World Economic and Financial Surveys

Global Financial Stability Report

Sovereigns, Funding, and Systemic Liquidity

OCT 10

INTERNATIONAL MONETARY FUND

World Economic and Financial Surveys

Global Financial Stability Report

Sovereigns, Funding, and Systemic Liquidity

October 2010

International Monetary Fund
Washington DC

Production: IMF Multimedia Services Division
Cover: Creative Services
Figures: Theodore F. Peters, Jr.
Typesetting: Michelle Martin

Cataloging-in-Publication Data

Global financial stability report – Washington, DC :
International Monetary Fund, 2002 –
v. ; cm. — (World economic and financial surveys, 0258-7440)

Semiannual
Some issues also have thematic titles.

ISSN 1729-701X

1. Capital market — Developing countries — Periodicals.
2. International finance — Periodicals. 3. Economic stabilization — Periodicals. I. International Monetary Fund. II. Series: World economic and financial surveys.
HG4523.G563

ISBN: 978-1-58906-948-0

Please send orders to:
International Monetary Fund, Publication Services
P.O. Box 92780, Washington, D.C. 20090, U.S.A.
Tel.: (202) 623-7430 Fax: (202) 623-7201
E-mail: publications@imf.org
Internet: www.imfbookstore.org

CONTENTS

The following symbols have been used throughout this volume:

. . . to indicate that data are not available;

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

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

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

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

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

"n.a." means not applicable.

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

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

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

PREFACE

The *Global Financial Stability Report* (GFSR) assesses key risks facing the global financial system with a view to identifying those that represent systemic vulnerabilities. In normal times, the report seeks to play a role in preventing crises by highlighting policies that may mitigate systemic risks, thereby contributing to global financial stability and the sustained economic growth of the IMF's member countries. Despite ongoing economic recovery, the global financial system remains in a period of uncertainty. The current report highlights how risks have changed over the last six months, traces the sources and channels of financial distress with an emphasis on sovereign risk, and provides a discussion of policy proposals under consideration to mend the global financial system.

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

Contributors to this report also include Sergei Antoshin, Rabah Arezki, Ivailo Arsov, Giovanni Callegari, Alexandre Chailloux, Phil de Imus, Joseph Di Censo, Joshua Felman, Jeanne Gobat, Dale Gray, Simon Gray, Kristian Hartelius, Geoffrey Heenan, Allison Holland, Talib Idris, Silvia Iorgova, Hui Jin, Andreas Jobst, Sanjay Kalra, Geoffrey Keim, William Kerry, John Kiff, Michael Kisser, Andrea Maechler, Kazuhiro Masaki, Paul Mills, Ken Miyajima, Sylwia Nowak, Ceyda Oner, Nada Oulidi, Hiroko Oura, Jaume Puig, Scott Roger, Samer Saab, Christian Schmieder, Liliana Schumacher, Mark Stone, Narayan Suryakumar, Amadou Sy, Han van der Hoorn, Chris Walker, Ann-Margret Westin, and Huanhuan Zheng. Martin Edmonds, Oksana Khadarina, Yoon Sook Kim, Marta Sánchez-Saché, Ryan Scuzzarella, and Dmytro Sharaievskyi provided analytical support. Nirmaleen Jayawardane, Juan Rigat, and Ramanjeet Singh were responsible for word processing. David Einhorn of the External Relations Department edited the manuscript and coordinated production of the publication.

This particular issue draws, in part, on a series of discussions with banks, clearing organizations, securities firms, asset management companies, hedge funds, standards setters, financial consultants, and academic researchers. The report reflects information available up to September 24, 2010.

The report benefited from comments and suggestions from staff in other IMF departments, as well as from Executive Directors following their discussion of the *Global Financial Stability Report* on September 20, 2010. However, the analysis and policy considerations are those of the contributing staff and should not be attributed to the Executive Directors, their national authorities, or the IMF.

EXECUTIVE SUMMARY

The global financial system is still in a period of significant uncertainty and remains the Achilles' heel of the economic recovery. Although the ongoing recovery is expected to continue under the baseline scenario, resulting in a gradual strengthening of balance sheets, progress toward global financial stability has experienced a setback since the April 2010 Global Financial Stability Report (GFSR). The recent turmoil in sovereign debt markets in Europe highlighted increased vulnerabilities of bank and sovereign balance sheets arising from the crisis. The financial situation has subsequently improved, owing to the forceful response by policymakers which helped to stabilize funding markets and reduce tail risk, but substantial market uncertainties persist. Global output has expanded in line with earlier projections, with growth in emerging market countries particularly strong. Mature economies are transitioning from temporary support to more self-sustaining private demand. Nevertheless, sovereign balance sheets are highly vulnerable to growth shocks, making debt sustainability less certain. In this context, policymakers must tackle the following key reforms in order to ensure a viable global financial system and safeguard the recovery: (1) deal with the legacy problems in the banking sector, including, where necessary, recapitalization; (2) strengthen the fundamentals of sovereign balance sheets; and (3) continue to clarify and specify regulatory reform, building on the substantial improvements proposed by the Basel Committee on Banking Supervision (BCBS).

The setback in progress toward financial stability was precipitated by turmoil in the sovereign debt markets in Europe, where increased vulnerabilities of sovereign and bank balance sheets became the focus of market concern. Existing sovereign debt sustainability challenges, combined with concentrated short-term debt rollovers and an undiversified investor base, left some euro area sovereigns vulnerable to funding pressures. These pressures spilled over to the banking sector, increasing the likelihood of a grim scenario of shrinking credit, slower growth, and weakening balance sheets. The forceful response at the national and supranational level to address sovereign risks and strengthen confidence in the financial system, including in particular through the provision of detailed information on bank balance sheets, helped to stabilize funding markets and mitigate risks, but conditions remain fragile.

Chapter 1 of this report presents an analysis of the challenges facing advanced countries as they deal with the juxtaposition of a slower recovery, higher debt levels and rollovers, and a still-impaired financial sector. The report starts from the premise that private and sovereign balance sheets will continue to strengthen in a gradually improving economic environment and that policy measures to address legacy problems in key banking systems are implemented alongside important stabilization policies. Nonetheless, higher downside macroeconomic risks, sovereign financing pressures, and intensifying funding strains could produce a difficult environment, requiring adept policy maneuvering.

In Europe, coordinated support programs and the announcement of ambitious fiscal reforms in countries facing the greatest funding difficulties helped contain the turmoil in the euro area after its rapid escalation in 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. Second-tier institutions and banks in countries whose sovereign spreads remain under pressure continue to have only limited access to funding markets and face rising costs. Although governments have put in place national and supranational backstops to ensure that

markets remain open, continuing forceful policy measures are needed to remain firmly on track toward building financial system resilience.

In the United States, financial stability has improved, but pockets of vulnerability remain in the banking system. Although banks have been able to raise a substantial amount of capital, and expected demands appear manageable, some raising of additional capital may be needed to reverse recent deleveraging trends and possibly to comply with U.S. regulatory reforms. Weakness in the real estate sector constitutes an additional challenge in the United States. To a large extent, the apparently modest capital needs of U.S. banks reflect the large scale of government-sponsored enterprises and other government interventions without which those needs would have been substantially higher. This highlights the extent to which risk has been transferred from private to public balance sheets, as well as the need to address the burden placed on public institutions.

In Japan, a near-term disruption in the government bond market remains unlikely. So far, the stable domestic savings base and healthy current account surplus reduce the need to attract external funding sources. Over time, the factors presently supporting the Japanese bond market—high private savings, home bias, and the lack of alternatives to yen-denominated assets—are expected to erode as the population ages and the workforce declines.

Overall, emerging markets have proven very resilient to sovereign and banking strains in advanced economies, and most have continued to enjoy access to international capital markets. Cross-border spillover effects were mostly confined to regions with significant economic and financial links to the euro area. With the current slowdown in growth in advanced countries, emerging markets, in general, have become increasingly attractive to investors because of their relatively sound fundamentals and stronger growth potential. This shift in global asset allocation is likely to increase as long as this relative difference persists. However, a potential buildup of macro-financial risks stemming from strong capital inflows—including from excess demand in local markets and possible increased volatility—remains a concern for countries on the receiving end of this ongoing asset reallocation.

Policies to Address Risks

Policymakers in many advanced countries will need to confront the interactions created by slow growth, rising sovereign indebtedness, and still-fragile financial institutions. In addition, the foundations underpinning the new financial regulatory regime need to be put into place.

Address legacy problems in the banking system. Confidence in the financial sector has not been fully restored. On the bright side, bank regulatory capital ratios have improved and global writedowns and loan provisions have declined. Our estimate of crisis-related bank writedowns between 2007 and 2010 has fallen slightly from $2.3 trillion in the April 2010 GFSR to $2.2 trillion now, driven mainly by a fall in securities losses. In addition, banks have made further progress in recognizing those writedowns, with more than three-quarters of them already reported, leaving a residual amount of approximately $550 billion. There has been less progress, though, in dealing with the imminent bank funding pressures: nearly $4 trillion of bank debt will need to be rolled over in the next 24 months. As a consequence, exits from extraordinary financial system support, including the removal of government guarantees of bank debt, will have to be carefully sequenced and planned. Resolving and/or restructuring weaker financial institutions—through closure, recapitalization, or merger—remains a priority so that funding markets can return to normal and the industry to better health. National and supranational backstops should be available to provide support where needed.

Strengthen the fundamentals of sovereign balance sheets. In the short term, adequate supranational support should be available to sovereign balance sheets in those countries facing immediate strains. In the medium run, sovereign balance sheets need to follow a credible path to ensure fiscal sustainability (see the October 2010 *World Economic Outlook* and the November 2010 *Fiscal Monitor*). Sovereign refinancing risks should be addressed by debt management policies that lengthen the average maturity structures as market conditions permit. Managing and reducing public contingent liabilities using price-based mechanisms should also be part of the plan.

Clarify and specify regulatory reforms. Much of the proposed financial reform agenda remains unfinished. International rule-making bodies have made progress to identify the most egregious failings of the global financial system in the run-up to the crisis, but their member countries have yet to agree on many of the details of the reforms. Dealing with too-important-to-fail entities, strengthening supervisory incentives and resources, and developing the macro-prudential framework are still under discussion. Further progress will require a willingness to suppress domestic interests in favor of a more stable and better functioning global financial system. The sooner reforms can be clarified, the sooner financial institutions can formulate their strategic priorities and business models. In the absence of such progress, regulatory inadequacies will continue for some time, increasing the chances of renewed financial instability.

As part of these ongoing efforts, 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. In particular, common equity will represent a higher proportion of capital and thus allow for greater loss absorption. Also, the amount of intangible and qualified assets that can be included in capital will be limited (to 15 percent). These include deferred tax assets, mortgage servicing rights, significant investments in common shares of financial institutions, and other intangible assets. 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 banking sector resilience to absorb any future shocks that may lie ahead. Furthermore, it is essential to make progress with the overall reform agenda. Putting in place sound micro-prudential regulation is not sufficient. Appropriate regulation needs to be developed with a macro-prudential approach to dampen procyclicality and to limit the systemic effects of financial institutions, some of which are not banks.

Overall, policymakers cannot relax their efforts to reduce refinancing risks, strengthen balance sheets, and reform regulatory frameworks. As apparent on several occasions over the past three years, conditions in the global financial system now have the potential of jumping from benign to crisis mode very rapidly. Against this backdrop, policymakers should not squander opportunities to strengthen and recapitalize banking systems, address too-important-to-fail entities, reduce contingent liabilities, and place sovereigns on a credible fiscal path. With the situation still fragile, some of the public support that has been given to banks in recent years will have to be continued. Planned exit strategies from unconventional monetary and financial policies may need to be delayed until the situation is more robust. At the same time, it is important to ensure that the need for extraordinary support is temporary, as it is no substitute for repairing and reforming financial sectors, and realigning their incentives to build stronger balance sheets and reduce excessive risk taking.

For emerging markets, the policy challenges are different, with most of the financial system risks on the upside. Many will need to cope with the effects of relative success, where maintaining stability will depend on their ability to deal with surges in portfolio inflows. Traditional macroeconomic policies may need to be supplemented in some cases by macro-prudential measures as they may not be fully adequate to meet the macro-financial challenges arising from particular domestic circumstances, such as inflation pressures or asset bubbles. Policies to address high and volatile capital flows are well known (see Chapter 4 of the April 2010 GFSR and IMF Staff Position Note 10/04). Moreover, emerging markets should continue to pursue policies aimed at fostering the development of local financial systems, so that they have the capacity to absorb and safely and efficiently intermediate higher volumes of capital flows.

Chapter 2: Systemic Liquidity Risk

A defining characteristic of the crisis was the depth and duration of the systemic liquidity disruption to key funding markets—that is, the simultaneous and protracted inability of financial institutions to roll over or obtain new short-term funding across both markets and borders. Chapter 2 examines this episode and shows how banks became more vulnerable to a funding problem as a result of several factors: new suppliers of wholesale funds that were less-

stable providers; greater use of secured lending markets (repurchase agreements) based on cyclically high valuations of collateral (in particular for structured credit products) and insufficient margining processes; growing use of cross-border, short-term funding of longer-term assets in foreign currency; weaknesses in the infrastructure of associated markets; and a lack of information about counterparty risks. Importantly, many were unaware about the extent of interactions between banks and nonbank institutions in the use of short-term funding markets. Hence when central banks had to step in to stabilize markets, they had to extend liquidity to nonbanks, accept a larger diversity of collateral as protection for their lending, set up cross-border foreign currency swap lines, and engage in other actions, all of which raised moral hazard issues that remain unaddressed.

Making progress to mitigate systemic liquidity risk is difficult and not easily measured, as funding markets consist of a diverse set of institutions that interact in multiple markets, each with different infrastructure characteristics. Chapter 2 examines this issue, both for institutions and markets. Current proposals focus on micro-prudential measures aimed at improving liquidity buffers and lowering asset/liability mismatches in individual banks—the BCBS proposals being most prominent. While helpful, addressing systemic liquidity risks by raising buffers at one institution does not fully protect against a system-wide liquidity shortage. In these circumstances, central banks will likely need to step in as a liquidity provider of last resort to support markets and institutions. To avoid overuse of central bank facilities and to minimize moral hazard, the liquidity risk framework should focus on ensuring that banks and others considered important to liquidity and maturity transformation are contributing in some form to systemic risk insurance in good times. To do this effectively, a good measure of systemic liquidity risk will have to be developed. However, there are significant data gaps to be addressed in order to appropriately measure and monitor systemic liquidity risks.

Although mitigating systemic liquidity risk at the level of institutions is certainly part of the answer, funding markets also need attention. Policies to make secured funding markets, such as repurchase ("repo") markets, function more effectively can help lower systemic risks and prevent liquidity constraints from turning into solvency concerns. Specifically, better collateral valuation rules, margining policies, and the use of central counterparties could all help to lower vulnerabilities. Preventing investor runs from money market mutual funds is also a necessary policy goal. The chapter recommends that stable net asset values (NAVs) not be used for investments in such funds, in order to ensure that fund investors better understand that the value of their investments will fluctuate with market conditions. This would need to be initiated carefully and in a period of stable funding conditions to ensure that such a change does not cause the run it was meant to prevent. Other remedies, such as those suggested for banks (higher buffers and less maturity transformation), can also be used to deal with liquidity risks in these funds. In those cases where flexible NAVs are not instituted, it is crucial that such funds be subject to the same requirements as deposit-taking institutions.

Chapter 3: Credit Ratings

The recent escalation of sovereign credit risk and the ratings downgrades of structured credit instruments over the last couple of years have highlighted the financial stability implications of credit rating agencies. Does the information content provided by ratings have negative implications for financial stability, or is it the way they are used? Chapter 3 sheds light on this issue, using sovereign debt ratings as its focus.

The use of ratings is mandated in a number of regulatory environments—most notably in capital requirements for banks in the standardized approach of Basel II. Many private sector entities—pension funds, insurance companies, and mutual funds—use ratings or ratings-based indices to make investment decisions. Central banks also use ratings in their collateral policies. Shifts in asset allocations based on ratings downgrades, for instance below an investment-grade rating, can be destabilizing, causing forced sales and so-called "cliff effects" in the pricing of such securities. The chapter finds that, indeed, ratings matter for the pricing of sovereign debt and that such cliff effects are most prominent when ratings fall below the investment grade barrier. In fact, even before an actual downgrade,

early warnings via a negative "outlook" or "watch" recommendation convey even more information in advance of a downgrade and have a greater impact on market prices.

As to accuracy, sovereign ratings are found to have generally performed well. Sovereigns that have defaulted since 1975 were rated below investment-grade in the year prior to their default, suggesting that the ordinal ranking that agencies profess to use is meaningful. That said, recent changes in types of risks taken on by sovereigns (such as contingent liabilities from the banking sector) imply that better publicly available sovereign risk information would be helpful to rating agencies and investors.

The credit rating agencies have attempted to produce stable "through-the-cycle" ratings to satisfy clients who find it costly to frequently alter trading decisions that are based on ratings. The chapter shows that a typical smoothing technique used by at least one rating agency is deemed likely to contribute to procyclicality in ratings compared to a method that accurately reflects current information at a "point in time." This is because a "through-the-cycle" approach waits to detect whether the degradation is more permanent than temporary and larger than one notch. However, this often means that the lagged timing of the downgrade accentuates the already negative movement in credit quality.

Overall the chapter suggests the following policies to lessen some of the adverse side effects that ratings and rating agencies may have on financial stability.

- First, regulators should remove references to ratings in their regulation where they are likely to cause cliff effects, encouraging investors to rely more on their own due diligence. Similarly, central banks should also establish their own credit analysis units if they take collateral with embedded credit risks.
- Second, to the extent that ratings continue to be used in the standardized approach of Basel II, credit rating agencies should be overseen with the same rigor as banks that use the internal-ratings approach—credit metrics reported, ratings models backtested, and ex post accuracy tests performed.
- Third, regulators should restrict "rating shopping" and conflicts of interest arising from the "issuer pay" business model by requiring the provision of more information to investors. A user-pay-based business model is difficult to maintain because of the inability to restrict access to ratings and their public good characteristic of aggregating difficult-to-obtain private information. Hence, mitigating conflicts of interest in the issuer-pay design through disclosure of any preliminary ratings obtained and how the ratings are paid for is preferred.

CHAPTER 1

ECONOMIC UNCERTAINTY, SOVEREIGN RISK, AND FINANCIAL FRAGILITIES

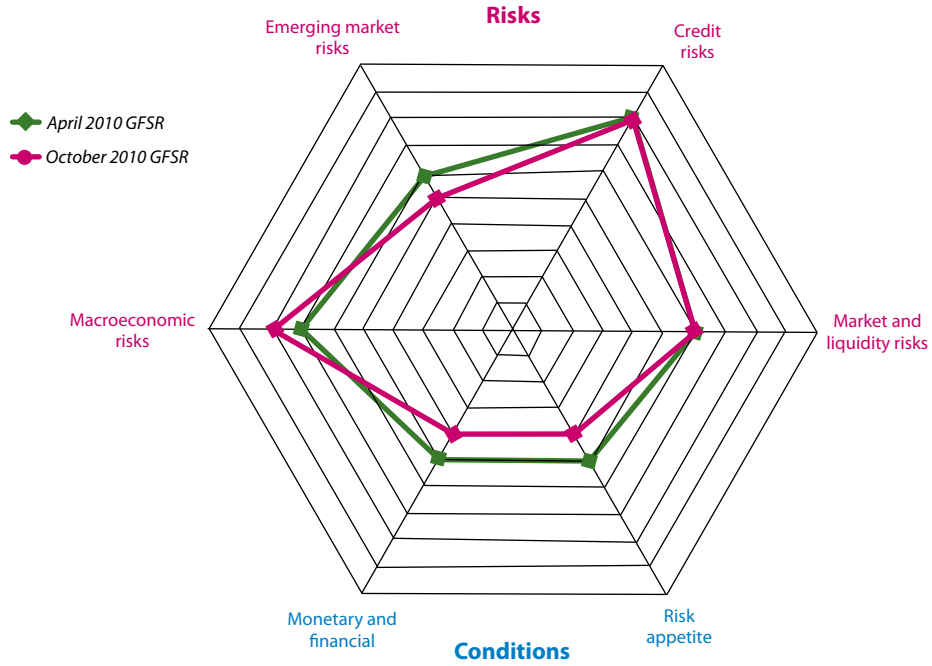
A. What Is the Outlook for Global Financial Stability?

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 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.

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.

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

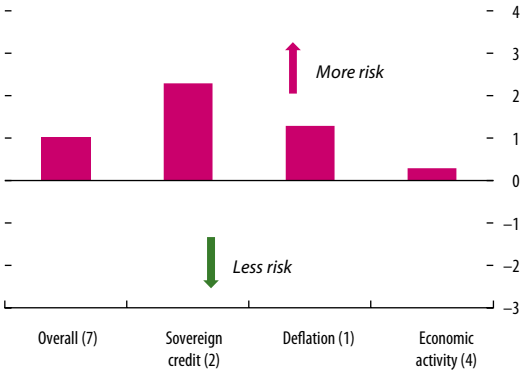


Note: Away from center signifies higher risks, easier monetary and financial conditions, or higher risk appetite.

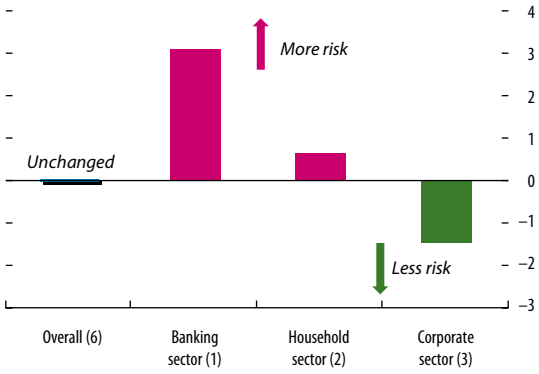
Figure 1.2. Global Financial Stability Map: Assessment of Risks and Conditions

(In notch changes since the April 2010 GFSR)

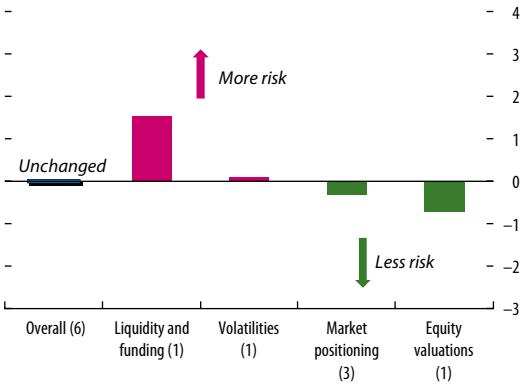
Macro risks increased as sovereign debt and deflation concerns rose amid increased economic uncertainty.



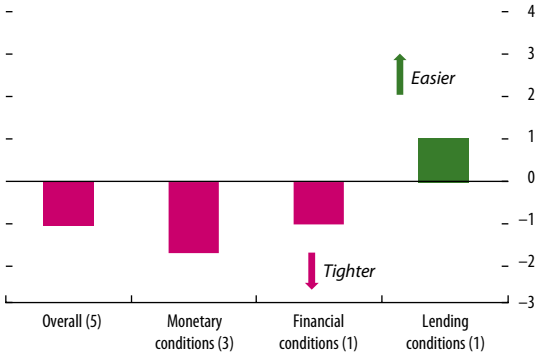
Credit risks were unchanged, as increased strains in the banking system were offset by a stronger corporate sector.



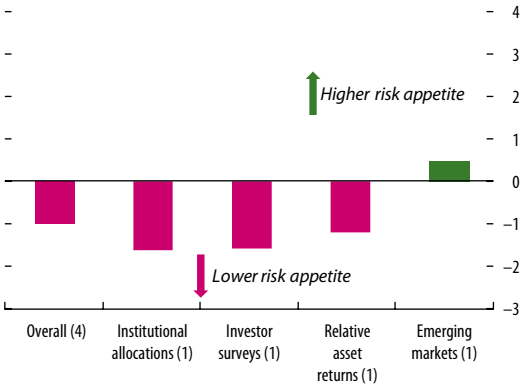
The policy response to address sovereign and bank funding strains helped contain overall *market and liquidity risks*…



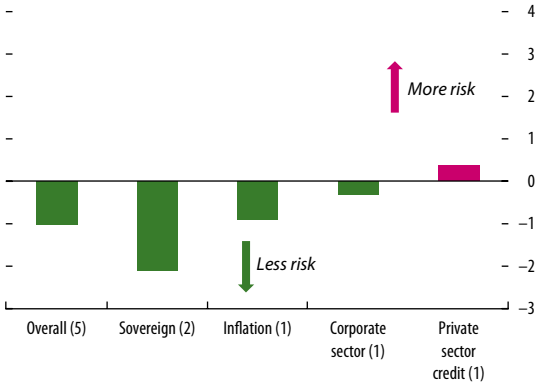
…but *monetary and financial conditions* were still tighter as a result of these strains and initial moves to exit from extraordinary support measures.



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



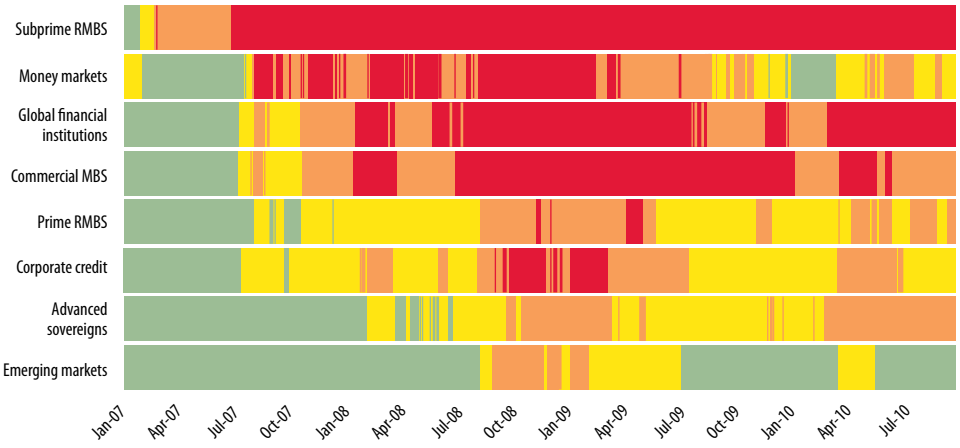
…consistent with lower *risks in emerging markets* with stronger fundamentals and growth outlook.



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.

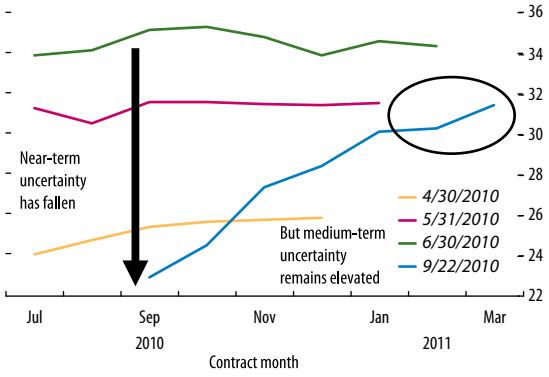
Macroeconomic risks have increased, as heightened market pressures for fiscal consolidation have complicated the challenge of managing a smooth transition to self-sustaining growth. The recovery has begun to lose steam, after better-than-expected growth in early 2010. Consumer confidence and other leading 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 deleveraging, 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.

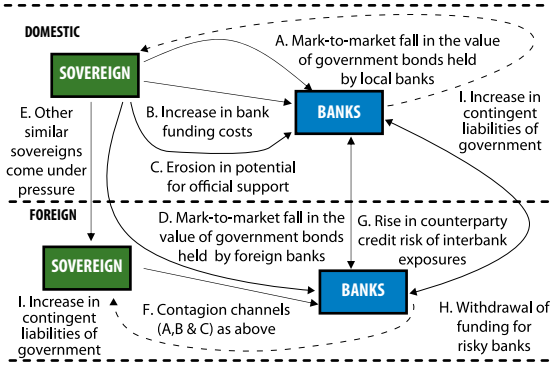
Emerging market risks have nevertheless declined. Spillovers from the sovereign debt turmoil in Europe

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.

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



Source: IMF staff.

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.

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.

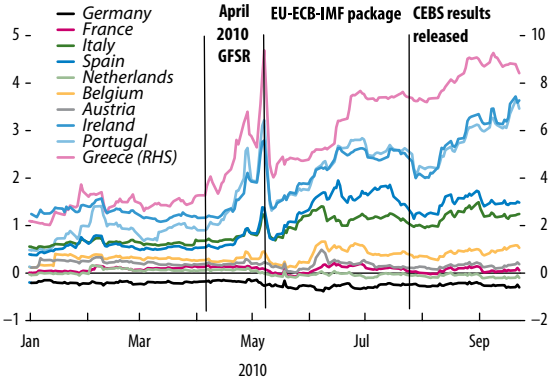
Many advanced economies have since announced plans to shore up their public sector balance sheets. Although in around one-half of advanced economies overall deficits are now projected to narrow in 2010, in many major economies deficits will be larger than last year. While the average deficit for advanced 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

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

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



Source: Bloomberg L.P.
Note: CEBS = Commitee of European Banking Supervisors.

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]	General Government Debt Held Abroad[5]	Domestic Depository Institutions' Claims on General Government[6]		BIS Reporting Banks' Consolidated International Claims on Public Sector[7]	
						Percent of 2010 GDP	Percent of depository institutions' consolidated assets		
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.

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

[2]Gross 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.

[3]Net 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.

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

[5]Most 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.

[6]Includes 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.

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

[8]Based 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.

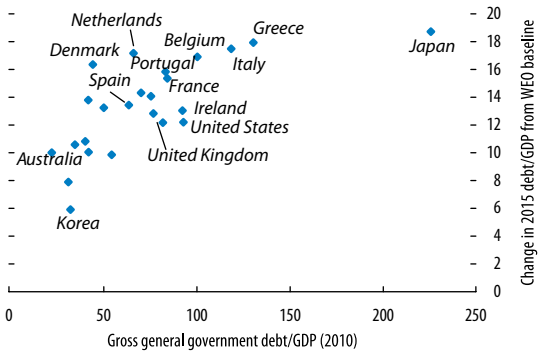
Many advanced economies face high public debt funding needs, as primary balances remain in deficit and shorter-term debt issued during the financial crisis matures over the next year and a half

[2] See 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).

