues are discussed in Chapter 2.

[4]Theoretically, safe assets can be viewed as equivalent to a portfolio of Arrow-Debreu securities. An Arrow-Debreu security has an identical payoff in a particular state of the world across time, and a zero payoff in all other states. If an investor constructs a portfolio that includes an Arrow-Debreu security for each state of the world (assuming that financial markets are complete and investors are able to do so), he or she would effectively hold a safe asset.

[5]See IMF (2010b) for a more extensive discussion of ratings and their role in the crisis. The chapter recommends decoupling credit ratings from regulatory rules to avoid the buildup of inaccurate perceptions identified above.

Figure 3.1. Ten-Year Government Bond Yields in Selected Advanced Economies
(In percent)
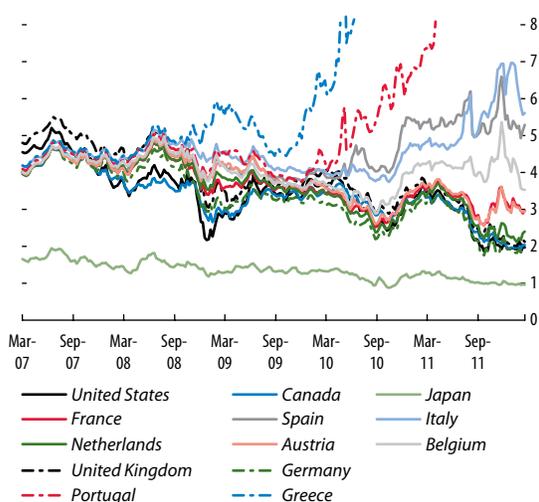
Source: Bloomberg L.P.
Note: Yields greater than 8 percent are deliberately excluded to clarify developments in the low-yield range.

perceived as safe have spiked in the aftermath of the crisis, while yields on bonds viewed as safe havens irrespective of credit rating (such as those of the United States, Japan, and Germany, for example) have declined to historical lows (Figure 3.1).

A historical overview of sovereign debt ratings suggests that shifts in relative safety have precedents. Despite the limitations in the information content of sovereign debt ratings, the long time span of S&P ratings provides useful insights about the evolution of asset safety (Table 3.1):

- The current degree of differentiation across sovereigns in the OECD is more pronounced than in previous periods, with historically low ratings in southern Europe, Iceland, and Ireland, and downgrades in countries that had maintained AAA ratings since S&P reinstated sovereign ratings in the mid-1970s—Austria, France, and the United States.
- Sovereign ratings in Greece, Iceland, Ireland, Italy, Portugal, and Spain followed a sharp downward correction after an increase in the 1990s.
- OECD government debt was predominantly rated AAA during the 1990s.
- The share of unrated OECD sovereigns was high until the mid-1980s, in part reflecting low

defaults and high perceptions of safety in the 1960s and the 1970s.[6]

The first three points suggest that during some periods, such as periods of calm, ratings did not sufficiently capture the credit quality of assets with varied underlying fundamentals.

In practice, relative asset safety can be seen by considering a continuum of asset characteristics. Safe assets meet the criteria of: (1) low credit and market risks, (2) high market liquidity, (3) limited inflation risks, (4) low exchange rate risks, and (5) limited idiosyncratic risks. The first criterion, low credit and market risks, is pivotal to asset safety, as a lower level of these risks tends to be linked with higher liquidity. However, high market liquidity depends on a wider array of factors, including ease and certainty of valuation, low correlation with risky assets, an active and sizable market, and low market correlation, among others.[7] Importantly, different investors place a different emphasis on each of these criteria. For example, investors with long-term liabilities—such as pension funds and insurance companies—place limited emphasis on market liquidity and thus consider less liquid, longer maturity assets as safe. If their potential payoffs are linked to inflation and no inflation indexed securities are available, pension funds emphasize the real capital preservation aspect of safe assets. Global reserve managers consider all of these aspects, in view of the high share of credit instruments denominated in foreign currencies and their need to maintain ready liquidity. Finally, demand for some noncredit instruments, such as gold, is largely driven by perceptions of its store of value, with less regard to its market risk.

Changes in Safe Asset Perceptions

The global financial crisis was preceded by considerable overrating, and hence mispricing, of safety. In retrospect, high credit ratings were applied too often, both for private and sovereign issuers, and they did not sufficiently differentiate across assets with different underlying qualities.

[6]See also Gaillard (2011).
[7]For a more detailed discussion of the safety criteria for assets underlying liquidity risk management, see BCBS (2010a), pp. 5–6.

Table 3.1. Historical Overview of S&P Sovereign Debt Ratings of Selected OECD Countries, 1970–January 2012

Country	Year of First Rating	1970	1975	1980	1985	1990	1995	2000	2005	2010	2011	2012 (End-January)
Austria	1975	NR	AAA	AAA	AAA	AAA	AAA	AAA	AAA	AAA	AAA	AA+
Belgium	1988	NR	NR	NR	NR	AA+	AA+	AA+	AA+	AA+	AA	AA
Canada	1949	AAA	AAA	AAA	AAA	AAA	AA+	AA+	AAA	AAA	AAA	AAA
Denmark	1981	NR	NR	NR	AA+	AA	AA+	AA+	AAA	AAA	AAA	AAA
Finland	1972	NR	AAA	AAA	AAA	AAA	AA-	AA+	AAA	AAA	AAA	AAA
France	1975	NR	AAA	AAA	AAA	AAA	AAA	AAA	AAA	AAA	AAA	AA+
Germany	1983	NR	NR	NR	AAA	AAA	AAA	AAA	AAA	AAA	AAA	AAA
Greece	1988	NR	NR	NR	NR	BBB-	BBB-	A-	A	BB+	CC	CC
Iceland	1989	NR	NR	NR	NR	A	A	A+	AA-	BBB-	BBB-	BBB-
Ireland	1988	NR	NR	NR	NR	AA-	AA	AA+	AAA	A	BBB+	BBB+
Italy	1988	NR	NR	NR	NR	AA+	AA	AA	AA-	A+	A	BBB+
Japan	1959	NR[1]	AAA	AAA	AAA	AAA	AAA	AAA	AAA	AA	AA-	AA-
Luxembourg	1994	NR	NR	NR	NR	NR	AAA	AAA	AAA	AAA	AAA	AAA
Netherlands	1988	NR	NR	NR	NR	AAA	AAA	AAA	AAA	AAA	AAA	AAA
Norway	1958	NR[1]	AAA	AAA	AAA	AAA	AAA	AAA	AAA	AAA	AAA	AAA
Portugal	1988	NR	NR	NR	NR	A	AA-	AA	AA-	A-	A-	A
Spain	1988	NR	NR	NR	NR	AA	AA	AA+	AAA	AA	AA-	A
Sweden	1977	NR	NR	AAA	AAA	AAA	AA+	AA+	AAA	AAA	AAA	AAA
Switzerland	1988	NR	NR	NR	NR	AAA	AAA	AAA	AAA	AAA	AAA	AAA
Turkey	1992	NR	NR	NR	NR	NR	B+	B+	BB-	BB	BB	BB
United Kingdom	1978	NR	NR	AAA	AAA	AAA	AAA	AAA	AAA	AAA	AAA	AAA
United States	1941	AAA	AAA	AAA	AAA	AAA	AAA	AAA	AAA	AAA	AA+	AA+

Legend:
AAA
AA
A
BBB
Noninvestment grade

Sources: Standard & Poor's; and IMF staff estimates.
Note: The Organization for Economic Cooperation and Development (OECD) was established in 1961. Countries selected constituted the OECD membership in 1970. Ratings shown are S&P's long-term foreign currency ratings. NR = not rated.
[1]Sovereign rating suspended; see Bhatia (2002).

Table 3.2. Long-Term Senior Sovereign Debt Ratings and Implied Probabilities of Default

Interpretation of Rating	S&P Rating	Average Implied Five-Year Probability of Default (in percent)	
		2007	2011
Highest quality	AAA	0.108	1.266
High quality	AA+ AA AA-	0.110	2.423
Strong payment capacity	A+ A A-	0.213	2.684
Adequate payment capacity	BBB+ BBB BBB-	0.734	6.050
Likely to fulfill obligations, ongoing uncertainty	BB+ BB BB-	2.795	4.240
High-risk obligations	B+ B B-	4.041	18.410

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

Note: For each country, the implied probabilities of default are estimated from its observed CDS spreads. The probabilities of default shown here are averages for countries whose ratings fall within specific S&P rating ranges.

- AAA-rated securitizations were found to embed much higher default risks than warranted by their high ratings. For example, as of August 2009, 63 percent of AAA-rated straight private-label residential mortgage-backed securities issued from 2005 to 2007 had been downgraded, and 52 percent were downgraded to BB or lower.[8]
- Five-year probabilities of default associated with AAA-rated sovereign debt were about 0.1 percent in 2007, suggesting virtually no credit risk, but markets' implied default rates had risen to more than 1 percent by 2011 (Table 3.2). The large difference between the implied default probabilities within each rating bucket across the two periods suggests that the default probabilities do not increase consistently with the decline in ratings, reaffirming ratings should not be relied upon as the sole quantitative measure of safety.[9]

[8]See IMF (2009a) for a detailed discussion of securitization and credit ratings flaws.
[9]The implied volatility of default falls from 6.050 to 4.240 between the BBB and BB rating groups and rises again for the B groupings, showing the large volatility across ratings.

- Haircuts on the highest rated securitized instruments in the U.S. private bilateral repo market increased sharply from near-zero precrisis levels to more than 30 percent for certain instruments (see Gorton, 2009).
- In the euro area, the years following the creation of the monetary union were characterized by almost perfect convergence of government bond yields. As evidenced by greater risk differentiation since 2010, this development was arguably not justified on the basis of fiscal fundamentals of different euro area member states.

Empirical analyses confirm the mispricing of risk prior to the crisis. Returns show a high degree of homogeneity across assets of different quality within each asset class (Figure 3.2). Asset classes were grouped closely into asset pools with limited differentiation in terms of safety. These pools included: (1) U.S. debt (sovereign, agency, and corporate); (2) Japanese debt (sovereign and corporate); (3) European debt (sovereign and corporate), including EU covered bonds and highly collateralized bonds issued by German banks (Pfandbriefe); (4) emerging market sovereign debt; and (5) a more dispersed set including equity market indices, commodities, and currencies. The very tight clustering of euro area sovereign debt shown in Figure 3.2 confirms that, indeed, prior to the crisis, there was little price differentiation across assets of varied quality.[10] Moreover, sovereign debt instruments of advanced economies were found to have highly homogeneous exposures to aggregate risk factors.[11] This suggests that market prices did not embed information sufficient to differentiate the underlying risks of countries with weaker fundamentals.[12]

After the crisis, the differentiation in the perceived safety of various asset classes increased

[10]See Annex 3.1 for details.
[11]These factors include (1) the excess return on the global market portfolio as a measure of perceived market risk of an asset or a portfolio, (2) the VIX as a measure of market uncertainty, (3) the term spread as a measure of rollover or reinvestment risk, (4) a measure of market liquidity based on bid-ask spreads, (5) credit spreads between AAA and BBB corporate bonds, (6) innovations to the London interbank offered rate (LIBOR), and (7) a measure of future global inflation risk.
[12]The only noticeable difference was in exposures to the market factors, with U.S. debt appearing markedly safer than European debt.

Figure 3.2. Asset Exposures to Common Risk Factors before and after Global Crisis

- ◆ U.S. debt
- ◆ Japanese debt
- ◆ European sovereign debt
- ◆ European corporate debt
- ◆ Emerging market debt
- ◆ Currencies
- ◆ Commodities
- ◆ Equity

Before Crisis, January 2000–September 2008

U.S. Treasuries
U.S. agency
U.S. corp AA
U.S. corp AAA
U.S. corp A
U.S. corp BBB
Gold

Greater perceived safety

After Crisis, October 2008–December 2011

U.S. agency
U.S. Treasuries
U.S. corp AAA
U.S. corp AA
U.S. corp A
Gold
U.S. corp BBB

Greater perceived safety

Higher market risk

Sources: Bloomberg L.P.; and IMF staff estimates.
Note: Based on principal component analysis of the assets' excess returns. Figure plots the factor loading, showing the influence of the excess return of a single asset on the common risk factors. The first principal component is positively correlated with global liquidity (measured by the M2 money supply of the G4 economies) and with market risk, which is proxied by the excess return on a global market portfolio. The second component is positively correlated with safety, which, as expected, shows a negative correlation with the VIX and thus has limited sensitivity to volatile market conditions. Axis arrows show direction of higher market risk and greater perceived safety.

markedly.[13] The analysis suggests that investors have become more discerning in their assessment of safety. The results show increasing signs of greater differentiation in the perception of safety across European assets and a clear decoupling of highly

rated U.S. debt—including sovereign, agency, and AAA-rated corporate securities—from lower-rated corporate instruments (Figure 3.2). AAA-rated U.S. corporate debt has become clustered with U.S. sovereign debt, and lower-rated U.S. debt with European entities. Altogether, sovereign debt and highly rated corporate debt in Japan and the United States have become more tightly clustered in a pattern suggesting that investors perceive assets in both countries as safer than those in Europe. Heightened uncertainty also bolstered the perceived safety of gold. Markets also appear to have put higher trust in the safety of the Japanese yen, whose differentiation from other currencies has increased markedly. Overall, perceptions of the relative safety of various currencies have remained tightly linked to the perceived safety of their respective countries' or regions' debt instruments, perhaps suggesting exposures to common risk factors. Detailed analysis (not shown) of the risk factors that affect safe asset returns indicates that the crisis has exacerbated differences in exposures to such factors across asset classes. For example, differences in inflation risk exposures across the portfolios became significant only after the crisis.

The evolution of the volatility of debt returns also confirms that the differentiation between safer and riskier debt instruments increased considerably as a result of the crisis. For example, before the crisis, this volatility—at roughly 3 percent—was almost identical across Europe. However, afterward, the volatility in peripheral euro area countries outstripped that in the rest of Europe by more than 1 percent a month, a nontrivial difference (Figure 3.3).[14] Importantly, U.S. and Japanese debt became less volatile after the crisis, suggesting an investor perception of increased safety.

[13]These patterns are confirmed by the statistical techniques of principal component analysis and hierarchical clustering.

[14]Excess returns represent the difference between the monthly returns on a given portfolio and the return on the one-month U.S. Treasury bill. Volatility is calculated as the standard deviation of monthly excess returns in the sample.

Figure 3.3. Volatility of Excess Returns in Debt Instruments before and after Crisis
(In percent)
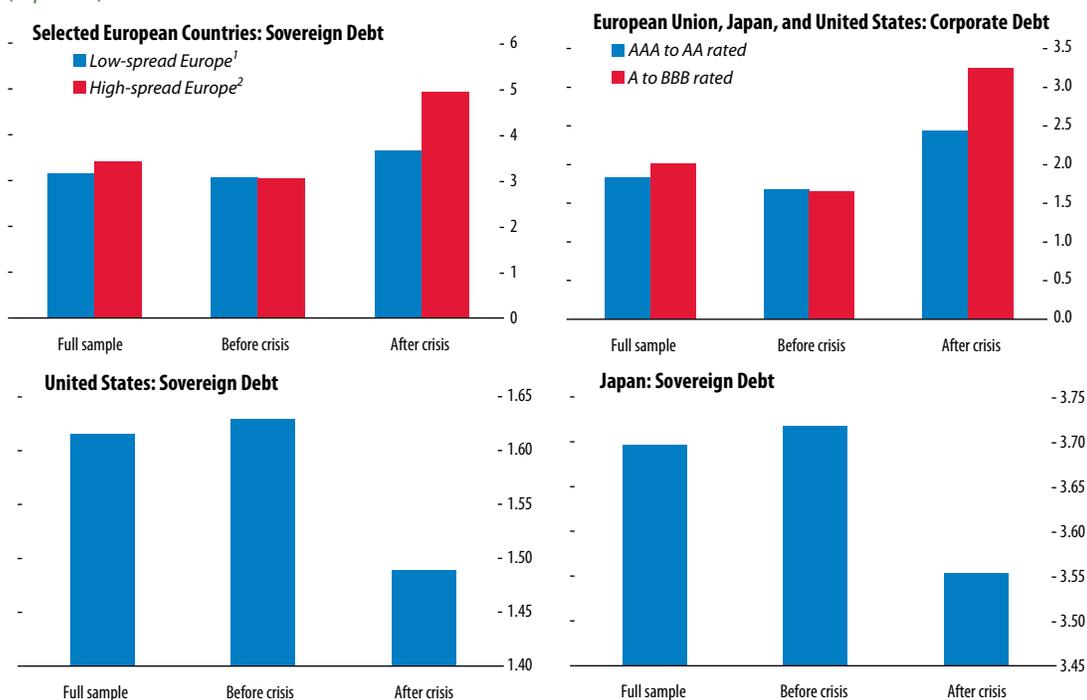
Sources: Bloomberg L.P.; and IMF staff estimates.
Note: "Before crisis" refers to the period until December 2007; "after crisis" from January 2008 to October 2011. For Europe, threshold between the low- and high-spread countries is at 350 basis points.
[1]Austria, Denmark, Finland, France, Germany, Luxembourg, Netherlands, Norway, and United Kingdom.
[2]Portugal, Ireland, Italy, and Spain. Greece and Slovenia are excluded due to the lack of data.

Roles of Safe Assets for Various Participants

The Universe of Potentially Safe Assets

While many assets have some attributes of safety, the global universe of what most investors view as potentially safe assets is dominated by sovereign debt. As of end-2011, AAA-rated and AA-rated OECD government securities accounted for $33 trillion or 45 percent of the total supply of potentially safe assets (Figure 3.4). Although asset safety should not be viewed as being directly linked to credit ratings, they are used here as a rough indication of market perception. Securitized instruments—including mortgage-backed and other asset-backed securities and covered bonds—still play an important role as potentially safe assets, accounting for 17 percent of the global aggregate, followed by corporate debt (11 percent), and gold (11 percent). The markets for supranational debt and covered bonds are limited, collectively accounting for roughly 6 percent.

Overview of the Uses of Safe Assets

Safe assets have several broad-based roles in international financial markets. Their characteristics—including their steady income streams and ability to preserve portfolio values—are key considerations in investors' portfolio decisions. Safe assets serve as high-quality collateral critical to many transactions, including those in private repo, central bank repo, and OTC derivatives. They are integral to prudential regulations, influencing, at least in part, the amount of safe assets on banks' balance sheets. Safe assets are widely embedded in portfolio mandates and often act as performance benchmarks. Yields on government bonds are reference rates for the pricing, hedging, and valuation of risky assets. Finally, safe assets—at least in the case of advanced economies—have been a part of central banks' liquidity operations in response to the crisis.

Figure 3.4. Outstanding Amounts of Marketable Potentially Safe Assets
(In trillions of U.S. dollars and percent of total)

Total = $74.4 trillion

- Gold $8.4 11%
- Corporate debt (Investment grade) $8.2 11%
- Covered bonds $3.3 4%
- ABS, MBS, other securitization $12.9 17%
- U.S. agency debt $2.4 3%
- Supranational debt $1.0 1%
- A/BBB OECD government securities $5.0 7%
- AAA/AA OECD government securities $33.2 45%
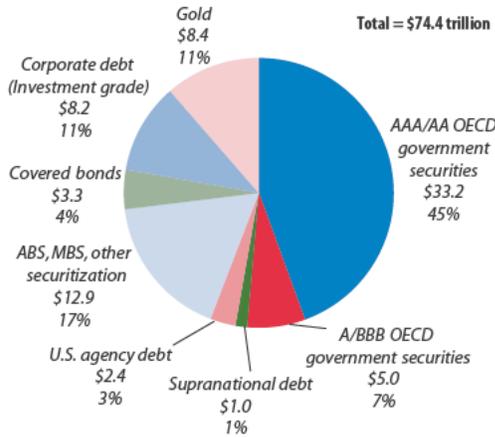
Sources: Bank for International Settlements; Dealogic; the European Covered Bond Council (ECBC); SIFMA (the Securities Industry and Financial Markets Association); Standard & Poor's, World Gold Council; and IMF staff estimates.
Note: Data for government and corporate debt are as of 2011:Q2; supranational debt and gold, as of end-2011; covered bonds, as of end-2010; and U.S. agency debt and securitization, as of 2011:Q3. ABS = asset-backed securities; MBS = mortgage-backed securities; OECD = Organization for Economic Cooperation and Development.

Figure 3.5. Holdings of Government Securities Worldwide, by Investor Type, End-2010
(In trillions of U.S. dollars and percent of outstanding sovereign debt)

Total = $41.3 trillion

- Other $9.0 22%
- Central banks including reserve managers $8.9 21%
- Sovereign wealth funds $0.5 1%
- Pension funds $2.7 7%
- Insurance companies $6.4 15%
- Banks $13.8 34%

Sources: Bank for International Settlements (BIS); Bankscope; Organization for Economic Cooperation and Development; and IMF staff estimates.
Note: Banks include commercial, investment, and development banks; data for pension funds include only direct holdings; SWF holdings are an IMF staff estimate; reserve manager holdings are an IMF staff estimate based on a representative allocation of total official reserves to government securities and own government bond holdings by the Federal Reserve, Bank of England, and Bank of Japan. "Other" is estimated as a remainder based on BIS data on total outstanding government securities worldwide.

Each of these safe asset functions has a different degree of relevance for various types of investors.[15] For example, banks—which collectively account for the largest share of safe asset holdings—demand safe assets for several purposes (Figure 3.5): (1) managing their inherent maturity mismatches, (2) fulfilling their primary dealer and market-making functions, (3) obtaining preferential regulatory treatment through their sovereign debt holdings, and (4) using collateral for repo and derivatives transactions. Safe assets are critical to the conservative, value preservation policies of global reserve managers, and their need for ready liquidity. Value preservation is also a high priority for some types of sovereign wealth funds—particularly stabilization funds—whose fiscal stabilization role is similar to that of reserve managers. The demand for safe assets by insurance companies and pension funds—long-term safe asset investors—is largely driven by their need to

bridge intrinsic asset-liability mismatches and preserve market value to meet long-term liabilities. Safe assets for nonfinancial corporations and individual investors largely take the form of sovereign debt, although the size of such holdings is limited.[16]

The extent of investor demand varies considerably across countries and has also changed as a result of the global financial crisis. In the United States, foreign investors have dominated the market for U.S.

[15]The classification and collection of data on holdings of government securities by investor type are yet to be standardized. At present, there is no comprehensive centralized database on government securities holdings. The issue is addressed by an ongoing initiative of the IMF, Bank for International Settlements, European Central Bank, and others to close existing data gaps.

[16]This chapter does not discuss in detail the demand for safe assets by individual investors and nonfinancial corporations. Their holdings of government securities are limited and typically unleveraged, unlike those of other investors, and are unlikely to pose considerable risks to global financial stability. Even in the United States, where they play a more prominent role relative to most other countries, households and nonfinancial corporations hold less than 11 percent of domestic government debt. In the euro area, their holdings, on average, account for less than 8 percent of total government debt (Lojsch, Rodríguez Vives, and Slavík, 2011). Customer bank deposits are considerably more sizable, amounting to roughly $40 trillion globally at end-2010. Their relevance for global financial stability, however, is related to tail-risk events—such as potential bank runs—that are beyond the scope of this chapter. In many countries, such deposits are covered by deposit insurance schemes that—within the covered maximum—provide a degree of safety to individual and corporate investors.

Figure 3.6. Sovereign Debt Holdings, by Type and Location of Investor
(In percent of total, June 2011 or latest available)

United States
Total outstanding marketable debt[1] = $9.3 trillion

- Domestic banks[2]
- Insurance, pension, and mutual funds
- Other
- Federal Reserve
- Nonresidents

3.0
18.7
11.8
18.2
48.2

[1]Excludes $5 trillion of nonmarketable public debt securities held mostly in intragovernmental accounts.
[2]Domestic depository institutions.

United Kingdom
Total outstanding debt = $1.6 trillion

- Intragovernmental holdings
- Domestic banks[3]
- Insurance companies and pension funds
- Other
- Bank of England
- Nonresidents

0.1
10.8
30.4
29.0
19.7
10.0

[3]Monetary financial institutions excluding the central bank.

Japan
Total outstanding debt[4] = $8.7 trillion

- Intragovernmental holdings[5]
- Domestic banks[6]
- Japan Post Group
- Insurance companies and pension funds[7]
- Other
- Bank of Japan
- Nonresidents

0.4
24.6
29.0
25.3
7.3
8.3
5.0

[4]Japanese government bonds (JGB) only.
[5]Excludes social security fund holdings.
[6]Depository institutions, securities investment trusts, and securities companies, excludes Japan Post Bank.
[7]Includes social security fund holdings, excludes Japan Post Insurance.

Euro area
Total gross consolidated debt = $10.5 trillion

- Domestic banks[8]
- Insurance companies and pension funds[9]
- Other
- ESCB[10]
- Nonresidents[11]

52.1
26.5
11.9
7.8
1.7

[8]Other monetary institutions.
[9]Refers to debt held by other financial institutions.
[10]Sum of holdings by national central banks of the respective country's government debt.
[11]Sum of individual member countries nonresident holdings, that is, includes intra–euro area nonresident holdings.

Source: IMF staff estimates based on Andritzky (forthcoming).
Note: The classification and collection of holdings data of government securities by investor type are yet to be standardized.

Treasuries in view of its large size and depth and its high perceived degree of safety. However, postcrisis monetary stabilization efforts increased the prominence of the Federal Reserve as a holder of government debt. In Europe and Japan, domestic banks have played an important role as sovereign debt investors, in each case accounting for about 25 percent of outstanding sovereign debt (Figure 3.6). In the United Kingdom, insurance companies and pension funds have been traditional holders of government securities, although the Bank of England and foreign investors assumed a more prominent role after the global financial crisis.

To assess emerging demand pressures in safe asset markets, the following subsections review the principal uses of safe assets by the largest market participants. The discussion in subsequent sections then turns to the ability of safe asset supply to keep up with potential demand, and the implications for financial stability of a further rise in safe asset supply-demand imbalances.

Use in Portfolio Construction

Probably the most basic use of safe assets is as a source of steady income and capital preservation in portfolio construction. The importance of this function varies considerably across investor types, based on their investment strategies and horizons.

Banks

Banks have intrinsic incentives to hold safe assets to manage liquidity and solvency risks. Safe assets—particularly short-term government securities—play a key role in banks' day-to-day asset-liability management. Banks' inherent maturity mismatches justify their holding some assets with high market liquidity and stable returns. Shorter-term safe assets permit banks to curb unwanted maturity mismatches and manage their short-term funding needs. At times of stress, banks can also temporarily increase safe asset allocations to: (1) raise capital ratios via exchange for riskier assets, (2) access secured funding markets, or (3) counterbalance trading book losses to stabilize income.[17]

Banks' role in safe asset demand is particularly important, given that they are the largest holders of safe assets in the form of government securities. Their role is particularly pronounced in China, France, Japan, and the United States, where banks jointly account for about 55 percent of the roughly $14.8 trillion in sovereign debt held by banks globally (Figure 3.7, top panel). In some countries such holdings account for a considerable share of banking sector assets, as high as roughly 30 percent in Turkey, and more than 20 percent in Brazil, Mexico, and Japan (Figure 3.7, bottom panel).[18] Overall, sovereign debt plays a considerably more important role in the asset allocation of emerging market banks than of banks in advanced economies, which—with the exception of Japan—have higher allocations in riskier assets.

Banks' demand for government bonds is also linked to their symbiotic relationship with their respective governments. Some banks act as primary dealers and market makers for government bonds and support secondary market liquidity for such bonds through active trading. For example, 46 of the 71 banks that were part of the 2011 EU capital exercise are primary dealers of domestic government

Figure 3.7. Banks' Holdings of Sovereign Debt, by Selected Country, End-September 2011
(In percent)
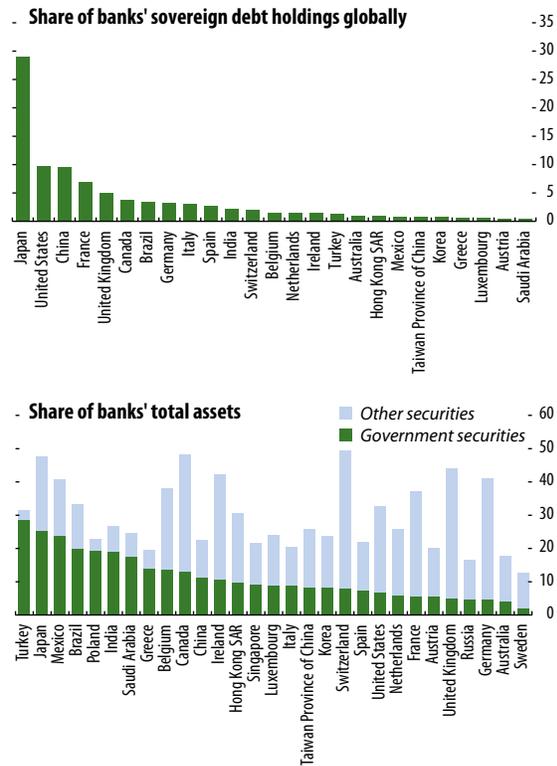
Sources: Bankscope; and IMF staff estimates.
Note: Data are as of end-September 2011 or latest available. Estimates only reflect data for banks—mostly larger banks—with information in Bankscope.

bills or bonds.[19] Primary dealer arrangements are also common in Canada, Japan, the United States, and other advanced economies, though their requirements and obligations vary considerably across countries.

Official Reserve Managers

Official reserve managers use safe assets in portfolio allocation, placing priority on safety, liquidity, and returns, in that order. Reserve managers put a premium on short-term safety in order to meet short-term contingent liabilities linked to balance of

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[17]In some cases, banks hold cash at their respective central bank, which also serves as a store of value.

[18]However, banks' practice of excessive buying of sovereign debt is generally discouraged in less developed financial systems, in part to provide banks with incentives to enhance their intermediation role via lending to nonfinancial corporations and households.

[19]Based on Association for Financial Markets in Europe (2011); websites of national debt management offices or ministries of finance; and IMF staff calculations. Banks that are members of the Bund Issuance Auction Group or the Gilt-Edged Market Makers were considered primary dealers for Germany and the United Kingdom, respectively.

payments requirements and other financial stability considerations. Thus, from a reserve manager's perspective, liquidity and low credit and market risks are key aspects of asset safety, as assets need to be readily available for sale, without incurring valuation losses.

The upsurge in reserve manager demand for safe assets in the past decade has been linked to the considerable accumulation of global foreign exchange reserves. Official reserves increased from $2.2 trillion at end-2001 to $10.8 trillion at end-October 2011, with China's reserve holdings alone rising more than 15-fold from $0.2 trillion to $3.3 trillion. This rapid growth is in part linked to precautionary saving motives and higher risk aversion in the wake of the Asian crisis in the late 1990s.

Safe asset investments by reserve managers take the form of government and other securities, deposits at other central banks and international institutions, and gold. The securities portfolio (64 percent of total reserves) mostly consists of government securities, estimated at approximately $7 trillion as of end-October 2011.[20] Bank deposits, which had increased steadily as a share of reserves, declined considerably with the onset of the crisis as their perceived safety changed. Reserve managers withdrew roughly $0.5 trillion of deposits and other investments from the banking sector in a flight to safety during the global financial crisis (Figure 3.8).[21] Since the crisis, reserve managers have reversed their long-term position as net sellers of gold, and have turned into net buyers.[22] At end-October 2011, the official sector accounted for 22 percent of the global holdings of physical gold.[23]

[20]IMF staff estimate derived from total global official reserve holdings (IMF, International Financial Statistics data); the share of securities in total official reserve holdings for countries subscribing to the IMF's Special Data Dissemination Standard (SDDS); and the share of U.S. Treasury securities in foreign official holdings of U.S. Treasury and corporate securities (TIC data), assuming that these shares are representative of global reserve portfolio allocations.

[21]See Pihlman and van der Hoorn (2010). Note that the jump in IMF positions in 2009 (Figure 3.8) was not related to asset allocation decisions by reserve managers but to the allocations of special drawing rights (SDR) provided by the IMF.

[22]Aggregated gold holdings (by fine ounce) of reserve managers reporting to the IMF SDDS increased in 2009, 2010, and the first 10 months of 2011. This may be partly related to the IMF's use of central banks' selling quotas to liquidate some of its own holdings.

[23]Based on data from the World Gold Council.

Figure 3.8. Official Reserve Accumulation, by Instrument
(Components in percent, left scale; total in trillions of U.S. dollars, right scale)
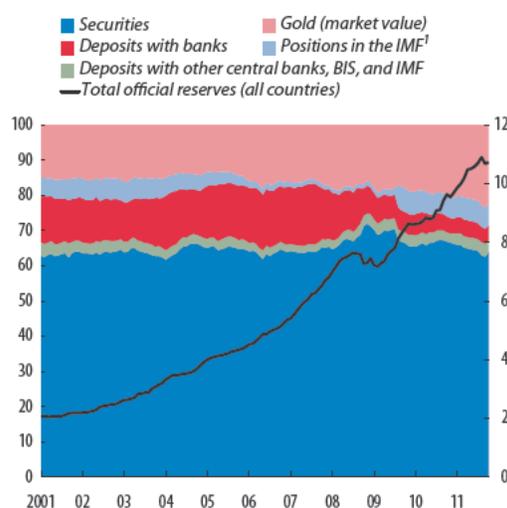
Source: IMF Composition of Official Foreign Exchange Reserves.
Note: BIS = Bank for International Settlements.
[1]Positions in the IMF comprise reserve tranche positions and SDR holdings.

Reserve managers' demand for sovereign debt is likely to persist, if not grow, in the medium term. Global official reserves are projected to rise by 11.3 percent in 2012 and by 61 percent by end-2016, indicating higher potential demands for sovereign debt, even if their relative share in reserve managers' portfolio contracts.[24] Some large reserve managers are already diversifying away from government securities, as their accumulated reserves have exceeded balance of payments and monetary policy needs.

Sovereign Wealth Funds (SWF)

The pattern of SWF safe asset allocations is highly heterogeneous. Safe asset demand by SWFs varies based on each fund's type, objectives, and investment horizons. Only a few types make extensive use of safe assets.

Stabilization funds typically have conservative asset allocations focused heavily on high-quality sovereign assets. Their investment horizons and liquidity objectives are close to those of global reserve managers, in view of their role in countercyclical fiscal policies. Hence, stabilization funds have low risk-return

[24]Reserve projections are based on the *World Economic Outlook*.

profiles and tend to invest mostly in fixed-income assets, particularly shorter-term sovereign instruments.

Pension reserve funds, reserve investment corporations, and saving funds have a very limited demand for safe assets. They tend to have longer investment horizons justified by their specific mandates and objectives: (1) they expect fund outflows far in the future (pension reserve funds), or (2) their mandate is to reduce reserve holding costs (reserve investment corporations), or (3) their express objective is to transfer wealth across generations (saving funds).

Current SWF holdings of sovereign debt are estimated to be at $500 billion to $600 billion, accounting for roughly 18 to 21 percent of SWFs' total assets. See Box 3.1 for the methodology behind this estimate. This is less than one-tenth of the amount of sovereign debt held by official reserve managers.

The potential for SWFs to exert pressure on sovereign debt demand is ambiguous. Several countries are currently setting up new stabilization funds, which invest heavily in sovereign debt. Existing SWFs, particularly in emerging economies, are also likely to continue to grow if relatively high commodity prices and current account surpluses persist, potentially raising sovereign debt demand. However, SWFs with long-term investment horizons have been increasing the share of real estate and alternative investments in their portfolios—a trend likely to continue. Also, many SWFs with dual objectives (for example, stabilization and saving) increasingly emphasize their saving mandates, resulting in higher allocations in riskier asset classes.

Insurance Companies and Pension Funds

Insurance companies and pension funds complement their risky asset holdings with safe asset allocations, mainly to match liabilities. At end-2010, insurance companies held approximately $6.4 trillion in government bonds, and pension funds held about $2.7 trillion.[25] Life insurance companies that offer mostly products with guaranteed returns place a higher priority on value preservation and thus maintain conservative portfolios with high allocations

to long-term high-quality debt. Pension fund demand for safe assets is related to the nature of their liabilities and their risk tolerance.[26] Asset allocations at many pension funds are dominated by sovereign debt holdings. Across OECD countries, bonds—a large share of which are sovereign—accounted for 50 percent of aggregate pension fund assets at end-2010.

The low-interest-rate environment in advanced economies since late 2008 may marginally curb pension funds' demand for safe assets. A protracted period of low interest rates would put pressure on pension funds to shift to riskier assets as the present value of future payable benefits increases—an increase that is even greater if longevity risk is properly accounted for.[27] Under such conditions, pension funds may embark on a search for yield by shifting asset allocation to riskier assets. However, such a shift is likely to be gradual, given that pension funds tend to change their strategic asset allocations only slowly.[28]

The Role of Safe Assets as Collateral

Safe assets play a critical role as a source of high-quality, liquid collateral in a wide range of financial transactions. Their use as collateral spans private and central bank repo markets and OTC derivatives markets.

Private bilateral and tri-party repo markets depend heavily on safe assets as collateral.[29] While, in principle, any type of asset could be used as collateral in private repos, liquid assets with high credit quality are the preferred type of collateral and are associated with lower secured funding costs than other assets. The bilateral repo market is structured around global dealer banks that, in part, reuse the received collateral to meet demand by other financial institutions and

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[25]Based on OECD data and IMF staff estimates. Holdings by pension funds do not account for indirect holdings of government bonds via mutual funds.

[26]For example, pension funds with inflation-linked liabilities tend to focus on real returns.

[27]See Chapter 4 for a discussion of the increase in pension fund liabilities due to longevity risk; also see IMF (2011b).

[28]See IMF (2011b).

[29]Tri-party repos are repurchase agreements in which a third party—a custodian bank or a clearinghouse—provides intermediation of transactions, including collateral allocation, collateral substitution, and marking to market. In the United States, the two key tri-party agents are Bank of New York Mellon (BNY Mellon) and JPMorgan Chase. In Europe, the tri-party repo market is dominated by Euroclear, Clearstream, BNY Mellon, and JPMorgan Chase (Singh, 2011).

Box 3.1. The Size of Sovereign Wealth Funds and Their Role in Safe Asset Demand

The amount of assets held by all sovereign wealth funds is estimated here to be about $2.8 trillion. However, these funds' investments in safe assets vary significantly by type of fund.

Due to the lack of a generally agreed definition of a sovereign wealth fund (SWF), estimates of their sizes vary considerably. Upper-end estimates—such as the often-cited $4.7 trillion from the Sovereign Wealth Funds Institute—double count by including central bank assets already captured in official reserves. Estimates here use the definition of SWF in the Santiago Principles, based on publicly available data for 30 SWFs meeting the definition, and explicitly excluding central banks and state-owned enterprises.[1] More than 70 percent of SWFs in the sample provide information on the size and allocation of their assets. Estimates for the rest are based on consensus estimates of size, and within-sample weighted averages for SWFs of the same type for approximations of asset allocations. SWFs that follow several objectives—including those of Azerbaijan, Norway, and Trinidad and Tobago—were categorized by prevailing operational objective based on judgment. In this fashion, the aggregate size of SWF assets is estimated here at $2.8 trillion.

