

ECONOMIC UNCERTAINTY, SOVEREIGN RISK, AND FINANCIAL FRAGILITIES

A. What Is the Outlook for Global Financial Stability?

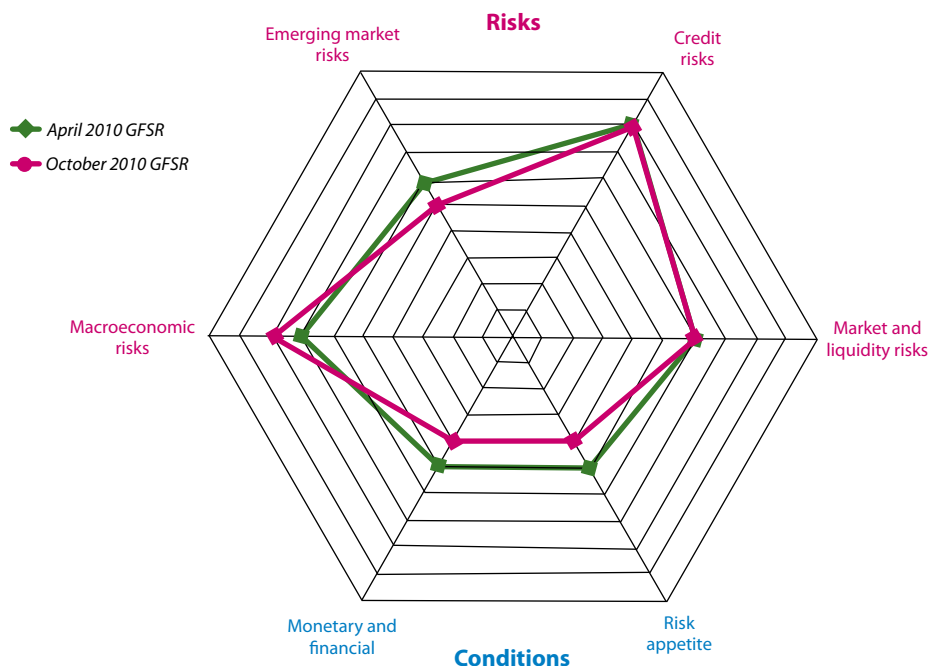
Despite the ongoing economic recovery, the global financial system remains in a period of significant uncertainty. The baseline scenario is for balance sheets to strengthen gradually as the economy recovers, and as further progress is made in addressing legacy problems in key banking systems. However, substantial downside risks remain. Mature market governments face the difficult challenge of managing a smooth transition to self-sustaining growth, while stabilizing debt burdens under low and uncertain economic prospects. Without further bolstering of balance

Note: This chapter was written by a team led by Peter Dattels and consisting of Sergei Antoshin, Giovanni Callegari, Joseph Di Censo, Phil de Imus, Martin Edmonds, Kristian Hartelius, Geoffrey Heenan, Talib Idris, Silvia Iorgova, Hui Jin, Matthew Jones, William Kerry, Paul Mills, Ken Miyajima, Christopher Morris, Nada Oulidi, Jaume Puig, Marta Sánchez-Saché, Christian Schmieder, Narayan Suryakumar, and Huanhuan Zheng.

sheets, banking systems remain susceptible to funding shocks that could intensify deleveraging pressures and place a further drag on public finances and the recovery. Emerging market economies have proven resilient to recent turbulence, but are vulnerable to a slowdown in mature markets and face risks in managing sizable and potentially volatile capital inflows. Policy actions need to be intensified to contain risks in advanced and emerging economies, address sovereign debt burdens, tackle the legacy challenges of the crisis for the banking system, and put in place a new regulatory and institutional landscape to ensure financial stability.

Overall progress toward global financial stability has suffered a setback since the April 2010 *Global Financial Stability Report* (GFSR), as illustrated in our global financial stability map (Figure 1.1) and the associated assessment of risks and conditions (Figure 1.2). The turmoil in sovereign debt markets in Europe highlighted

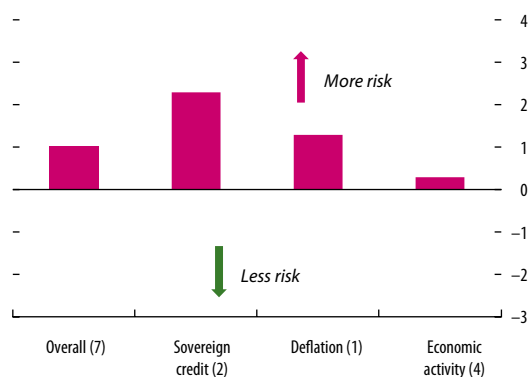
Figure 1.1. Global Financial Stability Map



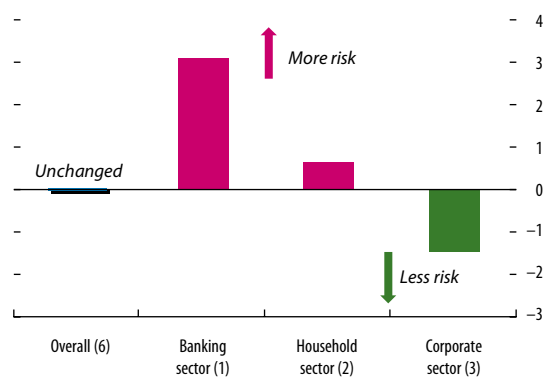
Note: Away from center signifies higher risks, easier monetary and financial conditions, or higher risk appetite.

Figure 1.2. Global Financial Stability Map: Assessment of Risks and Conditions*(In notch changes since the April 2010 GFSR)*

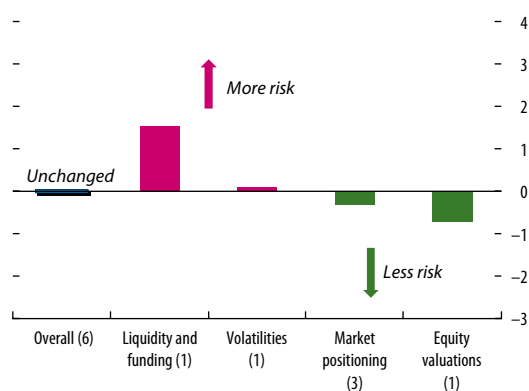
Macro risks increased as sovereign debt and deflation concerns rose amid increased economic uncertainty.



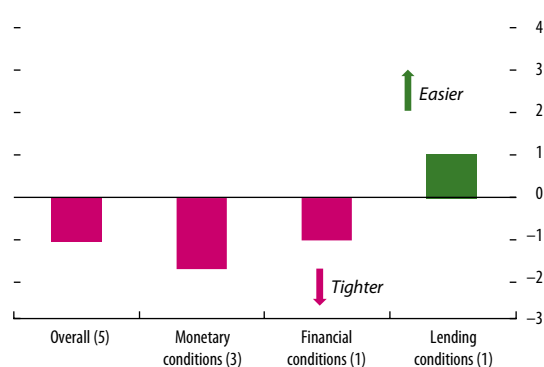
Credit risks were unchanged, as increased strains in the banking system were offset by a stronger corporate sector.



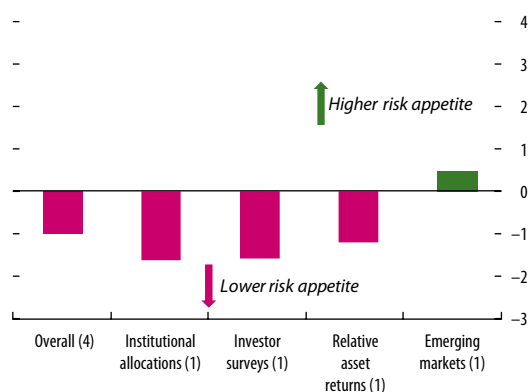
The policy response to address sovereign and bank funding strains helped contain overall market and liquidity risks...



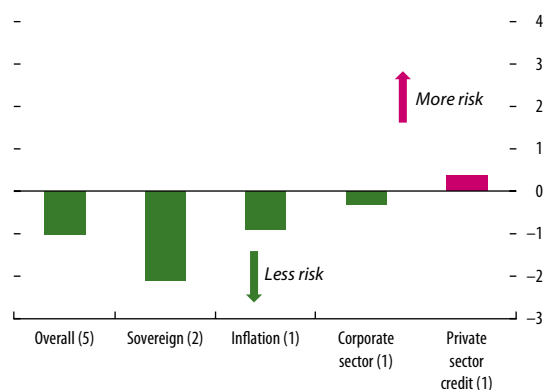
...but monetary and financial conditions were still tighter as a result of these strains and initial moves to exit from extraordinary support measures.



Risk appetite contracted, except for retail inflows to emerging market mutual funds...



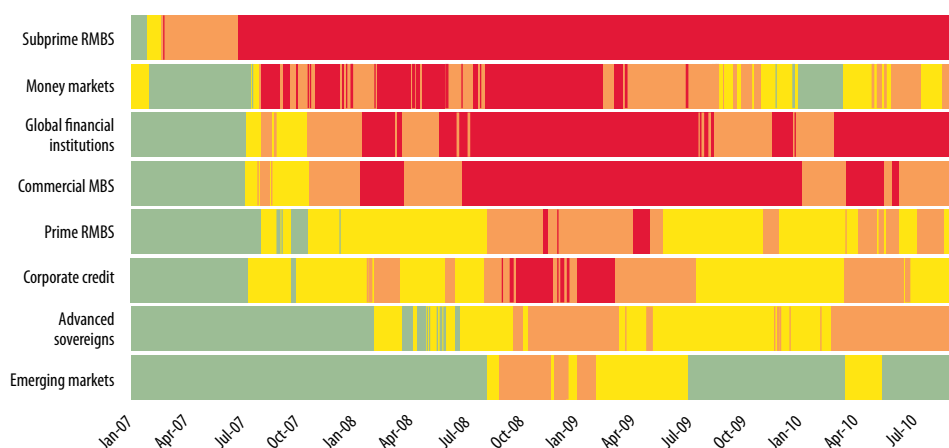
...consistent with lower risks in emerging markets with stronger fundamentals and growth outlook.



Source: IMF staff estimates.

Notes: Changes in risks and conditions are based on a range of indicators, complemented with IMF staff judgment (see Annex 1.1. in the April 2010 GFSR and Dattels and others (2010) for a description of the methodology underlying the global financial stability map). Overall notch changes are the simple average of notch changes in individual indicators. The number next to each legend indicates the number of individual indicators within each sub-category of risks and conditions. For lending standards, a positive value represents a slower pace of tightening or faster pace of easing.

Figure 1.3. Markets Heat Map



Source: IMF staff estimates.

Note: The heat map measures both the level and one-month volatility of the spreads, prices, and total returns of each asset class relative to the average during 2003–06 (i.e., wider spreads, lower prices and total returns, and higher volatility). The deviation is expressed in terms of standard deviations. Light green signifies a standard deviation under 1, yellow signifies 1 to 4 standard deviations, orange signifies 4 to 9 standard deviations, and red signifies greater than 9. MBS = mortgage-backed security; RMBS = residential mortgage-backed security.

increased vulnerabilities of bank and sovereign balance sheets arising from the crisis. The forceful response by European policymakers helped to stabilize funding markets and reduce tail risks. The additional transparency provided by the disclosure of European bank stress test results also reduced uncertainty over sovereign exposures, and provided relief for bank and sovereign funding markets. However, the outlook is still subject to considerable downside risks, and tail risks remain elevated.

Macroeconomic risks have increased, as heightened market pressures for fiscal consolidation have complicated the challenge of managing a smooth transition to self-sustaining growth. The recovery has begun to lose steam, after better-than-expected growth in early 2010. Consumer confidence and other leading indicators have started to level off, reflecting rising uncertainty about the next phase of the recovery. Section B examines the many sovereign risk vectors that could undermine financial stability, as well as the difficult challenge that many governments of advanced economies face in stabilizing debt burdens under low and uncertain growth prospects.

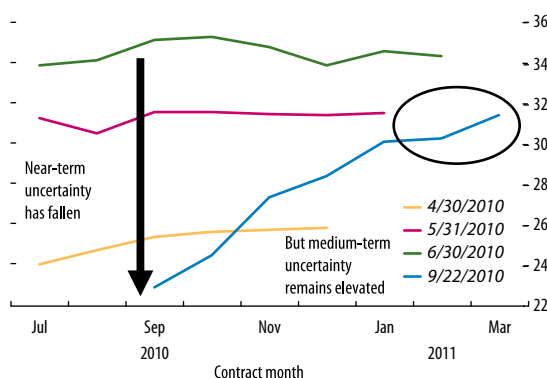
The improvement in overall *credit risks* experienced in the last year has paused. The recovery has strengthened corporate balance sheets and stabilized some indicators of household leverage. However, against the backdrop of heightened economic uncertainty, continuing deleverag-

ing, and sovereign spillovers, core banking systems remain vulnerable to confidence shocks and are heavily reliant on government support. Risks remain in the euro area from the negative interactions between sovereign and banking risks. Challenges also remain for banking systems in the United States and Japan. Uncertainties surrounding the U.S. housing market and the risks of a “double dip” in real estate markets remain high. Overall, bank balance sheets need to be further bolstered to ensure financial stability against funding shocks and to prevent adverse feedback loops with the real economy.

The forceful policy response in Europe helped to reverse the sharp rise in *market and liquidity risks* experienced in April and May, leaving them broadly unchanged from the April 2010 GFSR (Figure 1.3). However, downside risks remain elevated, given the sizable refunding needs in the banking sector. Indeed, general levels of *risk appetite* have declined, with financial sector equities and credit experiencing the largest sell-offs during the crisis on concerns about exposures to sovereign debt. *Monetary and financial conditions* have also tightened as a result of these strains and because of initial steps by central banks to start unwinding support measures introduced in response to the global credit crisis.

Emerging market risks have nevertheless declined. Spillovers from the sovereign debt turmoil in Europe

Figure 1.4. Short-Term Uncertainty Has Fallen, but Uncertainty Remains High in the Medium Term
(Term structure of the VIX, in percent)

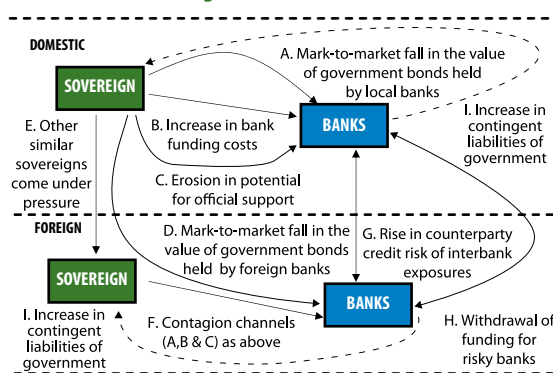


Source: Bloomberg L.P.
Note: The VIX is the Chicago Board Options Exchange Market Volatility Index.

remain fairly limited outside some emerging European countries with stronger linkages with the euro area. Nevertheless, emerging markets face the challenge of managing large and possibly volatile capital flows. Their higher growth prospects and sounder fundamentals point to a structural asset reallocation from advanced countries (Section D).

In sum, although the financial situation has improved after the turmoil in European sovereign debt markets, substantial market uncertainties persist and tail risks are elevated, with markets still expecting volatility to remain high (Figure 1.4). Policy actions are needed to contain low-probability but high-impact events by adequately addressing sovereign risks, tackling legacy problems in the banking system, and providing greater clarity on the new financial regulatory landscape.

Figure 1.5. Spillovers from the Sovereign to the Banks and Banks to Sovereigns



Source: IMF staff.

B. Sovereign Risks and Financial Fragilities

Coordinated support programs and the announcement of ambitious fiscal reforms in countries facing the greatest sovereign funding difficulties have helped contain the turmoil in the euro area after its rapid escalation in April-May. Nevertheless, sovereign risks remain elevated as markets continue to focus on high public debt burdens, unfavorable growth dynamics, increased rollover risks, and linkages to the banking system. As policymakers continue the difficult process of improving fiscal sustainability, they must also attenuate the channels of transmission from the sovereign to the financial system. This will help reduce the risk that sovereign debt concerns compromise financial stability.

The financial turmoil that engulfed parts of the euro area in April-May provided a stark reminder of the close linkages between sovereign risk and the financial system, as well as the potential for cross-border spillovers (Figure 1.5). Spreads on sovereigns perceived to face greater fiscal and growth challenges rose rapidly in the wake of Greece's funding difficulties. Similarly, markets began to differentiate more among sovereigns within the euro area and among banks with the greatest exposures to those economies.

In the countries perceived as most vulnerable by markets, an adverse feedback loop developed, with widening sovereign spreads raising concerns about

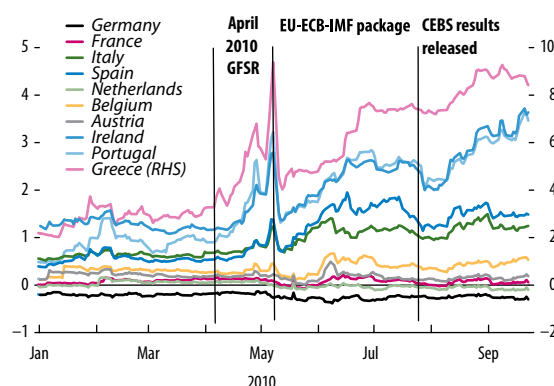
bank exposures. In turn, this drove up counterparty risk and led to higher funding costs, at times in an indiscriminate manner (Figure 1.6). Interbank markets also began differentiating between types of euro government collateral and the borrowing institution's country of origin. With each cycle, the affected sovereign's ability to backstop the financial system came into further doubt, as rising funding costs raised the magnitude and likelihood of bank interventions.

Many advanced economies have since announced plans to shore up their public sector balance sheets. Although in around one-half of advanced economies overall deficits are now projected to narrow in 2010, in many major economies deficits will be larger than last year. While the average deficit for advanced economies is projected to fall from 9 percent of GDP in 2009 to 8¼ percent of GDP in 2010, this is mostly due to lower financial sector support in the United States. Excluding this, the average deficit widened, slightly.¹ In 2011, fiscal exit will start in earnest, with consolidation efforts to be the main factor in reducing projected overall deficits by an additional 1¼ percent of GDP in advanced economies. Countries facing pressures in their sovereign debt markets are appropriately frontloading their consolidation efforts and are embarking on ambitious reductions in their deficits. However most other advanced economies still need to specify and enact policy measures that would allow them to achieve their medium-term targets.

Fiscal risks remain high, particularly in advanced economies, and significant structural weaknesses remain in sovereign balance sheets, which could spill over to the financial system, and more broadly have adverse consequences for growth over the medium term. Public debt is still rising in advanced economies, and considerably more needs to be done to ensure sustainability. Table 1.1 presents five categories of sovereign vulnerability indicators. These show that many advanced economies have significant weaknesses in one or more dimensions, exposing their economies and financial systems to heightened downside risks from overburdened public sector balance sheets.

Long-term solvency risks arising from high public sector indebtedness have the potential to crystallize

Figure 1.6. Ten-Year Sovereign Swap Spreads
(In percentage points)



Source: Bloomberg L.P.

Note: CEBS = Committee of European Banking Supervisors.

¹See the November 2010 edition of the IMF's *Fiscal Monitor* for further discussion (IMF, forthcoming).

Table 1.1. Sovereign Market and Vulnerability Indicators*(Percent of 2010 projected GDP, unless otherwise indicated)*

	Fiscal and Debt Fundamentals ¹			Financing Needs	External Funding	Banking System Linkages			Sovereign Credit Rating/Outlook (notches above speculative grade / outlook) (as of 9/22/10) ⁸
	Gross General Government Debt ²	Net General Government Debt ³	Primary Balance	Gross Central Government Debt Maturing Plus Fiscal balance (2010:Q4–2011) ⁴		Domestic Institutions' Claims on General Government ⁶	Domestic Depository Institutions' Claims on General Government ⁶	BIS Reporting Banks' Consolidated International Claims on Public Sector ⁷	
Australia	21.9	5.4	–4.3	4.5	7.2	2.2	1.2	2.6	9/Stable
Austria	70.0	59.9	–2.9	9.2	57.9	15.7	4.3	13.7	10/Stable
Belgium	100.2	91.4	–0.9	23.5	60.3	21.3	6.2	19.6	9/Stable
Canada	81.7	32.2	–4.5	16.2	14.0	18.4	9.8	3.5	10/Stable
Czech Republic	40.1	n.a.	–3.9	14.5	10.1	15.2	13.0	4.4	5/Stable
Denmark	44.2	0.3	–4.3	12.9	16.9	15.1	3.3	7.0	10/Stable
Finland	50.0	–40.7	–4.7	11.3	39.8	5.2	1.9	9.4	10/Stable
France	84.2	74.5	–5.8	21.5	51.4	19.1	4.5	9.6	10/Stable
Germany	75.3	58.7	–2.2	13.8	37.8	21.5	7.1	10.4	10/Stable
Greece	130.2	109.5	–2.2	24.6	94.2	20.6	9.0	29.9	0/Negative
Ireland	93.6	55.2	–15.0	17.3	54.9	14.8	1.4	11.7	7/Negative
Italy	118.4	99.0	–0.8	24.6	55.5	32.0	12.5	17.7	7/Stable
Japan	225.9	120.7	–8.2	59.1	11.5	74.7	23.7	1.3	8/Negative
Korea	32.1	n.a.	2.8	1.7	3.3	6.9	4.8	4.2	5/Stable
Netherlands	66.0	45.8	–4.2	17.5	44.0	12.7	3.3	8.2	10/Stable
New Zealand	31.0	3.2	n.a.	11.7	13.0	5.8	3.1	2.8	9/Negative
Norway	54.3	–152.3	8.6	–2.5	19.9	n.a.	n.a.	7.0	10/Stable
Portugal	83.1	78.9	–4.1	20.7	59.9	15.8	4.9	23.1	5/Negative
Slovak Republic	41.8	n.a.	–6.8	13.8	12.8	20.6	23.6	5.8	6/Stable
Slovenia	34.5	n.a.	–4.5	6.7	24.2	9.9	6.4	6.8	8/Stable
Spain	63.5	54.1	–7.5	19.0	31.1	22.2	6.7	7.9	9/Negative
Sweden	41.7	–12.7	–3.2	6.4	17.5	6.7	2.2	4.9	10/Stable
United Kingdom	76.7	68.8	–7.6	15.7	18.5	6.2	1.3	2.8	10/Negative
United States	92.7	65.8	–9.5	27.2	26.7	7.9	5.4	3.0	10/Stable

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

Note: Based on projections for 2010 from the October 2010 *World Economic Outlook* (WEO). See Box A1 in the WEO for a summary of the policy assumptions.

¹Percent of projected 2010 fiscal year GDP. Data for Korea are for the central government.

²Gross general government debt consists of all liabilities that require future payment of interest and/or principal by the debtor to the creditor. This includes debt liabilities in the form of Special Drawing Rights (SDRs), currency and deposits, debt securities, loans, insurance, pensions and standardized guarantee schemes, and other accounts payable.

³Net general government debt is calculated as gross debt minus financial assets corresponding to debt instruments. These financial assets are monetary gold and SDRs, currency and deposits, debt securities, loans, insurance, pension, and standardized guarantee schemes, and other accounts receivable.

⁴Central government debt maturing from October 2010 to December 2011 as a proportion of projected 2011 GDP plus projected general government fiscal deficit for FY2011.

⁵Most recent data for externally held general government debt (from Joint External Debt Hub) divided by 2010 projected GDP. New Zealand data from Reserve Bank of New Zealand.

⁶Includes all claims of depository institutions (excluding the central bank) on general government. U.K. figures are for claims on the public sector. Data are for second quarter 2010 or latest available.

⁷BIS reporting banks' international claims on the public sector on an immediate borrower basis for first quarter 2010, as a percentage of projected 2010 GDP.

⁸Based on average of long-term foreign currency debt ratings of Fitch, Moody's, and Standard & Poor's, rounded down. Outlook is based on the most negative of the three agencies.

into sovereign funding difficulties over the shorter term as a result of high debt rollovers and primary deficits, measured by the gross government funding ratio. As sovereign risk is repriced higher in both cash bond yield spreads and credit default swaps (CDS), an economy with large funding requirements may either lose primary market access or face sharply higher interest rates. In such situations, the composition of the bond buyer base can either help avert or exacerbate funding difficulties. Too heavy a reliance on foreign bond investors or any other narrow investor base introduces greater funding uncertainty, while well-diversified buyers imply more demand stability due to investors' varying risk tolerances and horizons. In the event of a disruption in government bond markets, bank holdings (both domestic and cross-border) of sovereign debt can quickly propagate one economy's stresses to the entire region. Cross-border spillovers have taken various forms, from increased correlation of risk premia to herd-like behavior by investors, but the most destabilizing have been the spillovers that disrupted bank funding sources. The continued intervention of the European Central Bank (ECB) and other central banks has been crucial in ameliorating this form of spillover during the current difficulties.