[3] As 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).

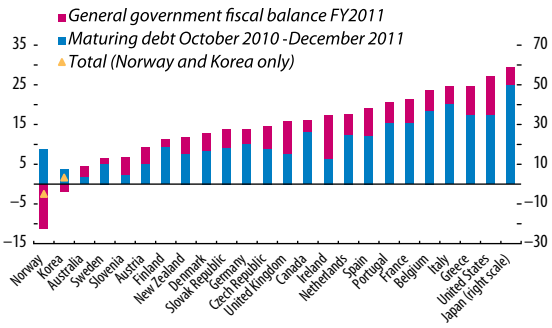
[4] See Annex 1.1 and IMF (forthcoming) for an analysis of fiscal risks.

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

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

[6]See 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.

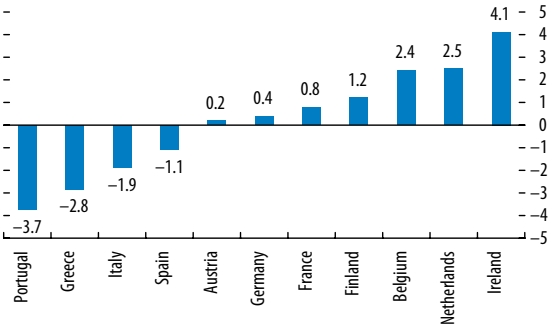
While still small, the potential for near-term sovereign funding challenges has increased as the linkages between the Japanese government bond market and domestic banks have risen in the past two years. Japanese banks' holdings of government securities as a proportion of their assets have gone up to 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

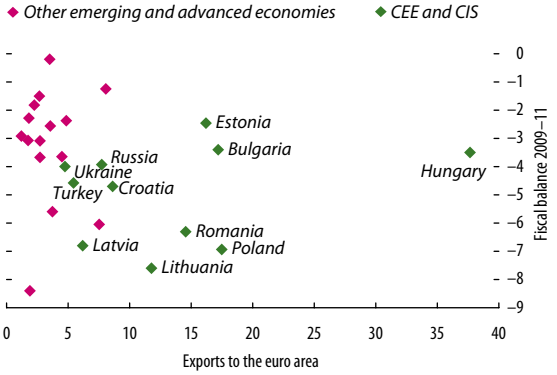
[7]See Tokuoka (2010) for a detailed discussion of the factors supporting Japanese government bond market stability and the medium-term outlook for financing Japan's public debt.

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



Sources: BNY Mellon iFlow℠ 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.

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.

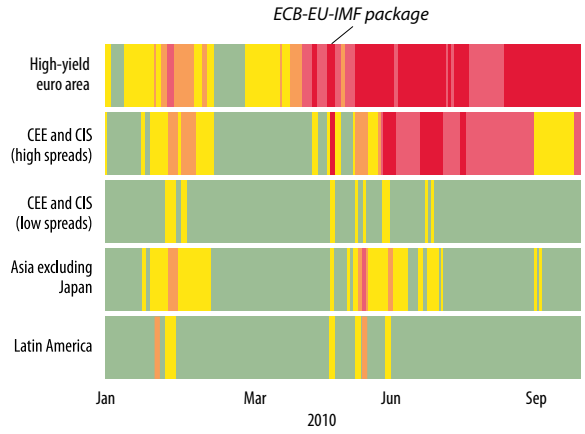
Implicit and explicit guarantees for the banking system have heightened concerns about risk transfer between banks and the sovereign.

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

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.

[8]The 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.

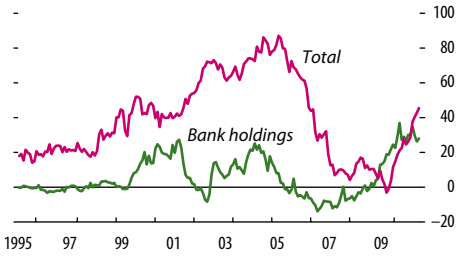
Additionally, interest rate risk has been growing in many regional banks as they have sought to counteract the contraction in lending by lengthening the duration of their JGB portfolios to augment profit margins. The largest banks, however, have partially mitigated interest rate risk by shortening the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

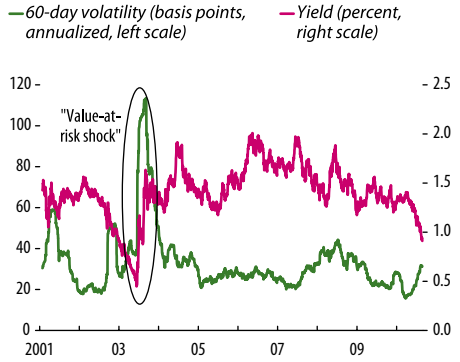
Japanese Government Bonds and Treasury Bills Outstanding

(In trillions of yen, 12-month change)



Source: Bank of Japan.

Ten-Year Japanese Government Bond Yields and Historical Volatility



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.

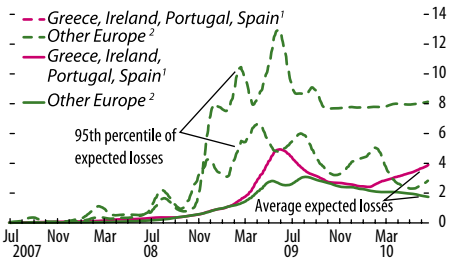
The CCA approach can also be used to analyze the impact of default/distress risk on the sovereign balance sheet by calculating an implied value for sovereign assets—as the value of sovereign assets is not directly observable—and estimating the expected losses on sovereign debt derived from the term structure 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.

[1]Annex 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.

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

[2]Sample 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.

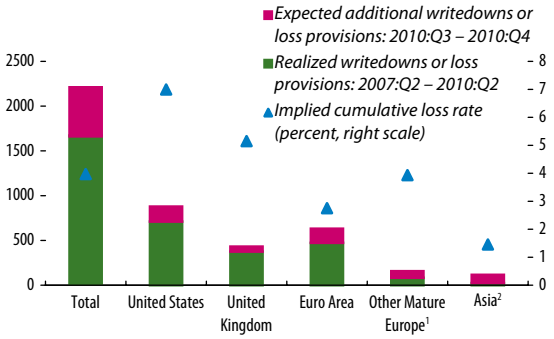
C. Sovereign and Banking System Spillovers

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.

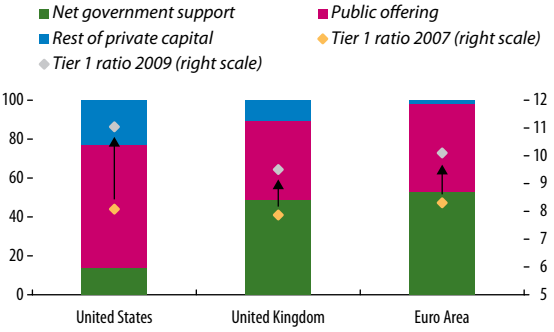
Our estimate of crisis-related total bank writedowns and loan provisions between 2007 and 2010 has now fallen from $2.3 trillion in the April 2010 GFSR to $2.2 trillion, driven mainly by a fall in securities losses (Figure 1.12). In addition, banks have made further progress in realizing those writedowns, 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.
[1]Includes Denmark, Iceland, Norway, Sweden, and Switzerland.
[2]Includes Australia, Hong Kong SAR, Japan, New Zealand, and Singapore.

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

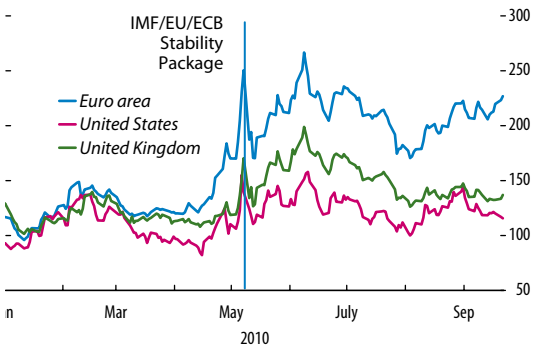


Sources: Bloomberg, L.P., Banking Supervision Committee, SNL Financial database; and IMF staff estimates.
Notes: Capital raised between 2008:Q1 and 2010:Q2.

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.

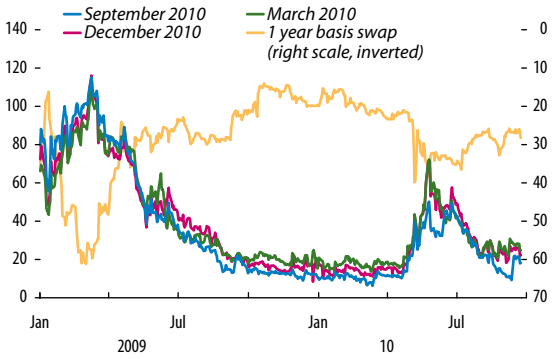
[9]As explained in previous editions of the GFSR, these estimates are subject to considerable uncertainty and range of error. See Box 1.1 of the October 2009 GFSR for further details (IMF, 2009b).

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]

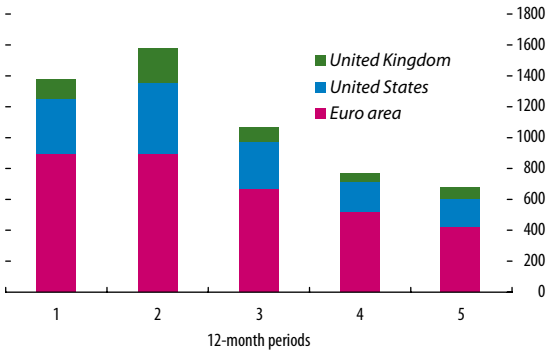
Banks now face the greatest vulnerabilities on the liabilities side of their balance sheet...

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.

[10]Accounting 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.

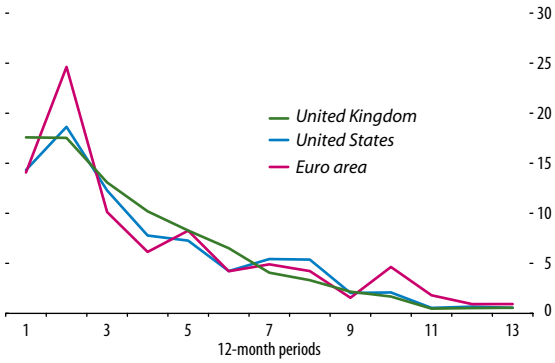
[11]European banks make greater use of wholesale funding than their U.S. peers because their balance sheets are generally larger relative to their deposit base. In Europe, the majority of mortgages and public sector loans are held on bank balance sheets or securitized in covered bonds. In the United 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)



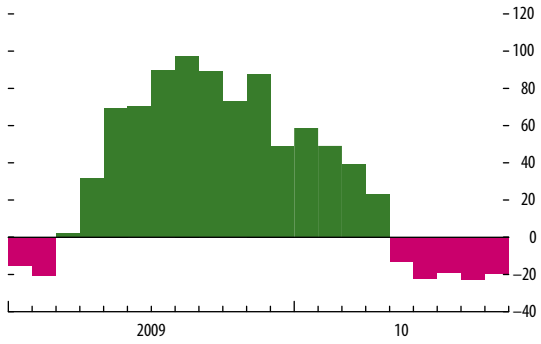
Source: Moody's.

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



Sources: Moody's; and IMF staff estimates.

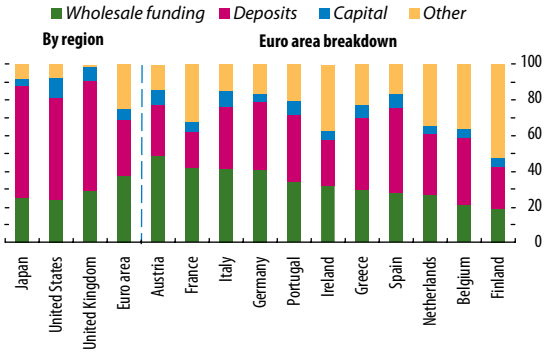
Figure 1.18. Euro Area: Bank Cumulative Net Issuance
(In billions of euros)



Sources: Dealogic; and IMF staff estimates.

Figure 1.19. Reliance on Wholesale Funding

(Percent of total liabilities, as of end-June 2010)

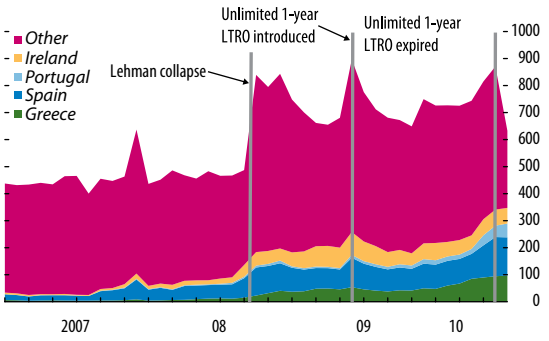


Sources: Bank of Japan; European Central Bank; Bank of England; and U.S. Federal Reserve.

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.

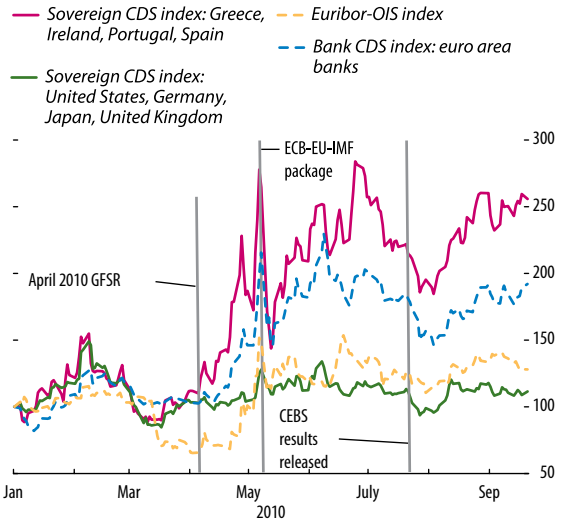
Access to funding markets for most banks has improved since late July. This easing in funding markets followed the publication of the results of the stress test on European banks coordinated by the Committee of European Banking Supervisors (CEBS).[12] The results, along with the detailed information 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 = Commitee of European Banking Supervisors

[12]This 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

[13]Some 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).

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

[15]The 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]

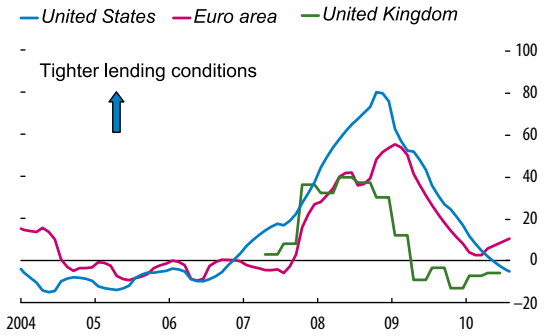
Credit growth has contracted or remained weak in countries that have seen the largest cross-border bank outflows (Figure 1.25). These outflows have tended to be in countries where subsidiaries have been more dependent on parent banks for funding, and where demand for credit has remained subdued. In countries 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

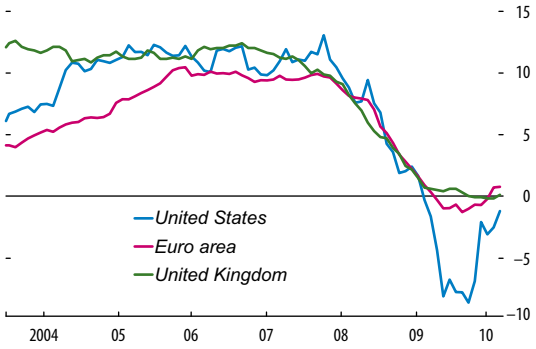
[16]Mitigating this, foreign bank lending from their local subsidiaries in CEE held up relatively well during the crisis.

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



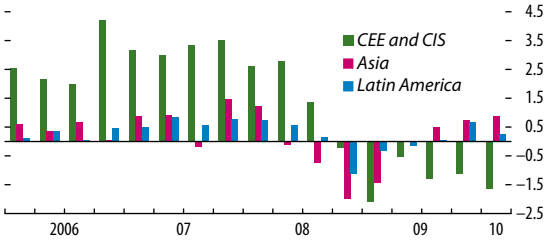
Sources: Lending surveys by the Bank of England, European Central Bank, and the U.S. Federal Reserve for households and corporates; and IMF staff estimates.

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



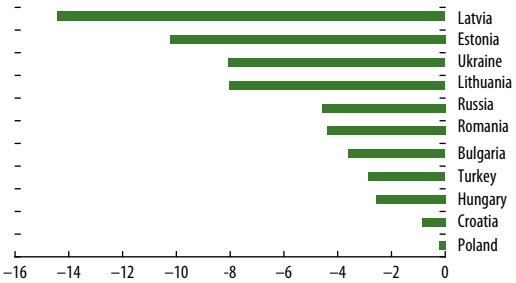
Sources: Haver; national authorities; and IMF staff estimates.

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



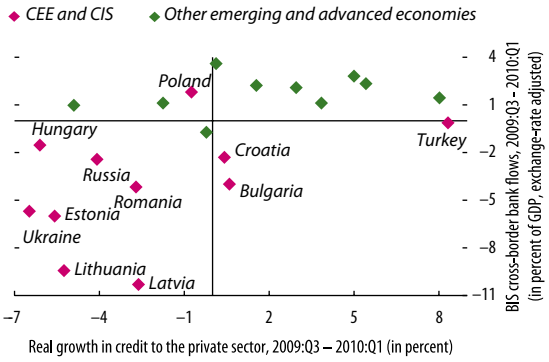
Sources: Bank for International Settlements; IMF, World Economic Outlook database; and IMF staff estimates.
Note: Locational statistics. CEE = central and eastern Europe. CIS = Commonwealth of Independent States.

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.

[17]For 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.

[18]The 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.

[19]Credit 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:

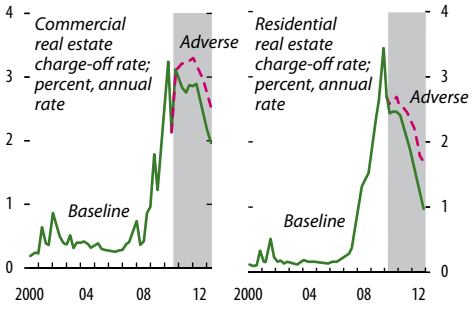
- *A low demand for houses*. Continued high unemployment, waning consumer confidence, and tighter underwriting standards could continue to discourage buyers from entering the residential market. The April 2010 expiration of the home-buyers' tax credit may also have brought forward sales, which could 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.

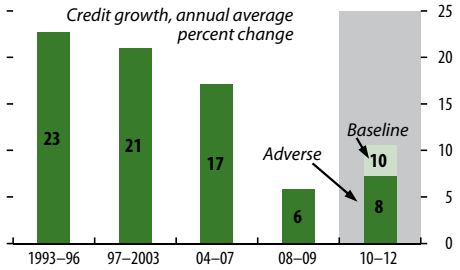
Box 1.3 (*continued*)

Risks Emerging from Real Estate Sectors

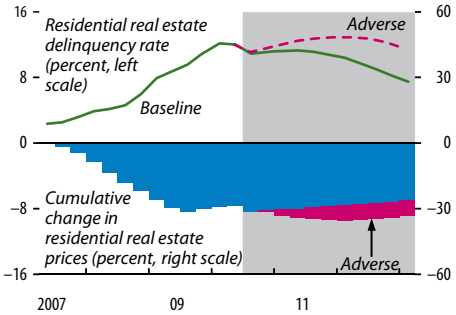
Real-estate loan charge-offs are expected to remain high throughout the forecast period...



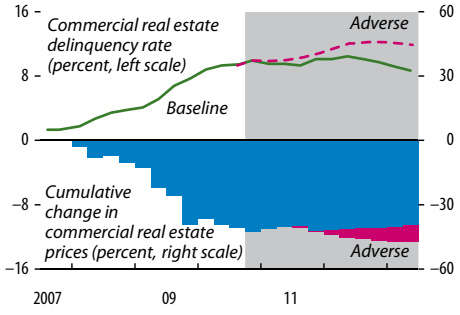
... contributing to weak post-recession credit growth relative to historical standards.



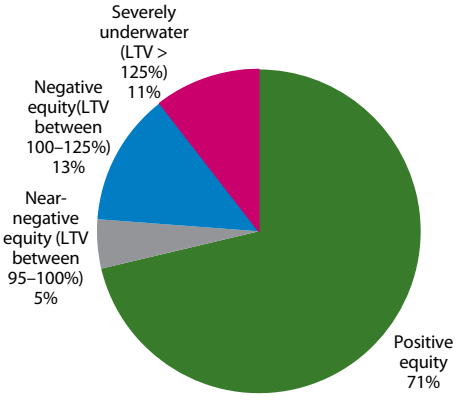
House prices are expected to recover only slightly, contributing to high delinquencies and losses...



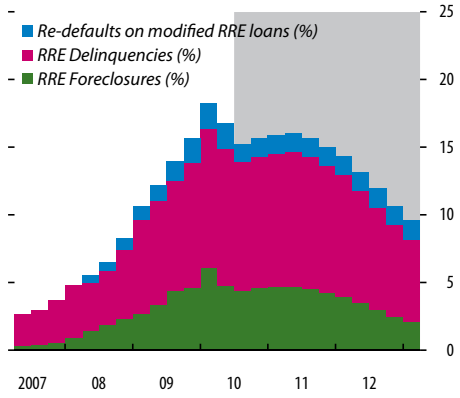
... a similar situation is expected for commercial real estate...



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 ratio[2]					
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.
[1]Banks with assets greater than $10 billion.
[2]Tier 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.

[20]The 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.

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

[22]The 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.

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

[24]Banks 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.

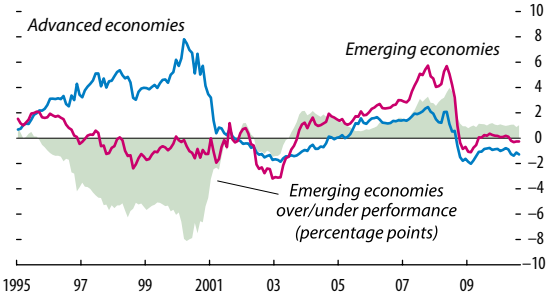
D. Managing Risks to Emerging Markets

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…

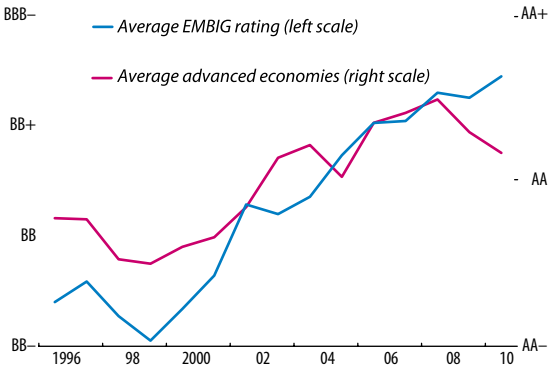
The escalation of the euro area sovereign turmoil in early-2010 reinforced the favorable risk-return profile of emerging markets on a relative basis.[25] On a risk-adjusted basis, emerging market equities have outperformed mature market counterparts since mid-2003, partly reflecting their diverging macroeconomic 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

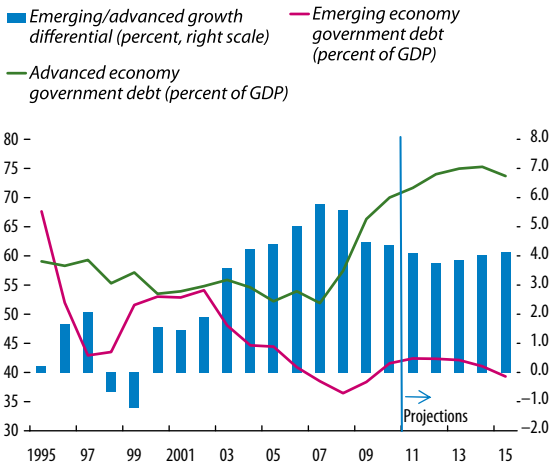


Sources: Moody's; Standard & Poor's; and IMF staff estimates.
Note: EMBIG = Emerging Markets Bond Index Global.

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

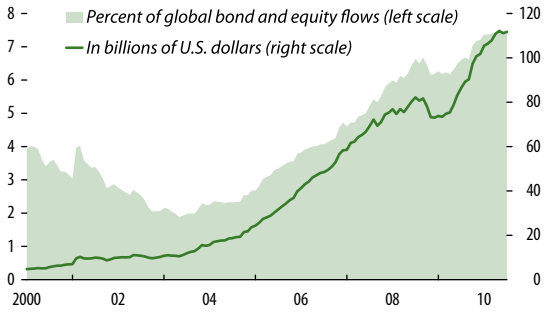
[26]Similarly, risk-adjusted total returns of emerging market sovereign external bonds began outperforming those of global investment-grade corporate bonds in 2004. The former's performance remained somewhat superior to the latter's as markets were sold off around Lehman's bankruptcy, but has lagged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

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

[28]Various 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.

[29]Cumulative institutional investor flows to emerging market bond and equity instruments were about $105 billion during January 2003–June 2010 based on BNY Mellon iFlow℠ 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 iFlow℠ 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 iFlow℠ data composition, with more countries covered, and greater penetration within the countries.

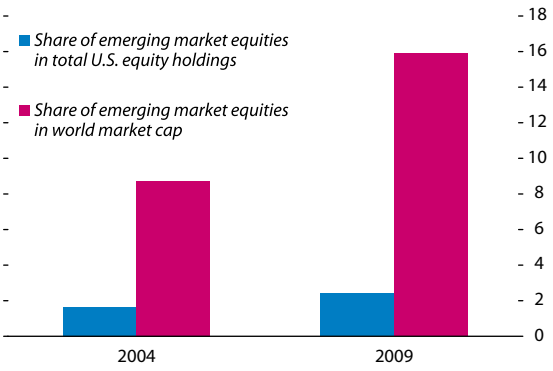
[30]In addition, emerging markets are gradually being included in global asset indices. For instance, Citigroup announced the inclusion of Mexico on its World Government Bond Index (WGBI) earlier this year, and is monitoring Indonesia, the Philippines, Taiwan Province of China, and Thailand for potential

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.

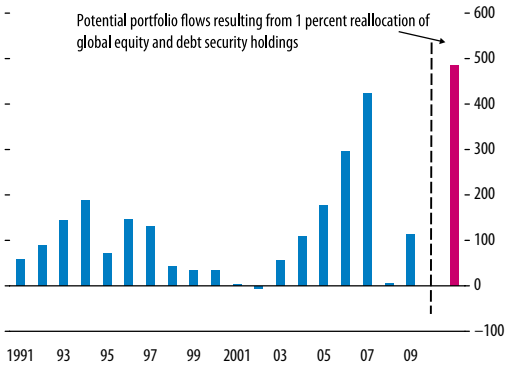
The prospect of heavy capital inflows could be destabilizing. Prior research suggests that the combination of large capital inflows and accommodative monetary policy raises the risk of asset-price, boom-bust cycles (IMF, 2010a, pp. 26–28). There is, in particular, an obvious risk that, in the absence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

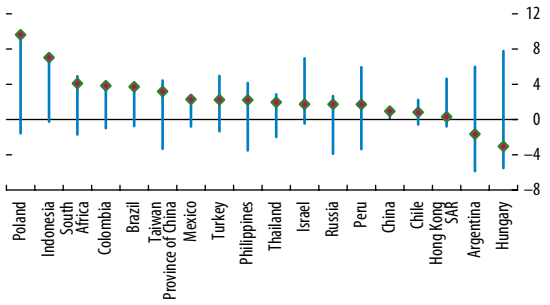
inclusion. Poland (2002), Singapore (2004), and Malaysia (2006) are already included in the index.

[31]In 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.

[32]The 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.

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

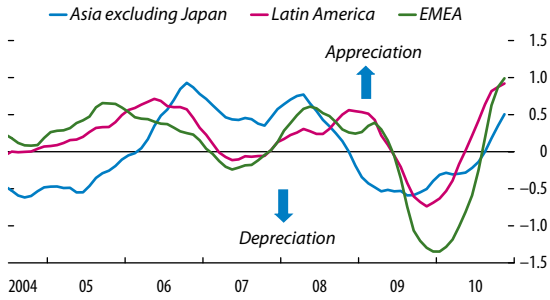
Figure 1.30. Equity and Debt Portfolio Inflows
(Percent of equity market capitalization and debt outstanding)



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).

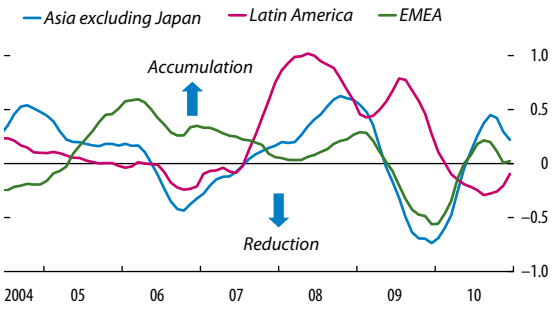
…which may be partially mitigated by macroprudential measures.

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

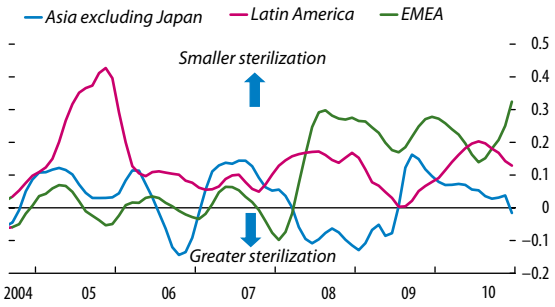
[34]Variables are broadly similar to the components of the exchange market pressures index, which combines movements in the bilateral exchange rate and international reserves (see IMF, 2007).