SWFs' preferences for safe assets vary, depending on their mandates and objectives (see Figure 3.1.1):

Stabilization funds are set up to insulate government budgets and economies from commodity price volatility and external shocks. They are largely fixed-income investors and allocate an average of 69 percent of their assets to government securities.[2]

Pension reserve funds are established to meet future pension liabilities on the governments' balance sheets and have very long investment horizons. Therefore, they hold very small portfolio shares in sovereign securities, averaging about 4 percent.[3]

Note: Prepared by Abdullah Al-Hassan, Jukka Pihlman, and Tao Sun.

[1]See International Working Group of Sovereign Wealth Funds (2008).

[2]*Stabilization funds* are those in Azerbaijan, Bahrain, Botswana, Chile, Kiribati, Mexico, Oman, Russia, Timor-Leste, and Trinidad and Tobago. *Pension reserve funds*: Australia, Chile, Ireland, and New Zealand. *Reserve investment corporations*: China, Korea, and Singapore. *Saving funds*: Abu Dhabi, Alberta (Canada), Alaska (United States), Bahrain, Brunei, Kazakhstan, Kuwait, Malaysia, Norway, Qatar, Russia, and Singapore.

Figure 3.1.1. Asset Allocations at Sovereign Wealth Funds, by Type of Fund, End-2010[1]
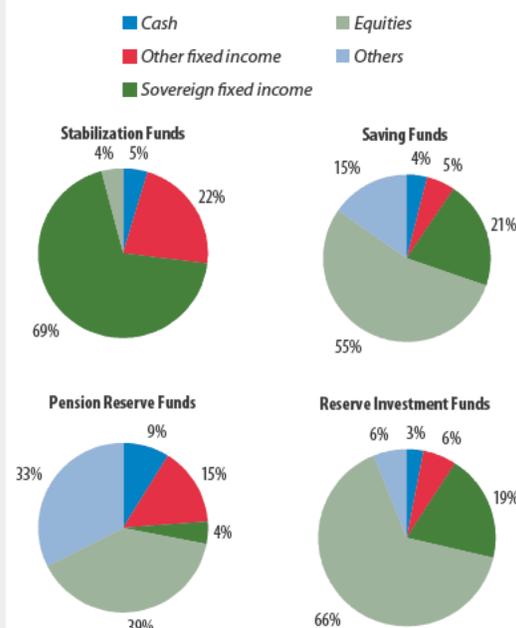
Source: IMF staff estimates based on annual reports and other information from SWFs.
[1]Or latest available.

Reserve investment corporations that invest a portion of foreign reserves to reduce reserve holding costs pursue higher returns through high allocations to equities and alternative investments—for example, up to 50 percent in South Korea and 75 percent in the Government of Singapore Investment Corporation (GIC)—and have a fairly limited need for liquidity. The share of sovereign securities in their portfolios is, on average, about 19 percent.

Saving funds, which are mandated to share cross-generational wealth or manage strategic government investment portfolios, allocate high portfolio shares to equities and other investment instruments—40 percent (e.g., Libya Investment Authority) and higher (e.g., Singapore's Temasek). Their sovereign debt allocations are limited to an average of 21 percent.

[3]The only exception is the Pension Reserve Fund in Chile, which moved toward a riskier allocation in 2011.

play a key role in liquidity provision. The key collateral providers—and, thus, the ultimate demanders of safe assets for collateral purposes—include hedge funds, broker-dealers, and banks, among others.[30]

In the United States and Europe, collateral in private repo markets is dominated by sovereign debt securities. With a total size of approximately $1.7 trillion, the tri-party repo market is an important source of funding for U.S. financial institutions.[31] In the United States, U.S. Treasury and agency securities—traditionally viewed as safe assets—collectively accounted for 83 percent of collateral in the U.S. tri-party repo market at end-September 2011.[32] In Europe, sovereign debt accounted for 79 percent of EU-originated collateral in the repo market at end-2011.[33] Tri-party repos account for only about 11 percent of repo transactions in Europe, where they relied on more diversified collateral, comprising government securities (45 percent), and another 41 percent in corporate bonds, covered bonds, and equity.

The potential impact of private repo collateral on safe asset demand depends on various factors. For example, if ongoing strains in unsecured interbank funding markets in Europe persist, the importance of collateralized funding in European banks' funding structures may increase, leading to stronger near-term demand for safe assets (see Chapter 2). However, the prospect of further bank deleveraging may, in part, mitigate further upward demand pressures stemming from the banking sector if that process entails a reduction in the assets held on their balance sheets.

Central bank collateral policies are another factor that affects banks' incentives to hold safe assets to meet funding needs. Safe assets in the form of government securities are a principal form of collateral in central bank repo operations in many countries. Their prevailing role is linked in part to the historically lower volatility and greater liquidity of government securities, particularly in times of stress. It is also related to the intrinsic comfort of central banks

that the probability of a sovereign default is (usually) low and that they take a highly senior position, reducing losses in the case of an outside counterparty default that is using sovereign collateral. However, during periods of severe market stress, central banks could (and did in the latest crisis) expand eligible collateral criteria to address market illiquidity (Annex 3.2).[34]

The potential move of standardized OTC derivatives contracts to central counterparties (CCPs) may spur demand for high-quality collateral. OTC derivative transactions are highly dependent on the use of collateral, with 80 percent of these including collateral agreements. In 2010, approximately 80 percent of collateral backing OTC derivatives transactions was in cash and an additional 17 percent was in government securities.[35] The shift of a considerable number of OTC derivatives transactions to CCPs under proposed changes to OTC derivatives regulation will elevate collateral demand by between $100 billion and $200 billion for initial margin and guarantee funds, though some of this will offset current needs in the OTC market (see Box 3.2). The resulting lower ability to rehypothecate, or reuse, the collateral in additional repo contracts when it remains within a CCP's default fund may intensify financial institutions' need for collateral to meet desired aggregate funding volumes.[36] Indeed, one CCP has already decided that high-grade corporate bonds will be accepted as initial margin for swap trades as a result of a shortage of high-quality assets.

Use in Prudential Regulations

Banks' high demand for safe assets was influenced in the past by the accommodative treatment of government bonds in prudential regulations, the most prominent of which are the following:[37]

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[30]See also Copeland, Martin, and Walker (2010).

[31]The information on U.S. repo markets is from the Federal Reserve Bank of New York (www.newyorkfed.org/tripartyrepo/margin_data.html).

[32]Agency securities include mortgage-backed securities.

[33]Mostly in the form of British, French, and German sovereign securities. See ICMA (2012).

[34]Also see Cheun, von Köppen-Mertes, and Weller (2009), for example.

[35]See ISDA (2011).

[36]See Singh (2011).

[37]Large exposure limits may influence bank demand for government debt when such holdings are treated differently from other assets. In many economies, domestic and other zero percent risk-weighted government bonds are explicitly exempt from limits on large exposures. This treatment may give rise to the risk that banks accumulate very large positions vis-à-vis individual

Box 3.2. The Impact of Changes in the OTC Derivatives Market on the Demand for Safe Assets

Moving a critical mass of OTC derivatives to central counterparties (CCPs) is expected to entail higher upfront initial margin and contributions to guarantee funds that reside at the CCP. This would result in increased demand for collateral.

In response to the global financial crisis, authorities in many jurisdictions are encouraging greater use of CCPs for OTC derivatives transactions.[1] In particular, the G20 has agreed that by end-2012 all standardized OTC derivatives should be centrally cleared so as to lower counterparty credit risk through multilateral netting. The global nature of OTC derivatives markets has also highlighted the need for international coordination to establish minimum cross-border risk management standards and avert regulatory arbitrage in cases where CCPs compete with each other.

The expected changes in OTC market infrastructure will likely increase demand for safe assets via higher demand for collateral.[2] While a shift toward central clearing of standardized OTC contracts will eliminate some of the need for bilateral collateralization, the move of a critical mass of OTC derivatives to CCPs is expected to increase the demand for collateral. The higher demand would arise from an upfront initial margin that typically is not posted on bilateral interdealer trades, and from contributions to guarantee funds at the CCP, with the size of contributions depending on the amount of cleared contracts.[3]

The direct incremental initial margin and the guarantee fund contributions are expected to amount to between $100 billion and $200 billion.[4] The higher estimate would be associated with effective incentives to boost counterparty participation—via a mandated wholesale move for dealers or through the assignment of higher capital charges. Moreover, a proliferation of CCPs without mutual recognition may raise total CCP collateral requirements even further. The lower estimate is associated with exemptions of certain types of OTC derivative counterparties (such as sovereigns and "hedgers") or types of contracts (such as foreign exchange derivatives) from the central clearing mandate. More importantly, restrictions on the market reuse (rehypothecation) of collateral posted with CCPs may lower the effective supply of collateral in the market and hence increase the liquidity risk premium (Singh, 2011).[5] For current CCP requirements, see Annex 3.3.

Note: Prepared by Hanan Morsy.
[1]See IMF (2010a) for a more detailed discussion of these issues.
[2]Collateral requirements are based on a party's likelihood of default, the risk—market, credit, operational, and counterparty—of the derivative transaction being collateralized, its tenor, and liquidity. In OTC derivatives markets, collateral is posted as a form of down payment against potential losses in the event of counterparty default.

[3]Under current market practices, dealers typically do not post independent amounts—equivalent to initial margins in clearinghouses—to each other, and do not ask for collateral from some types of customers, namely most sovereign and quasi-sovereign entities and some corporate clients. However, some regulators intend to impose costs for trades that are not moved to CCPs.
[4]Based on the methodology used in IMF (2010a).
[5]See Singh (2011) for a more detailed discussion.

- *Capital requirements,* via widespread application of zero credit risk weights for own sovereign debt (see Box 3.3);[38] and

- *Liquidity requirements,* via the favorable treatment of government bonds in the determination of existing liquidity-based prudential regulations in some countries.

sovereigns that are treated as safe by regulation but may actually be risky.
[38]Under Basel II, risk weights on the most highly rated (equivalent of AA– or higher) sovereign debt exposures are set at zero under the standardized approach, and at a minimum positive value based on banks' own models under the internal ratings-based (IRB) approach. Under the standardized approach, at national discretion where the exposure is denominated and funded in the domestic currency, banks may apply a preferential treatment to domestic sovereign exposures. Where a sovereign asset class is perceived to

be immaterial in size and risk profile, Basel II permits supervisors to allow the continued use of the standardized approach for that asset class by banks that are using the IRB approach for the rest of their portfolio. The Capital Requirements Directive (CRD) permits banks using the standardized approach to apply a zero risk weight to all sovereign exposures within the EU, and banks using the IRB approach may adopt the standardized approach for sovereign exposures, subject to supervisory approval and where the number of material counterparties is limited.

Box 3.3. Regulatory Risk Weighting of Banks' Government Debt Holdings: Potential Bias in Capital Adequacy Ratios

The potential removal of the zero percent risk weighting of banks' domestic sovereign debt holdings has implications for their solvency ratios. Many banks use zero percent risk weighting for sovereign debt, accounting for an upward bias in banks' capital adequacy ratios.[1] The analysis estimates risk weights implied by the default rates embedded in sovereign credit default swap spreads, with spreads prior to the global crisis adjusted to reflect medium-term sovereign fiscal positions.

To estimate the impact of a potential elimination of zero percent risk weighting for own local currency sovereign debt, precrisis risk weights on bank sovereign debt holdings are adjusted to reflect countries' medium-term fiscal fundamentals. Potential changes in banks' capital adequacy are assumed to be driven by risk weights based on default rates implied by sovereign credit default swap (CDS) spreads. CDS spreads do not only measure sovereign credit risk, because they depend on global and financial factors, and could be extremely volatile at times of market stress.[2] However, they are more forward-looking in nature and can capture increased fiscal risks better than many other market indicators.[3] When adjusted for fiscal fundamentals, they can provide a more realistic view of the sovereign risk bias in banks' capital adequacy ratios. However, given potential weaknesses in using

CDS spreads, the exercise is repeated using bond yields and similar results are obtained during a period of compressed spreads.[4]

CDS spreads observed before the global crisis are adjusted to "true" risk fundamentals based on medium-term sovereign fiscal positions.[5] The magnitude of the precrisis bias in capital adequacy ratios depends on the share of sovereign debt holdings in total bank assets (the exposure at default—EAD), the evolution of sovereign debt probability of default (PD), and the recovery rate (or 1 minus LGD—loss given default).[6] The estimations are carried out using global bank-by-bank data, and are based on the conservative assumption that all sovereign debt is risk weighted at zero.[7] EAD varies considerably across regions. Historically, the share of bank sovereign debt holdings in total assets has been considerably smaller in the euro area, the United

Note: Prepared by Srobona Mitra and Christian Schmieder.

[1] Sovereign risk is partially captured and controlled by the Basel II framework. Under the standardized approach used by most banks, zero percent risk weights apply to all sovereigns rated AA– and above. Under the internal ratings-based approach, banks are expected to apply a minimum probability of default (floor) of 3 basis points. Banks could deviate from this floor and apply lower risk weighting—even at zero percent—subject to supervisory discretion. The credit quality of sovereign debt held for trading purposes or for sale on banks' balance sheets also affects capitalization via their profit and loss accounts. In addition, interest rate risk in the banking book related to sovereign exposures is captured by Pillar 2 of Basel II, with supervisors expected to require additional capital for this risk. Moreover, the introduction of a non-risk-weighted leverage ratio under Basel III will complement risk-weighted capital adequacy requirements.

[2] See Alper, Forni, and Gerard (2012) and Schaechter and others (2012).

[3] Previous research shows that CDS spreads are more forward-looking than bond spreads, despite issues with liquidity in the CDS market (Chan Lau, 2003). Alper, Forni, and Gerard (2012) show that CDS spreads can better capture increased fiscal risks compared to relative asset swap (RAS) spreads, for example.

[4] For a more detailed discussion of various methodologies and other sovereign risk considerations in the context of risk weighting, see European Parliament (2010). For methodologies used in rating agency analysis, see Standard & Poor's (2011) and Fitch Ratings (2011), for example.

[5] Adjustments of the precrisis sovereign CDS spreads (2002–07) are carried out on the basis of the following equation: $\text{AdjCDS}_t = \text{CDS}_t + 459.33 \times \text{FII}$, where FII is the IMF's Fiscal Indicators Index, a continuous 0–1 index of fiscal fundamentals derived from 12 indicators of near- and medium-term fiscal risk (IMF, 2011c). The estimation is carried out using annual panel data for 2008–11, regressing CDS spreads on FII, a constant, and past CDS spreads, taking into account period fixed effects. The goal is to capture the relationship between fiscal fundamentals and more differentiated CDS in the wake of the crisis, and apply it to the precrisis period. The adjusted CDS spreads imply higher probabilities of default (PDs) in the calculation of the risk weights of banks' sovereign debt holdings based on Basel's internal ratings-based (IRB) model. The adjusted capital adequacy ratios for a region are asset-weighted averages for the bank-by-bank ratios in that region. The capital adequacy ratio for 2010 is IRB-adjusted to reflect PDs from observed CDS spreads.

[6] The LGD is assumed to be a constant of 45 percent, a standard assumption in the literature. It is identical to the LGD used for senior unsecured debt in the Basel II foundation IRB approach.

[7] For simplicity, it is assumed that all government debt holdings are domestic and risk weighted at zero percent—a conservative assumption that overestimates the bias. For the euro area, this definition would include exposure to other euro area sovereigns. In countries with flexible exchange rates and in situations in which banks hold their own sovereign debt in domestic currency, sovereign debt may be considered safer.

Box 3.3 *(continued)*

Figure 3.3.1. Share of Banks' Assets Allocated to Government Debt
(In percent, held-to-maturity, average of banks weighted by equity)
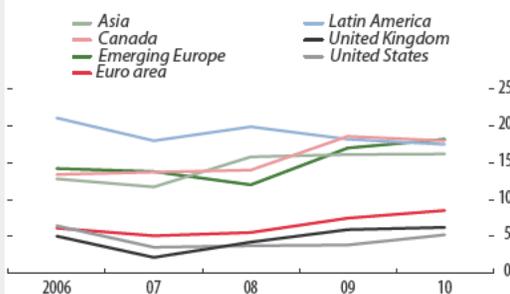
Sources: Bankscope; and IMF staff estimates.

Kingdom, and the United States than in other regions, notably emerging markets (Figure 3.3.1).

CDS spreads did not reflect adequately countries' fiscal fundamentals before the crisis, even though their differentiating power improved considerably afterward (Figure 3.3.2). As a result, the 2007 PD levels adjusted for fiscal fundamentals were considerably higher than those derived from actual CDS spreads. The differential between the two was particularly high for Europe, indicating weaker fiscal paths in some parts of Europe.

The estimated magnitude of capital adequacy bias was high for some regions. The 2007 bias is linked to a mixture of zero percent risk weighting and nondifferentiation of underlying fiscal risks in CDS spreads (Figure 3.3.3). Using internal ratings-based (IRB) risk weights

Figure 3.3.2. Sovereign CDS Spreads and Fiscal Fundamentals—Precrisis, Crisis, and Postcrisis
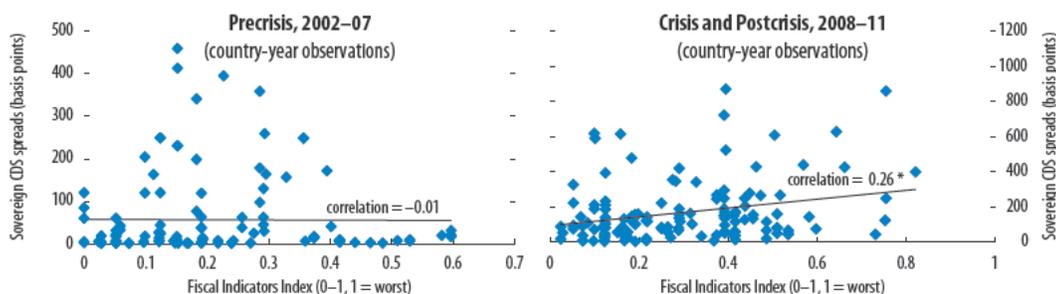
Sources: Bloomberg L.P.; IMF (2011c); and IMF staff estimates.
*Significant at 5 percent level.

Figure 3.3.3. Capital Adequacy Ratios—Actual, IRB-Adjusted, and IRB- and Risk-Adjusted, 2007 and 2010
(In percent)
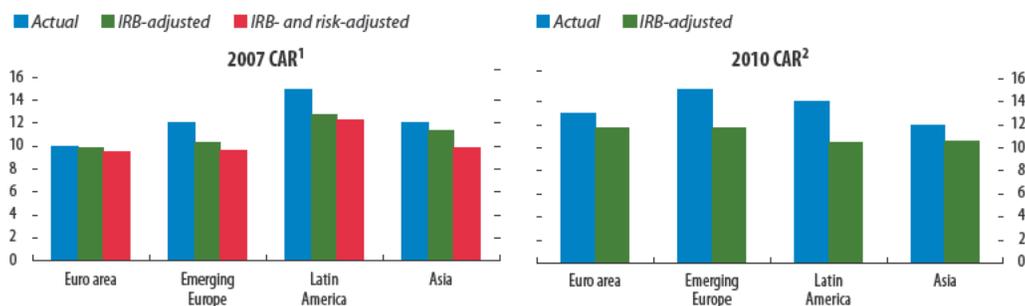
Sources: Bankscope; and IMF staff estimates.
Note: Data for each region are the median for all reporting banks. CAR = capital adequacy ratio; IRB = internal ratings-based.
[1]Actual = reported CAR; IRB-adjusted = CAR based on IRB risk weights for government security holdings, rather than zero, using observed CDS spreads in 2007 to extract estimates of probabilities of default (PDs); IRB- and risk-adjusted = IRB risk weights, using adjusted CDS spreads to extract estimates of PDs (adjusted CDS spreads = observed CDS spreads + 459.33 x IMF Fiscal Indicators Index).
[2]IRB-adjusted = CAR based on the observed sovereign CDS spreads and the associated PDs in 2010.

Box 3.3 *(continued)*

and PDs based on actual CDS spreads, the capital adequacy ratios are considerably lower for emerging markets. Adjusting further for risk differentiation (based on the observed differentiation seen during 2008–11), the capital adequacy ratios are even lower. The bias is low in advanced economies in view of their relatively low EADs. At end-2007, the difference between the observed capital adequacy ratio and the "IRB- and risk-adjusted" capital adequacy ratio ranged from 0.5 to 2 percentage points across the countries

in Europe. In emerging economies, adjustments were in the range of 2 to 3 percentage points, given those banks' more sizable domestic sovereign exposures and higher CDS spreads due to worse medium-term fiscal fundamentals. In Canada, Japan, the United Kingdom, and the United States, downward revisions of the capital adequacy ratios were relatively low, in the 0.2 to 1.5 percentage point range. The bias was even higher for some regions in 2010 because of worse fiscal fundamentals and higher EADs.

Even now, the favorable capital treatment does not adequately reflect underlying economic risks and may lead to higher bank allocations to sovereign debt than warranted by more accurate risk-return considerations.[39] The current preferential treatment of sovereign exposures is based partly on national supervisors' practice of applying zero risk weighting on sovereign debt within the same currency area. Many countries' supervisors apply the zero percent risk weight to their own sovereign debt. The European Union Capital Requirements Directive applies preferential treatment to debt issued by cross-border euro area sovereigns despite the fact that the countries have given up independent monetary policy and that their fiscal fundamentals vary widely. Setting the risk weights at levels reflecting actual underlying risks and medium-term fiscal fundamentals would eliminate this bias. More generally, underestimation of government debt-related risks in bank portfolios can account for an upward bias in capital adequacy ratios.[40] The magnitude of potential capital adequacy bias could be high (see Figure 3.7 and Box 3.3).

Bank demand for government debt is likely to expand in the future. The advent of new regulations may force banks to hold even more safe assets. For example, on the liquidity side, unless banks alter their liability structure to moderate their liquidity needs, the requirements of the new Basel III Liquidity Coverage Ratio (LCR) alone could further increase

the demand for safe assets by some $2 trillion to $4 trillion worldwide (see Box 3.4). An increase in the risk weights of riskier sovereigns could also spur stronger demand for the safest sovereign assets (see Box 3.3). In addition, business uncertainty is likely to put upward pressures on such demand.

The upcoming introduction of the LCR could influence how maturity risks associated with sovereign safe asset holdings are distributed within banks. Under Basel III, maturity restrictions on qualifying liquid assets are lifted, and assets—including government securities—with different terms to maturity are eligible to meet the LCR.[41] Government securities are a substantial component of the liquid assets required under Basel III; however, they are not the only qualifying liquid assets.

The upcoming implementation of the Solvency II regulations, although not yet finalized, may stimulate stronger demand by European insurance companies for certain assets. Under the current proposal for Solvency II, insurance companies would, for instance, not be required to hold regulatory capital against exposures to government bonds issued by member states of the European Economic Area, or government guarantees backed by multilateral development banks, regardless of the credit ratings or risk premiums of such instruments.[42] Solvency II may also boost the demand for highly rated safe assets because it links insurance companies' capital requirements to the credit ratings of their asset holdings.

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[39]Basel I alloted zero percent risk weights to all OECD countries. Following the Asian crisis in the 1990s, Basel II provided greater risk-weight differentiation for sovereign debt.

[40]Capital adequacy ratios are measured as the ratios of regulatory capital to risk-weighted assets.

[41]See Hannoun (2011).

[42]Solvency II is expected to be fully implemented in 2014.

Box 3.4. Impact of the Basel III Liquidity Coverage Ratio on the Demand for Safe Assets

Unless they change their funding profiles, banks may need to increase their government debt holdings to ensure that they meet the liquidity requirements of the new Liquidity Coverage Ratio (LCR).

The introduction of the LCR under Basel III could be an important regulatory driver of bank demand for safe assets.[1] The liquidity buffer held by banks to fulfill the LCR requirement includes two types of liquid assets, both of which are supposed to have high credit quality and low market risk, traits presumed to translate into high market liquidity (Table 3.4.1): Level 1 assets are meant to exhibit characteristics akin to the safest assets; those in Level 2 are subject to a haircut and a limit on their quantity in the overall liquidity requirement. The LCR excludes lower-quality assets (below Levels 1 and 2) because in times of severe market stress, banks are either unable to sell them or are forced to accept considerable fire-sale haircuts.[2]

LCR requirements could have a sizable impact on the global demand for safe assets. To fulfill the Basel III LCR requirements by end-2009, large G20 banks would have required approximately $2.2 trillion in additional liquid assets, at least partly in the form of sovereign debt assets, according to the 2010 Quantitative Impact Study (QIS) of the Basel Committee on Banking Supervision (BCBS,

Note: Prepared by Maximilian Fandl and Christian Schmieder.
[1]See BCBS (2010a). To meet the LCR, banks need to maintain sufficient liquid assets to cover net cash flows over 30 days without external funding. Calibration of the LCR is subject to revision until end-2014.
[2]See BCBS (2010a) for exceptions for countries with insufficient amounts of assets at Levels 1 and 2.

Figure 3.4.1. Large G20 Banks: Available Liquid Assets and Expected Shortfall to Meet the Liquidity Coverage Ratio, End-2009
(In trillions of U.S. dollars)

Sources: The Quantitative Impact Study (QIS) (BCBS, 2010b); Bankscope; and IMF staff estimates.
Note: In its initial and follow-up data collection, the QIS covered 249 banks, which are from 23 of the Basel Committee's 27 member countries and cover most of the G20 countries. The value for liquid assets required to meet the Basel III liquidity coverage ratio was inferred from the QIS report, and the shortfall is as given in that report. A report with the European subset of the QIS data is CEBS (2010).

2010b) (Figure 3.4.1). An extrapolation for smaller G20 banks and non-G20 banks—not included in the QIS sample—shows that the potential need for qualifying liquid assets globally is in the range of $2 trillion to $4 trillion, equivalent to 15 percent to 30 percent of banks' total current sovereign debt holdings.[3] The combined sample approximately

[3]Estimates based on the latest QIS and relevant bank data; a more precise estimate would require an update of the QIS. The extrapolation for smaller G20 banks and non-G20 banks assumes that the proportions of assets to net outflows (the LCR ratios) are identical to those of the large G20 banks in the 2010 QIS. The estimate of required liquid assets is presented as a share of total sovereign debt holdings only to provide a sense of the relative magnitude of the potential liquid asset needs. Certainly, the liquid assets to meet the LCR may take the form of non-sovereign eligible assets.

Table 3.4.1. Liquid Assets Eligible for the Liquidity Coverage Ratio

Type of Asset	Haircut (in percent)	Description
Level 1	0	Cash and central bank reserves (to the extent they can be drawn down in times of stress)
		Zero percent risk-weighted marketable securities or sovereign guarantees (including subsovereigns and public sector), central banks, and certain multilateral institutions
		Nonzero percent risk-weighted, domestic currency debt securities issued by sovereigns or central banks
		Nonzero percent risk-weighted, foreign currency debt securities issued by sovereigns or central banks to the extent that holding such debt matches the currency needs of the bank's operations in that jurisdiction
Level 2	15	20 percent risk-weighted marketable securities or guarantees by sovereigns (including subsovereigns and public sector), central banks, and certain multilateral institutions
		Covered bonds with high ratings (AAA to AA–)
		Plain-vanilla corporate bonds by nonfinancial corporations with high ratings (AAA to AA–)

Source: Bank for International Settlements.

Box 3.4 *(continued)*

doubles the total assets and hence the required liquid assets, based on the assumption that the balance sheet structure of smaller G20 banks and non-G20 banks is identical to the QIS banks. However, banks have three more years to adapt their funding profiles to meet the LCR, at which time their needs for safe assets could be lower. A more continuous

calibration of the qualifying liquid assets—including eligibility and haircuts—could ameliorate pressures on the markets for safe assets. It is worth noting that the estimates here cannot account for the cross-country variation in amounts demanded by individual institutions and potentially supplied by issuers of the required assets.

The Role of Central Bank Demand for Safe Assets

Some advanced economies' central banks have influenced the markets for safe assets via massive purchases of government securities (Figure 3.9).[43] Notably, the Federal Reserve and the Bank of England have resorted to such purchases in the wake of the crisis to boost system-wide liquidity and stimulate economic activity by lowering long-term interest rates. These policies have contributed to a substantial decline in the long-term yields on government securities. They have also been successful in compressing yields and improving market liquidity in certain non-government securities—including corporate bonds—thus enhancing this aspect of their perceived safety.[44]

• In the *United States*, the pace of the Federal Reserve's asset purchases accelerated markedly under QE2 (the second stage of the so-called quantitative easing program), even though the share of such purchases in overall holdings has not increased drastically compared with precrisis levels. During QE2, the Federal Reserve became the principal buyer of U.S. Treasury securities in the secondary market, while such purchases in other sectors—particularly the foreign official sector—slowed down.

• In the *United Kingdom*, the Bank of England increased its gilt holdings considerably—both in absolute terms and in terms of market share—in the two years since its first gilt purchase under the Asset Purchase Program in March 2009. As intended, the Bank of England increased its share in aggregate gilt holdings, while the shares of pension funds, insurance companies, and other financial institutions declined.

These large-scale purchase programs have turned the Federal Reserve and the Bank of England into large holders of long-term government securities, with some risks for safe asset markets. The longer-term purchases have resulted in a marked increase in the maturities of both central banks' government securities holdings. At end-January 2012, about 40 percent of the Bank of England's holdings consisted of securities with remaining maturities of 10 to 25 years (Figure 3.10).[45] In the United States, the share of longer-term securities in the Federal Reserve's portfolio increased to roughly 30 percent after the introduction of the Maturity Extension Program—also known as "Operation Twist."[46] The sizable presence of central banks in the long-term government securities markets may limit the room for further policy maneuver, and may constrain central bank flexibility in smoothly unwinding current monetary policies.[47] This can lead to a loss of asset safety in

[43]The Bank of Japan has been an active buyer of government debt since the introduction of quantitative easing in Japan in 2001 (terminated in 2006), and continues to be under its current Asset Purchase Program.
[44]See Yellen (2011); and Joyce, Tong, and Woods (2011). See IMF (2012) for a discussion of the role that central bank purchases of sovereign debt play in relieving the financial markets from absorbing large issuances. To the extent that central banks also supply central bank money (safe asset), reserve balances held by banks could increase, resulting in a change in composition of safe assets, rather than a decline (see the section below on "Central Bank Supply").

[45]Bank of England purchases are restricted to nominal gilts, with maturity initially capped at 25 years. However, the maturity restriction was subsequently relaxed as the purchase program expanded.
[46]Operation Twist was introduced to exert a downward pressure on long-term interest rates and support more accommodative broad financial conditions (Board of Governors of the Federal Reserve System, 2011).
[47]See Board of Governors of the Federal Reserve System (2011); and Fisher (2010).

Figure 3.9. Government Securities Purchases and Holdings by Sectors
(In percent)

United States

Cumulative net purchases relative to total outstanding amount at end-2006

Holdings share relative to outstanding issued

— Central bank
— Insurance and pensions
— Other domestic sectors
— Banks
— Investment funds
— Foreign sector

■ Central bank
■ Insurance and pensions
■ Other domestic sectors
■ Banks
■ Investment funds
■ Foreign sector

United Kingdom

— Central bank
— Insurance and pensions
— Other domestic sectors
— Banks
— Other financial institutions[1]
— Foreign sector

■ Central bank
■ Insurance and pensions
■ Other domestic sectors
■ Banks
■ Other financial institutions
■ Foreign sector

Sources: Bank of England; national flow of funds data; and IMF staff estimates.
[1]For the U.K., includes financial institutions other than investment funds.

real terms and to higher currency risks. Large-scale asset purchases can also have an adverse effect on the political incentives to improve fiscal discipline because the back stop of central bank purchases keeps interest rates and thus funding costs low.

Use as Benchmark Securities

Safe assets play an important role as benchmarks both to judge relative performance and to assign prices to other assets. They serve: (1) as an integral part of the mandates of some pension, mutual, and sovereign debt funds globally, and as fund perfor-

mance benchmarks (for example, market-neutral hedge fund strategies that attempt to be risk free); (2) as reference rates for the pricing, hedging, and valuation of a broad number of risky assets; and (3) as indicators of monetary and financial conditions (for example, an inverted government bond yield curve may signal an incipient economic contraction).

The integration of safe assets in the mandates of various funds suggests that potential shifts away from downgraded sovereign debt can lead to upward demand pressures on AAA-rated securities. Anecdotal evidence suggests that the most conservative global funds and mandates are now moving to AAA-rated

Figure 3.10. U.S. and U.K. Central Bank Holdings of Government Securities, by Remaining Maturity
(In percent of total amount outstanding)
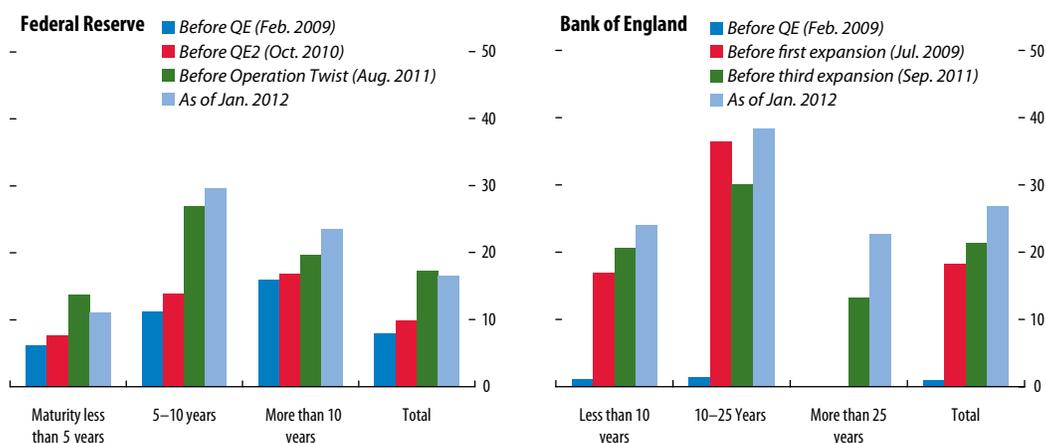
Sources: Bank of England; Federal Reserve; U.K. Debt Management Office; U.S. Department of the Treasury; and IMF staff estimates.
Note: End of month figures. Government securities for the Bank of England exclude treasury bills, indexed bonds, and undated bonds. QE = quantitative easing.

bond indices. For example, some euro government bond fund mandates and benchmarks are increasingly reallocating to AAA-rated sovereign debt. This process could accelerate if debt sustainability concerns widen and sovereign downgrades persist. A reversal of the mandate changes could potentially span years: credit and risk committees of reserve managers, insurance companies, and pension funds would need to be persuaded that the risk-return trade-offs on downgraded entities were sufficiently stable and well performing before the committees readmit them to the benchmark.

Safe assets—via the government yield curve—are also a traditional benchmark in the pricing and valuation of risky assets in financial markets. The benchmark role of the government yield curve is linked to the historically high market liquidity and perceived safety of government securities. Fixed-income securities are often priced at a spread to a government debt instrument of the same maturity. Because of their perceived safety, sovereign yields have also been typically used as risk-free rate proxies in asset valuations. Moreover, the benchmark role of government securities is critical for local market development in emerging economies. The establishment of a liquid government bond yield curve is viewed as a precondition for the development of other market segments—including derivatives and corporate bond markets—typically priced off the government yield curve.

A potential deterioration in their status as the safest assets raises questions about the future role of government securities as benchmarks in the pricing and evaluation of riskier assets. For example, there was speculation that Standard & Poor's downgrade of U.S. sovereign debt from AAA to AA+ in 2011 would lead to a potential loss of the benchmark status of U.S. Treasuries with highly detrimental consequences. Theoretically, complete removal of U.S. sovereign debt would alter portfolio choices rather substantially (see Box 3.5), but to date, the downgrade has had little discernible effect on the status of the U.S. Treasuries as benchmark securities.

In the absence of viable alternatives, it is unlikely that major government securities markets would lose their benchmark role. The role of an alternative benchmark in asset pricing and valuation is often played by the swap curve, even if it is not based on instruments that are considered mostly risk free. For example, the swap curve is the principal asset pricing benchmark in the euro area, given that there are no common sovereign debt instruments and no homogeneous euro area sovereign yield curve.[48] Swap curves—based primarily on "plain vanilla" interest rate

[48]The yield curve of the German bund may be regarded as an alternative benchmark. Also, the ECB publishes two euro area bond yield curves on a daily basis, one for all euro area countries and the other only for AAA-rated government bonds, but none of them is used as often as the swap curve in the euro area.

Box 3.5. The Impact of a Further Loss of Sovereign Debt Safety Illustrated in a Mean-Variance Framework

The impact of a hypothetical loss of sovereign debt safety can be assessed through its effect on portfolio choices in a typical mean-variance framework. The model estimates a mean-variance efficient frontier of returns of portfolios constructed from a set of base assets.[1] Even though the method assumes stable relationships among asset correlations across the experiments conducted below, it can help to illustrate the potential impact of the crisis and of a hypothetical elimination of safe assets on portfolio choices.

Contrary to intuition, the volatility of the optimal portfolios decreased after the crisis, thus raising the potential safety of bond portfolios for short-term investors.[2] The monthly volatility of the minimum variance portfolio decreased to 0.65 percent post-crisis from 0.85 percent in the period before 2008 (Figure 3.5.1). This result was driven by the sharp decline in the correlations across many of these assets after the global crisis, which allowed investors to reduce fluctuations in their portfolios despite stronger volatility in individual asset returns. This does not contradict the sharp increase of correlations across asset classes driven by the initial panic selling immediately after the failure of Lehman Brothers. More specifically, the crisis produced a decoupling of the returns of various sovereign bonds, giving investors the opportunity to better exploit the power of diversification and to construct portfolios whose ultimate volatility is much smaller. This highlights the importance of viewing asset safety from a portfolio perspective. For the minimum variance portfolio considered here, the crisis

Figure 3.5.1. Efficient Frontier, before and after Crisis
(In percent)

Sources: Bloomberg L.P.; and IMF staff estimates.
[1]January 1997 through December 2007.
[2]January 2008 through October 2011.

increased the role of U.S. sovereign debt—and of French, Spanish, and Finnish sovereign bonds—in the safest portfolio, and conversely reduced the importance of Pfandbriefe and Dutch, German, and Italian sovereign bonds.[3]

A hypothetical deterioration of highly rated sovereign debt would likely have considerable repercussions for the ability of investors to protect themselves from risks. Potential sovereign debt problems are modeled via the estimation of an efficient frontier that excludes the debt of key countries, such as France, Germany, the United States, and peripheral euro area countries. The exclusion of U.S. debt would make investors less capable of shielding their portfolios from risks, as shown by the sharp inward contraction in the efficient frontier (Figure 3.5.2). The special role of U.S. debt in safe portfolios is even more discernible when one compares the considerable impact of a deterioration of U.S. debt markets to the negligible impact of potential

Note: Prepared by Tiago Severo.
[1]The efficient frontier is the curve of minimum return volatilities for any given level of expected returns of portfolios constructed from base assets. The base assets consist of 14 sovereign debt instruments issued by major advanced economies, a highly collateralized bond issued by German banks (the Pfandbriefe), five broad stock indexes, and a short-term asset represented by the three-month Treasury bill. The efficient frontier is constructed from portfolios of the base assets to minimize the return volatility for any given level of expected returns. The expected returns on the assets and their variance-covariance matrix are estimated on the basis of a sample of monthly returns between January 1997 and October 2011.