Governments' efforts to credibly address fiscal sustainability concerns are made more difficult by significant uncertainty about growth prospects.

In responding to the global financial crisis, governments used their fiscal resources and balance sheets to support aggregate demand and strengthen private balance sheets, particularly for financial institutions. This helped prevent a deep recession, but at the cost of an expansion in public balance sheets.² Governments now face the challenge of dealing with the resulting higher debt burdens amid uncertain growth prospects, with even less fiscal room. Thus, many advanced economies must negotiate a delicate balance between fiscal consolidation to reduce debt and rollover risks, on the one hand, while ensuring sufficient growth to avoid adverse debt dynamics and unsustainable

debt burdens, on the other.³ At the same time there is continued uncertainty about prospective economic growth, with the risk of abrupt setbacks that could undermine fiscal sustainability and financial stability.

This sensitivity to growth is illustrated with a simple scenario. A moderate though protracted growth shock of 1 percent less than the *World Economic Outlook* (WEO) baseline between 2010 and 2015 could have a significant impact on advanced economy debt-to-GDP ratios.⁴ Figure 1.7 shows that countries with high pre-crisis debt loads tend to be more affected by an adverse growth shock—Japan ranks as most exposed. But another factor is the sensitivity of the fiscal balance to growth, which tends to be higher in those economies with larger automatic fiscal stabilizers. Public debt burdens are more relevant for southern Europe and Japan, whereas automatic stabilizers are important for northern Europe. Greece and Italy feature both a high level of debt and large automatic stabilizers, presenting higher fiscal risks. Belgium and the Netherlands are also vulnerable because their fiscal balances are more sensitive to a deterioration in economic growth.

If policymakers fall short in their commitments to fiscal consolidation, or if the latter is not pursued in a growth-friendly manner or not accompanied by the needed structural reforms to generate sufficient growth, the vulnerabilities flagged in Table 1.1 will become more acute. As demonstrated during the recent turmoil, a rapid surge in sovereign risk premia can jeopardize primary market access and create destabilizing funding pressures for the banking sector, increasing the likelihood of an adverse spiral involving the real economy.

High public debt rollover hurdles can telescope medium-term debt sustainability concerns into funding difficulties in the short term.

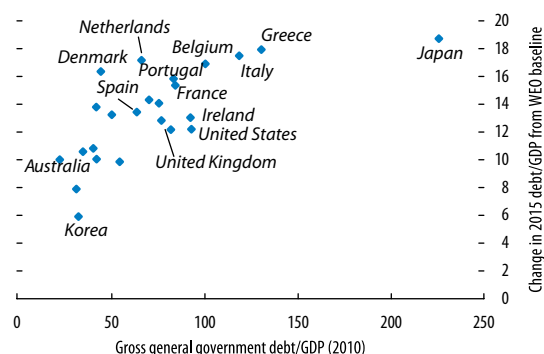
Many advanced economies face high public debt funding needs, as primary balances remain in deficit and shorter-term debt issued during the financial crisis matures over the next year and a half

²See the May 2010 edition of the IMF's *Fiscal Monitor* for further details on the share of the increase in debt from the crisis that is attributable to revenue losses, expenditures, and financial sector interventions (IMF, 2010b).

³As discussed in Chapter 3 of the October 2010 WEO, each percentage point of fiscal consolidation typically reduces GDP growth by half a percentage point after two years (IMF, 2010e).

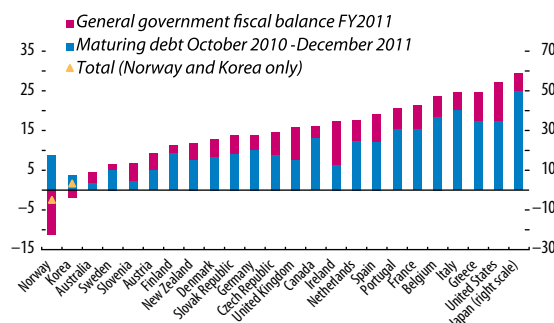
⁴See Annex 1.1 and IMF (forthcoming) for an analysis of fiscal risks.

Figure 1.7. Impact of a –1 Percent Growth Shock from World Economic Outlook (WEO) Baseline, 2010–15
(In percent of GDP)



Sources: IMF, World Economic Outlook database; and IMF staff estimates.

Figure 1.8. Sovereign Gross Funding Requirements
(Percent of projected 2011 GDP)



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

(Figure 1.8).⁵ However, as markets have increasingly focused on sovereign risks, the potential adverse consequences of an auction failure have increased. As a result, the combination of concentrated debt rollovers in countries with existing debt sustainability concerns and an undiversified investor base (either by residence or institution) has emerged as a key concern for many sovereign debt managers.

To complicate matters for some euro area economies, early indications of a strategic asset reallocation—a shift out of European government bonds that came under most market pressure and into the main government bond markets—have exacerbated rollover risks despite ECB and European Union (EU) policy support. Since the introduction of the euro, government bond investors typically have viewed euro area government paper as essentially risk-free from a sovereign credit perspective, with liquidity and marginal ratings divergences as the drivers in spreads. The reassessment of this paradigm could prompt a structural decline in demand for bonds issued by advanced economies with high-risk characteristics. This shift in the investor base for European government bonds will likely be measured in quarters if not years (Figure 1.9). Furthermore, investors with strict ratings guidelines in their portfolio mandates (notably central bank reserve managers) may also be less inclined to maintain their current allocation to sovereigns where credit spreads imply deteriorating credit rating prospects.⁶

Portfolio managers continue to be concerned about Greek debt, despite strong performance to date under its fiscal adjustment program and confirmed support from international partners. This concern weighs on market pricing of sovereign risk for a number of other countries and keeps spillover threats elevated.

Despite a large structural deficit and high government debt levels, a near-term dysfunction in the Japanese government bond market remains unlikely. Nevertheless, that bond market has several features—including a relatively short debt profile, high financing needs, a buyer base dominated by domestic banks—that could

⁵Based on an analysis in the November 2010 *Fiscal Monitor* (IMF, forthcoming).

⁶See Chapter 3 for a discussion of the role of sovereign credit ratings and their impact on financial stability.

allow a small risk of distress to transmit through the banking system, and accelerate medium-term fiscal solvency issues into near-term funding challenges.

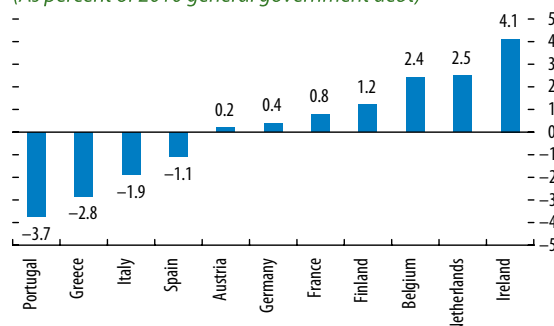
The Japanese government bond market continues to be supported by a stable investor base resulting from high private savings, the small presence of foreign investors, home bias, a current account surplus, and the lack of alternative yen-denominated assets. However, these factors supporting Japanese government bonds are also expected to erode over the medium term.⁷ In the aftermath of the turmoil in the euro area, both local and foreign investors may also reexamine Japan's fiscal position with a more critical eye. Achieving the government's recently announced fiscal targets and medium-term real growth objective of 2 percent (3 percent nominal) will thus be key to stabilizing debt dynamics and preventing downside risks from emerging and threatening financial stability.

While still small, the potential for near-term sovereign funding challenges has increased as the linkages between the Japanese government bond market and domestic banks have risen in the past two years. Japanese banks' holdings of government securities as a proportion of their assets have gone up to an all-time high, leading to higher interest-rate risk. At the same time, banks have become the dominant buyers of government securities, which could pose a potential financial stability risk if there were a sudden shock to government bond yields (Box 1.1).

Euro area sovereign debt strains have spilled over to central and eastern Europe (CEE) and the Commonwealth of Independent States (CIS) but have had a limited impact on other regions.

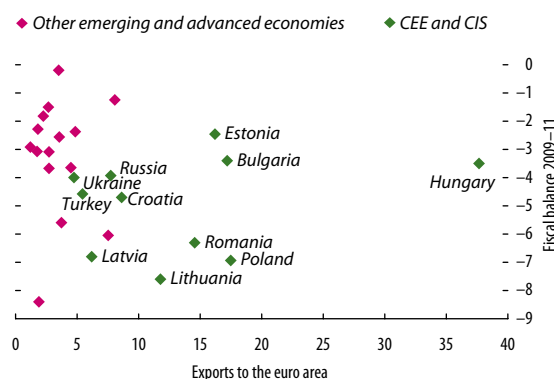
While most CEE and CIS sovereigns have been adversely affected by the euro area difficulties because of their high dependence on exports to the euro area (Figure 1.10), the greatest impact has been on those countries with preexisting sovereign credit concerns. For example, sovereign CDS spreads of those CEE and CIS countries with higher market-implied default risk have closely followed euro area spread widening (Figure 1.11). Currencies in these regions have also

Figure 1.9. Custodial Bond Flows, 2007–June 2010
(As percent of 2010 general government debt)



Sources: BNY Mellon iFlowSM data; and IMF staff estimates.

Figure 1.10. Exports and Fiscal Balance
(In percent of GDP)

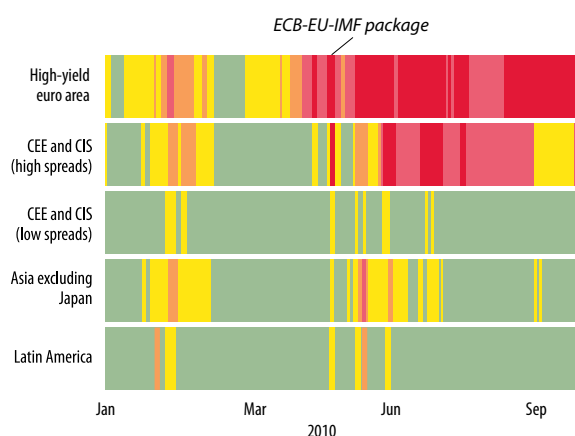


Sources: IMF, Direction of Trade Statistics and World Economic Outlook databases; and IMF staff estimates.

Note: Fiscal balances for 2010 and 2011 are estimates. CEE = central and eastern Europe. CIS = Commonwealth of Independent States.

⁷See Tokuoka (2010) for a detailed discussion of the factors supporting Japanese government bond market stability and the medium-term outlook for financing Japan's public debt.

Figure 1.11. Developments in Sovereign Credit Default Swap Spreads



Source: IMF staff estimates.

Note: Deviations from Q4 2009 average is measured in terms of standard deviations. Light green signifies a standard deviation under 1, yellow signifies 1 to 3 standard deviations, orange signifies 3 to 5 standard deviations, light red signifies 5 to 10 standard deviations, and dark red signifies greater than 10 standard deviations. High spreads = Bulgaria, Hungary, and Romania. Low spreads = Poland, Russia, and Turkey. CEE = central and eastern Europe. CIS = Commonwealth of Independent States.

experienced stronger spillovers from the euro area than other emerging markets. In contrast, impacts on Asia, Latin America, and the Middle East and Africa have been more muted.

Implicit and explicit guarantees for the banking system have heightened concerns about risk transfer between banks and the sovereign.

The health of the banking system and the sovereign have become more closely intertwined as a result of the unprecedented public support for banking systems during the crisis. Box 1.2 examines the interactions between the health of bank balance sheets, contingent liabilities of the sovereign to the banks, and sovereign spreads in two subsets of European countries, to illustrate the close connections apparent during the recent turmoil. The results indicate that contingent liabilities stemming from the banks included in the sample remain large, with significant tail risks from potential bank losses. Furthermore, should these contingent liabilities materialize, they could have a significant impact on the cost of funding and creditworthiness for some sovereigns. In some countries, high sovereign credit spreads could then spill over and increase bank spreads and funding pressures. This framework of interactions between sovereigns and banks can be used to quantify the various spillovers and feedbacks described in Figure 1.5; these linkages will be explored further in the following section on banking.

Against this backdrop, further policy action is required to reduce downside risks and contain the potential for tail events.

The announcement of national policy measures, together with the creation of the European Financial Stability Facility (EFSF) and actions by the ECB under the Securities Markets Program (SMP), was successful in halting the negative feedback loop that had developed in the euro area between sovereign and bank funding markets.⁸ Policymakers should now aim

⁸The ECB bought €60.8 billion of government securities under the SMP through the end of August 2010, but the composition of these purchases has not been publicly disclosed. The quantity of weekly bond purchases declined from €16.5 billion in the first week of May to a weekly average of €125 million in August. There is some indirect evidence of the program's positive impact on sovereign debt markets. For instance, bid-ask spreads

Box 1.1. Japan: Risk of Sovereign Interest Rate Shock

Japan's government bond market has several structural features that could allow a small risk of distress to quickly transmit through the banking system and telescope medium-term fiscal solvency issues into near-term funding difficulties. Japan has a shorter debt profile and higher gross funding needs than other countries (Table 1.1). Weak corporate demand for loans, limited domestic investment opportunities, and strong home bias have induced domestic banks to increase their Japanese government bond (JGB) exposures significantly over the past two years. Banks' JGB holdings in terms of total assets are at a record high—roughly 20 percent higher than the previous peak during the Bank of Japan's 2004 quantitative easing. This heavy dependency on bank purchases of JGBs brings with it a risk of a disorderly reversal in that market if a potential rebound in credit demand prompts banks to reduce their JGB holdings. Since Japanese banks are now the dominant buyer of JGBs (see first figure), the market could become disorderly, especially at the shorter end of the yield curve, if banks begin to slow or reverse their bond purchases.

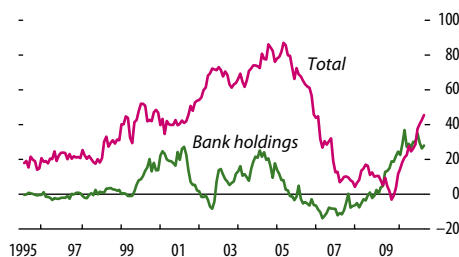
Additionally, interest rate risk has been growing in many regional banks as they have sought to counteract the contraction in lending by lengthening the duration of their JGB portfolios to augment profit margins. The largest banks, however, have partially mitigated interest rate risk by shortening the duration of their JGB holdings to hedge against a potential interest rate spike.

There are several factors that would likely prevent a sharp surge in JGB yields from escalating into funding difficulties. Banks' lack of reliance on wholesale funding means that they will not be susceptible to a shutdown of interbank markets, and a deposit run is highly unlikely. One-sided selling by commercial banks could be countered in the short term by purchases by public sector institutions. However, concerted and credible medium-term reforms that improve the fiscal balance and promote growth would be most effective in mitigating risks of instability in the JGB market.

Note: This box was prepared by Geoffrey Heenan, Silvia Iorgova, and Joseph Di Censo.

Japanese Government Bonds and Treasury Bills Outstanding

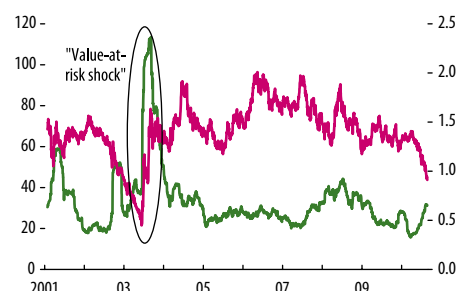
(In trillions of yen, 12-month change)



Source: Bank of Japan.

Ten-Year Japanese Government Bond Yields and Historical Volatility

— 60-day volatility (basis points, annualized, left scale) — Yield (percent, right scale)



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

Yet a sudden spike in JGB yields is not unprecedented. In June 2003, 10-year yields more than tripled in the course of three months, surging from a historically low 45 basis points to 1.6 percent (see second figure). This episode was termed the “VaR shock” because a rise in volatility increased risk measures in banks’ internal value-at-risk (VaR) models and led to one-sided selling by banks as they attempted to shed risk (Bank of Japan, 2010, Chapter 3). Despite better risk management practices, a similar correction today could be far more dramatic, given the higher exposure of banks to JGBs and heightened investor concerns regarding sovereign risk following the euro area turmoil.

Box 1.2. Risk Transmission between Sovereigns and Banks in Europe

This box uses the systemic contingent claims analysis (systemic CCA) framework (Gray and Jobst, 2010; IMF, 2010d) to estimate the magnitude of market-implied expected losses in the banking sector of European countries. This framework combines forward-looking market data and accounting information to infer the expected losses for a sample of 39 individual banks (those with traded equity and equity options data). It then uses the dependence structure between these institutions within each country to estimate the median and tail risk of expected losses by taking the 50th and 95th percentile of the joint distribution. This approach helps quantify the magnitude of the potential risk transfer to the government over time, depending on the size and interconnectedness of banks in the system. For the tail risk estimates, there is a 5 percent chance the system losses (over a one-year horizon) will be greater than the losses shown in the figure.

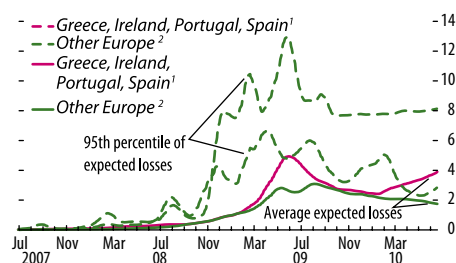
The CCA approach can also be used to analyze the impact of default/distress risk on the sovereign balance sheet by calculating an implied value for sovereign assets—as the value of sovereign assets is not directly observable—and estimating the expected losses on sovereign debt derived from the term structure of sovereign CDS spreads (Gray, Merton, and Bodie, 2007).¹ The size of government contingent liabilities from the banking system can then be calculated as a percent of sovereign assets, and the sensitivity of sovereign spreads to changes in contingent liabilities to the banks, or changes in the sovereign debt structure (e.g., due to rollover risks or shortening of maturity), or changes in sovereign assets (e.g., due to changes in fiscal revenues and expenditures) can be derived.

Using historically informed assumptions of both a moderate and high level of government guarantees to the banking sector (50 percent and 85 percent, respectively), the ratio of expected losses in the banking system to sovereign assets can be estimated. This measure can be used to estimate the change in implied sovereign spreads that would result from a change in expected bank losses for a given level of government guarantees for the banking system.

Note: This box was prepared by Dale Gray and Andreas Jobst.

¹Annex 1.2 provides more details on modeling the sovereign CCA and the systemic CCA framework.

Market Implied Average Expected Losses and Tail-Risk Losses for Selected Banking Systems (As percent of 2009 GDP)



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

Notes: Series are 20-day moving average of losses, expressed as a percent of 2009 GDP.

¹Sample of 11 banks in Greece (4), Ireland (3), Portugal (1), and Spain (3).

²Sample of 28 banks in Austria (3), Belgium (2), United Kingdom (5), Denmark (1), France (4), Germany (2), Italy (4), Norway (1), Sweden (4) and Switzerland (2).

For the subset of four euro area countries, the estimated change in implied sovereign CDS spreads from a 10 percent change in expected bank losses ranges from a low of 5 basis points for Spain and Portugal, to around 25 basis points for Greece and around 70 basis points for Ireland. These estimates assume that the government covers 85 percent of expected bank losses. Differences in sensitivity arise from a number of factors, both fundamental and as a result of the sample of banks used. Two key determinants of the impact on sovereign spreads are the size of the financial system in relation to the size of the sovereign balance sheet, and market expectations of banking system losses. From these two dimensions, Ireland's large-sized financial system and the large scale losses as a result of concentrated exposures to the real estate sector make the impact on spreads greater. Regarding Spain and Portugal, this estimate is likely to understate the change in spreads, because the sample of banks only includes the larger commercial banks. In the case of Ireland, markets appear to have already priced expected losses into sovereign spreads, as the sovereign CDS spreads rose by over 150 basis points from June to September 2010, in response to additional news about losses on Anglo Irish Bank. Looking ahead, the policy actions to put the bank into a resolution framework, coupled with other actions to stabilize the Irish banking system and the fiscal balance sheet are expected to limit the contingent liabilities faced by the government.

at consolidating and further expanding the success of the recent measures by tackling the remaining underlying vulnerabilities. The next section explores the extent to which major global financial systems would be able to withstand various downside risks.

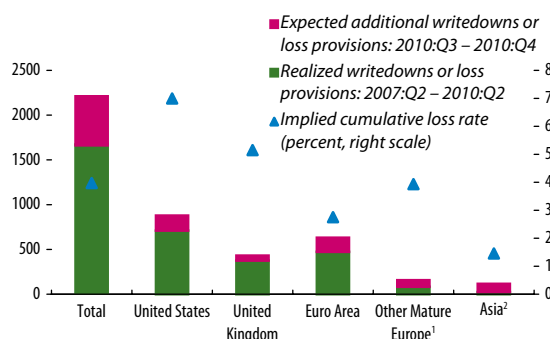
C. Sovereign and Banking System Spillovers

Fiscal challenges and heightened economic uncertainty have exposed banking systems' vulnerabilities to sovereign risks and funding shocks. In part, this reflects crisis legacy problems and incomplete reforms, as well as highly leveraged balance sheets reliant on wholesale funding. Our baseline scenario points to continued improvement in the financial situation along with further policy implementation. However, important challenges remain for European, U.S., and Japanese banking systems, in an environment combining risks to the economy, sovereign financing, and bank funding. Policies thus need to be further strengthened and balance sheets bolstered to reduce the risks of negative outcomes with repercussions for the economy.

The financial system continues to build on recent improvements.

Our estimate of crisis-related total bank writedowns and loan provisions between 2007 and 2010 has now fallen from \$2.3 trillion in the April 2010 GFSR to \$2.2 trillion, driven mainly by a fall in securities losses (Figure 1.12). In addition, banks have made further progress in realizing those writedowns, with more than three quarters already reported, leaving a residual amount of approximately \$550 billion.⁹ Importantly, the average Tier 1 capital ratio in the global banking system rose to over 10 percent at end-2009, although much of this is due to government recapitalization (Figure 1.13).

Figure 1.12. Bank Writedowns or Loss Provisions by Region
(In billions of U.S. dollars unless indicated)

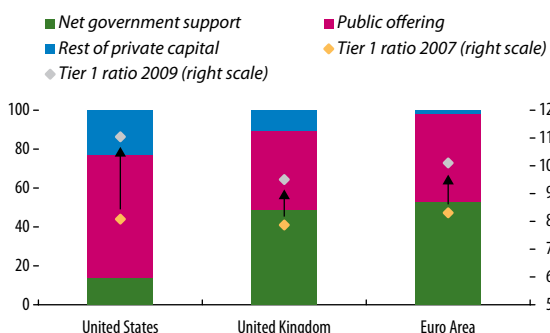


Source: IMF staff estimates.

¹Includes Denmark, Iceland, Norway, Sweden, and Switzerland.

²Includes Australia, Hong Kong SAR, Japan, New Zealand, and Singapore.

Figure 1.13. Capital Raised by Banks and Tier 1 Ratios
(In percent)



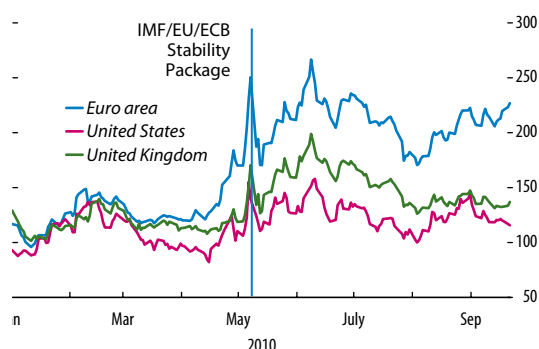
Sources: Bloomberg, L.P., Banking Supervision Committee, SNL Financial database; and IMF staff estimates.

Notes: Capital raised between 2008:Q1 and 2010:Q2.

on Greek, Irish, Portuguese, and Spanish sovereign bonds have narrowed since the SMP initiated purchases. Moreover, sovereign bonds issued by Greece, Ireland, and Portugal have significantly outperformed the euro area government bond index and other peers since the SMP began, and though marginally, Italy and Spain have also outperformed.

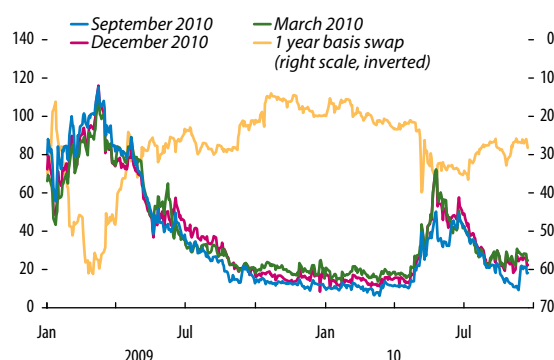
⁹As explained in previous editions of the GFSR, these estimates are subject to considerable uncertainty and range of error. See Box 1.1 of the October 2009 GFSR for further details (IMF, 2009b).