Figure 1.32. Change in Official Reserves
(Z score)



Sources: IMF, International Finanancial 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.

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

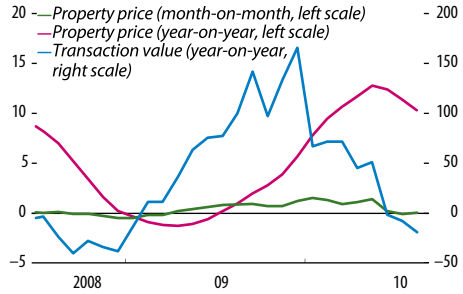
After a period of rapid credit expansion in 2009, the Chinese authorities have started to withdraw stimulus measures, in part to contain the build-up of credit risk and avoid potential ripple effects to the rest of the economy. In particular, the authorities are taking measures in both the real estate 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 entities 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.

China: Change in Property Price and Transaction Value
(In percent)



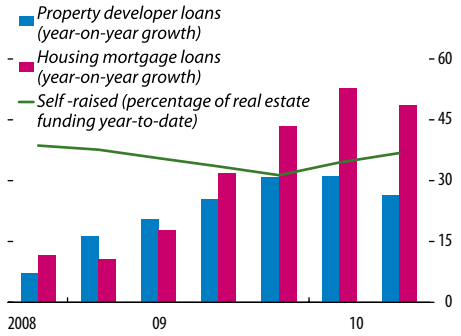
Sources: CEIC, national authorities; and IMF staff estimates.

Note: This box was prepared by Hui Jin.

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

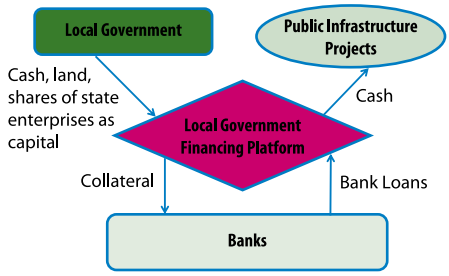
[2]The initial capital typically takes the form of government-owned land, cash, or shares of state enterprises.

China: Real Estate Funding
(In percent)



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

Typical Structure of Local Government Financing Platform



Source: IMF staff.

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 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.

[3]Private 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.

[4]As 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

[35]Chapter 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:

$$i_{BRL,off} = (1 + i_s)\ (f_{90,off}|e)^4 - 1.$$

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-

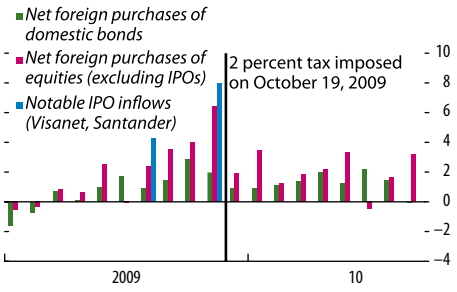
Note: This box was prepared by Chris Walker.

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

Box 1.5 (*concluded*)

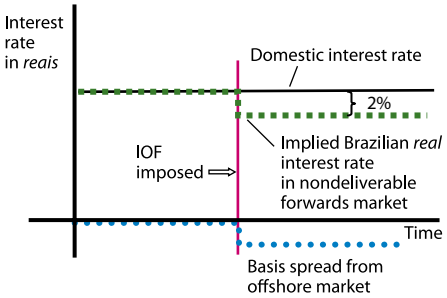
Monthly Portfolio Capital Inflows before and after Imposition of IOF

(In billions of U.S. dollars)



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

Expected Change in Interest Rates if the IOF Is Fully Binding



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 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-

[36]See 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).

[37]See "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.

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

[39]See 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] 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

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

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.

[1]Participating 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.

[2]The interim MAG report is available at www.bis.org/publ/othp10.pdf?noframes=1); the LEI report is available at www.bis.org/publ/bcbs173.pdf?noframes=1.

[3]The 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)

	Bank Response			
			Cut in Lending	
Assumptions	Cut in Dividends	Higher Lending Margins	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 Vlcek, 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.

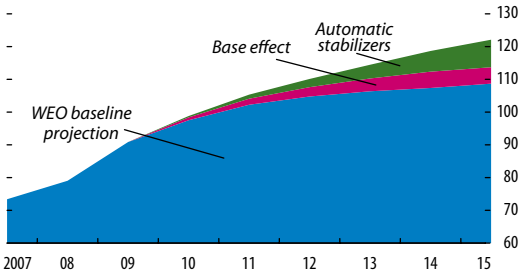
The third area in which the IMF contributed to the MAG and LEI analysis was in the estimation of international spillovers associated with the introduction of regulatory measures. This analysis employed a multi-country model with trade and financial linkages.[4] The model was first used to estimate the 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.

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

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.

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.

Annex 1.1. Impact of Adverse Growth Shock on Advanced Economy Debt Ratios[41]

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^{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

[41]This 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					
	Baseline	Baseline	Low-Growth Scenario	Change Baseline-Low Growth Scenario	Impact of the Shock on 2015 Debt due to:	
	2010	2015	2015	2015	Automatic Stabilizers	Change in the GDP Base
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 Risk[43]

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

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

[43]This 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).

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

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,

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

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

[46]In 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 $E = A_0N(d_1) - Be^{-rt}\,N(d_2)$ 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).

[47]The 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.

[48]The 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.

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.

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 shows 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.

[49]The 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.

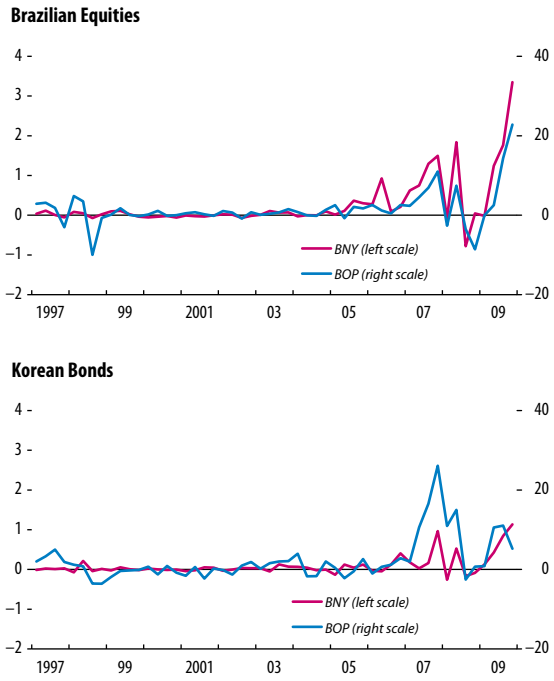
The results indicate that contingent liabilities stemming from the banks included in the sample remain large, with significant tail risks from potential bank losses. Furthermore, should these contingent liabilities materialize, they could have a significant impact on the cost of funding and creditworthiness 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 Markets[50]

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

[50]This 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 iFlow[SM] 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 iFlow[sm] 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 iFlow[sm] 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]

[51]Guidance on iFlow[sm] data and interpretation provided by Samarjit Shankar, Managing Director, BNY Mellon.

[52]For 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.

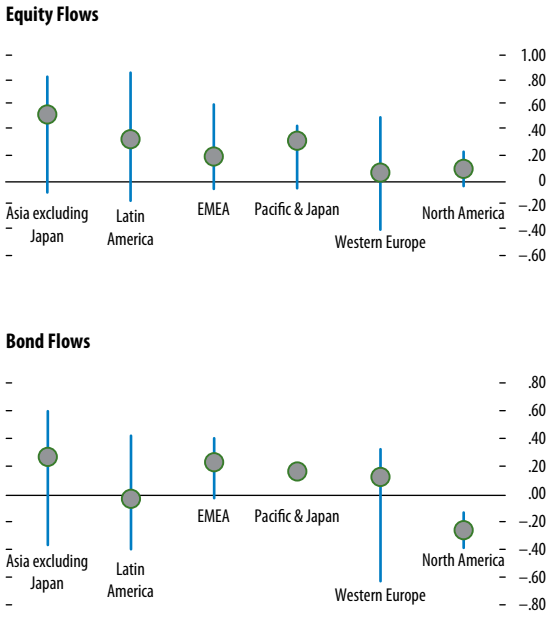
The VR statistic for q periods $VR(q)$ is calculated as follows:

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

where $\rho(k)$ is the k-lag autocorrelation coefficient, $flow_t$ is the daily equity flows measured in millions of U.S. dollars, $\hat{u}$ 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 iFlow[SM] data are not as consistent with the balance of payments data for advanced economies.

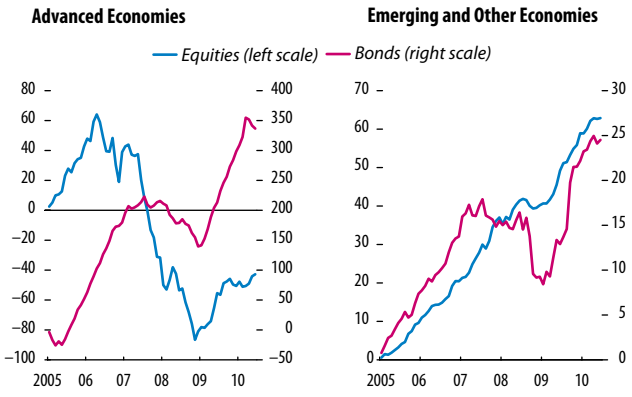
Figure 1.36. Correlation between Bank of New York Mellon iFlow[SM] and Balance of Payment Flows



Sources: BNY Mellon iFlow[SM] data; IMF, International Financial Statistics database; and IMF staff estimates.

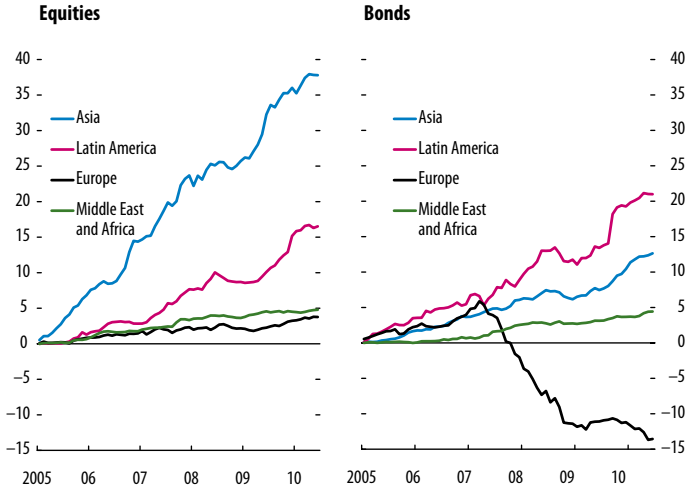
Note: EMEA = Europe, Middle East, and Africa. BNY = Bank of New York Mellon. Vertical lines represent correlation coefficient ranges for sample period from January 1997 to June 2010. Circles signify median values.

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



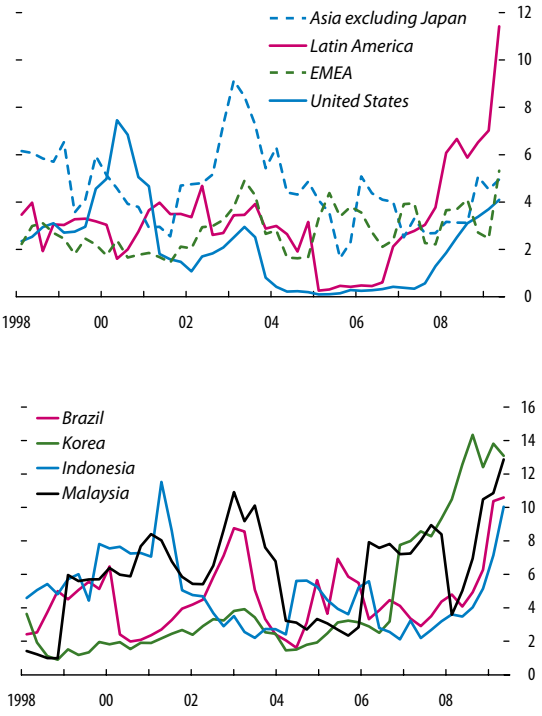
Sources: Bank of New York Mellon (BNY) iFlow[SM] data; and IMF staff estimates.

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



Sources: Bank of New York Mellon (BNY) iFlow[SM] data; and IMF staff estimates

Figure 1.39. Variance Ratios of Equity Flows to Selected Markets



Sources: BNY Mellon iFlow[SM] 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:

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

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, $\sigma^2_{R_{i,t}}$ 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

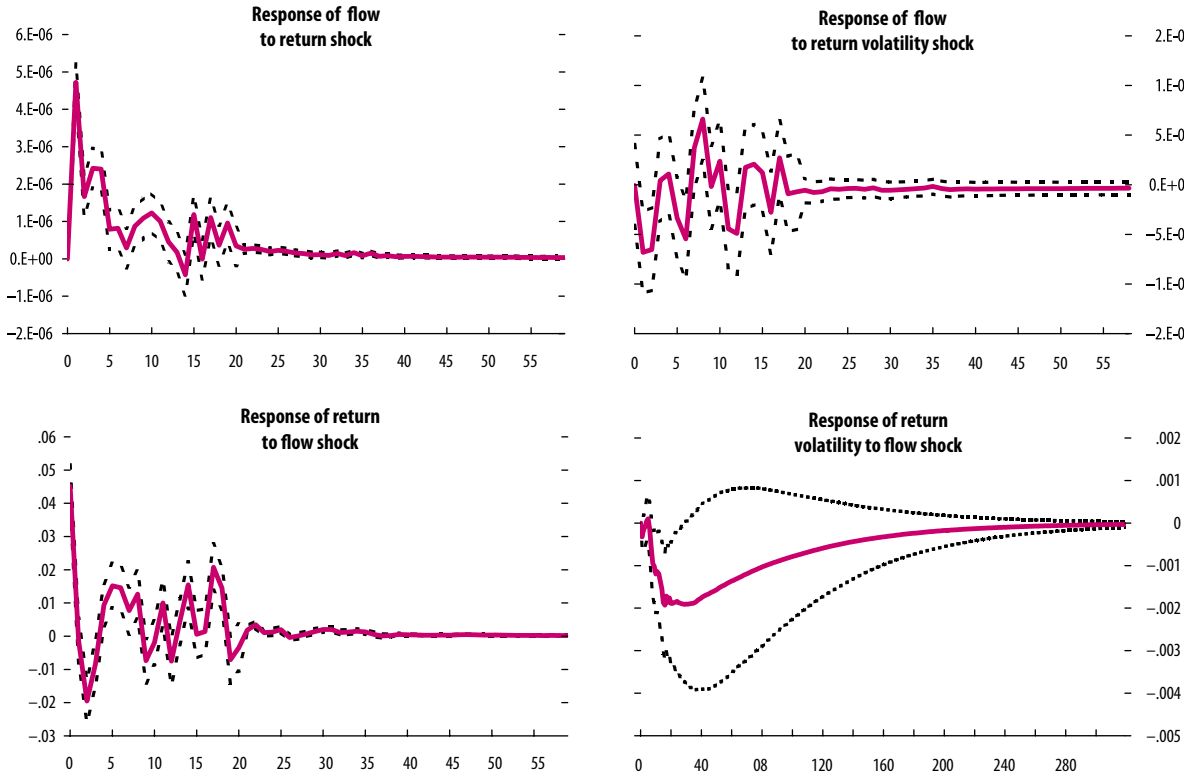
Equity flows to emerging and selected advanced economies tend to exhibit signs of herding behavior over a short horizon.[54] VR statistics over 60 days indicate flows to those markets have systematically been more persistent than flows to the United States over the period from 2003 to 2010 (Figure 1.39). 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

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

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

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

Figure 1.40. Impulse Response Functions



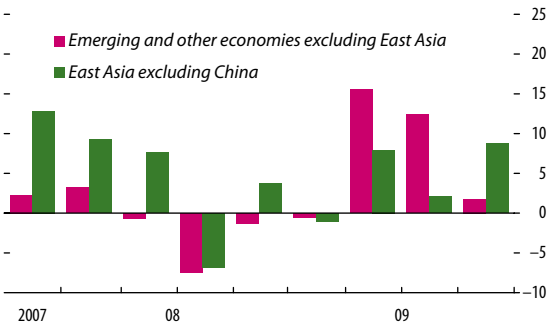
Sources: BNY Mellon iFlow[SM] data; and IMF staff estimates.
Note: Lower axis represents days from initial shock.

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 iFlow[sm] 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.

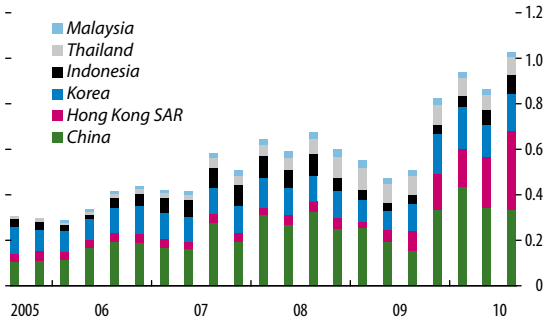
There are signs of a self-reinforcing cycle between inflows and risk-adjusted returns (Figure 1.40). The panel VAR estimation over the sample period January 2003 to June 2010 shows that flows to emerging and selected advanced markets increase in response to higher returns (Figure 1.40, first panel) and 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 portfo-

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 Tire[57]

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

[56]We 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.

[57]This 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.

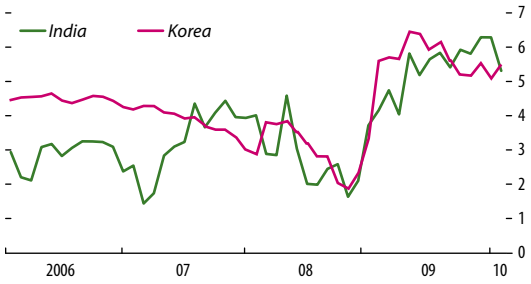
In large part, bond issuance surged because local corporates were trying to make up for tighter bank lending conditions. Asian banks had comfortable levels of liquidity and capital, yet after Lehman's collapse they followed their Western peers and curtailed credit to local corporates sharply. This led 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 Options[58]

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).
- ***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.

[58]This annex was prepared by Paul Mills.

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

[60]As recommended by the CBO (2010).

[61]This 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.

[62]See 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.mscibarra.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).

CHAPTER 2

SYSTEMIC LIQUIDITY RISK: IMPROVING THE RESILIENCE OF FINANCIAL INSTITUTIONS AND MARKETS

Summary

The inability of multiple financial institutions to roll over or obtain new short-term funding was one of the defining characteristics of the crisis. Systemic liquidity risks were underrecognized by both the private and public sectors and required unprecedented intervention by governments and central banks during the crisis. This chapter aims to better understand the vulnerabilities that led to the systemic liquidity crunch and, in doing so, begin to provide a holistic framework for dealing with them, with central banks expected to step in only in dire emergencies.

A key aspect of the crisis was the increased use by banks of short-term wholesale funding and the risks that it posed when these short-term markets dried up. Perhaps insufficiently recognized was that the wholesale providers of funds had also changed—instead of interbank markets acting to move unsecured funds where needed, other intermediaries, such as money market mutual funds, were growing suppliers of funds while traditional, more stable depositors were not. Secured lending through repurchase operations also grew immensely, greasing the funding markets.

The chapter shows that going forward a comprehensive approach is needed to better mitigate systemic liquidity risks. Higher liquidity buffers and lower asset/liability maturity mismatches in banks will help reduce the chance that an individual institution will run into liquidity difficulties. The proposals from the Basel Committee on Banking Supervision in this direction are likely to be a good starting point if designed and calibrated appropriately. To address the externality that some firms impose on the system as a whole, a measure of systemic liquidity risks attributable to them needs to be devised and perhaps a surcharge or insurance premia imposed. The chapter outlines some early proposals; a chapter in a subsequent GFSR will take up this topic more concretely.

The approach must also address how funding markets and nonbank institutions interact and, more specifically, how to correct infrastructure and practices that generate simultaneous and widespread dislocation in the funding markets. A well-functioning repurchase market is now a cornerstone of the wholesale funding market. In the run-up to the crisis, however, the market—in particular the triparty repo market—had features that increased systemic risks: poor collateral valuation and margining policies, a lack of due diligence about the counterparties' credit risk, and fragmented or nontransparent methods of clearing and settlement. Hence part of the solution will be requiring better internal controls on collateral valuation and margining policies, more transparency about counterparties, including through triparty relationships, and greater use of central counterparties for clearing and collateral management.

While still of less significance in Europe, U.S. money market mutual funds as a means of channeling institutional and retail funds to banks (both in the United States and abroad) are also now a systemically important component of funding markets. Ensuring that investments in such funds are regularly valued at market prices, and clearly differentiated from bank deposits, is another important method of mitigating systemic liquidity risk.

This chapter explores the causes of the system-wide breakdown in funding markets in the recent crisis and potential steps to ensure they are not repeated. The freezing up of the interbank, foreign currency swap, and secured money markets necessitated massive crisis intervention, cross-border coordination, and adjustments to central bank liquidity operations to stabilize the financial system and restore orderly market conditions. Central banks had to step in and take over the role of money markets in distributing liquidity in the system as banks and other lenders shunned transacting, particularly beyond very short-term maturities, due to rising counterparty risk concerns. In some places, central banks are still actively supporting money markets. Central banks also have become buyers of last resort of distressed assets, and governments have needed to guarantee bank debt.

To avoid a repeat of such breakdowns in the future, the Group of 20 (G-20) has called for strong liquidity buffers in the global financial system. A number of reforms and initiatives are under way to address shortcomings in financial institutions' liquidity practices, although policymakers have yet to put in place a framework that mitigates and manages the systemic aspect of liquidity risk—that is, the inability of markets to sustain liquid conditions so that financial institutions can fund maturity transformation and intermediation.

The crisis exposed shortcomings in liquidity risk management, with market and funding liquidity risks lightly managed even compared to other risks in banks and other financial intermediaries. The wider use of short-term wholesale funding markets, and hence greater maturity mismatch between assets and liabilities, was not fully appreciated. Secured funding markets were believed to be an effective and efficient source of funding, but the crisis proved these to be highly risk sensitive, unstable, and unreliable. Financial institutions did not factor in the possibility of a sudden, large-scale disruption in funding sources as investors withdrew owing to uncertainty over asset valuations, counterparty risks, and availability of liquidity.

The crisis exposed a bank-centric rather than a systemic approach to liquidity risk management by supervisors. Supervisors were not aware of the systemic implications of institutional funding and liquidity management, and how idiosyncratic risk (e.g., subprime credit risk) could quickly morph into a systemic liquidity risk for the financial system as a whole. Nor did they fully appreciate the adverse implications of cross-border and currency funding and flows, and of different infrastructures for trading, clearing, and settlement in important secured funding markets.

This crisis also exposed the systemic importance of nonbank funding sources. Decisions taken by key money market investors proved to be highly disruptive, not only for the United States, but also, in terms of the availability of U.S. dollar funding, for non-U.S.-based financial institutions. As these investors were not covered under the formal financial safety net, when systemic vulnerabilities materialized, governments and central banks had to provide guarantees and liquidity support to funding markets and also nonbank money market participants.[1]

This chapter aims to identify the failings that caused the systemic liquidity disruption in order to begin to identify policies to address these issues. It will examine how liquidity shocks contributed to systemic risk, with a focus on the role of the wholesale funding markets, and potential channels through which liquidity shocks propagate and are amplified, while exploring overall trends in the maturity structure of bank liabilities. The chapter puts into context recent reforms to strengthen liquidity risk management of banks. Finally, it suggests how regulatory policies may need to change to mitigate and manage systemic liquidity risk, and highlights elements absent from the current regulatory debate. It should be noted up front that information gaps in authorities' collection of funding and market data, reflecting also the over-the-counter (OTC) nature of many funding transactions, hamper the ability to perform adequate systemic liquidity risk analysis.

Note: This chapter was written by a team led by Jeanne Gobat and consisting of Alexandre Chailloux, Simon Gray, Andreas Jobst, Kazuhiro Masaki, Hiroko Oura, and Mark Stone. Excellent research support was provided by Oksana Khadarina and Dmytro Sharaievskyi.

[1]The safety net typically involves regulation and supervision (both capital adequacy and appropriate liquidity management), access to central bank lending, and a deposit protection scheme.

Review of the Systemic Liquidity Shock through Various Short-term Funding Markets

The financial crisis that began in 2007 generated unprecedented disruptions in key funding markets (Box 2.1). The asset-backed commercial paper (ABCP) funding market was hit first in August 2007 and played a critical role in spreading the subprime crisis to other funding markets (Covitz, Liang, and Suarez, 2009). Securitized products, primarily made up of the failing subprime mortgages, were widely used as collateral in the ABCP market. The complex and opaque nature of securitized products made valuation extremely difficult.[2] In some cases there was no market to provide an objective valuation of the claims in question.[3] In other cases, where prices were realized, other market participants used them to mark to market their positions, crystallizing their losses. This widespread absence of valuation information—the inability to identify precisely where losses lie and quantify them—made it difficult for market participants to discriminate among counterparties. This triggered a run by investors and rating downgrades of structured mortgage-backed securities. Yields on new ABCP issues soared and the outstanding amount of ABCP fell by almost 35 percent by end-2007 alongside a collapse of securitized products (Figures 2.1 and 2.2).[4] The shutdown of this market primarily hurt banks' off-balance-sheet vehicles and forced many to tap contingency liquidity lines they had with their sponsor parent banks.

The steep contraction in the ABCP, in turn, sparked concerns over banks' exposures to their off-balance-sheet vehicles (the risks of which had not been captured by disclosures or regulations).[5] Several U.S. and

[2]See IMF (2008) and Brunnermeier (2009) for a detailed discussion of market and funding problems in the early stages of the financial crisis.

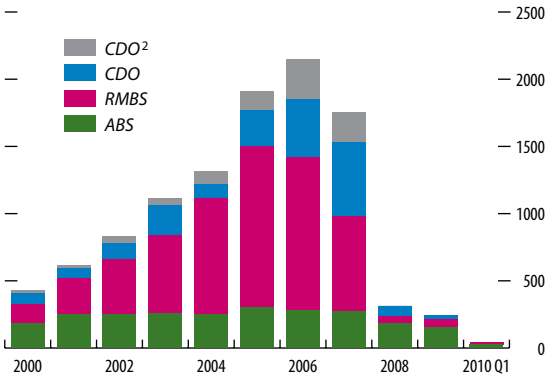
[3]Indeed, some securities had been priced by model rather than on the basis of market trading; when the models clearly failed to perform, there was in many cases no underlying market information on which to fall back.

[4]The total ABCP market was estimated to be about $1.4 trillion at end-March 2007, with about 80 percent of that located in the United States. This market shrunk to $410 billion at end-July 2010. The underlying assets now consist mainly of credit cards, trade receivables, commercial and auto loans, and securities.

[5]Citibank, JPMorgan Chase, Bank of America, State Street Bank, and Wachovia Bank were the top five commercial bank sponsors of ABCP programs by outstanding amount in the United States. In Europe, the top five sponsors were HBOS,

Figure 2.1. U.S. Private-Label Term Securitization Issuance by Type

(In billions of U.S. dollars)

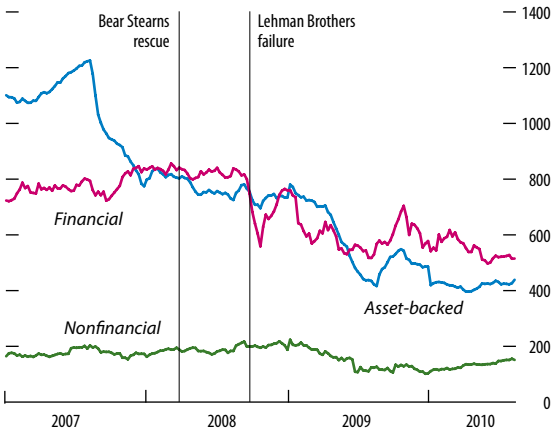


Sources: IMF staff estimates based on data from JPMorgan Chase & Co.; Board of Governors of the Federal Reserve System; and *Inside Mortgage Finance*.

Note: CDO = collaterallized debt obligation; CDO² = collateralized debt obligation-squared and CDOs backed by asset-backed securities (ABS) and residential mortgage-backed securities (RMBS).

Figure 2.2. United States: Outstanding Amount of Commercial Paper

(In billions of U.S. dollars; seasonally adjusted)



Source: Board of Governors of the Federal Reserve System.

Note: The commercial paper market consists of financial, nonfinancial, and asset-backed commercial paper.

Box 2.1. Role of Money Markets

This box describes key components of the money markets used by banks, nonbank financial companies, and nonfinancial firms for short-term secured and unsecured borrowing. Short-term secured funding grew rapidly prior to the crisis.

In general, money markets are integral to the transmission of monetary policy and help support price formation in longer-dated debt markets. Money markets consist of unsecured interbank trading, short-term debt issuance, short-term secured lending, and the derivatives market:

- The interbank unsecured market is the most prominent and longest existing component of the money markets. Banks use this over-the-counter market to lend and borrow funds from their peers. Banks tend to open credit lines only to creditworthy and well-established counterparties. Money market indices like the LIBOR were initially established to provide benchmark rates to the unsecured interbank market, but started to be used increasingly for the indexation of short-term derivatives and securities (like floating rate notes). Although this market has remained decentralized, it is often supported by electronic trading platforms that offer matching and settlement services to their participants.
- The short-term securities markets are normally dominated by treasury bills, but also include bank certificates of deposit and commercial paper. Banks issue certificates of deposit and sell them to their customers, predominantly money market funds or other nonbank financial institutions. Commercial paper is issued by nonbank financial firms (e.g., broker-dealers) and nonfinancial firms. These are purchased by a broader array of market participants, and in most cases, are held to maturity.
- The short-term secured funding market consists of collateralized lending, with the underlying collateral including commercial paper, treasury bills, other government securities, credit default obligations, other structured credit and credit products, and equity. The market is dominated by the repo market (see separate discussion in Box 2.3).
- The short-term asset-backed securities market has been hit hard during the crisis, following a relatively rapid expansion. The issuance of short-term securities backed by claims on longer-term assets initially focused on trade receivables. More recently, off-balance-sheet vehicles have issued asset-backed commercial paper to fund various stages of the securitization process, including to securitize real estate loans, car loans, or credit card receivables.
- The short-term derivatives market, while not a funding market, is generally seen as a full subsegment of the money markets, and is the largest in terms of notional exposure and turnover. Interest rate swaps and short-term interest rate futures contracts are used by banks for interest rate risk management purposes. They also serve to optimize bank funding costs and arbitrage interest differentials across currencies, along with foreign exchange swaps. Foreign exchange swaps allow banks to raise funding in one currency and to expand assets in another currency, without taking on any foreign exchange risk. However, this can entail foreign currency liquidity risk, given potential maturity mismatch between foreign currency assets and liabilities.