[2]The precrisis period covers the beginning of 1997 to the end of 2007; the crisis period covers the period from January 2008 through October 2011.

[3]The basic intuition for explaining the increased role for Spanish bonds after the crisis is that they became less correlated with the sovereign bonds of core advanced economies, particularly Finland, the Netherlands, the United Kingdom, and the United States. Given that the sovereign bonds of these core countries gained importance in the minimum variance portfolio, the appeal of Spanish bonds also increased. Moreover, Spanish bonds are highly correlated with Italian bonds. Thus, during the crisis, the optimal portfolio had large short positions in Italian bonds, offset by long positions in Spanish bonds. Conversely, German bonds became less important because of their high correlation with U.S. bonds.

Box 3.5 *(continued)*

Figure 3.5.2. Debt Deterioration and the Efficient Frontier
(In percent)
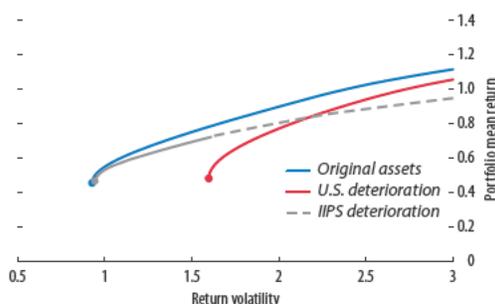
Sources: Bloomberg L.P.; and IMF staff estimates.
Note: IIPS = Ireland, Italy, Portugal, and Spain.

problems in other markets (Figure 3.5.2, line for Ireland, Italy, Portugal, and Spain). This interpretation assumes that the correlation structure remains intact and that investors are predominantly making buy/sell decisions on the basis of risk and return rather than for liquidity or other reasons.

swaps—incorporate market perceptions of average bank credit risk and interest rate expectations and thus embed explicitly some credit risk. In view of this risk, the swap curve is typically above the Treasury yield curve, with swap spreads widening with market volatility and higher counterparty credit risks. However, at times of heightened sovereign risks, the swap curve is linked to the Treasury yield curve, in view of the linkages between sovereign and banking risks. Overall, in the absence of viable alternatives, markets will likely continue to use government yield curves or swap curves as benchmarks, even if they are not perceived to be based on truly risk-free assets.

The Supply of Safe Assets

From the preceding discussion, it is clear that the demand for safe assets is subject to considerable upward pressures. This section examines whether supply is likely to satisfy such demands. It analyzes, in turn, the role of sovereign issuers, the private sector, central banks, and emerging markets (Table 3.3).

Sovereign Supply

Traditionally, the issuance of sovereign debt by the advanced economies has been a key source of safe assets in global financial markets. Before the crisis,

the safety of these instruments was underpinned by two features: the rarity of sovereign default, and the strength of advanced economies' political institutions, including government taxing power.

However, the recent considerable deterioration of some advanced economies' fiscal profiles has reduced the supply of sovereign debt perceived as safe. The sharp increase in advanced economies' public indebtedness after the global financial crisis, combined with low tax revenues and high current and future public expenditures, has raised concerns about the sustainability of their debt. Such concerns have been augmented by government difficulties—including the political gridlock in the United States and Europe—that have impaired the ability of advanced economies to devise credible adjustment strategies that properly balance short-term concerns about economic activity with long-term fiscal consolidation. Thus, while 68 percent of advanced economies carried a AAA-rating at end-2007, the proportion dropped to 52 percent by end-January 2012 (Figure 3.11, left panel).[49] This amounts to

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[49]As discussed previously, ratings are subject to considerable deficiencies and should be viewed only as a loose indication of credit quality. They are used here given their extensive use by investors and ready availability over time; as earlier GFSR analysis showed, asset safety should not be viewed as being directly linked to credit ratings. See IMF (2010b) for a more extensive discussion of ratings and their role.

Table 3.3. Demand and Supply Factors and Their Anticipated Impact on Safe Asset Markets

Source of Demand	Investor Type	Important Short- to Medium-Term Factors	Expected Impact on Demand
Stable store of value in a portfolio management context	Reserve managers	Importance of safety considerations in strategic asset allocation and rising overall reserves, partly mitigated by increasing diversification and reallocation to sovereign wealth funds	↑
	Insurance companies and pension funds	Demand related to overall investment policy, but low-interest-rate environment may limit safe asset allocation by putting pressure on profitability	→
	Nonbank financial institutions	Flight to safety due to the European sovereign debt crisis (temporary effect related to the market turmoil)	↑
High-quality collateral for financial transactions	Banks and other financial institutions	Gradual shift of over-the-counter derivatives to central counterparties	↑
		Limits on the reuse of collateral and decreasing velocity of collateral	↑
		Increasing importance of secured funding sources for financial institutions with more differentiation in terms of applied haircuts in repo transactions[1]	→
Cornerstone in prudential regulations	Banks	Introduction of the liquidity coverage ratio (Basel III) (temporary effect)	↑
		Higher risk weights for riskier or downgraded sovereign debt	[2]
	Insurance companies	Treatment of sovereign debt and covered bonds under Solvency II	↑
Part of crisis-related liquidity provision	Central banks	Crisis-related monetary easing	↑
Benchmark for other assets	Banks and other financial institutions	Shift in the structure of demand toward assets that are perceived as relatively safer (e.g., U.S., U.K., Germany)	[3]

Source of Supply		Important Short- to Medium-Term Factors	Expected Impact on Supply
Sovereign issuers		Considerable deterioration of fiscal profiles in some advanced economies	↓
Private sector		Reduced effectiveness of traditional hedging instruments	↓
Central banks		Crisis-induced extension of liquidity provision	↑
Emerging markets		Restricted ability to generate safe assets (financial development, legal institutions, etc.) and lower degree of financial depth than advanced economies	→

Source: IMF staff.

Note: → indicates no impact; ↑ indicates an increase; ↓ indicates a decrease.

[1] Temporary effect due to disruptions of funding markets but possibly a more structural trend in the future.

[2] Possibly less demand for riskier or downgraded sovereign debt and higher demand for relatively safer or higher-rated sovereign debt as substitute.

[3] Overall impact will depend on evolution of perceptions of safety for benchmark assets.

approximately $15 trillion of sovereign debt globally as of end-June 2011.

The experience of advanced economies shows that safety is a special characteristic of assets that can be lost very rapidly if market perception of soundness deteriorates. As the recent crisis in southern Europe suggests, once a country's ability or willingness to service its debt starts to be questioned by investors, they begin to move their holdings to other assets that are thought to be safer. Hence, deterioration in fiscal conditions has an important endogenous effect on the supply of safe financial instruments.

Figure 3.11. Distribution of Selected Advanced and Emerging Market Economies, by Sovereign Debt Rating
(In percent of total)
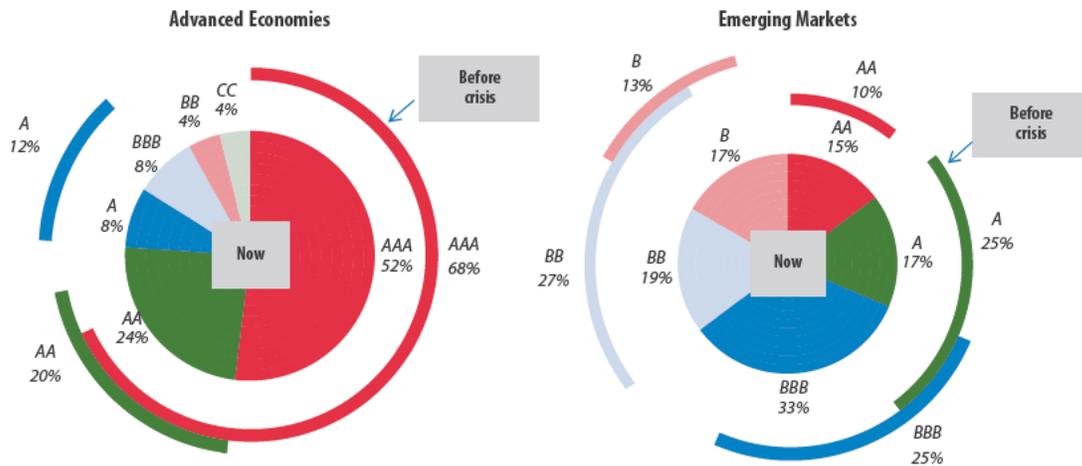
Source: IMF staff estimates based on S&P ratings of 25 advanced economies and 48 emerging market economies.

The considerable deterioration in the perceived safety of sovereign debt raises doubts about the ability of sovereigns to act as suppliers of safe assets, a role that they are best positioned to serve. The critical importance of advanced economies' sovereign debt is related to two factors: the very large stocks of these securities and their ability to readily meet the collateral and regulatory requirements faced by various investors. Regarding its formidable size, the aggregate general government gross debt of advanced economies amounted to over $47 trillion at end-2011, on average accounting for roughly 69 percent of each country's output (Figure 3.12). IMF projections suggest that the total outstanding government debt of this group of countries will rise to roughly $58 trillion by 2016, an increase of 38 percent in five years.[50] Unlike securitized instruments or covered bonds produced by the private sector, sovereign debt can generate safety that is intrinsic rather than synthetically created by combining the payoffs of risky instruments.

Both the lack of political will to reshape fiscal policies at times of rising concern over debt sustainability and an overly rapid reduction of fiscal deficits limit governments' capacity to produce assets with

low credit risk. When large primary deficits—in line with those observed in 2010—persist over extended periods, it is difficult to return public sector fundamentals to sound levels. This suggests that unsustainable fiscal policies that are not reversed in a timely manner impair long-term asset safety. Conversely, up-front austerity measures could impair the sustainability of a country's public debt, especially if accompanied by rapid private sector deleveraging and a contraction in GDP. Thus, the pace of improvement of fiscal fundamentals needs to account for the impact on economic growth and take into consideration country-specific circumstances.

The fiscal deterioration in advanced economies can have considerable consequences. If levels of recent credit default swap (CDS) spreads on sovereign debt are used as the criterion for excluding certain countries as suppliers of safe assets, current and projected supply would drop significantly.[51] Using spreads above 350 basis points at end-2011 as the cutoff would exclude Greece, Hungary, Ireland, Italy, Portugal, Slovenia, and Spain, and the projected 2012 supply of safe assets would

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[50]Outstanding government debt is measured in current prices. Projections of total outstanding debt are based on the *World Economic Outlook*.

[51]The exclusion of certain countries' assets is justified by investors' decisions to underweight or to exclude underperforming bonds, even where existing benchmarks are retained. See Chapter 2 for a discussion in the context of the recent removal of Portuguese bonds from the Citigroup World Government Bond Index.

Figure 3.12. OECD Countries: General Government Gross Debt Relative to GDP, End-2011
(In percent)
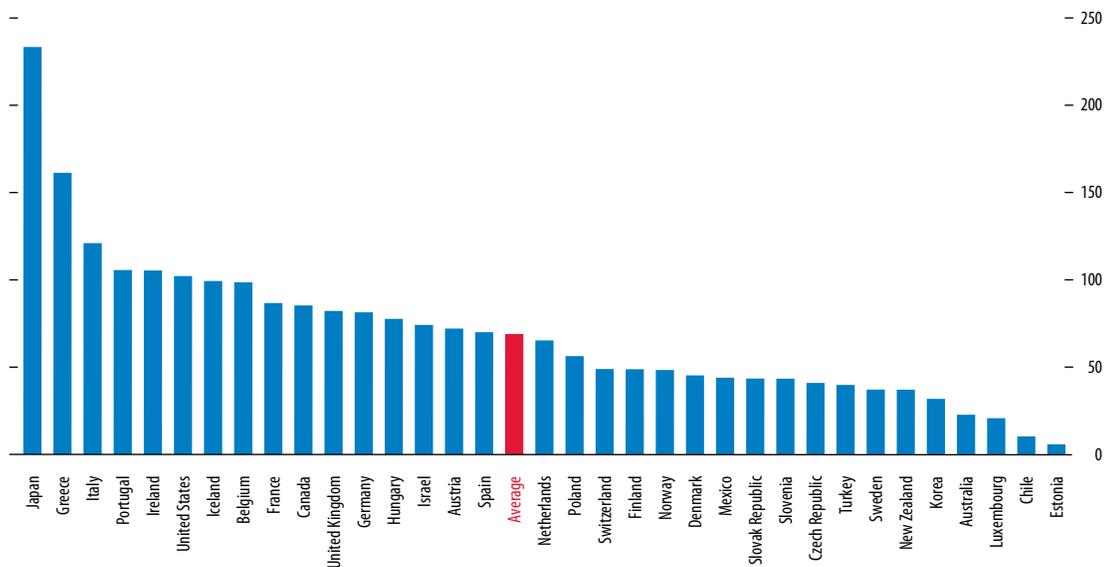
Source: IMF, World Economic Outlook database.

drop by $4.6 trillion (Figure 3.13).[52] This contraction would increase to $8.1 trillion, or approximately 16.4 percent of the 2012 total supply of advanced economy debt, if countries with five-year CDS spreads above 200 basis points at end-2011—including Belgium, France, Iceland, Poland, the Slovak Republic, and Turkey—are also excluded. Projections of advanced economy public indebtedness indicate that the exclusion of all 13 countries from the sample will reduce the supply of safe public debt by more than $9 trillion by 2016, or about 16 percent of the 2016 projected total.[53]

Private Sector Supply

The production of safe assets by the private sector largely collapsed with the onset of the global crisis. Total private sector securitization issuance declined from more

[52]The spreads are the prices paid for five years of protection (via CDS contracts) against default of the debt, with the price expressed in basis points of the nominal amount insured.

[53]The numbers are based on extrapolations rather than forecasts; realization of the latter depends critically on the developments in the Greek and euro area crisis discussions and other factors.

Figure 3.13. OECD Countries: General Government Gross Debt, 2010–16
(In trillions of U.S. dollars)

■ *Total*

■ *Excluding countries with CDS spreads above 350 basis points at end-2011[1]*

■ *Excluding countries with CDS spreads above 200 basis points at end-2011[2]*
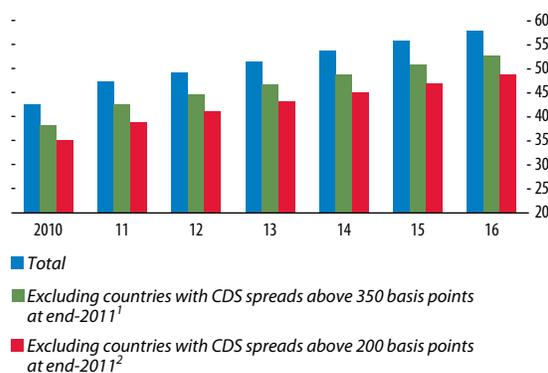
Sources: Bloomberg L.P.; and IMF, World Economic Outlook database.
Note: For 2012–16, the data are projections.
[1]Greece, Hungary, Ireland, Italy, Portugal, Slovenia, and Spain.
[2]Belgium, France, Greece, Hungary, Iceland, Ireland, Italy, Poland, Portugal, Slovak Republic, Slovenia, Spain, and Turkey.

Figure 3.14. Private-Label Term Securitization Issuance
(In trillions of U.S. dollars)
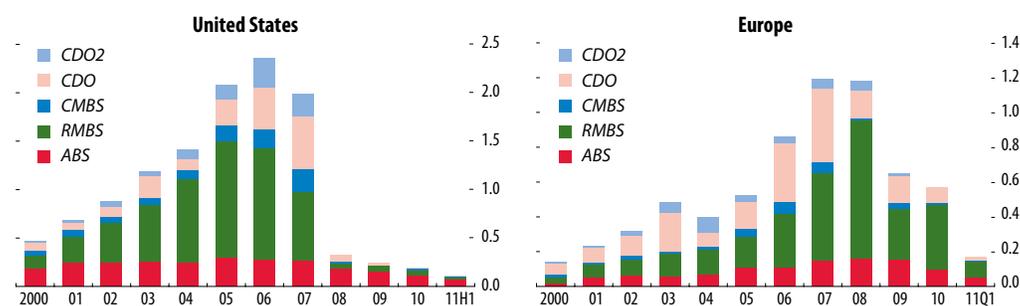
Sources: Association for Financial Markets in Europe; Board of Governors of the Federal Reserve System; Fitch Ratings; Inside Mortgage Finance; JPMorgan Chase & Co.; Merrill Lynch; and IMF staff estimates.
Note: ABS = asset-backed security; CDO = collateralized debt obligation; CDO2 = CDO-squared and CDOs backed by ABS and MBS; MBS = mortgage-backed security; RMBS = residential MBS; CMBS = commercial MBS.

than $3 trillion in the United States and Europe in 2007 to less than $750 billion in 2010 (Figure 3.14). The extraordinary volume of precrisis issuance was driven by the perception that the instruments were nearly risk-free while offering yields above those of the safest sovereigns. By construction, the high risk levels inherent to the lowest-rated (equity) tranches of the structured securities were expected to be offset by the near risk-free senior AAA-rated tranches. In reality, as the global financial crisis showed, the losses in the underlying portfolios were sufficiently large to threaten the solvency of even senior AAA-rated tranches. Moreover, the lack of information on the quality of the underlying assets made estimations of true asset value difficult and hence sensitive to sudden bad news. As a result, investors are still generally unwilling to invest much in these types of assets.

The ability of private issuers to generate safe assets depends critically on the inherent credit risk of issued instruments. These risks are determined not only by the issuers' default risk but also by the structure of such instruments. An interesting case in this regard is that of covered bonds, or German-style Pfandbriefe. Covered bonds are similar to traditional securitized instruments in being typically structured to ensure higher perceived safety than warranted by issuers' own credit profiles.[54] However, two critical aspects differentiate covered bonds from typical securitizations: the unobstructed access they provide to asset pools in case of an issuer default and, perhaps most importantly, the ongoing

substitutability of asset pools that underlie these bonds. The latter feature ensures that the quality of asset pools is kept high at all times, as issuers are required to substitute or add collateral in case of credit quality deterioration (thus ensuring overcollateralization).

Aside from securitization, there are other, more conventional strategies that allow investors to effectively manufacture safe assets from combinations of risky payoffs. For example, investors who want to purchase a safe debt instrument may buy risky debt from a corporation or a sovereign and combine it with a CDS on the reference entity. As long as counterparty risk in the CDS market is small, the payoff of this portfolio will resemble that of safe debt from the perspective of credit risk.

However, policies implemented during the recent turmoil may have reduced the effectiveness of traditional hedging instruments. For example, the authorities' desire to avert a trigger on CDS payments and the imposition of voluntary losses on private investor holdings of Greek sovereign debt until recently impaired the integrity of this hedging mechanism. Similarly, prohibitions imposed by some advanced economy governments on short sales of sovereign debt constrain investors' hedging strategies and thus their ability to create synthetically safe assets. Some investors have responded to these measures by resorting to alternative strategies that mimic the hedging properties of the disallowed hedging mechanisms. For example, the earlier decision to avoid the trigger of the CDS on Greek sovereign debt may have induced investors to short bonds issued by other euro area countries to obtain sovereign risk protection.

[54]See Packer, Stever, and Upper (2007).

Box 3.6. Conventional Monetary Policy and Its Demand for Safe Assets under Normal Conditions

On the supply side, central banks can augment banking system reserve balances, primarily via open market operations. From the perspective of a bank, such reserve balances can be viewed as safe assets because they: (1) are most liquid (can be used for immediate settlements), (2) carry no market risk (nominal values remain constant), and (3) do not embed credit risk (at least in nominal terms, given central banks' ability to issue fiat money).[1] Central banks also supply banknotes—a medium of exchange without market and credit risks in the present context—to the general public.[2]

On the demand side, central banks conduct collateralized lending—including securities repo transactions—and outright securities purchases to provide the most liquid assets to the financial system (Table 3.6.1). Central banks generally do not engage in unsecured lending so as to protect themselves (and ultimately, to protect taxpayers should central banks need to be recapitalized) against financial losses related to counterparty defaults. In this context, eligible collateral for open market operations and standing facilities also tends to be restricted to high-quality securities. However, the types and range of such collateral vary considerably across central banks,

Table 3.6.1. Proportion of Central Banks Using Selected Tools for Open Market Operations, 2010
(In percent)

Outright purchase of securities	56.3
Securities repo	79.6
Collateralized lending	65.0

Source: IMF Information Systems for Instruments of Monetary Policy (2010).

Note: Results are for 103 central banks. Many central banks use more than one of the tools shown.

in view of country-specific factors such as banking and financial market structures, number and diversity of counterparties, and statutory requirements.[3]

Similarly, eligible securities for outright purchases are generally limited to domestic government securities and, to a lesser extent, securities issued by central banks (Table 3.6.2). Because many countries have deep markets for government securities, such purchases are often used by central banks as a tool for injecting liquidity into the financial system while minimizing interference in domestic capital allocation and credit risk.

Table 3.6.2. Proportion of Central Banks Purchasing Selected Securities for Open Market Operations, 2010
(In percent)

Government securities	70.7
Central bank liabilities	43.1
Other	15.5

Source: IMF Information Systems for Instruments of Monetary Policy (2010).

Note: Results are for 58 central banks that conduct outright purchases of securities for open market operations. Many central banks purchase more than one of the types shown.

Note: Prepared by Ken Chikada.

[1] This in turn implies that central bank money is susceptible to inflation risk and thus is not entirely risk free.

[2] Central banks could also issue central bank bills or offer term deposits to financial institutions. Such instruments could be considered safe assets in a broader context, as they have zero credit risk and generally low market risk, given their short-term maturities. Also, they are typically used to absorb excess liquidity in the system and thus are tools for maturity and liquidity transformation within the central banks' liabilities.

[3] See Chailloux, Gray, and McCaughrin (2008); and Cheun, von Köppen-Mertes, and Weller (2009) for more details on the collateral frameworks.

Central Bank Supply

In response to the global financial crisis, major central banks undertook the role of providing safer assets. In normal times, central banks enlarge or reduce the supply of central bank money in the system through exchanges of high-quality securities with longer maturities and less liquidity; thus they in effect conduct maturity and liquidity transformation within the safe asset

universe (see Box 3.6).[55] In contrast, during the crisis, central banks could and actually did act as a backstop by temporarily exchanging riskier assets with safer ones (central bank money), in part via an expansion of eligible collateral types, with more frequent open market operations to a broader range of counterparties and at

[55] Liquidity here refers to closeness to cash.

Figure 3.15. Selected Advanced Economies: Changes in Central Bank Assets and Liabilities since the Global Crisis
(In percent relative to monetary base at end-2006)
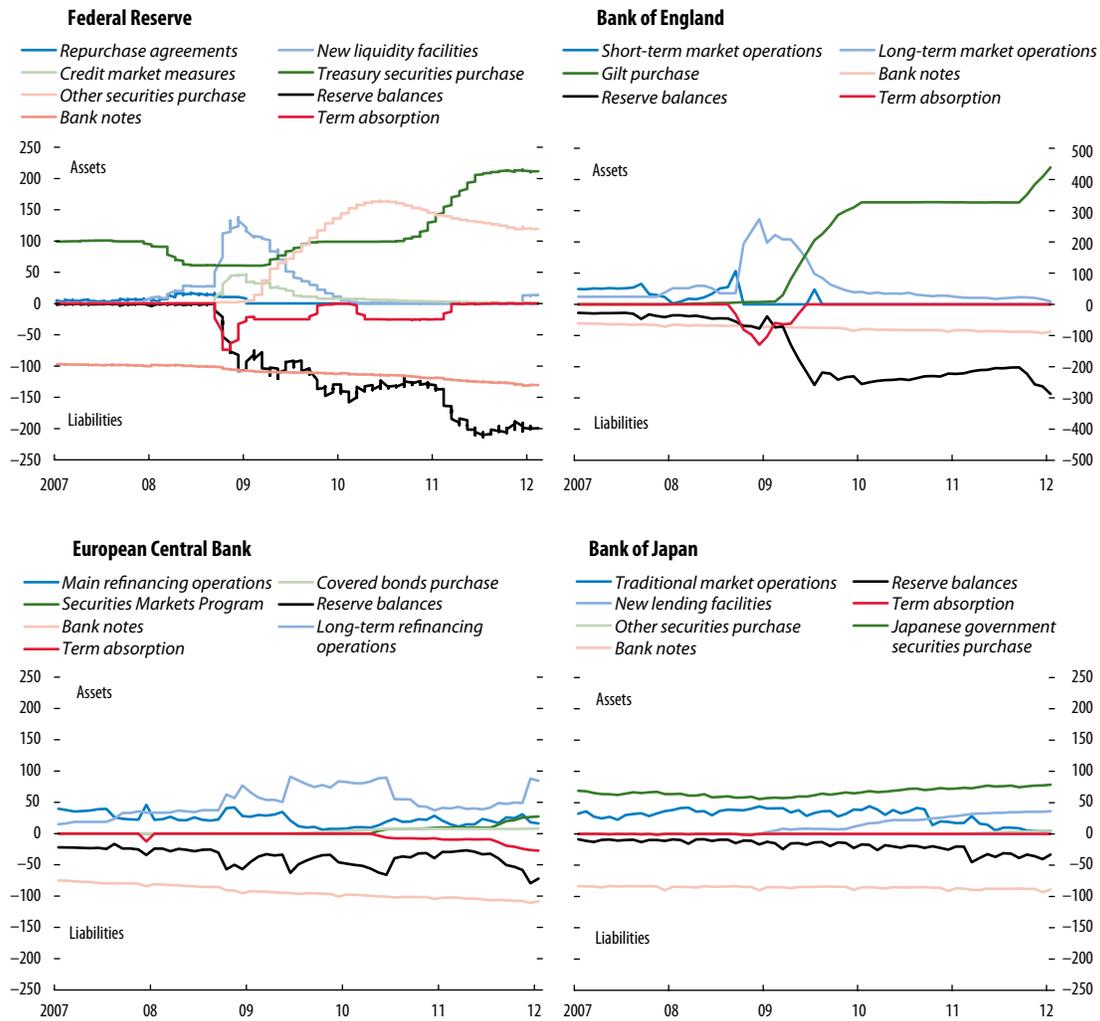
Sources: Bloomberg L.P.; central banks; Haver Analytics; and IMF staff estimates.

Note: Monetary base here is defined as bank notes in circulation plus reserve balances (including excess reserves and overnight deposit facilities). Term absorptions consist of term deposits, reverse repo transactions, central bank bills (for the Bank of Japan), and U.S. Treasury Supplementary Financing Account (for the Federal Reserve). New liquidity facilities and new lending facilities include measures that were already terminated. New liquidity facilities of the Federal Reserve include U.S. dollar liquidity swap arrangements with central banks. Credit market measures of the Federal Reserve consist of facilities such as the Commercial Paper Funding Facility, Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility, and Term Asset-Backed Securities Loan Facility.

longer maturities. They also made direct or indirect purchases of securities that had lost liquidity—a key characteristic of safety—in specific market segments, including commercial paper, corporate bonds, and asset-backed securities (Figure 3.15).[56] While valuable

as a crisis management tool, this process clearly has limits, as central banks assume the credit risk of the securities taken onto their balance sheets.

[56]This process is still under way in the euro area. For a more general discussion and assessment of unconventional monetary

policies, see Borio and Disyatat (2009); and IMF (2009b), for example. In contrast to a central bank's traditional role as the lender of last resort, Tucker (2009) refers to this new role as the market maker of last resort.

As a result of these crisis-driven operations, the increase in central bank reserve balances was quite pronounced, particularly for the Federal Reserve, the Bank of England, and the European Central Bank. Spikes in central bank liabilities were initially facilitated by newly established liquidity facilities and longer-term open market operations that replaced traditional short-term market operations.[57]

- In the *United States*—where capital markets play a considerable role in corporate and household financing—direct nongovernment securities purchases and indirect purchases via credit market measures accounted for most of the marginal increase in Federal Reserve assets.

- In *Japan*, the increase in reserve balances and central bank assets was less pronounced, given that the Japanese financial system was less affected by the global financial crisis.

- In *Europe,* market stress prompted the ECB to resume covered bond purchases, broaden the criteria for collateral eligibility and, most recently, initiate the provision of longer-term liquidity (at a maturity of 36 months) to support bank lending and liquidity in the euro area market.[58] The ECB also launched the Securities Markets Program (SMP) to ease stress in the markets for peripheral euro area sovereign bonds, playing a role akin to a market maker of last resort. It also reabsorbed SMP-provided liquidity via weekly operations. From the banks' perspective, the two operations jointly amounted to an exchange of assets (bonds) with lost safety features for safe assets (term deposits offered by the central bank). The ECB's three-year longer-term refinancing operations have provided large amounts of liquidity to euro area banks, part of which could be used to purchase safer securities.

Supply by Emerging Market Economies

The high demand for safe assets produced by advanced economies has been, in part, supported by the inability of emerging market issuers to contribute to the global supply of safe assets. Many emerging markets are still in the process of developing well-functioning financial systems, which are characterized by sound legal institutions and adequate property rights. The absence of market infrastructures on par with those of advanced economies means that governments, corporations, and individuals will continue to have difficulties pledging future cash flows associated with the issuance of local currency debt securities. Such limitations curb the supply of assets in local capital markets and limit the development of liquid financial markets, forcing some to seek assets outside their country, with attendant currency risks. Though shrinking, the disparity in the degree of financial depth between emerging markets and advanced economies is still considerable. At end-2009, emerging markets accounted for approximately 40 percent of global GDP (Kose and Prasad, 2010), but their contribution to financial depth was less than 20 percent of that of advanced economies (Table 3.4).

Financial Stability Implications

Considerable upward pressures on the demand for safe assets at a time of declining supply entails sizable risks for global financial stability. The unmet demand drives up the price of safety, with the safest assets affected first.[59] In their search for safety, investors that are unable to pay the higher prices are likely to settle for assets that embed higher risks than desired. These risks would also affect markets more broadly. For example, if prime collateral became too expensive, funding markets would need to accept lower-quality collateral and absorb risks that, depending on how far this process goes, may impinge on the trust that underpins effec-

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[57]Initially, the ample liquidity was partly offset by liquidity absorption operations to control policy interest rates. However, as the policy interest rates were subsequently cut closer to zero, use of absorption tools generally declined.

[58]Also, in November 2011, major central banks enhanced their capacity to provide dollar-based liquidity support to the global financial system by lowering the pricing on the existing temporary U.S. dollar liquidity swap arrangements.

[59]Quantification of demand pressures and forthcoming safe asset supply is difficult, given uncertainties in the economic and financial environment. Therefore, it is impossible to predict how demand pressures will translate into demand for specific assets (such as U.S. Treasuries) and how much of the projected supply will be considered safe.

Table 3.4. Top Five Financially Deep Worldwide Economies, as Share of Own GDP and of Global Financial Depth, 1989 and 2009

In Percent of Own GDP				In Percentage Contribution to Global Financial Depth			
1989		2009		1989		2009	
				World	100	World	6.71
Advanced economies				**Advanced economies**	92.58	**Advanced economies**	82.03
Japan	7.25	Ireland	21.61	United States	32.45	United States	29.28
Switzerland	6.48	United Kingdom	12.64	Japan	28.26	Japan	13.12
Belgium	5.45	Switzerland	11.48	United Kingdom	5.69	United Kingdom	7.73
United Kingdom	5.03	Netherlands	10.63	Germany	5.33	Germany	6.04
United States	4.51	Japan	9.31	France	4.53	France	5.40
Emerging markets				**Emerging markets**	7.42	**Emerging markets**	17.97
Lebanon	8.94	Hong Kong SAR	26.67	Brazil	1.94	China	7.13
Hong Kong SAR	7.44	Singapore	10.47	China	0.93	Brazil	1.63
Malaysia	4.92	Lebanon	7.44	Hong Kong SAR	0.67	Hong Kong SAR	1.56
Singapore	4.76	South Africa	6.47	Republic of Korea	0.66	Republic of Korea	1.15
South Africa	3.96	Malaysia	6.30	India	0.54	India	1.14

Source: Goyal and others (2011) based on data from the Bank for International Settlements, the World Bank, and an updated dataset of "external wealth of nations" constructed in Lane and Milesi-Ferretti (2007) for 50 economies, half advanced and half emerging, that collectively account for more than 90 percent of global GDP.

Note: Summing all assets and liabilities (held against residents and nonresidents) as a share of GDP gives a measure of the weight of total financial claims and counterclaims of an economy—both at home and abroad. Domestic claims are defined as the total of domestic financial liabilities, including broad money, resident claims on the banks, domestic securities, and stock market capitalization. The table also shows financial depth, as a share of global depth (right columns; each country's contribution is weighted by its GDP).

tive market functioning. Such frictions in funding markets can reduce the ability of financial institutions—including investment banks, asset managers, and hedge funds—to secure funding or onlend excess funds. This process was discernible in 2008 after the collapse of Lehman Brothers: because only short-term Treasuries continued to be widely accepted in repo operations, investors bid up their price to the point that their nominal yields turned negative.

Demand-supply imbalances in safe asset markets could also lead to more short-term volatility jumps, herding, and cliff effects. In an environment of persistent low interest rates and heightened financial market uncertainty, excess demand in the markets for safe assets can raise the frequency of short-term volatility spikes and potentially lead to asset bubbles. Rapid changes in investor perceptions of safety and insufficient differentiation in the risk categorization of assets, either in terms of creditworthiness or liquidity, could lead to cliff effects, in which deterioration in market conditions and a downgrade could lead to an automatic reclassification of assets to a lower category and a sudden price drop of those assets. Tying up high-quality collateral in CCP guarantee funds and initial margin to improve CCP solvency profiles may reduce liquidity in OTC derivative markets and, more generally, in repo mar-

kets; as a result, various shocks could lead to price spikes and shortages of high-grade collateral.[60]

Banks are also exposed to unintended risks related to the preferential regulatory treatment of sovereign debt. The common use of zero percent risk weighting on banks' holdings of their own sovereigns' debt, and the extension of this practice to holdings of other sovereign debt within a monetary union, leads to harmful effects on bank resilience and intermediation. It encourages more leverage on safe assets and potential overinvestment in higher-risk sovereigns with favorable risk-return characteristics, leading to possible undercapitalization of banks in times of stress.

Banks' sizable sovereign exposures, in part related to regulatory incentives, can act as a contagion channel between sovereigns and the banking sector with knock-on effects to the economy. Sovereign risks can have a negative spillover to banks via valuation losses on sovereign debt holdings and, thus, a drop in collateral values. This risk could lead to exclusion of sovereign securities from collateral pools and may impair banks' ability to obtain secured funding (Figure 3.16).[61] Mounting sovereign risks may also

[60]Collateral posted in CCP guarantee funds and for initial margin cannot be rehypothecated, unlike in repo markets, and hence reduces collateral available for other uses.

[61]See Committee on the Global Financial System (2011); and IMF (2011a) for a detailed discussion of the transmission chan-

Figure 3.16. Government Bond Holdings and Risk Spillovers between Sovereign and Banks
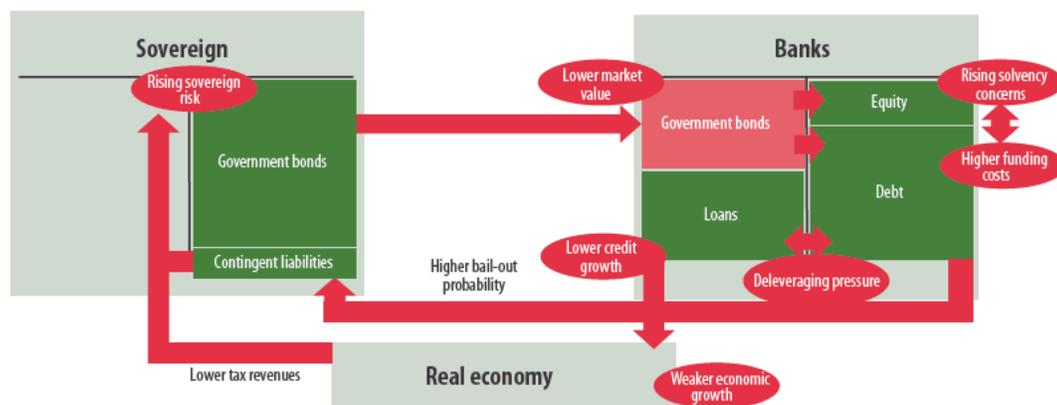
depress the value of explicit and implicit government guarantees and thus elevate the credit and liquidity risks—particularly funding costs—of banks benefiting from such guarantees. In reverse, banking sector stress can create higher contingent liabilities for the sovereign sector or the need for outright government support. If risk weights suddenly increase, banks may be prompted to deleverage by curbing new lending, leading to a dampening effect on economic growth, and to secondary effects on sovereigns via weaker tax revenues. Ultimately, this could exacerbate negative feedback loops between sovereigns and the banking sector, as has been observed in parts of Europe in recent months (see Chapter 2).

A crucial mitigating factor that may have tempered the immediate concerns arising from a shortage of safe assets has been the provision of abundant liquidity by central banks. Although these measures will allow banks to continue to fund themselves in the short term and hold onto assets of all risk profiles, they will not remove the underlying tension in the markets for safe assets, as described here.

nels. As discussed in IMF (2011a), even in cases where heightened sovereign risk is not reflected on banks' financial statements—for example, via banking book sovereign exposures and valuations at amortized costs—creditor perceptions of balance sheet weakness and heightened bank credit risk can increase bank vulnerability since credit risk is assessed in economic rather than accounting terms.

Key Conclusions and Policy Implications

Flexibility in policy design and implementation is warranted to ensure a smooth adjustment to the upcoming supply and demand pressures on the markets for safe assets. Investors' cost of safety will inevitably rise, but an adjustment process that is too abrupt or too volatile may compromise financial stability. Stronger demand for certain assets deemed the safest will put upward pressure on their prices, while assets suddenly viewed as less safe may be subject to downward pressures. Arguably, the cost of safety was distorted before the crisis, but the demands arising from regulatory reforms and ongoing central bank policies suggest potentially substantial pressure on certain safer asset classes. Policymakers should be cognizant of the effects of existing and upcoming policies on spurring demand for safe assets.

Ultimately, efforts to ensure that fine distinctions across safe assets are reflected in regulation or policy responses could help alleviate discontinuities or cliff effects in their usage and pricing.