Figure 1.14. Banking Sector Credit Default Swap Spreads
(In basis points)



Source: Datastream.

Figure 1.15. U.S. Dollar Three-Month Forward - Overnight Index Swap Spreads and Basis Swaps
(In basis points)



Source: Bloomberg L.P.

Despite these improvements, banking system risks are more elevated today compared with those described in the April 2010 GFSR.

The outbreak of sovereign strains in the euro area discussed above spilled over to the banking system, but credible action has been initiated to both address underlying sovereign vulnerabilities as well as to limit spillovers. Vulnerable euro area economies have frontloaded fiscal adjustment, and economies with more flexibility have begun the difficult process of fiscal consolidation. And backstops have been put in place at the supranational level to ensure adequate safeguards against sovereign financing strains.

Nevertheless, confidence is not fully restored and financial vulnerabilities persist. This is due to the existence of key structural financial vulnerabilities linked to sovereign risks, which remain elevated, and persistent fragilities and legacy challenges in the banking system, which add to the uncertainties of the economic outlook. In the United States, concerns about household balance sheets and real estate markets continue to cloud the outlook for loan quality in the banking sector and pose capital challenges for government-sponsored enterprises (GSEs). These vulnerabilities could reactivate the adverse feedback loop between the financial system and the economy that could undermine the global recovery.

The increase in overall banking system tensions since the April 2010 GFSR is reflected in the rise in the cost of credit default protection for financial institutions (Figure 1.14). The relatively greater pressure in European banking systems from both sovereign risks and wholesale funding strains has led euro area bank CDS levels to rise above those in the United Kingdom and the United States, although in all three cases they are down from their June peaks. Counterparty concerns spilled over to unsecured interbank markets, where steep rises in funding costs were seen in European dollar funding markets in April and May (Figure 1.15). Market counterparties—particularly U.S. money market mutual funds—became concerned about the risk of lending to banks with significant exposures to sovereigns facing fiscal and growth pressures. This, along with new rules in the United States intended to limit money market mutual funds' risks, led to a sharp

retraction of money market mutual funds' exposure to European banks.¹⁰

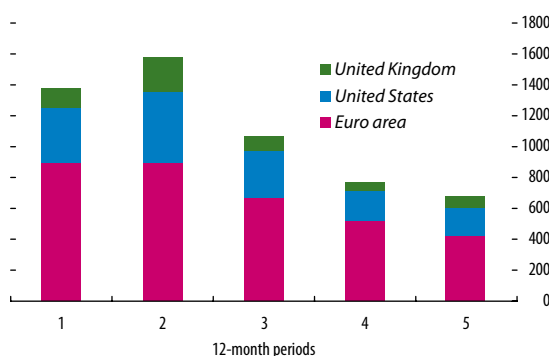
Banks now face the greatest vulnerabilities on the liabilities side of their balance sheet...

Structural weaknesses in bank balance sheets remain. As foreshadowed in the April 2010 GFSR, banks now face the greatest vulnerabilities on the liabilities side of their balance sheet. There has been little progress in lengthening the maturity of their funding, and as a result, over \$4 trillion of debt is due to be refinanced in the next 24 months (Figures 1.16, 1.17, and 1.18). Wholesale funding (including borrowing from the central bank) represents over 40 percent of total liabilities in the euro area banking systems in aggregate; this contrasts with around 25 percent in the United States, United Kingdom, and Japan (Figure 1.19).¹¹ Moreover, reliance on ECB liquidity support has been increasing in several countries (Figure 1.20). U.S. dollar funding remains a significant funding source for European banks, but one that is subject to rapid swings from factors outside their control. This therefore remains a particular vulnerability.

¹⁰Accounting guidelines on securitizations (FAS 166 and 167) and regulation AB on ABS contributed to the trend. The weighted average maturity of the prime U.S. funds came down from around 50 days in November 2009 to around 37 days in May 2010, a substantial reduction. However, the levels were still above the lows that they had reached at the peak of the crisis in late 2008 (at around 35 days). See Chapter 2 for further discussion of systemic liquidity risk.

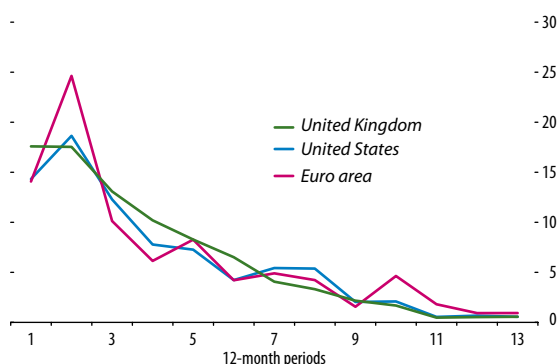
¹¹European banks make greater use of wholesale funding than their U.S. peers because their balance sheets are generally larger relative to their deposit base. In Europe, the majority of mortgages and public sector loans are held on bank balance sheets or securitized in covered bonds. In the United States, the equivalent assets are either held by government-sponsored entities, or funding was initially raised directly from the marketplace. The latter is the result of a more active municipal bond market in the United States. From an accounting perspective, there has been a stricter test for "true sale" to move assets off balance sheet under International Financial Reporting Standards (IFRS). (Under U.S. generally accepted accounting principles, the bankruptcy remoteness tests for assets off balance sheet were more lenient than under IFRS used by European banks. The implementation of FAS 166/167 in the United States has gone some way to remedy this discrepancy.) This means that U.S. bank balance sheets are inevitably leaner than those of their European peers. As a consequence, European banks have to rely more on the wholesale funding markets (and central banks) than do their U.S. peers.

Figure 1.16. Bank Debt Maturity Profile
(In billions of U.S. dollars, 12-month periods from July 1, 2010)



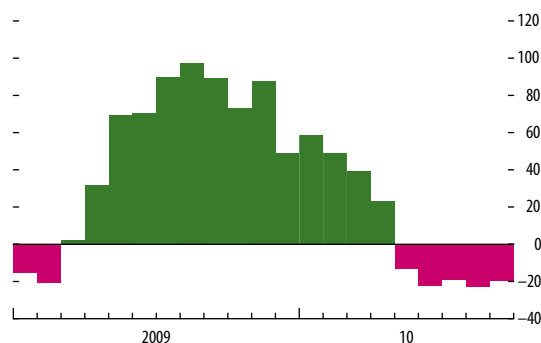
Source: Moody's.

Figure 1.17. Bank Debt Maturing as a Percentage of Total Outstanding



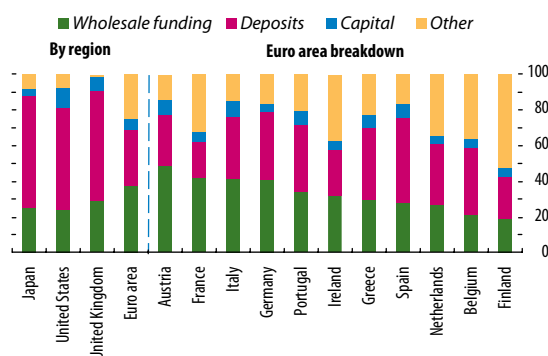
Sources: Moody's; and IMF staff estimates.

Figure 1.18. Euro Area: Bank Cumulative Net Issuance
(In billions of euros)



Sources: Dealogic; and IMF staff estimates.

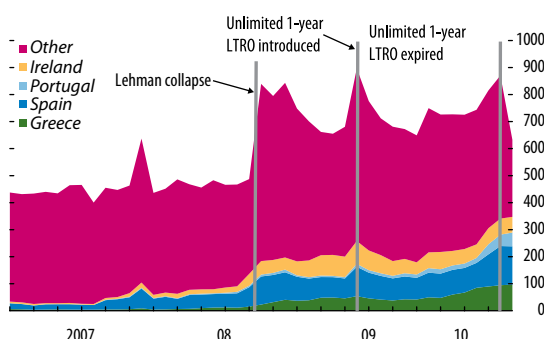
Figure 1.19. Reliance on Wholesale Funding
(Percent of total liabilities, as of end-June 2010)



Sources: Bank of Japan; European Central Bank; Bank of England; and U.S. Federal Reserve.

Note: Wholesale funding includes bonds, short-term securities, interbank financing, and central bank financing. For euro area countries, other funding includes external liabilities, defined as liabilities from outside the euro area. Data for Ireland exclude banks in the International Financial Services Centre. Data for Japanese investment banks as of end-March 2010.

Figure 1.20. European Central Bank Lending to Euro Area Monetary Financial Institutions
(In billions of euros)



Sources: European Central Bank; national central banks; and IMF staff estimates.

Note: Data for Ireland excludes International Financial Services Centre banks. LTRO = longer-term refinancing operations.

...leaving them vulnerable to a confidence shock.

With a phasing out of emergency central bank support measures, the divergence in the use of wholesale funding implies that European banks are inherently more vulnerable to a funding shock than U.S. banks. U.S. banks have also benefitted from the outright purchase of securities by the Federal Reserve, which has provided additional liquidity and reduced overall funding needs.

This refinancing may prove challenging for some banks, as it could take place at a time of unsettled markets when governments are anticipated to be issuing significant quantities of debt. In particular, some small and middle-tier banks, for which access to wholesale funding has not yet been fully restored, could face significant funding challenges going forward.

Overall, uncertainty about the economic outlook in mature economies remains particularly high, posing risks that sovereign stresses could re-emerge and negatively impact banks' access to funding markets. Bank funding costs could increase across the whole liability structure in response to a sovereign shock, in line with the experience following the increase in sovereign spreads in the first half of 2010 (Figure 1.21). As shocks would be differentiated across country banking systems and segments, individual banks may struggle to pass on the costs to customers under the terms of existing contracts, and may be forced to assume higher charges on their net interest incomes. As such, banks would be affected on both sides of the balance sheet.

The immediate policy response has led to improvement in market and funding conditions and a reduction in tail risks.

Tail risks have been reduced by unprecedented European policy initiatives—the ECB's Securities Markets Program and European Union governments' European Stabilization Mechanism—and by a frontloading of fiscal adjustment in response to market pressures. However, underlying sovereign and banking vulnerabilities remain a significant challenge amid lingering concerns about risks to the global recovery. Sovereign bond auctions in the euro area have successfully rolled over substantial maturities, albeit at higher costs.

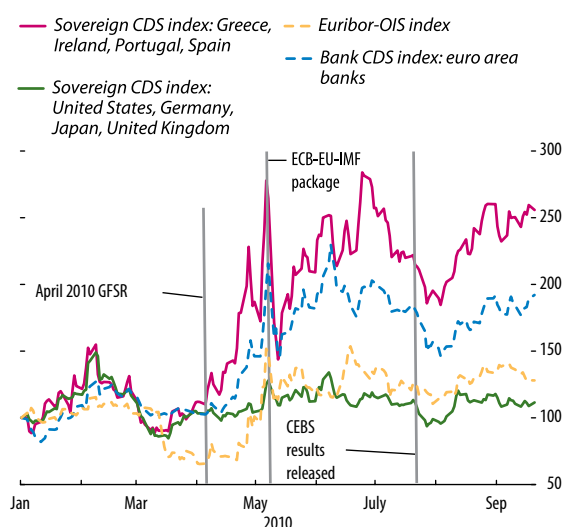
Access to funding markets for most banks has improved since late July. This easing in funding markets followed the publication of the results of the stress test on European banks coordinated by the Committee of European Banking Supervisors (CEBS).¹² The results, along with the detailed information on sovereign exposures and stress test parameters published by the authorities involved, helped to reassure markets. The more granular data gave market participants a much-needed opportunity to run their own analyses of bank strength, and thus to get into proportion some of the tail risk scenarios, based on more limited data, that had undermined confidence before the CEBS results were available. Shortly after, changes to certain aspects of the proposed Enhanced Basel II capital standards meant that banks are likely to have to increase regulatory capital in the short term by less than had been suggested in the December 2009 proposals. Top tier banks have issued significant amounts of senior unsecured debt, and many banks have been able to refinance maturing covered bonds. However, funding remains tight for some smaller banks, especially in countries where the sovereign also remains under pressure, and tiering in interbank markets remains.

Strong financial policies and adequate backstops will be important to address structural weaknesses and to reduce downside risks.

If the economy recovers as planned and sovereign and bank funding strains continue to subside, European banks should be able to repair balance sheets and gradually rebuild capital buffers. However, banks remain vulnerable to periods of renewed stress. To protect against these downside risks, bank balance sheets need to be placed on a more sustainable footing by ensuring they are well capitalized, have access to stable funding, and can earn self-sustaining margins.

Under stressed funding markets, bank creditors worry about their position in the repayment hierarchy in case of a bank default, and will strip away

Figure 1.21. Mature Market Credit Default Swap Spreads
(1/1/2010 = 100)



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

Note: OIS = overnight index swap; CEBS = Committee of European Banking Supervisors

¹²This stress test was conducted on a sample of 91 banks covering 65 percent of the total assets of the EU banking sector. In the most stringent version of that stress test, seven banks would have had Tier 1 capital ratios below the 6 percent threshold set for the exercise and would require €3.5 billion in capital. See <http://stress-test.c-ebs.org/documents/Summaryreport.pdf>.

the benefits of accounting conventions (e.g., holding government bonds to maturity).¹³ Creditors are likely to scrutinize their bank counterparties on the basis of the market value of their assets, using the most recent data they have on the assumption that these assets may have to be sold to meet repayment requirements. Accordingly, for banks to maintain access to funding markets, private creditors and investors may require them to maintain a buffer of capital in excess of standard solvency norms. Additional recapitalization and higher quality capital are still required in a number of countries to achieve this objective, and to break the sensitivity and interconnectedness between sovereign and bank balance sheets, and the correlation of market spreads.

Weaker, nonviable institutions still need to be resolved, and forced withdrawal of unprofitable capacity may still be necessary, to enable the portion of the industry that remains to become self-sustaining. In this connection, it is important that restructuring plans that have been announced in several countries be implemented rigorously and in a timely manner. This is particularly the case for segments of the banking system that have been found to have compromised business models. The German *Landesbanken*, for example, suffer from weak profitability and, in Spain, the *Cajas* sector is now undergoing substantial reform and excess capacity is being reduced. A healthy banking system also requires high-quality supervision by adequately resourced and skilled supervisory agencies, supported by an effective resolution framework.

To the extent that capital buffers cannot be built up to levels that ensure that banks have adequate access to funding markets, it is all the more important that public authorities continue to be prepared to provide capital and funding support. Our analysis suggests that the present situation is broadly manageable given existing backstop facilities in place.

However, additional public sector support for banks could, in some cases, strain public finances and risk a further rise in sovereign risk and a second-round

impact on banking systems. To arrest such a feedback loop, the EU has established and made operational the European Financial Stability Facility to support sovereign financing should further support prove necessary. In September, all three major credit ratings agencies gave the EFSF their highest possible ratings (on a provisional basis). This is a major step forward.

Funding and capital constraints—if left unaddressed—could reignite deleveraging pressures, especially within the euro area, and reestablish a negative feedback loop to the real economy.

Credit growth picked up in the first quarter of 2010 from the low levels at end-2009, but evidence from bank lending surveys suggests that the recent improvement may be temporary and credit growth may remain weak over the next year (Figures 1.22a and b).¹⁴

Under our base case, we expect credit growth to pick up after 2011, albeit to a significantly lower level than before the crisis.¹⁵ There is, however, a downside risk that funding and capital pressures could reignite deleveraging pressures. Under such circumstances, banks may find it difficult to secure all of the capital they need in markets and may look to sell assets to nonbanks, or allow them to mature. Banks could be forced to shrink balance sheets in order to alleviate pressures in funding markets, which risks pushing the deleveraging process into a fresh, more difficult phase.

Furthermore, such deleveraging would have a cross-border dimension reflecting the reliance of some banks on external funding. As capital markets become more focused on the relatively healthy financial systems, recycling savings away from weaker countries, this could add to stability strains in those countries that have vulnerable banks and the biggest debt burdens. The process could be strained further if large bank redemptions in coming quarters cause cash to be re-deposited in safe haven, rather than higher risk, countries within the euro area. So far, the ECB has provided substantial support

¹³Some recent analyses of the European banking sector that mark-to-market sovereign exposures in both the trading book and the banking book have been published by independent bank analysts (Keefe, Bruyette and Woods) and several investment banks (Barclays, Goldman Sachs, JP Morgan and RBS).

¹⁴Previous GFSRs have shown that nonbank credit provides a limited cushion for a pullback in bank credit.

¹⁵The capital standards and transition paths agreed by the Basel Committee Governors and Heads of Supervision at their July 26 meeting (www.bis.org/press/p100726.htm) should help support bank credit extension in the near term. However, deleveraging will likely continue for some years.

through refinancing of some country banking systems as well as purchases of government bonds through the SMP. However, a growing reliance would not indicate a return of confidence. Accordingly, it is important for national authorities to ensure that deep reforms of weak banking segments are addressed to fully restore confidence, reduce deleveraging pressures, stabilize funding markets (including across borders) and strengthen credit intermediation.

Cross-border outflows from CEE and CIS countries have been accompanied by a contraction in domestic credit.

Cross-border pressures have also been at play in the CEE and CIS countries. In contrast to other emerging market regions, many of these countries continued to see cross-border bank outflows through the first quarter of 2010, as western European parent banks continued to shed exposures to the region. This reflects a number of factors—including weak credit demand, funding strains, growing sovereign concerns, and regulatory pressures to increase capital adequacy ratios—as well as some intragroup flows within international banking groups (Figures 1.23 and 1.24).¹⁶

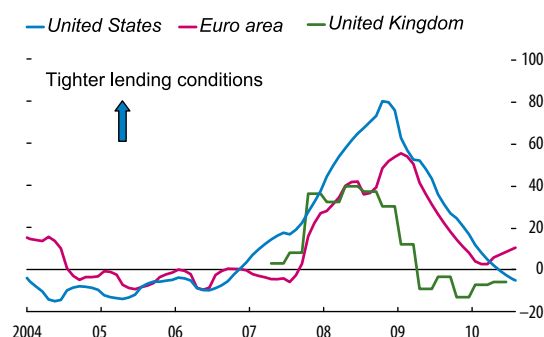
Credit growth has contracted or remained weak in countries that have seen the largest cross-border bank outflows (Figure 1.25). These outflows have tended to be in countries where subsidiaries have been more dependent on parent banks for funding, and where demand for credit has remained subdued. In countries with a higher degree of domestic bank ownership and/or larger domestic markets, such as Poland, Russia, and Turkey, there has been a pick-up in credit growth in recent months.

Challenges also remain for U.S. banking systems, as the real estate sector is prone to a double dip, exposing pockets of vulnerability.

In the United States, financial stability has improved but pockets of vulnerability remain in the banking system. Notwithstanding weak growth, high unemployment and record high charge-off rates, the expected capital drain for banks appears manageable on an industry-wide basis, as banks have been able

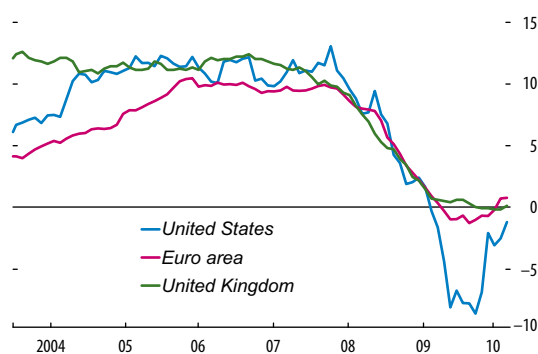
¹⁶Mitigating this, foreign bank lending from their local subsidiaries in CEE held up relatively well during the crisis.

Figure 1.22a. Lending Conditions
(Net percentage of domestic respondents tightening standards for loans)



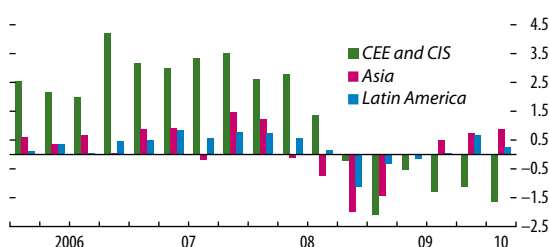
Sources: Lending surveys by the Bank of England, European Central Bank, and the U.S. Federal Reserve for households and corporates; and IMF staff estimates.

Figure 1.22b. Bank Lending to Private Sector
(In percent, year-on-year)



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

Figure 1.23. Bank for International Settlements Cross-Border Bank Flows by Region
(Percent of annual GDP, unweighted country average)

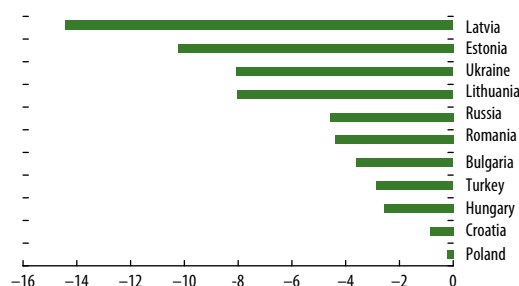


Sources: Bank for International Settlements; IMF, World Economic Outlook database; and IMF staff estimates.

Note: Locational statistics. CEE = central and eastern Europe. CIS = Commonwealth of Independent States.

Figure 1.24. Bank for International Settlements Cumulative Cross-Border Bank Flows by Country

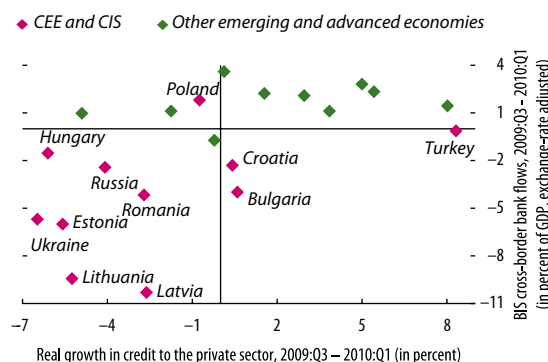
(As a percent of 2008 GDP for the 2008:Q4 – 2010:Q1 period)



Sources: Bank for International Settlements; IMF, World Economic Outlook database; and IMF staff estimates.
Note: Locational statistics.

Figure 1.25. Cross-Border Bank Flows and Local Credit

(In percent)



Sources: Bank for International Settlements (BIS); IMF, International Financial Statistics and World Economic Outlook databases; Central Bank of Brazil; European Central Bank; and IMF staff estimates.
Note: BIS locational statistics. CEE = central and eastern Europe. CIS = Commonwealth of Independent States.

to raise a substantial amount of capital.¹⁷ However, it will take time for banks to clean up their balance sheets. There is much uncertainty about banks' earnings outlook, as well as the shape of their credit loss profiles. Furthermore, as the recovery proceeds, banks may need to raise additional capital to comply with U.S. regulatory reform and other international initiatives, which are likely to put further pressure on retained earnings.

The outlook for both residential and commercial property appears to be particularly uncertain. To assess these risks, we conducted a stress test of the top 40 bank holding companies in the United States (Box 1.3). We found that, in an adverse scenario where real estate prices fell significantly, banks would require a total of \$13 billion in additional capital in order to maintain a 4 percent Tier 1 common capital ratio.¹⁸ Mid-sized banks are particularly vulnerable because it may be more difficult for them to raise capital.

In this scenario, credit growth could remain limited for some time. Our results suggest that, in the baseline scenario and in the absence of additional capital injections, credit growth could average around 10 percent for 2010–12, which is substantially lower than historical levels.¹⁹ In the adverse scenario, average credit growth could be around 8 percentage points for the forecast horizon.

¹⁷For example, since the publication of the U.S. authorities' Supervisory Capital Assessment Program (SCAP) stress tests, the participating institutions raised over \$210 billion in capital, 55 percent of which is in common equity.

¹⁸The recent stress test conducted for the U.S. Financial System Stability Assessment found that under the baseline scenario, three SCAP institutions would require \$7 billion in additional capital to maintain a 6 percent Tier 1 common equity ratio over 2010–14. A number of regional and smaller banks would also face capital shortfalls due to their high exposure to commercial real estate losses. In an adverse scenario, the capital shortfall increases to \$32 billion to maintain a less stringent 4 percent Tier 1 common equity ratio until end-2014 (IMF, 2010d, p. 9). The stress test results reported in Box 1.3 entailed a 6 percent Tier 1 capital hurdle.