Note: This box was prepared by Alexandre Chailloux and Andreas Jobst.

non-U.S. banks were forced to bring their ABCP conduit assets on balance sheet, creating a significant drain on their liquidity. This general uncertainty further reduced banks' funding access to the capital markets, which fell sharply in the latter part of 2007 (Figure 2.3). Institutions that relied primarily on wholesale funding were most vulnerable to the rapidly deteriorating conditions in wholesale funding markets.[6]

ABN AMRO, HSBC, ING, and Fortis. For a number of banks, their liquidity exposure to off-balance-sheet vehicles accounted for about 30 percent of total funding. ABCP programs in Australia and Canada were also affected (Moody's, 2007; and Fitch Ratings 2007).

[6]Wholesale funding accounted for 68 percent of Northern Rock's liabilities in 2007 (Yorulmazer and Goldsmith-Pinkham, 2010).

This widespread uncertainty over valuation and counterparty risk began affecting the global money markets, including the unsecured and secured markets (Figure 2.4). Banks began conserving liquidity, drawing down liquidity overseas, cutting back credit lines to counterparties to overnight, or ceasing to trade altogether. Yields on government securities across countries declined sharply, while short-term unsecured funding rates for banks, visible in the three-month U.S. dollar LIBOR-overnight index swap (OIS) spread, shot up.[7]

The interbank market strains exacerbated a shortage of U.S. dollars in the global markets, in particular for internationally active banks.[8] U.S. dollar funding was required especially by banks in Europe (e.g., Dutch, German, Swiss, and U.K. banks), but also by banks in Korea, to roll over short-term funding of longer-term U.S. dollar assets (Box 2.2). The shortage in U.S. dollars also affected the foreign exchange swap market, with the U.S. dollar being used as the main swap currency for cross-currency funding (Figure 2.5). This reflected the growing use of foreign exchange swaps to obtain foreign currency funding, including in emerging European countries. In response, several central banks established foreign exchange swap lines with the U.S. Federal Reserve at end-2007, and these then were expanded to include more central banks as the crisis spread into 2008.

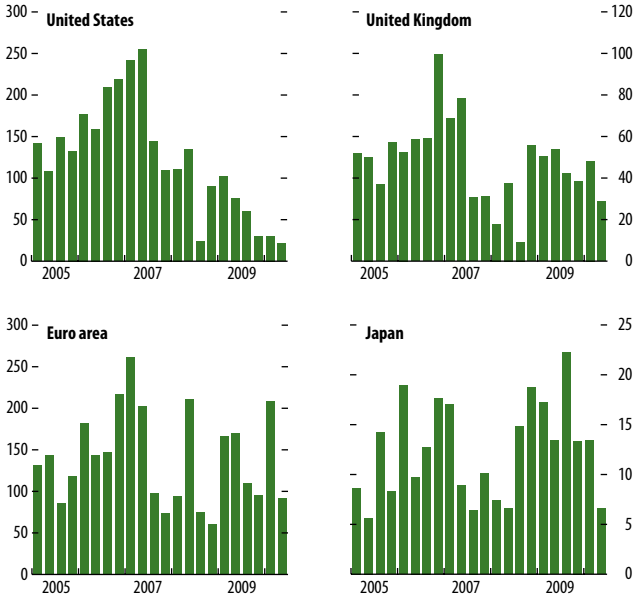
By this time, the repo market, in particular in the United States, showed signs of strains amidst heightened concerns about credit and counterparty risk (Figure 2.6).[9] This put at risk the funding model of investment banks that relied heavily on overnight repo operations for funding, with the share of overnight repos as a percent of total assets doubling between

[7]The spread is a proxy measure for counterparty and liquidity risk premia (Aït-Sahalia and others, 2009).

[8]McGuire and von Peter (2009) document the rapid expansion of cross-border borrowing and net foreign positions denominated in U.S. dollars by European banks over the past decade. European banks sharply increased their U.S. dollar assets between 2000 and 2009, and funded this by borrowing short term in the U.S. money market. See also McGuire and von Peter for a discussion on the U.S. dollar shortage in global banking, and CGFS (2010) for a detailed discussion of the functioning of cross-border markets during the crisis.

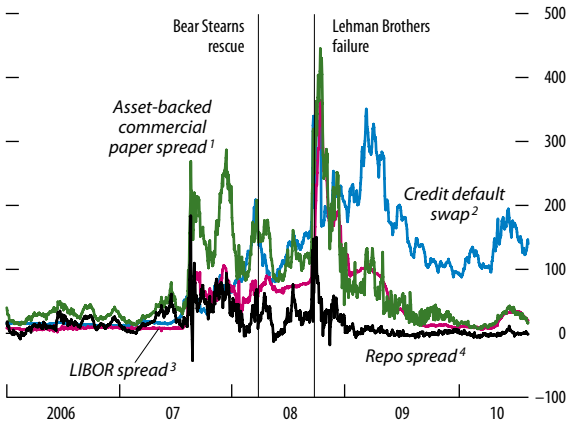
[9]Bear Stearns fell victim in March 2008 to deteriorating conditions in the repo market, given its heavy reliance on overnight repos for funding, but avoided bankruptcy due to the takeover by JPMorgan Chase.

Figure 2.3. Bank Bond Issuance
(In billions of U.S. dollars)



Source: DCM Analytics.

Figure 2.4. Aggregate Bank Credit Default Swap Rate and Selected Spreads
(In basis points)



Sources: Bloomberg L.P.; and IMF staff estimates.
[1]Spread between yields on 90-day U.S. asset-backed commercial paper and on three-month U.S. Treasury bill.
[2]The unweighted daily average of five-year credit default swaps for the following institutions: Morgan Stanley, Merrill Lynch, Goldman Sachs, JPMorgan Chase, Deutsche Bank, Bank of America, Citigroup, Barclays, Credit Suisse, and UBS.
[3]Spread between yields on three-month U.S. LIBOR and on three-month U.S. overnight index swap.
[4]Spread between yields on three-month U.S. Treasury repo and on three-month U.S. Treasury bill.

Box 2.2. Disruptions to Cross-Border Funding and Foreign Exchange Swaps

In several countries affected by the financial crisis, financial institutions were confronted with major difficulties accessing cross-border wholesale funding and foreign exchange swap markets. This box summarizes how the crisis affected countries such as Australia, Korea, and Hungary.

Although financial institutions in Australia and Korea had very little direct exposure to troubled U.S. credit instruments such as subprime mortgage loans, asset-backed securities, or collateralized debt obligations, and had healthy capital ratios going into the crisis, they are characterized by greater reliance on wholesale funding than their peers in the region.[1] Wholesale funding accounts for about 50 percent of total funding at Australian banks and a bit less for Korean banks. It is sourced in both the domestic and international financial markets. This increased their vulnerability to the major dislocations in the cross-border funding markets:

- The largest Australian banks source about one-third of their funding in the offshore markets. Although they continued to have access to the offshore money and capital markets but at higher cost, there was some concern that they could face difficulties rolling over their U.S. dollar short-term obligations. Australian banks subsequently prefunded their obligations and diversified their currency and funding base, and also lengthened their maturity structure through strong growth in deposits and issuance of long-term bonds. As a consequence of these actions, the short-term component of total liabilities declined to 25.6 percent at end-2009 (of which 12.3 percent was foreign), down from 32.2 percent at mid-2007 (of which 13.8 percent was foreign).
- In Korea, foreign bank branches rely on lending by their foreign parent bank. During the peak of the crisis, investments in securities and lending by the foreign bank branches fell dramatically as their global parent banks (in particular U.K. and euro area banks) retreated and deleveraged. This affected liquidity conditions in the local foreign currency market, and led to a dislocation of the foreign currency swap market and affected local Korean banks' foreign currency liquidity management, as most found themselves at the same time shut out from the international market for U.S. dollar funding. Lack of a deep liquid foreign exchange market exacerbated the problem.

The authorities in both countries took several measures to stabilize their financial system and foreign currency funding market. The establishment of deposit and wholesale funding guarantees by the Australian government in October 2008 (expired at the end of March 2010) and considerable central bank actions to provide sufficient liquidity helped maintain confidence in the financial sector. Both the Reserve Bank of Australia and the Bank of Korea established foreign exchange swap lines with the U.S. Federal Reserve (these lines expired in February 2010). The Bank of Korea also expanded its collateral facilities to include U.S. dollar instruments and provided foreign currency liquidity to the private sector. The Australian and Korean financial systems coped better than others in part because of their stronger macroeconomic and overall banking fundamentals.

In late 2008, turbulence in global money markets spread to European emerging economies, reflecting also the use of foreign exchange swaps to fund domestic foreign currency lending. There was significant Swiss franc lending in a number of these countries. The most acute tensions were felt in Hungary, where the drying up of dollar funding and the sharp depreciation of the domestic currency—reflecting market concerns about fiscal sustainability—resulted in a sharp tightening of liquidity conditions and higher funding costs. The central bank created several new facilities to inject both forint and foreign currency liquidity. Tension in the foreign exchange swap market receded after the U.S. Federal Reserve and the Swiss National Bank swaps provided significant support.

Still, implicit rate spreads have remained significantly above pre-crisis level; even the implied spreads for the Czech koruna, which was relatively stable in the crisis, have switched from persistently negative to persistently positive. This can be attributed to more conservative risk pricing, some segmentation between swap and domestic money markets, and reliance on cross-border funding and swap operations that had fueled rapid credit expansion.

Note: This box was prepared by Pierluigi Bologna, Erlend Nier, Alessandro Giustiniani, and Jeanne Gobat.

[1]New Zealand banks were also affected. They are similarly dependent on wholesale funding, with most being subsidiaries of Australian banks. To improve banks' liquidity and lower reliance on short-term offshore funding, the authorities introduced new quantitative liquidity requirements, effective as of April 2010.

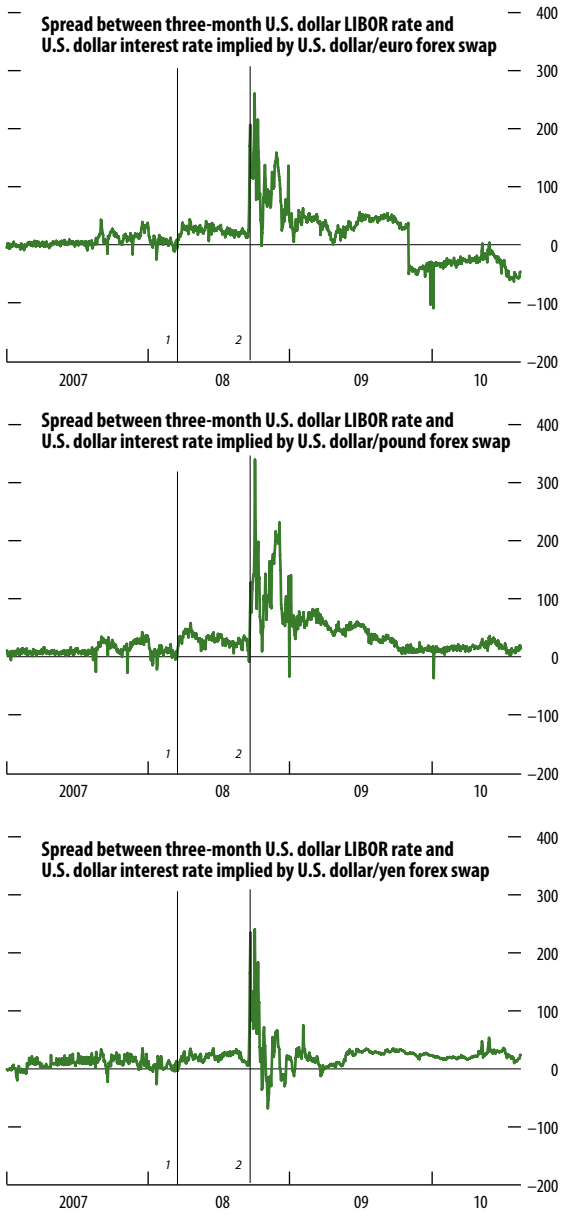
2000 and 2007.[10] Following the bankruptcy of Lehman Brothers in September 2008, conditions in the repo market deteriorated sharply as key cash lenders pulled back from the market or scaled down their nongovernment repo holdings.[11]

Moreover, the events related to Bear Stearns and Lehman Brothers greatly increased the realization that repo markets were not immune to counterparty risk. Indeed, realizing that credit risks had been priced too low, cash providers drastically adjusted their conditions, including higher repo rates, accepting only top-quality collateral, at significantly higher haircuts (Table 2.1). Mark-to-market conventions forced lower valuations, which in turn led to fire sales of assets and a self-fulfilling vicious circle of lower valuations, higher volatilities, and larger haircuts.

Developments since late 2008 indicate that key funding markets remain shut down despite significant intervention by central banks. The commercial paper market has not picked up in the United States. Money market funds are placing a greater amount of their funds in government-backed repos and short-term certificates of deposit, including those of European banks. In Europe, the greater issuance of securitized products largely reflects the European Central Bank's (ECB) expanded open market operations, in which asset-backed securities and covered bonds can be used as collateral. While overall unsecured borrowing rates have come down since their peaks in September 2008, turnover and the number of active participants in the unsecured market have fallen, with most transactions overnight (Figure 2.7) (ECB, 2009a). Nongovernment repo operations also remain sharply lower or inactive for the United States and Europe, with shorter-term duration (Figure 2.8). Greater risk aversion and ongoing concerns over counterparty risk can also be seen in a growing shift to electronic trading backed by central counterparties (CCPs) in the euro area.

Generally, since the start of the crisis, central banks have assumed a bigger role in intermediating between institutions both to provide short-term

Figure 2.5. U.S. Dollar Currency Spread Implied by Three-Month Forex Swap Contracts
(In basis points)

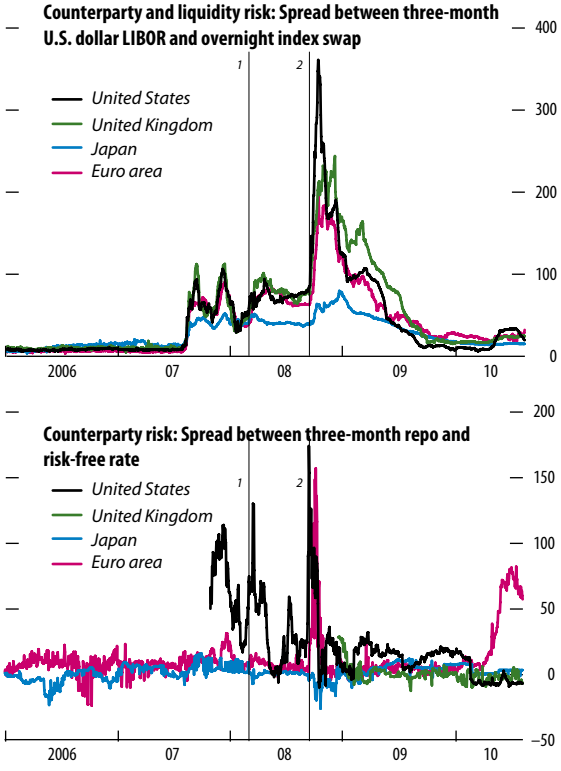


Sources: Bloomberg L.P.; and IMF staff estimates.
1. March 14, 2008: Bear Stearns rescue.
2. September 14, 2008: Lehman Brothers failure.

[10]Term repos with a maturity of up to three months stayed roughly constant as a percent of total assets during this period (Brunnermeier, 2009).

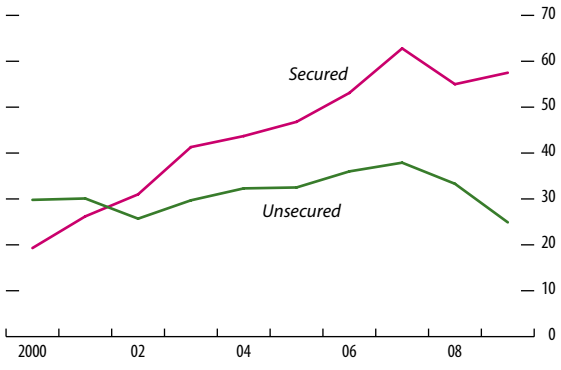
[11]Money market funds came under wholesale redemption pressures after Reserve Fund's Primary Fund "broke the buck" when its share price fell below par.

Figure 2.6. Selected Indicators of Short-Term Funding Rates
(In basis points)



Source: Bloomberg L.P.
Note: Risk-free rate refers to a three-month government bond rate.
1. March 14, 2008: Bears Stearns rescue.
2. September 14, 2008: Lehman Brothers failure.

Figure 2.7. Share of Average Daily Turnover of Secured and Unsecured Lending and Borrowing for Euro Area Banks
(Total aggregated average daily turnover volume in 2002 = 100)



Source: European Central Bank, *Euro Money Market Survey 2009.*
Note: The total turnover includes unsecured lending and borrowing, secured lending and borrowing, derivatives, and short-term securities.

liquidity through repo-based activity and as a buyer of last resort of short-term distressed assets (Figure 2.9). Moreover, sustained adverse funding and market liquidity conditions as well as the push to increase longer-term funding have started to erode banks' margins and earnings, since long-term funding is more expensive (see Chapter 1 for more details on current funding conditions).

Funding Markets as Propagation Channels of Systemic Liquidity Risk

Secular Shift in Banks' Funding Markets

While banks have always specialized in maturity transformation from short-term liabilities, primarily in the form of deposits to long-term loan assets, a noticeable development of the pre-crisis period has been greater reliance on short-term wholesale funding. Banks in Korea, the United Kingdom, and the euro area have made greater use of short-term wholesale funding to expand their balance sheets, although there is considerable variation within countries and across banks in the euro area (Figure 2.10) (ECB, 2009b). In the United States, commercial banks have made less direct use of short-term wholesale funding, although the balance sheet data do not account for the largest banks' exposures to their off-balance-sheet vehicles. Focusing on U.S. banking data also ignores the significant increase in maturity transformation by investments banks that relied extensively on very short-term wholesale funding (Figure 2.11).

In most of these countries, global financial integration, along with deregulation and innovation (such as securitization), has permitted banks to diversify funding sources, including across currencies and markets. In the United States, key participants in the "shadow banking" system, such as money market mutual funds (MMMFs), have been central to this trend (Figure 2.12). Banks and other institutions such as broker dealers, finance companies, and off-balance-sheet vehicles and conduits, have tapped these for short-term funding.

Repo as a Driver of Wholesale Funding Growth

The repo market has represented the fastest growing component of the wholesale funding markets, and hence it is useful to understand its genesis (Box 2.3).

Table 2.1. Typical Haircut on Term Securities Financing Transactions
(In percent)

	BBB+/A Corporates	AA-AAA Corporates	A-AAA ABS-Auto/CC/SL	AA-AAA-RMBS/CMBS	< AA ABS-RMBS/CMBS	Unpriced ABS/MBS/All Subprime	AA-AAA CLO	AA-AAA CDO	Unpriced CLO/CDO
2007:Q1	0	0	0	0	0	0	0	0	0
2007:Q2	0	0	0	0	0	0	0	0	0
2007:Q3	0	0	0	0	0	0	0	0	0
2007:Q4	0	0	0	0	0	0–5	0	5–10	5–10
2008:Q1	0	0	0–5	0–10	5–15	10–20	0–10	15–25	20–30
2008:Q2	0	0	0–5	5–10	10–15	15–20	10–15	20–30	30–35
2008:Q3	0	0	5–15	0	15–25	n.a.	0	25–30+	30–40
2008:Q4	0–5	0–5	10–20	20–30+	20–30+	n.a.	0	n.a.	n.a.
2009:Q1	0–5	0–5	15–20	20–30+	20–30+	n.a.	25–35	n.a.	n.a.
2009:Q2	0–5	0–5	15–20	20–30+	20–30+	n.a.	25–35	n.a.	n.a.

Source: Gorton and Metrick (2009).

Note: BBB+/A Corporates = corporate bonds rated between BBB+ and A, inclusive; AA-AAA Corporates = corporate bonds rated between AA and AAA, inclusive; A-AAA ABS Auto/CC/SL = asset-backed securities (ABS) comprised of auto loans, credit-card receivables, or student loans, with ratings between A and AAA, inclusive; AA-AAA ABS RMBS/CMBS = residential mortgage-backed security (RMBS) or commercial mortgage-backed security (CMBS) with ratings between AA and AAA, inclusive; < AA ABS RMBS-CMBS = RMBS or CMBS with ratings AA and lower, inclusive; Unpriced ABS/MBS/All Subprime = all tranches of ABS and MBS and all subprime securitized bonds that do not have public pricing posted on Bloomberg or Reuters; AA-AAA CLO = collateralized loan obligations (CLO) with ratings between AA and AAA, inclusive; AA-AAA CDO = collateralized debt obligations (CDOs) with ratings between AA and AAA, inclusive; Unpriced CDO/CLO = all tranches of CDO and CLO securitized bonds that do not have public pricing posted on Bloomberg or Reuters.

Repo markets have doubled in size since 2002, with gross outstanding amounts for the United States and euro area repo markets at year-end 2007 amounting to $10 trillion, and another $1 trillion for the U.K. repo market (Hördahl and King, 2008). However, these numbers are estimates given that almost all of the repo transactions are conducted over the counter.

The legal security afforded by repo operations has made them attractive and accessible to a broad class of investors and was a major reason for their rapid expansion. Unlike unsecured money market lending, the security offered by the irrevocable transfer of legal ownership of the collateral gave repo cash lenders a sense of protection against counterparty risk. It thereby created a larger potential set of counterparties for banks, as well as funding alternatives and short-term investments for other market participants, such as money market mutual funds, corporate treasurers, and investment banks.

In recent years, repo operations have benefited from other developments. The greater use of CCPs in Europe and triparty arrangements in the United States allow for the centralization of some administrative functions such as collateral management. Rapid securitization allowed for wider use of securitized products as collateral. Regulations under Basel I and II also favored repos as a funding instrument. Banks sought alternatives to lower capital charges associated with unsecured transactions and used repo operations to do this. This in turn freed up capital and allowed them to add leverage to grow more rapidly, while it also spurred demand for lower-rated collateral (Chailloux and Jobst, forthcoming).

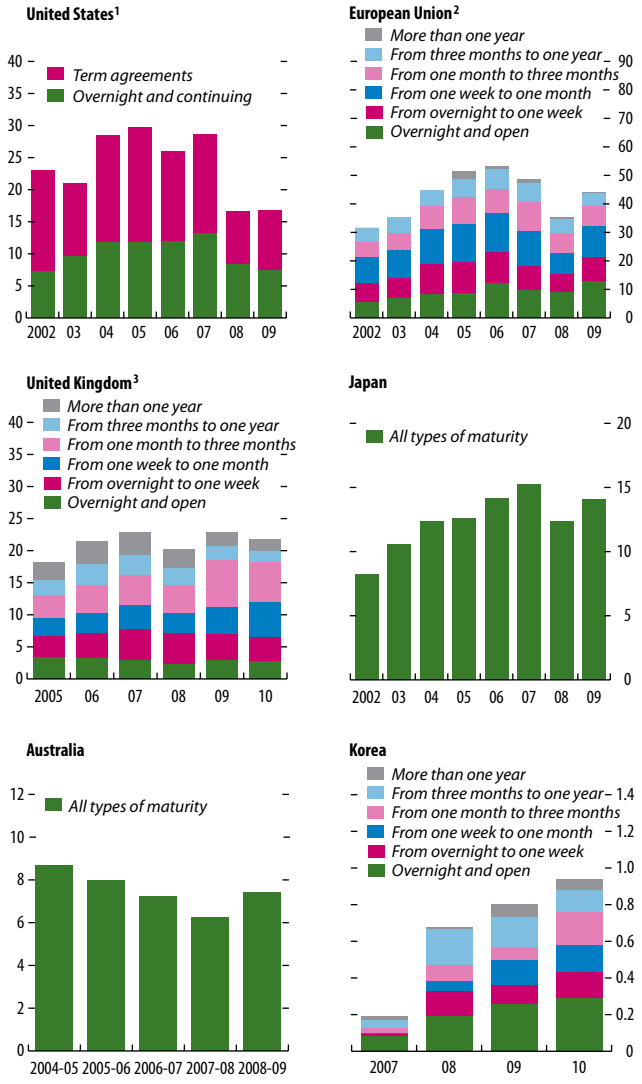
Growing Role of Money Market Mutual Funds

MMMFs have played a central role in of the wholesale money market, and in the run-up to the crisis, with their outright purchases of mortgage-backed ABCP. [12] MMMFs have also been critical

[12]The U.S. MMMFs' total holdings of financial assets at end-2009 amounted to about $3.3 trillion, equivalent to 22 percent of GDP, and they also account for a significant share of the triparty repo market. See Senior Supervisory Group (2009) and Investment Company Institute (2009).

Figure 2.8. Outstanding Amounts of Private Market Repo Operations

(In percent of GDP)



Sources: European Repo Council; International Capital Market Association; Australian Financial Markets Association; Association for Financial Markets in Europe; Asia Securities Industry and Financial Markets Association; Korea Securities Depository; Federal Reserve Bank of New York; Bank of Japan; and Bank of England.

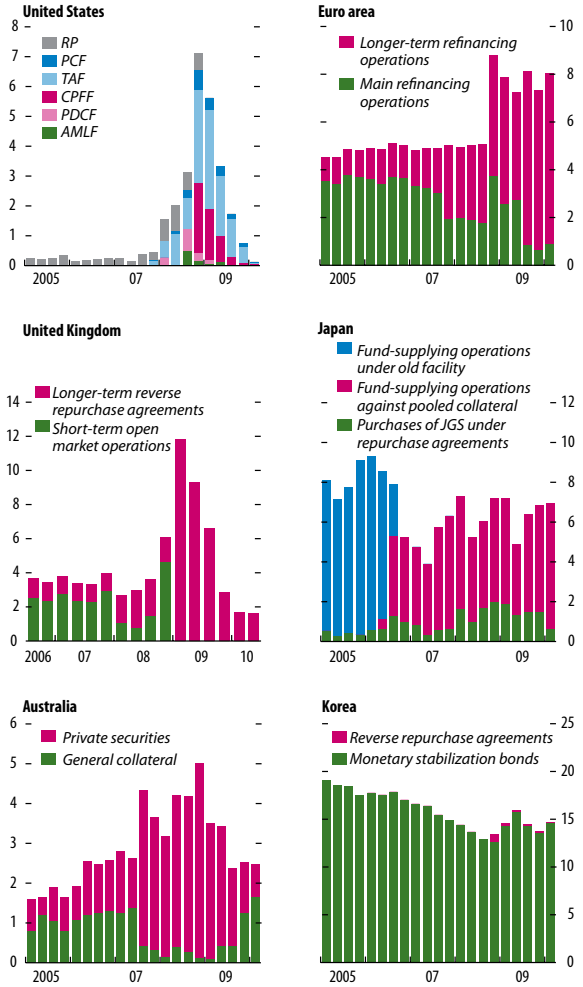
[1]Data based on the primary dealer statistics published by the Federal Reserve Bank of New York, reflecting the general trend of repo market operations. These statistics exclude transactions between counterparties that are not primary dealers, such as mutual funds.

[2]Data based on ERC-ICMA European Repo Survey, excluding forward-start repo operations. The survey also includes repo operations of non-European banks within Europe.

[3]Data include only transactions based on government collateral (U.K. gilts).

Figure 2.9. Central Bank Temporary Reserve-Providing Operations

(In percent of GDP; outstanding amounts unless noted otherwise)



Sources: U.S. Federal Reserve; European Central Bank; Bank of England; Bank of Japan; Reserve Bank of Australia; CEIC database; and IMF, World Economic Outlook database.