- As shown in Box 3.3, the common application of a zero percent risk weight on holdings of debt issued by a bank's own sovereign, irrespective of its risk, tends to inflate bank capital adequacy levels. This creates a perception of safety detached from underlying economic risks and leads to an inflated demand for such safer assets. Hence, for banks, sovereign debt should ultimately carry assigned risk weights that more accurately reflect

the relative credit risk of the issuing sovereign.[62] While a discussion of changes in risk weights for sovereign debt should be initiated, any alteration will need to be examined carefully in advance since establishing risk weights is particularly difficult in the context of sovereign debt. Measures such as CDS spreads are likely to be too volatile to be practically implementable; however, there is a range of other methods for estimating sovereign risk that could be considered.[63] Any change to risk weights should be introduced gradually and reviewed periodically to avoid market disruptions. It should be noted that the introduction of a non-risk-weighted leverage ratio under Basel III will complement risk-weighted capital adequacy requirements.

• The new liquidity coverage ratio in Basel III would require banks to hold more liquid assets to better address short-term funding pressures. The qualifying highly liquid assets mostly consist of the safest assets; as Box 3.4 shows, banks could require some $2 trillion to $4 trillion of such assets to meet the new ratio unless they adjust their funding profiles. It will be important to ensure that, when the regulation is formally implemented at end-2014, haircuts for liquid assets of different quality can be reviewed at appropriate intervals and reflect the differential risks across the eligible assets. Basel III's observation period for the ratio would allow the Basel Committee to revisit the calibration of haircuts to avoid sudden changes. Attention to the implementation of Solvency II for EU insurance companies is also warranted, as similar incentives to hold certain safe assets are also present.

• The use of safe assets as collateral for CCP default funds—in the context of the anticipated move of OTC contracts to CCPs—is another area where demand pressures can be alleviated by some flex-

ibility in the definition of acceptable safe assets. By ensuring that CCP oversight allows for a broad range of collateral (with appropriate risk-based haircuts and minimum criteria for inclusion) alongside other risk management practices, undue pressures on certain types of safe assets can be avoided without compromising the soundness of the CCP.

Supply-side measures could stem upward price pressure on highly demanded safe assets.

• The issuance of government securities is not meant to be the sole means of satisfying the demand for safe assets. Nonetheless, countries that experience fiscal difficulties and face questions about their credit quality would obviously benefit from a strong and credible commitment to medium-term fiscal adjustment, not least because it could curb the downward migration in their credit ratings and could help them regain their debts' safe asset status.[64] Strategies to lower debt levels, improve debt management, and put in place better fiscal infrastructures are generally welcome, as they improve governments' creditworthiness, lower borrowing costs, and enhance economic growth prospects. However, in times of financial stress, these features also help support financial stability by reducing the chance of widespread fire-sales and avoiding rapid declines in the quality of collateral.

• The production of safe assets by the private sector is an important source of supply and should not be unnecessarily impeded. The private market can synthetically create safe assets via combinations of existing intrinsically risky instruments and hedging strategies. To ensure that such products fulfill their safety role, there is a need to introduce: (1) intensive supervision, (2) better incentives for issuers (aligning issuer's compensation with the longer-term performance of the created securities), (3) a robust legal framework, and (4) improved public disclosure to ensure that securitized products are well understood and market participants have the resources and information to price and manage the risks. Well-conceived and regulated

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[62]Banks are already permitted to use their own models and apply nonzero risk weights to sovereign debt. Even without using their own models, banks are also permitted to hold more capital against sovereign risk.

[63]For a more detailed discussion of various methodologies and other sovereign risk considerations in the context of risk weighting, see European Parliament (2010). For methodologies used in rating agency analysis, see Standard & Poor's (2011) and Fitch Ratings (2011), for example.

[64]See IMF (2012) regarding the benefits for financial stability of addressing long-term fiscal challenges.

covered bond structures of mortgages (with overcollateralization and the ability to replace impaired loans) are one good example. Sound securitization can also play a role.[65] In contrast, short sale restrictions and hurdles to the use of CDS contracts inhibit the creation of synthetic safe assets. Importantly, the creation of such assets needs to be monitored closely to avert negative experiences similar to the sharp decline in the quality of structured credit products—perceived as safe in view of their AAA ratings—during the financial crisis.

- In emerging markets, prudent fiscal policies together with ongoing improvement in domestic financial infrastructure—including legal certainty, clearing and settlement systems, and transparent and regular issuance procedures—will support further deepening of local sovereign bond markets. Over the longer run, these improvements will facilitate the use of such securities as safe assets both within their domestic context and possibly in global markets.

- It has been suggested that the issuance of bonds that would rely on the ability and willingness of a group of countries to jointly and severally honor their payment obligations could be a source of safe asset production. By sharing creditworthiness, these securities would diminish the chance of sharp increases in borrowing costs due to country-specific events. However, such securities would be considered safe only to the extent that the framework within which they were issued ensured the fiscal sustainability of all the countries backing

[65]See IMF (2009a) for a discussion of what constitutes "safe" securitization.

them. Moreover, while such assets could augment the quantity of safe assets available to investors (in terms of credit risk and market liquidity), sovereigns whose creditworthiness was higher than the pooled credit quality underlying the new bond would face higher borrowing costs.

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One clear policy response to the crisis has been to make financial institutions more resilient, in part by encouraging them to hold safer assets. This additional policy step, in the context of a shrinking supply, will drive up the price of safety. By itself, this is an appropriate outcome, but the key will be to ensure that prices are allowed to adjust smoothly. In particular, regulatory reforms should be formulated so that the fine distinctions across the relative safety of various instruments and strategies are discernible to all institutions requiring safe assets. Moreover, regulations and market practices should be designed flexibly and phased in gradually according to an internationally agreed schedule, to avoid situations that could harm financial stability.

The provision of abundant liquidity by central banks, especially if in exchange for less liquid collateral, affords crucial temporary relief from some of the strains arising from a shortage of safe assets. Although such measures ensure stability of the financial system in the short term and represent an appropriate crisis management response, they will not provide the lasting answer to the problem of a demand-supply imbalance in safe assets. In sum, maintaining flexible and efficient markets in light of the changing supply and demand conditions for safe assets will help to guarantee a smooth adjustment process and thereby a safer, more stable financial system.

Annex 3.1. Exposures to Common Risk Factors

This exercise analyzes the information contained in the time series and the cross-section of asset returns to identify common factors across a broad set of potentially safe assets. A key objective of the analysis is to gauge how the global financial crisis may have affected commonalities and risk factor exposures across various assets and thus infer the changes in the relative riskiness of these assets. The analysis uses the excess returns of various assets relative to the return on the one-month U.S. Treasury bill, as a safe short-term instrument, to control for the variability in interest rate levels over time.

Methodology

Principal Component Analysis (PCA)

A key aspect of analyzing large sets of asset returns is that their behavior may, in reality, be related to a handful of common patterns. Intuitively, sets of different assets may behave similarly because of the effect of underlying unobservable factors. Statistical methods can assist when the nature of such factors cannot be determined reasonably a priori. PCA is a useful technique in this regard, as it reduces a set of asset returns to a smaller set of uncorrelated variables (principal components) that can capture most of the variability in the original data. Thus, PCA can help identify patterns in data and highlight their similarities and differences. It uses an orthogonal transformation to construct the principal components. The first principal component has as high a variance as possible (that is, accounts for as much of the variability in the data as possible). Each succeeding component in turn has the highest variance possible under the constraint that it be orthogonal to (uncorrelated with) the preceding components. The higher the degree of co-movement in the original series, the fewer the number of principal components needed to explain a large portion of the variance of the original series.

Clustering Analysis

To understand the nature of the commonalities in asset returns, cluster analysis is used to identify the structure in the assets' correlation matrix before and after the crisis. The cluster analysis uses an algorithm to sort asset returns into groups in which the members of each group are as similar as possible. At the same time, the groups are formed to be as dissimilar from one another as possible. In effect, the cluster analysis creates groupings in a way that maximizes the average correlations between asset returns in the same group and minimizes such correlations across different groups. The cluster analysis uses Ward's method, which forms clusters so as to minimize the total within-cluster variance. Each step finds the pair of clusters that leads to a minimum increase in total within-cluster variance after merging that pair with the others. This increase is a weighted squared distance between cluster centers.

Data

An initial set of 127 global assets were examined as the broadest set from which investors could choose, spanning asset classes for sovereign and quasi-sovereign bonds, corporate bonds, commodity indices, currencies, and equity indices. Overall, the data cover the period between February 1977 and October 2011, although data availability varies across assets.[65] A narrower representative set of 56 assets across the various classes was used in the analysis to maintain a fully balanced sample, as is required by both techniques. Using monthly asset dollar returns, the excess total return for each asset (in dollars) was computed relative to the return on the one-month U.S. Treasury bill.

Empirical Results

The PCA identifies a few common factors that explain the patterns of correlations between excess monthly asset returns. A significant amount of commonality in the variation of monthly asset returns is captured by the first principal component, which accounts for half of the variation. Furthermore, the first two principal components collectively explain two-thirds of the variance in the asset returns. The first principal component is highly correlated with global liquidity, measured by the money supply (M2) of the G4 economies, and with the excess return on

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Note: Prepared by Hanan Morsy.

[65]For most assets, the data start in the 1990s.

the global market portfolio.[66] This suggests that the first principal component is associated with different measures of market risk. The second principal component captures perception of safety, reflected by a high negative correlation with market volatility measured by the VIX index. The second principal component is also significantly related to liquidity and credit spreads, suggesting that it proxies for safety. Other econometric methods were used to check the robustness of the results, including factor model regressions.

The hierarchical clustering broadly confirms the results of the principal component analysis. Prior to

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[66]Monetary policies created an environment of low interest rates, prompted a search for yield, and lowered funding costs for leveraged investors, thereby creating a push factor on asset prices across the globe and inducing prices to move in tandem.

The use of excess market portfolio returns—computed as the difference between the average returns for all assets in the sample and the return on the one-month U.S. Treasury bill—is motivated by the capital asset pricing model. Assets with large exposures to the market tend to be perceived by investors as risky since they typically perform poorly when markets are down. Data for the return on the one-month U.S. Treasury bill were downloaded from the website of Kenneth French (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french).

the crisis, asset classes were grouped closely into asset pools, corresponding to (1) U.S. debt (sovereign, agency, and corporate); (2) Japanese debt (sovereign and corporate); (3) European sovereign and corporate debt, including highly collateralized bonds issued by German banks (Pfandbriefe) and EU covered bonds; (4) emerging market sovereign debt; and (5) equity market indices, commodities, and currencies. The tight clustering of euro area sovereign debt shows little pricing differentiation across assets of different credit quality.

Postcrisis, AAA-rated corporate securities appear to have decoupled from lower-rated instruments, clustering with U.S. sovereign debt, while corporate debt rated AA and below clustered with European entities. Gold clustered with lower-rated U.S. corporate debt, separated from other commodities. Japanese and U.S. sovereign and highly rated corporate debt have become more tightly clustered, suggesting that investor perceptions of asset safety for both countries differed markedly from those for Europe. All of the above suggests that investors became more discerning in terms of safety.

Annex 3.2. Central Bank Securities Policies since 2007

Table 3.5. Central Bank Changes in Policies on Collateral and Purchases of Nongovernmental Securities since 2007

	Federal Reserve	European Central Bank	Bank of England	Bank of Japan	Bank of Canada	Swiss National Bank
Collateral policies						
Broadening of type of securities eligible for collateral or repo	X[1]	X	X	X	X[2]	X
Easing in credit rating requirements		X		X	X[2]	
Easing in securities lending facilities	X[3]		X	X		
Nongovernment securities purchases[4]						
Commercial papers[5]	(X)[6]		X	X[7]		
Asset-backed securities	(X)[6]	X[8]				
Corporate bonds			X	X[7]		X[9]
Other securities	X[10]			X[11]		

Sources: respective central banks.

Note: The table does not cover all the measures taken by the central banks.

[1]By introducing new lending facilities accepting broader types of collateral. All the new facilities were either closed or expired.

[2]By introducing new lending facilities. All the new facilities were terminated or discontinued by April 2010.

[3]Term Securities Lending Facility. Closed in February 2010.

[4]Excludes securities purchased under resale agreements.

[5]Includes asset-backed commercial paper.

[6]By providing funding directly to borrowers and investors in the markets. The new facilities were either closed or discontinued.

[7]Purchases were terminated in December 2009 but resumed under the Asset Purchase Program established in October 2010.

[8]Covered bonds. Purchases were terminated in June 2010 but resumed in October 2011.

[9]Discontinued in December 2009.

[10]Direct obligations of, and mortgage-backed securities issued by, housing-related government-sponsored enterprises.

[11]Equity held by financial institutions (conducted as prudential policy and terminated in April 2010). Exchange-traded funds and real estate investment trusts purchased under the Asset Purchase Program established in October 2010.

Annex 3.3. Collateral Requirements of Central Counterparties for Over-the-Counter Derivatives

Central counterparty (CCP)-related collateral requirements mostly take the form of cash and government securities (Table 3.6). Initial margin— deposits from all transaction parties that act as buffers against potential losses to the CCPs following default of a clearing member—usually takes the form of cash and marketable securities issued by selected sovereigns and their agencies. To mitigate risk, various haircuts are applied to marketable bonds depending on their riskiness. The recent European sovereign debt crisis has had implications for CCPs, in terms of both the deterioration of collateral quality and the increase in the risks of counterparties directly linked to sovereign governments. Collateral eligibility rules for guarantee (or default) funds—comprised of clearing member deposits that act as additional buffers against potential losses under a range of stress scenarios—are usually stricter than those for initial margin, and only cash and marketable securities issued by selected sovereigns are acceptable.

The potential increase in the demand for qualified collateral—given the incremental initial margin and default fund requirements associated with moving all standardized over-the-counter derivatives to CCPs— may account for shortages in the supply of cash and government bonds. Large banks that are also clearing members may offer collateral transformation services to their customers to turn less liquid assets into CCP-acceptable ones through repos and swaps. This could potentially exacerbate liquidity pressures for CCPs during market downturns, when clearing members would need to provide liquid funds for their clients at a time when they themselves are being subjected to a liquidity freeze.

Table 3.6. Collateral Requirements of the Big Three CCPs Handling OTC Derivatives

Chicago Mercantile Exchange	Intercontinental Exchange (ICE) Clear	LCH.Clearnet Swapclear
Guarantee fund: U.S. dollars, marketable U.S. Treasury securities, selected U.S. agency securities, and selected money market funds.	Guarantee fund and initial margin: The U.S. operation (ICE Clear Credit) accepts cash of selected countries and marketable U.S. Treasury securities. The U.K. operation (ICE Clear Europe) accepts cash of selected countries, and marketable securities issued by selected governments.	Default fund: Cash in British pounds only.
Performance bond: Cash of selected countries, marketable U.S. Treasury securities, selected U.S. government agency securities and agency mortgage-backed securities, selected foreign government bonds, stocks selected from the Standard & Poor's 500 index, selected money market mutual funds, and gold.[1]		Initial margin: Cash of selected currencies and securities issued or guaranteed by selected governments and selected government agencies.[2]
Variation margin: Cash	Variation margin: Cash	Variation margin: Cash

Source: IMF staff discussions with CCPs.

Note: CCP = central counterparty; OTC = over the counter.

[1]For OTC interest rate swaps (but not for credit default swaps), the Interest Earning Facility 4 (IEF4) program allows participants to pledge corporate bonds into a tri-party account to meet the performance bond requirements.

[2]LCH.Clearnet also accepts performance bonds as initial margin.

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THE FINANCIAL IMPACT OF LONGEVITY RISK

Summary

As populations age in the decades ahead, the elderly will consume a growing share of resources. It is recognized that this will strain public and private balance sheets, and governments and private pension providers have been preparing for the financial consequences of aging. However, these preparations are based on baseline population forecasts that in the past have consistently underestimated how long people live.

Unexpected longevity beyond those baseline forecasts, while clearly beneficial for individuals and society as a whole, is a financial risk for governments and defined-benefit pension providers, who will have to pay out more in social security benefits and pensions than expected. It may also be a financial risk to individuals, who could run out of retirement resources themselves. These risks build slowly over time, but if not addressed soon could have large negative effects on already weakened private and public sector balance sheets, making them more vulnerable to other shocks and potentially affecting financial stability.

Few governments or pension providers adequately recognize longevity risk. Where they do, they find it is large. This chapter shows that if individuals live three years longer than expected—in line with underestimations in the past—the already large costs of aging could increase by another 50 percent, representing an additional cost of 50 percent of 2010 GDP in advanced economies and 25 percent of 2010 GDP in emerging economies. In an example, the chapter shows that for private pension plans in the United States, such an increase in longevity could add some 9 percent to their pension liabilities. Because the stock of pension liabilities is large, corporate pension sponsors would have to make many multiples of typical annual pension contributions to match these extra liabilities.

Addressing longevity risk requires a three-pronged approach. First, governments should acknowledge the significant longevity risk they face through defined-benefit plans for their employees and through old-age social security schemes. Second, risk should be appropriately shared between individuals, pension plan sponsors, and the government. An essential reform measure would allow retirement ages to increase along with expected longevity. This could be mandated by government, but individuals could also be encouraged to delay retirement voluntarily. Better education about longevity and its financial impact would help make the consequences clearer. Allowing flexibility for pension providers is also important: where it is not feasible to increase contributions or retirement ages, benefits may have to decrease. Risk transfers in capital markets from pension plans to those that are better able to manage the risk are a third approach. The chapter highlights a number of instruments in this growing market, and potential measures to improve its functioning.

Better recognition and mitigation of longevity risk should be undertaken now. Measures will take years to bear fruit and effectively addressing this issue will become more difficult if remedial action is delayed. Attention to population aging and the additional risk of longevity is part of the set of reforms needed to rebuild confidence in the viability of private and public sector balance sheets.

The economic and fiscal effects of an aging society have been extensively studied and are generally recognized by policymakers, but the financial consequences associated with the risk that people live longer than expected—longevity risk—has received less attention.[1] Unanticipated increases in the average human life span can result from misjudging the continuing upward trend in life expectancy, introducing small forecasting errors that compound over time to become potentially significant. This has happened in the past. There is also risk of a sudden large increase in longevity as a result of, for example, an unanticipated medical breakthrough. Although longevity advancements increase the productive life span and welfare of millions of individuals, they also represent potential costs when they reach retirement.

More attention to this issue is warranted now from the financial viewpoint; since longevity risk exposure is large, it adds to the already massive costs of aging populations expected in the decades ahead, fiscal balance sheets of many of the affected countries are weak, and effective mitigation measures will take years to bear fruit. The large costs of aging are being recognized, including a belated catch-up to the currently *expected* increases in average human life spans. The costs of longevity risk—*unexpected* increases in life spans—are not well appreciated, but are of similar magnitude. This chapter presents estimates that suggest that if everyone lives three years longer than now expected—the average underestimation of longevity in the past—the present discounted value of the additional living expenses of everyone during those additional years of life amounts to between 25 and 50 percent of 2010 GDP. On a global scale, that increase amounts to tens of trillions of U.S. dollars, boosting the already recognized costs of aging substantially.

Threats to financial stability from longevity risk derive from at least two major sources. One is the

threats to fiscal sustainability as a result of large longevity exposures of governments, which, if realized, could push up debt-to-GDP ratios more than 50 percentage points in some countries. A second factor is possible threats to the solvency of private financial and corporate institutions exposed to longevity risk; for example, corporate pension plans in the United States could see their liabilities rise by some 9 percent, a shortfall that would require many multiples of typical yearly contributions to address.

Longevity risk threatens to undermine fiscal sustainability in the coming years and decades, complicating the longer-term consolidation efforts in response to the current fiscal difficulties.[2] Much of the risk borne by governments (that is, current and future taxpayers) is through public pension plans, social security schemes, and the threat that private pension plans and individuals will have insufficient resources to provide for unexpectedly lengthy retirements. Most private pension systems in the advanced economies are currently underfunded and longevity risk alongside low interest rates further threatens their financial health.

A three-pronged approach should be taken to address longevity risk, with measures implemented as soon as feasible to avoid a need for much larger adjustments later. Measures to be taken include: (i) acknowledging government exposure to longevity risk and implementing measures to ensure that it does not threaten medium- and long-term fiscal sustainability; (ii) risk sharing between governments, private pension providers, and individuals, partly through increased individual financial buffers for retirement, pension system reform, and sustainable old-age safety nets; and (iii) transferring longevity risk in capital markets to those that can better bear it. An important part of reform will be to link retirement ages to advances in longevity. If undertaken now, these mitigation measures can be implemented in a gradual and sustainable way. Delays would increase risks to financial and fiscal stability, potentially requiring much larger and disruptive measures in the future.

Note: This chapter was written by S. Erik Oppers (team leader), Ken Chikada, Frank Eich, Patrick Imam, John Kiff, Michael Kisser, Mauricio Soto, and Tao Sun. Research support was provided by Yoon Sook Kim.

[1]See, for example, IMF (2011a).

[2]See IMF (2012).

Box 4.1. The Evolution of Life Expectancy in the Twentieth and Twenty-First Centuries

Most gains in life expectancy at birth are attributable to improvements in infant mortality, but they have also occurred in life expectancy at older ages, the variable most important for longevity risk.

Life expectancy at birth has increased greatly in the past 100 years. In the 1750s, estimated life expectancy at birth was below 40 years in northern and western Europe. Life expectancy at birth rose steadily after that and has seen a near linear increase since about 1900, reaching about 80 years by 2010 in the best performing areas (the Nordic countries, New Zealand, and Japan). More generally, life expectancy at birth has been increasing in all regions of the world, rising from a global average of 48 years in 1950 to 60 years in 1980 and close to 70 years by 2010. The increases over the past decades have been particularly marked in countries classified by the United Nations as less developed and least developed (see Figure 4.1.1).

The large increase in life expectancy at birth is mainly attributable to a decline in infant mortality rates. In the period 1950–70, more than 70 percent of the increase in life expectancy at birth in Canada and the United States was due to improvements in mortality at ages below 65 years. In the other advanced economies about 85 percent of the increase was due to improvement at younger ages.

What matters for longevity risk, however, are developments in life expectancy at older ages, which has also improved significantly over the past 100 years. Life expectancy at age 60 in advanced economies in Europe, for example, rose from 15 years in 1910 to

Figure 4.1.1. Life Expectancy at Birth
(In years)

- World
- More developed regions
- Less developed regions, excluding least developed countries
- Least developed countries
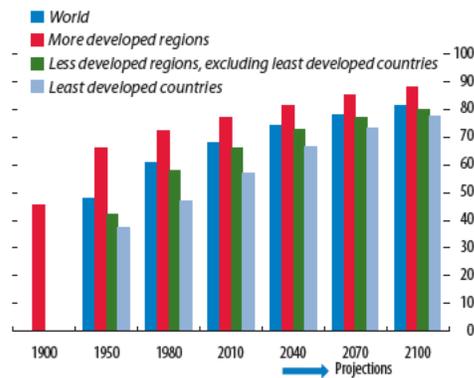
Sources: Kinsella and He (2009); United Nations (2011); and IMF staff estimates.
Note: The regional groupings reflect the UN classification.

24 years in 2010, and is expected to improve further. This raises the question of how far life expectancy can be extended and whether there is a maximum life span for humans (Siegel, 2005).

These effects can be visualized in so-called life curves, which track (and project) the proportion of a population that remains alive at various ages (see Figure 4.1.2, in which the year labels represent the year of birth). If people died evenly across age groups, the curve would be closer to a downward-sloping diagonal line. With a high rate of infant mortality, the curve drops steeply near age zero, as in the curve for 1851.

If all people died at the same age, the curve would be a rectangle, with 100 percent of the population being alive before that age, and 0 percent

Note: Prepared by Frank Eich, John Kiff, and Mauricio Soto.

The chapter proceeds as follows. After defining and quantifying longevity risk, the chapter investigates its impact, who is exposed to it, and how it affects their liabilities, including in the current low-interest-rate environment. The chapter then describes the market for longevity risk transfer, identifying impediments, and looks forward with measures that could promote its development. It concludes with potential policy implications.

Longevity Risk

Longevity risk is the risk that actual life spans of individuals or of whole populations will exceed expectations.[3] As described in Box 4.1, people have been

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[3]This chapter focuses on *aggregate* longevity risk, the risk that people on average live longer than expected. Individuals face an individual or "idiosyncratic" longevity risk that may cause them to outlive their financial resources, sometimes referred to as "retirement ruin" (Milevsky, 2006).

Box 4.1 *(continued)*

Figure 4.1.2. Life Curves for the United Kingdom, by Year of Birth, 1851–2031
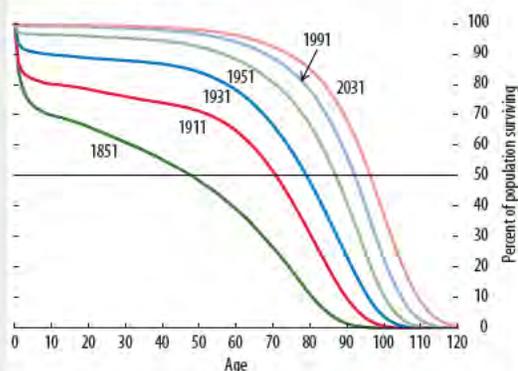
Source: Office of National Statistics.
Note: Proportion of persons born in a given year surviving to successive ages. For example, of people born in 1851, 50 percent survived to about age 47.

after that age. Developments in longevity that have made the life curve more rectangular over time have been dubbed the "rectangularization" of the life curve.

Using various methodologies detailed in Box 4.2, most current forecasts assume that increases in life expectancy, including those at older ages, will slow down in the future. As noted in the main text, that assumption is arguable. Nonetheless, the United Nations projects that by 2050 life expectancy at age 60 will increase to an average of 26 years in advanced economies and about 22 years in developing economies—an improvement of about 1 month per year. These expected increases are slightly below the increases experienced in the past for the United States and Canada but substantially below those in the rest of the world (see Table 4.1.1).

Table 4.1.1. Longevity Trends, 1970–2050
(In years)

	Observed			Projected	
	1970–2010	Increase per year	Standard deviation	2010–50	Increase per year
Change in life expectancy at birth					
United States and Canada	8.2	0.20	0.14	4.3	0.11
Advanced Europe	8.6	0.21	0.13	4.7	0.12
Emerging Europe	1.1	0.03	0.36	6.8	0.17
Australia and New Zealand	10.8	0.27	0.27	4.9	0.12
Japan	10.8	0.27	0.23	4.6	0.11
Change in life expectancy at age 60					
United States and Canada	4.9	0.12	0.11	3.1	0.08
Advanced Europe	5.7	0.14	0.13	3.7	0.09
Emerging Europe	0.6	0.02	0.18	3.8	0.09
Australia and New Zealand	7.2	0.18	0.23	3.7	0.09
Japan	7.7	0.19	0.19	3.7	0.09

Sources: Human Mortality Database as of December 13, 2011; and IMF staff estimates.

living longer lives for at least a century now, and this has obvious benefits. But governments, private companies, and individuals all potentially face financial risks if people on average live longer than expected. In particular, defined-benefit pension plans, insurance companies that offer life annuities, and governments that sponsor old-age social security systems would have to pay benefits longer than anticipated, increasing the present discounted value of their liabilities.

The main source of longevity risk is therefore the discrepancy between expected and actual life spans, which has been large and one-sided: forecasters, regardless of the techniques they use, have consistently underestimated how long people will live (Box 4.2). These forecast errors have been systematic over time and across populations. A study by the U.K. Office for National Statistics (Shaw, 2007) has evaluated the forecast errors made in

Box 4.2. Forecasting Longevity

Longevity forecasts can be made using various meth-ods. Forecasting models can be broadly categorized into (i) methods that attempt to understand and use the underlying drivers of mortality and (ii) extrapo-lative methods, which use only historical trends to forecast future developments.

So-called process-based methods and econometric models seek an understanding of the underlying fac-tors driving death rates. These methods use biomedi-cal assumptions to forecast death rates from various causes, leading to longevity rates of "cohorts" (people in a particular demographic section of the population born in a particular year or period). Econometric methods principally model longevity as a function of general economic, environmental, and epidemiologi-cal factors. A difficulty with both approaches is that they require a model for the relationship between underlying factors and longevity. Also, if they are used to make forecasts of longevity, forecasts need to be available for any underlying factors used in the model.[1]

Extrapolative approaches do not attempt to iden-tify the drivers of death rates but use only informa-tion contained in historical data to forecast future mortality rates. Such models could assume that his-torical trends continue into the future, either exactly or in some "smoothed" form, or could try to derive a more sophisticated model from historical trends (possibly disaggregated by cohort) that could then be used for a forecast. Methods can be deterministic—meaning that they directly calculate future changes from past trends—or stochastic, meaning that they apply random changes from a probability distribution

derived from past developments to generate future changes.

When Lee and Carter (1992) showed that their extrapolative model explained 93 percent of the variation in mortality data in the United States, it became the standard model for the longevity forecast literature and the preferred forecasting methodology for the U.S. Census Bureau and the Social Security Administration. Employing time-series analysis, the model estimates an underlying "mortality index" using variations in mortality data across different age groups over time. The index can then be used to forecast future longevity.[2]

A drawback with the extrapolative approach, including that of Lee and Carter, is that it looks only at the past and does not use available information (or assumptions) about possible future developments that affect longevity, such as medical breakthroughs or changes in behavior. Although the Lee-Carter model has been successfully applied to Canada, France, Japan, Sweden, and the United States, it has not been as successful in some other countries. For example, it has trouble explaining developments in the United Kingdom because of cohort effects that depend on the year in which a group of individuals was born. Forecasters in the United Kingdom now generally use another extrapolative method (Currie, Durban, and Eilers, 2004). Other studies have explicitly included cohort effects.[3]

Note: Prepared by John Kiff and Michael Kisser.

[1]For a detailed discussion of these issues, see for example Continuous Mortality Investigation (2004).

[2]Specifically, the model assumes that $\ln[m(x, t)] = a(x, t) + b(x)k(t) + \varepsilon(x, t)$ where $m(x, t)$ denotes the death rate at age x and time t. The death rate is a direct function of the individual's age through $a(x)$. It also depends on $k(t)$, which represents falling mortality rates (that is, improvements in longevity) over time. How much mortality falls at a given point in time also depends on the individual's age, through $b(x)$. ε is a random term.

[3]A detailed comparison of different stochastic mortality models can be found in Cairns and others (2009).

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the United Kingdom over the past decades (Figure 4.1). It showed that future estimates of longevity were consistently too low in each successive fore-cast, and errors were generally large. In fact, under-estimation is widespread across countries: 20-year forecasts of longevity made in recent decades in

Australia, Canada, Japan, New Zealand, and the United States have been too low by an average of 3 years (Bongaarts and Bulatao, 2000). The system-atic errors appear to arise from the assumption that currently observed rates of longevity improve-ment would slow down in the future. In reality,

Figure 4.1. United Kingdom: Projected Life Expectancy at Birth, for Males, 1966–2031
(In years)
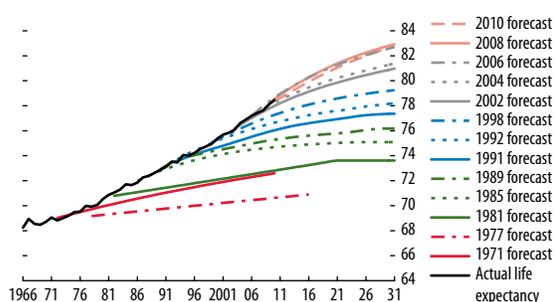
Source: Office of National Statistics.

they have not slowed down, partly because medical advances, such as better treatments for cancer and HIV-AIDS, have continued to raise life expectancy (Box 4.3).

Life expectancy at birth is most often used to discuss longevity, although the measure most relevant for longevity risk is life expectancy at pensionable age. The latter has increased less in the past, but the rectangularization of the life curve (see Box 4.1) implies that more of the increases in life expectancy in the future will be due to increases at older ages. Still, higher longevity at younger ages is clearly *not* a risk. Longer healthy and productive lives (before retirement) add to incomes, retirement savings, and tax revenues. This matters particularly in countries with currently low life expectancy, where longer life spans generally are economically beneficial.

Appropriate longevity assumptions should use the most recent longevity data and allow for future increases in longevity. Even when pension providers use updated data, they do not always allow for reasonable further future increases in longevity from its current level. In fact, longevity at age 60 in the advanced economies has increased in every decade over the past half century by an average of one to two years (see Table 4.1.1 in Box 4.1). Typical assumptions for pension liability valuations in some countries suggest that longevity assumptions may not adequately account for future developments in longevity. Although valuations typically incorporate some future increases that exceed current life expectancy tables, those increases are still much smaller in a number of countries than those that have occurred in the past (Table 4.1). This is partly because regulatory frameworks—while mandating the use of the most recent actual longevity data—often do not require that *future* expected improvements in longevity are included in calculations of pension liabilities.

The substantial costs of aging already faced by society provide a useful starting point to assess the magnitude of longevity risk. The most common measure of aging is the old-age dependency ratio—the ratio of the population 65 and older to the population 15 to 64. Over the period 2010–50 old-age dependency ratios are expected to increase from 24 to 48 percent in advanced economies and from 13 to 33 percent in emerging economies. These numbers are subject to considerable uncertainty, not only regarding longevity, but also with respect to developments in fertility. United Nations populations

Table 4.1. Pension Estimates and Population Estimates of Male Life Expectancy at Age 65 in Selected Advanced Economies
(In years)

Country	(1) Typical Assumption for Pension Liability Valuation[1]	(2) Population Life Expectancy[2]	Difference: (1)–(2)	(3) Observed Improvements since 1990[3]
Australia	19.9	18.7	1.2	3.5
Austria	20.8	17.0	3.8	3.4
Canada	19.4	18.2	1.2	2.6
Germany	19.0	16.9	2.1	3.3
Ireland	21.0	16.7	4.3	3.8
Japan	18.8	18.6	0.2	2.7
United Kingdom	21.2	17.2	4.0	3.9
United States	18.4	17.5	0.9	2.4

Sources: Sithole, Haberman, and Verrall (forthcoming); Human Mortality Database as of February 22, 2012.

[1]Takes into account some future improvement in longevity.

[2]Does not take into account future improvement in longevity.

[3]Difference beween the latest population life expectancy at age 65 and that in 1990 (taken from the Human Mortality Database).

Box 4.3. An Example of a Longevity Shock

The advent of antiretroviral drugs for people with HIV infection in the mid-1990s created a positive longevity shock for patients but undid the financial expectations of existing investors in viatical settlements.

The AIDS epidemic emerged in the early 1980s and drove down the life expectancy of patients infected with HIV. During the early years of the epidemic, patients with HIV whose infection had progressed to AIDS were considered terminally ill, with a life expectancy measured in months.

Often without other sources of income, patients with AIDS turned to the value embedded in their life insurance policies for financial resources in a transaction known as a viatical settlement. If their life insurance policies permitted it, terminally ill patients could obtain a significant proportion of the face value of their policy as an immediate cash payment by selling the policy to a third party. The size of the cash payment depended principally on the life expectancy of the policy owner.

A number of viatical settlement companies emerged during the 1980s. Although settlement terms varied widely, some sense of the financial provisions can be gleaned from government regulations that were introduced in the 1990s to protect those selling their life insurance. For example, in the United States, Virginia regulations stipulate minimum payout percentages to be received by the seller that range from 80 percent of face value for those with a life expectancy of less than 6 months to 60 percent of face value for those with a life expectancy of up to 24 months. For 25 months or more, the payout could be less, as only the cash

surrender value was required (Virginia Registrar of Regulations, 2003).

In the mid-1990s, HAART (highly active anti-retroviral therapy) drugs became available and sharply improved the outlook for those infected with HIV. Whereas the median survival time after infection with HIV without treatment is about 11 years, the survival time at age 20 with treatment is estimated to be close to 50 years.[1] For those patients who progress to AIDS, the improvement in life expectancy with treatment is even more dramatic. The median survival time after diagnosis with AIDS without treatment is 6 to 19 months (Zwahlen and Egger, 2006). With treatment, many individuals recover from AIDS to a state of latent HIV infection, with survival rates similar to other HIV-infected individuals.

The introduction of these life-saving anti-HIV medications led to a large positive longevity shock for those living with HIV. Viatical settlements disappeared quickly as life expectancies rose. Investors in viatical settlements saw a significant realization of longevity risk, with associated losses, as they were required to continue to pay premiums for much longer than expected and were faced with delayed payouts. Data on such losses are not available, but a crude estimate can be made from the minimum percentage payouts in the Virginia regulations: if life expectancy rose from less than 6 months (80 percent payout) to more than 24 months (60 percent payout or less), the loss to investors could be 20 percent or more.

[1]UNAIDS Reference Group for Estimates, Modeling and Projections (2006); and Antiretroviral Therapy Cohort Collaboration (2008).

Note: Prepared by S. Erik Oppers.

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forecasts therefore have a baseline, and low and high fertility variants.[4] A way to measure the associated financial burden of an aging society is to estimate the cost of providing all individuals aged 65 and older with an average income necessary to keep their standard of living at its preretirement level. That income, measured as a percentage of the average preretirement income, is called the "replacement rate." A reasonable replacement rate

may differ across countries, but the literature generally puts it in the range of 60 to 80 percent.[5]

[4]The United Nations projects that life expectancy at age 65 will increase by two years over the period 2010–50.

[5]The 60 to 80 percent range for replacement rates reflects the fact that retirees often need lower gross incomes to maintain their preretirement standards of living: retirees do not pay payroll taxes and pensions generally have preferential income tax treatment. In addition, retirees do not need to save for retirement and do not incur work-related expenses such as transportation. On the other hand, medical expenses may be higher. Several studies suggest that the actual replacement rates are within this range for the advanced economies (OECD, 2009, 2011; Borella and Fornero, 2009; Palmer, 2008; and Disney and Johnson, 2001).