¹⁹Credit growth rates averaged around 23 percent over 1993–96 (following the savings and loan crisis) and 15 percent over 2004–07 (after the 2002–03 recession).

Box 1.3. Risks of a Double Dip in the U.S. Real Estate Markets

The stabilization of U.S. real estate prices remains fragile, and negative macro-financial spillovers could cause a double dip in real estate. U.S. residential house prices fell by over 30 percent between 2006 and 2009, and the value of commercial properties has dropped by over 40 percent since early 2007. The outlook remains weak, with the latest home price expectation survey showing a 1.7 percent decrease in 2010 and an average 1.8 percent increase in 2011–12.

Large uncertainties surround real estate price forecasts (Tsounta and Klyuev, 2010). On the upside, real estate activity, which is at historically low levels, could recover faster than expected, while loan restructurings help dampen foreclosure pressures. The inventory of unsold new houses has already dropped by 37 percent to about eight months of supply, and affordability indicators are at new-record highs. On the downside, poor labor market conditions, sluggish growth, and rising delinquencies could restart an adverse feedback loop of rising foreclosures, falling prices, more redefaults, and tighter financial conditions, which could ultimately lead to a double dip in real estate.

Although manageable from a financial stability perspective, a double dip in real estate could have a long-lasting impact on the economic recovery. Limited data and high interconnectedness across risk factors have made it particularly difficult to assess the severity of negative macro-financial spillovers. In the short term, most banks appear in a position to absorb a further deterioration in real estate, partly due to their strong recapitalization (and likely ability to continue to tap capital markets) but also because of their efforts to dampen the flow of properties going into foreclosure through loan modifications and extensions. But unless real estate prices recover materially over the coming quarters, these efforts may defer rather than avoid future foreclosures, adding to the large “shadow inventory” of properties for sale and hence depressing the recovery of real estate prices for some time to come, with negative implications for banks’ ability to support growth going forward.

For residential real estate (RRE), powerful downside risks to house prices include:

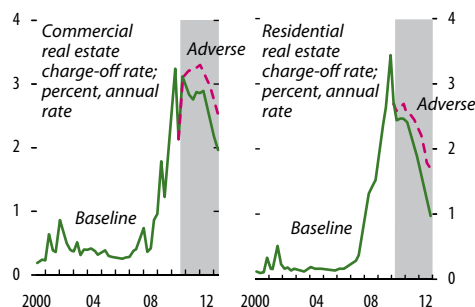
- *A low demand for houses.* Continued high unemployment, waning consumer confidence, and tighter underwriting standards could continue to discourage buyers from entering the residential market. The April 2010 expiration of the home-buyers’ tax credit may also have brought forward sales, which could further depress activity in the coming quarters.
- *A high rate of foreclosures.* Today, one in every seven homeowners with a mortgage is at least 30 days late on payment or already in foreclosure. Foreclosures in 2010 are expected to easily surpass the all-time record of 2.8 million in 2009. Foreclosed properties, which accounted for a third of home sales in the past year, sold at a discount of around 35 percent and lowered house prices and crystallized losses on banks’ RRE exposures of \$2.2 trillion.
- *An even larger “shadow inventory” of houses for sale.* Although loan modifications and the recent stabilization of house prices have managed to bring down banks’ loss rates on RRE loans, which are believed to have peaked at end-2009, they did little to reduce the large gap between the rate of foreclosures and that of seriously delinquent mortgages (90 days or more past due), suggesting a significant pent-up supply of future houses for sale (see panel of figures).
- *A high rate of redefault on modified mortgages.* In addition, recorded delinquency rates may underestimate the actual flow of houses potentially going into foreclosure, as they do not account for efforts to modify loans of creditworthy borrowers. These modifications, however, have left borrowers with high debt service-to-income ratios (64 percent in the case of the Home Affordable Modification Program). At end-March 2010, almost 60 percent of modified residential loans had already redefaulted. This high redefault risk on modified loans suggests that the shadow inventory of houses for sale could be larger than that suggested by standard foreclosure and delinquency measures.
- *A rise in “strategic defaults.”* Over one-third of residential foreclosures are believed to be “strategic,” in the sense that borrowers were current on their loan payments but walked away because the value of their property was worth less than its debt (Chicago Booth/Kellogg School, 2010). This figure could rise further, if the number of mortgages with negative

Note: This box was prepared by Ivailo Arsov, Andrea Maechler, and Geoffrey Keim. The authors are grateful to Evridiki Tsounta for her insightful suggestions and background material.

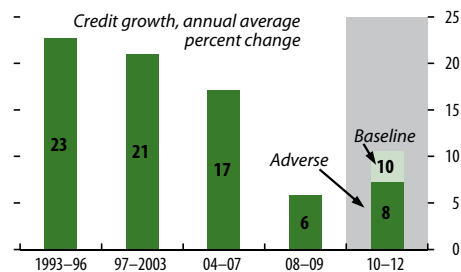
Box 1.3 (continued)

Risks Emerging from Real Estate Sectors

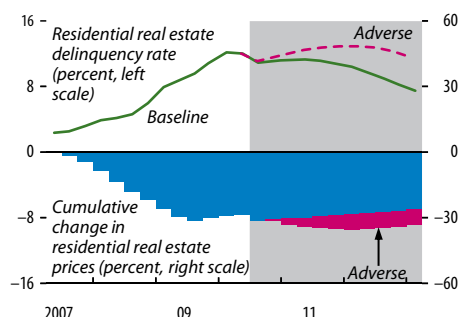
Real-estate loan charge-offs are expected to remain high throughout the forecast period...



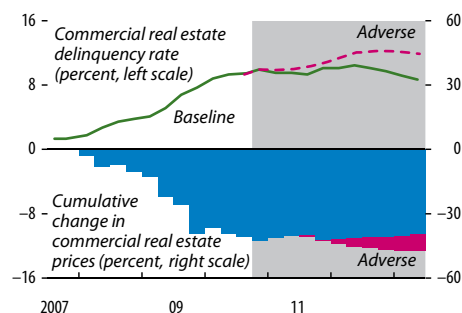
... contributing to weak post-recession credit growth relative to historical standards.



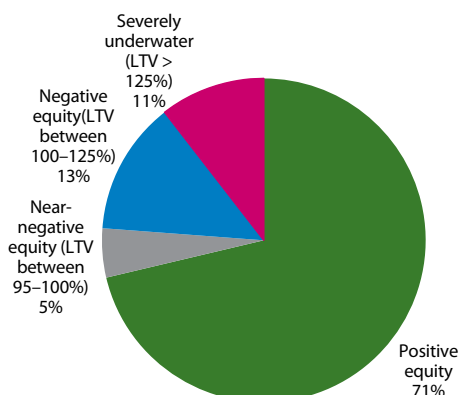
House prices are expected to recover only slightly, contributing to high delinquencies and losses...



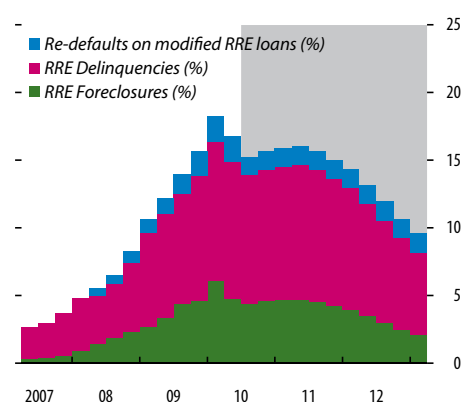
... a similar situation is expected for commercial real estate...



Already, a sizable fraction of borrowers owe more on their loan than their house is worth...



... which could add to an already high shadow inventory of foreclosed homes.



Sources: First American Core Logic; Haver Analytics; SNL Financial; Board of Governors of the Federal Reserve System; and IMF staff estimates.
Note: RRE = residential real estate.

equity continues to grow and the behavior becomes more socially acceptable (see panel figure on residential real estate delinquency). Lenders seem ill-prepared for this risk, which is not well captured in most risk models and provisioning rules.

The outlook for commercial real estate (CRE) appears even more fragile, as property owners are struggling with low cash flows from poor retail performance, rising vacancies, and falling rent. Other risk factors include:

- *High refinancing risk due to high loan-to-value ratios.* Banks face about \$1.4 trillion in CRE loans expected to mature in 2010–14, nearly half of which are seriously delinquent or “underwater” (with a loan value exceeding the property value) (COP, 2010). For example, the unpaid percentage of loans scheduled to mature in 2010 reached 36 percent, or three times higher than for loans that matured one year earlier, with the greatest difficulty involving five-year loans, where the unpaid balance reached 46 percent.
- *A high rate of CRE loan extensions.* In an attempt to break the cycle and support viable borrowers, banks have increasingly restructured or extended CRE loans reaching maturity, as confirmed also in the responses to the April 2010 Senior Loan Officer Opinion Survey (Board of Governors of the Federal Reserve System, 2010).
- *A high rate of redefault on CRE loans.* If conditions do not improve materially in the coming quarters, these

restructurings, which affected around 4.8 percent of total CRE delinquent loans at end-March 2010, will exacerbate the future bunching up of delinquent or underwater loans in need of refinancing, with negative consequences for bank losses, financial conditions, foreclosures, and property values.

A stress test of the top 40 U.S. bank holding companies, which used an adverse scenario, showed that 5 banks would require \$13 billion in additional capital to maintain a 4 percent Tier 1 common capital ratio (see table). This scenario, which affected banks’ entire loan book, also assumed real GDP growth to slow to 1.2 percent in 2011, with unemployment hovering above 9 percent over the test horizon. Negative macro-financial linkages led to a cumulative 6 and 19 percent cumulative fall in RRE and CRE prices, respectively, over the test horizon (around 10 percentage points lower than under the baseline). While in the short term RRE loan modifications, which amounted to 2.5 percent of total RRE loans, depressed banks’ charge-off rates below their end-2007 peak of 2.7 percent, redefaults, which affected 65 percent of all modified loans, kept them elevated at around 2 percent until end-2012. In CRE, despite heavy loan restructuring, poor economic conditions and falling loan-to-value ratios continued to raise charge-off rates, which reached 3.3 percent at end-2011, while redefaults slowed down their normalization in the outer years.

Capital Needs of 40 U.S. Bank Holding Companies: Adverse Real Estate Scenario, 2010–12

(In billions of dollars except as noted otherwise)

	Top Four (4)	Regional (8)	Midsize ¹ (16)	Total U.S. (40)	SCAP (18)
Tier 1 common capital/risk-weighted assets ratio²					
4 percent	0.0	0.2	12.9	13.1	7.3
6 percent	37.0	3.4	16.3	56.7	49.7
Number of banks requiring injection					
4 percent	0	1	4	5	1
6 percent	2	3	10	15	5
Tier 1 capital/risk-weighted assets ratio					
6 percent	0.0	0.0	2.6	2.6	0.0
8 percent	34.1	0.2	3.5	37.7	34.1
Number of banks requiring injection					
6 percent	0	0	2	2	0
8 percent	2	1	3	6	2

Source: IMF staff estimates.

Note: SCAP = Supervisory Capital Assessment Program.

¹Banks with assets greater than \$10 billion.

²Tier 1 common capital deducts all “noncommon” elements of Tier 1 capital (i.e., qualifying minority interest in consolidated subsidiaries, qualifying trust preferred securities, and qualifying perpetual preferred stocks).

Much of the credit risk in housing has been shifted to the GSEs.

While the capital needs of U.S. banks appear manageable, this has resulted from significant mortgage-related losses being absorbed by the GSEs (Fannie Mae and Freddie Mac) and other government interventions. Without these actions to absorb losses and balance sheet risks, U.S. bank capital needs would be substantially higher. Private bank balance sheets benefit from several sources of official sector assistance. First, the GSEs, together with the Federal Housing Administration (FHA), accounted for 95 percent of mortgage-backed security issuance in the first half of 2010, and are instrumental in facilitating mortgage modifications. As of end-June 2010, the GSEs received \$148.5 billion in senior preferred capital injections from the U.S. Treasury, with substantially more anticipated.²⁰ Second, the reserves of the FHA have fallen \$11 billion below their congressionally-mandated minimum level.²¹ Third, the Deposit Insurance Fund of the Federal Deposit Insurance Corporation (FDIC) was in deficit by \$15.2 billion as of June 2010 and will face further challenges in dealing with the remaining large number of problem banks and in generating the fees needed to reach its new target ratios.²²

The U.S. administration has launched a public consultation on GSE reform and is committed to proposing legislation in 2011 (see Annex 1.5). The necessity of reform is highlighted by analysis for the U.S. Financial Sector Assessment Program (IMF, 2010d). Calculating joint probabilities of distress from

CDS movements, the analysis found a disproportionate share of extreme unexpected losses in the system in 2008–09 attributable to the GSEs despite the various federal support measures. GSE reform is therefore critical to perceptions of the creditworthiness of the U.S. government.²³

Japanese banks have low capital and weak profitability, and continue to be exposed to equity market volatility.

There are two key vulnerabilities in the Japanese banking system, apart from the risk of an interest rate spike for regional banks discussed previously. First, Japanese banks have been facing depressed profitability that has limited their ability to rely on retained earnings to support capital adequacy going forward. In the current low interest rate environment, net interest margins—the prevailing component of banks' profits—remain heavily depressed, putting significant downward pressure on domestic profitability. As a result, banks are under increasing pressure to enhance profitability through a shift in business models, such as increasing reliance on fee-generating income or overseas expansion. Second, a stock market downturn could put pressure on Japanese banks' profitability and capitalization, given that they remain exposed to equity market volatility. Large banks' equity investments, on average, still account for more than 75 percent of tangible common equity, against less than 10 percent across large banks internationally. Regional banks also have relatively high equity exposures, with equity investments at 36 percent of tangible common equity.²⁴

Policymakers should concentrate on strengthening their banking systems.

As the discussion above has shown, adverse scenarios cannot be ruled out in Europe, the United States, and Japan. The policy section discusses in detail the policy priorities to ensure financial stability.

²⁰The Treasury is committed to providing uncapped capital support through 2012 and capped but large amounts thereafter. Estimates of the potential total cost of the GSE bailout to the taxpayer, using varying assumptions, range from \$160 billion to \$1 trillion. The estimates (shown with their source and date) include \$160 billion (Office of Management and Budget, February 2010); \$290 billion (Credit Suisse, May 2010); \$389 billion (Congressional Budget Office, August 2009); \$500 billion (Barclays Capital, December 2009). Agency mortgage-backed securities and debt are still rated AAA due to government support, and almost zero risk-weighted (0.8 percent) for bank capital purposes.

²¹The FHA insures lower-credit-quality mortgages with low down-payments that are then securitized by Ginnie Mae.

²²The Dodd-Frank reform act raised the minimum target ratio for the insurance fund to 1.35 percent of insured deposits, to be met by September 2010. Currently this would require FDIC-insured banks to contribute \$88.5 billion.

²³Transparency would be enhanced by placing the GSEs "on-budget" to reflect the economic reality of their control by the U.S. government (CBO, 2010).

²⁴Banks have made some progress in reducing equity cross-holdings, but the process has been relatively slow. The level of stock holdings among domestic banks stood at ¥18.4 trillion at end-May 2010 against ¥21.2 trillion at end-2007.

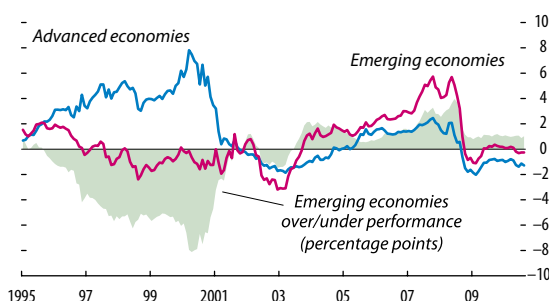
D. Managing Risks to Emerging Markets

Emerging market policymakers are facing greater challenges navigating risks that are differentiated across and within regions. Some countries in emerging Europe face greater downside risks from potential spillovers from the sovereign and banking sectors in Europe. In other regions with stronger trade links to advanced countries and less access to international capital markets, economies are still recovering from deep downturns, and there are mounting concerns over a growth slowdown in advanced countries. In contrast, some countries in Asia and Latin America continue to experience a potential buildup of risks stemming from strong capital inflows. Countries experiencing stronger growth, more favorable interest rate differentials, and/or greater openness to foreign portfolio capital are seeing inflows resulting from global asset reallocation by institutional investors. This could increase volatility in portfolio capital flows and strain local market valuations.

The crisis in advanced countries has shifted perceptions of risk-reward in favor of emerging markets assets...

The escalation of the euro area sovereign turmoil in early-2010 reinforced the favorable risk-return profile of emerging markets on a relative basis.²⁵ On a risk-adjusted basis, emerging market equities have outperformed mature market counterparts since mid-2003, partly reflecting their diverging macroeconomic fundamentals (Figure 1.26).²⁶ This dynamic is also evident in the decoupling in rating changes for advanced and emerging sovereigns, which favor the latter (Figure 1.27a). Developed country sovereigns have experienced 25 downgrades since early 2008, while emerging market sovereigns have seen 21 upgrades during 2010, concentrated in Latin America. This trend is set to continue, particularly as public debt levels in emerging markets are expected to near pre-crisis lows

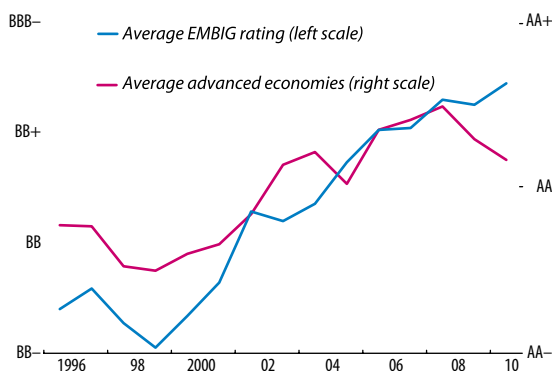
Figure 1.26. Emerging and Advanced Economies' Equity Returns
(In percent)



Sources: Bloomberg L.P.; Morgan Stanley Capital International; and IMF staff estimates.

Note: Volatility-adjusted returns, calculated as three-year rolling log returns divided by three-year historical standard deviation of returns.

Figure 1.27a. Sovereign Ratings

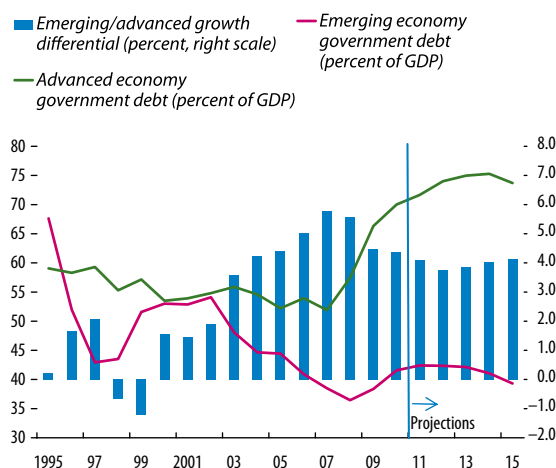


Sources: Moody's; Standard & Poor's; and IMF staff estimates.

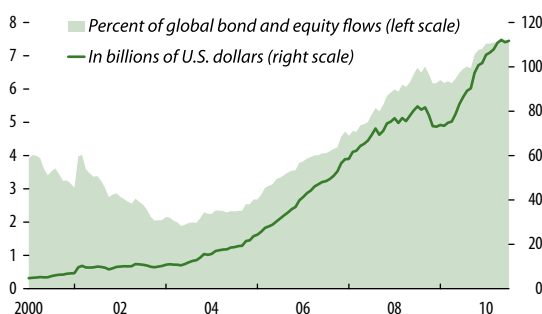
Note: EMBIG = Emerging Markets Bond Index Global.

²⁵Partly reflecting this trend, issuance of external bonds, equities and loans by emerging and other economies has rebounded following a sizable drop in April-May.

²⁶Similarly, risk-adjusted total returns of emerging market sovereign external bonds began outperforming those of global investment-grade corporate bonds in 2004. The former's performance remained somewhat superior to the latter's as markets were sold off around Lehman's bankruptcy, but has lagged since mid-2009 as major developed markets rebounded.

Figure 1.27b. Government Debt and Growth Differential

Sources: IMF, World Economic Outlook database (gross government debt, median of individual country ratios); and IMF staff estimates.

Figure 1.28. Cumulative Net Foreign Flows to Emerging Market Bond and Equity Funds

Sources: BNY Mellon iFlowSM data; and IMF staff estimates.
Note: Flows are cumulated from January 1997.

in the next few years (Figure 1.27b).²⁷ In contrast, debt levels are projected to remain elevated in the near future for advanced economies.

...contributing to an apparent reallocation of assets toward emerging markets...

Custodial flow data, which reflect the activity of institutional global investors, point to an ongoing portfolio reallocation of assets toward emerging markets and away from mature economies.²⁸ The share of flows to emerging market bond and equity instruments started increasing in 2003, supported by the outperformance of emerging market assets on a risk-adjusted basis (Figure 1.28).²⁹ Since then, the share of portfolio flows to emerging market assets has almost quadrupled. Most of the growth can be attributed to equity inflows, with Asia registering the sharpest increase. Among bond inflows, Latin America exhibited the fastest growth, followed by Asia, and then emerging Europe, the Middle East, and Africa (EMEA), where outflows became persistent after 2007 coinciding with the global credit crisis. Overall institutional investor flows to emerging markets remained strong in Asia and Latin America. In addition, retail inflows to funds dedicated to emerging market equities have outperformed mature market counterparts since the start of the global credit crisis, and retail flows to emerging market bond funds have also increased sharply, bolstered by carry-trade incentives.³⁰

²⁷Declining public debt levels are a key factor underpinning the improvement in emerging market credit ratings (Jaramillo, 2010).

²⁸Various tests indicate that the custodial flow of information is fairly consistent with the official balance of payments data, at least on emerging markets. See Annex 1.3.

²⁹Cumulative institutional investor flows to emerging market bond and equity instruments were about \$105 billion during January 2003–June 2010 based on BNY Mellon iFlowSM data. Cumulative retail investor flows to emerging market bond and equity funds reported by Emerging Portfolio Fund Research (EPFR) for the same period were at about \$165 billion. BNY Mellon iFlowSM flows tend to exhibit less volatility than the EPFR flows. The higher share of emerging markets may also be attributed to the change in BNY Mellon iFlowSM data composition, with more countries covered, and greater penetration within the countries.

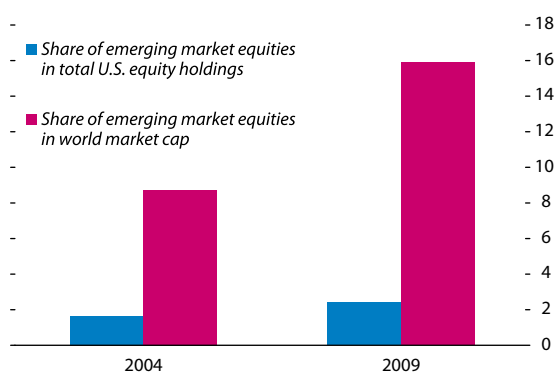
³⁰In addition, emerging markets are gradually being included in global asset indices. For instance, Citigroup announced the inclusion of Mexico on its World Government Bond Index (WGBI) earlier this year, and is monitoring Indonesia, the Philippines, Taiwan Province of China, and Thailand for potential

There is scope for additional sizable asset reallocation to emerging markets, which could be overwhelming in some cases. Institutional investors worldwide have not yet adopted a global approach in their equity allocation process (MSCI Barra, 2010). For example, U.S. investors are heavily underweight non-U.S. equities (especially emerging markets) relative to an allocation based on market capitalization (Figure 1.29a).³¹ The reallocation of a small proportion of financial assets of advanced countries could have very large effects on emerging market countries. Total emerging market assets only account for around 2 to 7 percent of real money portfolios currently. A 1 percentage point reallocation of global equity and debt securities held by G-4 real money investors, which amounts to about \$50 trillion, would result in additional portfolio flows of \$485 billion. This would be larger than the record annual portfolio flows to emerging markets of \$424 billion recorded in 2007 (Figure 1.29b). Countries receiving a larger share of these flows relative to the size of their markets could face significant challenges. Poland and Indonesia rank highest among emerging markets receiving large portfolio flows relative to the size of their domestic markets (Figure 1.30).³² The potential pressure would be mitigated by the likely gradual nature of such a portfolio reallocation.³³

...potentially leading to underpricing of risk.