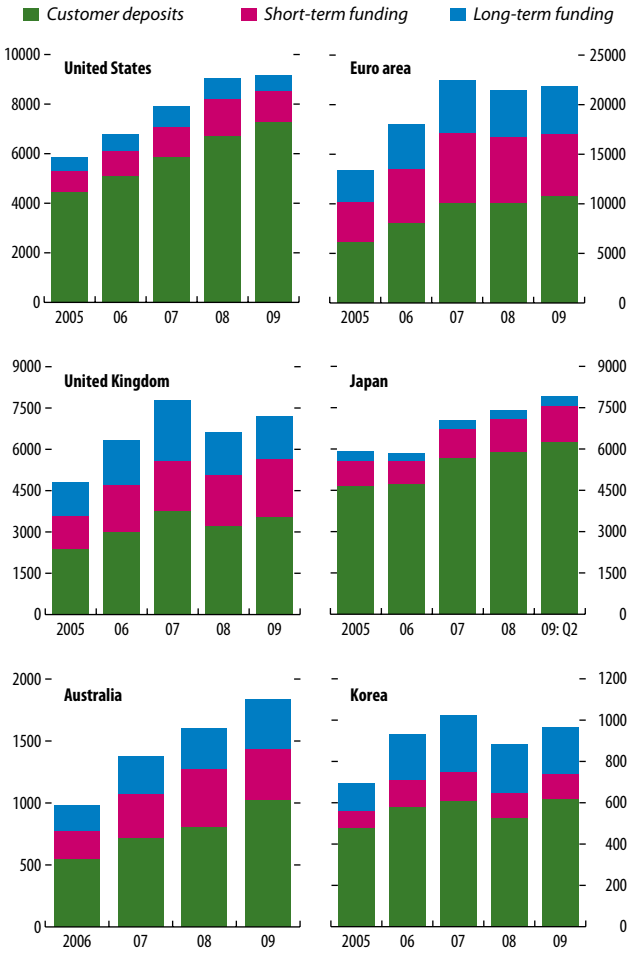
Note: The panels show central bank operations that add reserves to the system, excluding outright asset purchases (sometimes described as permanent reserve-providing operations) and foreign exchange swap operations. Changes from pre-crisis levels in these temporary reserve-providing operations reflect additional central bank support of the market, which allows for uniform treatment of different central bank balance sheets. Other operations are not considered as differing practices in the outright purchases, and in the level of remuneration of excess reserves, complicate comparisons across central banks. TAF = Term Auction Credit Facility; CPFF = Commercial Paper Funding Facility; PDCF = Primary Dealer and Other Broker-Dealer Credit Facility; AMLF = Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility; PCF = Primary Credit Facility; RP = repurchase agreement; JGS = Japanese government securities. The TAF, CPFF, PDCF, AMLF, and PCF were introduced by the United States in 2008.

in financing foreign banks' short-term U.S. dollar funding needs. Financial reports of prime money market mutual funds show that they placed about half of their assets in securities (such as certificates of deposit) issued by non-U.S. banks (Baba, McCauley, and Ramaswamy, 2009).

MMMFs in the United States originated in the 1970s from a desire by investors to escape Regulation Q, which set a ceiling on interest rates offered by deposit-taking institutions on demand deposits, and to avoid the reserve requirements imposed on depository institutions. MMMFs have also flourished due to two key regulatory features: (1) "hold to maturity" accounting conventions that allowed them to use stable net asset values (NAVs) for reporting and redemptions; and (2) the right to take on some credit, market, and maturity risk without being subject to stringent regulations. In the past, sponsoring banks made (and on a number of occasions had to fulfill) an explicit commitment to support the losses of their MMMFs with their own resources if the share values were to fall below par ("breaking the buck").

By contrast, MMMFs in Europe have not taken such a central role in maturity transformation.[13] MMMFs in Europe are predominantly used by institutional investors, and many operate with both variable and stable NAVs. ECB monetary data show that MMMF holdings for the area as a whole remain small relative to banks' retail deposits (around 8 percent).[14] This evidence is further corroborated by industry data that highlight the limited development of MMMFs in Europe: the European Fund and Asset Management Association shows that MMMF holdings in the United States represent 2.5 times the outstanding amount in the European Union (EU). This is in part because some of the incentives to move from deposits to MMMF investments that are present in the United States (such as higher reserve requirements and no interest payable on demand deposits) are absent in the European financial system.

Figure 2.10. Commercial Bank Funding Structure
(In billions of U.S. dollars)

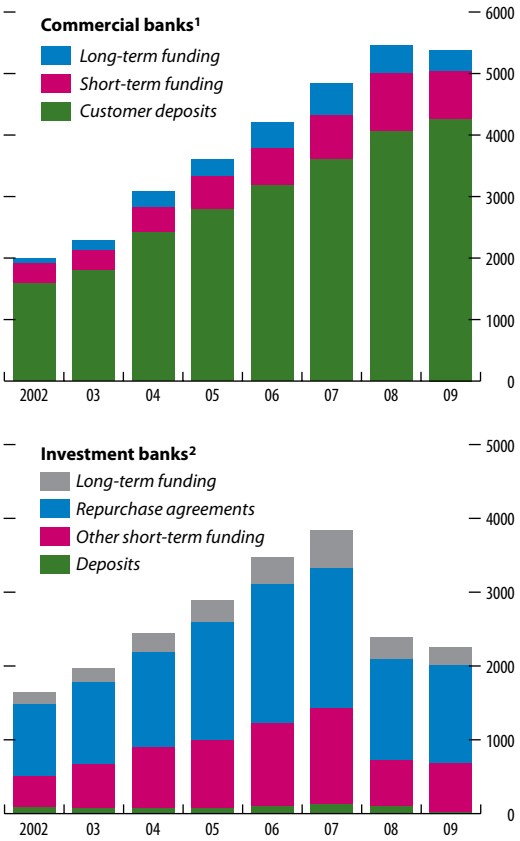


Source: ©2003 Bureau van Dijk Electronic Publishing-Bankscope.
Note: The selected banks account for more than 80 percent of each country's total bank assets.

[13]The term MMMF covers a range of different assets in the European Union, mostly falling under Undertakings for Collective Investments in Transferable Securities Regulations; steps are being taken to harmonize definitions and regulation.

[14]This includes demand deposits and time deposits.

Figure 2.11. United States: Funding Structure of Selected Largest Commercial and Investment Banks
(In billions of U.S. dollars)



Source: ©2003 Bureau van Dijk Electronic Publishing-Bankscope.
Note: Short-term funding is funding with maturity less than one year.
[1]Top 10 commercial banks in terms of total assets.
[2]Data for investment banks capture 60 percent of total investment bank assets as reported by Bankscope. For 2008 and 2009, data exclude Lehman Brothers and Bear Stearns.

In Japan, MMMFs witnessed strong growth in the 1990s as investors sought higher yields to offset close to zero interest rates on bank deposits—a result of the Bank of Japan's monetary easing. However, in the fall of 2001, several MMMFs' net asset values fell, due mainly to defaults of bonds issued by Enron, and investors incurred financial losses.[15] As a result, investors shifted their funds back to bank deposits (deposits at the time were protected by the government's blanket guarantee), and MMMF investments have remained low since then.

The Buildup of Vulnerabilities

The greater use of short-term wholesale funding was key to the buildup of vulnerabilities in the system, including excess leverage and maturity mismatch. A number of studies have shown that financial systems that relied more on wholesale funding were more vulnerable to the global financial crisis.[16] The greater use of wholesale funding exposed them to new types of liquidity-related risks that were fully accounted for neither in the risk management practices of financial institutions nor in the systemic oversight framework of regulators (Box 2.4). The risks include those delineated below.

New Counterparty Risks

- The broadening circle of repo users to less regulated institutions that are either outside of the purview of supervisors, or subject to a different supervisory regime, or not regulated at all made it difficult to monitor exposures. The critical role played by MMMFs in the short-term funding

[15]In Japan, MMMFs are valued on a daily basis at market value.

[16]Ratnovski (2009) explores the factors behind the unusual resilience of Canadian banks and finds that they relied less on wholesale funding than their peers in other advanced countries. Rajan (2006) notes that banks' greater reliance on market liquidity makes their balance sheets more suspect in times of crisis. Demirgüç-Kunt and Huizinga (2009) found that banks' reliance on nondeposit sources of funds increases their risk. Other studies show that banks that relied more heavily on wholesale funds were more affected by the liquidity crunch, experienced a larger abnormal decline in their share prices, and cut back more on lending activity (Raddatz, 2010). See also Brunnermeier (2009), Adrian and Shin (2009), and Ratnovski and Huang (2010).

market was not well understood. This increased the vulnerability of funding markets to a sudden withdrawal of liquidity by the MMMFs as their investors made redemption requests.

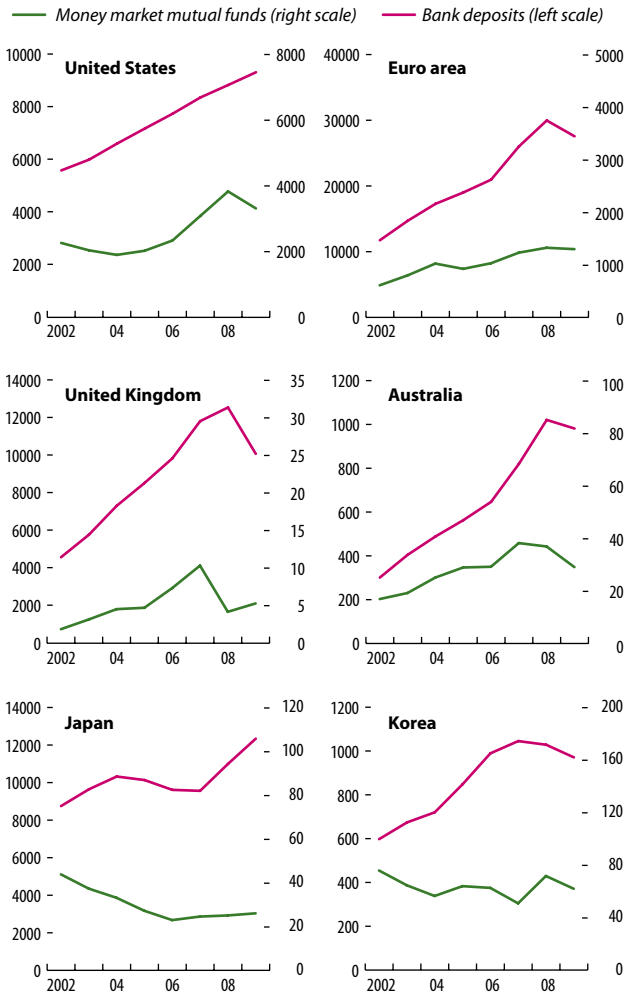
Credit Risks of the New Collateral

- As risks were increasingly underestimated in the run-up to the crisis, lower-quality securities began to be used as collateral in secured funding markets. This use was encouraged by a change to the U.S. bankruptcy code in 2005 that allowed a safe harbor for mortgage-backed and related securities in repo transactions, implying that these securities would not be pooled with other assets for distribution to other creditors.[17]
- At the same time, the generalized use of models to assign values for infrequently traded, exotic structured credit products supported their growing use as collateral in part because the models did not reflect the discount that fire sales would generate and the likelihood of longer liquidation periods. Hence, these securities were inappropriately being valued around par on an ongoing basis, generating haircuts close to zero.

Underestimation of Market Risks

- The prolonged low nominal interest and unusual low risk premia environment led to an underestimation of market risk, overestimation of asset valuations, and compressed margins. This in turn allowed for faster asset expansion that banks in turn could use to access credit markets. In this environment of rising values of collateral assets, repo providers also opted for small haircuts to maximize the potential for higher collateral turnover of their repo operations. Such procyclicality-induced feedback effects resulted in excessive leverage and risk taking in the upswing, and as a consequence, excessive deleveraging in falling asset markets, both with consequences for financial stability and the real economy.

Figure 2.12. Bank Deposits versus Money Market Mutual Funds
(In billions of U.S. dollars)



Sources: Investment Company Institute; CEIC database; Haver Analytics; Australian Bureau of Statistics; Investment Trusts Association, Japan; and IMF, International Financial Statistics database.

Note: Total net assets of money market mutual funds; and amounts outstanding of bank deposits.

[17]This provision was previously restricted to treasury and agency securities, certificates of deposit, and bankers' acceptance (Sissoko, 2010).

Complex and Poorly Understood Infrastructure

- Although to a lesser extent, some of the vulnerabilities were exacerbated by poorly understood incentives in the repo market infrastructure and uncertainties about how it might function during a period of stress. For instance, the growing use by institutions (notably in the United States) of triparty agents for repo operations contributed to the watering down of margin maintenance as due diligence was essentially transferred from the original counterparties to these agents.
- The fragmented structure of repo service providers in Europe (Box 2.5), with multiple trading venues and competing collateral management venues, including three CCPs, a large number of national central security depositories (CSDs), and two established international central security depositories (ICSDs)—Clearstream and Euroclear—has repeatedly contributed recently to difficulties in the European repo market.[18]
- In the United States, the concentration of a key element of the repo market infrastructure in two banks, Bank of New York Mellon and JPMorgan Chase, providing triparty repo agent services, has been considered a vulnerability of liquidity risk management in the United States.[19]

In sum, the buildup of vulnerabilities to systemic liquidity risk occurred through shortcomings in liquidity risk management at individual institutions, poor market practices, the complexity of the infrastructures of funding markets, and regulatory gaps. Hence, policymakers will need to develop solutions that address all these shortcomings. This will help mitigate systemic liquidity risk and lower the probability of liquidity crises occurring. These solutions are addressed in the next two sections.

[18]Some of the cross-border settlement difficulties reflect the fact that most of these national systems were created before the establishment of the euro. See also the recent report by the Committee on Payment and Settlement Systems (CPSS, 2010) for further details on the fragmented nature and associated risks of repo markets.

[19]The U.S. Financial Sector Assessment Program also identified the inadequacy of risk management practices of cash lenders and clearing banks and the lack of effective plans for managing the triparty collateral of a large securities dealer in the case of its default as vulnerabilities (IMF, 2010a).

Policies to Strengthen the Resilience of Funding Markets

A striking feature of the financial crisis has been the breakdown of the short term secured funding markets. It is not unusual to find the unsecured interbank markets shut down during times of financial stress, as institutions ration liquidity and credit, but what was more puzzling about the crisis was the inability of financial institutions to borrow short-term against assets that had relatively low risks (Acharya, Gale, and Yorulmazer, 2008). While unsecured markets are vulnerable to changes in perceived counterparties, such concerns should be mitigated in collateralized transactions. Going forward, reforms should be aimed at improving the functioning of both the secured and unsecured markets, acknowledging that such reforms may be less effective in the unsecured market, as the reason for its breakdown during times of distress and heightened counterparty risk is harder to fix. Nonetheless, policymakers should strive to ensure that both markets provide for a more reliable source of funding during good and bad times.

Fixing the Unsecured Interbank Market

Determining how best to repair the unsecured market is difficult because the underlying reason for the dislocation in times of systemic crisis is the widespread uncertainty regarding counterparty risk that occurs when perceived credit differentiation closes the market to some participants.

Hence, better information available to participants so that they can accurately assess counterparty risks would be necessary to keep unsecured interbank markets open at such times. It should be recognized that information available to market participants may not entirely address counterparty concerns, particularly when disruption in unsecured markets remains protracted. In these cases, supervisors may ultimately need to address the uncertainty by identifying insolvent institutions in the system and using bank resolution tools to restore confidence.

Fixing the Secured Funding Market

As noted above, two main vulnerabilities deserve special attention to fix the functioning of secured markets: (1) collateral valuation and margin policies; and

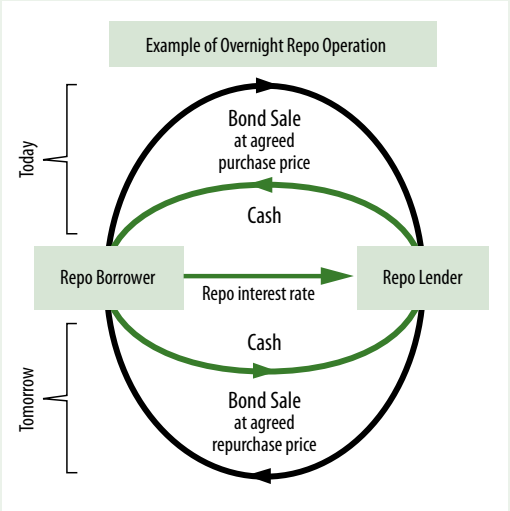
Box 2.3. The Repo Markets: A Primer

The repo market is used by large institutional investors to lend short-term cash, while banks and broker-dealers and others use it to borrow by offering collateral in return for cash. The market was at the epicenter of the global funding crisis, as cash lenders began asking for larger haircuts and safer securities as collateral. This box explains key features underpinning a repo transaction.

A repurchase agreement (or "repo") is a sale of securities coupled with an agreement to repurchase the same securities at an agreed price at a future date, typically at a higher price. Functionally, it is similar to a collateralized loan, where the borrower pledges securities as collateral. The transfer of ownership for the duration of the transaction offers a high degree of security by limiting the credit risk to that of the underlying assets. The most commonly used collateral is government bonds, though corporate bonds, municipal bonds, asset-backed securities, and equities may also be used. Since the cash provider is in possession of the security, the provider can sell the asset to recover the cash if the cash borrower defaults on its obligation. Most repo operations are overnight, but "term agreements" are struck for several months or longer. On maturity, the borrower pays back the loan principal with interest and the lender returns the collateral.

Cash borrowers pay a repo rate, tied to general market interest rates, which is typically lower than unsecured money market rates because a repo is less risky. The repo lender determines the collateral eligibility and the haircut that caps the maximum loan amount. Historical price variability of the security may cause the cash lender to insist on asking for more collateral value than the amount of the loan. The difference is the initial margin (or haircut). The initial margin protects the buyer against a decline in collateral value and against counterparty risk.

The safety of a repo ultimately relies on the adequacy of the collateral (and the legal contract). Lenders accept illiquid collateral only subject to appropriate initial margins and limits. Collateral is regularly revalued and, if its value falls, extra collateral is quickly requested (a process called margin maintenance). Due to relatively intense operational requirements, some repo participants outsource the management of their collateral to so-called triparty repo agents. This is most common in the United States because of the administrative burden of handling a large number of nongovernment securities. More generally, the effectiveness of repo markets is a function of the market liquidity in which the collateral trades and the soundness of clearing and settlement frameworks.



The cash lender can re-use the collateral during the term of the repo, whether via an outright sale, an onward repo, or a pledge to a third party. If the lender sells the asset outright, it is taking a short position. When the lender is willing to accept a wide range of securities as collateral (mostly high-grade government and perhaps corporate bonds), the repo is against general collateral. Most repos are based on general collateral. A special repo is where the cash lender specifies the securities (which may include equities) needed in the context of its operations (for example, to make delivery in a separate transaction). Special repos are commonly used by securities dealers. In order to deliver the promised security the dealer will arrange to borrow it through a special repo transaction with a client or another dealer, or alternatively purchase the security outright.

Note: This box was prepared by Andreas Jobst.

Box 2.4. What Went Wrong in Financial Firms' Liquidity Risk Management Practices?

The recent global crisis revealed regulatory and institutional shortcomings in liquidity risk management at individual institutions. This box discusses the main shortcomings in liquidity risk management, drawing from industry surveys, including Deloitte (2009), ECB (2007, 2008), and Senior Supervisory Group (2009).

Prior to the crisis, liquidity risk generally took a backseat in importance to credit and market risk management. There was no regulatory capital charge against liquidity risk under the Basel framework, unlike credit and market risks, with the regulatory focus on solvency. Liquidity risk was mostly considered a short-lived funding problem and not a threat to a financial institution's profitability and solvency. Central bank operations and deposit insurance schemes were considered sufficient to handle liquidity problems at a bank and system-wide level. Money markets were viewed as efficient, with repo markets, in particular, believed to buffer cash lenders against counterparty and credit risks, and deeply liquid, as evidenced by their treatment under the Basel II capital regime.

Although banks did have a liquidity risk management system, including liquidity stress testing and a contingency funding plan, they were unprepared for a long-lasting liquidity shock and the systemic nature of the crisis, and failed to account for the following:

- The possibility of a severe or complete shutdown of secured funding markets owing to concerns about the liquidity of markets for assets used as collateral. While some tested for increased haircuts and margin calls, they were usually meant to reflect increased counterparty risk specific to the borrowing bank, rather than the generalized precipitous price decline across a wide class of underlying collateral assets.
- The possibility of second-round market effects and other amplification mechanisms causing liquidity spirals and nonlinear effects, including rising counterparty risk concerns. The close interaction between market and funding liquidity and counterparty risk—whereby small initial shocks could be transmitted to a wider range of markets and participants—was not appreciated.
- The possibility of a simultaneous and severe disruption in several key funding markets. While some banks tested for some funding market shutdown, the extent of affected funding markets was much wider than anticipated in stress tests and contingency plans.
- The possibility that potential contingent cash liabilities would materialize. Many banks were forced in the crisis to provide cash support to their sponsored off-balance-sheet vehicles because of credit guarantees, credit line commitments, or reputation-based support, although in some cases they had no legal obligation. Such operations expanded the need to find cash in distressed funding markets.
- The possibility of a long-lasting liquidity shock. Liquidity shocks are commonly viewed as short lived. In this crisis, liquidity stress is still ongoing, affecting funding options, net interest margins, and earnings, and could affect some institutions' solvency.
- Underestimation to an extent reflects the fact that these extreme market funding events had never occurred, and hence there was no historical event on which to rely for modeling and operational risk management purposes. This in part reflects the enormous structural changes that have occurred in the banking sector and global financial system, including the critical importance of nonbank financial institutions in maturity transformation.

Note: This box was prepared by Hiroko Oura.

(2) infrastructure issues, such as clearing and settlement, including the use of CCPs.

Both the U.S. Triparty Repo (TPR) Infrastructure Reform Task Force and a working group associated with the Committee on the Global Financial System have put forth sets of recommendations to address shortcomings brought to the fore in collateral valuation and margin policies by financial institutions. Implementation of these recommendations would help minimize macro-prudential risks emanating from collateral management and risk management practices. They include:

Box 2.5. Repo Infrastructure: Trading, Clearing, and Settlement

Repo operations are supported by a complex trading and settlement infrastructure that involves various service providers and trading and clearing platforms as well as risk management systems. It tends to be also fragmented within and across countries, reflecting the fact that repo trades can take place at a bilateral level, through triparty agents, or through central counterparties. This box briefly describes the key functions that service providers offer.

Repo operations basically comprise six different functions: trading, matching, collateral management, clearing, custody, and settlement. Repo operations can be conducted bilaterally between two market participants, or using a third party to which collateral management is outsourced, i.e., using a triparty repo arrangement. The third party can be a custodian bank or any entity providing operational services, such as custody of securities, settlement of cash and securities, collateral valuation, and optimization tools to allocate collateral efficiently (like those provided by Euroclear Bank and Clearstream Banking, the two large international central security depositories).

Repo trading is carried out electronically (via trading platforms, such as BrokerTec or MTS, the electronic platform for euro-dominated government securities trading) or through traditional over-the-counter channels. Electronic trading venues generally offer various clearing and settlement options, which allow trading counterparties to either channel their settlement instructions through clearinghouses, such as central counterparties (CCPs), or directly toward local central security depositories. Some trading platforms offer trading, matching services, and automated connection to a CCP that guarantees fulfillment of transactions and collateral management across different custodians (like Eurex Clearing general collateral repo pooling services).

Where a CCP is used, it acts as a clearinghouse between the trading counterparties and, after execution of a trade (confirmation), enforces the specific terms of the contract and guarantees their satisfaction until maturity. In this capacity, it undertakes the following functions: (1) daily valuation of the contract, including the determination/application of haircuts and the adjustment of margins according to day-to-day changes in replacement cost (variation or mark-to-market valuations); (2) the monitoring of counterparty risk to ensure the compliance of dealers with the terms of the contract; and (3) initiation of settlement to recover net final payments if default or termination occurs.

Note: This box was prepared by Alexandre Chailloux and Andreas Jobst.

Repo Market: Service Providers and their Functions

		Functions					
Service Providers	Institution Name	Trade	Match	Collateral Management	Clearing	Custody	Settlement
Electronic trading platforms	BrokerTec, MTS, Eurex Repo	✔	✔[1]				
Trade matching and regulatory reporting systems	Trax and Trax II		✔				
Triparty agents	Euroclear Bank, Clearstream Banking, SIS SegaInterSettle, JPMorgan Chase, Bank of New York Mellon			✔	✔	✔[1]	✔[1]
Central counterparty/ Clearinghouse	LCH.Clearnet, Cassa di Compensazione e Garanzia, Eurex Clearing, Fixed Income Clearing Corporation (FICC) , Japan Government Bond and Clearing Corporation (JBCC)	✔	✔	✔	✔		
Central security depositories (CSDs)	Euroclear Bank, Clearstream Banking, National CSDs					✔	✔

Note: This table is not meant to be comprehensive and does not include smaller service providers with limited geographic reach.
[1]Not provided by all service providers in this category.

- *Enhance collateral valuation practices.* This can be achieved through (1) more frequent collateral valuation adjustments, (2) more realistic assumptions in terms of holding and liquidation periods, and (3) more rigorous valuation approaches (that restrict the eligibility of the most hard-to-price and illiquid assets as collateral). Sound valuation methodologies would also need to rely on "mean reversion" (through-the-cycle) assessments of volatility, spreads, and liquidity of the underlying market.
- *Strengthen margining standards.* This can be achieved through higher frequency changes to margin, with incremental margin adjustments more desirable than discrete, large-scale margin calls that can be destabilizing. This would require greater transparency about how margin policies are constructed and so-called "haircut grids" that assign differential haircuts to different types of collateral, maturities, and counterparties. The setting of initial margins should be calibrated to account for the likelihood of longer periods for liquidating the underlying collateral. In addition, supervisors should periodically validate the initial margins generated by banks' in-house models.
- *Minimum haircuts/initial margins.* Some thought is being given to having regulators assign minimum haircuts that would be recalibrated for different collateral types. While such regulatory oversight is welcome, it would be important that such minimum margins respond over time to changes in risk, which, if ignored, could have unintended consequences for the flows of liquidity.
- *Transparency and independent pricing.* One way to minimize the risk of pricing disputes and sudden adjustments to collateral values (so-called "cliff effects") is to have third parties provide on a continuous basis price estimates for collateral used in repo transactions that could be used by others. More generally, greater provision of data to the market would help enhance collateral risk management. To this end, in May 2010 the U.S. Federal Reserve began collecting and releasing data on types of repo collateral and on margin levels to the public.

While to date market regulators have been advocating the use of CCPs as a key tool to mitigate counterparty risk in OTC markets, the use of CCPs for repo transactions, which can lower operational, counterparty, and liquidity risk in repo transactions, should be encouraged as well.[20] To facilitate the use of the growing number of CCPs in Europe, the Operations Group of the European Repo Council (ERC) recently reached an agreement with the two ICSDs to establish linkages so as to permit their collateral pools to serve as the basis for repos to be cleared by customers at their preferred CCP.[21]

The key benefits of using CCPs in repo transactions are:

- They lower operational risk by specifying and enforcing consistent collateral and margin agreements. Unlike bilaterally negotiated deals, CCPs maintain the same set of procedures and rules for all their clearing members.
- They mitigate counterparty risk for clearing members by guaranteeing the satisfaction of contractual agreements and can use collateral posted to them as part of the clearing member obligations to close out the position even if the repo borrower defaults. The underlying collateral for the repo transaction is automatically allocated to the owed clearing member in the CCP.
- They can reduce liquidity risk and improve collateral management through the process of multilateral netting. While bilateral repo counterparties can net standardized trades when supported by legal opinions, CCPs net exposures across multiple repo transactions of all clearing members, optimizing their use of collateral and better conserving economic capital. Netting helps lower the potential loss incurred by a repo cash lender to a specific defaulting repo borrower.[22] Since more multilateral netting can be accomplished when trades are concentrated in a single CCP, too many CCPs would lessen this benefit. Here, policies could be considered that

[20]See IMF (2010b) for a fuller discussion of CCPs in the context of OTC derivatives.

[21]The proposed model foresees enhanced trading in triparty repos, via a single CCP, with settlement neutrality (i.e., the CCP evaluates and allocates collateral for settlement requirements, but settlement can occur with any ICSD or CSD) pending final agreement on collateral transfers.

[22]Contract netting occurs when identical cash flows within a contract are netted. In addition, payment netting occurs throughout the life of a transaction as all payment obligations are replaced with a single amount on each payment date.

would not discourage greater cross-border linkages across CCPs to accomplish this goal.

As with CCPs in the OTC derivatives markets, CCPs serving repo markets should be subject to minimum regulatory requirements ensuring their safety and soundness. This would help to assure a level playing field across CCPs, prevent unhealthy competition between CCPs, and enhance the transparency of how the infrastructure operates.

However, moving repos to CCPs is not costless. Because the use of CCPs entails greater focus on collateral policies and the posting of particular types of collateral, there are implications for the market liquidity of eligible collateral—a particular concern for other repo participants. The concentration of some types of collateral within CCPs could become a source of systemic risk itself unless CCPs themselves are subject to very high-quality risk management processes that help avoid high correlation between collateral and counterparty risk. Moreover, the collateral posted at CCPs is not available for other uses, potentially lowering the liquidity of some types of collateral and earnings from relending the collateral (called "rehypothecation") that is taken out of circulation.

In the United States, discussions to strengthen the clearing and settlement process in repo transactions have mainly focused the triparty repo markets. The TPR Task Force has proposed reforms to the current operational arrangements, including the elimination of the intraday exposure of clearing banks created by the daily unwinding of all trades. It also emphasized the need for market participants to manage liquidity risk more conservatively, notably with respect to the risk posed by the reliance on the rollover of large overnight funding operations, and to the assumptions made on the liquidity of various types of collateral under stress.

Minimizing Investor Runs: Money Market Mutual Funds

A number of reforms have been put in place to address MMMFs' critical role in the secured funding market, with the main focus on minimizing the risk of a run by investors. The U.S. Securities and Exchange Commission recently modified its "2a-7 Funds" rule governing mutual funds under the Investment Company Act. These funds will face new constraints in terms of asset quality and new liquidity rules so that they can withstand increased redemption pressures. MMMFs will be required to hold 10 percent of their assets in liquid instruments that can be liquidated within one day and 30 percent of their assets in instruments that can be liquidated within one week.[23] They must maintain a maximum weighted average maturity of 60 days, down from 90 days at present, to lower maturity mismatch risks. They face more restrictive limits on collateral acceptable for their repo operations, a ban on the ability to hold illiquid securities, and additional financial disclosure. They also are now permitted to suspend redemptions if asset values fall below a certain level, to allow for an orderly liquidation of assets.

These measures are a significant step forward to lowering the risk profile of the industry, but may not be sufficient to mitigate the systemic liquidity risk this sector poses in the medium term. Ideally, institutions that contribute to systemic liquidity risk via maturity transformation and which offer banking services should be set up and regulated as banks. One option, then, for U.S. MMMFs would be to retain the bank-like nature of the business through relicensing as banks. This would clearly require a substantial change in structure, capitalization, and regulation.