Figure 4.2. Increases in Costs of Maintaining Retirement Living Standards due to Aging and to Longevity Shock
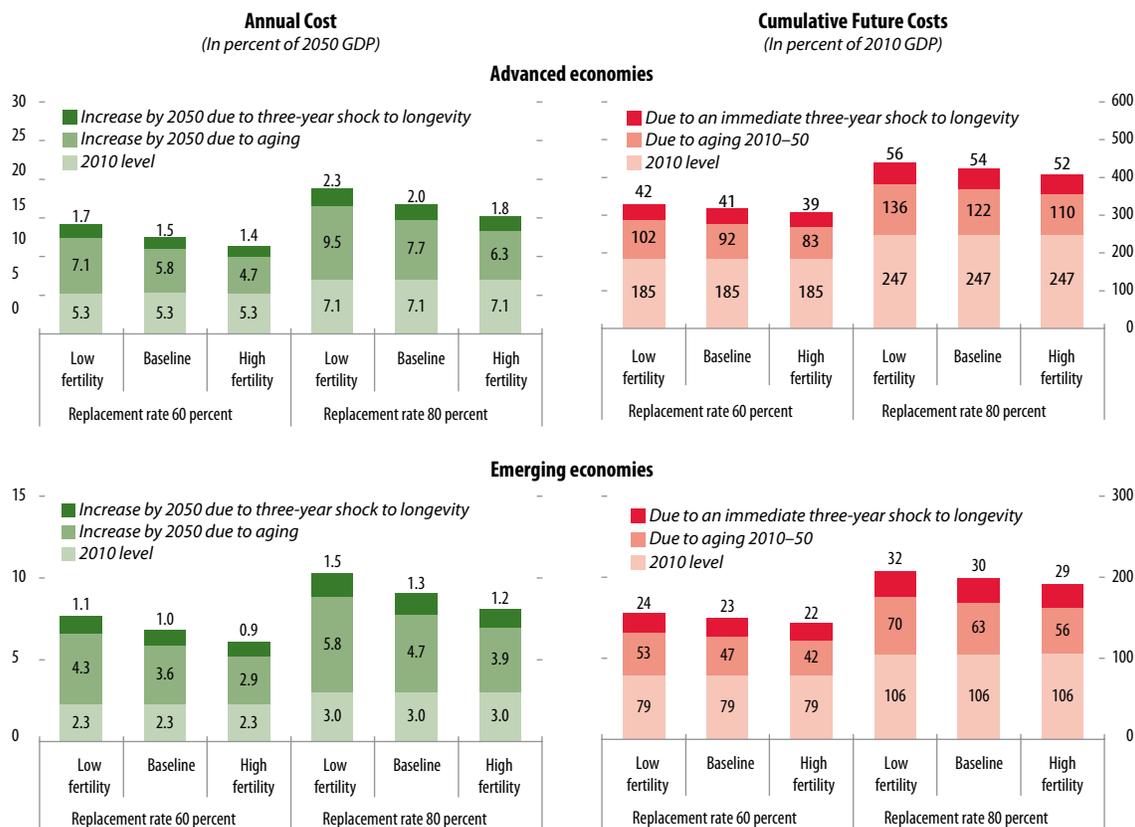
Sources: United Nations; and IMF staff estimates.
Note: The left panels correspond to spending levels in 2050—a flow measure—expressed as share of 2050 GDP. The right panels represent the present discounted value of all future spending—a stock measure—expressed as a share of 2010 GDP. This calculation uses a discount rate of 1 percent, which is equivalent to assuming a differential between the interest rate and rate of growth of 1 percentage point. The replacement rate is the percentage of preretirement income needed to maintain standard of living during retirement.

Under the demographic trends expected by the United Nations, and with a 60 percent replacement rate, the aggregate expenses of the elderly will roughly double over the period 2010–50. In the baseline population forecast and with a 60 percent replacement rate, the annual cost rises from 5.3 percent to 11.1 percent of GDP in advanced economies and from 2.3 percent to 5.9 percent of GDP in emerging economies (Figure 4.2). Taken over the full period, the cumulative cost of this increase because of aging in this scenario is about 100 percent of 2010 GDP for the advanced economies and about half that amount in emerging economies. The numbers reflect pension costs only and do not account for likely increases in health and long-term care costs, which will further

increase the burden of aging. Much of the costs of aging will need to be funded through existing retirement systems, and various reforms have been put in motion to deal with these cost pressures (see IMF, 2011a).

A longevity shock of three years would add nearly half to these cumulative costs of aging by 2050. A three-year shock approximates the average underestimation of longevity in the past.[6] Using the same calculation as in the previous paragraph, in the

[6]Bongaarts and Bulatao (2000) found underestimations of life expectancy at birth, not life expectancy at pensionable age. However, other evidence supports at least a three-year underestimation for life expectancy at older ages as well: in the Netherlands, for example, life expectancy at 65 rose from 14 years in 1971 to 18 years in 2010. In the United States, life expectancy at 63 rose from 15 years in 1971 to 19 years in 2007.

baseline aging scenario the additional cost of providing all individuals of age 65 with a 60 to 80 percent replacement rate for those additional three years adds about 1.5 to 2.0 percentage points of GDP to the *annual* cost of aging in advanced economies in 2050, and 1.0 to 1.3 percentage points of GDP in emerging economies. These annual increments imply a cumulative cost of about 50 percent of 2010 GDP for the advanced economies and about 25 percent of 2010 GDP for the emerging markets—in each case adding nearly half to the cost of aging.[7]

There is uncertainty around these estimates, but the effects are of similar magnitude in different aging scenarios. In the U.N. high fertility variant (which leads to slower aging of the population as a whole), the cumulative effect of a longevity shock in advanced economies is still in the range of 39 to 52 percent of GDP, depending on the replacement rate. For emerging economies, the range is between 22 and 29 percent.

The Impact of Longevity Risk

Although longevity risk develops and reveals itself slowly over time, if left unaddressed it can affect financial stability by building up significant vulnerabilities in public and private balance sheets. On a macroeconomic level, the effects of a longevity shock on the economy and markets are similar to the effects of aging—they propagate through the size and composition of the labor force, public finances, corporate balance sheets, private saving and

investment, and potential growth (Box 4.4). While the effects of longevity risk perhaps act too slowly to cause sharp movements in asset prices, if unaddressed they add to balance sheet vulnerabilities, affecting fiscal sustainability and the solvency of private financial and corporate institutions. This in turn makes institutions and markets more prone to the negative effects of other shocks.

The Effect of Longevity Risk on Fiscal Sustainability

Governments in particular bear a significant amount of longevity risk. Their longevity exposure is threefold: (i) through public pension plans, (ii) through social security schemes, and (iii) as the "holder of last resort" of longevity risk of individuals and financial institutions. An unexpected increase in longevity would increase spending in public schemes, which typically provide benefits for life. If individuals run out of resources in retirement they will need to depend on social security schemes to provide minimum standards of living. There may also be an expectation that governments will step in if financial institutions or corporations face solvency threats from longevity exposure. In addition, private pensions in some countries are backed by guarantee funds (including in Japan, Sweden, the United Kingdom, and the United States), but these may be underfunded (as in the United States), representing an additional contingent liability for the government.

The longevity risk faced by governments adds strain to public balance sheets, which have already seriously deteriorated under the stress of the financial crisis (see Chapter 2). To the extent that governments are not acknowledging longevity risk (and few in fact do), fiscal balance sheets become more vulnerable. If not adequately addressed soon, it could potentially further threaten fiscal sustainability.

The framework that was used earlier to calculate the overall potential cost of longevity risk can be used country by country to estimate its effect on fiscal sustainability. Table 4.2 summarizes the impact of aging and a longevity shock on the fiscal position for a number of advanced and emerging market economies.

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[7]The large addition to the cost of aging because of the longevity shock can be seen intuitively as follows. The total cost of aging is the result of two factors: first, lower fertility rates (two-thirds of the effect) and, second, an increase in life expectancy at the age of retirement (one-third of the effect). Longevity at the age of retirement, the second factor, increases by nearly two years in the U.N. baseline, so that an additional shock of three years should have an impact of (3 years/2 years) × 1/3 which equals ½. Because changes in fertility take a long time to work themselves through the age structure, they are unlikely to have a large impact on the financial implications of aging over the next few decades. For example, if fertility rates were to immediately increase by 0.5 children per woman across all regions, the old-age dependency ratio in 2030 would remain virtually unchanged. In contrast, an increase in life expectancy at age 60 of one year would increase old-age dependency ratios substantially. Migration can alter the demographic structure quickly. Immigration of young adults and children from "younger" nations could offset to some extent the aging of populations in advanced economies.

Box 4.4. The Impact of Aging on the Macro Economy and on Financial Stability

This box summarizes the literature on the impact of aging on the macro economy and on financial stability.

The Macro Economy

The macroeconomic effects of aging can be summarized with the help of the national accounts identity and the Cobb-Douglas production function.

Note: Prepared by Patrick Imam and Tao Sun.

The national account framework shows the relation between aggregate production, income, domestic demand, and the external accounts through the following equations:

$$GDP = (C_{\text{private}} + I_{\text{private}}) + (C_{\text{public}} + I_{\text{public}}) + X - M \tag{1}$$

$$GNDI = C_{\text{private}} + C_{\text{public}} + S_{\text{private}} + S_{\text{public}} \tag{2}$$

4.4.1. Impact of Aging on the Macro Economy

Framework	Variable	Impact	Channels
National account framework	Consumption	Changing consumption pattern toward nontradables	• Different consumption patterns for the elderly (see Eghbal, 2007, for a case study of Italy) tend to shift demand toward services and lead to an increase in the price of nontradables compared with tradables, causing an increase in the real exchange rate.
	Investment	Reducing investment return	• If the aging population is also declining, this may lead additionally to falling rates of return on public investment. If governments do not plan for a declining population, existing public capital (e.g., schools, public infrastructure) may become underutilized to the extent that their use differs among generations.
	Savings	Reducing private and public saving	• According to the life-cycle hypothesis, older people will tend to liquidate existing savings. • Assuming no migration or fertility rise, with fewer active individuals, governments pay out more in health care and pension benefits and collect less tax revenue, leading to deteriorating fiscal conditions. • Rising fiscal deficits (negative public saving) could put the fiscal outlook on an unsustainable trajectory.
	Current account	Reducing current account balance	• The net effect of falling private and public saving on the current account depends on the relative changes in saving and investment. It is expected that the effect will apply to both current account surplus and deficit countries (see Lee and Mason, 2010). • The shrinking current account balance in some major countries, such as China and Japan, may contribute to the adjustment of global imbalances to the benefit of global financial stability.
Cobb–Douglas production function	GDP	Reducing growth rates	• Skirbekk (2004) finds that skills that are key inputs to innovation—problem solving, learning, and speed—tend to degenerate with age, leading to a population that is less creative and entrepreneurial, thereby reducing growth rates. • Empirically, the IMF (2004) finds that per capita GDP growth is positively correlated with changes in the relative size of the working age population and negatively correlated with changes in the share of the elderly.
			• Empirical evidence from OECD countries shows that the complementary role of young and old workers means an optimum mix that exists may be damaged by having too many old workers (Feyrer, 2007).
	Capital	Reducing real interest rates	• Aging is likely to translate into a gradual rise in the ratio of capital to labor and some concomitant decline in longer-term real interest rates (Visco, 2005). The flattened yield curve would reduce the effectiveness of monetary policy transmission and could impact institutions such as banks or pension funds that rely on a steep curve for their business model. This effect may be counterbalanced by decreasing saving, which may drive up interest rates.
	Labor	Affecting labor supply and returns	• An aging population will tend to shrink the labor force, which could lead to a lack of both unskilled and skilled workers. Countervailing factors, however, such as working longer (by raising the pension eligibility age for instance) or encouraging migration, could counteract the shrinking labor supply effect. • The higher capital-to-labor ratio would tend to lower expected returns on investment. Similarly, the same countervailing factors, such as working longer and immigration, may help buffer the decline in returns on investment.
	Productivity	Reducing productivity growth	• The elderly demand more services than the rest of the population (van Groezen, Meijdam, and Verbon, 2005), which tends to shift consumption toward services and away from durables. Given generally lower productivity growth in the service sector, this will tend to reduce productivity growth in the overall economy.

Box 4.4 *(continued)*

where:

   GDP = gross domestic product

      C = consumption expenditures

       I = gross domestic investment

     X = exports of goods and services

    M = imports of goods and services

$GNDI$ = gross national disposable income

     S = gross national savings

$(S - I) = CA$ = current account balance

The impact of aging on each of the components of the national income identity is summarized in Table 4.4.1.

The effect of aging on GDP can be further investigated by considering the Cobb-Douglas production function, which describes the relationship of the aggregate output of the economy to the use of inputs, as follows:

$$Q = AL^{\alpha}K^{\beta} \qquad\qquad (3)$$

where:

Q = total production (the value of all goods produced in a year)

L = labor input

K = capital input

A = total factor productivity

Exponents α and β are the output elasticities of labor and capital, respectively, which are viewed as constants determined by available technology at a point in time.

Thus, changes in GDP as a result of aging can be explained by changes in the labor supply, in the capital stock, and in productivity, as summarized in Table 4.4.1.

Financial Stability

The impact of aging on financial stability occurs largely through changes in the allocation of assets and liabilities among individuals and institutions. These effects are summarized in Table 4.4.2.

Table 4.4.2. Impact of Aging on Financial Stability

Balance Sheet Items	Impact	Channels
Assets	Reallocation of saving from riskier to safe assets may lead to potential mispricing of risk	• The rising demand for safe assets by the elderly (including through their pension funds) may lead to safe asset shortages and an overpricing of safe assets. At the same time, since risky assets such as equities are increasingly shunned, there is a possibility of an underpricing of riskier assets (Caballero, 2006). • These effects may be counterbalanced by defined-benefit funds with funding gaps in the current low-interest-rate environment, which may invest in risky assets to enhance expected returns. Underpricing may also be mitigated by international investors' buying the cheaper risky assets.
	Running down assets may result in negative wealth effects	• Evidence is increasingly emerging that asset prices fall with advancing population aging (Poterba, 2004). For instance, an aging population, by requiring less housing, puts downward pressure on house prices (Takáts, 2010). The same principle applies to equity prices, although because equities are internationally tradable, they are somewhat less susceptible to supply/demand changes driven by aging (Brooks, 2006). • Negative wealth effects could have deflationary consequences (as suggested by Japan's experience), which could lead to a negative price spiral that further depresses economic activity.
Liabilities	Changing borrowing habits may alter banks' business model	• The business model of banks is closely related to the life-cycle behavior of consumers. In their early years, consumers are net borrowers from banks, to pay for education and housing. Over their life time, consumers pay back their debt to banks. Therefore, in a consumer's later years, banks will increasingly be used for payment/transaction purposes, and less for maturity transformation. With fewer young borrowers, traditional lending activities would decline, and banks would have to enter new activities and act more like nonbanks. If not well managed (including through supervision), this transition could pose risks to financial stability. • With saving increasingly being channeled to capital markets via pension funds, the similarity of investment approaches may lead to herding, which, combined with procyclicality in the markets, could raise volatility and threaten financial stability.
	Individuals, governments, and pension providers face longevity risk	• Aging societies face heightened longevity risk—the risk of living longer than expected. Currently, there is a lack of instruments to hedge this risk. Those exposed—defined-benefit pension plan sponsors (i.e., corporations and governments), social security systems (i.e., governments), and individuals themselves—could face financial difficulties in the event of a realization of this risk. In the case of corporations, such difficulties could lead to potentially large changes in stock prices. Extreme longevity risk is likely to be borne by the sovereign, and a realization of this risk can lead to a substantial deterioration of the fiscal accounts and possible debt sustainability issues.

Table 4.2. Longevity Risk and Fiscal Challenges in Selected Countries
(In percent of 2010 nominal GDP)

Country	(1) Household Total Financial Assets (2010)[1]	(2) Present Discounted Values of Needed Retirement Income	(3) General Government Gross Debt (2010)	(4) Gap: (1) − (2)	(5) Increase in Present Discounted Values Given Three-Year Increase in Longevity
United States	339	272 to 363	94	67 to −24	40 to 53
Japan	309	499 to 665	220	−190 to −356	65 to 87
United Kingdom	296	293 to 391	76	3 to −95	44 to 59
Canada	268	295 to 393	84	−27 to −125	42 to 56
Italy	234	242 to 322	119	−8 to −88	34 to 45
France	197	295 to 393	82	−97 to −196	40 to 54
Australia	190	263 to 350	21	−73 to −161	36 to 49
Germany	189	375 to 500	84	−186 to −311	55 to 74
Korea	186	267 to 357	33	−81 to −170	39 to 52
China	178	197 to 263	34	−19 to −85	34 to 45
Spain	165	277 to 370	60	−112 to −205	39 to 52
Hungary	108	190 to 254	80	−82 to −146	34 to 45
Czech Republic	89	216 to 289	39	−127 to −200	36 to 48
Poland	88	160 to 213	55	−72 to −125	27 to 35
Lithuania	80	189 to 252	39	−109 to −172	34 to 45

Sources: National flow of funds accounts; national accounts; IMF (2011c); and IMF staff estimates.

Note: Range of values in columns (2), (4), and (5) cover, at the low end, a replacement rate of 60 percent of preretirement income and, at the high end, an 80 percent replacement rate for retirees aged 65 or older to maintain preretirement standard of living during the 2010–50 period.

[1]For China, 2009.

- In many countries, the private sector does not appear to have sufficient financial assets to deal with aging-related costs, let alone with longevity risk. In most countries, the estimated present discounted value of required retirement income under current U.N. longevity assumptions for 2010–50 [Table 4.2, column (2)] exceeds household total financial assets [column (1)].[8] Gaps vary among countries, partly because of differing aging trends; they may also reflect individuals counting to varying degrees on income from social security schemes and on net housing wealth (which are excluded from the table because of data limitations).

- In Japan and Germany, for instance, the gaps between financial assets and potential liabilities are equivalent to between about 2 and 3½ times their respective GDPs in 2010, assuming again a range of replacement rates of 60 to 80 percent of the average wage. Although some of the gaps

[8]Column (1) of Table 4.2 includes the claims on defined-benefit pension plans, balances of defined-contribution plans, claims on insurance reserves, and other financial assets. In a defined-contribution plan, an employee contributes a set amount to a retirement plan. These amounts, often complemented by employer's contributions, are then invested. The amount available at retirement depends only on contributions and cumulated rates of return; there is no promise of a particular payment upon retirement.

in the table would be covered by social security, housing equity, and further asset accumulation by households, it is unlikely that current household wealth is sufficient to provide for the necessary retirement income in many countries.

- The potential effects of longevity risk on government liabilities are substantial in many countries. With the private sector ill-prepared for even the expected effects of aging, it is not unreasonable to suppose that the financial burden of an unexpected increase in longevity will ultimately fall on the public sector. Implied increases in potential public liabilities from a three-year extension of average lifetimes are generally between one-third and one-half of 2010 GDP, with larger effects in Germany (two-thirds of 2010 GDP) and Japan (three-fourths of 2010 GDP) [Table 4.2, column (5)].

- The contingent liabilities from longevity risk could add to already-stretched debt-to-GDP ratios in a number of countries. For instance, if the risk of an extra three years of longevity were indeed to fall on the government, debt-to-GDP ratios could rise to about 150 percent in Germany and the United States and to 300 percent in Japan [Table 4.2, sum of columns (3) and (5)].

The Effect of Longevity Risk on Private Institutions

The rising awareness of longevity risk is starting to affect the corporate sponsors of retirement plans. For corporations that offer defined-benefit schemes, unexpected increases in longevity assumptions (sometimes forced by improved accounting rules) hurt firms' profits, affect their balance sheet, and—ultimately—their stock price.[9] Institutional investors and credit rating agencies are increasingly scrutinizing longevity risks in defined-benefit schemes, and forcing companies to increase reserves. In addition, merger and acquisition activities are increasingly complicated by risks in defined-benefit schemes, including longevity risk (Pensions Institute, 2005).

Longevity risk is also affecting financial institutions. For life insurance companies, longevity risk may lead to losses on their existing annuity contracts, potentially leading to regulatory increases in reserves for such contracts. For insurance companies with important annuity business (as is the case for many in France, Japan, and the United Kingdom) large and continuous longevity increases have a potentially substantial financial impact. Without the benefits of diversified business lines, stand-alone annuity providers, such as those in the United Kingdom, run even greater risks of insolvency. For pension funds, longevity risk can add significantly to underfunding (see example below). To the extent that insurance companies and pension funds are interconnected with other financial institutions (including, importantly, banks), the financial consequences of a longevity shock could propagate through the financial system. Longevity risk may also have an upside, however, depending on the specific exposure of financial institutions. For example, to the extent that life insurance companies have written more life policies than annuities, they benefit when their policyholders live longer, since that leads to longer premium payments and delayed payouts. This is why life insurance companies are a "natural buyer" of longevity risk (see "Longevity Risk in the Low-Interest-Rate Environment" below).

An Example: The Impact of Longevity Risk on U.S. Defined-Benefit Plans

This example uses detailed data from the U.S. Department of Labor (DOL) to estimate the longevity risk faced by defined-benefit pension plans in the United States.[10] Actuarial and financial information on large U.S. pension funds are contained in filings of the DOL's Form 5500 between 1995 and 2007 (the most current year available). Important statistics from this form for evaluating longevity risk are total liabilities, number of plan participants, and the actuarial assumptions used.

The Form 5500 data suggest that the use of outdated mortality tables has been a common practice (Table 4.3).[11] Until recently, a majority of plans used the Group Annuity Mortality table of 1983, and many still did by the end of the sample period, implying a lag of almost a quarter-century in their mortality assumptions. Throughout the sample, only a few plans used the latest available table.[12] This exposes many pension providers to substantial longevity risk. Indeed, a study by Dushi, Friedberg, and Webb (2010) compared the present value of pension liabilities as reported by the plan sponsor (using its own longevity assumptions) with the liabilities that result from using longevity forecasts by the Lee-Carter model.[13] The study argued that the use of outdated mortality tables is causing pension liabilities to be understated by some 12 percent for a typical male participant in a defined-benefit pension plan.[14]

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[10]For a complete treatment of this example, see Kisser and others (forthcoming).

[11]Actuaries typically use mortality statistics to compute liabilities. Mortality is of course the complement of longevity, and therefore conceptually equivalent.

[12]For some pension funds, information on the underlying mortality table is not available as the corresponding tables are classified as "other" with no further information given. Anecdotal evidence suggests that some funds may have switched to another recently proposed table (the RP-2000 mortality table), but this evidence cannot be used in the analysis. Nonetheless, assuming that plans that do not report a mortality table use the most recent one changes the results of the analysis only marginally.

[13]For a description of the Lee-Carter model, see Box 4.2.

[14]Similarly, Antolín (2007) computes the impact on a hypothetical pension plan of an unexpected improvement in life expectancy and finds that the present value of pension liabilities increases between 8.2 percent and 10.4 percent.

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[9]Recent acknowledgment of unrealized losses of banks has caused large declines in their share prices. A similar event could occur for corporations with pension liabilities.

Table 4.3. Mortality Tables Used by Reporting Pension Plans
(In percent)

Year	1951 GAM	1971 IAM	1984 UP	1983 IAM	1983 GAM	1994 UP	2007 Mortality Table	Other	Hybrid	None
1995	1	0	7	1	48	6	0	3	22	0
1996	0	0	6	0	57	1	0	6	19	0
1997	0	0	4	0	62	1	0	6	17	0
1998	0	0	4	0	66	1	0	6	15	0
1999	0	0	3	0	67	1	0	7	14	3
2000	0	0	3	0	68	2	0	7	13	2
2001	0	0	2	0	69	2	0	8	12	2
2002	0	0	2	0	69	2	0	10	11	3
2003	0	0	2	0	66	3	0	13	11	3
2004	0	0	1	0	63	3	0	17	10	3
2005	0	0	1	0	49	3	0	31	10	3
2006	0	0	1	0	28	3	0	55	8	3
2007	0	0	1	0	16	2	12	57	6	4

Sources: U.S. Department of Labor; and IMF staff estimates.

Note: GAM = Group Annuity Mortality table; IAM = Individual Annuity Mortality table; UP = Unisex Pension table. "Other" includes undefined mortality tables. "Hybrid" means that the standard mortality tables have been modified by the pension fund. "None" means that no mortality table has been used.

Each mortality table implies different life expectancies of retirees, and the impact of longevity increases can be inferred across funds and from instances when plans shift to the use of an updated table. The difference in implied life expectancy of 63-year-old males (the average retirement age in the sample) between the most dated and the most current mortality table is 5.2 years (Figure 4.3). For the substantial fraction of plans previously employing the 1983 Group Annuity Mortality table, a switch to the 2007 table (as required since 2008) implies an increase in longevity of 2.1 years.

Because the Form 5500 data show which table is used each year by each plan, the increase in the longevity assumptions is known when a plan switches to an updated table. Hence, controlling for other changes over time, a regression method can be used to disentangle increases in liabilities due to differences in discount rates, benefit payments, and the number of plan participants (Annex 4.1). The results imply that U.S. pension funds face a longevity risk that would see their total liabilities increase by about 3 percent for each additional year that their retirees live beyond the age of 63, implying a 9 percent increase for a three-year longevity shock.

The estimated shock is considerable, since it affects a large stock of liabilities; multiples of sponsors' typical yearly contributions would be necessary to increase assets commensurately. For example, a longevity adjustment in the Nether-

Figure 4.3. Life Expectancy at Age 63, by Year of Mortality Table
(In years)
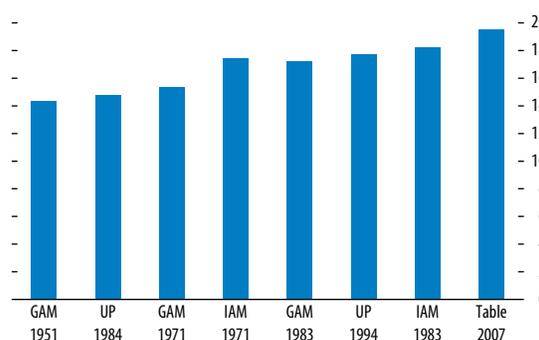
Sources: For GAM 1951, SOA (1983); for UP 1984, Jackson and Fellers (1976); for GAM 1971, Greenlee and Keh (1971); for IAM 1971, Cherry (1971); for GAM 1983, SOA (1983); for UP 1994, SOA (1995); for IAM 1983, SOA (1981); for Table 2007, *Federal Register* (2007).

Note: GAM = Group Annuity Mortality table; IAM = Individual Annuity Mortality table; UP = Unisex Pension table.

lands in 2010 led to an increase in liabilities of the pension sector of about 7 percent (or 8 percent of GDP). This increase in liabilities could not be matched by an increase in assets through employer and employee contributions; other measures to cover the shortfall are now being considered, including foregoing indexation of pensions and possible lowering of nominal pensions—measures allowable under Dutch law, but not typically available in most countries (Box 4.5).

Longevity Risk in the Low-Interest-Rate Environment

Pension plans, providers of annuities, and other providers of retirement income face larger increases in liabilities because currently low interest rates exacerbate the financial impact of longevity risk. Longevity risk pertains to events in the future, so its financial consequences must be discounted. The lower the discount rate, the higher the present discounted value of the cost of longevity risk events.[15] A stress test framework for defined-benefit pension plans developed by Impavido (2011) indicates how the impact of longevity risk is dependent on interest rates.

The magnitude of the effects of longevity changes on pension liabilities differs depending on the age structure of a pension plan, on the actuarial assumptions used, and on how shocks are applied. Therefore, the calculations in this section should be viewed as an illustrative example that is based on the following specific assumptions:[16]

- To simulate longevity shocks, "extension factors" are applied to all age-specific mortality rates in the original mortality table in Impavido (2011), so that average life expectancy would be increased by three years.
- Retirement benefits in the model are single-life inflation-indexed annuities, based on a final-salary

Figure 4.4. Increase in Actuarial Liabilities from Three-Year Increase in Longevity, by Discount Rate
(In percent)

Source: IMF staff estimates.
Note: Actuarial liabilities are projected benefit obligations of a model pension plan.

formula with an accrual rate of 1 percent.[17] The exercise assumes an inflation rate of 1 percent, annual real salary increases for active employees of 1 percent, and an annual inflation correction for retirees receiving an annuity.

- The calculations assume that all pension plan members enter the plan at age 20 and retire at age 60.

The calculations confirm that lower discount rates have significant effects on the size of longevity risk (Figure 4.4). With a discount rate of 6 percent, a three-year extension in average life expectancy increases liabilities by 8 percent in this example; with a discount rate of 2 percent, the same three-year shock increases liabilities by almost 14 percent.

Low interest rates therefore affect pension plans in two ways: by increasing their liabilities and by exposing them to higher longevity risk. In some countries liabilities of defined-benefit pension plans already exceed assets (leaving their funding ratios below 1), partly because of declining or low discount rates, which increase the present discounted value of liabilities.[18] The same discount effect applies to longevity risk, exacerbating the underfunding problem. In a sample of advanced economies, a three-

[15]For accounting purposes, the discount rate used in calculating pension liabilities is typically the yield on long-term high-quality domestic corporate bonds; for prudential regulation purposes, it is often the long-term government bond yield, which is currently around historical lows.

[16]For more information on technical details and assumptions, see Impavido (2011).

[17]Single-life refers to an annuity that does not include survivor benefits.

[18]See IMF (2011b) for the possible effects of protracted low interest rates on pension plans.

Box 4.5. Pension Reform in the Netherlands: Proactively Dealing with Longevity Risk

A recent agreement on pension reform in the Netherlands explicitly factors in longevity risk. The flexibility permitted by this agreement is exemplary, providing potential guidance to other countries facing similar longevity issues.

The Netherlands has a mandatory pension scheme for all employees based on the premise of full pre-funding. Dutch pension funds have accumulated a large pool of assets, amounting to about 130 percent of GDP (OECD, 2011). Still, liabilities exceed assets, with the funding ratio falling below 100 percent recently. Several developments have contributed to this fall, including declines in asset prices since the start of the financial crisis, falling interest rates, and increases in life expectancy.

Longevity risk has contributed to the decline in funding ratios. In 2005, a new Financial Assessment Framework was introduced, later codified in the new Pension Act of 2007, mandating that pension funds not only use the latest mortality tables to calculate liabilities (which had been the practice), but also take into account the latest forecasts of future increases in longevity (which had previously not been included). This change had the effect of increasing aggregate liabilities of Dutch pension funds by some 5 to 6 percent. An update of future longevity assumptions in 2010 further increased liabilities by 7 percent, or €50 billion (8 percent of 2011 GDP; Stichting van de Arbeid, 2011). These large longevity shocks led to significant declines in funding ratios.

These developments prompted a discussion on pension reform in the Dutch Labor Foundation, a consultative body consisting of trade unions and employers' associations. In 2010, a Pension Accord was reached, recommending the following elements for reform:

Note: Prepared by S. Erik Oppers.

- *Contribution stabilization.* The Accord recognized that a maximum limit had been reached on contribution rates by employers and employees. Contribution adjustments could no longer be part of the mechanism used to absorb changes in life expectancy or financial market shocks.
- *Marked-to-market assets and liabilities.* While the assets of Dutch pension funds have traditionally been marked-to-market, the liabilities had been discounted at the risk-free interest rate. A discussion is now ongoing about replacing this with the expected long-term return, allowing future liabilities to be discounted at a market-based rate. More realistic valuations will allow better management of the risks.
- *No unconditional nominal commitments.* Future pension benefits are explicitly conditional on the investment performance of the pension fund. Financial market shocks will be offset by reductions in benefits (for pensioners) or accrual rates (for active participants) aimed at returning the funding ratio to 100 percent over a 10-year period.
- *Adjustments for changes in longevity.* Pensions will be adjusted to relate the number of expected benefit years to the number of accrual (working) years, thus linking the effective retirement age to expected developments in longevity. In practice, the retirement age for private pensions will rise with that for the public old-age pension, to 66 in 2020, with further adjustments every 5 years in line with projected longevity.

The reform elements from the Pension Accord have been transmitted to the government as recommendations, to be codified and implemented in the period ahead. It is expected that these reforms will result in a pension system that is more robust to financial market and longevity shocks.

year longevity shock could further reduce funding ratios by between 6 and 10 percent (Table 4.4). Moreover, low interest rates also lower the return on the fixed-income assets in the portfolio, making it more difficult for plans to earn their way out of the underfunding problems.

Mitigating Longevity Risk

Like any other risk faced by economic agents—such as interest rate or exchange rate risk—longevity risk should be recognized and addressed. On a global scale, *reducing* longevity risk would require reversing

Table 4.4. Corporate Pension Funding Ratios and Discount Rate Assumptions for Selected Countries
(In percent)

	Funding Ratio			Discount Rate	
	2006	2010	With Three-Year Longevity Shock[1]	2006	2010
Japan	70	62	55	2.0	1.5
United Kingdom	87	95	88	5.1	5.4
Netherlands	89	97	90	4.6	5.1
United States	89	85	79	5.8	5.4
Ireland	90	95	89	4.7	5.2
Canada	92	91	84	5.1	5.2
Switzerland	99	87	77	2.7	2.6

Sources: Towers Watson (2011); Watson Wyatt (2007); and IMF staff estimates.

Note: The funding ratios in this table are ratios of the current market value of plan assets to the plans' projected benefit obligations, which are based on a survey of accounting assumptions for corporate defined-benefit plans. Regulatory calculation requirements may differ from accounting assumptions, and funding ratios in this table may therefore differ from ones reported by regulators.

[1]Calculations assume projected benefit obligations increase by parameters derived from the model used in Figure 4.4. The discount rate for this calculation was 2 percent for Japan and Switzerland, and 6 percent for the others. Possible effects of a longevity shock on the plans' assets are not taken into account.

the current bias toward underestimating longevity. Given the uncertainties inherent in forecasting, however, it is likely that longevity risk will remain. To effectively deal with longevity risk, three types of approaches are required: (i) addressing government longevity exposure; (ii) risk sharing between governments, pension providers, and individuals (including across generations), coupled with an improved ability of individuals to self-insure against their individual longevity risk and attention to the sustainability of the old-age safety net; and (iii) market-based transfer of longevity risk to those that are better able to bear it.

One of the most effective offsets to longevity risk is individuals' human capital, their labor or entrepreneurial income. By linking the retirement age to expected future developments in longevity, longer working lives can offset longer life spans, essentially keeping the number of years in retirement (and thus financial retirement needs) fairly constant. Increases in the retirement age can be mandated by the government for its own retirement or old-age payments, reducing the liabilities of the government (and of private pension providers if they use the government retirement age as a benchmark). People have also been working longer spontaneously—without government intervention—as individuals choose to work longer in response to living longer healthy lives and when they realize they might live longer than previously expected. Additional years spent working can increase financial buffers of individuals, helping further to

offset their individual longevity risk. The extra labor income would also generate additional tax revenue, offsetting some of the public sector's costs.

Addressing the Longevity Exposure of the Public Sector

Addressing the substantial longevity risk of the public sector will first require measuring the extent of its exposure. As in the case of the private sector, determining future contingent liabilities demands realistic estimates of future life spans for individuals covered by public pension plans and old-age social security schemes. In addition, it would be important to assess the extent of the contingent liability that governments hold because of possible insufficient retirement resources in the private sector.

The longevity risk could be partly quantified with a variety of longevity scenarios, possibly derived from the range of assumptions that are typically used in population forecasts. Such an analysis could effectively "stress test" the public finances regarding their exposure to longevity risk and their resilience to various shocks and outcomes. The exercise would be akin to the stress tests used by private financial institutions to determine their exposure and resilience to various types of financial and macroeconomic risks that affect their liquidity and solvency.

Mitigation of the identified risk would likely require a combination of policies. These could include

Figure 4.5. Index of Share of Pension Entitlements Linked to Life Expectancy in Selected Countries
(In percent)
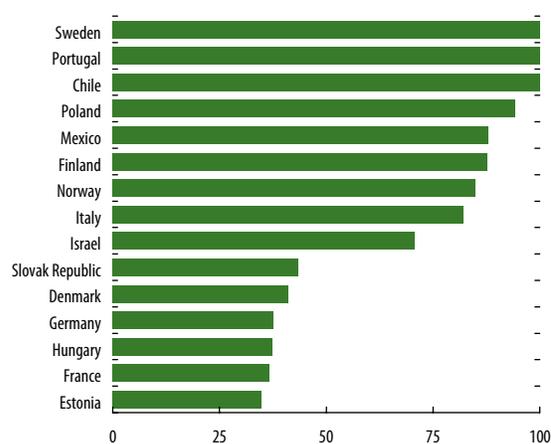
Source: OECD (2011).
Note: Index includes links to life expectancy through defined-contribution plans.

risk sharing with individuals (see the section below) by adjusting the terms of pension plans and social security schemes (including reducing benefits, increasing contributions rates, and raising the statutory retirement age), and reducing debt in anticipation of potential longevity pressures. The main considerations for these adjustments are the sustainability of the public debt, the ability of public schemes to alleviate old-age poverty, the consequences for intergenerational equity, and transfers across income groups. Finally, like private holders of longevity risk, governments could also use the possibility of selling the risk in the capital markets (see the section on "Market-Based Transfer of Longevity Risk" below).

Only a few governments so far have taken steps to limit their exposure to longevity risk (Figure 4.5). Some countries have adjusted pension formulas to relate improvements in life expectancy to benefits (Finland, Germany, Japan, and Portugal) or to the retirement age (Denmark, France, and Italy), transferring some of the longevity risk to individuals. Some governments have instituted defined-contribution plans (Chile and Sweden). Governments could also consider increasing contribution rates to social security schemes.[19] Although

[19]This is an option for countries that still have room for raising payroll contribution rates. In countries where the tax wedge—income and payroll taxes as a share of labor earnings—is already near or above 50 percent of total labor costs, raising contribu-

such transfers could be an effective way to share the burden of aging and longevity risk, any measures need to be carefully designed to avoid overwhelming the retirement resources of individuals, in which case the risk would return to the government as the holder of last resort.

Risk Sharing across Sectors

Longevity risk is too large to be managed by any one sector of society. The solution therefore demands better risk sharing between the private business sector, the public sector, and the household sector (individuals). Much of the risk is now borne by pension providers and governments. Risk sharing could be promoted by having pension plans share longevity burdens with retirees through raising the retirement age, and increasing financial buffers for individuals to allow "self-insurance" against longevity risk.

More flexibility in the design of retirement income schemes would allow more effective burden sharing between pension providers and retirees, increasing the system's resilience to longevity shocks. Providers of pension income are already taking measures to shift some longevity risk to individuals, but national regulations differ as to the flexibility that plan sponsors have in this respect. Private and public pension providers should optimally have a variety of ways to cope with financial shortfalls as a result of unexpected increases in longevity and share the associated financial burden, including increasing the retirement age, increasing pension premiums, and reducing pensions, measures that are currently being discussed in the Netherlands.[20] Where flexibility is lacking (such as in the United Kingdom), plan sponsors are closing down defined-benefit plans and

tion rates could have adverse labor market effects. Another option is to equalize the taxation of pensions and other forms of income—many advanced economies tax pensions at a lower rate, even though there is little justification for taxing pensions differently than other forms of income. Where increasing revenues is desirable, alternative revenue sources such as consumption taxes could also be considered, particularly to finance the redistributive components of pension systems.

[20]For annuities, rather than adjusting the pensionable age, Richter and Weber (2009) and Denuit, Haberman, and Renshaw (2011) discuss contracts that link payouts to longevity.

switching to defined-contribution schemes. Insurance companies are also taking longevity risk into account by charging higher premiums for annuities.

As pension providers shed aggregate longevity risk, individuals are increasingly exposed to their own individual longevity risk; to cope, individuals should delay their retirement and increase their financial buffers. Effective burden sharing requires increasing individual financial buffers for retirement, for example by mandating additional retirement savings or encouraging saving through tax policy. In order for these buffers to be available for retirement, financial stability and prudent investment strategies (with appropriate shares of "safe" assets—see Chapter 3) are key to avoid a situation where turmoil in financial markets would deplete buffers intended for retirement (as occurred recently in some countries that rely heavily on defined-contribution schemes, including the United States).