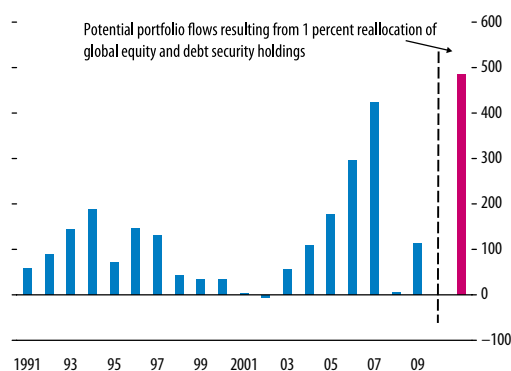
The prospect of heavy capital inflows could be destabilizing. Prior research suggests that the combination of large capital inflows and accommodative monetary policy raises the risk of asset-price, boom-bust cycles (IMF, 2010a, pp. 26–28). There is, in particular, an obvious risk that, in the absence of appropriate reform measures, credit may be extended

Figure 1.29a. Emerging Market Equities Market Capitalization and Investor Allocations
(In percent)



Sources: Bloomberg, L.P.; IMF Coordinated Portfolio Investment Survey; Federal Reserve; and IMF staff estimates.

Figure 1.29b. Portfolio Flows to Emerging Markets and Developing Countries
(In billions of U.S. dollars)



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

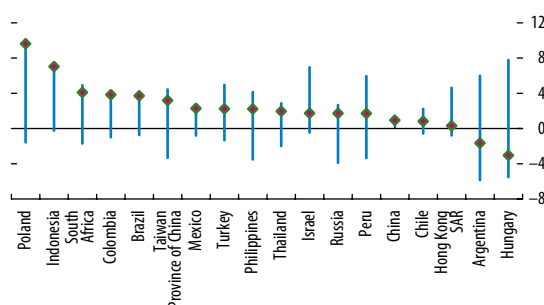
inclusion. Poland (2002), Singapore (2004), and Malaysia (2006) are already included in the index.

³¹In some cases, this also reflects barriers to entry for foreign investors. “Home bias” in equity allocation is also pronounced in the euro area and Japan, suggesting eventual scope for additional portfolio reallocations to emerging markets.

³²The inclusion of an emerging market economy into an index can also trigger outsized portfolio reallocations. For instance, Mexico’s inclusion in Citigroup’s WGBI could result in a one-off doubling of annual debt inflows.

³³A diversification in the composition of investors to real money accounts with long investment horizons could also help to reduce the volatility of outflows.

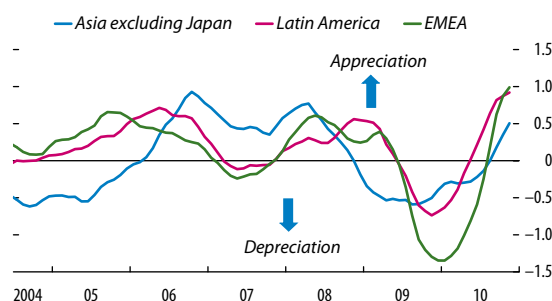
Figure 1.30. Equity and Debt Portfolio Inflows
(Percent of equity market capitalization and debt outstanding)



Sources: Bloomberg L.P.; IMF, International Financial Statistics database; and IMF staff estimates.

Note: Lines indicate ranges of portfolio flows (four-quarter trailing average) during 2003:Q4–2010:Q1, as percent of average equity market capitalization and debt outstanding during this period. Diamonds are 2010:Q1 values. 2009:Q4 for China, Colombia, Hong Kong SAR, Hungary, Israel, Mexico, and Peru.

Figure 1.31. Nominal Effective Exchange Rate Performance
(Z score)



Sources: IMF, International Financial Statistics database; and IMF staff estimates.

Note: Year-on-year change in nominal effective exchange rates is normalized to a z score for individual countries and combined into unweighted regional averages. Showing six-month moving average. EMEA = Europe, Middle East, and Africa.

out of highly leveraged funding. As highlighted in the April 2010 GFSR, accommodative monetary policies in core markets and ample global liquidity propelled flows toward emerging markets that had prospects of stronger growth, currency appreciation, and better asset performance. Given prospective monetary policy developments in the United States and other major markets, this trend is likely to continue. Part of the inflows may result in “herding,” where portfolio allocation is made simply on the basis of what other investors already do, and “crowded trades,” where a large share of investors hold the same belief that the asset price should appreciate in the short run.

Investors flow data suggest emerging markets tend to suffer from herding behavior.

Econometric results suggest portfolio flows to emerging markets tend to be persistent and have high degrees of autocorrelation, when measured over a time horizon of up to several months (Annex 1.3). High persistence in flows is often attributed to herding behavior. Inflows were found to be particularly persistent in Brazil, Indonesia, and Korea—countries where the authorities have also introduced measures to mitigate the impact of capital flows. Potentially reflecting this herd behavior, there is some evidence of a self-reinforcing cycle between inflows and returns. Specifically, the model shows that inflows to emerging markets increase in response to higher returns and lower volatility of returns, and that higher inflows reinforce the increase in risk-adjusted returns. This is consistent with circumstantial evidence that unfulfilled demand from foreign investors for local currency assets may have reduced market volatility and made local assets more attractive from a risk/return perspective. The data also show that an increase in persistence of flows tends to be followed by flow reversals. Therefore, statistical measures of persistence from high-frequency datasets could be useful as an early warning indicator for gauging the likelihood of sudden stops.

Macroeconomic policies to cope with strong capital flows may pressure exchange rates and local prices...

There are various macroeconomic policies that can be deployed to address the effects of capital inflows, including exchange rate appreciation, reserve accumulation, and tighter fiscal policy, though these come with

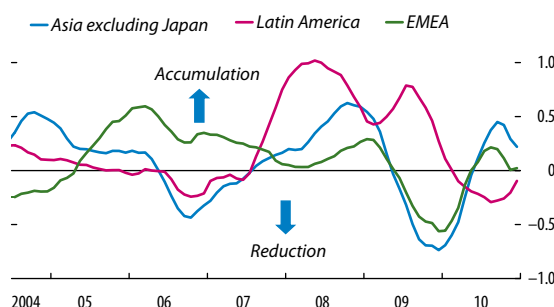
trade-offs. In line with capital flow pressures, emerging market exchange rates have appreciated in nominal effective terms (Figure 1.31).³⁴ While one response to a surge in capital inflows may be to allow currency appreciation, some countries have elected to intervene in currency markets to reduce exchange rate volatility and resist currency appreciation. This appears to be broadly the case for Asia, where currencies have appreciated by less than in other regions, but the pace of reserve accumulation has remained relatively high (Figure 1.32). At the same time, Asian monetary authorities are believed to have sought to sterilize the impact of rising reserves to a greater extent, in an effort to limit upward pressure on domestic liquidity and prices (Figure 1.33).

...which may be partially mitigated by macro-prudential measures.

A stronger prudential framework can also help mitigate the adverse consequences of surging capital inflows. Prudential measures can complement macroeconomic policies to limit a buildup of financial vulnerabilities related to, for instance, banking sector leverage, short-term foreign capital inflows, or foreign currency exposures. These measures can focus on individual institutions or the financial system as a whole, and take the form of quantitative and qualitative standards on capital adequacy, risk management, asset concentration, and liquidity, among others. In China, measures taken by the authorities have helped engineer a slowdown in the local real estate and credit markets, even though a precipitous decline in property prices may increase risks to the local banking system (Box 1.4). Indonesia's policy package has been effective in reducing foreign participation in the most volatile segment of the local fixed-income market, although after an initial decline inflows have started to pick up again. Measures by the Korean authorities may help to reduce volatility in local banks' short-term external borrowings and narrow the maturity mismatch between dollar assets and liabilities.

As a last resort, other measures to limit capital inflows may also need to be considered, taking into

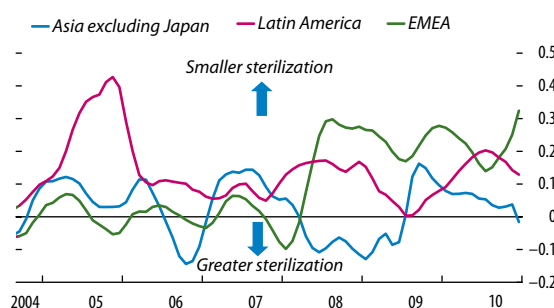
Figure 1.32. Change in Official Reserves
(Z score)



Sources: IMF, International Financial Statistics database; and IMF staff estimates.

Note: Year-on-year change in reserves is normalized to a z score for individual countries and combined into unweighted regional averages. Showing six-month moving average. EMEA = Europe, Middle East, and Africa.

Figure 1.33. Sensitivity of Money Supply to Central Bank Foreign Assets
(Slope coefficient)



Sources: IMF, International Financial Statistics database; and IMF staff estimates.

Note: Slope of one-year rolling regression of year-on-year changes in M2 on those in central bank net foreign assets. Showing three-month moving average. See Annex 1.3 of the October 2007 *World Economic Outlook* for the underlying model. EMEA = Europe, Middle East, and Africa.

³⁴Variables are broadly similar to the components of the exchange market pressures index, which combines movements in the bilateral exchange rate and international reserves (see IMF, 2007).

Box 1.4. China's Banking System: Managing Challenges after Credit Expansion

After a period of rapid credit expansion in 2009, the Chinese authorities have started to withdraw stimulus measures, in part to contain the build-up of credit risk and avoid potential ripple effects to the rest of the economy. In particular, the authorities are taking measures in both the real estate sector and local government financing platforms (LGFPs) to limit potential risks to the banking system.

To address concerns of an over-heated real estate sector in late 2009 and early 2010, the Chinese authorities introduced a wide range of measures to curb real estate-related risks. These include (1) an increase in minimum down payment for home buyers that purchase first homes larger than 90 square meters; (2) a reduction in maximum loan-to-value (LTV) ratios and increase in mortgage interest rates for second and third home buyers; (3) discouraging lending to third home buyers, particularly in selected high price areas; (4) in-depth scrutiny of developers' practices, including new rules against hoarding of housing units; and (5) mandating the withdrawal of state-owned companies from non-core property market operations.

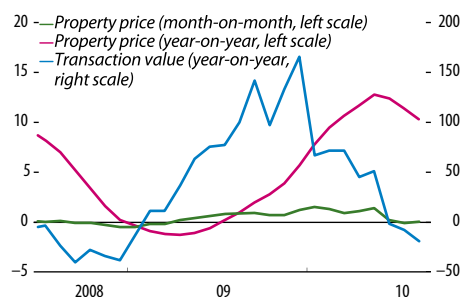
As an early response to these measures, the property market started to show signs of cooling. Aggregate property prices leveled off and transaction values have declined (first figure). Both developer and mortgage lending have slowed year-on-year, with developers forced to rely more heavily on self-raised funding (second figure). However, a potentially sharper-than-expected property price contraction could still lead to an upsurge in non-performing loans, both in the real estate sector and in industries dependent on property markets such as steel, concrete, and construction materials.

At the provincial level, the rise of LGFP borrowing during the 2009 government-led stimulus has also increased potential bank credit risks going forward. The number of LGFPs—investment enti-

Note: This box was prepared by Hui Jin.

China: Change in Property Price and Transaction Value

(In percent)



Sources: CEIC, national authorities; and IMF staff estimates.

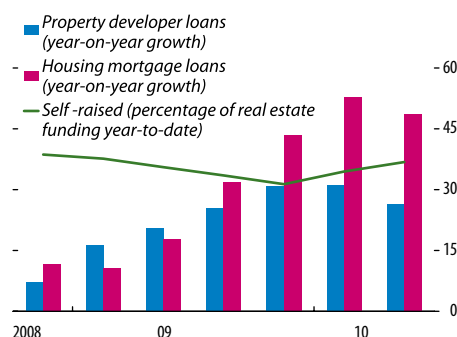
ties set up by local governments to support project financing, particularly in infrastructure—grew very rapidly in the recent period after relatively limited activity in the past. Local governments—which face sizable fiscal constraints and legal restrictions on bank borrowing and bond issuance—established LGFPs to fund projects and support the development of the local economies.¹ Typically, LGFPs were set up via the initial injection of capital—including land (third figure)—often also supported by implicit government guarantees to attain financing on favorable terms.² A sharper-than-expected property market correction could thus trigger a negative spillover to LGFPs, as banks adjust down land collateral valuations or halt debt rollovers. More fundamentally, the surge in funding to LGFPs has also raised concerns regarding the economic viability of some of the more marginal projects funded through LGFPs.

¹The tax reform of 1994 revamped the tax distribution system and directed a higher proportion of tax revenues to the central government.

²The initial capital typically takes the form of government-owned land, cash, or shares of state enterprises.

China: Real Estate Funding

(In percent)



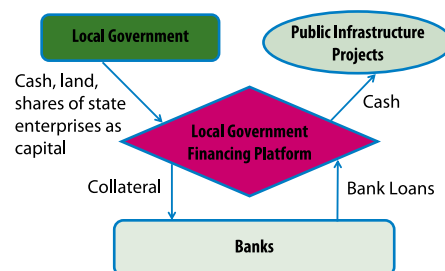
Sources: CEIC; national authorities; and IMF staff estimates.

Moreover, the absence of a comprehensive framework on LGFP financing operations poses a concern about the size and quality of bank exposures to these entities. First, estimates of the scale of LGFP-related lending vary considerably due to the lack of a consistent definition of LGFPs and the paucity of data on their operations and borrowing activities.³ Second, there are also issues about the quality of some LGFP loans. Implicit government guarantees and possible local government influence on certain regional banks' credit policies could negatively impact banks' credit underwriting.

The Chinese authorities have acknowledged the existence of lending risks associated with the LGFPs and the property markets, but regard the overall risk as being under control. The strongest signal so far has come from the State Council in June when it issued measures to strengthen the management of LGFPs. Four main policy measures were launched: (1) assess, verify, and properly manage the debts

³Private sector estimates of LGFP borrowings range from Y 6 trillion to Y 11 trillion. For instance, Y 7 trillion is equivalent to close to 18 percent of the total outstanding loans at end-2009.

Typical Structure of Local Government Financing Platform



Source: IMF staff.

assumed by the LGFPs; (2) classify and regulate the function and operation of existing LGFPs; (3) strengthen the supervision of LGFPs' lending activities, as well as banks and other financial institutions' lending practices to LGFPs; and (4) prohibit local governments from making guarantees for LGFP debts.⁴ Continuing actions by the Chinese authorities to obtain better information on the scale and nature of banks' exposures to LGFPs and to improve their underwriting are important. Going forward, the policy focus of the authorities should be placed on measuring and managing contingent risks and considering the introduction of alternative sources of funding by local governments for development purposes.

⁴As a follow-up, the Ministry of Finance, National Development and Reform Commission, People's Bank of China, China Banking Regulatory Commission jointly issued detailed implementation rules.

account appropriate caveats.³⁵ In Latin America, evidence is mixed as to whether the Brazilian entry tax on inflows to domestic bond and equity markets was effective in reducing the amount of portfolio inflows, despite having an impact on the composition of capital flows (Box 1.5).

Increasing signs of a secular shift in asset allocation to emerging markets require policies to enhance local market absorption.

The policy measures adopted in many countries have yet to address the overarching issue of a secular asset allocation shift from developed markets to assets in emerging economies. To this end, policies should aim to enhance local market capacity to absorb capital flows, tilting the balance in favor of long-term capital and increasing the impact of foreign flows on employment and overall growth (Annex 1.4). Such policies could entail unification of government bond-issuing authorities, simplification of corporate bond issuance procedures, removal of barriers for issuance, and other regulatory, legal, and infrastructure improvements.

E. Policy Priorities

We are in a period of significant uncertainty for financial stability. The economic recovery is proceeding, accompanied by substantial market volatility. The recent experience of the intertwining of sovereign and banking risk, notably in the euro area, means that policymakers cannot relax their efforts to reduce refinancing risks, strengthen sovereign and private balance sheets, and reform regulatory frameworks. The risks posed by sovereign debt burdens must be addressed through the pursuit of credible, medium-term strategies of fiscal consolidation. Policy action is needed in the financial sphere to: (1) deal with the legacy problems in the banking sector, including where necessary, recapitalization; and (2) pursue orderly and globally consistent regulatory reform. The financial system remains fragile and ongoing cross-border deleveraging could, under certain circumstances, initiate a further adverse feedback loop between the financial system and the real economy. Continuing forceful policy

measures are needed to ensure we remain firmly on track toward building financial system resilience. This is essential to underpin the economic recovery in the short term and to achieve strong and sustained growth over the medium term.

If the economy recovers as planned and sovereign and bank funding strains continue to subside, banks should be able to repair balance sheets and gradually rebuild capital buffers. This should facilitate the resumption of credit and thus further favor the recovery. However, this report suggests that the European financial system remains vulnerable to downside risks and further funding strains if capital buffers are not strengthened. In the United States, steps need to be taken to safeguard against the repercussions for financial stability of a double dip in the real estate market and the situation will require continued enhanced surveillance.

Legacy problems in the banking system need to be urgently addressed, and further support may be necessary in the short term in certain cases to minimize downside risks.

Crisis intervention policies have strengthened bank balance sheets at the cost of a transitory weakening of public balance sheets. Hence, the success of the overall strategy will ultimately depend on quick and resolute actions to solve structural problems in the banking sector. Implementation failures or undue delays would in turn expose sovereigns to considerable risks. Accordingly, the legacy problems in global banking systems need to be addressed and financial regulation strengthened in order to better insulate sovereigns from risks to private banking balance sheets going forward, though the role of public sector support will continue to be important in the short term.

Weaker nonviable financial institutions still need to be resolved, and forced withdrawal of unprofitable capacity may still be necessary, to enable the remaining industry to become self-sustaining. This will require urgent follow-through on commitments, such as in Germany and Spain, to reduce excess capacity and strengthen financial systems to restore confidence more fully and enhance credit intermediation.

To protect against potential downside risks, banks need to be better capitalized, have access to stable

³⁵Chapter 4 of the April 2010 GFSR found that the impact of capital controls has historically been mixed, and often temporary.

Box 1.5. Brazil's Tax on Capital Inflows, 2009–10

Brazil's reimposition of an upfront tax on capital inflows in October 2009 triggered a wave of interest in many countries in the potential use of such measures to limit exchange rate appreciation. There is evidence that the Brazilian measures worked to change the composition of capital inflows and that they had a small but discernible impact on interest rate arbitrage. However, they do not appear to have reduced aggregate capital flows into Brazil.

In response to heavy portfolio inflows and substantial exchange rate appreciation during the preceding seven months, Brazil imposed a 2 percent entry tax (the IOF) on inflows to domestic bond and equity markets on October 19, 2009.¹ Other types of capital flows, including direct investment, and dollar borrowing by Brazilian banks and firms, were not directly affected. The Finance Ministry announced that the measure was intended to combat speculation in capital markets, and to counteract the appreciation of the *real*, which it viewed as damaging export industries and employment. This was not the first time Brazil had employed controls on portfolio inflows—up until October 2008 it had levied a 1½ percent tax on bond (but not equity) inflows, but the authorities had eliminated the tax in response to the financial crisis.

Nominal appreciation against the dollar came to an end after the IOF was imposed, but reserves continued to rise steadily and the *real* continued to appreciate against the euro. Daily exchange-rate volatility was essentially unchanged after the tax. Foreign reserves continued to accumulate but at a reduced pace of about \$100 million a day, compared with a little more than \$200 million a day in the seven months before the tax was imposed. Chow breakpoint tests fail to show a decisive structural break associated with the tax for either reserves accumulation or for the dollar exchange rate.

Foreign investors appear to have exploited some opportunities to divert flows away from investments on which the IOF would have a significant impact to those where it would not. Equity flows, which had reached a record pace in March–October 2009, and for which the effects of the IOF would have been

significant, did diminish after October. However, and somewhat surprisingly, the rate of inflows into domestic bonds, where the impact of the IOF should also have been large, remained quite robust after the IOF was imposed. There were increases in short- and long-term dollar borrowing, neither of which is subject to the IOF in its present form. Foreign net long *real* positions in the domestic derivatives market, for which the effective incidence of the tax would be much lower than in the bond market, have also increased on average since the IOF.

Futures-implied offshore interest rates can be constructed and compared with actual interest rates to test the effectiveness of arbitrage under the capital inflow tax. The nondeliverable-forwards (NDF) implied interest rate in Brazilian *reais*, based on the offshore nondeliverable currency forward, $f_{90,off}$, can be calculated as:

$$i_{BRL,off} = (1 + i_f) (f_{90,off}/e)^4 - 1.$$

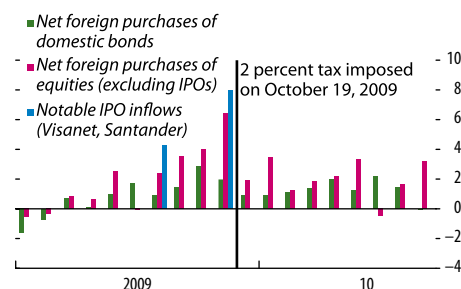
This measure can then be compared to the onshore Brazilian three-month interest rate to determine a “basis spread,” as $BS_{off} = (i_{BRL,off} - i_{BRL})$. Full covered interest parity would entail that this be zero. For most emerging markets, however, basis spreads are not zero, even under normal market conditions.

If the IOF is effective in breaking the link between domestic and foreign fixed-income markets, or in inserting a wedge between the two, this should be evident in market prices. If the new regulations eliminate arbitrage, or impose a cost of arbitrage between domestic and offshore markets, then there should be a difference between the implied interest rate in Brazilian *reais* available offshore through the NDF market, and the interest rate in *reais* available onshore in Brazil. The implied interest rate in *reais* should be lower offshore, where the IOF cannot be collected. The basis spread derived from NDF trading should become negative, entailing a lower-than-market interest rate in Brazilian *reais*. If the 2 percent IOF is fully binding and if there had been full arbitrage before it was imposed, then the basis spread should widen by 2 percent on instruments with a one-year maturity.

In the event, offshore basis spreads showed small but discernible signs of shifting in the period after imposition of the IOF. Offshore NDFs strength-

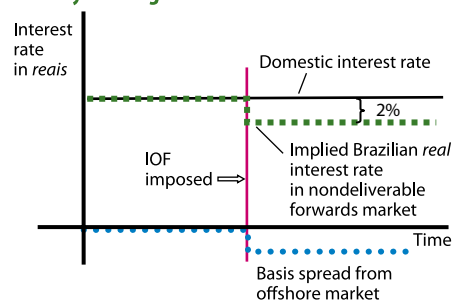
Note: This box was prepared by Chris Walker.

¹IOF stands for Imposto sobre Operações Financeiras, as the tax is known in Brazil.

Box 1.5 (concluded)**Monthly Portfolio Capital Inflows before and after Imposition of IOF**
(In billions of U.S. dollars)

Sources: BCB; and IMF staff estimates.
Note: IOF = Imposto sobre Operações Financeiras;
IPO = initial public offering.

ened relative to onshore currency forwards, and the NDF-implied basis spread did widen, although by only a fraction of the 2 percent (or 8 percent for 90-day instruments) that would occur if the IOF were fully binding. Both of these relative movements of offshore spreads were in a direction and of a magnitude consistent with a small but discernible effect

Expected Change in Interest Rates if the IOF Is Fully Binding

of the tax on cross-border arbitrage. There was little movement in onshore spreads. Overall, movements in Brazilian basis spreads did not diverge appreciably from those of comparable emerging economies that took no special actions during this period, suggesting that the net impact of the IOF on interest rate arbitrage was not large.

funding, and be able to earn self-sustaining margins. Additional recapitalization and higher quality capital are still required in many advanced economies to achieve this objective. Supervisors should continue to encourage banks to raise funding when markets are open and to buttress capital. In some cases, when sufficient capital cannot be raised in the marketplace for an otherwise viable institution, further injections of government capital may be needed to strengthen balance sheets.

Exits in the short term from extraordinary financial system support and economic stimulus have to be carefully considered in this light.

With the situation still fragile, some of the public support that has been given to banks in recent years will have to be continued. Special liquidity or swap

facilities have already been provided in some cases, and various countries' government-guaranteed debt issuance programs have been extended beyond their original termination dates. Planned exit strategies from unconventional monetary and financial support may need to be delayed until the situation is more robust, especially in Europe, paying due attention to the available fiscal room for maneuver. In some cases it may be necessary to return to unconventional monetary policy instruments whose use had been halted.

At the same time, care needs to be taken to ensure that the need for extraordinary liquidity support is temporary. Accordingly, sustained high levels of reliance on such support should be reduced by resolving or restructuring weak banking institutions and addressing systemic banking system fragilities, as discussed above. More generally, persistently low

levels of interest rates can lead to side effects that need careful monitoring. Easy money and liquidity support are no substitutes for repairing and reforming financial sectors and realigning their incentives to build stronger balance sheets and reduce excessive risk taking.