The more favorable option, as it is a less fundamental change, would be to require that MMMFs, over time, move to a floating NAV. This could be too disruptive at the moment to implement given bank funding pressures, as it may result in investors shifting funds to banks and other markets, and thus its introduction would need to be carefully planned. (See Chapter 1 for a discussion of banks' rollovers of liabilities over the next several years.) However, a floating NAV would enhance awareness that the market risks are borne by the investor, and that an MMMF investment is different from a bank deposit where there is a guaranteed return of the principal underpinned by public deposit insurance. This would also address level playing field concerns currently favoring MMMFs in the United States relative to commercial banks (Krug-

[23]With some $3 trillion of money market fund assets in 2009, the liquidity rules would require that the money market fund industry have $290 billion in daily liquidity and $870 billion in weekly liquidity (Investment Company Institute, 2009).

man, 2010; Tucker, 2010). Moving to a floating NAV would also eliminate the first-mover advantage, a contributor to destabilizing runs, whereby early redemption requests are paid at par, even if actual asset values are lower, leaving investors who redeem later to bear disproportionate losses.

One compromise, and an alternative idea floated by the industry to contain the risk of a run (while retaining a stable NAV), is to create a private liquidity "bank" that MMMFs could resort to in crisis times. The bank would augment the liquidity already required as a result of the recent rule changes. This, however, might not necessarily protect MMMFs against a systemic run, and in such circumstances the fund might need to close, and/or central bank intervention might be necessary to assure normal functioning in the money markets, as was the case in the current crisis.

More generally, there needs to be greater clarification as to the definition of money market mutual funds. In particular, there are a host of funds, so-called enhanced cash funds (ECFs) in the U.S. financial system, that, similar to MMMFs, aim to provide liquidity and capital (principal) preservation. ECFs are available only to institutional investors, not retail investors, and they are not regulated by the SEC 2a-7 rule.[24] However, the ambiguity over their status created some market confusion in 2007, as many ECFs were forced to shut down, and they were identified in the press incorrectly as money market mutual funds (Investment Company Institute, 2009). While not of systemic importance, they contribute to maturity transformation risk, and given their close resemblance to MMMFs, their role and regulatory status should be clarified. Similarly, the regulatory framework governing MMMFs in Europe also needs to be clarified and strengthened given their growing importance. As a first step in this direction, the Committee for European Securities Regulators (CESR) published guidelines to harmonize the definition of MMMFs across Europe. These guidelines are approaching SEC's Rule 2a-7, although differences remain, such as on minimum liquidity requirements. The proposed guidelines by CESR also retain the current choice whereby an MMMF can maintain either a floating or a constant NAV.

Policies to Strengthen Prudential Liquidity Regulations for Institutions

To help mitigate systemic liquidity risks by lowering the probability that an individual institution runs into liquidity difficulties, discussions are under way to impose prudential liquidity requirements on commercial banks. Several advanced countries have already upgraded their prudential liquidity regulations. These include New Zealand and the United Kingdom.[25] Switzerland finalized additional liquidity requirements based on the stress tests for its two big banks in June 2010.

The Basel Committee on Banking Supervision (BCBS, 2009) proposed in December 2009 two sets of standardized quantitative requirements to enhance liquidity buffers in the banking system: the liquidity coverage ratio (LCR), and net stable funding ratio (NSFR). These have subsequently been slightly modified.[26] The current plan is to phase in the LCR as of the end of 2012. The NSFR will be modified and final proposals will be issued later in 2010. The implementation of the NSFR is not expected before early 2018, after an observation period starting in 2012. The proposed regulations are to be applied to banks in a uniform manner, while national regulators may apply more stringent requirements to individual institutions based on their liquidity risk profile. The quantitative approach by the BCBS is the first instance of international consensus on liquidity requirements—a departure from the more qualitative recommendations that the Committee had previously endorsed—and

[24]ECFs aim for a stable net asset value of $1, but their NAV can fluctuate on a daily basis above and below that value. ECFs seek to deliver higher returns by including instruments with moderately longer maturities and by taking on somewhat more interest rate risk, credit risk, and liquidity risk than MMMFs. They emerged in the early 2000s due to low spreads in traditional cash equivalents (i.e., deposits and MMMFs) as investors began looking for short-term investment products that could provide better returns.

[25]The United Kingdom's liquidity requirements address some precursors to the systemic liquidity events witnessed during the crisis.

[26]The December 2009 proposals were partially amended and reviewed in July 2010 and released in September 2010. See BCBS (2009, 2010a, 2010b).

represents a significant step forward (BCBS, 2008). The rules are as follows:

- *LCR:* The ratio is intended to ensure that banks can survive an acute stress situation lasting at least one month. The stress scenario includes specific assumptions on a combined idiosyncratic (institution-specific) and systemic shock (affecting the whole financial system).[27] Banks are required to maintain a level of unencumbered, high-quality assets that can be converted into cash to meet their liquidity needs for a 30-day time horizon in times of stress. The eligible assets include two tiers of liquid assets. Level 1 assets are cash, central bank reserves, and high-quality sovereign debt. Level 2 assets comprise high-quality corporate and covered bonds (with rating AA- or higher) and non-zero-risk-weighted sovereign debt (issued in foreign currency to the extent that this currency matches the currency needs of the banks' operations in that jurisdiction). Level 2 assets, however, will be subject to haircuts and limited to a cap of 40 percent of the overall stock of liquid assets.
- *NSFR:* This metric, as presented at end-2009, is still under review. Its purpose is to promote stable sources of funding in line with the liquidity profile of assets and contingent calls related to off-balance-sheet items. Available stable funding should be instruments that are expected to be reliable sources of funds over a one-year horizon under extended idiosyncratic stress.[28]

The proposed regulations are a welcome addition to the solutions for systemic liquidity risk, as banks are encouraged to hold higher liquidity buffers and lower maturity risk. Liquidity risks are notoriously difficult to measure and control, so the BCBS's proposal represents the first concrete attempt to address a consistent problem during the crisis. That said, there are a couple of areas that need to be further elaborated, and care needs to be given to the implications the rules may have on how banks fund themselves. This is why the BCBS recently decided to lengthen the phase-in period. The following outcomes should be accounted for in the final calibration of the regulations:

- Banks will likely compete more vigorously for deposits and other long-term funding sources, and those that rely more on secured short-term funding are likely to be more affected. Overall, funding costs are expected to rise given the limited pool of deposits, with a potential impact on net interest margins and profitability. This is already taking place in several countries where banks rely more heavily on short-term wholesale funding, partly due to bank management decisions and partly due to supervisory action. Also, deposits could become more interest rate sensitive and less stable, and hence less reliable. To the extent that these changes represent the true costs of safer and more stable funding they should be welcomed. Careful attention to whether they unduly constrain credit growth, however, is warranted.
- The regulations could also potentially push banks to take on more risks to maintain their profitability given the higher holdings of low-yielding liquid assets, and lower income from trading, while longer-term funding requirements could potentially reduce bank margins given higher funding costs.
- If liquid assets eligible for the regulation are defined too narrowly, market liquidity for government securities could potentially dry up as banks decide to hold on to these rather than manage their liquidity actively. This could change secondary market trading activity in government securities, and potentially undermine the price discovery and liquidity-generating function of certain assets. At the same time, excessive holdings of government securities could create unintended concentration risks for banks.
- Moreover, in certain jurisdictions, government securities may not be the most liquid securities market, given prudent fiscal policies and other factors, while other securities markets that are receiving less favorable regulatory treatment may be more liquid

[27]Idiosyncratic shocks comprise credit rating downgrades, deposit runs, the disappearance of unsecured funding, surging haircuts for secured funding, or extra collateral for off-balance-sheet items (e.g., derivatives).

[28]The NSFR is calculated as a ratio of available stable funding (ASF) sources to required stable funding (RSF) sources. This ratio should exceed 100 percent. The RSF is calculated by applying a factor to each category of assets according to their liquidity. Similarly, the ASF is calculated by applying a factor to each category of liabilities. Four categories of stable funding sources are proposed: Tier 1 and Tier 2 capital and liabilities with effective maturity of one year or longer, "stable" deposits of retail and small business customers, less stable deposits of retail and small business customers, and wholesale funding provided by nonfinancial corporate customers. All other liabilities are not considered sources of stable funding.

and play a significant role in financial institutions' liquidity management.[29] Ignoring the actual liquidity characteristics and usage of eligible assets may be counterproductive, and in some jurisdictions, it may lead to an increase in the liquidity risk profile of the banking system rather than to a reduction.

- The proposed rules will likely have varying implications for banks' business models and the markets and regions within which they operate (such as mortgage banks).[30] Some restructuring is desirable, but commercial banks with a large retail deposit base may have an advantage over banks that use a less stable source of funding. However, the rules could complicate group-wide liquidity risk management for institutions composed of different legal entities, potentially limiting some of these advantages.

The impact of the BCBS regulations would vary across jurisdictions based on the design of other aspects of systemic liquidity policy. These interactions should be considered so that they do not give rise to competitive distortions. For example:

- *Reserves held at central banks*. In the BCBS regulations, reserves held at central banks are classified as liquid assets "to the extent that they can be drawn down in times of stress." If that means that reserve balances exceeding mandatory requirements (i.e., excess reserves) are counted as liquid assets, banks that hold a large amount of excess reserves at the central bank on a regular basis will be better able to meet the requirements.
- *Definition of stable deposits*. In the BCBS regulations, deposits that are covered by an effective deposit insurance scheme can be categorized as "stable deposits," for which lower run-off ratios would be applied than for other deposits. Different application of deposit insurance schemes across national jurisdictions could affect what are considered "stable" deposits. Further, the reliability of deposits as a stable funding base, as mentioned above, could change with the implementation of the rules, although a longer phasing-in period may help lower this risk.
- *The range of eligible liquid assets*. If eligibility for central bank collateral is used as the only criterion for liquid assets (the current BCBS proposal qualifies the definition of liquid assets with other criteria such as marketability and minimum rating), the competitive landscape for banking could be altered depending on how narrowly or broadly jurisdictions define which assets are eligible.

In sum, the proposed prudential liquidity requirements are to be welcomed as they address many of the basic issues that arise in the crisis. As recognized by the BCBS, this is a difficult area for which to devise internationally consistent quantitative regulations, and more work is required to calibrate them well. Care also needs to be given to designing the proposed rules so that they can be flexibly applied and broad enough to adjust to changes in the financial structure. In addition, the BCBS regulations currently apply only to depository institutions, and standard setters should consider extending their application, in some form, to nonbank financial institutions that, as the crisis demonstrated, can contribute to maturity transformation and systemic liquidity risk. This could mitigate the potential buildup of liquidity risks in the less regulated "shadow banking" system.

Outstanding Policy Issues in Addressing Systemic Liquidity Risk

Minimize Moral Hazard by Pricing the Systemic Externality

While the proposed BCBS liquidity rules address idiosyncratic risk, they only partially address the risks that arise from the inability of institutions to access markets to sustain sufficient market and funding liquidity under stress. There is a need to disentangle when

[29]Denmark is a good example of this. Banks hold covered bonds for liquidity management purposes. The covered bond market is viewed as highly liquid even in times of stress. Banks' exposure to government securities is relatively small. Implementing the LCR would generate significant stresses as there may not be sufficient short-term government securities to meet the rule, and banks would have to be required to hold longer-term and less liquid government securities.

[30]For instance, Danish mortgage banks fund each individual mortgage with fully maturity-matched mortgage bonds, but will be penalized for this approach under the proposed net stable funding ratio calculation. The BCBS is working on a general definition that can reflect such arrangements.

liquidity strains are driven by individual institutions, which optimally should self-insure and bear this cost through higher liquidity buffers, from when events affect multiple institutions simultaneously, requiring central bank liquidity support. Rapid withdrawals by participants in money markets contributed to the spread of financial losses and liquidity strains well beyond what subprime credit positions would have justified. Regulatory capital and liquidity requirements are not designed to deal with such extreme events. In cases when market funding freezes up, central bank support is warranted to assure that liquidity risks do not morph into solvency problems and undermine financial intermediation and the real economy.

While the deterioration of liquidity conditions in stressful times can be arrested by central banks' liquidity operations, any robust systemic liquidity framework would need to encourage appropriate pricing of liquidity risk in good times to limit its negative impact in times of market stress and minimize the moral hazard problem. Against this backdrop, a systemic liquidity risk regulatory framework should focus on ensuring that banks and others considered important to liquidity and maturity transformation are contributing in some form to systemic risk insurance in good times. To this end, a number of proposals are being floated, including those identified below.

- Gorton and Metrick (2009) advocate a systemic liquidity risk insurance guarantee fee that explicitly recognizes the public sector cost of bailing out repo counterparties. The primary objective would be to induce a change in behavior in order to promote the internalization of systemic risks.
- Brunnermeier and others (2009) call for explicit consideration of the risks associated with the liability structure of banks in the form of a risk premium associated with the relative importance of wholesale funding.
- Perotti and Suarez (2009) suggest introducing mandatory liquidity insurance. The charge would have to be paid in good times in exchange for emergency liquidity support during systemic stress. The tax would be imposed on the wholesale funding base and increase proportionately with the maturity mismatch in assets and liabilities. Retail deposits would be excluded as they are covered by the deposit insurance scheme. The charge would be imposed on all institutions with access to a formal financial safety net and guarantees.
- Acharya and Oncu (2010) focus on the United States and propose excluding only very liquid and safe collateral, such as treasuries and agency debt, from "stays" in bankruptcy proceedings, whereby such assets would not be treated as part of the firm's assets for distribution in the bankruptcy proceedings.
- In a more extreme view, Roe (2009) argues that the internalization of such cost would ideally be achieved by exposing repo lenders to counterparty risk by disallowing unrestricted access to collateral even in case of default of the counterparty. This would likely reverse the current advantages investors and borrowers have to use the repo market.

A future GFSR will introduce a more holistic measure of systemic liquidity risk to directly take account of the connections between various participants in the wholesale funding markets. Aside from improving surveillance of funding markets, this could form the basis for a systemic liquidity risk insurance premium or surcharge.

Strengthen the Central Bank Liquidity Support Framework

Central bank liquidity support is an integral part of the overall systemic liquidity framework and acknowledges that large systemically driven liquidity shocks cannot always be effectively managed by individual firms. Central banks intervene in financial markets through various routes, including open market operations, standing facilities, and by use of emergency liquidity assistance. During the crisis several advanced-country central banks significantly adjusted their liquidity framework and available instruments. Some of these changes have been made permanent while others are viewed as temporary crisis measures. With the exception of the euro area, most of them have been scaled back significantly.

Looking ahead, central banks should have available instruments capable of providing necessary liquidity

to their financial system in order to ensure financial stability while conducting monetary policy effectively. Which measures should be used on a regular basis or be kept for temporary use for addressing systemic liquidity disruption depends on such factors as the structure of the financial system.

The design of macro-prudential policies should assess the implications they may have for central bank operations and financial stability. For instance, a central bank's eligibility criteria for collateral would influence banks' holdings of eligible assets and thereby change the market for those assets. At the same time, reserve balances that banks hold at the central bank (and collateral eligibility) should be taken into account in banks' prudential liquidity regulations, as they indeed are by the BCBS in its definition of liquid assets.

The scope of counterparties included in central bank liquidity support arrangements may need to be expanded in some countries. As financial intermediation outside the conventional banking sector has increased due to financial innovation, central banks in these countries need to be able to deal with a broad range of counterparties—both the number of counterparties and the types of financial firms—in systemically important funding markets to effectively support systemic liquidity under different market conditions.

In addition, a wider range of eligible collateral may be helpful for financial firms to access central bank liquidity in times of need. An excessively narrow definition of eligible assets could result in disruption of the markets depending on availability of those assets. As central banks face trade-offs between effective liquidity provision and risks to their balance sheet, the appropriateness of pricing and risk management measures (e.g., haircuts, margin calls) that take into account credit and liquidity risks of financial assets will need to be reviewed.

The parameters of reserve balances held at the central bank also warrant review. The appropriate level of reserves should take into account the implications for financial stability, as reserve balances may work as the first line of defense against liquidity shocks. In general, larger reserves could help better absorb liquidity shocks and thereby enhance resilience of the financial system, while an excessive amount of reserves could discourage banks from implementing effective internal risk management systems and could lock up more collateral with the central bank. The role that the central bank expects to play in supporting the liquidity of money markets is a key consideration in choosing the appropriate level of reserves' supply and remuneration (the opportunity cost of holding reserves is important), as well as the design of a reserve maintenance period.

Consider the Cross-Border Dimension of Maturity Transformation

The crisis exposed the global dimension of managing systemic liquidity in stressed money market conditions. In response to the vulnerability of offshore dollar markets, especially in Europe and Asia, and the potential for feedback to U.S. markets given linkages via the interbank market, the U.S. Federal Reserve established foreign exchange swap agreements with 14 foreign central banks. These proved an effective means to provide dollar liquidity to strained offshore markets. Although first-round support for such markets has been wound down, some swap arrangements have been resurrected in the wake of the new market turbulence in Europe. The experience suggests merit in ensuring that such facilities are readily available in the future. Central banks should review the pricing and other terms of operations when lending foreign currencies to ensure that the incentive structure motivates market participants to enhance their own cross-border liquidity management, and to turn to such facilities only in times of stress.

Finally, greater consideration should be given to the cross-border dimension of maturity transformation. The crisis demonstrated that national authorities were not aware of the scale of the cross-border dimension of complex money markets within which their supervised institutions fund and manage liquidity. Close international cooperation should be sought to systematically collect information on relevant markets; ensure that new liquidity regulations adequately cover the additional vulnerabilities of cross-border, cross-currency positions; and ensure continued, timely, effective, and well-coordinated responses to systemic cross-border turmoil. Since banks adjust their funding structure in response to changing collateral and counterparty risk regardless of national borders, different domestic regulatory standards could segment liquidity within markets and specific jurisdictions. Indeed, anecdotal evidence suggests that domestic banks are more likely to charge lower haircuts and interest to domestic than foreign counterparties.

Conclusions and Policy Considerations

The chapter finds that systemic liquidity risk arises from weaknesses in market risk management practices and market infrastructure, and regulatory gaps. The chapter reviews how vulnerable funding and risk management strategies threatened to undermine the solvency of financial institutions and the stability of the overall system during the crisis. In particular, financial institutions failed to take into account the possibility of a sudden loss of access to secured financing, as investors withdrew from the market owing to uncertainty over asset valuations, counterparty risk, and availability of liquidity.

These liquidity risks were not fully accounted for in the risk management practices of financial institutions or in the systemic oversight framework of regulators. Policymakers are still struggling with how to adequately address the systemic component of liquidity risk.

To encourage progress in this difficult area, this chapter has analyzed factors contributing to market and funding illiquidity and potential channels through which liquidity shocks propagate and are amplified. In the United States, the maturity transformation took place in the large, unregulated shadow banking sector, while in Europe and elsewhere the banking system's overreliance on short-term wholesale funding, including through offshore markets, left it vulnerable when markets dried up. The lack of a systemic perspective in ongoing policy efforts primarily reflects the conceptual difficulties arising from the complex interactions between the banks and the nonbank financial institutions. These nonbank institutions may not be willing to provide funding during periods of market stress; nor can they access traditional lender-of-last-resort facilities at central banks.

The chapter suggests that policies to address systemic liquidity risk must deal both with institutions and the markets within which they interact.

For institutions, the chapter recommends:

- Higher liquidity buffers for all financial institutions (not just banks) that are reliant on short-term wholesale markets for funding and that engage in maturity transformation.
- New guidelines on how much maturity transformation by financial institutions is appropriate when they have access to the financial safety net. However, care needs to be given to ensure that these do not give rise to moral hazard so that eligible firms do not reduce their risk management practices.
- Consideration of a fee or surcharge on the externality produced by institutions when they do not take into account the effect of their behavior on funding markets.

In sum, market participants should be paying the full cost of their idiosyncratic liquidity risk. Policies to this end are in progress, including the liquidity rules as proposed by the BCBS. However, more needs to be done to ensure that the role of nonbank institutions in funding markets is adequately understood and the risks they pose are mitigated in some way.

For liquidity-providing markets, the chapter recommends:

- Better collateral valuation and margining practices for repo markets.
- Improving clearing and settlement infrastructure, including greater use of central counterparties in repo markets.
- Over time, removing the regulatory privileges given to money market mutual funds by letting them choose either to move toward floating net asset valuation, or else be overseen and regulated as banks, and as such their liabilities would be treated as deposits.

The regulatory framework should further ensure that core financial market infrastructures such as central counterparties, receive emergency liquidity support in times of systemic liquidity crisis. Central bank systemic liquidity policies should be periodically reevaluated in light of financial institutions' changing funding structure and markets. Finally, there are significant data gaps that need to be addressed in order to appropriately measure and monitor systemic liquidity risks.

References

Acharya, Viral, Douglas Gale, and Tanju Yorulmazer, 2008, "Rollover Risk and Market Freezes" (unpublished; New York: Federal Reserve Bank of New York, September).

Acharya, Viral, and Sabri Oncu, 2010, "The Repo Market," in *Regulating Wall Street: A New Architecture for Global*

Finance, ed. by Viral Acharya, Thomas Cooley, Matthew Richardson, and Ingo Walter (New York: Wiley & Sons).

Adrian, Tobias, and Hyun Song Shin, 2009, "Money, Liquidity, and Monetary Policy," *American Economic Review*, Vol. 99, No. 2, pp. 600–05.

Aït-Sahalia, Yacine, Jochen Andritzky, Andreas Jobst, Sylwia Nowak, and Natalia Tamirisa, 2009, "How to Stop a Herd of Running Bears? Market Response to Policy Initiatives during the Global Financial Crisis," IMF Working Paper No. 09/204 (Washington: International Monetary Fund).

Baba, Naohiko, Robert McCauley, and Srichander Ramaswamy, 2009, "U.S. Dollar Money Market Funds and non-U.S. Banks," *BIS Quarterly Review* (Basel: Bank for International Settlements, March).

Basel Committee on Banking Supervision (BCBS), 2008, *Liquidity Risk: Management and Supervisory Challenges* (Basel: Bank for International Settlements, February).

———, 2009, *International Framework for Liquidity Risk Measurement, Standards and Monitoring* (Basel: Bank for International Settlements, December).

———, 2010a, "The Group of Governors and Heads of Supervision Reach Broad Agreement on Basel Committee Capital and Liquidity Reform Package," Press Release (July 26).

———, 2010b, "The Group of Governors and Heads of Supervision announces higher global minimum capital standards," September 12 (Basel: Bank for International Settlements).

Brunnermeier, Markus K., 2009, "Deciphering the 2007–08 Liquidity and Credit Crunch," *Journal of Economic Perspectives*, Vol. 23, No. 1, pp. 77–100.

———, Andrew Crocket, Charles Goodhart, Avinash D. Persaud, and Hyun Shin, 2009, "The Fundamental Principles of Financial Regulation," Geneva Reports on the World Economy (Geneva: International Center for Monetary and Banking Studies).

Chailloux, Alexandre, and Andreas Jobst, forthcoming, "Saving Private Repo," IMF Working Paper (Washington: International Monetary Fund).

Committee on the Global Financial System (CGFS), 2010, "The Role of Margin Requirements and Haircuts in Procyclicality," CGFS Paper No. 36 (Basel: Bank for International Settlements).

Committee on Payment and Settlement Systems (CPSS), 2010, "Strengthening Repo Clearing and Settlement Arrangements," CPSS Publication No. 91 (Basel: Bank for International Settlements).

Covitz, Daniel, Nellie Liang, and Gustavo Suarez, 2009, "The Evolution of a Financial Crisis: Panic in the Asset-backed Commercial Paper Market," Finance and Economics Discussion Series 2009-36 (Washington: Board of Governors of the Federal Reserve System).

Deloitte, 2009, "The Global Risk Management Survey: Sixth Edition. Risk Management in the Spotlight."Available via the Internet: www.deloitte.com/us/globalrisksurvey.

Demirgüç-Kunt, Asli, and Harry Huizinga, 2009, "Bank Activities and Funding Strategies: The Impact on Risks and Returns," World Bank Policy Research Working Paper 4837 (Washington: World Bank).

European Central Bank (ECB), 2007, "Report on EU Banking Structures," ECB Press Release, October 5.

———, 2008, *EU Banks' Liquidity Stress Testing and Contingency Funding Plans* (Frankfurt: European Central Bank, November).

———, 2009a, *Euro Money Market Study 2008* (Frankfurt: European Central Bank, February).

———, 2009b, "EU Banks' Funding Structures and Policies," *ECB Monthly Bulletin* (May), pp. 61–73.

Fitch Ratings, 2007, "Asset Backed Commercial Paper & Global Banks' Exposure—10 Key Questions," September 12. Available via the Internet: www.americansecuritization.com/uploadedFiles/Fitch_ABCP.pdf.

Gorton, Gary, and Andrew Metrick, 2009, "Securitized Banking and the Run on Repo," Yale ICF Working Paper No. 09–14 (Yale University and National Bureau of Economic Research).

Hördahl, Peter, and Michael R. King, 2008, "Developments in Repo Markets during the Financial Crisis," *BIS Quarterly Review* (Basel: Bank for International Settlements, December).

International Monetary Fund (IMF), 2008, "Market and Funding Illiquidity: When Private Risk Becomes Public," Chapter 3 in *Global Financial Stability Report*, World Economic and Financial Surveys (Washington, April).

———, 2010a, *United States—Financial System Stability Assessment,* IMF Country Staff Report No. 10/247 (Washington).

———, 2010b, "Making Over-the-Counter Derivatives Safer: The Role of Central Counterparties," Chapter 3 in *Global Financial Stability Report*, World Economic and Financial Surveys (Washington, April).

Investment Company Institute, 2009, "Report of the Money Market Working Group" (Washington, March). Available via the Internet: www.ici.org/pdf/ppr_09_mmwg.pdf.

Krugman, Paul, 2010, "Making Financial Reform Fool-Resistant," *New York Times*, April 4.

McGuire, Patrick, and Goetz von Peter, 2009, "The US Dollar Shortage in Global Banking," *BIS Quarterly Review* (Basel: Bank for International Settlements, March).

Moody's Investor Services, 2007, "Moody's Update on Bank Sponsored ABCP Programs: A Review of Credit and Liquidity Issues," September 12. Available via the Internet: www.americansecuritization.com/uploadedFiles/Moodys_ABCP.pdf.

Perotti, Enrico, and Javier Suarez, 2009, "Liquidity Insurance for Systemic Crises," *Policy Insight,* Vol. 31 (London: Centre for Economic Policy Research).

Raddatz, Claudio, 2010, "When the Rivers Run Dry: Liquidity and the Use of Wholesale Funds in the Transmission of the U.S. Subprime Crisis," Policy Research Working Paper No. 5203 (Washington: World Bank).

Rajan, Raghuram G., 2006, "Has Finance Made the World Riskier?" *European Financial Management*, Vol. 12, No. 4, pp. 499–533.

Ratnovski, Lev, 2009, "Bank Liquidity Regulation and the Lender of Last Resort," *Journal of Financial Intermediation*, Vol. 18, No. 4, pp. 541–58.

———, and Rocco Huang, 2010, "The Risks of Bank Wholesale Funding," ECB Working Paper No. 1223 (Frankfurt: European Central Bank).

Roe, Mark, 2009, "End Bankruptcy Priority for Derivatives, Repos and Swaps," *Financial Times* (December 16).

Senior Supervisory Group, 2009, *Risk Management Lessons from the Global Banking Crisis of 2008* (Basel: Bank for International Settlements).

Sissoko, Carolyn, 2010, "The Legal Foundations of Financial Collapse," *Journal of Financial Economic Policy*, Vol. 2, No. 1, pp. 3–34.

Tucker, Paul, 2010, "Shadow Banking, Financing Markets and Financial Stability," remarks at the BGC Partners Seminar, Bank of England, London (January 21).

Yorulmazer, Tanju, and Paul Goldsmith-Pinkham, 2010, "Liquidity, Bank Runs and Bailouts: Spillover Effects during the Northern Rock Episode," *Journal of Financial Services Research*, Vol. 37, No. 2, pp. 83–98.

CHAPTER 3

THE USES AND ABUSES OF SOVEREIGN CREDIT RATINGS

Summary

The sharp downgrades of structured credit products that followed in the wake of the subprime mortgage crisis and the more recent downgrades accompanying weakened sovereign balance sheets have focused attention on credit rating agencies (CRAs) and their rating methodologies. In part this attention reflects the myriad ways in which ratings drive investment decisions and collateral eligibility standards, even those of central banks. Securities regulations and rules have played a big part in this rating reliance, as well as prudential regulations. This chapter focuses on how well CRAs do their job and whether they inadvertently contribute to financial instability. The chapter specifically focuses on sovereign ratings, given the most recent escalation in sovereign credit risk and the propensity for ratings to affect sovereign debt markets.

Although CRAs have been under a cloud of suspicion following their role in structured credit markets, it should be acknowledged that ratings serve several useful purposes. They aggregate information about the credit quality of borrowers, including sovereign entities, corporations, financial institutions, and their related debt offerings. They thus allow such borrowers to access global and domestic markets and attract investment funds, thereby adding liquidity to markets that would otherwise be illiquid.

The chapter examines the top three CRAs (Fitch Ratings, Moody's Investors Service, and Standard & Poor's) to see whether they serve their various roles effectively and, more specifically, whether they rate sovereign debt accurately. It concludes that CRAs' ratings influence market prices, and that downgrades through the investment-grade barrier trigger market reactions. It shows that their market impact is associated not only with new information, but also with a "certification" role, though this is most evident through their use of "outlooks," "reviews," and "watches" (pre-rating change warnings) rather than actual rating changes.

CRAs insist that they do not target their ratings to specific credit risk metrics, such as default probabilities or expected losses, but only to ordinal rankings of credit risk. Tested against this objective, the chapter finds that the CRAs' discriminatory power of sovereign default risk is validated to some extent. For example, all sovereigns that defaulted since 1975 had noninvestment-grade ratings one year ahead of their default.