These buffers could then be used for self-insurance of households against longevity shocks without recourse to government resources, resulting in better burden sharing between households and the public sector. For instance, to avoid running out of resources before the end of life, households could be required to use a minimum portion of their retirement savings to buy an annuity contract, which guarantees a specific recurring payment until death. However, this annuitization should be well designed and well regulated to ensure consumers fully understand these contracts and to avoid the undue concentration of this risk among annuity sellers.

Few households purchase annuities, partly because annuities are not priced at actuarially fair levels for general populations (Dushi and Webb, 2006). Unattractive pricing is partly due to administrative costs and profit margins. In addition, those who expect to live longer than average are more apt to purchase annuity contracts—a form of adverse selection. Annuity companies take this selection bias into account in their pricing, which makes these products unattractive for the general public. To get around this problem, some governments have made annuitization compulsory—for example, the United Kingdom until recently, and Singapore in 2013 (Fong, Mitchell, and Koh, 2011). As an alternative, Piggott, Valdez, and Detzel (2005) have proposed

that groups of retirees pool and self-annuitize to reduce adverse selection costs. Another option for elderly homeowners is to increase retirement income by consuming their home equity via reverse mortgages.[21]

Better education about retirement finances and about the concept of longevity risk are important if individuals are to increase their financial buffers for retirement and self-insure against longevity risk. Retirement finance is a complex subject, and although it is related to decisions about medical care and housing, it is often considered in isolation instead of holistically. Most households are probably unaware of the magnitude of the individual (idiosyncratic) longevity risk to which they are exposed, which make it less likely that they will be willing or able to self-insure against longevity risk. Improved education on these issues should therefore be part of a comprehensive plan of governments to address longevity risk.

Market-Based Transfer of Longevity Risk

Further sharing of longevity risk could be achieved through market-based transfer of longevity risk to those better able to cope with its adverse financial consequences. In such a market, the "supply" of longevity risk would meet "demand" for that risk. That is, the risk would be transferred from those who hold it, including individuals, governments, and private providers of retirement income, to (re-)insurers, capital market participants, and private companies that might benefit from unexpected increases in longevity (providers of long-term care and health care, for example).[22] In theory, the price of longevity risk would adjust to a level at which the risk would be optimally spread through market transactions.[23]

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[21]In a reverse mortgage the lender advances payments to the borrower. The loan continues to accrue interest and is settled using the proceeds from selling the property when the borrower dies.

[22]Reinsurers purchase (for a premium payment) blocks of insurance contracts from insurance companies looking to manage their risk exposures. Subject to any agreed-to conditions, the reinsurer then becomes responsible for paying any claims on the underlying insurance policies.

[23]Risk transfer would be beneficial to financial stability even for aggregate longevity risk. The benefit does not result from diversification—the aggregate risk cannot be diversified away—but from shifting the risk to those that are better able to handle its financial consequences.

Figure 4.6. Structure of Pension Buy-Out and Buy-In Transactions
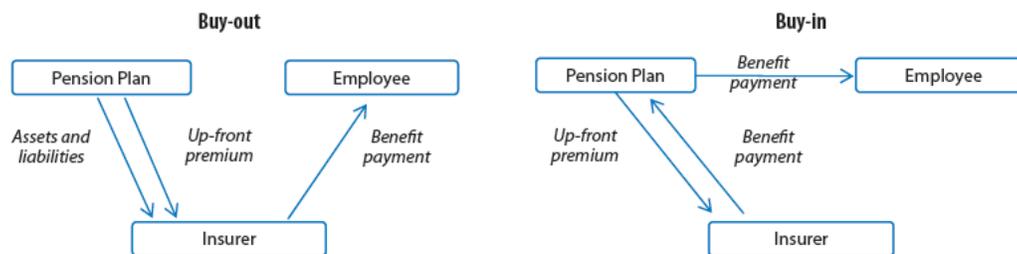
Simply designed, over-the-counter (OTC) bilateral contracts and longevity bonds are the two principal instruments through which longevity risk can be transferred. The bilateral solutions include pension buy-outs and buy-ins, swaps, and other derivative contracts.[24]

Bilateral Contracts

Buy-ins and buy-outs are simple transactions accomplishing risk transfer, but each has different implications for the sponsor. In a buy-out transaction all of the pension fund's assets and liabilities are transferred to an insurer for an up-front premium (Figure 4.6). The pension liabilities and their offsetting assets are removed from the pension fund sponsor's balance sheet and the insurer takes over full responsibility for making payments to pensioners. In a buy-in, the sponsor pays an up-front premium to the insurer, who then makes periodic payments to the pension fund sponsor equal to those made by the sponsor to its members. This "insurance policy" is held as an asset by the pension plan; the premium is the cost of the insurance policy that guarantees payments even if retirees live longer than expected.

In another type of bilateral transaction, the longevity swap, the pension fund obtains a similar protection from higher-than-expected pension payouts. The plan sponsor makes periodic fixed "premium" payments to the swap counterparty, which in turn makes periodic payments that are based on the difference between the

actual and expected benefit payments (Figure 4.7). The sponsor maintains full responsibility for making benefit payments to its employees. An advantage of buy-ins and swaps is that they can be used to hedge the longevity risk associated with specific subsets of the underlying population. An advantage of swaps is that longevity risk can be isolated, whereas buy-in and buy-out transactions typically also transfer the investment risk of the assets. Longevity swaps can also be combined with other types of derivative contracts, such as inflation, interest rate, and total return swaps, to create so-called "synthetic" buy-ins that transfer all of the risks.

Longevity Bonds

The payout on a longevity bond would depend on an index that tracks the longevity experience of a given population (Figure 4.8). The periodic payment (or coupon) on a longevity bond would be proportional to the number of survivors in the population. Therefore, the issuer of the bond (an investment bank or insurance company) pays more to the owner of the bond (the pension fund sponsor) when longevity is higher. The owner of the bond could thus use the periodic payments from the bond to offset any higher-than-expected payments to retirees. Because investors can offset some of their longevity risk with this bond, the interest rate they demand for holding it may be lower than for regular bonds. One disadvantage is that, unlike a swap, the owner of the bond

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[24]Longevity risk can also be transferred to capital markets via "life settlement" securitizations. A life settlement occurs when the owner of a life insurance policy sells the policy for an amount below the face value of the policy (i.e., the amount paid when the policyholder dies). The purchaser becomes responsible for making premium payments in return for collecting death benefits. Although life settlement volumes have been growing recently, they have not reached the point at which securitization becomes viable on a large scale. Life settlements are akin to viatical settlements (see Box 4.3).

Figure 4.7. Structure of Longevity Swap Transactions

Figure 4.8. Structure of Longevity Bond Transaction
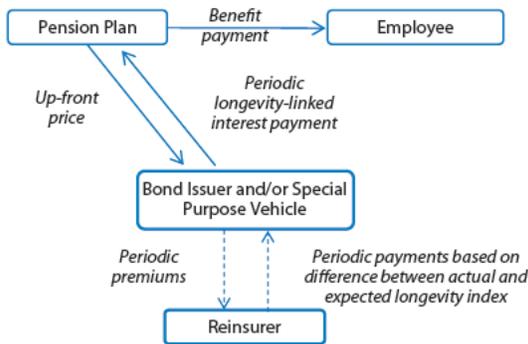
Figure 4.9. Attitudes of Pension Plan Sponsors toward Hedging Pension Risk, by Type of Risk
(In percent of respondents)

What is your attitude toward hedging?

- ■ *We will hedge at any price (these are unrewarded risks)*
- ■ *We will hedge at what we believe is fair value*
- ■ *We have a predetermined strategy for hedging using triggers*
- ■ *We will not hedge these risks*
- ■ *We do not have a policy in relation to hedging these risks*
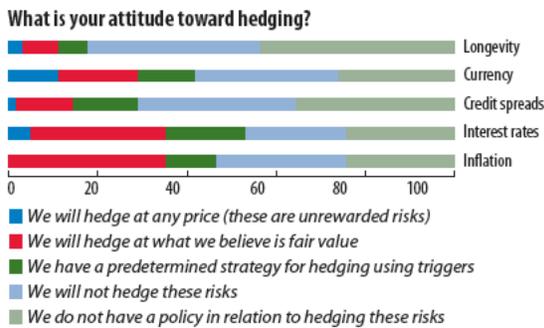
Source: Aon Hewitt (2011).

Figure 4.10. Attitudes of Potential Sellers of Longevity Risk toward Hedging
(In percent of respondents)

How would you describe your attitude toward hedging longevity risk?
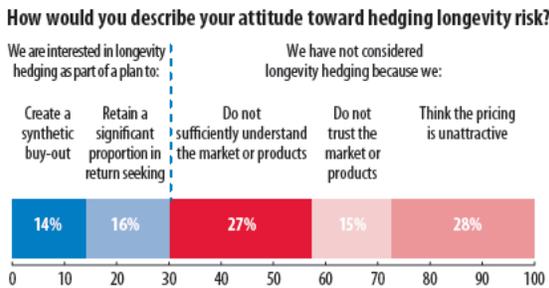
Source: Aon Hewitt (2011).

must make a large up-front payment to the issuer, resulting in counterparty risk exposure to the issuer. To date, there has been no successful longevity bond issuance, although there have been several false starts.

Challenges for the Risk Transfer Market

The use of capital market-based longevity risk management solutions has been growing, but their use remains small, with the notable exception of the swap, buy-in, and buy-out markets in the United Kingdom and the Netherlands (Box 4.6). Explanations for the slow growth include challenges on the sell and buy sides, as well as market infrastructure issues affecting both sides of the transaction.

For those that are "selling" (that is, trying to reduce) their longevity risk, a major reason for a limited market for longevity risk transfer is that only a few pension plan sponsors recognize longevity risk at all, and fewer still have plans to address it. Longevity risk is seen as less important to hedge than other financial risks (Figure 4.9). It is also considered to be dominated by the higher volatility of asset valuations and liability discount rates, which may mask the slower-moving effects of increases in life expectancy. In addition, many plan sponsors would have to first recognize and remedy existing underfunding before transferring their longevity risk, making risk transfer an "expensive" exercise. Also hindering the transfer market is a degree of moral hazard, in which pension providers may expect a government bailout if a significant longevity event threatens their financial viability.

Lack of familiarity with the market for longevity risk is another impediment. That lack of familiarity was shown in a recent survey (Aon Hewitt, 2011), which suggested that potential sellers of longevity risk (i) lacked an understanding of the market, (ii) lacked trust in longevity products, and (iii) considered pricing to be unattractive (Figure 4.10).

Another concern for sellers of longevity risk is basis risk. In this context, basis risk exists because the payout in a risk transfer deal is typically linked to an index that is based on the longevity experience of a sample population, whereas actual payouts depend on the actual pool of retirees of the pension provider.[25]

[25]Basis risk can be large, caused by differences in life expectancy at age 65 depending on gender, employment history, income, and geographic location. For example, for a higher-income female in

Box 4.6. Recent Activity in the Dutch and U.K. Buy-Out, Buy-In, and Longevity Swap Markets

This box provides an overview of recent activity in the longevity risk transfer market in the Netherlands and the United Kingdom.

Transactions by defined-benefit pension funds in the United Kingdom to transfer their longevity risk averaged about £8 billion per year in the period 2008–10 and rose to about £9 billion in 2011 (see Figure 4.6.1). About half have been longevity swaps, with investment banks increasing their activity in this market starting in 2008 as buyers or intermediaries. Almost all of the largest transactions (greater than £1 billion) are swaps, with buy-outs being used primarily for smaller funds (less than £500 million). There have been a number of small transactions in the Netherlands over the last few years, and a €12 billion longevity swap between Aegon and Deutsche Bank in early 2012 (Steinglass and Wilson, 2012).

The different risk-transfer solutions are associated with particular types of counterparties (see Figure 4.6.2). U.K. insurers regulated by the Financial Services Authority are associated with all of the buy-in and buy-out activity, whereas almost all of the longevity swap transactions have been made by investment banks. In turn, insurers and banks have passed some of this risk to reinsurers via swap contracts. So far, none of the risk has been passed on to capital markets, although some longevity bond transactions may be in the works.

Despite numerous buy-out, buy-in and swap transactions (see Table 4.6.1 for the largest), to date no longevity bonds have been issued. The European Investment Bank tried to issue a longevity bond in 2004, but it was cancelled due to lack of interest on

Note: Prepared by John Kiff.

Figure 4.6.1. U.K. Longevity Risk Transfers, by Type of Transfer
(In billions of pounds sterling)
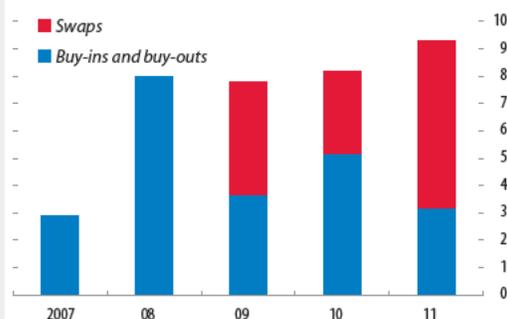
Sources: Hymans Robertson; and IMF staff estimates.

Figure 4.6.2. Structure of Longevity Transfers by U.K. Defined-Benefit Pension Plans, by Type of Counterparty
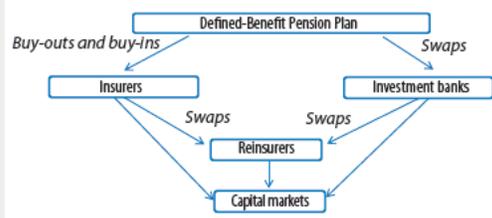
both the buy and sell sides (Biffis and Blake, 2009). The World Bank's attempt in 2010 also did not succeed (Zelenko, 2011). The experience with longevity bonds contrasts with the much more active market for "mortality" bonds, which transfer medium-term (three- to five-year) risk associated with catastrophic mortality events such as pandemics.

Table 4.6.1. Largest Longevity Risk Transfers by U.K. Pension Plans

Pension Plan	Provider	Deal Type	Value (In billions of pounds sterling)	Date
Rolls Royce	Deutsche Bank	Swap	3.0	November 2011
RSA Insurance	Rothesay Life[1]	Swap	1.9	July 2009
ITV	Credit Suisse	Swap	1.7	August 2011
British Airways	Rothesay Life[1]	Buy-in[2]	1.3	June 2010
British Airways	Rothesay Life[1]	Swap	1.3	December 2011
Babcock	Credit Suisse	Swap	1.2	July 2010
Thorne	Pension Corporation	Buy-out	1.1	December 2008
Turner & Newall	Legal & General	Buy-in	1.1	October 2011
Cable & Wireless	Prudential (U.K.)	Buy-in	1.0	September 2008
Pilkington	Legal & General	Swap	1.0	January 2012

Source: Hymans Robertson.

[1]An insurance subsidiary of Goldman Sachs.

[2]Synthetic buy-In (longevity swap plus asset swap).

The small size of the longevity risk market is due in part to a dearth of buyers of longevity risk relative to its potential sellers. Since global longevity risk is large and many individuals and institutions (including governments) are already exposed, there are few natural buyers for this risk.

Reinsurers and insurers exposed to life insurance risk are one class of natural buyers, as the acquisition of longevity risk may provide a partial hedge for their insurance exposure. This is because the two risks largely offset each other—life annuity liabilities increase when annuitants live longer, whereas life insurance liabilities decrease.[26] However, reinsurer capacity to take on longevity risk may already be approaching the limit (which market participants estimate at approximately $15 billion per year), so a broader investment base is needed to match the large potential seller volume. Other natural buyers might include those companies that would benefit from having people living longer, including firms in the health care, home-care, and pharmaceutical industries.[27] As this risk gets transferred to capital market participants outside the regulated perimeter, supervisors need to remain vigilant to ensure that final recipients understand the risks they take on and can manage them appropriately.

A relatively untapped pool of potential buyers of longevity risk consists of asset managers, sovereign wealth funds, and hedge funds. Asset managers and sovereign wealth funds may be encouraged by the fact that longevity risk is likely to be largely uncorrelated to the other risk factors in their portfolio.[28] However, hedge funds may be put off by the long duration of the contracts, which may make them inappropriate for most hedge fund's investment styles. A solution to the duration problem could be the Deutsche Börse's longevity swaps based on their XPect® family of longevity indices.[29] These swaps settle based on changes in expected life curves over shorter time periods.

Buyers of longevity risk may be discouraged by the illiquidity of instruments and by asymmetric information. Sellers of longevity risk would tend to seek customized hedge contracts to maximize the effectiveness of risk transfer, whereas many buyers of this risk would likely look for standardized instruments to maximize liquidity. This fundamental difference in perspective complicates the development of an active market. More standardized products would improve liquidity for buyers, but would also increase basis risk for sellers, because standardization will likely increase the demographic differences between the actual pool of retirees and the reference pool on which payments are based. In addition, the asymmetry of information in risk transfer deals disadvantages buyers, which can lead to mispricing in markets. For example, a pension fund may know more than risk buyers about the health of its retirees. Therefore, only those pension funds with the longest-living populations may want to hedge the risk.

Both buyers and sellers of longevity risk face counterparty risk. Longevity deals tend to be long-term contracts in which the counterparty may fail to honor its financial commitments over time. Such counterparty risk is usually addressed with collateralization, which can involve significant costs because it requires that the proceeds be invested in high-quality liquid securities that may be in short supply (see Chapter 3). This consideration favors derivative contracts, such as longevity swaps, which require the collateralization of only the net payments, which is

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the southeast of England life expectancy at 65 is approximately 22 years, whereas for a low-income male living in the north it is just under 13 years (Byrne and Harrison, 2005). Recent research has proposed index-based hedge methodologies to reduce such basis risk to acceptably low levels (Coughlan and others, 2011; and Li and Hardy, 2011).

[26]Cox and Lin (2007) and Dowd and others (2006) discuss the role that derivative contracts (mortality/survivor swaps) can play in such hedging. Mortality risk can be used in part to hedge longevity risk, but the risk reduction may be lower than expected because mortality risk contracts are short term in nature (typically one- to five-year maturity) with a large exceptional element (e.g., pandemic risk), while longevity risk is a longer-term risk (typically 20- to 80-year horizon) and reflects largely unanticipated changes in trend.

[27]There are fewer prospects for swapping risk between countries with different demographics. Developing and advanced economies have different levels of longevity, but they probably do not want to buy each other's longevity *risk*. What matters in trading longevity risk across countries is not the difference in longevity levels per se, but the degree to which they are correlated. It is likely that the correlations across countries are increasing, making such an investment unattractive.

[28]However, the value of instruments for transferring longevity risk is correlated with interest rate levels via their role in the present value discounting of future payouts, so the lack-of-correlation rationale may be weaker than expected.

[29]The monthly XPect® indices are based on data from Germany, the Netherlands, and the United Kingdom. They track a number of male and female cohorts defined by birth dates (1900–19, 1920–39, 1940–59, 1960–79, and 1980–99).

the difference between what each swap participant owes the other.[30]

Finally, both sides of the market are also affected by a lack of reliable and sufficiently detailed information about longevity developments. Life tables are not updated frequently and are only available for relatively aggregated groups in the population. Sophisticated longevity risk management and transfer would benefit from much more disaggregated demographic data (including, for example, by postal code and cause of death), which can reduce basis risk; indexes of such data would facilitate the design and trading of longevity risk transfer instruments. Index-based transactions may also lessen the problem of asymmetric information.

The Role of Government

Government may be able to facilitate the private sector in developing an efficient market for the transfer of longevity risk. A thriving market in longevity risk would transfer this risk to those that can better bear it, promoting financial stability, a clear public good. The government can promote this market through a number of measures, including:

- *Providing more detailed longevity data.* The lack of detailed longevity and related demographic data is a major constraint facing the longevity risk market. Governments are best placed to provide such data, perhaps through national statistics offices or government actuaries.[31] Essential data would include longevity information that is disaggregated by geographic area, as well as by gender, socioeconomic status, cause of death, and occupation. The government could also usefully track the emergence and

evolution of new diseases, especially those afflicting the elderly (such as Alzheimer's disease), medical advances (such as new diagnostics and treatments, and genetic advances), and lifestyle changes (such as smoking and obesity rates).

- *Enhancing regulation and supervision.* Governments could provide tighter regulation to promote the recognition and mitigation of longevity risk, including through stricter funding requirements and enhanced accounting transparency for pension funds and insurance companies. Indeed, pension regulations requiring the mitigation of financial risks could be expanded to include longevity risk.

- *Improving the education of market participants.* Surveys suggest that market participants are generally unaware of longevity risk. There is a role for government to promote awareness of the importance of addressing longevity risk similarly to other financial risks. Pension supervisors are well placed to take on this task. In addition, in some countries, households are provided with periodic estimates of their pension resources to sensitize them to potential shortfalls.

Some market participants have suggested that there is also a role for the government in jumpstarting the market for longevity bonds, but it is not clear what market failure governments could correct. Government-issued bonds would provide benchmarks and liquidity to the market, and some say that once the market is established, the government could reduce its issuance and let the private sector take over (Blake, Boardman, and Cairns, 2010). However, unless tied to rising retirement ages, issuance of longevity bonds would expose governments to additional longevity risk. It is not clear that the advantages of jumpstarting the market outweigh the costs, although estimates of net gains are difficult to measure. Some liken the issuance of longevity bonds to that of inflation-indexed bonds that helped that market thrive.

Conclusions and Policy Considerations

Longevity risk is large and affects all of society. If everyone in 2050 lived just three years longer than now expected—in line with the average underestimation of longevity in the past—society would need extra resources equal to 1 to 2 percent of GDP per

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[30]Biffis and others (2011) show that the cost of collateral to secure longevity swaps can be quite reasonable, especially when counterparty default risk and collateral rules are symmetric.

[31]The private sector also has a role in providing better data. The Life and Longevity Markets Association is a nonprofit group of several investment banks, insurers, and reinsurers interested in facilitating the structuring of longevity risk transfer deals. It is pushing for the development of a more standardized and liquid index-based longevity risk market. The group is setting up standardized term sheets and pricing methodologies for swap transactions and pushing for the production of detailed and frequently updated life tables. Efforts of individual companies (including Credit Suisse in 2006, Goldman Sachs in 2007, and JP Morgan in 2007) to develop indexes have been met with skepticism by market participants, who doubt the independence of their calculations.

year. If this longevity shock occurred today and society wanted to save to pay for these extra resources for the next 40 years (that is, fully fund these additional "pension liabilities"), advanced economies would have to set aside about 50 percent of 2010 GDP, and emerging economies would need about 25 percent of 2010 GDP—a sum totaling tens of trillions of dollars. As such, longevity risk potentially adds one-half to the vast costs of aging up to the year 2050—and aging costs themselves are not fully recognized in most long-term fiscal plans.

Private pension providers and governments are particularly exposed to longevity risk and this risk is greatly increased in the current low-interest-rate environment. In line with other estimates in the literature, the analysis in this chapter finds that the liabilities of U.S. pension plans would rise by 9 percent for a three-year increase in longevity. Governments may be even more exposed: many not only sponsor defined-benefit pension plans for their employees, but maintain extensive old-age social security systems covering most of the population. In addition, the government is likely liable for the "tail" of longevity risk: in the case of a longevity shock affecting the entire population, the private sector would likely be overwhelmed by the financial consequences. In that case, the losses are likely to be assumed by the government in some way, including through pension fund guarantee schemes that take on the pension liabilities of failing institutions and social security schemes that aim to prevent old age poverty.

Longevity risk is generally not well recognized, although this is slowly improving. Until recently, few pension plans or governments explicitly recognized the existence of longevity risk, and even fewer prepare for or mitigate it. Even if updated mortality tables were used, adequate provisions for future mortality improvements were often not being applied. Regulations tend not to emphasize longevity risk and supervisors may themselves not be fully aware of the extent of longevity risk faced by pension providers. Few governments have assessed the longevity risk present in public pension plans and social security systems. In the past few years, more pension plans and insurers have started to pay attention to longevity risk, especially in the United Kingdom and the Netherlands, and the market for risk

transfer has developed some activity, although representing just a fraction of the existing risk.

Longevity risk affects financial stability by threatening fiscal sustainability and weakening private sector balance sheets, adding to existing vulnerabilities in the current environment. Although longevity risk is a slow-burning issue, it increases the vulnerability of the public and private sectors to various other shocks. The risk is therefore perhaps not immediate, but the longer these vulnerabilities are allowed to build up, the more likely it is that there will be large adjustments in the future.

Policy Recommendations

- Governments should acknowledge the existence of longevity risk in their balance sheets as contingent liabilities and ensure that it does not threaten the sustainability of the public finances. A credible and realistic plan to deal with longevity risk can help restore confidence in the long-term sustainability of the public finances. A first-best policy would be to link the eligibility age for public pensions to actual developments in longevity (thereby responding to longevity risk events as they materialize and holding constant the duration of retirement), preferably through automatic or formula-based periodic adjustments to avoid recurring public debate about the issue. In countries where higher taxation is unlikely to affect labor supply much, this policy could be complemented by increases in contribution rates. Reducing benefits, though perhaps most difficult politically, is a third way of coping with the issue.

- Given the magnitude of longevity risk, risk sharing between businesses, the government, and individuals will help alleviate pressures on any one sector. The government could promote risk sharing in several ways. It could increase the ability of pension providers to share shortfalls with plan participants. The government could promote increased financial buffers for individuals, for example by promoting retirement products that take account of possible future increases in longevity. Individuals could then share the burden of longevity risk by self-insuring against longevity risk to some extent. This would require better education on retirement finance

and improved awareness by individuals of longevity risk. Because individuals would turn to public resources if they run out of retirement resources, the government is a natural provider of such education and of regular updates on estimated personal retirement resources.

- Although the private sector will further develop market-based transfer mechanisms for longevity risk if it recognizes the benefits of doing so, the government has a potential role in supporting this market. Measures could include provision of better longevity data, better regulation and supervision, and education to promote awareness of longevity risk. Those governments that are able to limit their own longevity risk could consider issuing a limited quantity of longevity bonds to jumpstart the market.

- Full recognition and effective mitigation of longevity risk requires improvements in data availability and transparency. Public or private development of longevity indexes and more diverse population-specific mortality tables would facilitate assessment of longevity risk and its transfer. The credibility of these data would be enhanced if they were compiled by government statistical offices or independent industry associations acting at arm's length from the market.

- Regulation and supervision of institutions exposed to longevity risk should be improved. Insurance companies and defined-benefit pension plans should have to deal with longevity risk just as

they must manage other financial risks, such as interest rate risk and inflation risk. Doing so would require at least an annual assessment using the most up-to-date mortality tables, conservative assumptions for future mortality improvements, and the use of appropriate discounting factors, all enforced by appropriately strengthened accounting rules. Recognition of underfunding by pension plans and their sponsors is key; they need realistic plans to achieve full funding over a reasonable period, because longevity risk can be transferred more easily once a plan is fully funded.

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In sum, better recognition and mitigation of longevity risk should be undertaken now, including through risk sharing between individuals, pension providers, and the public sector, and through the development of a liquid longevity risk transfer market. Longevity risk is already on the doorstep and effectively addressing it will become more difficult the longer remedial action is delayed. Much of the apprehension surrounding fiscal sustainability relates to the apparent inability to address structural fiscal issues in the affected countries. Attention to population aging—and, *a fortiori,* the additional risk of longevity—is part of the set of reforms needed to rebuild confidence in the viability of sovereign balance sheets.

Annex 4.1. The Impact of Longevity Risk on U.S. Defined-Benefit Plans

This annex describes an empirical measure of the impact of longevity risk on defined-benefit pension plan liabilities. The analysis uses actuarial and financial data from U.S. corporate pension funds, which plan sponsors are required to submit annually to the U.S. Department of Labor on the department's Form 5500. The data used here cover the period 1995–2007.[32] As of 2007, the total amount of U.S. defined-benefit pension liabilities equaled approximately $2.2 trillion and covered more than 42 million plan participants.

When computing the present value of future pension obligations, corporations have to make and report several actuarial assumptions, including the discount rate they apply and the mortality tables underlying the computations of the expected length of future payout streams. The data show that there is a substantial level of variation in the use of mortality tables across funds and over time. This variation can be used in a regression analysis to estimate the impact of an additional year of life expectancy on the present value of pension liabilities.

Regression Specification

The regression specification is based on the idea that defined-benefit pensions can be modeled as an annuity; that is, a specified regular payment for the remainder of life. Following de Witt (1671) it is known that the present value of a pension liability (L) is given by

$$L = pb \sum_{i=1}^{T} \frac{(1 - s_i)}{(1 + r)^i} \qquad (4.1)$$

where p is the number of plan participants, T is the assumed maximum life span, s_i denotes the survival probability over i periods, b is the promised amount of periodical payouts, and r denotes the discount rate.[33] Due to data limitations, we will proxy for the valuation equation by using

$$L \approx pb \left[\frac{(1 - (1 + r)^{-n})}{r} \right] \qquad (4.2)$$

where n is the expected number of future payouts.[34] Rearranging terms and taking the logarithm, it follows that

$$\log(L) \approx \log(p) + \log(b) - \log(r)$$
$$+ \log[(1 + r)^n - 1] - n\log(1 + r) \qquad (4.3)$$

Linearizing the two last terms of equation (4.3), we obtain

$$\log(L) = \alpha + \beta_1 \log(p) + \beta_2 \log(b) + \beta_3 \log(r)$$
$$+ \beta_4 n + \beta_5 \log(r)n + e \qquad (4.4)$$

which can be estimated in a panel regression, accounting for plan-specific effects. The main interest is in the coefficient β_4, which is the effect of one additional year of life expectancy on the present value of pension liabilities.

Results

The impact of longevity assumptions on pension liabilities is estimated using the simple pension valuation model of equation (4.4) with the Form 5500 data and focusing on only those participants who are already receiving the "annuity," namely, retired plan participants. Table 4.5 summarizes the results.

Note: Prepared by Michael Kisser.
[32]The required level of detail differs depending on whether a plan is classified as small or large and on the type of plan (welfare plans, pension plans, common trusts, and so on). A plan is generally classified as large if it has more than 100 participants. The starting point for the coverage period was determined by the fact that information regarding the underlying mortality tables used in actuarial computations became available in 1995. The final year of the period, 2007, is the most recent for which Form 5500 data have been published.

[33]In reality, the promised periodic payment, b, would differ across employees. However, using the average payment across employees leads to a similar valuation.
[34]Note that the life expectancy is equal to the sum of the individual survival probabilities. The valuations presented in equations (4.1) and (4.2) will be exactly equal to each other when the discount rate, r, equals zero. If we assume that r is low (as in the current macroeconomic environment) then the approximation is reasonable.

Table 4.5. The Impact of Longevity Risk on Pension Liabilities

	Coefficient
log (discount rate)	−0.945***
log (participants)	0.914***
log (benefit)	0.519***
Longevity	0.03***
Observations	89552
R-squared	0.742

Source: IMF staff calculations.

Note: The initial estimation of equation (4.4) included the interaction term between longevity and log(discount rate), as specified. However, the high correlation between longevity, log(discount rate), and the interaction term rendered all three variables statistically insignificant in this specification. Subsequently, the interaction term was excluded; these results are reported in the table. *** p <0.001.

The regression explains 74 percent of the variation in (the logarithm of) pension liabilities and shows that an additional year of life expectancy at age 63 increases pension liabilities by approximately 3 percent.[35]

[35]A substantial number of pension plans do not specify the actuarial table used, which potentially biases the results. However, if all those plans are assumed to use the latest table (the strongest assumption possible), the results of the regression are substantially the same.

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GLOBAL FINANCIAL STABILITY REPORT
STATISTICAL APPENDIX, APRIL 2012

This presentation complements the main text of the *Global Financial Stability Report* (GFSR) with data on financial developments in regions and countries as well as in selected sectors.

Unless otherwise noted, the data reflect information available up to February 16, 2012. The data come for the most part from sources outside the IMF. Although the IMF endeavors to use the highest quality data available, it cannot

be responsible for the accuracy of information obtained from independent sources.

Please note that effective with the April 2011 issue, the IMF's Statistics Department assumed responsibility for compiling the Financial Soundness Indicators tables, and they are no longer part of this appendix. However, these tables will continue to be linked to the GFSR Statistical Appendix on the IMF's public website.

The following symbols and conventions have been used in this appendix:

- . . . to indicate that data are not available;
- — to indicate that the figure is zero, or less than half the final digit shown, or the item does not exist;
- – between years and months (for example, 2008–09 or January–June) to indicate the years or months covered, including the beginning and ending years or months;
- / between years (for example, 2008/09) to indicate a fiscal or financial year.

"Billion" means a thousand million; "trillion" means a thousand billion.

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

"n.a." means not applicable.

Minor discrepancies between constituent figures and totals are due to rounding.

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

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Figure 1. Major Net Exporters and Importers of Capital in 2011

Economies That Export Capital[1]

Other economies[2] 21.2%
Germany 12.8%
China 12.5%
Taiwan Province of China 2.6%
Saudi Arabia 8.8%
Qatar 3.1%
Iran, Islamic Republic of 3.2%
Singapore 3.6%
Netherlands 3.9%
Japan 7.5%
Norway 4.4%
Kuwait 4.6%
Switzerland 5.6%
Russia 6.3%

Economies That Import Capital[3]

Other economies[4] 31.8%
Canada 4.0%
Brazil 4.3%
United States 38.5%
Spain 4.5%
France 5.0%
Italy 5.7%
Turkey 6.3%
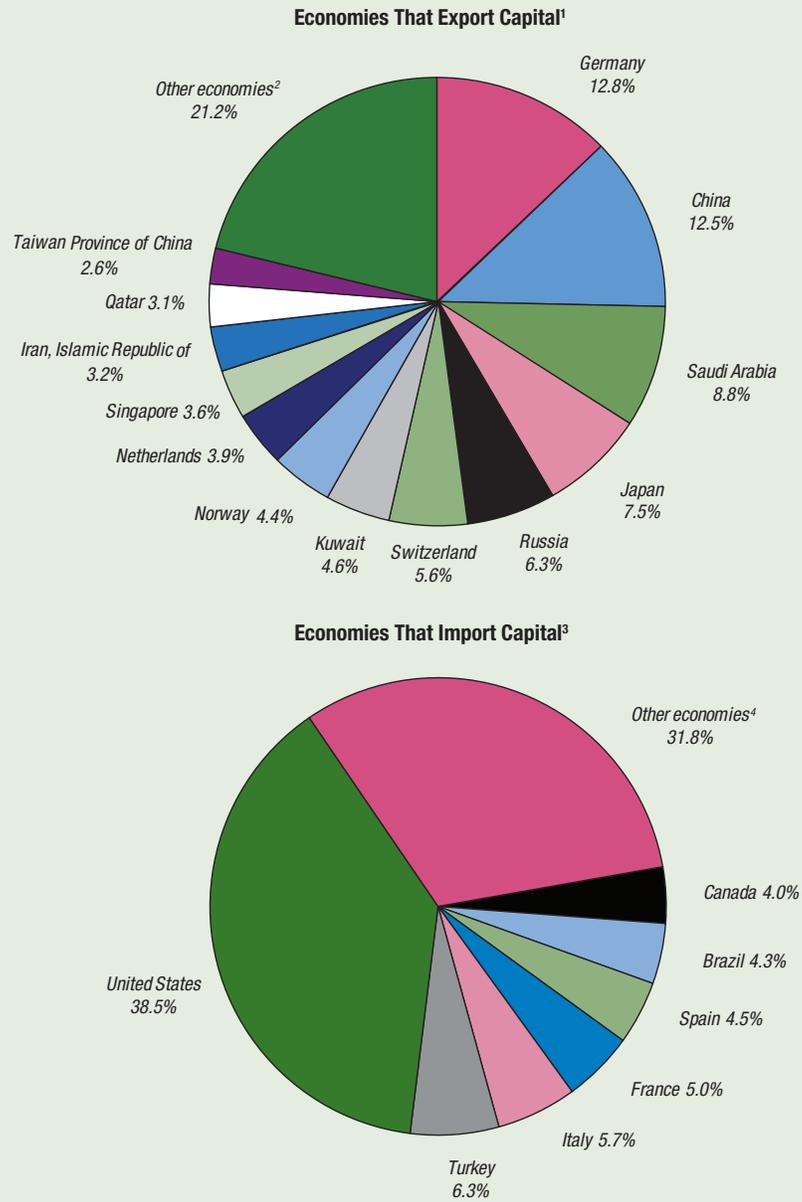
Source: IMF, World Economic Outlook database as of April 4, 2012.
[1]As measured by economies' current account surplus (assuming errors and omissions are part of the capital and financial accounts).
[2]Other economies include all economies with shares of total surplus less than 2.6 percent.
[3]As measured by economies' current account deficit (assuming errors and omissions are part of the capital and financial accounts).
[4]Other economies include all economies with shares of total deficit less than 4.0 percent.

Figure 2. Sovereign Credit Default Swap Spreads
(Five-year tenors, in basis points)
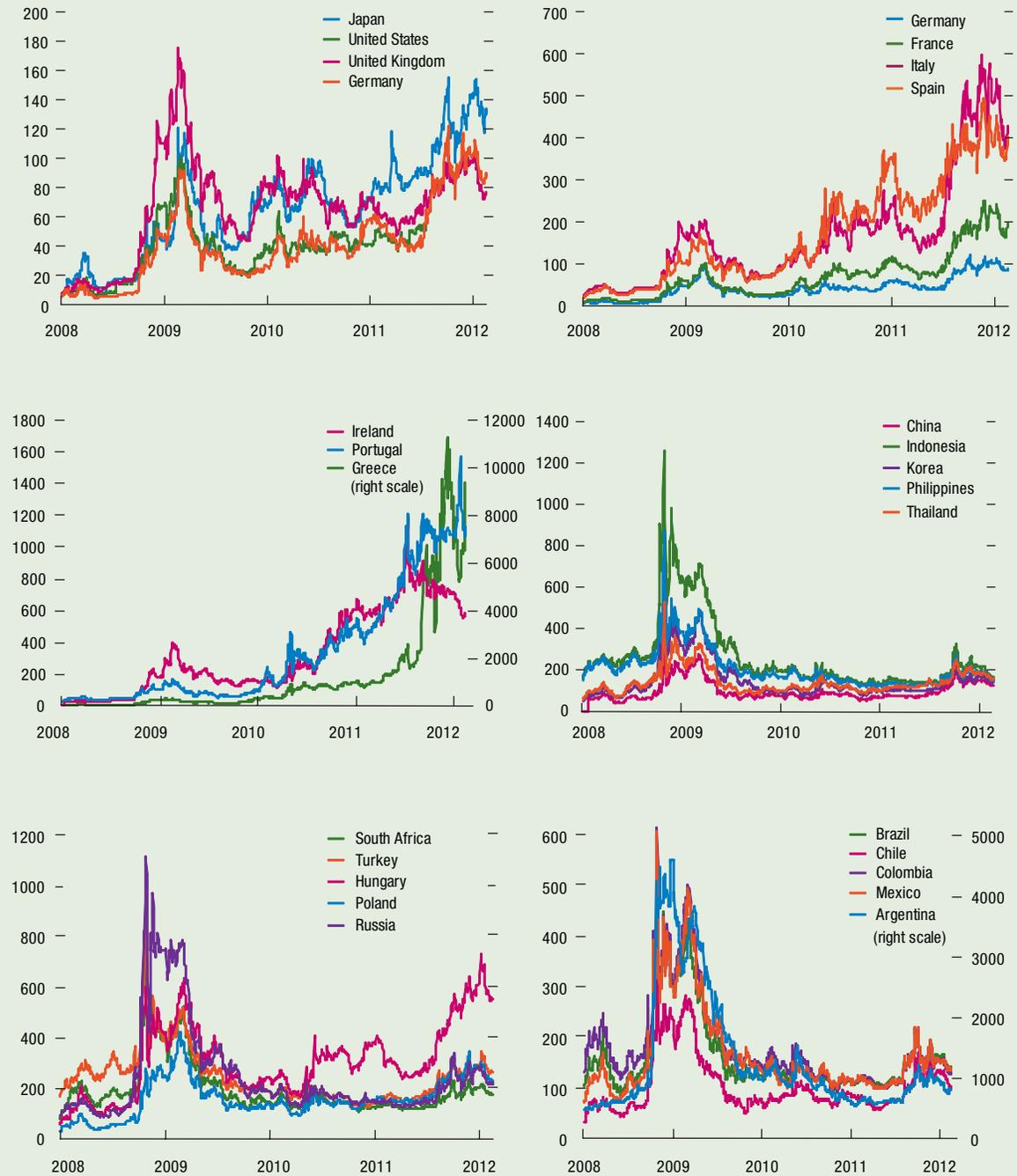
Source: Bloomberg L.P.