Supranational sovereign funding backstops should be made fully operational. Markets are relying on a functional EFSF to prevent the spread of sovereign financing risk within the euro area, and operational risks have been mitigated by establishing the EFSF's financial structure, its credit rating, and its *modus operandi* (e.g. seniority of its claims relative to other creditors) so as to provide reassurance that financing would be available in a crisis. Similar reassurance over multilateral backstops would also be advisable in non-euro area Eastern European countries potentially vulnerable to losses of market confidence.

In the medium term, risks to financial stability from rising sovereign debt burdens and contingent liabilities need to be reduced, given the extensive linkages to the financial system.

Advanced economy sovereigns need to specify credible growth-friendly fiscal consolidation measures that ensure a medium-term reduction of debt levels, including the reform of entitlement programs, and deliver on adjustment plans, generally starting next year. (See the November 2010 *Fiscal Monitor* for further discussion.) Fiscal measures need to be complemented by structural reforms to improve competitiveness and raise trend growth, thereby reinforcing long-term fiscal solvency and strengthening the financial system.

Governments need to manage and reduce their contingent liabilities. First, authorities should work to eliminate the ability of significant financial enterprises in the public or private sectors to enjoy subsidized borrowing costs from explicit or implicit taxpayer support. This applies most obviously to the U.S. GSEs, which need to be reformed to prevent subsidized risk-taking for private gain at taxpayers' expense. (See Annex 1.4 on reform options for the GSEs.) Also, the German *Landesbanken* should be consolidated and reformed to create viable and limited businesses that do not require public support in the future. Moreover, "too-important-to-fail" (TITF) entities also increase

sovereign credit risk by gaining market share through cheaper borrowing costs derived from assumed taxpayer support.³⁶ Policymakers will have succeeded in addressing the TITF problem only when "systemic" institutions receive no significant benefit resulting from their status through lower borrowing costs or ratings uplifts and actively seek to lower their interconnectedness to reduce their regulatory requirements. It is incumbent upon finance ministries and those charged with overseeing systemic risk to ensure that this happens.

Debt managers need to articulate credible medium-term funding strategies for the composition and structure of their portfolios that complement the overall financing approach. Information sharing and communication among bond investors and policymakers will be critical in this effort. Essentially, advanced economy debt managers need to adopt appropriate techniques to mitigate financing risks in less liquid markets where funding access is less reliable.³⁷

The policy challenges for many emerging market policymakers center on coping with the effects of relative success and stability.

As this chapter has noted, it is now apparent that the financial crisis has accelerated a trend of convergence and catch-up by emerging markets. Nevertheless, policymakers in these countries face significant uncertainty in still volatile financial market conditions. Although economic fundamentals are generally strong, emerging economies may not be fully immune to downside risks from an advanced economy slowdown. Upside risks are also present and pose their own challenges, including the potential for renewed surges in capital inflows. The current environment may thus call for targeted use of macroprudential tools to reduce volatility of, and sensitivity to, capital inflows and asset price pressures, in combination with adequate macro-

³⁶See Haldane (2010) for instance. Potential policy measures include tougher supervisory standards for TITF firms, specific resolution mechanisms (insolvency regimes; "living wills"; viable cross-border insolvency regimes), additional capital requirements linked to systemic risks, limits on market share or asset size, and restrictions on activities of TITF firms (see the April 2010 GFSR, Box 1.5).

³⁷See "Stockholm Principles," Guiding Principles for Managing Sovereign Risk and High Levels of Public Debt (IMF, 2010c).

economic policies (including exchange rate flexibility). In some cases, rapid capital outflows could be a risk if the authorities lose credibility over ensuring fiscal sustainability or control of inflation.

More vulnerable emerging economies should persist with economic and financial adjustment to shore up stability.

In the emerging markets most affected by the crisis, like those in the CEE and CIS regions, policies should continue to help improve the health of sovereign and private balance sheets given heightened global concerns over sovereign risks. A comprehensive consolidation strategy will be critical to safeguard fiscal sustainability. Financial policies should aim at achieving an orderly deleveraging and lay the foundations for a recovery in credit growth. To restore and safeguard financial stability, banks need to be well-capitalized, and steps need to be taken to strengthen the supervisory and institutional framework, to address the problem of impaired assets, and to reduce currency mismatches on private sector balance sheets. Recent currency volatility has highlighted the need to examine the impact of domestic currency depreciation on borrowers in foreign currency loans, and how the increased likelihood of default can be mitigated.

The new financial architecture must be clarified and specified to lay the foundations of a properly robust financial system, consistent with an orderly deleveraging of private banks.

The steps taken to address financial fragility thus far contain many of the elements necessary to promote stability (see Box 1.6). However, more progress is needed, in some cases urgently (e.g., U.S. GSE reform). A number of proposals still lack the specificity and calibration needed for their implementation.

A key concern has been whether the reforms would lower the availability, or raise the cost, of credit and hence adversely affect economic growth before the recovery is well established. Recently published work led by the BCBS and the FSB, conducted in close collaboration with the IMF regarding the macroeconomic impact, suggests that reforms to strengthen bank capital and liquidity requirements would have only a modestly adverse temporary

impact on aggregate output and clear net long-term economic benefits (see Box 1.7).

We welcome the recent proposals of the BCBS, which represent a substantial improvement in the quality and quantity of capital in comparison with the pre-crisis situation. Common equity will represent a higher proportion of capital and thus allow for greater loss absorption. Also, the amount of intangibles and qualified assets will be limited to 15 percent.³⁸ Phase-in arrangements have been developed to allow banks to move to these higher standards mainly through retention of earnings.

As the global financial system stabilizes and the world economic recovery is firmly entrenched, phasing out intangibles completely and scaling back the transition period should be considered. This will raise further banking sector resilience to absorb any shocks that may lie ahead. It would have been desirable to provide for the eventual exclusion of all intangible assets from capital, and, under the baseline scenario of the WEO, shorter phase-in periods would not have placed undue pressure on the banking system and the economy. The longer financial institutions remain with lower buffers, the higher the burden will be on supervisors.

The process of banks' refinancing can be smoothed by giving banks certainty over the future measures of liquidity risk against which they will be judged.³⁹ Moreover, regulators need to insist not just on robust capital and liquidity buffers for banks but also on a consistent application of regulations to the "shadow" banking system and the enhancement of market infrastructures, thereby contributing to significant reductions in systemic risk (Barrell and others, 2009). It is also essential to address the systemic threat posed by "too important to fail" institutions through the introduction of regulation, supervision, and resolution frameworks which adequately take into account their cross-border dimension. Generally, failing to globally address systemic risk will leave an oversized burden to national supervisors and regulators and a financial system that is vulnerable to future crises.

³⁸These include deferred tax assets, mortgage servicing rights, significant investments in common shares of financial institutions, and other intangible assets.

³⁹See Chapter 2 for a fuller discussion of the Basel proposals on liquidity risk.

Box 1.6. Key Findings of the U.S. Financial Sector Assessment Program

Systemic market pressures have abated following a bold and aggressive policy response, but the cost of intervention has been high and stability is still tenuous. Implementing reforms recently signed into law is the next challenge.

The factors that contributed to the crisis were multifaceted but underscored regulatory weaknesses. The scale and breadth of the global financial crisis revealed critical shortcomings and gaps in the U.S. supervisory and regulatory framework, both at a micro- and macro-prudential level, as well as insufficient market discipline. These weaknesses allowed an unsustainable buildup of vulnerabilities prior to the crisis that ultimately led to the crisis itself. These included a massive lending boom, a housing bubble, a rapid rise of a “shadow” banking system, a decline in underwriting standards, weaknesses in risk management, governance, and compensation structures, and the growing use of complex derivative and structured credit instruments whose risk properties and contribution to systemic fragility were poorly understood.

Although bolder action could have been envisaged, most of the major provisions of the Dodd-Frank regulatory reform legislation are in line with Financial Sector Assessment Program (FSAP) recommendations. Less than three years after the beginning of the crisis, the U.S. authorities signed into law a comprehensive package of reforms that addresses many of the exposed weaknesses and gaps, even if it missed the opportunity for streamlining the complex regulatory architecture. If well implemented, it could address many of the issues that left the system vulnerable, bolstering market discipline and stability through better transparency and less complexity. The priority now is to ensure effective implementation in the following ways:

- *Effective discharge of macro-prudential responsibilities*, including through proactive identification and

prompt response to systemic risks by the newly established Financial Sector Oversight Council.

- *Stronger micro-prudential regulation and supervision* involving more robust and consistent regulation and consolidated supervision, particularly for systemic institutions, forceful action to improve cooperation among multiple regulatory agencies, and closing of material gaps in market regulation.
- *Stronger market discipline*, including through new liquidation mechanisms to ensure the orderly resolution of failing systemic financial groups as well as reform of credit policies that have imposed conflicting mandates on supervisors and weakened the financial position of the housing-related government-sponsored enterprises.
- *Continued U.S. role in building an international consensus on reforms*, including ensuring that U.S. legislation does not widen the scope for regulatory arbitrage.

Stress tests carried out by the FSAP team showed pockets of vulnerabilities in the system and considerable interdependencies among institutions. Thanks to substantial public and private capital injections, capital buffers now appear adequate from a systemic perspective. Nonetheless, some institutions may still face strains even under a baseline macroeconomic scenario, given the lagged effects of the economic downturn on credit quality, regulatory demands for higher capital, and the continuing adjustment to more sustainable levels of leverage. And even a modestly adverse scenario in which growth dropped and unemployment remained high could leave important parts of the system—especially the regional and smaller banks—facing further difficulties. The tests also illustrated the significant linkages within the banking system, cautioning that a shock to one bank could spill over to the system overall. The linkages extended abroad and distress in U.S. banks could not only affect banks in Europe, but the effect also could flow the other way.

Note: This box was prepared by Andrea M. Maechler.

To mitigate deleveraging, authorities still need to foster the return of safe private sector securitization.⁴⁰

⁴⁰See Chapter 2 of the October 2009 GFSR on restarting securitization.

The high degree of securitization in some countries before the crisis means that if the level of aggregate credit is not to shrink sharply over the next five years, banks must raise capital to hold more loans outright, issue covered bonds, and/or securitization activity

Box 1.7. Macroeconomic Costs of Regulatory Measures

Since February 2010, the IMF has participated in two international working groups to estimate the potential macroeconomic costs of global measures to strengthen the resilience of banking systems.¹ The Macroeconomic Assessment Group (MAG) focused on transitional macroeconomic costs, while the second group focused on long-term economic impact (LEI). The groups published their respective reports on August 16, 2010.² The results of these analyses suggest that the macroeconomic effects of the main regulatory measures evaluated—increases in capital and liquidity requirements—are likely to have a much less adverse macroeconomic impact in both the short and long terms than has been suggested by financial industry estimates (such as those of the Institute of International Finance – IIF), and more in line with academic estimates.³

The MAG analysis of the transitional effects of tighter capital requirements used a variety of different estimation techniques and models applied to diverse economies with a view to obtaining results that are robust to errors in modeling approaches and assumptions. The results suggest that a 1 percentage point increase in the required ratio of capital relative to risk-weighted assets (TCE/RWA) would typically lead to a peak reduction in real GDP by less than 0.2 percent. The analysis found that the impact was

sensitive to assumptions about how banks respond to higher capital requirements. If banks respond by increasing lending spreads or cutting dividends in order to raise capital, the macroeconomic costs would be substantially less than if they cut lending. The analysis also found that around half of the adverse impact of higher capital or liquidity requirements could be offset by an easing of the stance of monetary policy. Both findings tend to point toward the benefits of a relatively gradual implementation of tighter capital requirements. A longer implementation period would be likely to lead both to more adjustment through raising capital rather than through cutting lending and to greater scope for monetary policy to take offsetting actions.

The LEI analysis looked at long-run costs and benefits of regulatory measures. On the cost side, the LEI group estimated that a 1 percentage point increase in capital adequacy requirements would reduce real GDP by about 0.1 percent—about half the transitional cost estimated by the MAG. Increased liquidity requirements would have a roughly similar GDP effect. To the extent that the required return on bank equity is reduced by having sounder banks, the long-run cost would be even lower. On the benefit side, the analysis suggests that higher capital ratios would reduce the risk of crises and the associated loss of output, though the benefit would tend to diminish as capital ratios increase. In principle, it would be appropriate to raise the capital ratio to the point where the marginal cost of raising capital requirements was equal to the marginal benefit in terms of output losses associated with crises. However, a simple evaluation of this “break-even” point is complicated by the substantial uncertainty, based on experience, between the level of capital ratios and the probability and severity of financial crises and their impact on GDP.

The IMF contributed to the MAG and LEI analyses in three ways. First it provided the various national forecasters with a common set of assumptions regarding the external macroeconomic environment faced by each country, based on the April 2010 *World Economic Outlook* forecasts. Second, the IMF estimated the macroeconomic effects of changes in capital and liquidity requirements using dynamic stochastic general equilibrium (DSGE)

Note: This box was prepared by Scott Roger.

¹Participating countries were Australia, Brazil, Canada, China, France, Germany, Italy, Japan, Korea, Mexico, Netherlands, Spain, Switzerland, United Kingdom, and United States. Other participants were the Bank for International Settlements, European Central Bank, the European Commission, and the IMF.

²The interim MAG report is available at www.bis.org/publ/othp10.pdf?noframes=1; the LEI report is available at www.bis.org/publ/bcb173.pdf?noframes=1.

³The IIF and MAG/LEI results, however, are not directly comparable. The MAG and LEI analyses focus on changes in capital and liquidity requirements, while the IIF includes a significantly wider range of possible measures, including changes in the definition of capital, introduction of countercyclical capital requirements, and increases in U.S. bank funding costs in response to changes in Federal Deposit Insurance Corporation coverage. Other differences stem from different assumptions regarding monetary policy responses to regulatory measures, bank dividend policies, and very different approaches to estimating the macroeconomic effects of changes in bank lending spreads and volumes.

Peak Euro Area Output Effects of a 2 Percentage Point Increase in Required Bank Capital Ratios

(In percentage points of GDP)

Assumptions	Bank Response			
	Cut in Dividends	Higher Lending Margins	Cut in Lending	
			Reduction in Loan Riskiness	No Change in Loan Riskiness
Monetary policy response				
Two-year implementation	-0.5	-0.6	-0.9	-1.3
Four-year implementation	-0.3	-0.4	-0.5	-0.8
No monetary policy response				
Two-year implementation	-0.8	-0.9	-1.2	-1.9
Four-year implementation	-0.4	-0.6	-0.7	-1.1

Source: IMF staff estimates.

models for the euro area and the United States (Roger and Vitek, forthcoming). This was used in both the MAG and LEI exercises. In the MAG analysis, the DSGE models were used to estimate the impact of a rise in capital requirements. The results varied considerably according to how banks were assumed to adjust, the scope for a monetary policy response, and the length of the implementation period. The table gives an idea of the range of potential outcomes for the euro area. Estimates for the United States were very similar.

Faced with an increase in required capital ratios, banks can respond by cutting dividend payments or raising lending spreads in order to increase retained earnings held as capital. Alternatively, they can cut lending in order to reduce assets, either across the board or focusing on cutting the riskier assets. The table shows that actions to raise capital would have a much less adverse effect on GDP than cutting lending, especially if the lending cuts were not focused on the high risk-weighted portion of the loan portfolio. The table also shows that lengthening the implementation period and allowing monetary policy to take the regulatory tightening into account would both substantially reduce the peak output effects.

Higher liquidity requirements would also have an adverse transitory impact on output, as banks would need to raise lending spreads or cut dividends to offset the loss of income associated with holding a higher proportion of low-yielding assets. However, the analysis indicated that much of the adverse effect would be offset by the favorable impact of higher liquidity on risk-weighted assets and, therefore, on the capital adequacy ratio. As a result, it was estimated that a

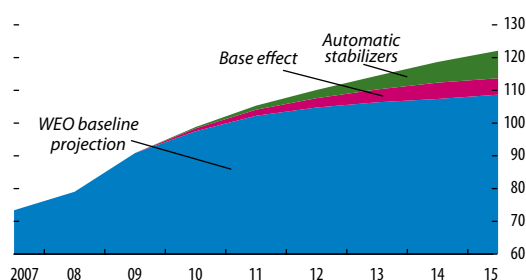
25 percent increase in liquidity requirements would reduce output by a peak of about 0.2 percent of GDP.

The DSGE models were also used in the LEI analysis. In this context, the model results suggested that in the long run a 1 percent increase in the TCE/RWA ratio might cut the level of GDP by about 0.1 percent. The model was also used to investigate the impact of countercyclical capital requirements, and found that a countercyclical rule linked to credit growth might reduce output variability by around one-third in the euro area, and by around one-quarter in the United States.

The third area in which the IMF contributed to the MAG and LEI analysis was in the estimation of international spillovers associated with the introduction of regulatory measures. This analysis employed a multi-country model with trade and financial linkages.⁴ The model was first used to estimate the impact of increases in interest rate spreads associated with higher capital and liquidity requirements on a country-by-country basis, similar to what was done using individual national models, and served as a check on national estimates. Then the model was used to estimate the effects of all countries raising interest spreads simultaneously. The difference, which represents the spillovers not taken into account in country-by-country analyses, boosted the estimated impact of the measures by around one-quarter.

⁴The model is a modified version of the model presented in Vitek (2009).

**Figure 1.34. Public Debt, Advanced Economies:
Impact of Adverse Growth Shock**
(In percent of GDP)



Source: IMF, *World Economic Outlook* (October 2010); and IMF staff calculations for growth and debt projections; European Commission (2005) and Girouard and André (2005) for elasticity of revenues and expenditures to output shock

Note: Includes a 1 percent reduction in real GDP actual growth between 2010 and 2015; the growth shock affects only the output gap, and it is assumed to leave potential GDP unaltered.

needs to recover. This can be assisted by improving investors' understanding of risks and the rating process (e.g., U.S. credit card securitization has been comparatively less affected by the crisis due to its familiar structure). For the return of safer securitization it is essential to introduce closer supervision, better incentives for issuers, and public disclosure to ensure that securitized products are well understood.

In sum, this is an ambitious policy agenda, but one that is needed to provide the greatest protection against future shocks and crises, and ensure continuing global financial stability. This is essential to underpin the economic recovery over the short run and to achieve strong and sustained growth over the medium term.

Annex 1.1. Impact of Adverse Growth Shock on Advanced Economy Debt Ratios⁴¹

This annex provides further detail on the sensitivities of advanced economy debt-to-GDP ratios to a growth shock described in Figure 1.7. We develop two scenarios: the baseline (i.e., the WEO forecast) and the low-growth scenario, where growth is 1 percent less than in the baseline between 2010 and 2015. These scenarios assume that that potential GDP is unaffected by the growth shock and that governments refrain from any corrective discretionary action to smooth the impact. As a consequence, the shock affects the deficit and debt GDP ratios through higher automatic stabilizers and the change in the GDP base.

In the low-growth scenario, the public debt-to-GDP ratio d_t is assumed to evolve as:

$$d_t = d_{t-1}(1 + r_t) - pb_t,$$

where pb_t is the primary balance and r_t is the growth adjusted interest rate. In turn the primary balance is calculated as:

$$pb_t = pb_t^{WEO} + (\eta_R - \eta_G) \Delta og_t,$$

where pb_t^{WEO} is the primary balance to GDP ratio of the baseline scenario, η_R and η_G are semi-elasticity of revenues and expenditures to changes in the output gap, and Δog_t is the change in output gap between the

⁴¹This annex was prepared by Giovanni Callegari.

Table 1.2. Low-Growth Shock: Impact Analysis and Rating
(In percent of GDP)

	Gross General Government Debt/GDP				Impact of the Shock on 2015 Debt due to:	
	Baseline	Baseline	Low-Growth Scenario	Change Baseline-Low Growth Scenario	Automatic Stabilizers	Change in the GDP Base
	2010	2015	2015	2015		
Japan	225.5	250.4	269.1	18.7	6.8	11.9
Greece	130.2	135.5	153.4	18.0	10.5	7.4
Italy	118.4	118.5	136.0	17.5	11.2	6.3
Netherlands	66.0	79.0	96.2	17.2	13.6	3.6
Belgium	100.2	107.5	124.4	16.9	12.0	4.9
Denmark	44.1	41.4	57.7	16.4	14.1	2.3
Portugal	83.1	97.3	113.2	15.8	11.2	4.6
France	84.1	89.0	104.4	15.4	11.1	4.3
Iceland	121.6	80.8	95.3	14.6	9.0	5.5
Austria	70.0	77.9	92.2	14.3	10.6	3.7
Germany	75.3	76.5	90.6	14.1	10.3	3.7
Sweden	41.7	29.8	43.6	13.8	11.8	2.0
Spain	63.5	82.8	96.3	13.4	9.8	3.6
Finland	50.0	65.6	78.8	13.2	10.7	2.5
Ireland	92.2	102.7	115.7	13.0	8.7	4.3
Cyprus	60.8	72.8	85.8	13.0	10.0	3.0
United Kingdom	76.7	86.4	99.2	12.8	9.0	3.9
Malta	70.0	69.8	82.5	12.8	9.2	3.5
United States	92.7	110.2	122.4	12.2	7.4	4.7
Canada	81.7	74.1	86.2	12.2	7.9	4.2
Czech Republic	40.1	57.3	68.1	10.8	8.7	2.1
Slovenia	34.5	36.6	47.1	10.6	8.9	1.7
Israel	76.7	70.9	81.0	10.1	6.6	3.5
Slovak Republic	41.8	45.1	55.1	10.0	8.1	2.0
Australia	22.1	22.5	32.5	10.0	8.9	1.1
Norway	54.3	51.0	60.8	9.8	8.3	1.5
Luxembourg	20.1	31.4	41.2	9.8	8.7	1.1
Switzerland	39.5	35.0	44.5	9.5	7.6	1.9
New Zealand	31.0	33.7	41.6	7.9	6.2	1.6
Korea	32.1	21.8	27.6	5.9	4.8	1.1

Sources: IMF, October 2010 *World Economic Outlook*; IMF staff calculations for growth and debt projections; European Commission (2005) and Girouard and André (2005) for elasticity of revenues and expenditures to output shock. Based on calendar year GDP.

baseline and the low-growth scenario. The interest rate is derived by dividing the amount of interest payments by the stock of debt observed at the end of the preceding year.⁴²

Table 1.2 decomposes the overall impact of the shock in the contribution of automatic stabilizers and that of the change in the GDP base, while Figure 1.34 shows the dynamic of these two factors for the aggregate of advanced countries. The impact of

the growth shock depends on two factors: the size of the pre-shock stock of public debt and the size of the automatic stabilizers.

Annex 1.2. Systemic Contingent Claims Analysis of Banking and Sovereign Risk⁴³

Contingent claims analysis (CCA) stems from option pricing theory pioneered by Black and

⁴²For background methodological details, see Escolano (2010).

⁴³This annex was prepared by Dale Gray and Andreas Jobst.

Scholes (1973) and Merton (1973), and, thus, is forward-looking by construction, providing a consistent framework based on current market conditions rather than on historical experience.⁴⁴ When applied to the analysis and measurement of credit risk, CCA is commonly called the “Merton Model,” which is predicated on three market-implied principles: (1) the values of liabilities (equity and debt) are derived from assets; (2) liabilities have different priority (i.e., senior and junior claims); and, (3) assets follow a stochastic process. Assets (defined as the present value of income flows, proceeds from asset sales, etc.) are stochastic and over a certain time horizon may be above or below promised payments on debt, which constitute a default barrier. The basic analytical tool is the risk-adjusted (CCA) balance sheet where the total market value of bank assets, A , is equal to the sum of its equity market value, E , and its risky debt, D , maturing at time T . Asset value is stochastic and may fall below the value of outstanding liabilities, which constitute the bankruptcy level B (“default threshold” or “distress barrier”). B is defined as the present value of promised payments on debt discounted at the risk-free rate.⁴⁵ The value of risky debt is equal to default-free debt minus the present value of expected loss due to default. The equity value can be computed as the value of a call option, $E(t) = A(t) N(d_1) - Be^{-rt} N(d_2)$ where r is the risk-free rate, σ is the asset return volatility, and $N(d)$ is the cumulative probability of the standard normal density function below d .

$$d_1 = \frac{\ln\left(\frac{A}{B}\right) + \left(r + \frac{\sigma^2}{2}\right) T}{\sigma\sqrt{T}} \text{ and } d_2 = d_1 - \sigma\sqrt{T}.$$

The present value of market-implied expected losses associated with outstanding liabilities can be valued as an implicit put option, which is calculated with the default threshold B as strike price on the asset value A of each institution. Thus, the present value of market-

implied expected loss can be computed as $P_E(t) = Be^{-rT} N(-d_2) - A(t) N(-d_1)$.