Despite the CRAs' goals of delivering only ordinal rankings, ratings are often used as though they map into specific credit-risk metrics, including in the Basel II standardized approach to determining bank capital requirements. Given this important use, and assuming Basel II's reliance on ratings remains, CRAs should provide default probabilities or expected losses. Also, they should be expected to meet the same rating calibration and validation standards as those required of banks that use the Basel II internal-ratings-based approach, since the CRAs are a substitute for this more sophisticated approach.

In addition, to reduce the negative "cliff effects" in prices and spreads that rating changes imply, the chapter recommends that regulations that hardwire buy or sell decisions to ratings be eliminated. This recommendation is already being implemented to some degree in some countries, but could usefully be extended. As well, CRAs should continue to provide additional information on the accuracy of their ratings, the underlying data, and their efforts to mitigate the conflicts of interest that are associated with their "issuer pay" model of charging issuers for their ratings.

In the wake of the recent U.S. structured finance "rating crisis" and recent European sovereign downgrades, many are asking whether credit rating agencies (CRAs) play a useful role in the market and whether their credit risk assessments are accurate. Because the current degradation of sovereign balance sheets raises very real concerns about their creditworthiness, and hence, how it is measured by credit ratings, this chapter will focus on sovereign debt ratings. One key concern is whether rating downgrades destabilize financial markets, since they are embedded in many regulations and private contracts, particularly when downgrades cross into noninvestment-grade categories. This chapter shows that CRA attempts to avoid volatile ratings by using smoothing practices actually make ratings more prone to procyclical "cliff effects," which in turn are amplified by the way that ratings are used as sell triggers. Much of this was apparent in the structured credit market debacle, but sovereign ratings are also prone to cliff effects.

Despite the recent criticism leveled at CRAs, they play a significant role in the marketing of fixed-income instruments, with most investors requiring that their fixed-income holdings have a credit rating. Sovereigns seek ratings so that they and their private sector borrowers can access global capital markets and attract foreign investment. More recently, ratings of structured products have been a key factor in the development of the originate-to-distribute model, since the ability to obtain cost-efficient funding depended on getting the highest possible long-term rating (AAA/Aaa). Also, with more than 70 CRAs globally (Annex 3.1), issuing credit ratings apparently has been a good business. This chapter will focus only on the "big three"—Fitch Ratings, Moody's Investors Service, and Standard & Poor's (S&P)—because their sovereign rating coverage dwarfs that of the others, and because they maintain a longer history of ratings (Box 3.1).

According to the theoretical literature, CRAs potentially provide information, monitoring, and certification services. First, since investors do not often know as much as issuers about the factors that determine credit quality, credit ratings address an important problem of asymmetric information between debt issuers and investors. Hence, CRAs provide an independent evaluation and assessment of the ability of issuers to meet their debt obligations. In this way, CRAs provide "information services" that reduce information costs, increase the pool of potential borrowers, and promote liquid markets. This implies that market prices are influenced by rating actions, and that CRA opinions can be important from a financial stability perspective. In theory, CRAs also provide valuable "monitoring services" through which they influence issuers to take corrective actions to avert downgrades via "watch" procedures. These implicitly insert a contract between the issuer and the CRA where the former implicitly promises to undertake specific actions to mitigate the risk of a downgrade (Boot, Milbourn, and Schmeits, 2006).

Although monitoring services can be useful, rating downgrades can lead to knock-on and spillover effects that destabilize financial markets (Box 3.2). These problems stem from the "certification" role played by ratings when they are embedded in regulatory capital requirements and thresholds, and in triggers in various financial contracts. For example, prudential regulations typically allow for less capital or reserves to be held against highly rated, fixed-income instruments. Central banks depend on ratings to determine which securities can serve as collateral for their money market operations. Suitability standards, such as those that constrain money market investments, are often based on rating thresholds. In these ways ratings influence institutional demand and market liquidity, and serve as buy-sell triggers. The strength of the three CRAs' roles is empirically assessed below.

The structured finance credit rating debacle, which was covered in some detail in the April 2008 *Global Financial Stability Report*, shows how ratings can run amok. In that event, the contention that ratings represent accurate default risk metrics was brought into question by the sheer volume and intensity of the multiple downgrades of U.S. mortgage-related structured finance securities in the wake of the crisis. For example, Figure 3.1 shows that over three-quarters of all private-label residential mortgage-backed securities issued in the United States from

Note: This chapter was written by a team headed by John Kiff, and comprised of Allison Holland, Michael Kisser, Sylwia Nowak, Samer Saab, Liliana Schumacher, Han van der Hoorn, and Ann-Margret Westin, with research support from Yoon Sook Kim and Ryan Scuzzarella.

Box 3.1. The Global Credit Rating Agency Landscape

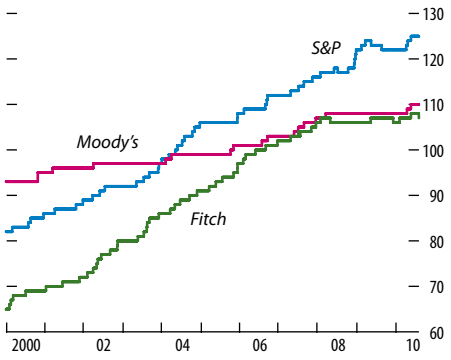
This box shows why the three major credit rating agencies surpass all others in global scope. In particular, their coverage of sovereigns is by far the largest.

When most think of credit rating agencies (CRAs) they think of the "big three" of Fitch Ratings, Moody's, and Standard & Poor's (S&P). Still, Annex 3.1 lists 74 CRAs worldwide. In the United States, the Securities and Exchange Commission recognizes 10 of these as nationally recognized statistical rating organizations (NRSROs), which are listed in the table below. Similarly, the European Central Bank recognizes the big three as well as DBRS as "external credit assessment institutions," while in Japan the big three as well as the two Japanese CRAs that also are NRSROs are considered "designated rating agencies" by the Financial Services Agency.

However, only the big three CRAs are truly global and broad in their product coverage ("global-full spectrum"), the rest being either regional or product-type specialists. Also, their sovereign rating coverage dwarfs that of the others. For example, LACE Financial rated only 59 sovereigns as of July 30, 2010, whereas S&P rated 125, Moody's 110, and Fitch 107 (see figure). They also have reasonably long histories of sovereign ratings, which is required for the empirical analysis of the chapter. For example, at the beginning of 2000, Moody's rated 93 sovereigns, S&P 82, and Fitch 65, whereas the two Japanese NRSROs rated only about 20 (Alsakka and ap Gwilym, forthcoming).

Note: This box was prepared by John Kiff and Ann-Margret Westin.

Total Number of Sovereigns Rated by the Three Major Credit Rating Agencies



Sources: Fitch; Moody's; and Standard & Poor's.
Note: For 2010, data through July 31, 2010.

U.S. Nationally Recognized Statistical Rating Organizations (as of August 10, 2010)

Credit Rating Agency	Head Office	Rating Scope	Number of Sovereigns Rated	Business Model	Internet Home Page
A.M. Best Company, Inc.	United States	Global-Insurance	n.a.	Issuer-Pay	www.ambest.com
DBRS	Canada	Global-Corporates and Structured Finance	n.a.	Issuer-Pay	www.dbrs.com
Egan-Jones Rating Company	United States	Global-Corporates	n.a.	User-Pay	www.egan-jones.com
Fitch Ratings	United Kingdom and United States	Global-Full Spectrum	107	Issuer-Pay	www.fitchratings.com
Japan Credit Rating Agency, Ltd.	Japan	Japanese-Full Spectrum	35	Issuer-Pay	www.jcr.co.jp
LACE Financial Corp.	United States	U.S. Corporates, Global Banks, & Sovereigns	59	User-Pay	www.lacefinancial.com
Moody's Investors Service	United States	Global-Full Spectrum	110	Issuer-Pay	www.moodys.com
Rating and Investment Information, Inc.	Japan	Japanese-Full Spectrum	46	Issuer-Pay	www.r-i.co.jp
Realpoint LLC	United States	U.S.-Structured Finance	n.a.	User-Pay	www.realpoint.com
Standard & Poor's (S&P)	United States	Global-Full Spectrum	125	Issuer-Pay	www.standardandpoors.com

Sources: U.S. Securities and Exchange Commission (www.sec.gov/divisions/marketreg/ratingagency.htm); and rating agency websites.
Note: "Full spectrum" includes banks and other corporations, insurance companies, sovereigns, and structured finance.

Box 3.2. Spillover Effects of Sovereign Rating Downgrades

This box summarizes a working paper by Arezki, Candelon, and Sy (forthcoming) that examines the spillover effect of selected European sovereign rating downgrades during the 2007–10 period. The main finding is that rating downgrades have statistically significant spillover effects across countries and financial markets. The form of the spillover effect depends on linkages between countries.

The euro area crisis highlights the interdependence between different financial markets. This crisis has seen sovereign credit rating downgrades, widening of sovereign credit default swap (CDS) spreads, and pressures on stock markets. Did credit rating news in one country have an impact on financial markets in other euro area countries? Indeed, financial markets throughout the euro area have been under pressure, although credit rating actions were concentrated in a few countries such as Greece, Ireland, Portugal, and Spain.

Arezki, Candelon, and Sy (forthcoming) assess the impact of sovereign rating news on various financial markets across countries in the euro area. The analysis uses daily sovereign CDS spreads and stock market indices, including banking and insurance subindices. This approach fully captures the interdependence between financial markets and allows for identifying which markets and countries are the most affected by any given downgrade. The main result is that sovereign rating downgrades impact not only the financial markets in the country subject to the downgrade but also other euro area countries. For instance, Austrian CDS spreads and stock market indices moved sharply following the downgrades of Baltic countries, while the Austrian credit rating remained unchanged. One possible channel of this spillover effect is the exposure of Austrian banks to the Baltic countries.

Note: This box was prepared by Rabah Arezki and Amadou Sy.

2005 to 2007 that were rated AAA by S&P are now rated below BBB-, that is, below investment grade.[1] While downgrades are expected to some extent, a large number of them—in particular when they involve several notches at the same time or when the downgrading takes place within a short period after issuance or after another downgrade—are evidence of rating failure. This chapter looks at such sovereign rating failures to form a view about the reliability of sovereign ratings, and hence whether policies governing their use should be altered as a result.

The chapter will start with a primer on credit rating definitions and principles, and then review the various ways that ratings have become embedded in regulations and private contracts. It will then describe how CRAs actually assess sovereign credit risk, and present various empirical tests used to assess sovereign rating accuracy and information value. The chapter will close with some policy suggestions aimed at mitigating these cliff effects and their impact.

[1]For more on the history and meaning of the "investment-grade" distinction, see Fons (2004).

Basic Rating Definitions and Principles

A credit rating measures the relative risk that an entity or transaction will fail to meet its financial commitments, such as interest payments and repayment of principal, on a timely basis.[2] These relative risks are mapped into discrete rating grades that are usually

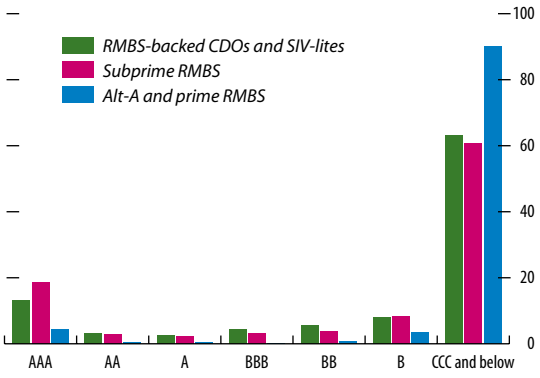
[2]A sovereign is typically deemed to default when it fails to make timely payment of principal or interest on its publicly issued debt, or if it offers a distressed exchange for the original debt. Default events do not usually include the failure to repay debt owed to other governments and official creditors, including the IMF and World Bank. S&P measures default risk in terms of default probability whereas Moody's ratings measure expected loss. Fitch rates issuers on a default probability basis and instruments on an expected loss basis. Hence, in theory, Moody's ratings should diverge from Fitch's and S&P's on the same issuer according to variations in loss severity, as the expected loss can be approximated by the product of the default probability and expected loss severity. However, in practice, there is little divergence, particularly among investment-grade ratings.

expressed in terms of alphabetic identifiers. For example, from the most creditworthy to the least, Fitch and S&P use AAA, AA, A, and BBB for investment-grade long-term credit risk, and BB, B, CCC, CC, C, and D for "speculative" long-term credit risk (see Table 3.1 for Moody's scales).[3] Modifiers are attached to further distinguish and rank ratings within each of the broader classifications—Fitch and S&P use pluses and minuses (e.g., AA+ and AA-) and Moody's uses numbers (Aa1 and Aa3).[4]

CRAs typically signal in advance their intention to consider rating changes. For example, Fitch, Moody's, and S&P all use negative "review" or "watch" notifications to indicate that a downgrade is likely within the next 90 days. They use a negative "outlook" notification to indicate the potential for a downgrade within the next two years (one year in the case of speculative-grade credits).[5]

Although the CRAs do not explicitly quantify their scales, they do provide ex-post summaries of defaults by rating grades (Table 3.1).[6] Furthermore, in their structured finance methodologies, they have revealed their target default probabilities and loss

Figure 3.1. Ratings of AAA-Rated U.S. Mortgage-Related Securities
(In percent of S&P's originally rated 2005–07 issuance as of July 31, 2010)



Source: Standard & Poor's.
Note: RMBS = residential mortgage-backed security; CDO = collateralized debt obligation; and SIV = structured investment vehicle.

[3]The CRAs sometimes distinguish between local and foreign currency obligations, with the gap usually in favor of the former, reflecting the sovereign's greater access to local currency. Although such gaps are still frequently found among Fitch and S&P ratings, these distinctions are now infrequent among Moody's ratings (Moody's, 2010a).

[4]The discussion here centers on long-term debt rating scales. Those for short-term obligations tend to be simpler. For example, Moody's has three "Prime" grades that roughly map into the 10 long-term investment-grade notches. There are also differentiated scales for municipal securities and preferred shares, as well as a plethora of specialized ratings, such as "loss given default assessments" and "bank financial strength ratings" (Moody's, 2010c). Bank financial strength ratings measure the likelihood that a bank will require assistance from third parties, including central banks and governments.

[5]For example, between June 26, 1989 and March 31, 2010, S&P published 74 negative sovereign CreditWatch notices, 51 of which were followed by downgrades within an average of six weeks. Over the same period, 212 negative outlooks were followed by 118 downgrades within an average of six months. Also, 404 stable outlooks were followed by 82 upgrades and only 30 downgrades, and 202 positive outlooks by 143 upgrades and no downgrades.

[6]It should be kept in mind that Moody's default data include only 13 sovereign defaults since 1998. Of the 108 sovereigns that Moody's currently rates, 39 have been added since 1998. Also, according to Moody's, two-thirds of the 1983–2009 sovereign defaults were for unrated sovereigns.

Table 3.1. Long-Term Senior Debt Rating Symbols

			Moody's Five-Year Default Rates (1983–2009) *(in percent)*		
Interpretation	Fitch and S&P	Moody's	Idealized	Corporate	Sovereign
Highest quality	AAA	Aaa	0.003	0.086	
High quality	AA+	Aa1	0.031		
	AA	Aa2	0.068		
	AA–	Aa3	0.142	0.247	
Strong payment capacity	A+	A1	0.261		
	A	A2	0.467		
	A–	A3	0.730	0.806	0.000
Adequate payment capacity	BBB+	Baa1	1.100		
	BBB	Baa2	1.580		
	BBB–	Baa3	3.050	2.027	2.437
Likely to fulfill obligations, ongoing uncertainty	BB+	Ba1	5.280		
	BB	Ba2	8.410		
	BB–	Ba3	11.860	11.444	8.079
High-risk obligations	B+	B1	16.120		
	B	B2	20.710		
	B–	B3	27.050	26.240	10.572
Vulnerable to default	CCC+	Caa1	36.314		
	CCC	Caa2	48.750		
	CCC–	Caa3	69.821		
Near or in bankruptcy or default	CC	Ca			
	C	C		52.350	32.458
	D	D			

Sources: Fitch; Moody's; and Standard & Poor's.

rates. Examples of such target rates are the Moody's "idealized" default rates in Table 3.1, based on historical default rates over various horizons, and analyst judgments. The "idealization" process is intended to ensure the appropriate smooth ranking of default probabilities by rating.

However, the CRAs make it clear that they do not strive to maintain constant default rates for given letter grades (see Table 3.2). According to Cantor and Mann (2003, p. 6), this would require changing ratings "en masse in response to changes in cyclical conditions." More recently, the CRAs have made a special effort to clarify this point, both because of criticisms made of their quantitative models and because some uses of ratings by investors and the authorities, including central banks, are not fully compatible with this risk ordering idea. For example, the Basel II standardized approach is based on AAA/AA ratings implying a 0.10 percent probability of defaulting during a three-year period, single-A ratings a 0.25 percent probability, 1.00 percent for BBB instruments, and so on (BCBS, 2006, Annex 2). The Eurosystem's high "credit threshold" for collateral posted against monetary policy operations is defined in terms of a BBB- rating that implies a 0.40 percent one-year default probability (ECB, 2008a).

The CRAs also make it clear that rating stability is another key rating objective. In particular, they aim to make sure that the higher rating grades are more stable than the lower rating categories. S&P (2010b) recently formalized this objective in its revamped criteria. The stability criterion is driven by an aversion of market participants to the potential transaction-related costs that would be triggered by frequent rating changes (Cantor and Mann, 2007). The portfolio governance rules, regulations, and contractual triggers that would be associated with such transactions are discussed in the next section.

One of the ways in which CRAs achieve this stability is by rating "through the cycle" (TTC) instead of at a "point in time" (PIT), thereby attempting to avoid procyclicality. In more practical terms, ratings are typically based on the ability of an issuer to survive a cyclical trough. Once the rating is set, it is changed only in response to changes in fundamental factors, such as secular trends or unanticipated policies. Under this approach, a recession or tightening of

Table 3.2. Rating Agency Statements on What Their Ratings Are Designed to Measure

Fitch	"Credit ratings express risk in relative rank order, which is to say they are ordinal measures of credit risk and are not predictive of a specific frequency of default or loss. Fitch Ratings' credit ratings do not directly address any risk other than credit risk, ratings do not deal with the risk of a market value loss on a rated security due to changes in interest rates, liquidity and other market considerations."
Moody's	"There is an expectation that ratings will, on average, relate to subsequent default frequency, although they typically are not defined as precise default rate estimates. Moody's ratings are therefore intended to convey opinions of the relative creditworthiness of issuers and obligations...Moody's ratings process also involves forming views about the likelihood of plausible scenarios, or outcomes—not forecasting them, but instead placing some weight on their likely occurrence and on the potential credit consequences. Normal fluctuations in economic activity are generally included in these scenarios, and by incorporating our views about the likelihood of such scenarios, we give our ratings relative stability over economic cycles and a sense of horizon."
Standard & Poor's	"Standard & Poor's credit ratings are designed primarily to provide relative rankings among issuers and obligations of overall creditworthiness; the ratings are not measures of absolute default probability. Creditworthiness encompasses likelihood of default and also includes payment priority, recovery, and credit stability."

Sources: Fitch (2010b); Fons (2002); and Standard & Poor's (2009).

global liquidity should not, in itself, trigger a downgrade.[7] PIT assessments tend to focus on the current conditions of an issuer.

More recently CRAs have started to develop new methodologies that shift the criteria from a TTC to a "through-a-crisis" focus. For example, the new S&P (2010b) credit stability criterion uses hypothetical stress scenarios as benchmarks for calibrating the criteria across different sectors and over time. Each scenario is constructed to be relevant for a specific rating grade. The scenario for a particular grade reflects the level of stress that issuers rated in that grade, say AAA, should be able to withstand without defaulting. In contrast to the TTC rating approach, this new stability criterion allows for hypothetical scenarios affecting fundamental components. In this way, ratings become measures of risk conditional on the realization of extreme scenarios (rather than conditional on the continuation of the current macroeconomic situation).

In either case, however, investors and policymakers should be aware that TTC ratings may appear to underperform the short-term predictive power of PIT assessments. Some of these implications are discussed in greater depth below.

[7]One of the challenges of producing TTC ratings is differentiating fundamental versus cyclical factors. These challenges are similar to those faced by central banks that try to maintain their monetary policy targets.

The Evolving Roles and Regulation of Credit Ratings and Credit Rating Agencies

Credit ratings have long played a significant role in the marketing of fixed-income instruments to investors, but over time they have also found their way into various rules and regulations.[8] As a result, rating downgrades often lead to knock-on and spillover effects that can have destabilizing impacts on financial markets (Box 3.2). Country authorities have taken a two-pronged approach to mitigate these effects by seeking to reduce regulatory reliance on ratings, and by regulating the CRAs directly. In their efforts to reduce rating reliance, regulators are, however, recognizing that some smaller and less-sophisticated investors will have to continue to rely on ratings.

Central banks continue to use credit ratings rather mechanistically in their rules that determine the securities they accept as collateral in liquidity provision and market operations, and the margin or haircut applied thereon. For example, the U.S. Federal Reserve's Term Auction Lending Facility mandates that only asset-backed securities rated AAA/Aaa by two or more of the major nationally recognized statisti-

[8]For a history of the rating business in the United States, going back to Moody's *Analyses of Railroad Investments* published in 1909, and the increased regulatory reliance on ratings, see Cantor and Packer (1994), Partnoy (1999), and Federal Register (2008).

cal rating organizations (NRSROs) are eligible for nonrecourse loans. Similarly, the European Central Bank (ECB) requires that marketable assets meet "high credit standards" in order to be eligible as collateral, in turn requiring at least one BBB- credit rating from one of the four accepted "external credit assessment institutions" (with the exception of asset-backed securities, for which the credit rating at issuance should be AAA) (ECB 2008a, 2008b, and 2009).

Joint Forum Stocktaking Confirms Extensive Use of Credit Ratings in Regulations

A Joint Forum (2009) survey of the use of credit ratings by its member regulatory authorities in the banking, securities, and insurance sectors found that the reliance on credit ratings was widespread in regulations and legislation for the banking and securities sector, with more limited use in the insurance sector.[9] Credit rating references were found to be more prevalent in U.S. and Canadian legislation and regulations relative to those in Europe, Japan, and Australia. In the United States, the Securities and Exchange Commission (SEC) first used the term NRSRO in 1975 in its net capital rule for broker-dealers as an objective benchmark to prescribe capital charges for different types of debt securities.

Since its introduction in 1975, the NRSRO designation, and hence credit ratings, have found their way into other federal securities laws and regulations and elsewhere (Federal Register, 2008). For instance, insurance codes set by state regulators rely on ratings to determine appropriate investments for insurance companies. By 1997, the number of references to NRSROs in U.S. securities legislation had risen to more than 1,000, while there were some 400 citations each in pension, banking, and real estate legislation (Partnoy, 1999). This is consistent with the findings of the Joint Forum (2009) report that an important role of credit ratings is to identify or classify assets, usually in the context of eligible investments or permissible asset concentrations. Ratings were also found to play key roles in evaluating the risks associated with assets purchased as part of securitization offerings, and in determining disclosure requirements, as well as prospectus eligibility and exemptions. Still, the Joint Forum report found that the most common use of credit ratings is for regulatory capital.

Private Sector Contracts Are Also Highly Dependent on Credit Ratings

An SEC (2003) survey found that most mutual funds, pension funds, insurance companies, private endowments, and foundations use credit ratings to comply with internal by-law restrictions or investment policies that require certain minimum credit standards. External credit ratings constitute objective and easily verifiable third-party opinions. These institutions were also found to use ratings to ensure compliance with various regulatory requirements, even though they typically conducted their own credit analysis for risk management purposes, or to identify pricing discrepancies for their trading operations. Moreover, fixed-income portfolio manager performance is often benchmarked against standard indices that are usually constructed on the basis of credit ratings. For example, only investment-grade-rated (BBB-/Baa3 or better) instruments make it into the Barclays Euro Government Bond indices, implying that a bond downgrade to below the investment-grade threshold often triggers immediate liquidation.[10]

The SEC (2003) survey also noted the widespread use of "ratings triggers" in financial contracts that terminate credit availability or accelerate credit obligations in the event of specified downgrades. Moody's (2001) describes three instances of rating-trigger-related "mutual assured destruction" during 2000–01, including the collapse of Enron. In that case, trading and other financial agreements gave counterparties the right to demand cash collateral, and lenders the right to demand repayment of outstanding loans once Enron's credit rating declined below certain levels (Moody's, 2001).[11]

[9]The Joint Forum (2009) survey included 26 agencies representing 12 different countries, as well as five responses referring to international frameworks.

[10]In some cases, the liquidation requirement is actually triggered when an investment-grade issuer is just above the threshold (e.g., BBB-/Baa3 or BBB/Baa2) but on review for a downgrade, or when one of the relevant CRAs has issued the equivalent of a negative outlook.

[11]The other examples of rating-trigger-related corporate failures given in Moody's (2001) involve PG&E Corporation (and

Rating triggers in over-the-counter (OTC) derivative contracts also played a role in the near collapse of AIG. As long as the insurer and its financial products subsidiary (AIG FP) were rated AAA, the terms and conditions of their contracts did not oblige them to post collateral against these positions.[12] However, after the first downgrade (to AA+ in March 2005) they had to start posting collateral. As the crisis unfolded their mounting collateral posting requirements, coupled with liquidity strains from their securities lending unit, eventually became unsustainable. By September 2008, given the potentially disastrous systemic knock-on effects of a failure to post collateral, the U.S. authorities decided to supply AIG with liquidity assistance, which, at one point, exceeded $100 billion.

Country Authorities Working to Reduce Rating Reliance

Authorities are currently seeking to reduce regulatory reliance on credit ratings, while being mindful of not returning to inferior alternatives, such as risk-insensitive systems (for example, the Basel I framework) or model-based systems that are not yet sufficiently robust. The Financial Stability Board is currently working on proposals to reduce reliance on external ratings in rules and regulations, in line with the Group of Twenty (G-20) Declaration at the Toronto 2010 Summit (G-20, 2010) in June. In the United States, the financial sector reform bill signed into law in July 2010 explicitly requires all federal agencies to review and modify regulations to remove references to or reliance upon credit ratings and substitute an alternative standard of creditworthiness.[13] In Japan, the Financial Services Agency recently adopted a proposal aimed at reducing the use of credit ratings in the regulatory and supervisory framework.

Other options being explored include forcing institutions to conduct appropriate due diligence (with consequences for their required capital holdings if they fail to do so). In particular, institutional investors are being required to follow the International Organization of Securities Commissions' (IOSCO) best due diligence practices. There are also considerations to require CRAs to comply with the IOSCO Code of Conduct in order for their ratings to be used for Basel II purposes, and to reduce cliff effects in the standardized approach. Such a cliff effect occurs when there is a downgrade, in particular below the investment-grade threshold, which in turn has an additional liquidity effect due to the need to meet regulatory requirements. Similarly, central banks should to an increasing extent rely on internal credit assessments.

Notwithstanding the current move toward reducing the regulatory reliance on credit ratings, CRAs and their ratings will inevitably continue to play important roles in financial markets. For example, smaller and less-sophisticated investors that do not have the economies of scale to do their own credit assessments will inevitably continue to rely extensively on external information, including credit ratings. Hence, any steps to reduce overreliance on ratings should differentiate both according to the size and sophistication of the institution, and the instruments concerned, making sure there is sufficient information for most users to do their own due diligence. Also, it will be important that the authorities continue efforts to improve CRA procedures, including transparency, governance, and mitigation of conflicts of interest.

Recent and Ongoing Measures to Regulate Credit Rating Agencies

At the 2009 London Summit, the G-20 leaders agreed that the regulatory oversight of CRAs, consistent with the IOSCO (2008) credit rating *Code of Conduct Fundamentals*, should be established by end-2009 (G-20, 2009). As a result, national and regional initiatives have been undertaken or are under way to strengthen oversight of CRAs, with some of them initiated even before the crisis. The SEC has adopted or proposed amendments to its rules on NRSROs to increase transparency, tighten oversight, and reduce conflicts of interest. In the European Union (EU), regulation introducing oversight and supervision of CRAs entered into force in December 2009, and there is a proposal for the new European Securities and Markets Authority to be in charge of registration and

its subsidiary Pacific Gas and Electric Company) and Southern California Edison Company.

[12]For more on the risk management of OTC derivative contracts, see IMF (2010, Chapter 3).

[13]In August 2010, the U.S. banking regulators published an advance notice of proposed rulemaking that invited comments on credit rating alternatives for their regulations.

supervision of CRAs. In Australia and in Japan, new regulatory frameworks for CRAs became effective in January and April 2010, respectively, while in Canada, a proposal to introduce regulatory oversight of CRAs was published for comment in July 2010. Many other G-20 countries have also introduced or are in the process of introducing new regulatory oversight for CRAs. (See Box 3.3 for a summary of the major initiatives and proposals.)

One particular ongoing concern is the conflict of interest arising from the issuer-pay model. Currently, almost all credit ratings are paid for by the issuer of the instruments, which might give issuers incentives to shop around for the best rating. In theory, a CRA should have a vested interest, including under an issuer-pay model, in providing reliable ratings on an ongoing basis in order to maintain its "reputational capital" (Partnoy, 1999; Bergevin, 2010). However, the significant increase over time in references to credit ratings in rules and regulations, combined with limited competition, has affected the business model of CRAs by creating a more or less "guaranteed market" with few incentives to compete on the basis of rating quality. Furthermore, some would argue that an investor-pay model, where ratings are paid for by investors through subscription fees, can also give rise to conflicts of interest.[14] A large investor could try to influence CRAs to provide lower initial ratings (which tend to provide higher yields), while institutions that can only invest in highly rated instruments due to regulatory requirements might pressure a CRA to assign an investment-grade rating on a particular security (Partnoy, 2009).