Figure 3. Selected Credit Default Swap Spreads
(Five-year tenors, in basis points)

Sovereigns by Region

Corporates by Credit Quality
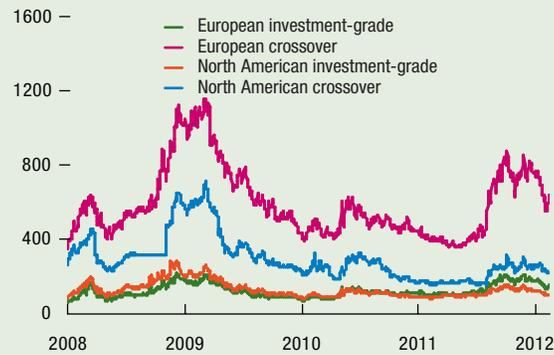
Banks by Region
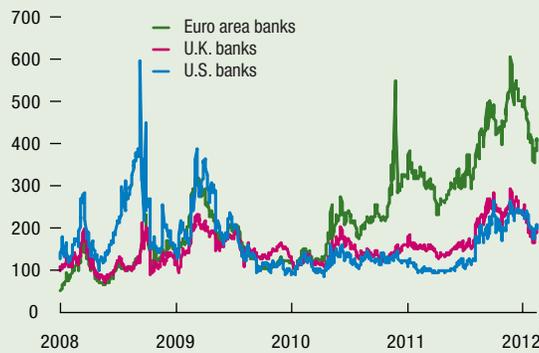
Sources: Bloomberg L.P.; and Datastream.
CEEMEA = Central and Eastern Europe, Middle East, and Africa.

Figure 4. Selected Spreads
(In basis points; monthly data)
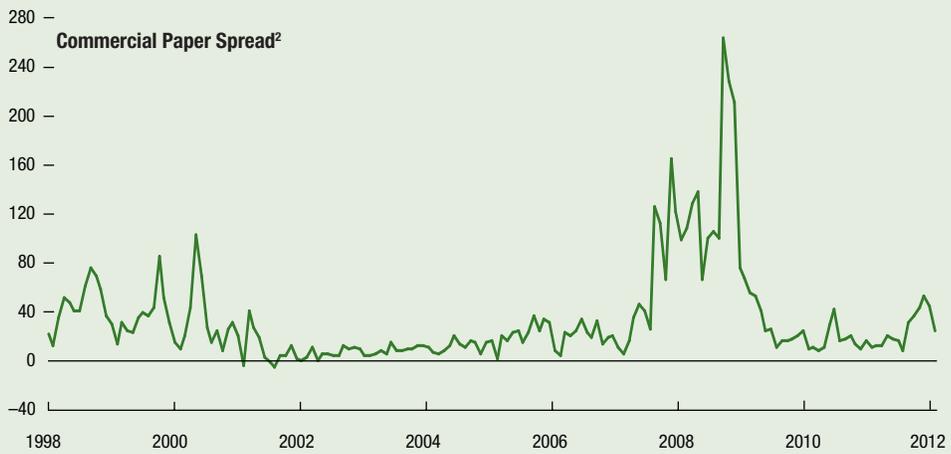
Sources: Bloomberg L.P.; and Merrill Lynch.
[1]Spread between yields on three-month U.S. Treasury repo and on three-month U.S. Treasury bill.
[2]Spread between yields on 90-day investment-grade commercial paper and on three-month U.S. Treasury bill.
[3]Spread over 10-year government bond.

Figure 5. Implied Volatility Indices
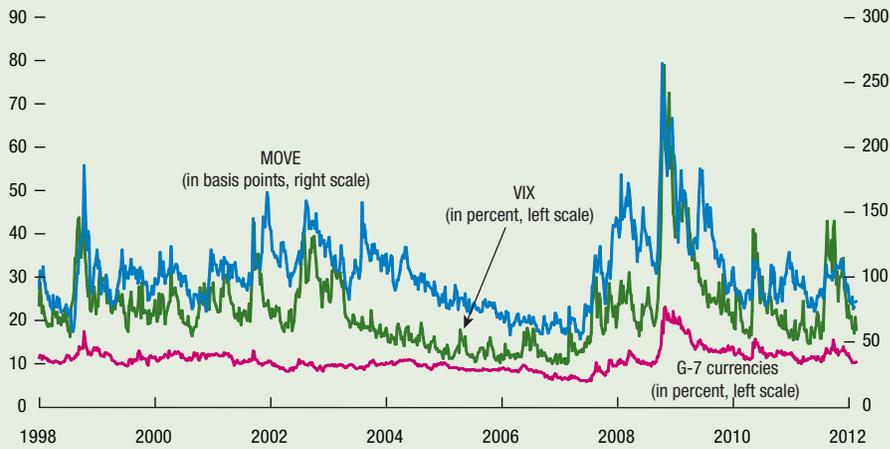
Source: Bloomberg L.P.
Note: VIX = Chicago Board Options Exchange volatility index on the Standard & Poor's 500 and denotes equity volatility. MOVE = Bank of America Merrill Lynch Option Volatility Estimate index and denotes one-month Treasury options volatility. G-7 currencies = VXY index from JPMorgan Chase & Co. and denotes G-7 foreign exchange volatility.

Figure 6. Twelve-Month Forward Price/Earnings Ratios

Source: I/B/E/S.

Figure 7. United States: Corporate Bond Market
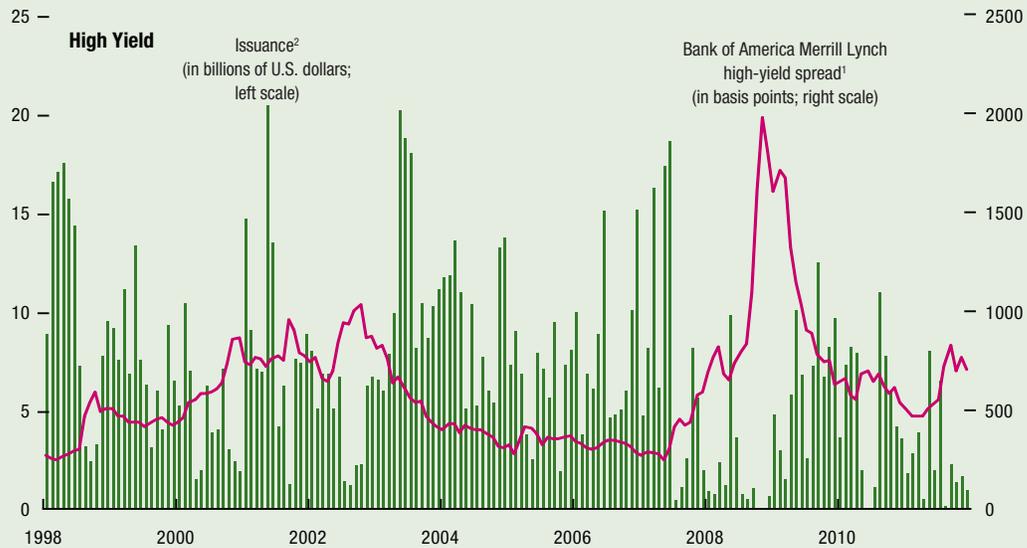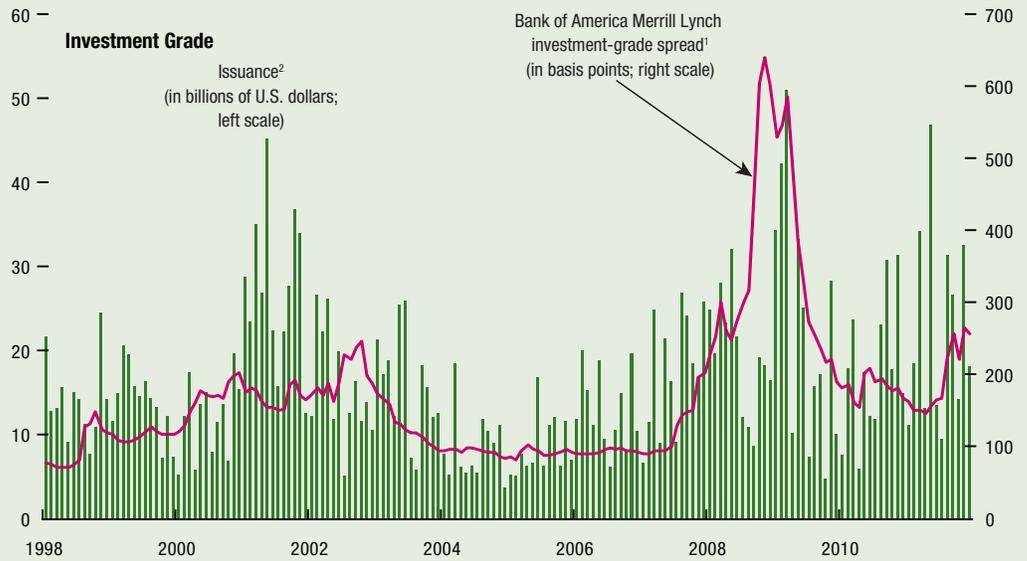
Sources: Board of Governors of the Federal Reserve System; and Bank of America Merrill Lynch.
[1]Option-adjusted spread; in basis points; right scale.
[2]Gross issuance.

Figure 8. Euro Area: Corporate Bond Market

Investment Grade

Bank of America Merrill Lynch
investment-grade spread[1]
(in basis points; right scale)

Issuance[2]
(in billions of U.S. dollars;
left scale)

High Yield

Issuance[2]
(in billions of U.S. dollars;
left scale)

Bank of America Merrill Lynch
high-yield spread[1]
(in basis points; right scale)
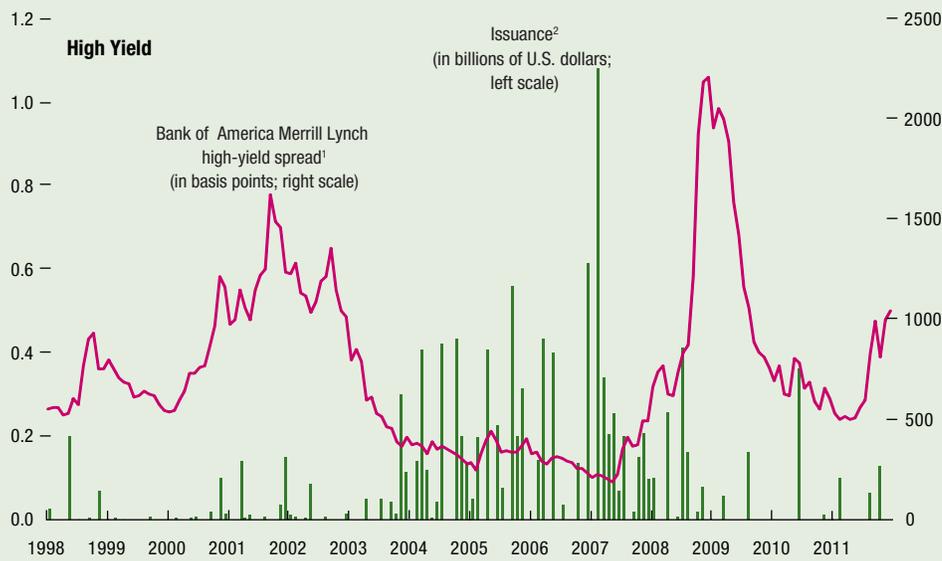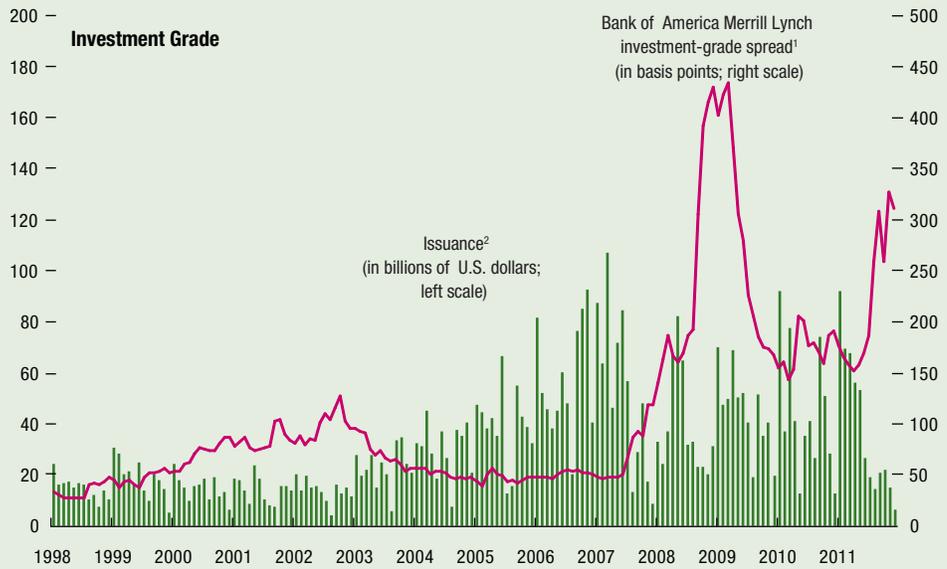
Sources: DCM Analytics; and Bank of America Merrill Lynch.
[1]Option-adjusted spread; in basis points; right scale.
[2]Gross issuance.

Figure 9. United States: Commercial Paper Market

Discount Rate Spread[1]
(In basis points; weekly data)

Amount Outstanding
(In billions of U.S. dollars; monthly data)

Asset-backed
(right scale)

Nonfinancial
(left scale)

Financial
(right scale)
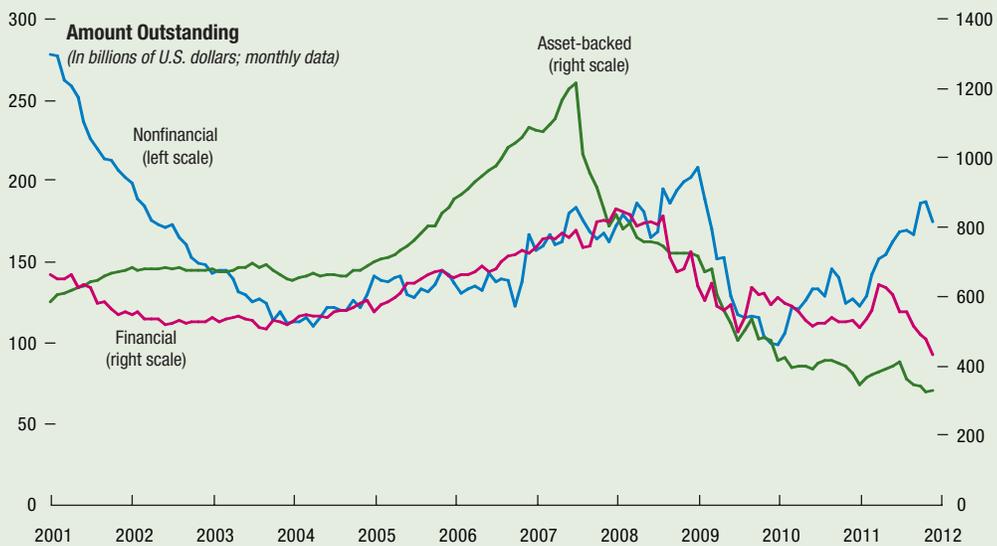
Source: Board of Governors of the Federal Reserve System.
[1]Difference between 30-day A2/P2 and AA nonfinancial commercial paper.

Table 1. Selected Indicators on the Size of the Capital Markets, 2010
(In billions of U.S. dollars unless noted otherwise)

	GDP	Total Reserves Minus Gold[2]	Stock Market Capitalization	Debt Securities[3] Public	Debt Securities[3] Private	Debt Securities[3] Total	Bank Assets[4]	Bonds, Equities, and Bank Assets[5]	Bonds, Equities, and Bank Assets[5] (In percent of GDP)
World	63,074.9	9,644.8	54,562.2	41,274.2	53,289.7	94,563.9	107,774.7	256,900.9	407.3
European Union[1]	15,171.6	431.5	10,150.0	10,392.9	20,741.3	31,134.2	45,273.1	86,557.4	570.5
Euro area	12,134.4	300.2	5,696.2	8,676.2	16,069.6	24,745.8	30,830.0	61,271.9	504.9
North America	16,103.6	178.4	19,453.9	12,304.6	22,188.5	34,493.1	17,473.7	71,420.6	443.5
Canada	1,577.0	57.0	2,170.4	1,139.1	972.7	2,111.8	3,138.4	7,420.6	470.5
United States	14,526.6	121.4	17,283.5	11,165.5	21,215.8	32,381.3	14,335.3	64,000.0	440.6
Japan	5,488.4	1,061.5	4,099.6	11,635.5	2,518.2	14,153.7	11,172.4	29,425.7	536.1
Memorandum items:									
EU countries									
Austria	379.8	9.6	126.0	239.1	471.1	710.2	1,307.6	2,143.8	564.5
Belgium	470.2	16.5	269.3	437.3	701.7	1,139.0	1,546.9	2,955.2	628.5
Denmark	312.0	73.5	244.2	123.0	674.9	797.9	1,147.4	2,189.5	701.8
Finland	238.5	7.3	213.2	100.3	131.9	232.1	495.6	940.9	394.6
France	2,562.8	55.8	1,758.7	1,724.0	3,404.6	5,128.6	9,370.9	16,258.2	634.4
Germany	3,286.5	62.3	1,429.7	2,025.6	3,328.3	5,353.9	5,305.5	12,089.1	367.8
Greece	305.4	1.3	67.6	382.5	302.9	685.3	591.4	1,344.3	440.1
Ireland	207.0	1.8	60.4	127.1	712.4	839.5	992.1	1,892.0	914.1
Italy	2,060.9	47.7	598.4	2,186.8	2,170.6	4,357.4	3,261.8	8,217.7	398.7
Luxembourg	53.4	0.7	101.1	5.4	90.6	96.0	1,024.1	1,221.2	2,285.6
Netherlands	780.7	18.5	327.2	408.8	1,911.4	2,320.3	2,608.9	5,256.3	673.3
Portugal	229.0	3.7	87.8	178.1	357.6	535.7	717.9	1,341.4	585.8
Spain	1,395.0	19.1	631.7	795.5	2,462.9	3,258.3	3,377.8	7,267.8	521.0
Sweden	462.1	42.6	596.6	170.6	648.8	819.4	702.0	2,117.9	458.3
United Kingdom	2,263.1	68.3	3,613.1	1,423.1	3,348.1	4,771.2	12,593.7	20,978.0	927.0
Newly industrialized Asian economies[6]	1,896.6	1,167.6	5,059.4	774.1	1,084.5	1,858.5	4,261.4	11,179.3	589.4
Emerging market economies[7]	21,636.6	6,299.4	12,535.8	5,456.6	3,374.2	8,830.8	22,839.4	44,206.0	204.3
Of which:									
Asia	9,557.9	3,646.8	6,680.9	2,796.6	1,925.9	4,722.5	14,853.1	26,256.5	274.7
Latin America and the Caribbean	4,900.3	632.9	2,669.5	1,664.2	992.3	2,656.5	3,476.5	8,802.5	179.6
Middle East and North Africa	2,400.5	1,016.1	848.6	94.8	126.6	221.4	1,644.7	2,714.7	113.1
Sub-Saharan Africa	1,043.6	157.8	727.1	144.8	100.4	245.1	650.9	1,623.1	155.5
Europe	3,734.2	845.8	1,609.8	756.3	229.0	985.3	2,214.2	4,809.3	128.8

Sources: World Federation of Exchanges; Bank for International Settlements (BIS); IMF, International Financial Statistics (IFS) and World Economic Outlook databases as of April 4, 2012; ©2003 Bureau van Dijk Electronic Publishing-Bankscope; Board of Governors of the Federal Reserve System, *Flow of Funds*; and Bloomberg L.P.

[1]This aggregate includes euro area countries, Denmark, Sweden, and the United Kingdom.

[2]Data are from IFS. For euro area, the data also include the total reserves minus gold holdings of the European Central Bank.

[3]Data are from BIS. The data include international and domestic debt securities. For data definition and coverage, refer to the BIS Guide to the International Financial Statistics.

[4]Total assets of commercial banks, including subsidiaries. For Austria, the data are from Austrian National Bank. For Ireland, the data are from Central Bank of Ireland. For Luxembourg, the data are from Commission de Surveillance du Secteur Financier. It comprises the assets of commercial, savings, and private banks. For Portugal, the data are from Bank of Portugal.

[5]Sum of the stock market capitalization, debt securities, and bank assets.

[6]Hong Kong SAR, Korea, Singapore, and Taiwan Province of China.

[7]This aggregate comprises the group of emerging and developing economies defined in the *World Economic Outlook*.

Table 2. MSCI Equity Market Indices

	2011				2007	2008	2009	2010	2011
	Q1	Q2	Q3	Q4					
					(Period-on-Period Percent Change)				
All Country World Index	**3.9**	**−0.5**	**−17.9**	**6.7**	**−71.1**	**−40.9**	**26.2**	**3.5**	**−9.4**
Emerging Markets Index[1]	**1.7**	**−2.1**	**−23.2**	**4.1**	**36.5**	**−54.5**	**74.5**	**16.4**	**−20.4**
Latin America	**0.4**	**−3.6**	**−25.1**	**7.8**	**46.9**	**−52.8**	**98.1**	**12.1**	**−21.9**
Argentina	−12.0	0.1	−31.7	−4.6	−5.4	−55.3	61.1	70.1	−42.6
Brazil	2.0	−5.3	−27.7	7.6	75.3	−57.6	121.3	3.8	−24.9
Chile	−8.3	7.2	−26.4	7.7	20.8	−37.3	81.4	41.8	−22.1
Colombia	−0.0	5.2	−13.0	1.6	12.6	−27.7	76.5	40.7	−7.1
Mexico	0.5	−1.3	−20.0	9.0	9.3	−44.0	53.1	26.0	−13.5
Peru	−14.0	−16.4	−5.2	11.6	86.0	−42.4	69.3	49.2	−23.9
Asia	**1.3**	**−0.9**	**−21.9**	**3.2**	**38.3**	**−54.1**	**70.3**	**16.6**	**−19.1**
China	2.9	−3.6	−25.7	8.0	63.1	−51.9	58.8	2.3	−20.3
India	−5.2	−4.2	−20.3	−14.3	71.2	−65.1	100.5	19.4	−38.0
Indonesia	4.7	6.5	−11.5	5.4	50.8	−57.6	120.8	31.2	4.0
Korea	6.5	0.8	−23.3	5.9	30.0	−55.9	69.4	25.3	−12.9
Malaysia	3.6	2.8	−17.8	10.8	41.5	−43.4	47.8	32.5	−2.9
Pakistan	−0.6	0.4	−7.1	−10.6	32.5	−75.4	78.1	19.5	−17.1
Philippines	−4.4	2.7	−7.6	6.8	38.0	−53.8	60.2	30.3	−3.2
Taiwan Province of China	−4.3	1.0	−20.4	−0.4	5.4	−48.7	75.1	18.3	−23.3
Thailand	3.5	−3.1	−15.5	11.5	40.9	−50.3	70.0	50.8	−5.6
Europe, Middle East, & Africa	**4.7**	**−4.0**	**−24.8**	**2.5**	**25.8**	**−56.7**	**63.5**	**20.9**	**−22.6**
Czech Republic[1]	16.3	1.4	−23.3	−1.9	51.7	−45.1	19.6	−7.4	−11.3
Egypt	−23.7	−3.2	−20.7	−12.5	54.8	−53.9	32.8	9.5	−48.8
Hungary	20.2	0.1	−44.4	−2.4	13.4	−62.4	73.9	−10.7	−34.7
Israel	−2.9	−6.1	−26.1	4.1	35.8	−30.9	51.3	2.2	−29.8
Jordan	−9.7	−4.2	−4.6	0.5	20.9	−35.8	−7.7	−12.0	−17.0
Morocco	5.5	−5.3	−9.7	−10.0	44.0	−13.0	−8.3	10.8	−18.8
Poland	6.9	2.8	−34.8	−6.1	22.7	−56.2	37.3	12.6	−32.6
Russia	16.3	−7.1	−31.0	6.1	22.9	−74.2	100.3	17.2	−20.9
South Africa	−2.8	−2.5	−17.7	6.1	14.7	−40.0	53.4	30.7	−17.3
Turkey	−5.5	−6.0	−15.6	−15.7	70.0	−63.4	92.0	18.4	−36.8
Sectors									
Energy	11.6	−8.5	−26.3	6.2	51.9	−62.1	82.1	7.5	−20.1
Materials	1.2	−5.9	−19.5	0.5	48.8	−52.2	74.8	14.6	−23.0
Industrials	−3.3	0.3	−29.6	1.7	66.6	−62.8	56.3	27.1	−30.6
Consumer discretionary	1.4	7.8	−19.6	2.0	16.2	−53.2	113.0	29.5	−10.4
Consumer staple	−2.0	6.1	−13.3	9.3	24.1	−36.5	66.7	27.6	−1.4
Health care	−5.1	2.1	−17.9	−3.5	28.8	−18.2	40.1	25.6	−23.2
Financials	0.3	−2.9	−26.4	3.8	28.9	−54.2	76.6	14.5	−25.6
Information technology	−2.0	−3.8	−17.9	7.0	−0.1	−51.9	104.7	13.9	−17.1
Telecommunications	1.0	0.6	−11.0	1.7	50.4	−44.9	21.8	10.9	−8.0
Utilities	2.0	0.5	−24.8	8.4	34.4	−43.4	51.2	4.9	−16.4

Table 2 *(concluded)*

| | 2011 | | | | | | | | |
	Q1	Q2	Q3	Q4	2007	2008	2009	2010	2011
					(Period-on-Period Percent Change)				
Developed Markets Index[1]	4.3	−0.3	−17.1	7.1	**7.1**	**−42.1**	**27.0**	**9.6**	**−7.6**
Australia	3.2	−1.4	−21.4	6.5	25.0	−52.3	68.8	10.0	−14.8
Austria	6.0	−0.5	−37.9	−5.1	0.7	−69.0	38.4	7.3	−37.8
Belgium	5.5	0.6	−19.3	2.1	−5.3	−67.5	54.3	−2.2	−12.5
Canada	7.2	−5.2	−19.4	4.5	27.6	−46.6	52.7	18.2	−14.4
Denmark	8.8	−6.7	−24.3	8.2	24.2	−48.2	35.2	29.8	−16.8
Finland	1.2	−10.3	−26.1	−2.0	45.0	−56.4	7.2	7.1	−34.2
France	10.5	2.2	−30.2	2.3	10.9	−44.9	27.6	−6.7	−19.3
Germany	7.2	4.0	−31.0	3.9	32.5	−47.2	21.3	6.0	−20.1
Greece	15.2	−17.9	−46.9	−27.5	29.2	−67.1	22.6	−46.4	−63.6
Hong Kong SAR	−0.8	−2.0	−20.6	5.7	37.5	−52.9	55.2	19.7	−18.4
Ireland	7.6	7.4	−21.2	22.3	−21.9	−72.7	9.9	−19.7	11.4
Italy	13.8	−4.8	−31.6	0.2	2.7	−52.1	22.6	−17.6	−25.7
Japan	−5.9	0.1	−7.3	−4.0	−5.4	−30.5	4.4	13.4	−16.2
Netherlands	10.3	−6.0	−22.3	6.3	17.5	−50.1	37.9	−0.6	−14.4
New Zealand	2.6	10.9	−8.8	−2.5	4.0	−56.2	43.0	3.2	1.1
Norway	6.6	−4.3	−21.8	9.3	28.4	−65.2	82.5	7.4	−12.8
Portugal	8.7	−2.5	−22.0	−10.1	21.0	−53.6	35.4	−14.6	−25.7
Singapore	−0.7	0.5	−19.5	−1.6	23.9	−49.5	67.3	18.4	−21.0
Spain	12.9	−0.2	−23.3	−3.8	20.7	−43.0	36.5	−25.4	−16.9
Sweden	4.8	−1.7	−26.6	8.7	−1.4	−51.4	60.2	31.3	−17.8
Switzerland	0.7	5.2	−17.5	4.1	3.9	−31.6	22.9	9.8	−9.1
United Kingdom	2.8	0.7	−16.2	8.2	4.7	−50.6	37.3	5.2	−6.1
United States	5.5	−0.3	−14.5	11.1	4.1	−38.6	24.2	13.2	−0.1

Source: Morgan Stanley Capital International.
Note: Price indices in U.S. dollar terms.
[1]The country and regional classifications used in this table follow the conventions of MSCI, and do not necessarily conform to IMF country classifications or regional groupings.

Table 3. Emerging Markets Bond Index: EMBI Global Yield Spreads
(In basis points)

	2011				2007	2008	2009	2010	2011
	Q1	Q2	Q3	Q4					
					(Levels)				
EMBI Global	**299**	**288**	**465**	**426**	**255**	**724**	**294**	**289**	**426**
Latin America									
Argentina	539	568	993	925	410	1,704	660	507	925
Brazil	174	150	277	225	220	429	189	189	225
Chile	117	131	181	172	151	343	95	115	172
Colombia	153	121	240	191	195	498	198	172	191
Ecuador	780	783	868	846	614	4,731	769	913	846
El Salvador	330	321	510	478	199	854	326	302	478
Mexico	160	148	267	222	172	434	192	173	222
Panama	150	127	252	201	184	539	166	162	201
Peru	173	169	279	216	178	509	165	165	216
Uruguay	176	151	312	213	243	685	238	188	213
Venezuela	1,137	1,117	1,450	1,258	523	1,864	1,041	1,114	1,258
Asia									
China	151	155	293	278	120	228	64	126	278
Indonesia	204	178	332	274	275	762	230	183	274
Malaysia	109	131	233	178	119	370	136	117	178
Pakistan	774	857	1,136	1,274	535	2,112	688	654	1,274
Philippines	174	160	289	242	207	546	206	163	242
Vietnam	295	329	549	510	203	747	314	323	510
Europe, Middle East, & Africa									
Bulgaria	185	198	351	340	153	674	179	195	340
Egypt	322	289	424	607	178	385	-3	221	607
Hungary	276	268	512	605	84	504	186	345	605
Iraq	298	348	616	603	569	1,282	447	314	603
Lebanon	308	323	387	384	493	794	287	270	384
Poland	156	152	309	310	67	314	124	151	310
Russia	188	204	407	364	157	805	203	224	364
Serbia	366	407	625	601	304	1,224	333	418	601
South Africa	163	159	278	261	164	562	149	145	261
Turkey	204	201	366	385	239	534	197	177	385
Ukraine	419	468	860	940	303	2,771	989	461	940
Latin America	373	355	527	468	275	746	355	357	468
Non-Latin America	225	225	402	382	227	699	224	220	382

Table 3 *(concluded)*

| | 2011 | | | | 2007 | 2008 | 2009 | 2010 | 2011 |
	Q1	Q2	Q3	Q4					
					(Changes)				
EMBI Global	**10**	**−10**	**177**	**−39**	**84**	**469**	**−430**	**−5**	**137**
Latin America									
Argentina	32	29	425	−68	194	1,294	−1,044	−153	418
Brazil	−15	−24	127	−52	30	209	−240	0	36
Chile	2	14	50	−9	67	192	−248	20	57
Colombia	−19	−32	119	−49	34	303	−300	−26	19
Ecuador	458	3	85	−22	−306	4,117	−3,962	144	−67
El Salvador	28	−9	189	−32	40	655	−528	−24	176
Mexico	−13	−12	119	−45	57	262	−242	−19	49
Panama	−12	−23	125	−51	38	355	−373	−4	39
Peru	8	−4	110	−63	60	331	−344	0	51
Uruguay	−12	−25	161	−99	58	442	−447	−50	25
Venezuela	23	−20	333	−192	340	1,341	−823	73	144
Asia									
China	25	4	138	−15	69	108	−164	62	152
Indonesia	21	−26	154	−58	122	487	−532	−47	91
Malaysia	−8	22	102	−55	53	251	−234	−19	61
Pakistan	120	83	279	138	381	1,577	−1,424	−34	620
Philippines	11	−14	129	−47	52	339	−340	−43	79
Vietnam	−28	34	220	−39	108	544	−433	9	187
Europe, Middle East, & Africa									
Bulgaria	−10	13	153	−11	87	521	−495	16	145
Egypt	101	−33	135	183	126	207	−388	224	386
Hungary	−69	−8	244	93	26	420	−318	159	260
Iraq	−16	50	268	−13	43	713	−835	−133	289
Lebanon	38	15	64	−3	98	301	−507	−17	114
Poland	5	−4	157	1	20	247	−190	27	159
Russia	−36	16	203	−43	58	648	−602	21	140
Serbia	−52	41	218	−24	118	920	−891	85	183
South Africa	18	−4	119	−17	80	398	−413	−4	116
Turkey	27	−3	165	19	32	295	−337	−20	208
Ukraine	−42	49	392	80	131	2,468	−1,782	−528	479
Latin America	**16**	**−18**	**172**	**−59**	**95**	**471**	**−391**	**2**	**111**
Non-Latin America	**5**	**0**	**177**	**−20**	**68**	**472**	**−475**	**−4**	**162**

Source: JPMorgan Chase & Co.
Note: The country and regional classifications used in this table follow the conventions of JPMorgan, and do not necessarily conform to IMF country classifications or regional groupings.