Several widely used techniques have been developed to calibrate the CCA models using a combination of balance sheet information and forward-looking information from equity markets. The market value of assets of corporations and financial institutions cannot be observed directly but it can be implied using financial asset prices. From the observed prices and volatilities of market-traded securities, one can estimate the implied values and volatilities of the underlying assets in financial institutions.⁴⁶

Once the asset value and asset volatility are known, together with the default barrier, time horizon, and the discount rate r , the values of the implicit put option, $P_E(t)$, can be calculated.⁴⁷ The credit spread, s , is related to the implicit put option and the default barrier, B , and can thus be written as a function of the risk-neutral default probability (RNDP) and loss given default (LGD).

$$\begin{aligned} s &= -T^{-1} \ln(1 - P_E(t)/Be^{-rT}) \\ &= -T^{-1} \ln(1 - \text{RNDP} \times \text{LGD}). \end{aligned}$$

For robustness, however, we define $P_E(t)$ consistent with the closed-form Gram-Charlier model in Backus, Foresi, and Wu (2004), which allows for kurtosis and skewness in returns and does not require market option prices to implement, but is constructed using the same diffusion process for stock prices as the Black-Scholes model.

Systemic Contingent Claims Analysis Methodology

The goal is to measure the expected losses in the financial sector (and the systemic risk stemming from multiple institutions), which entails measuring the joint,

⁴⁴Although market prices are subject to market conditions not formally captured in this approach, they endogenize the capital structure impact of government interventions.

⁴⁵Moody’s KMV defines this barrier equal to total short-term debt plus one-half of long-term debt.

⁴⁶In the traditional Merton (1973) model, the calibration requires knowledge about value of equity, E , the volatility of equity, σ_E , and the distress barrier as inputs into equations $E = A_0 N(d_1) - Be^{-rt} N(d_2)$ and $E\sigma_E = A\sigma_A N(d_1)$ in order to calculate the implied asset value A and implied asset volatility σ_A . Note that all input variables are calculated from market prices, with the exception of the default barrier, which is derived from the default point (i.e., short-term debt plus half of long-term debt) provided by Moody’s KMV for each sample firm. See Gray, Merton, and Bodie (2007, 2008); and Gray (2009).

⁴⁷The implicit put option $P_E(t)$ equals the default probability (DP) times the LGD.

or systemic, financial sector risk from the implicit put options (i.e., expected losses) from CCA for individual financial institutions. However, a simple summation of the implicit put options presupposes that the correlation between them is one. In addition, conventional (bivariate) correlation is ill-suited for systemic risk analysis when extreme events occur jointly (and in a nonlinear fashion). To address this issue, we view the financial sector as a *portfolio of expected losses* (with individual risk parameters), whose joint implicit put option value is defined as the multivariate density of each financial institution's individual marginal distribution of market-implied expected losses and their time-varying dependence structure.

We apply the so-called “systemic CCA framework,” which quantifies systemic risk of market-implied expected losses from the financial sector based on the conceptual underpinnings of the CCA methodology. This framework combines equity market data and accounting information to define a default barrier to infer the risk-adjusted balance sheets for individual financial institutions and then estimate the dependence between them in order to estimate the joint market-implied expected losses as point estimates of a multivariate distribution (Gray and Jobst, 2010; Gray, Jobst, and Malone, 2010; IMF, 2010d). We assume that the marginal distributions of individual expected losses fall within the domain of generalized extreme value (GEV) distribution, which identifies possible limiting laws of asymptotic tail behavior of normalized extremes in order to quantify the possibility of common extreme shocks (Pickands, 1981; Coles, Heffernan and Tawn, 1999; Poon, Rockinger, and Tawn, 2004; Jobst, 2007). The choice of the empirical distribution function of the underlying data to model the marginal distributions avoids problems associated with using specific parameters that may or may not fit these distributions well—a problem potentially exacerbated during stressful periods (IMF, 2009a, pp. 130–31).⁴⁸ As opposed to the traditional (pairwise) correlation-based approach, this method of measuring “tail dependence” is better suited to analyzing extreme linkages of multiple (rather

than only two) entities, because it links the univariate marginal distributions in a way that formally captures both linear and nonlinear dependence over time while explicitly accounting for joint tail behavior.

Measuring Expected Losses and Contingent Liabilities from the Financial Sector

To measure the implicit and explicit government guarantees (contingent liabilities) we define α as the fraction of bank default risk covered by the government so $\alpha P_E(t)$ is a measure of the contingent liability due to implicit and explicit guarantees, and $(1 - \alpha)P_E(t)$ is the risk retained by the banks. It is this retained risk that is reflected in bank CDS prices. In cases where the sovereign spread is below the bank spread, the implicit put option calculated for each financial institution from equity market and balance sheet information using CCA can be combined with information from CDS markets to estimate the government's contingent liabilities. However, in cases where the sovereign spread is higher than the spread that reflects the default risk in the bank, there can be a spillover from the sovereign that increases the bank's CDS spreads. The spreads for the banks can be seen as a function of the implicit put option (derived from equity information) times the fraction of risk retained by the banks (as described in the systemic CCA section above) plus a premium (δ) if high sovereign spreads spill over to increase bank spreads:

$$s_{Bank} = -\frac{1}{T} \ln\left(1 - \frac{(1 - \alpha)P_{Equity,Bank}}{B_{Bank}e^{-rT}}\right) + \delta.$$

Sovereign Contingent Claims Analysis and the Interaction between the Sovereign and the Banks

The CCA framework can be used to calibrate risk-adjusted sovereign balance sheets and integrated with banking sector balance sheets in a simple but illustrative framework to show the interaction and potential destabilization of values of spreads and risks in both the sovereign and banking sectors. Distressed financial institutions can lead to large government contingent liabilities, which in turn reduce government assets and lead to higher risk of default on sovereign debt.

⁴⁸The dependence function is estimated iteratively on a unit simplex that optimizes the coincidence of multiple series of cross-classified random variables—similar to a chi-statistic that measures the statistical likelihood that observed values will differ from their expected distribution.

Distressed sovereigns have high spreads that can spill over to the banking sector. The CCA approach can be adapted to the sovereign (Gapen and others, 2005; Gray, Merton, and Bodie, 2007). For developed country sovereigns, CCA can be adapted in the following way. The value of sovereign debt can be seen as having two components, the *default-free value* (promised payment value) and the *expected loss* associated with default when the assets are insufficient to meet the promised payments. The value of sovereign assets at time horizon T , relative to the promised payments on sovereign debt (the sovereign debt or distress barrier) is the driver of these expected losses. There is a random element to the way the sovereign asset value evolves over time. In the absence of measureable sovereign equity and equity volatility, such as in the case of a developed country sovereign where the assets and debt are all in the same currency, the CCA can be used to derive an implied value for sovereign assets based on expected losses on sovereign debt derived from the *full term structure of sovereign spreads*.

This framework of interactions between the sovereign and banks can quantify the various spillovers and feedbacks described earlier in Figure 1.5. A simple model shows the ways in which sovereign and bank spreads can interact and potentially lead to a destabilization process. If sovereign spreads increase, this can lead to an increase in bank spreads because (1) the implicit bank put option could increase as the value of the bank's holdings of government debt decreases; (2) the banks may have higher borrowing costs as higher sovereign borrowing costs spill over to them (i.e., the premium (δ) increases); and (3) in the event of severe sovereign distress, the credibility of sovereign bank guarantees could decrease.

An adverse feedback loop could arise in the situation where the financial system is large compared to the government and distress in the financial system triggers a large increase in government financial guarantees/contingent liabilities. Potential costs to the government, due to the guarantees, can lead to a rise in sovereign spreads. Banks' spreads depend on retained risk, which is lower given the application of government guarantees, and also on the creditworthiness of the sovereign (as a result of fiscal sustainability and debt service burden), as investors view the banks' and sovereign risk as intertwined.

Concern that the government balance sheet will not be strong enough for it to make good on guarantees could lead to deposit withdrawals or a cutoff of credit to the financial sector, triggering a destructive feedback where both bank and sovereign spreads increase.⁴⁹ In some situations, this vicious cycle can spiral out of control, resulting in the inability of the government to provide sufficient guarantees to banks and leading to a systemic financial crisis and a sovereign debt crisis.

There can also be constructive feedback loops. For example, results from banking stress tests required by regulators can lead to transparency and capital-raising by banks that lower bank spreads, reduce the cost of implicit and explicit government guarantees, and reduce government spreads, which can feed back, helping banks borrow more cheaply.

Box 1.2 uses the systemic CCA and sovereign CCA to examine the interactions between the health of bank balance sheets, contingent liabilities of the sovereign to the banks, and sovereign spreads in a small subset of European countries. The figures in that box show the systemic CCA market implied expected losses—average and tail losses for selected European banking systems.

The systemic CCA implied CDS spread (derived from equity and balance sheet information and incorporating the systemic CCA model dependence structure, 50th percentile) can be compared to the weighted observed bank CDS spreads and to sovereign spreads. It is useful to contrast two very different situations. For countries where the banking risk spillover to the sovereign is the dominant risk transmission channel, the systemic CCA implied CDS spreads are higher than the sovereign and actual bank spreads (e.g., systemic CCA implied CDS could be 600–700 basis points as compared to sovereign and bank observed spreads in the 200–300 basis point range). This is consistent with a depressing effect of widespread government guarantees on actual bank CDS spreads. At the other extreme is the case where bank systemic CCA implied CDS have surpassed sovereign spreads and observed bank CDS spreads have moved in lock step with sovereign spreads, with both being above the systemic CCA implied CDS. In such cases it is possible that 300 to 500 basis points of observed bank spreads are due to the spillover from sovereign spreads.

⁴⁹The Iceland crisis of 2008 is a case in point.

Box 1.8. Calibrating a Sovereign Risk-Adjusted Contingent Claims Analysis (CCA) Balance Sheet

Sovereign spreads are related to the sovereign implicit put option (P_{sov}) and sovereign default barrier (B_{sov}) via the following relationship:

$$s_{sov} = -\frac{1}{T} \ln \left(1 - \frac{P_{sov}}{B_{sov} e^{-rT}} \right).$$

Using sovereign CCA, the formula for the ratio of the sovereign implicit put option to the sovereign default barrier present value is:

$$\frac{P_{sov}}{B_{sov} e^{-rT}} = N(-d_2) - \frac{A_{sov}}{B_{sov}} \frac{1}{e^{-rT}} N(-d_1),$$

which is inserted in the sovereign spread equation above. Market data can then be used to estimate implied sovereign assets and sovereign asset volatility. The full term structure of the sovereign CDS (CDS for years 1, 3, 5, 7, and 10) is used to estimate (1) sovereign “leverage ratio”—the ratio of sovereign default barrier to the implied sovereign asset level; and (2) implied volatility, σ_A , that most closely matches

the observed sovereign spread term structure. In a second step, sovereign debt data is used to estimate the level of the sovereign default barrier, and dividing this estimate of the default barrier by the leverage ratio gives an estimate of the implied sovereign asset value.

The sovereign asset value can be broken down into its key components: reserves (R), present value of the primary fiscal surplus ($PVPS$), implicit and explicit contingent liability ($\alpha Put_{E,Banks}$), and “Other” remainder items:

$$A_{sov,t=0} = R + PVPS - \alpha Put_{E,Banks} + Other.$$

Thus an increase in the sovereign contingent liabilities to the banks, $\alpha P_E(t)$, decreases sovereign assets, which in turn increases the sovereign expected losses in sovereign debt, P_{sov} , which increases sovereign spreads. This framework can also be used to analyze the potential impact on sovereign spreads of changes in the composition of sovereign short- and long-term debt (rollover risks), which affects the default barrier and in turn affects sovereign credit spreads.

The methodology to calibrate sovereign “leverage ratio” and sovereign asset values described in Box 1.8 was applied to several European countries. Information on sovereign debt structure provides an estimate of the sovereign default barrier, which then is used to back out estimated sovereign assets. We can compare the size of government contingent liabilities as a percent of sovereign assets and assess the sensitivity of sovereign spreads to changes in contingent liabilities to the banks, or changes in the sovereign default barrier (due to rollover risks or shortening of maturity), or changes in sovereign assets (due to changes in fiscal revenues and expenditures). Using assumptions of both a moderate and high level of government guarantees to the banking sector (50 percent and 85 percent, respectively), the ratio of expected losses in the banking system to sovereign assets can be estimated. This measure can be used to estimate the change in sovereign spreads that would result from a change in expected bank losses for a given level of government guarantees for the banking system as shown in Box 1.2.

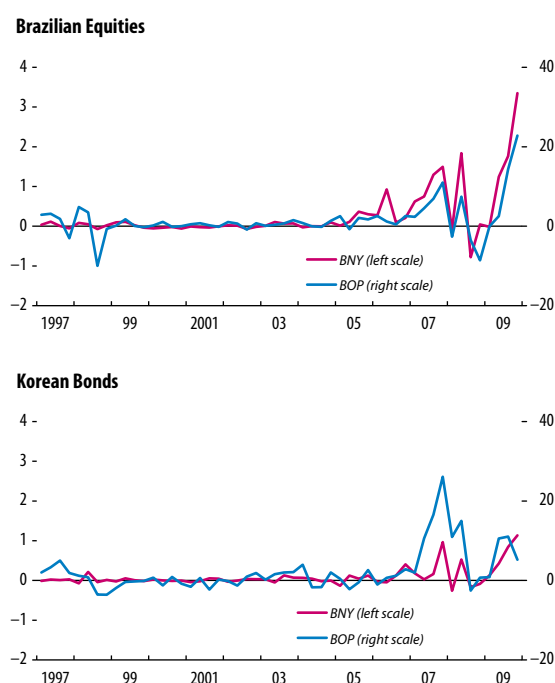
The results indicate that contingent liabilities stemming from the banks included in the sample remain large, with significant tail risks from potential bank losses. Furthermore, should these contingent liabilities materialize, they could have a significant impact on the cost of funding and creditworthiness for some sovereigns. In some countries, high sovereign credit spreads could then spill over and increase bank spreads and raise funding pressures.

Annex 1.3. Analyzing Portfolio Inflows to Emerging and Selected Advanced Markets⁵⁰

Short-term capital flows to emerging and selected advanced markets have been broadly strong, though not without periods of retrenchment during the global credit crisis. To help inform policymakers about the characteristics of capital flows and the potential impact

⁵⁰This annex was prepared by Ken Miyajima and Huanhuan Zheng.

Figure 1.35. Brazilian and Korean Securities Flows
(In billions of U.S. dollars)



Sources: BNY Mellon iFlowSM data; and IMF staff estimates.
Note: BNY = Bank of New York Mellon; BOP = balance of payments.

on local asset prices, this annex analyzes the persistence of capital flows and the dynamic interaction among flows, returns, and return volatility, using custodial flow data. It finds that persistence has increased across a number of emerging and selected advanced markets—more so than, for instance, in the United States. In addition, there appears to be a self-reinforcing cycle, whereby elevated foreign inflows are driven by higher asset returns and lower market volatility, in turn potentially leading to potentially unrealistic perceptions of higher risk-adjusted returns and an underpricing of risk. Strong inflows, particularly when driven by herding behavior, could have negative implications for financial stability if they are followed by sudden reversals or stops.

Data Description

The portfolio flow data are drawn from iFlowSM provided by BNY Mellon, the world's largest custodian with total assets of more than \$22 trillion.⁵¹ Approximately 85 to 90 percent of the holdings are based on real money investors, including institutional managers, pension funds, and central banks. The data are daily, updated on a trade-date basis, and stationary. The particular dataset analyzed in this annex represents bond and equity flows in terms of net purchases, covering 50 economies (both advanced and emerging) from January 1, 1997 to June 16, 2010. The dataset represents about 15 to 23 percent of the outstanding stock of tradable securities in most markets, and nearly half of the securities are non-U.S. While daily equity flow data are available from various stock exchanges for a number of emerging markets, the BNY Mellon iFlowSM data cover a wider range of countries and include both bond and equity flows. Various tests indicate that the dataset is fairly consistent with the official balance of payments data, at least in emerging and selected advanced markets (Figures 1.35 and 1.36).⁵²

⁵¹Guidance on iFlowSM data and interpretation provided by Samarjit Shankar, Managing Director, BNY Mellon.

⁵²For example, net equity flows to Brazil reported by BNY Mellon represent about 10 percent of those recorded in the balance of payments, with a correlation coefficient of 84 percent. Similarly, net bond flows to Korea represent about 5 percent of those recorded in the balance of payments, with a correlation

The data show that bond and equity flows to emerging and selected advanced markets remained strong throughout the global credit crisis, particularly to Asia and Latin America, the two key destinations for custody flows in such markets (Figures 1.37 and 1.38). Likely reflecting concerns about fiscal and external vulnerabilities, foreign investors have continued to retrench in Europe, Middle East, and Africa (EMEA) bonds since 2007. By way of comparison, foreign equity flows to mature markets started falling in early 2006, and continued to decline through the collapse of Lehman Brothers in late 2008, before recovering in 2009. Bond flows into advanced economies also dipped temporarily during the crisis, but recovered more quickly, and have since surpassed recent peaks (Figures 1.37 and 1.38).

Methodology

Variance Ratio

Variance ratio (VR) statistics are computed to study the extent to which flows tend to be sustained at current levels, or the degree of persistence. A VR above 1 indicates that flows tend to be unidirectional. In addition, the greater the VR, the more likely that the current trend continues, making future flows more predictable. A VR below 1 indicates the direction of flows tends to change.

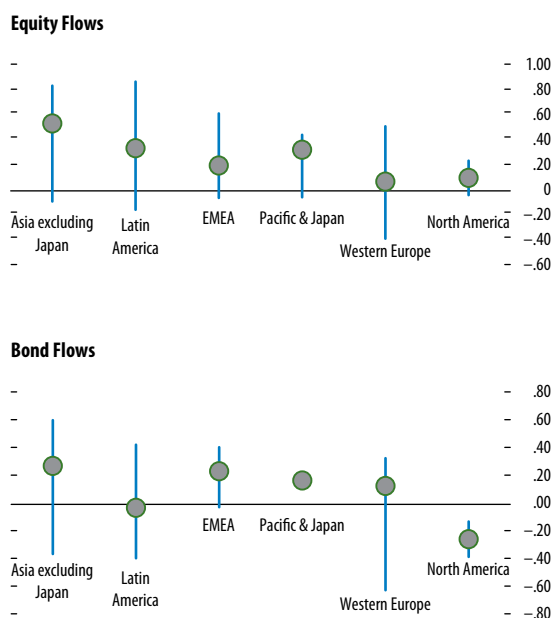
The VR statistic for q periods $VR(q)$ is calculated as follows:

$$VR(q) = 1 + \sum_{k=1}^{k=q} \rho(k) = \frac{\sum_{k=q}^T (\sum_{t=k-q}^k flow_t - q\bar{u})^2}{\sum_{t=1}^T (flow_t - q\bar{u})^2} \frac{(T-1)T}{(T-q+1)(T-q)q},$$

where $\rho(k)$ is the k -lag autocorrelation coefficient, $flow_t$ is the daily equity flows measured in millions of U.S. dollars, \bar{u} is the average flow over the whole sample, and T is the total number of observations.

coefficient of 61 percent. More broadly, correlation coefficients are positive and significant for the majority of countries, and negative coefficients tend to be insignificant. A smaller share of the BNY Mellon advanced economy custody holdings represent cross-border flows; this probably explains why the BNY Mellon iFlowSM data are not as consistent with the balance of payments data for advanced economies.

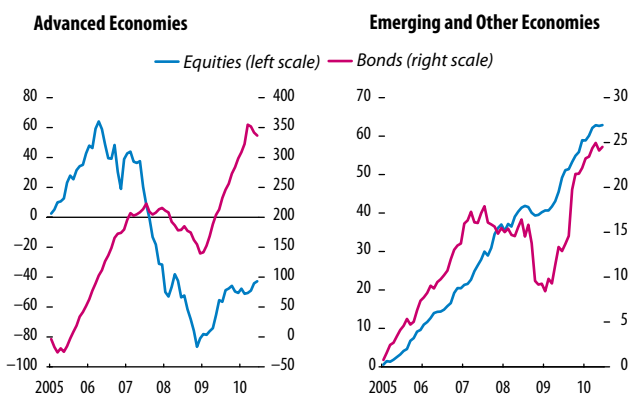
Figure 1.36. Correlation between Bank of New York Mellon iFlowSM and Balance of Payment Flows



Sources: BNY Mellon iFlowSM data; IMF, International Financial Statistics database; and IMF staff estimates.

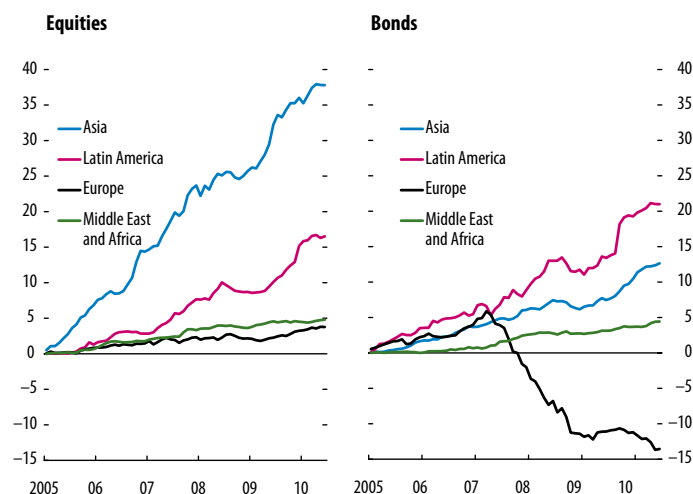
Note: EMEA = Europe, Middle East, and Africa. BNY = Bank of New York Mellon. Vertical lines represent correlation coefficient ranges for sample period from January 1997 to June 2010. Circles signify median values.

Figure 1.37. Cumulative Bank of New York Mellon iFlowSM Inflows to Advanced and Emerging and Other Economies (In billions of U.S. dollars)



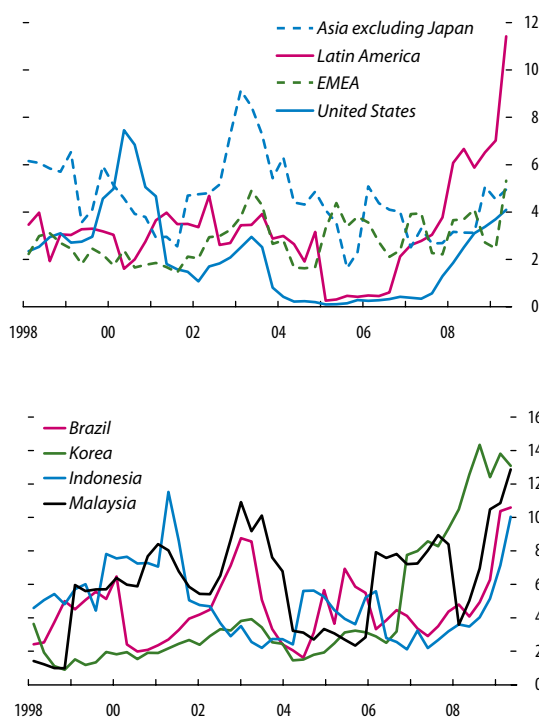
Sources: Bank of New York Mellon (BNY) iFlowSM data; and IMF staff estimates.

Figure 1.38. Cumulative Bank of New York Mellon iFlowSM Inflows to Emerging and Other Economies, by Region
(In billions of U.S. dollars)



Sources: Bank of New York Mellon (BNY) iFlowSM data; and IMF staff estimates

Figure 1.39. Variance Ratios of Equity Flows to Selected Markets



Sources: BNY Mellon iFlowSM data; and IMF staff estimates.

Daily Dynamic Interaction

A panel vector autoregression (VAR) consisted of local currency asset return, equity flow and the market volatility:

$$\begin{cases} R_{i,t} = c + \sum_{j=1}^q \beta_{11,j} R_{i,t-j} + \sum_{j=1}^q \beta_{12,j} F_{i,t-j} + \sum_{j=1}^q \beta_{13,j} \sigma_{R_{i,t-j}}^2 + \epsilon_1 \\ F_{i,t} = c + \sum_{j=1}^q \beta_{21,j} R_{i,t-j} + \sum_{j=1}^q \beta_{22,j} F_{i,t-j} + \sum_{j=1}^q \beta_{23,j} \sigma_{R_{i,t-j}}^2 + \epsilon_2 \\ \sigma_{R_{i,t}}^2 = c + \sum_{j=1}^q \beta_{31,j} R_{i,t-j} + \sum_{j=1}^q \beta_{32,j} F_{i,t-j} + \sum_{j=1}^q \beta_{33,j} \sigma_{R_{i,t-j}}^2 + \epsilon_3 \end{cases}$$

where q is the number of lags, which is selected to be 20 in our estimation. R denotes the domestic market return in local currency, F represents the market capitalization-weighted equity flow, $\sigma_{R_{i,t}}^2$ is the 60-trading-day (approximately one quarter) volatility of return. To study the dynamic interaction among these three factors, we focus on the impulse response function (IRF) under the assumption that volatility precedes flows, and flows precede returns.⁵³

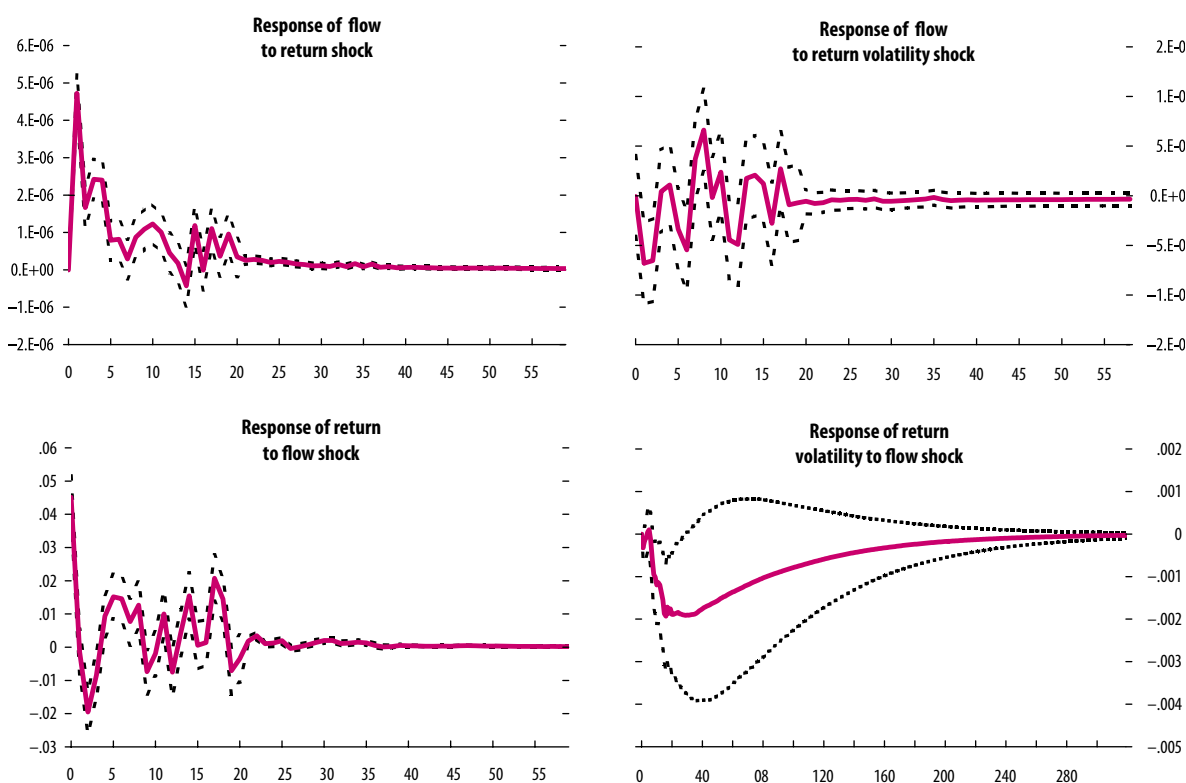
Results

Equity flows to emerging and selected advanced economies tend to exhibit signs of herding behavior over a short horizon.⁵⁴ VR statistics over 60 days indicate flows to those markets have systematically been more persistent than flows to the United States over the period from 2003 to 2010 (Figure 1.39). In general, while solid economic fundamentals may increase flows in the long run, herding may lead to temporary increases in flows. Historically, a long period of persistence has been frequently followed by a reversal (CGFS, 2009). In fact, between 1987 and 2006, about one-third of episodes involving large capital inflows ended with a sudden stop or a currency crisis.⁵⁵ Thus, the recent increase in VR across a number of

⁵³The general conclusions are, however, not subject to the assumption, and also apply under a different ordering, say, with flows preceding returns and volatility.

⁵⁴Statistical analysis was conducted only on equity flows, which tend to be more representative than bond flows of the balance of payments.

⁵⁵IMF (2007, pp. 1–29). Similar findings are found during the period 1980 to 2004 in Schadler (2008).

Figure 1.40. Impulse Response Functions

Sources: BNY Mellon iFlowSM data; and IMF staff estimates.
 Note: Lower axis represents days from initial shock.

regions—especially in Latin America—raises concerns about threats to financial stability.

In response to increased foreign inflows, policymakers in a number of countries have introduced a variety of measures. For instance, authorities in Brazil, Indonesia, and Korea introduced measures to mitigate the impact of strong capital flows on domestic macroeconomic and financial stability—precisely in countries where the BNY Mellon iFlowSM data found foreign equity inflows had become especially persistent. The measures in these countries might have changed the overall composition of capital inflows, but they have not as yet significantly reduced the persistence of equity inflows.

There are signs of a self-reinforcing cycle between inflows and risk-adjusted returns (Figure 1.40). The

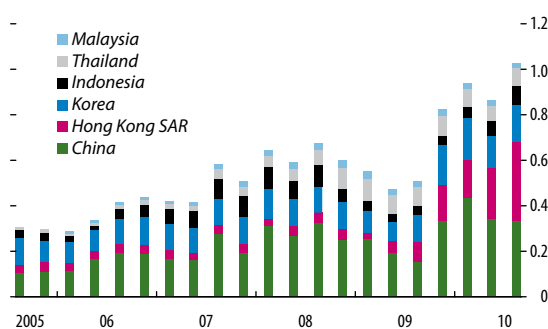
panel VAR estimation over the sample period January 2003 to June 2010 shows that flows to emerging and selected advanced markets increase in response to higher returns (Figure 1.40, first panel) and lower volatility of returns (Figure 1.40, second panel), indicating that flows are chasing higher risk-adjusted returns. This is not altogether surprising, and is a common trend observed in broader asset allocation, especially among retail investors. The model also shows that a sharp increase in flows is followed by a period of generally higher returns (Figure 1.40, third panel) and lower volatility of returns (Figure 1.40, fourth panel), providing evidence of a self-reinforcing cycle of portfolio inflows and market returns in emerging and selected advanced markets. An important caveat in this analysis is that other variables may be driving portfolio

Figure 1.41. Outstanding Local Currency Corporate Bonds
(Quarterly percent change)



Sources: Bank for International Settlements; and IMF staff estimates.

Figure 1.42. Local Currency Government and Corporate Bond Issuance
(In trillions of U.S. dollars)



Source: Asian Development Bank.

lio inflows. However, among those tested, we found returns and market volatility to be most significant.⁵⁶

This self-reinforcing cycle between flows and returns exacerbates market movements on the upside and on the downside, with important implications for financial stability. Higher returns and lower volatilities resulting from elevated foreign inflows can lead to perceptions of higher risk-adjusted returns and an underpricing of risk. By the same token, if flows to emerging markets reverse suddenly, a self-reinforcing cycle of outflows and lower risk-adjusted returns could follow, potentially resulting in a deep market sell-off.

Annex 1.4. Asia's Local Currency Corporate Bond Market—A New Spare Tire⁵⁷

In 2009, there was a surge in local currency bond issuance in Asia. Why did this happen at a time when investors were risk-averse and firms were slashing their investment programs? The answer seems to be that Asian bond markets have now become the long-awaited “spare tire” for Asian financial systems. Large corporates were consequently able to turn to this market when domestic banks became reluctant to lend.

Local currency corporate bond issuance surged in emerging Asia in 2009. Following several quarters of minimal or even negative net issuance, the stock of local currency bonds began to increase in the second quarter (by over 20 percent in emerging Asia excluding China) (Figure 1.41). Issuance rose particularly in India, Indonesia, and Korea (Figure 1.42). The surge is puzzling for several reasons. To begin with, emerging Asian corporates typically do not rely much on bond issuance for funding; local currency bonds are only about one-third of bank lending, and during 2002–08 their ratio to GDP barely increased at all. Moreover, the surge took place in the middle of a recession, when investment needs were relatively small. Finally, the

⁵⁶We found no evidence that economic fundamentals affected equity flows at a monthly frequency. The VIX, a measure of one-month implied volatility on the S&P that is often used as a proxy for global volatility, was found to significantly affect flows. Since our model already included a measure of domestic market volatility and since the global measure did not enhance our results, we opted not to include the VIX as an explanatory variable.

⁵⁷This annex was prepared by Joshua Felman, Sanjay Kalra, and Ceyda Oner.

surge occurred when corporate bond spreads were hovering above 100 basis points on average in the three large markets (India, Korea, and Singapore), twice the levels prevailing during 2002–05.

In large part, bond issuance surged because local corporates were trying to make up for tighter bank lending conditions. Asian banks had comfortable levels of liquidity and capital, yet after Lehman's collapse they followed their Western peers and curtailed credit to local corporates sharply. This led large corporates to substitute bond financing for bank loans, even as their overall financing needs were declining. Not all companies could do this, however, as Asia's bond markets are limited to only the largest and best-rated companies. As a result, governments stepped in to help small and medium-sized enterprises, expanding programs that guarantee bank lending and providing funds directly through state-controlled banks.

Beyond substitution, there was another important factor influencing corporates' desire to issue: the level of interest rates. While corporate bond spreads remained elevated, the absolute level of bond yields dropped, with those in India and Korea reaching the lowest levels in the decade. Bond yields were also low relative to the cost of borrowing from banks, evident in the increase in the spread between prime lending rates and corporate bond yields in India and Korea (Figure 1.43). Accordingly, some corporates took advantage of the favorable cost conditions to pre-fund their expected future funding needs.

Demand for these bond issues was fueled by the revival of risk appetite among foreign investors. As risk aversion fell from its post-Lehman levels and bond yields in advanced countries reached exceptionally low levels, a renewed search for yield began on the back of a very easy monetary stance in core mature markets. With Asian corporates having proved resilient to the downturn and with Asia beginning to recover ahead of the advanced countries, investors began reallocating funds to regional assets.

The experience of 2009 suggests that Asian bond markets have come a long way since 1997. Programs such as the Asian Bond Market Initiative adopted by the ASEAN+3 (the Association of Southeast Asian Nations plus China, Japan, and Korea) have succeeded in developing Asia's local corporate bond markets to the point where they are now able to be the spare tire that

Figure 1.43 Spread Between Prime Rate and Corporate Bond Yield Index
(In percentage points)



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

was so notable by its absence in the Asia crisis of a decade ago. Going forward, the region's corporate bond markets should go beyond this role, providing a viable and deep source of funding, both in good times and bad. Moreover, the scope should be expanded beyond a handful of large, highly rated companies to smaller corporates, which represent the bulk of the region's corporate sector.

Annex 1.5. Where Now for Fannie and Freddie? A Review of the Options⁵⁸

The recent overhaul of U.S. financial regulation entirely omitted reform of the housing-related government-sponsored enterprises (GSEs).⁵⁹ The U.S. administration has launched a consultation on the future of those housing GSEs and is committed to propose legislation in 2011. This annex reviews the issues and options.

Before the United States embarks on a fundamental review of its housing finance system whose consequences could last decades, it would be advisable to:

- **Fully understand why the GSEs failed.** The dual mandate of the GSEs of private profitability combined with public policy objectives and weak regulation promoted risk-taking at the expense of taxpayers. Given weak governance, conflicting objectives, and susceptibility to lobbying and capture, the reformed institutions should be tightly proscribed from expanding their mission. To increase transparency and reflect the U.S. government's de facto ownership and control, the existing GSEs should be brought "on-budget."⁶⁰
- **Consider the appropriate contracts to finance home purchases in the long term.** Is constructing an infrastructure to facilitate the provision of 30-year fixed-rate but freely-callable mortgages necessary when few other countries offer the product on such a scale? A more radical approach would be to consider the feasibility of financing home purchases through nonleveraged arrangements more conducive to housing price stability (e.g., shared-appreciation mortgages; lease-to-buy schemes).

⁵⁸This annex was prepared by Paul Mills.

⁵⁹See the U.S. Financial Sector Stability Assessment for a preliminary discussion (IMF, 2010e).

⁶⁰As recommended by the CBO (2010).

- **Reassess U.S. housing subsidies.** Currently, U.S. housing is heavily subsidized (CBO, 2009), with benefits skewed toward higher earners with itemized tax filings, despite having little discernible impact on the homeownership rate. If housing subsidies are deemed necessary, their delivery should be through tax credits for homeownership rather than through subsidies to mortgage payments.
- **Ensure that a mechanism to stabilize housing can be deployed.** The rapid expansion of private-label mortgage securitization in 2004–07 relied on the assumption that a nationwide U.S. housing recession would never occur. In the process, lending conditions were relaxed simultaneously across local markets, raising their correlations and leading to the very conditions that undermined the initial assumption.⁶¹ By increasing mortgage lending or guarantee fees when house prices or mortgage lending are growing rapidly, the successors to the GSEs could contribute to the Federal Reserve's new responsibility for macro-prudential oversight.

Agreed-Upon Elements of Reform

There is near-universal agreement that GSE reform should address:

- **The ambiguity of the GSEs' status as quoted companies with private shareholders but with publicly-mandated housing objectives and implicit guarantees from the U.S. taxpayer.** Most of the gains from the agencies' lower cost of borrowing accrued to private sector shareholders and managers rather than borrowers, giving the GSEs incentives to lobby aggressively for the preservation of their status.⁶² Any private successor bodies need to be small enough to be allowed to fail, while any remaining government mortgage guarantees should be charged at a market rate. If any subsidy element remains, it should be scored on budget.

⁶¹This is an example of "Goodhart's Law" in operation, whereby action taken on the basis of a statistical regularity acts to undermine the aforementioned regularity.

⁶²See Passmore (2005). In July 2008, it was estimated that the GSEs had saved homebuyers a total of \$100 billion over their lifetimes (going back to the 1930s for Fannie Mae), an amount already exceeded by capital injections since 2008.

- *The winding down of the GSEs' investment portfolios.* The GSEs borrowed up to \$1.7 trillion at low rates based on the government's implicit guarantee, to buy other GSE and private-label mortgage-backed securities (MBS), and other corporate securities, at a yield pick-up. Holdings of subprime and Alt-A MBS were the primary source of the GSEs' heavy losses in 2008–09. Although sometimes justified on the basis of providing a backstop source of MBS demand in a crisis, any continuing role can be temporary and housed elsewhere on the public sector's balance sheet.
- *Weak regulation.* Despite the Office of Federal Housing Enterprise Oversight declaring the GSEs adequately capitalized in July 2008, the U.S. authorities were forced to place them into conservatorship in September 2008. Future regulation of any successor bodies needs to be independent of political lobbying, and the bodies should be treated as equivalent to private sector mortgage insurance companies, if necessary coming under Fed oversight as systemically important financial holding companies. Political lobbying by any successor bodies in receipt of public funds should be circumscribed.

There are then a number of different models for U.S. housing finance. The alternatives include:

- *Full privatization.* GSEs would be recapitalized and sold to the public, perhaps in smaller, competing mortgage insurance entities that would be prevented from merging. The GSEs' conservatorships would be terminated, with Congress legislating to rescind their federal charters and associated privileges. If standardization is needed for the MBS market, this could be given to the GSEs' regulator, or the Fed, or a private sector cooperative utility. Such a cooperative could act to pool mortgages underwritten along standardized "conforming" lines into uniform MBS structures to maximize market liquidity and preserve the "to-be-announced" market (Dechario and others, 2010).
- *Public utility.* The GSEs' investment operations could be allowed to run-off, with a new public entity that charges market rates to assume the mortgage guarantee and securitization operations. There would be no ambiguity over the federal

backing for the new public entity. This would preserve government support for securitization while retaining the MBS liquidity benefits that come from standardization.

- *Wind up and do nothing.* Following the stabilization of the housing market, the GSEs could be placed into run-off. The United States could then rely on on-balance-sheet bank lending, covered bond issues, and the return of private-label securitization to provide mortgage finance.

Whichever mix of these operations is chosen, the future creditworthiness of the U.S. government and the stability of the financial system depend on ensuring any GSE successor bodies are not used covertly to subsidize housing costs for political ends by accumulating contingent liabilities to the U.S. taxpayer.

References

- Backus, David K., Silverio Foresi, and Liuren Wu, 2004, "Accounting for Biases in Black-Scholes," August 31. Available via the Internet: <http://ssrn.com/abstract=585623>.
- Bank of Japan, 2010, *Financial System Report* (March). Available via the Internet: www.boj.or.jp/en/theme/finsys/fsys/index.htm.
- Barrell, Ray, E. Philip Davis, Tatiana Fic, Dawn Holland, Simon Kirby, and Iana Liadze, 2009, "Optimal Regulation of Bank Capital and Liquidity: How to Calibrate New International Standards," Occasional Paper Series No. 38 (London: Financial Services Authority).
- Black, Fischer, and Myron Scholes, 1973, "The Pricing of Options and Corporate Liabilities," *Journal of Political Economy*, Vol. 81, No. 3, pp. 637–54.
- Board of Governors of the Federal Reserve System, 2010, "The April 2010 Senior Loan Officer Opinion Survey on Bank Lending Practices," April (Washington). Available via the Internet: www.federalreserve.gov/boarddocs/snloansurvey/201005/default.htm.
- Chicago Booth/Kellogg School, 2010, "Financial Trust Index: The Results: Wave VII," July 20. Available via the Internet: www.financialtrustindex.org/resultswave7.htm.
- Coles, Stuart, Janet Heffernan, and Jonathan Tawn, 1999, "Dependence Measures for Extreme Value Analyses," *Extremes*, Vol. 2, No. 4, pp. 339–65.
- Committee on the Global Financial System (CGFS), 2009, "Capital Flows and Emerging Market Economies," CGFS Papers No. 33. (Basel: Bank for International Settlements).

- Congressional Budget Office (CBO), 2009, *The Budget and Economic Outlook: An Update*, August (Washington).
- _____, 2010, *CBO's Budgetary Treatment of Fannie Mae and Freddie Mac*, January (Washington).
- Congressional Oversight Panel (COP), 2010, "February Oversight Report: Commercial Real Estate Losses and the Risk to Financial Stability," February 10 (Washington). Available via the Internet: <http://cop.senate.gov/reports/library/report-021110-cop.cfm>.
- Dattels, Peter, Rebecca McCaughrin, Ken Miyajima, and Jaume Puig, 2010, "Can You Map Global Financial Stability?," IMF Working Paper No. 10/145 (Washington: International Monetary Fund).
- Dechario, Toni, Patricia Mosser, Joseph Tracy, James Vickery, and Joshua Wright, 2010, "A Private Lender Cooperative Model for Residential Mortgage Finance," Staff Report No. 466, August (New York: Federal Reserve Bank of New York).
- Escolano, Julio, 2010, *A Practical Guide to Public Debt Dynamics, Fiscal Sustainability, and Cyclical Adjustment of Budgetary Aggregates*, Technical Notes and Manuals (Washington: International Monetary Fund).
- European Commission (EC), 2005, *New and Updated Budgetary Sensitivities for the EU Budgetary Surveillance*, Directorate General, Economic and Financial Affairs September 30 (Brussels: European Commission).
- Gapen, Michael T., Dale F. Gray, Cheng Hoom Lim, and Yingbin Xiao, 2005, "Measuring and Analyzing Sovereign Risk with Contingent Claims," IMF Working Paper No. 05/155 (Washington: International Monetary Fund).
- Girouard, Nathalie, and Christophe André, 2005, "Measuring Cyclically-Adjusted Budget Balances for OECD Countries," OECD Economics Department Working Paper No. 434 (Paris: Organization for Economic Cooperation and Development).
- Gray, Dale F., 2009, "Modeling Financial Crises and Sovereign Risk," *Annual Review of Financial Economics*, Vol. 1 (December), pp. 117–44.
- _____, and Andreas A. Jobst, 2010, "New Directions in Financial Sector and Sovereign Risk Management," *Journal of Investment Management*, Vol. 8, No.1, pp. 23–38.
- Gray, Dale F., Andreas A. Jobst, and Samuel W. Malone, 2010, "Quantifying Systemic Risk and Reconceptualizing the Role of Finance for Economic Growth," *Journal of Investment Management*, Vol. 8, No. 2, pp. 90–110.
- Gray, Dale F., Robert C. Merton, and Zvi Bodie, 2007, "Contingent Claims Approach to Measuring and Managing Sovereign Credit Risk," *Journal of Investment Management*, Vol. 5, No. 4, pp. 5–28.
- _____, 2008, "A New Framework for Measuring and Managing Macrofinancial Risk and Financial Stability," Harvard Business School Working Paper No. 09-015.
- Haldane, Andrew G., 2010, "The \$100 Billion Question," speech delivered at the Institute of Regulation and Risk, Hong Kong, March 30. Available via the Internet: www.bankofengland.co.uk/publications/news/2010/036.htm.
- International Monetary Fund, 2007, *World Economic Outlook*, World Economic and Financial Surveys (Washington, October).
- _____, 2009a, *Global Financial Stability Report*, World Economic and Financial Surveys (Washington, April).
- _____, 2009b, *Global Financial Stability Report*, World Economic and Financial Surveys (Washington, October).
- _____, 2010a, *Regional Economic Outlook, Asia and Pacific*, World Economic and Financial Surveys (Washington, April).
- _____, 2010b, *Fiscal Monitor*, World Economic and Financial Surveys (Washington, May).
- _____, 2010c, "Debt Managers Agree 'Stockholm Principles' to Help Manage Sovereign Risk and High Levels of Public Debt in an Environment of Elevated Uncertainty," Press Release 10/331, September 9 (Washington). Available via Internet: www.imf.org/external/np/sec/pr/2010/pr10331.htm.
- _____, 2010d, "United States: Publication of Financial Sector Assessment Program Documentation—Technical Note on Stress Testing," IMF Country Report No. 10/244, July (Washington). Available via the Internet: www.imf.org/external/pubs/cat/longres.cfm?sk=24101.0.
- _____, 2010e, *World Economic Outlook*, World Economic and Financial Surveys (Washington, October).
- _____, forthcoming, *Fiscal Monitor*, World Economic and Financial Surveys (Washington).
- Jaramillo, Laura, 2010, "Determinants of Investment Grade Status in Emerging Markets," IMF Working Paper (WP/10/117).
- Jobst, Andreas A., 2007, "Operational Risk: The Sting is Still in the Tail But the Poison Depends on the Dose," *Journal of Operational Risk*, Vol. 2, No. 2, pp. 1–56.
- Merton, R. C., 1973, "Theory of Rational Option Pricing," *Bell Journal of Economics and Management Science*, Vol. 4, No. 1, pp. 141–83.
- MSCI Barra, 2010, *MSCI Barra Yearbook 2009*. Available via the Internet (by subscription): www.msibarra.com/research/resources/2009/the_msci_barra_2009_yearbook.html.
- Passmore, Wayne, 2005, "The GSE Implicit Subsidy and the Value of Government Ambiguity," *Finance and Econom-*

- ics Discussion Series No. 2005-05 (Washington: Board of Governors of the Federal Reserve System).
- Pickands, James, 1981, "Multivariate Extreme Value Distributions," *Proceedings of the 43rd Biennial Session of the International Statistical Institute*, pp. 859–78.
- Poon, Ser-Huang, Michael Rockinger, and Jonathan Tawn, 2004, "Extreme Value Dependence in Financial Markets: Diagnostics, Models, and Financial Implications," *Review of Financial Studies*, Vol. 17, No. 2, pp. 581–610.
- Roger, Scott, and Jan Vlcek, forthcoming, "Macroeconomic Costs of Higher Bank Capital and Liquidity Requirements," IMF Working Paper (Washington: International Monetary Fund).
- Schadler, Susan, 2008, "Managing Large Capital Inflows: Taking Stock of International Experiences," ADB Institute Discussion Paper 97 (Tokyo: Asian Development Bank Institute).
- Tokuoka, Kiichi, 2010, "The Outlook for Financing Japan's Public Debt", IMF Working Paper No. 10/19 (Washington: International Monetary Fund).
- Tsounta, Evridiki, and Vladimir Klyuev, 2010, "U.S.: Housing Market—A Rocky Recovery," July 21, unpublished (Washington: International Monetary Fund).
- Vitek, Francis, 2009, "Monetary Policy Analysis and Forecasting in the World Economy: A Panel Unobserved Components Approach," IMF Working Paper No. 09/238 (Washington: International Monetary Fund).