Table 4. External Financing in Emerging and Developing Economies: Total Bonds, Equities, and Loans
(In millions of U.S. dollars)

	2008	2009	2010	2011	2011 Q1	2011 Q2	2011 Q3	2011 Q4
Total	**324,584.4**	**426,815.5**	**583,076.6**	**542,506.8**	**153,741.4**	**161,023.8**	**119,674.0**	**108,067.6**
Sub-Saharan Africa	**5,771.0**	**15,146.7**	**17,663.2**	**19,029.8**	**6,816.6**	**4,127.0**	**5,334.6**	**2,751.6**
Angola	15.0	1,813.8	3,767.8	2,346.4	—	1,346.4	1,000.0	—
Botswana	—	825.0	1.9	—	—	—	—	—
Burkina Faso	—	—	—	10.9	—	—	—	10.9
Cameroon	—	—	—	150.0	—	150.0	—	—
Cape Verde	—	—	—	—	—	—	—	—
Central African Republic	—	—	—	—	—	—	—	—
Côte d'Ivoire	45.0	150.7	2,332.1	—	—	—	—	—
Ethiopia	100.2	46.8	693.9	377.2	—	377.2	—	—
Gabon	600.0	—	119.0	63.9	—	—	63.9	—
Ghana	1,000.0	1,331.5	45.5	2,280.0	—	215.0	2,000.0	65.0
Kenya	277.0	125.7	—	37.9	—	—	37.9	—
Madagascar	—	—	78.8	—	—	—	—	—
Mali	110.4	—	—	—	—	—	—	—
Mauritius	29.0	—	—	9.7	—	—	9.7	—
Morocco	346.6	—	1,346.9	13.0	—	13.0	—	—
Mozambique	808.5	55.0	—	90.1	—	80.0	4.8	5.3
Namibia	97.6	—	—	500.0	—	—	—	500.0
Nigeria	472.5	2,414.7	1,638.7	1,816.7	1,567.4	249.3	—	—
Rwanda	—	—	—	90.9	29.2	—	61.7	—
Senegal	—	200.0	118.9	500.0	—	500.0	—	—
Seychelles	—	168.9	—	—	—	—	—	—
Sierra Leone	—	—	—	131.8	116.5	15.3	—	—
South Africa	1,366.1	7,544.7	7,459.7	10,576.3	5,103.4	1,180.9	2,121.6	2,170.5
Tanzania	358.1	—	60.0	35.0	—	—	35.0	—
Togo	125.0	—	—	—	—	—	—	—
Uganda	—	300.0	—	—	—	—	—	—
Zambia	20.0	90.0	—	—	—	—	—	—
Zimbabwe	—	80.0	—	—	—	—	—	—
Central and Eastern Europe	**39,751.2**	**36,152.2**	**52,119.7**	**59,747.6**	**17,934.2**	**21,757.6**	**9,100.4**	**10,955.4**
Albania	78.1	—	407.3	—	—	—	—	—
Bulgaria	1,415.0	540.5	46.0	124.7	—	124.7	—	—
Croatia	870.6	3,718.0	1,950.2	4,017.4	2,109.2	1,073.3	222.4	612.4
Hungary	7,865.6	5,980.3	3,832.5	9,200.3	3,750.0	3,177.3	1,245.0	1,028.0
Latvia	1,892.0	278.2	26.7	500.0	—	500.0	—	—
Lithuania	263.3	2,415.2	2,785.9	1,500.0	750.0	—	—	750.0
Macedonia, FYR	—	452.8	—	189.7	16.0	—	—	173.7
Montenegro	6.4	6.3	254.0	253.8	—	253.8	—	—
Poland	8,106.3	11,717.4	18,306.0	10,981.3	2,477.6	5,548.5	639.7	2,315.5
Romania	1,890.0	161.3	1,456.7	4,437.0	172.3	4,264.7	—	—
Serbia	235.3	886.8	—	1,000.0	—	—	1,000.0	—
Turkey	17,128.6	9,995.4	23,054.3	27,543.4	8,659.0	6,815.3	5,993.3	6,075.8
Commonwealth of Independent States	**71,316.6**	**59,367.3**	**60,231.4**	**68,415.4**	**20,636.0**	**22,852.3**	**13,187.4**	**11,739.7**
Armenia	11.0	2.4	—	86.6	—	11.6	—	75.0
Azerbaijan	126.6	539.8	2,555.0	125.0	125.0	—	—	—
Belarus	327.0	53.5	1,736.7	858.5	800.0	58.5	—	—
Estonia	328.9	322.0	17.2	322.2	—	—	322.2	—
Georgia[1]	984.8	55.5	250.0	500.0	—	500.0	—	—
Kazakhstan	10,542.1	1,053.7	3,770.0	3,068.1	1,175.4	300.0	1,200.0	392.7
Kyrgyz Republic	7.4	46.2	—	—	—	—	—	—
Moldova	171.3	28.4	—	—	—	—	—	—
Mongolia[1]	6.8	1.0	894.5	150.0	—	—	—	150.0
Russia	54,247.8	53,539.9	46,139.1	57,714.0	16,338.9	19,344.9	11,033.1	10,997.1
Tajikistan	16.7	3.2	—	—	—	—	—	—
Ukraine	4,529.8	3,716.7	4,869.0	5,591.1	2,196.6	2,637.4	632.1	125.0
Uzbekistan	16.4	5.0	—	—	—	—	—	—

Table 4 *(concluded)*

	2008	2009	2010	2011	2011 Q1	Q2	Q3	Q4
Developing Asia	**92,860.5**	**168,595.6**	**260,773.8**	**225,711.3**	**69,364.5**	**66,405.0**	**59,693.8**	**30,248.1**
Bangladesh	65.4	56.4	—	86.0	86.0	—	—	—
Bhutan	—	—	92.2	—	—	—	—	—
Cambodia	—	—	—	—	—	—	—	—
China	28,469.7	68,266.1	79,830.9	70,131.4	19,849.1	22,334.8	20,318.7	7,628.8
Fiji	—	—	—	250.0	250.0	—	—	—
India	37,361.7	56,890.8	115,959.6	88,368.5	32,397.8	23,528.4	23,489.6	8,952.7
Indonesia	13,542.5	13,151.9	19,537.4	21,097.3	4,482.2	8,715.4	3,334.8	4,564.9
Lao P.D.R.	592.0	213.7	3,000.0	—	—	—	—	—
Malaysia	3,927.7	7,122.7	17,199.7	19,951.8	2,633.0	6,920.3	4,531.0	5,867.4
Marshall Islands	204.0	—	660.0	2,067.2	427.2	1,130.0	510.0	—
Nepal	15.0	—	—	—	—	—	—	—
Pakistan	837.8	534.3	596.1	627.7	389.6	—	89.2	148.9
Papua New Guinea	—	11,428.5	—	718.0	240.0	—	215.0	263.0
Philippines	2,590.2	7,358.7	10,542.3	7,836.5	4,314.7	1,145.4	1,728.9	647.5
Sri Lanka	538.7	560.0	1,205.6	1,150.0	—	—	1,150.0	—
Thailand	3,056.3	1,573.2	8,038.5	9,766.7	4,104.9	1,404.5	2,504.5	1,752.8
Vietnam	1,659.5	1,439.2	4,111.6	3,660.2	190.0	1,226.1	1,822.1	422.0
Middle East and North Africa	**56,125.1**	**52,386.9**	**58,784.1**	**47,415.7**	**10,783.4**	**8,608.6**	**5,827.1**	**22,196.5**
Algeria	1,738.0	—	1.9	—	—	—	—	—
Bahrain	1,245.0	2,159.5	2,874.9	1,877.9	698.0	—	—	1,179.9
Egypt	6,128.5	1,757.0	5,482.6	2,989.4	754.7	829.7	650.0	755.0
Iraq	—	—	—	400.0	400.0	—	—	—
Jordan	—	—	750.0	—	—	—	—	—
Kuwait	3,146.8	1,463.3	3,671.6	1,853.8	1,496.6	357.2	—	—
Lebanon	3,203.2	2,945.6	2,103.5	3,937.6	265.0	1,000.0	1,200.0	1,472.6
Oman	950.6	565.8	2,418.9	1,277.0	296.0	452.8	396.8	131.4
Qatar	9,782.4	14,663.8	6,217.5	11,060.4	—	473.6	—	10,586.8
Saudi Arabia	5,532.7	2,282.9	16,129.9	1,895.0	377.6	1,411.8	—	105.6
Syrian Arab Republic	80.0	—	—	—	—	—	—	—
Tunisia	403.5	1.4	—	85.0	—	85.0	—	—
United Arab Emirates	21,492.1	26,500.0	19,083.0	22,039.7	6,495.7	3,998.5	3,580.3	7,965.3
West Bank and Gaza	—	—	50.3	—	—	—	—	—
Yemen Arab Republic	2,422.2	47.6	—	—	—	—	—	—
Latin America and the Caribbean	**58,760.1**	**95,166.9**	**133,504.4**	**122,187.1**	**28,206.7**	**37,273.4**	**26,530.7**	**30,176.3**
Argentina	1,651.4	209.3	4,799.1	7,704.9	2,472.3	3,621.1	383.1	1,228.5
Bolivia	100.0	—	253.0	200.0	—	—	—	200.0
Brazil	28,060.4	39,616.7	67,565.1	37,965.0	10,928.6	18,282.9	3,331.7	5,421.8
Chile	4,570.4	4,060.1	7,959.8	11,851.2	2,219.9	3,864.7	3,127.6	2,639.1
Colombia	1,991.7	6,210.0	4,201.2	14,176.5	1,656.9	3,050.4	2,112.0	7,357.2
Costa Rica	85.0	—	5.8	425.0	—	175.0	—	250.0
Dominican Republic	479.6	15.0	2,024.7	750.0	—	—	500.0	250.0
Ecuador	—	—	—	36.0	36.0	—	—	—
El Salvador	—	855.0	200.0	653.5	653.5	—	—	—
Guatemala	5.0	—	—	450.0	—	—	150.0	300.0
Honduras	113.6	—	—	30.0	—	—	—	30.0
Jamaica	450.0	1,085.0	1,825.2	1,567.4	598.4	—	—	969.0
Mexico	10,432.3	24,957.9	28,733.5	26,257.8	4,637.7	4,934.7	12,013.7	4,671.7
Panama	4,389.3	2,201.4	477.3	1,870.8	653.3	—	512.6	704.8
Paraguay	98.8	—	—	—	—	—	—	—
Peru	2,330.0	3,606.4	7,945.9	1,695.0	935.0	—	—	760.0
St. Lucia	—	—	—	175.0	175.0	—	—	—
Trinidad and Tobago	—	850.0	13.8	—	—	—	—	—
Uruguay	2.6	500.0	—	694.8	—	494.8	200.0	—
Venezuela	4,000.0	11,000.0	7,500.0	15,684.2	3,240.0	2,850.0	4,200.0	5,394.2

Source: Data provided by the Bond, Equity and Loan database of the International Monetary Fund sourced from Dealogic.
Note: Deal inclusion conforms to the vendor's criteria for external publicly syndicated gross issuance, generally excluding bilateral deals.
[1]Georgia and Mongolia, which are not members of the Commonwealth of Independent States, are included in this group for reasons of geography and similarities in economic structure.

Table 5. External Financing in Emerging and Developing Economies: Bonds
(In millions of U.S. dollars)

	2008	2009	2010	2011	2011 Q1	Q2	Q3	Q4
Total	**65,371.7**	**133,724.3**	**207,168.2**	**207,737.0**	**64,960.2**	**64,025.4**	**32,274.1**	**46,477.2**
Sub-Saharan Africa	**83.1**	**2,368.9**	**6,032.1**	**6,667.0**	**5,017.0**	**1,150.0**	**—**	**500.0**
Côte d'Ivoire	—	—	2,332.1	—	—	—	—	—
Gabon	—	—	—	—	—	—	—	—
Ghana	—	—	—	—	—	—	—	—
Namibia	—	—	—	500.0	—	—	—	500.0
Nigeria	—	—	—	500.0	500.0	—	—	—
Senegal	—	200.0	—	500.0	—	500.0	—	—
Seychelles	—	168.9	—	—	—	—	—	—
South Africa	83.1	2,000.0	3,700.0	5,167.0	4,517.0	650.0	—	—
Central and Eastern Europe	**14,941.4**	**21,173.5**	**29,964.5**	**32,964.4**	**12,012.5**	**11,965.8**	**2,875.9**	**6,110.4**
Albania	—	—	407.3	—	—	—	—	—
Bulgaria	—	—	—	—	—	—	—	—
Croatia	—	3,148.0	1,250.0	2,774.1	1,700.8	1,073.3	—	—
Estonia	—	—	—	322.2	—	—	322.2	—
Hungary	5,281.3	3,045.3	3,523.5	8,673.8	3,750.0	2,650.8	1,245.0	1,028.0
Latvia	607.6	—	—	500.0	—	500.0	—	—
Lithuania	104.9	2,388.1	2,750.0	1,500.0	750.0	—	—	750.0
Macedonia, FYR	—	243.9	—	—	—	—	—	—
Montenegro	—	—	254.0	253.8	—	253.8	—	—
Poland	3,785.1	8,598.3	10,445.7	6,858.5	1,879.8	2,423.2	308.7	2,246.9
Romania	1,162.5	—	1,429.1	4,264.7	—	4,264.7	—	—
Serbia	—	—	—	1,000.0	—	—	1,000.0	—
Turkey	4,000.0	3,750.0	9,904.8	6,817.3	3,931.9	800.0	—	2,085.4
Commonwealth of Independent States	**20,073.9**	**14,155.3**	**36,859.1**	**23,841.5**	**9,716.2**	**10,021.6**	**900.0**	**3,203.8**
Azerbaijan	49.6	—	130.0	125.0	125.0	—	—	—
Belarus	3.0	—	1,325.2	800.0	800.0	—	—	—
Georgia[1]	500.0	—	250.0	500.0	—	500.0	—	—
Kazakhstan	3,040.0	671.2	3,560.8	1,408.1	947.4	300.0	—	160.7
Mongolia[1]	—	—	175.0	—	—	—	—	—
Russia	15,881.3	10,259.1	27,200.1	16,468.4	5,743.7	6,981.6	700.0	3,043.1
Ukraine	600.0	3,225.1	4,218.0	4,540.0	2,100.0	2,240.0	200.0	—
Developing Asia	**7,726.4**	**15,166.4**	**25,855.4**	**41,344.8**	**13,431.2**	**17,945.6**	**6,190.0**	**3,777.9**
China	2,055.3	2,242.8	10,241.7	21,735.9	6,693.7	9,424.9	4,170.0	1,447.2
Fiji	—	—	—	250.0	250.0	—	—	—
India	157.5	1,750.0	1,050.0	3,126.4	1,656.4	450.0	1,020.0	—
Indonesia	4,200.0	5,223.6	3,423.9	6,295.0	180.0	4,115.0	—	2,000.0
Malaysia	439.7	—	2,338.6	4,171.5	300.0	3,590.7	—	280.7
Pakistan	—	—	—	—	—	—	—	—
Philippines	350.0	5,350.0	6,451.2	3,976.0	3,651.0	275.0	—	50.0
Sri Lanka	—	500.0	1,000.0	1,000.0	—	—	1,000.0	—
Thailand	523.8	—	350.0	700.0	700.0	—	—	—
Vietnam	—	100.0	1,000.0	90.0	—	90.0	—	—
Middle East and North Africa	**5,756.8**	**29,237.0**	**27,011.2**	**27,265.3**	**5,199.4**	**4,432.5**	**2,500.7**	**15,132.8**
Bahrain	350.0	750.0	2,500.0	1,179.9	—	—	—	1,179.9
Egypt	—	300.0	2,100.0	500.0	—	—	500.0	—
Iraq	—	—	—	—	—	—	—	—
Jordan	—	—	750.0	—	—	—	—	—
Kuwait	305.7	500.0	900.0	196.6	196.6	—	—	—
Lebanon	3,138.2	2,865.6	1,925.0	3,937.6	265.0	1,000.0	1,200.0	1,472.6
Morocco	—	—	1,346.9	—	—	—	—	—
Oman	—	—	—	—	—	—	—	—
Qatar	—	13,830.0	6,035.1	5,000.0	—	—	—	5,000.0
Saudi Arabia	—	140.0	650.0	—	—	—	—	—
Tunisia	—	—	—	—	—	—	—	—
United Arab Emirates	1,962.9	10,851.4	10,804.2	16,451.3	4,737.8	3,432.5	800.7	7,480.3

Table 5 *(concluded)*

| | 2008 | 2009 | 2010 | 2011 | 2011 | | | |
					Q1	Q2	Q3	Q4
Latin America and								
the Caribbean	**16,790.2**	**51,623.2**	**81,445.8**	**75,654.0**	**19,584.0**	**18,510.0**	**19,807.6**	**17,752.4**
Argentina	65.0	145.0	4,013.0	2,325.0	1,332.2	629.7	363.1	—
Brazil	6,484.7	9,796.7	32,605.3	21,995.9	5,278.0	10,940.5	2,427.4	3,350.0
Chile	99.8	2,651.4	5,041.1	5,314.2	1,839.7	300.0	1,524.6	1,650.0
Colombia	1,039.7	5,503.0	1,912.8	6,007.1	1,197.1	1,600.0	2,000.0	1,210.0
Costa Rica	—	—	—	250.0	—	—	—	250.0
Dominican Republic	—	—	750.0	750.0	—	—	500.0	250.0
Ecuador	—	—	—	—	—	—	—	—
El Salvador	—	800.0	—	653.5	653.5	—	—	—
Guatemala	5.0	—	—	150.0	—	—	150.0	—
Jamaica	350.0	1,085.0	1,075.0	694.2	400.0	—	—	294.2
Mexico	4,361.0	15,340.9	23,792.9	21,586.3	4,422.7	4,545.0	8,292.5	4,326.2
Panama	235.0	1,323.0	—	1,258.6	500.8	—	350.0	407.8
Peru	150.0	2,628.2	6,255.7	1,405.0	785.0	—	—	620.0
St. Lucia	—	—	—	175.0	175.0	—	—	—
Trinidad and Tobago	—	850.0	—	—	—	—	—	—
Uruguay	—	500.0	—	494.8	—	494.8	—	—
Venezuela	4,000.0	11,000.0	6,000.0	12,594.2	3,000.0	—	4,200.0	5,394.2

Source: Data provided by the Bond, Equity and Loan database of the International Monetary Fund sourced from Dealogic.

Note: Deal inclusion conforms to the vendor's criteria for external publicly syndicated gross issuance, generally excluding bilateral deals.

[1]Georgia and Mongolia, which are not members of the Commonwealth of Independent States, are included in this group for reasons of geography and similarities in economic structure.

Table 6. External Financing in Emerging and Developing Economies: Equities
(In millions of U.S. dollars)

	2008	2009	2010	2011	2011 Q1	Q2	Q3	Q4
Total	**44,067.2**	**83,740.0**	**133,098.1**	**73,552.2**	**18,551.5**	**32,592.4**	**13,775.6**	**8,632.7**
Sub-Saharan Africa	**884.1**	**1,236.6**	**2,841.1**	**1,476.4**	**242.2**	**245.9**	**581.8**	**406.6**
Botswana	—	—	1.9	—	—	—	—	—
Central African Republic	—	—	—	—	—	—	—	—
Ghana	—	—	45.5	—	—	—	—	—
Kenya	252.0	—	—	37.9	—	—	37.9	—
Madagascar	—	—	78.8	—	—	—	—	—
Mauritius	—	—	—	9.7	—	—	9.7	—
Namibia	87.6	—	—	—	—	—	—	—
Nigeria	—	—	—	—	—	—	—	—
Rwanda	—	—	—	90.9	29.2	—	61.7	—
South Africa	544.5	1,236.6	2,715.0	1,337.9	213.0	245.9	472.5	406.6
Central and Eastern								
Europe	**1,104.5**	**3,835.6**	**7,501.8**	**3,733.0**	**597.8**	**3,125.3**	**9.9**	**—**
Bulgaria	—	—	46.0	—	—	—	—	—
Estonia	—	—	17.2	—	—	—	—	—
Croatia	—	—	—	—	—	—	—	—
Hungary	—	1,201.7	—	—	—	—	—	—
Lithuania	15.0	—	35.9	—	—	—	—	—
Poland	1,089.5	2,634.0	7,402.8	3,733.0	597.8	3,125.3	9.9	—
Romania	—	—	—	—	—	—	—	—
Turkey	—	—	—	—	—	—	—	—
Commonwealth of								
Independent States	**4,087.2**	**1,257.8**	**6,998.1**	**11,164.4**	**4,053.9**	**5,266.6**	**706.3**	**1,137.6**
Armenia	—	2.4	—	11.6	—	11.6	—	—
Georgia[1]	100.0	—	—	—	—	—	—	—
Kazakhstan	219.9	195.1	209.2	—	—	—	—	—
Mongolia[1]	—	—	683.5	—	—	—	—	—
Russia	2,850.3	955.6	5,454.4	10,794.1	4,053.9	4,978.0	624.6	1,137.6
Ukraine	917.0	104.7	651.0	358.8	—	277.1	81.7	—
Developing Asia	**21,440.6**	**61,077.9**	**86,923.2**	**38,012.5**	**9,352.3**	**12,869.1**	**12,046.8**	**3,744.3**
Bangladesh	—	—	—	86.0	86.0	—	—	—
Cambodia	—	—	—	—	—	—	—	—
China	11,973.8	39,853.7	45,447.7	23,498.7	4,849.2	7,049.7	8,619.9	2,979.9
India	6,008.4	16,223.1	26,178.8	7,016.4	1,862.4	4,097.3	879.3	177.4
Indonesia	2,212.9	1,285.5	6,317.3	2,229.3	1,085.0	871.5	—	272.9
Lao P.D.R.	—	—	111.2	—	—	—	—	—
Malaysia	660.0	3,603.9	5,817.6	2,972.4	529.5	358.6	1,770.2	314.1
Pakistan	109.3	—	92.9	—	—	—	—	—
Papua New Guinea	—	—	—	—	—	—	—	—
Philippines	125.2	0.4	959.6	596.0	—	425.0	171.1	—
Sri Lanka	3.7	—	5.6	—	—	—	—	—
Thailand	257.4	111.2	1,990.5	1,553.6	880.2	67.0	606.4	—
Vietnam	90.0	—	2.1	60.0	60.0	—	—	—
Middle East and								
North Africa	**3,831.9**	**916.5**	**1,695.3**	**182.4**	**—**	**13.0**	**—**	**169.5**
Bahrain	—	—	80.0	—	—	—	—	—
Egypt	483.6	114.2	142.0	—	—	—	—	—
Kuwait	1,642.0	—	—	—	—	—	—	—
Lebanon	—	—	—	—	—	—	—	—
Morocco	346.6	—	—	13.0	—	13.0	—	—
Oman	34.6	—	474.8	63.9	—	—	—	63.9
Qatar	900.0	—	137.5	—	—	—	—	—
Saudi Arabia	—	639.9	687.4	105.6	—	—	—	105.6
United Arab Emirates	425.0	162.4	123.3	—	—	—	—	—
West Bank and Gaza	—	—	50.3	—	—	—	—	—

Table 6 *(concluded)*

	2008	2009	2010	2011	2011 Q1	Q2	Q3	Q4
Latin America and the Caribbean	**12,719.0**	**15,415.6**	**27,138.6**	**18,983.4**	**4,305.3**	**11,072.6**	**430.8**	**3,174.7**
Argentina	—	—	73.1	3,576.1	1,140.1	1,457.6	—	978.5
Brazil	10,435.4	12,963.4	24,633.3	9,028.6	2,985.0	5,767.0	276.6	—
Chile	—	31.8	1,214.3	2,339.7	180.3	2,110.4	—	49.1
Colombia	—	619.0	295.5	3,597.6	—	1,450.4	—	2,147.2
Mexico	2,127.2	1,567.3	661.7	441.4	—	287.2	154.3	—
Panama	156.4	—	103.0	—	—	—	—	—
Peru	—	234.1	157.7	—	—	—	—	—

Source: Data provided by the Bond, Equity and Loan database of the International Monetary Fund sourced from Dealogic.
Note: Deal inclusion conforms to the vendor's criteria for external publicly syndicated gross issuance, generally excluding bilateral deals.
[1]Georgia and Mongolia, which are not members of the Commonwealth of Independent States, are included in this group for reasons of geography and similarities in economic structure.

Table 7. External Financing in Emerging and Developing Economies: Loans

(In millions of U.S. dollars)

	2008	2009	2010	2011	2011 Q1	Q2	Q3	Q4
Total	**215,145.4**	**209,351.1**	**242,810.3**	**261,217.6**	**70,229.6**	**64,406.1**	**73,624.3**	**52,957.7**
Sub-Saharan Africa	**4,457.2**	**11,541.2**	**7,443.0**	**10,873.5**	**1,557.4**	**2,718.2**	**4,752.8**	**1,845.0**
Angola	15.0	1,813.8	3,767.8	2,346.4	—	1,346.4	1,000.0	—
Botswana	—	825.0	—	—	—	—	—	—
Burkina Faso	—	—	—	10.9	—	—	—	10.9
Cameroon	—	—	—	150.0	—	150.0	—	—
Cape Verde	—	—	—	—	—	—	—	—
Côte d'Ivoire	45.0	150.7	—	—	—	—	—	—
Ethiopia	100.2	46.8	693.9	377.2	—	377.2	—	—
Gabon	600.0	—	119.0	63.9	—	—	63.9	—
Ghana	1,000.0	1,331.5	—	2,280.0	—	215.0	2,000.0	65.0
Kenya	25.0	125.7	—	—	—	—	—	—
Mali	110.4	—	—	—	—	—	—	—
Mauritius	29.0	—	—	—	—	—	—	—
Mozambique	808.5	55.0	—	90.1	—	80.0	4.8	5.3
Namibia	10.0	—	—	—	—	—	—	—
Nigeria	472.5	2,414.7	1,638.7	1,316.7	1,067.4	249.3	—	—
Senegal	—	—	118.9	—	—	—	—	—
Sierra Leone	—	—	—	131.8	116.5	15.3	—	—
South Africa	738.5	4,308.1	1,044.8	4,071.5	373.5	285.0	1,649.1	1,763.9
Tanzania	358.1	—	60.0	35.0	—	—	35.0	—
Togo	125.0	—	—	—	—	—	—	—
Uganda	—	300.0	—	—	—	—	—	—
Zambia	20.0	90.0	—	—	—	—	—	—
Zimbabwe	—	80.0	—	—	—	—	—	—
Central and								
Eastern Europe	**24,034.2**	**11,465.1**	**14,670.5**	**23,372.3**	**5,323.9**	**6,666.5**	**6,536.9**	**4,845.1**
Albania	78.1	—	—	—	—	—	—	—
Bulgaria	1,415.0	540.5	—	124.7	—	124.7	—	—
Croatia	870.6	570.0	700.2	1,243.3	408.4	—	222.4	612.4
Estonia	328.9	322.0	—	—	—	—	—	—
Hungary	2,584.3	1,733.3	309.0	526.6	—	526.6	—	—
Latvia	1,284.3	278.2	26.7	—	—	—	—	—
Lithuania	143.5	27.2	—	—	—	—	—	—
Macedonia, FYR	—	209.0	—	189.7	16.0	—	—	173.7
Montenegro	6.4	6.3	—	—	—	—	—	—
Poland	3,231.7	485.2	457.6	389.8	—	—	321.2	68.6
Romania	727.5	161.3	27.6	172.3	172.3	—	—	—
Serbia	235.3	886.8	—	—	—	—	—	—
Turkey	13,128.6	6,245.4	13,149.4	20,726.1	4,727.1	6,015.3	5,993.3	3,990.4
Commonwealth of								
Independent States	**46,826.5**	**43,632.1**	**16,357.1**	**33,087.3**	**6,865.9**	**7,564.1**	**11,258.9**	**7,398.4**
Armenia	11.0	—	—	75.0	—	—	—	75.0
Azerbaijan	77.0	539.8	2,425.0	—	—	—	—	—
Belarus	324.0	53.5	411.5	58.5	—	58.5	—	—
Georgia[1]	384.8	55.5	—	—	—	—	—	—
Kazakhstan	7,282.2	187.4	—	1,660.0	228.0	—	1,200.0	232.0
Kyrgyz Republic	7.4	46.2	—	—	—	—	—	—
Moldova	171.3	28.4	—	—	—	—	—	—
Mongolia[1]	6.8	1.0	36.0	150.0	—	—	—	150.0
Russia	35,516.2	42,325.2	13,484.6	30,451.5	6,541.3	7,385.3	9,708.5	6,816.4
Tajikistan	16.7	3.2	—	—	—	—	—	—
Ukraine	3,012.8	386.9	—	692.3	96.6	120.3	350.4	125.0
Uzbekistan	16.4	5.0	—	—	—	—	—	—

Table 7 *(concluded)*

	2008	2009	2010	2011	2011 Q1	Q2	Q3	Q4
Developing Asia	**63,693.5**	**92,351.2**	**147,995.2**	**146,354.1**	**46,581.0**	**35,590.2**	**41,457.0**	**22,725.8**
Bangladesh	65.4	56.4	—	—	—	—	—	—
Bhutan	—	—	92.2	—	—	—	—	—
China	14,440.6	26,169.6	24,141.6	24,896.8	8,306.1	5,860.2	7,528.8	3,201.7
India	31,195.8	38,917.7	88,730.7	78,225.8	28,879.0	18,981.2	21,590.3	8,775.3
Indonesia	7,129.6	6,642.7	9,796.3	12,573.0	3,217.2	3,728.9	3,334.8	2,292.0
Lao P.D.R.	592.0	213.7	2,888.7	—	—	—	—	—
Malaysia	2,828.0	3,518.8	9,043.4	12,808.0	1,803.5	2,971.0	2,760.9	5,272.6
Marshall Islands	204.0	—	660.0	2,067.2	427.2	1,130.0	510.0	—
Nepal	15.0	—	—	—	—	—	—	—
Pakistan	728.5	534.3	503.2	627.7	389.6	—	89.2	148.9
Papua New Guinea	—	11,428.5	—	718.0	240.0	—	215.0	263.0
Philippines	2,115.0	2,008.3	3,131.5	3,264.4	663.6	445.4	1,557.8	597.5
Sri Lanka	535.0	60.0	200.0	150.0	—	—	150.0	—
Thailand	2,275.1	1,462.0	5,698.0	7,513.1	2,524.7	1,337.5	1,898.1	1,752.8
Vietnam	1,569.5	1,339.2	3,109.5	3,510.2	130.0	1,136.1	1,822.1	422.0
Middle East and								
North Africa	**46,883.0**	**22,233.4**	**31,424.5**	**19,980.9**	**5,584.0**	**4,176.1**	**3,326.4**	**6,894.3**
Algeria	1,738.0	—	1.9	—	—	—	—	—
Bahrain	895.0	1,409.5	294.9	698.0	698.0	—	—	—
Egypt	5,644.8	1,342.8	3,240.6	2,489.4	754.7	829.7	150.0	755.0
Iraq	—	—	—	400.0	400.0	—	—	—
Jordan	—	—	—	—	—	—	—	—
Kuwait	1,199.1	963.3	2,771.6	1,657.2	1,300.0	357.2	—	—
Lebanon	65.0	80.0	178.5	—	—	—	—	—
Oman	916.0	565.8	1,944.2	1,213.1	296.0	452.8	396.8	67.5
Qatar	8,882.5	833.8	45.0	6,060.4	—	473.6	—	5,586.8
Saudi Arabia	5,532.7	1,503.0	14,792.4	1,789.4	377.6	1,411.8	—	—
Syrian Arab Republic	80.0	—	—	—	—	—	—	—
Tunisia	403.5	1.4	—	85.0	—	85.0	—	—
United Arab Emirates	19,104.3	15,486.2	8,155.5	5,588.5	1,757.9	566.0	2,779.6	485.0
Yemen Arab Republic	2,422.2	47.6	—	—	—	—	—	—
Latin America and								
the Caribbean	**29,250.9**	**28,128.1**	**24,919.9**	**27,549.7**	**4,317.3**	**7,690.9**	**6,292.3**	**9,249.2**
Argentina	1,586.4	64.3	713.0	1,803.8	—	1,533.8	20.0	250.0
Bolivia	100.0	—	253.0	200.0	—	—	—	200.0
Brazil	11,140.3	16,856.6	10,326.5	6,940.5	2,665.7	1,575.3	627.7	2,071.8
Chile	4,470.7	1,377.0	1,704.4	4,197.2	200.0	1,454.2	1,603.0	940.0
Colombia	952.0	88.0	1,993.0	4,571.8	459.8	—	112.0	4,000.0
Costa Rica	85.0	—	5.8	175.0	—	175.0	—	—
Dominican Republic	479.6	15.0	1,274.7	—	—	—	—	—
Ecuador	—	—	—	36.0	36.0	—	—	—
El Salvador	—	55.0	200.0	—	—	—	—	—
Guatemala	—	—	—	300.0	—	—	—	300.0
Honduras	113.6	—	—	30.0	—	—	—	30.0
Jamaica	100.0	—	750.2	873.2	198.4	—	—	674.8
Mexico	3,944.1	8,049.7	4,278.8	4,230.0	215.0	102.5	3,567.0	345.5
Panama	3,997.9	878.4	374.3	612.2	152.5	—	162.6	297.0
Paraguay	98.8	—	—	—	—	—	—	—
Peru	2,180.0	744.1	1,532.4	290.0	150.0	—	—	140.0
Trinidad and Tobago	—	—	13.8	—	—	—	—	—
Uruguay	2.6	—	—	200.0	—	—	200.0	—
Venezuela	—	—	1,500.0	3,090.0	240.0	2,850.0	—	—

Source: Data provided by the Bond, Equity and Loan database of the International Monetary Fund sourced from Dealogic.

Note: Deal inclusion conforms to the vendor's criteria for external publicly syndicated gross issuance, generally excluding bilateral deals. Data reflect commitments rather than actual disbursements.

[1]Georgia and Mongolia, which are not members of the Commonwealth of Independent States, are included in this group for reasons of geography and similarities in economic structure.

Table 8. Equity Valuation Measures: Dividend-Yield Ratios

	2007	2008	2009	2010	2011	2011 Q1	Q2	Q3	Q4	10-year average
Emerging Markets	**1.9**	**4.1**	**2.0**	**2.1**	**3.0**	**2.2**	**2.4**	**3.0**	**3.0**	**2.5**
Asia	**1.8**	**4.2**	**1.7**	**2.0**	**2.8**	**2.0**	**2.2**	**2.9**	**2.8**	**2.3**
Europe/Middle East/Africa	**2.0**	**4.3**	**2.2**	**2.1**	**3.2**	**2.3**	**2.6**	**3.3**	**3.2**	**2.6**
Latin America	**2.1**	**4.0**	**2.7**	**2.3**	**3.3**	**2.4**	**2.8**	**3.1**	**3.3**	**2.9**
Argentina	1.6	2.7	1.1	1.9	8.4	2.2	4.2	6.6	8.4	2.1
Brazil	2.2	4.6	2.9	2.7	4.1	2.8	3.3	3.9	4.1	3.7
Chile	1.7	2.6	1.6	1.4	2.3	1.4	1.6	2.1	2.3	2.2
China	1.2	3.1	1.9	2.2	3.2	2.2	2.5	3.4	3.2	2.3
Colombia	2.3	2.4	2.8	2.1	2.6	2.1	2.5	2.6	2.6	3.0
Egypt	1.8	6.3	4.8	3.5	5.3	5.0	4.6	4.7	5.3	4.0
Hungary	2.3	4.6	1.3	1.6	2.4	1.5	1.7	2.6	2.4	2.0
India	0.7	1.8	0.9	0.9	1.5	1.0	1.2	1.4	1.5	1.4
Indonesia	1.5	5.4	1.9	2.2	2.4	2.1	2.3	2.6	2.4	3.1
Jordan	1.8	3.4	3.1	2.5	3.1	2.7	3.0	3.1	3.1	2.6
Malaysia	2.0	4.1	2.4	2.3	2.8	2.6	2.8	3.3	2.8	2.5
Mexico	1.6	2.8	2.4	1.6	1.2	1.7	1.7	1.4	1.2	1.9
Morocco	2.7	3.2	4.9	4.3	5.5	4.3	4.8	5.1	5.5	3.9
Pakistan	4.1	12.5	6.4	5.6	8.3	6.6	6.6	7.5	8.3	7.4
Philippines	2.2	4.4	2.2	2.4	2.7	2.8	2.6	3.1	2.7	2.3
Poland	3.6	5.9	3.0	2.5	5.4	2.5	2.8	5.3	5.4	3.0
Russia	1.2	3.5	1.4	1.5	2.4	1.4	1.9	2.4	2.4	1.8
South Africa	2.7	4.5	2.7	2.3	3.2	2.8	2.9	3.4	3.2	3.1
Sri Lanka	1.9	9.8	1.6	1.2	2.2	1.2	1.5	1.6	2.2	2.8
Thailand	2.9	6.5	2.9	2.6	3.3	2.8	3.0	3.8	3.3	3.4
Turkey	2.3	5.8	2.1	2.2	3.3	2.5	2.7	2.8	3.3	2.7

Source: Morgan Stanley Capital International.

Note: The country and regional classifications used in this table follow the conventions of MSCI, and do not necessarily conform to IMF country classifications or regional groupings.

Table 9. Equity Valuation Measures: Price/Earnings Ratios

	2007	2008	2009	2010	2011	2011 Q1	Q2	Q2	Q4	10-year average
Emerging Markets	**17.1**	**8.5**	**20.6**	**14.6**	**10.8**	**14.1**	**12.8**	**10.2**	**10.8**	**14.3**
Asia	**19.0**	**9.4**	**24.3**	**15.2**	**11.4**	**14.9**	**13.8**	**10.9**	**11.4**	**15.4**
Europe/Middle East/Africa	**14.6**	**6.7**	**16.2**	**12.1**	**8.2**	**11.8**	**10.8**	**8.3**	**8.2**	**13.0**
Latin America	**16.0**	**9.0**	**18.3**	**15.9**	**11.8**	**14.4**	**12.3**	**10.4**	**11.8**	**13.7**
Argentina	13.1	3.7	8.0	8.8	5.2	7.3	8.0	5.4	5.2	18.3
Brazil	15.5	7.9	17.0	13.8	9.8	12.7	10.5	8.7	9.8	11.7
Chile	22.1	13.3	18.7	21.4	17.2	18.6	18.5	15.9	17.2	21.8
China	27.0	10.3	21.1	14.6	9.4	14.9	12.8	8.6	9.4	15.4
Colombia	27.0	13.4	25.1	23.5	17.2	24.5	19.6	17.6	17.2	28.9
Egypt	21.5	7.1	13.9	17.4	10.3	13.3	16.0	12.2	10.3	14.9
Hungary	12.8	3.7	14.2	12.2	8.7	13.2	12.1	7.3	8.7	11.7
India	32.8	10.5	21.8	22.4	14.4	19.9	17.8	15.0	14.4	18.2
Indonesia	21.5	8.7	16.4	19.0	15.2	19.0	17.2	14.5	15.2	13.7
Jordan	21.3	14.4	15.9	21.3	16.9	24.6	20.3	18.3	16.9	22.8
Malaysia	16.9	10.2	20.3	18.1	16.9	18.2	17.2	15.1	16.9	16.7
Mexico	16.4	12.3	22.7	23.9	21.8	22.1	20.7	17.9	21.8	16.6
Morocco	27.2	26.0	14.3	17.5	14.0	17.4	15.1	14.7	14.0	20.3
Pakistan	13.4	3.8	10.1	9.1	6.2	9.0	8.0	7.3	6.2	9.4
Philippines	16.5	11.7	19.1	17.5	15.8	16.5	16.2	14.7	15.8	17.8
Poland	15.2	7.3	19.3	14.1	8.0	13.3	11.9	8.1	8.0	7.6
Russia	14.1	3.4	15.6	8.3	4.9	8.8	7.5	5.1	4.9	10.6
South Africa	14.9	10.7	16.6	18.9	16.4	17.3	17.1	15.5	16.4	14.5
Sri Lanka	14.7	7.1	77.7	20.5	13.2	19.9	16.3	15.3	13.2	18.8
Thailand	14.8	7.1	19.3	14.8	11.1	14.3	12.2	9.8	11.1	13.1
Turkey	10.9	5.3	12.6	10.8	9.2	10.4	10.9	10.4	9.2	11.6

Source: Morgan Stanley Capital International.

Note: The country and regional classifications used in this table follow the conventions of MSCI, and do not necessarily conform to IMF country classifications or regional groupings.

Table 10. Emerging Markets: Mutual Funds

Net Asset Values
(In millions of U.S. dollars)

					2011			
	2008	2009	2010	2011	Q1	Q2	Q3	Q4
Bonds	**60.3**	**88.6**	**162.4**	**183.8**	**171.5**	**194.8**	**183.2**	**183.8**
Global	50.0	76.2	141.9	157.3	148.5	167.7	156.3	157.3
Asia	6.7	7.8	14.9	20.5	16.0	19.7	20.6	20.5
Europe/Middle East/Africa	3.0	3.0	3.2	3.0	4.2	4.3	3.5	3.0
Latin America	0.6	1.5	2.4	2.9	2.7	3.1	2.8	2.9
Equities	**326.6**	**709.4**	**959.1**	**781.2**	**945.7**	**967.7**	**737.0**	**781.2**
Global	156.2	334.7	477.0	416.5	471.2	491.2	385.1	416.5
Asia	124.1	264.4	338.4	269.5	328.5	337.0	257.7	269.5
Europe/Middle East/Africa	23.5	42.7	62.6	40.1	68.2	64.7	42.1	40.1
Latin America	22.9	67.6	81.1	55.0	77.8	74.8	52.1	55.0

Net Flows
(In millions of U.S. dollars)

					2011			
	2008	2009	2010	2011	Q1	Q2	Q3	Q4
Bonds	**−18.2**	**9.5**	**53.6**	**16.1**	**1.9**	**13.1**	**3.5**	**−2.3**
Global	−15.4	9.6	46.5	13.6	1.5	11.5	2.4	−1.8
Asia	−0.7	0.1	6.8	2.7	0.2	1.1	1.7	−0.2
Europe/Middle East/Africa	−1.9	−0.5	−0.2	−1.0	0.0	0.0	−0.6	−0.3
Latin America	−0.1	0.4	0.4	0.8	0.2	0.4	0.1	0.0
Equities	**−49.4**	**83.2**	**95.6**	**−46.8**	**−23.7**	**10.7**	**−24.7**	**−9.1**
Global	−11.1	44.2	63.6	−4.7	−12.3	9.4	−5.1	3.3
Asia	−25.2	26.4	22.0	−24.2	−11.3	3.9	−9.9	−6.8
Europe/Middle East/Africa	−6.3	1.5	7.3	−7.0	2.7	−1.4	−5.4	−2.9
Latin America	−6.8	11.1	2.6	−10.9	−2.8	−1.2	−4.3	−2.6

Source: EPFR Global.

Note: Flows data derive from both tradtional and alternative funds domiciled globally with $16 trillion in assets. The country and regional classifications used in this table follow the conventions of Emerging Portfolio Fund Research and individual fund managers, and do not necessarily conform to IMF country classifications or regional groupings.