The U.S. financial sector reform legislation signed into law in July 2010 will require several agencies to conduct studies of various proposals to deal with the conflict of interest arising from the issuer-pay model. One of the proposals to be studied (by the SEC) would establish a Credit Rating Agency Board to assign NRSROs the rating of specific structured finance products to thwart rating shopping by issuers. The SEC and Government Accountability Office are also charged with reviewing alternative CRA business models and compensation schemes. In addition, a 2009 SEC amendment to the rules relating to the oversight of the NRSROs explicitly prohibits anyone who participates in determining a credit rating from also participating in any fee negotiations or discussions.[15] A more radical approach to the incentive conflict problem could be to move to performance-based pay, where only a smaller fee would be paid up front while the remaining fee would be earned over time, based on the ultimate accuracy of the rating. Alternatively, Partnoy (2009) has suggested that CRAs be required to hold stakes in certain instruments that they rate highly, although it is unlikely that all CRAs would have sufficient capital to support potential losses on such an asset.

Self-Improvement Measures Taken by the Credit Rating Agencies

Since the onset of the financial crisis, the major CRAs have also taken steps themselves to improve rating quality, transparency, and corporate governance. They have conducted rating reviews across asset classes, revised ratings where necessary, and updated criteria and models with new factors and assumptions. Several CRAs have improved staff training, including by teaming up with high-ranking universities. There has been a further emphasis on the publication of the underlying research, as well as revamped external websites to enhance transparency. For example, to better signal concerns about potential rating pressures for structured finance products, some CRAs started publishing early indicators of a potential rating change over the next one- to two-year period. Given the intensification of the global financial crisis, there has been a particular emphasis on publishing better and more accessible research on sovereign creditworthiness.

In order to enhance governance, the major CRAs have revised their codes of conduct to conform to the updated IOSCO code of May 2008, focusing on the

[14]In the mid-1970s, as credit ratings started to become more important because of the increasing reliance on ratings in rules and regulations, NRSROs stopped selling ratings to investors and instead began charging the companies that issue the debt they rate (Partnoy, 1999 and 2009). Still, some of the smaller and more focused current NRSROs, such as Egan-Jones Rating Company (which focuses on corporates), Lace Financial Corporation, and Realpoint, LLC (which focuses on structured finance), base themselves on subscription-based business models.

[15]For more information see www.sec.gov/rules/final/2009/34-59342-secg.htm.

Box 3.3. Developments in the Regulation of Credit Rating Agencies

In the wake of the recent financial crisis, many countries have taken steps to enhance the regulatory framework for credit rating agencies, focusing on registration, enhanced oversight, and transparency. Some countries are also moving toward reduced reliance on credit ratings in rules and regulations. This box examines the regulatory steps taken in this regard in the United States, Europe, Japan, Australia, and Canada.

United States

The U.S. *Credit Rating Agency Reform Act of 2006* gave the Securities and Exchange Commission (SEC) authority to regulate credit rating agencies (CRAs). The act's overriding purpose is to improve rating quality for the protection of investors by fostering accountability, transparency, and competition in the credit rating industry and by establishing a transparent registration system and oversight regime for nationally recognized statistical rating organizations (NRSROs).

The SEC has introduced new measures aimed at reforming CRA transparency and disclosure standards and reducing potential conflicts of interest, given the current "issuer-pay" compensation model. NRSROs are required to publish a description of their rating methodologies and procedures, plus certain rating performance analytics.[1] In addition, issuers will have to share with the other NRSROs all information they provide to any particular NRSRO with respect to structured credit product ratings.

On July 21, 2010, the *Dodd-Frank Wall Street Reform and Consumer Protection Act* was signed into law.[2] The law increases internal controls for CRAs, requires greater transparency of rating procedures and methodologies, and provides the SEC with greater enforcement and examination tools regarding NRSROs. In particular, the law:

- Requires each NRSRO to have a board of directors of which at least half (but not fewer than two) are independent members, some of whom must be users of NRSRO ratings;
- Introduces the possibility of exposing NRSROs to liability as experts;[3]
- Suggests that the SEC should exercise its rulemaking authority to prevent conflict of interest arising from employees of NRSROs providing services to issuers of securities that are unrelated to the issuance of credit ratings;
- Requires each NRSRO to establish, maintain, enforce, and document an internal control structure to govern implementation of and adherence to policies, procedures, and methodologies for determining ratings;
- Asks the SEC to adopt rules that require each NRSRO to establish, maintain, and enforce policies and procedures that clearly define and disclose the meaning of any ratings symbol and apply this symbol consistently for all instruments for which the symbol is used;
- Requires the removal of certain statutory references to credit ratings and requires that all federal agencies review and modify regulations to remove references to or reliance upon credit ratings and substitute an alternative standard of creditworthiness; and

Note: This box was prepared by Ann-Margret Westin.

[1]The first set of rules adopted by the SEC in 2007 required CRAs to include certain rating performance statistics (for example, historical downgrade and default rates within each major rating category). These rules were refined in 2009. In addition, CRAs have to make publicly available, in machine-readable form on a six-month delay, rating action histories for a randomly selected 10 percent of issuer-paid ratings for each class of credit rating for which they have issued 500 or more issuer-paid ratings. Furthermore, all such data must be made publicly available on a 12-month lag. See www.sec.gov/rules/final/2009/34-59342-secg.htm and www.sec.gov/rules/final/2009/34-61050-secg-nrsro.htm.

[2]For a summary of the law, see Davis Polk (2010). For the full text of the bill, see www.govtrack.us/congress/bill.xpd?bill=h111-4173.

[3]The law nullifies Rule 436(g) under the Securities Act, which exempts credit ratings provided by NRSROs from being considered part of a registration statement prepared or certified by a person within the meaning of Sections 7 and 11 of the act. As a result, registrants, in order to include an NRSRO credit rating in a registration statement, would be required to file the NRSRO's consent along with the registration statement, in turn exposing the NRSRO to liability for material misstatements or omissions with respect to such included ratings. As a result, the major CRAs have already announced that they will not allow debt issuers to include their ratings in prospectuses or debt registration statements for now. The SEC has given issuers six months to comply with the new law, currently allowing them to omit credit ratings from the registration statements.

Box 3.3 *(continued)*

- Establishes an SEC Office of Credit Ratings that will put in place fines and other penalties for violations by NRSROs, administer SEC rules with respect to NRSRO practices in determining ratings, and conduct an annual examination of each NRSRO.

The law also mandates a number of studies. In particular, the SEC is required to undertake a study of the credit rating process for structured finance products and the conflicts of interest associated with the issuer-pay and subscriber-pay models, the range of metrics to determine the accuracy of ratings, and alternative means of compensation to create incentives for accurate ratings. The SEC must also study the feasibility of establishing an independent organization to assign NRSROs to determine credit ratings for structured finance products, and create and oversee a Credit Rating Agency Board that would assign a "qualified" CRA to rate each new issue of asset-backed securities, unless it determines that an alternative system would be more appropriate.[4] The SEC is also asked to provide a study of the independence of NRSROs and how this affects ratings issued, while the Government Accountability Office must conduct a study of alternative means for compensating CRAs in order to create incentives to provide more accurate ratings.

Europe

The European Commission (EC) in November 2008 established a group chaired by Jacques de Larosière to examine possible improvements to supervision and regulation of CRAs. As a result, a first set of regulations on CRAs was adopted in September 2009, responding to what was seen as major weaknesses in the activities of CRAs. The regulation, which came into force in December 2009, has introduced mandatory registration for all CRAs operating in the European Union (EU). Specific treatment can be extended on a case-by-case basis to CRAs operating exclusively from non-EU jurisdictions provided that their countries of origin have established regulatory and supervisory frameworks as stringent as the one now put in place in the EU.

Registered CRAs will have to comply with a comprehensive set of rules to make sure that ratings are not affected by conflicts of interest; that CRAs remain vigilant, ensuring the quality of the rating methodology; and that they act in a transparent manner. The regulation also includes a surveillance regime for CRAs. In particular, CRAs:

- May not provide advisory services;
- Will not be allowed to rate financial instruments if they do not have sufficient quality information on which to base their ratings;
- Must disclose the models, methodologies, and key assumptions on which they base their ratings;
- Must differentiate the ratings of more complex products by adding a specific symbol; and
- Should have at least two independent directors on their boards whose remuneration cannot depend on the business performance of the rating agency.

According to the regulation, the Committee of European Securities Regulators will be in charge of the registration and day-to-day supervision of the

[4]The board would be made up of a majority of investors, and of at least one issuer representative, one rating agency representative, and one independent member. The probability of a CRA being chosen could depend on past performance. The board would also be able to prevent CRAs from charging unreasonable fees for providing a rating.

quality and integrity of the ratings process and reducing conflicts of interest.[16] Some have updated their fee policies to ensure a clearer separation between their core rating activities and other business development activities, and clarified the definition of "ancillary business," that is, what is not included in the core rating business. Also, and in line with the recently approved U.S. financial sector reform bill, several CRAs have implemented "look-back" reviews, that is, reviews of historical ratings when a rating analyst leaves a CRA to join an organization that was previously rated by the particular analyst.

[16]See IOSCO (2009). For examples of the CRAs' own codes of conduct, see www.fitchratings.com/jsp/creditdesk/CodeOfConduct.faces?context=3&detail=1 and www.standardandpoors.com/ratings/policies-and-code-of-conduct/en/us.

Box 3.3 *(concluded)*

CRAs. However, in June 2010 the EC proposed the introduction of centralized EU oversight of CRAs, entrusting the proposed new European Securities and Market Authority (ESMA) with exclusive supervisory powers over CRAs registered in the EU, making CRAs the first type of institution subject to centralized EU supervision. Under the proposal, the ESMA will have powers to request information, launch investigations, and perform on-site inspections. Furthermore, issuers of structured finance products will have to provide all other interested CRAs with access to the information they give to the CRA rating their product, enabling the other CRAs to issue unsolicited ratings.[5]

Japan

Similarly, in Japan, the *Financial Instruments and Exchange Act* was amended in June 2009 to introduce a set of regulations on CRAs, effective April 2010, to ensure (1) independence of CRAs from security issuers; (2) quality and fairness in the rating process; and (3) transparency for market participants. Among several measures, the Financial Services Agency (FSA) of Japan has introduced a registration system that requires registered CRAs to disclose rating policies in a timely manner, take measures to control quality and prevent conflict of interests, and avoid providing advisory services. Unregistered CRAs are still allowed to operate, but in using their credit ratings, issuers must notify investors of the fact that those ratings are issued by unregistered CRAs effective October 2010.[6] The Japanese FSA also recently adopted a proposal to amend the relevant cabinet office ordinances with the aim of reducing the use of credit ratings in the regulatory and supervisory framework, effective January 2011.

Australia and Canada

Since January 1, 2010, CRAs in Australia have been required to hold an Australian Financial Services license, requiring them to, among other things, manage conflicts of interests, have in place risk management systems, lodge annual compliance reports, and disclose procedures, methodologies, and assumptions for ratings. Measures have also been taken to enhance CRA exposure to legal liability.[7]

Meanwhile, in July 2010 the Canadian Securities Administrators published for comment a proposal aimed at introducing securities regulatory oversight of credit rating organizations. Central to the proposal is the requirement for credit rating organizations to apply to become a "designated rating organization" to allow their ratings to be used for various purposes within securities legislation. Once designated, a rating organization would be required to have and enforce a code of conduct that is based on the code published by IOSCO, and to establish policies and procedures to manage conflicts of interest, prevent inappropriate use of information, appoint a compliance officer, and make an annual filing.[8]

[5]For further information go to http://ec.europa.eu/internal_market/securities/agencies/index_en.htm.

[6]For further information go to www.fsa.go.jp/en/news/2010/20100331-4.html.

[7]For further information go to www.asic.gov.au/asic/asic.nsf.

[8]For further information go to www.securities-administrators.ca/aboutcsa.aspx?id=915.

The Way Forward

Despite efforts so far, conflicts of interest are still present and will require a two-pronged approach. There seem to be few viable alternative compensation models to an issuer-pay business model in the foreseeable future. In particular, it is not realistic to return to a general investor-pay subscription model. Already as of 1999, 95 percent of all CRA revenue stemmed from issuer fees, reflecting in large part a desire to solve the free-rider problem of nonsubscribers accessing the rating information (Partnoy, 1999). Excluding nonsubscribers would be even more difficult in today's information society. Meanwhile, the more radical compensation model of performance pay could be desirable looking ahead, in line with similar initiatives in banking supervision to have compensation be more closely related with

risks undertaken. However, this business model, as well as a model based on more "skin in the game," is unlikely to gain momentum for the time being. Tellingly, no current regulatory initiatives seriously question the issuer-pay compensation model. Rather, the issuer-pay model should be expected to stay for now and the way forward should be a combination of gradually reducing the regulatory reliance on credit ratings to the extent possible, while at the same time enhancing CRA regulatory oversight. Reducing regulatory reliance on ratings will diminish some of the incentives to shop for ratings, since CRAs will no longer face a captive market but rather will need to compete on the basis of rating accuracy. The decline in regulatory reliance on ratings might in turn spur a decline in the use of ratings in private contracts as well. Still, credit ratings are likely to continue to serve an important role given the substantial existing information and analytical capacity asymmetries, in particular for smaller investors and illiquid instruments. Therefore, enhanced oversight of the CRAs will be essential, in line with IOSCO's new objectives and principles (IOSCO, 2010).

Enhanced competition would need to be combined with tougher measures against rating shopping. Although there are more than 70 CRAs globally, only three to four cover the lion's share of the global market. While there are few formal barriers for entering the market, fixed costs are still high given the information needs and the importance of company reputation, in turn stifling entry. Looking ahead, enhanced competition would be welcome, although there are a few caveats. Empirically, event studies suggest that the arrival of an additional CRA to a market has led to lower rating quality/higher ratings, in part reflecting enhanced opportunities for rating shopping, while not enhancing the information content.[17] Hence, measures should be taken to discourage such rating shopping, including requiring disclosure about any preliminary ratings. Also, establishing a public CRA, in the spirit of enhancing competition, could entail its own conflicts of interest if it rated sovereigns, given the importance of sovereign credit ratings.

Regulators will also need to decide on how to treat CRA liability issues. In the United States, civil suits against CRAs have so far been unsuccessful, as ratings qualify as "opinions" rather than expert recommendations. This is set to change with the recent Dodd-Frank Act (see Box 3.3), which subjects CRAs to greater liability. Similar measures have also been taken in Australia. With significant regulatory reliance on credit ratings, users could argue that legal recourse for rating inaccuracy is warranted. This might, however, become less important as the regulatory reliance on ratings declines over time.

[17]For example, see Becker and Milbourn (2010) and Bongaerts, Cremers, and Goetzmann (2009).

Fundamental Sovereign Credit Risk Analysis

The CRAs are constantly fine-tuning their rating methodologies. It would appear that sovereign ratings have performed somewhat better through this crisis than they did during the Asian crisis. However, the analysis below suggests that there is still scope to capture more effectively some factors that have been significant in shaping the current crisis—namely, the level of short-term debt and the size of contingent liabilities.

Overall, the CRAs base their ratings on key economic factors coupled with some qualitative assessment (particularly of the nature of institutions and the political environment). These factors are described in significant detail in their publications, and much of the underlying information is in the public domain. This suggests that internal-ratings models could readily use the equivalent information. However, the analysis below of various tests of quantitative, model-driven ratings suggests that the qualitative judgmental element is an equally important rating driver.

Overview of Sovereign Rating Approaches

The CRAs determine sovereign ratings based on a range of quantitative and qualitative factors with which they gauge a country's ability and willingness to repay its debt (Box 3.4). The limited number of actual sovereign defaults constrains back-testing of any empirical model when trying to determine a sovereign's creditworthiness (and associated probability of default). Another factor that differentiates the rating of sovereigns over and above other instrument ratings is the concept of "willingness to pay." This reflects the potential risk that even if the sovereign had the *capacity* to pay, it may not be *willing* to pay if it judges the social or political costs to be too great. To capture this element, CRAs assess a range of qualitative factors such as institutional strength,

Table 3.3. Key Factors in Sovereign Credit Rating Assessments

Fitch	Macroeconomic policies, performance, and prospects; structural features of the economy; public finances; external finances
Moody's	Economic strength; institutional strength; financial strength of the government; susceptibility to event risk
Standard & Poor's	Political risk; economic structure; economic growth prospects; fiscal flexibility; general government debt burden; offshore and contingent liabilities; monetary flexibility; external liquidity; external debt burden

Sources: Fitch (2010a); Moody's (2008); and Standard and Poor's (2008).

political stability, fiscal and monetary flexibility, and economic vitality. In addition, a country's track record of honoring its debt is an important indicator of willingness to pay, a characteristic that is otherwise difficult to measure objectively. These qualitative factors are complemented with quantitative factors such as the level of debt and official international reserves, the composition of debt (in particular the currency composition and maturity profile), and the extent of the debt burden, for example as captured in interest costs.

The fundamental analysis that feeds the rating process is comparable across the CRAs, but it differs in the way individual factors are classified and grouped, and in the specificity with which the CRAs present their methodologies. Hence, although the overall information sets are similar, Fitch and Moody's classify their indicators under four categories of key factors, while S&P uses nine (Table 3.3 and Box 3.4).[18] The CRAs use public information as well as additional information supplied to them by the country authorities. Though sometimes difficult to achieve, a quality check of the data is an important part of the country risk analysis.

While CRAs make a significant effort to use clear and objective criteria to "score" country performance under each factor, the actual rating is not a mechanical weighting of these factors. As with their other ratings, sovereign ratings are determined by a rating committee that takes into account all the material presented by a relevant analyst and then forms a judgment of where the country stands relative to other credits.[19] This judgment is necessary in order to take into account the relevance of political and institutional factors; it also allows the ratings to adapt to changing circumstances, permitting the relative weight of various factors—for example, levels of domestic and short-term debt—to vary over time.

Also, rating methodologies themselves evolve over time and continue to be adjusted in response to new information and economic developments. These adjustments tend to be small, and CRAs are generally careful to keep the number of rating changes triggered by these adjustments to a minimum. However, following the Asian crisis—when the CRAs were widely criticized for failing to spot at an early stage the build-up of risks that would affect a sovereign—there was a more significant review and change in their sovereign risk methodologies. For example, Fitch adjusted its approach to more closely monitor countries with a high proportion of short-term external debt, even if overall debt levels were modest, while S&P increased its focus on external obligations, including private sector external debt and contingent liabilities.

The quality of CRA ratings would benefit from better sovereign data and transparency. Indeed, S&P has been assigning a greater weight to issues of transparency and the quality of fiscal data since the Asian crisis.[20] Global data transparency initiatives could give CRAs and other market participants access to key sovereign data in a more relevant and timely fashion. Also, such initiatives would help identify the current information gaps, including on contingent

[18]Between 1998 and 2008 the number of key factors considered by S&P has varied between 8 and 10.

[19]The rating committee typically also draws on staff from other rating teams, sectors, and regions. One reason is to help ensure consistency across rating groups. Another reason is to mitigate the risk of conflict of interest or "issuer capture" referred to above. Since the onset of the crisis, some CRAs have taken steps to further broaden their rating committee representation. In fact, one element of the EU proposals on regulating CRAs is to ensure the regular rotation of rating committee members to mitigate issuer capture. This will need to be carefully balanced, though, so that the benefits of consistency through time are not lost.

[20]For more analysis on the importance of disclosing fiscal risks from exogenous shocks and the realization of explicit or implicit contingent obligations of the government, see Everaert and others (2009).

Box 3.4. An Overview of the Factors Influencing Sovereign Credit Ratings

This box reviews the quantitative and qualitative factors that the credit rating agencies (CRAs) use to gauge a country's ability and willingness to repay its debt. Although there are significant overlaps in which factors the CRAs use, there are differences in the relative weightings of factors, not only between CRAs, but also between types of countries.

Each of the three main credit rating agencies identifies a set of key drivers that determine its sovereign credit ratings (see table). For each driver, a range of quantitative and/or qualitative criteria is assessed.[1] While there may be some differences in how these factors are characterized, there is significant overlap in the underlying information that is considered. For example, all of the CRAs consider GDP per capita, the level and composition of debt, financial resources of the government, some indicator of political stability, and the robustness of the financial sector to be key criteria. However, there are some differences—for example, Fitch and S&P appear to put relatively more weight on contingent liabilities of the government, while Moody's appears to put more relative weight on event risk. Similarly, both Moody's and S&P appear to consider a broader set of factors when considering the general economic structure, including income discrepancies, competitiveness and protectionist factors (S&P), and innovation and investment in human capital (Moody's), relative to Fitch. The relevance of each factor also depends on the (type of) country under review. For instance, the level of reserves is a much more prominent factor for countries operating under a fixed or managed exchange rate regime.

Each CRA differs slightly in how the information is aggregated into a single rating. For example, Fitch uses a sovereign rating model that combines the criteria into

Note: This box was prepared by Allison Holland, Samer Saab, and Han van der Hoorn.

[1]These criteria are described more fully in each of the CRAs' criteria reports. See Fitch Ratings (2010a), Moody's Investor Services (2008), and Standard & Poor's (2008).

Indicators Used by the Credit Rating Agencies (By Type of Driver)

	Fitch	Moody's	Standard & Poor's
Macro/ Growth	GNP and GDP per capita Consistency of monetary and fiscal policies and credibility of policy framework Sustainability of long-term growth path Competitiveness of economy Depth of demand for local currency Capacity to implement countercyclical macro policies Composition of current account	GDP per capita Long-term volatility of nominal output Scale of economy Integration in economic and trade zones	Rate and pattern of economic growth Range and efficiency of monetary policy tool Size and composition of savings and investment Money and credit expansion Price behavior in economic cycles
Public finance	Financial assets of government Sovereign net foreign asset position Volatility of government revenue Revenue-to-GDP ratio Medium-term public debt dynamics Credibility of fiscal policy framework and institutions Financial flexibility	Government's ability to raise taxes, cut spending, sell assets, or obtain foreign currency (e.g., from official reserves)	General government revenue, expenditure, and surplus/deficit trends Compatibility of fiscal stance with monetary and external factors Revenue-raising flexibility and efficiency Expenditure effectiveness and pressures Size and health of nonfinancial public sector enterprises
Debt	Size and growth rate of public debt Composition of government debt (maturity, interest rate, and currency) Contingent liabilities of government Maturity and currency structure of foreign liabilities and assets Distribution of foreign liabilities and assets by sector Payment record	Level of debt Interest payments and revenues Structure of government debt Debt repayment burden Debt dynamics Conditional liabilities Financial depth	General government gross and net debt; gross and net external debt Share of revenue devoted to interest Debt service burden Maturity profile and currency composition Access to concessional funding Debt and breath of local capital markets
Financial sector	Macro-prudential risk indicators Quality of banking sector and supervision Contingent liabilities of banking sector Foreign ownership of banking sector	Financial sector strength Contingent liabilities of banking sector	Robustness of financial sector Effectiveness of financial sector

a single score that is calibrated to derive a long-term issuer default rating. However, the actual rating can deviate from this model-generated rating, given that the model may not capture all relevant developments; this is where the rating committee, a body within each CRA, can provide additional value. In the case of Moody's, each of the four key factors is rated on a five-point scale, which is combined in three stages. In the final stage, economic resilience—factors (1) and (2)—and financial robustness—factors (3) and (4)—are blended with peer group information and any missing information considered relevant. In the case of S&P, each of the nine key factors is ranked on a six-point scale but there is no precise formula for combining the scores. In addition, trends in each of the factors, as well as their absolute level, are also taken into account in the final rating.

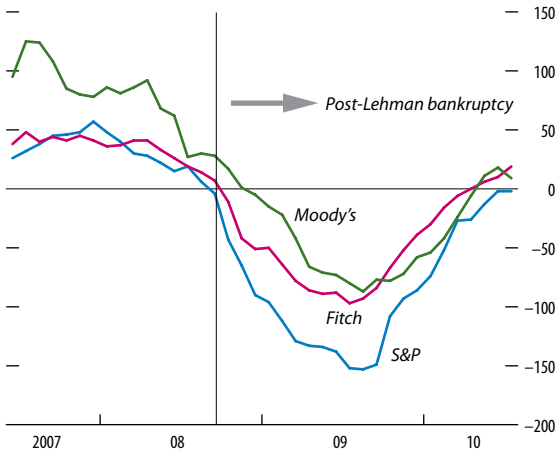
In general, the CRAs assign both foreign currency and local currency ratings to each sovereign. While there is often little difference between the two in the case of advanced economies, in the case of emerging and developing economies the local currency rating is generally higher. This difference can be attributed to the fact that it is often easier to repay local currency debt than foreign currency debt, given the central bank's ability to create the local currency. When determining the foreign currency rating, a country's ability to convert domestic assets into foreign currency is critical to the assessment. A well-developed domestic capital market that facilitates local-currency, long-term funding at relatively low cost will likely translate into a higher local currency rating. In contrast, countries that are members of a currency union, with fully dollarized economies, or with a fixed peg, tend to have identical local and foreign currency ratings. When market analysts refer to "the sovereign rating," they are generally referring to the long-term foreign currency rating.

Indicators Used by the Credit Rating Agencies (By Type of Driver) ***(concluded)***

	Fitch	Moody's	Standard & Poor's
External finances	Capital flows Willingness of nonresidents to extend credit and purchase domestic assets Share of current output devoted to servicing external debt Reserve adequacy	Balance of payments dynamics Foreign exchange reserves Access to foreign exchange External vulnerability indicator	Impact of fiscal and monetary policies on external accounts Structure of the current account Composition of capital flows Reserve adequacy
Exchange rate	Exchange rate regimes Indexation and dollarization	Exchange rate regime Indexation and dollarization	Compatibility of exchange-rate regime and monetary goals Indexation and dollarization
Political	War risk Legitimacy of political regime Relations with international community and institutions	War Degree of political consensus Political chaos Efficiency and predictability of government action Level of policy transparency	Stability and legitimacy of political institutions Popular participation in political processes Orderliness of leadership succession Transparency in economic policy decisions and objectives Public security Geopolitical risk
Structural/ Institutional	Effectiveness of government Openness to international capital flows and trade Strength of business environment, human capital, and governance Rule of law, respect for property rights Control of corruption	Transparency Level of innovation Investment in human capital Respect for property rights	Efficiency of public sector Institutional factors, such as central bank independence Timeliness, coverage, and transparency in reporting Competitiveness and profitability of private sector
Other	Savings ratios Openness of economy to trade Commodity dependence	Earthquakes Hurricanes Speculative crises	Prosperity, diversity, and degree of market orientation Income discrepancies Protectionism and other nonmarket influences Labor flexibility

Note: This table generalizes the presentation of indicators by the CRAs into a common set of key drivers.
Sources: Fitch (2010a); Moody's (2008); and Standard & Poor's (2008).

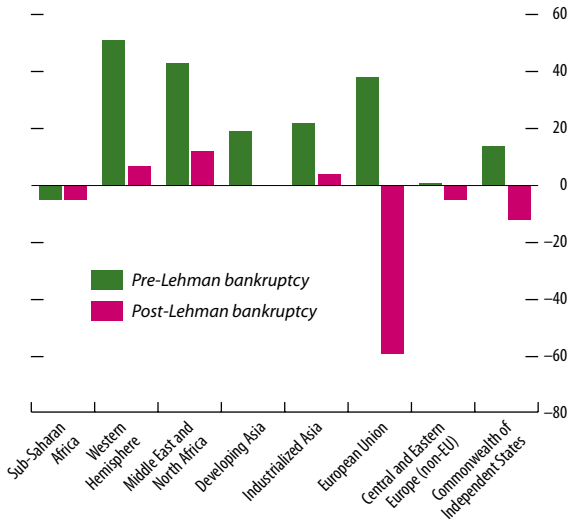
Figure 3.2. Sovereign Rating Changes and Warnings
(Rolling 12-month sum of rating actions)



Sources: IMF staff calculations using data from Fitch; Moody's; and Standard & Poor's.

Note: This figure shows rolling 12-month cumulative sums of all sovereign foreign currency rating actions across all sovereign ratings by each credit rating agency. For example, each positive (negative) rating outlook is +1 (–1); a review for upgrade (downgrade) is +2 (–2); and a positive (negative) rating change is +3 (–3).

Figure 3.3. Moody's Sovereign Rating Changes and Warnings by Selected Regions, May 2007–June 2010
(Cumulative sum of rating actions)



Source: IMF staff calculations using data from Moody's.

Note: No changes were made for the United States and Canada during this period. This figure shows cumulative sums of all sovereign foreign currency rating actions for the period May 2007–June 2010. For example, each positive (negative) rating outlook is +1 (–1); a review for upgrade (downgrade) is +2 (–2); and a positive (negative) rating change is +3 (–3). The regional groupings are based on the conventions used in the IMF's *World Economic Outlook*.

liabilities settled in national currency and those outside the scope of the monetary and central government authorities.[21]

A number of empirical studies have tried to infer the relative weighting of each factor in determining the ultimate rating (see Jaramillo, 2010, for a summary). A crude analysis that simply counts the frequency with which specific words appear in methodological papers might give a tentative indication of their relative importance to each CRA. This would suggest that Moody's attaches a relatively higher weight to the ability to pay, whereas Fitch and S&P focus relatively more on willingness to pay. Moody's also seems to attach greater weight to debt levels, particularly relative to official international reserves and other sovereign assets—that is, the affordability of debt—than the other two agencies. S&P appears to deviate from the other agencies in that it seems to attach relatively high weight to political risks and to monetary policy. (See Box 3.5 for a review of recent empirical work that has sought to reverse engineer ratings from fundamental inputs.)

Sovereign Credit Ratings through the Recent Crisis

One defining feature of the recent crisis is that it originated in advanced economies, with many emerging market economies relatively insulated. Overall, the sovereign rating environment began deteriorating significantly in the spring of 2008, with a strong downward trend evident starting in September 2008 (Figure 3.2). However, as also discussed in Chapter 1, this overall development masks important differences in performance across regions and levels of income (Figure 3.3). For example, Latin America and the Middle East continued to register positive rating actions both before and after the Lehman Brothers bankruptcy, as many emerging markets have demonstrated considerable resilience through the crisis. On

[21]An example of data transparency initiatives is the IMF's International Reserves and Foreign Currency Liquidity Data Template, which includes in its two-dimensional framework (foreign currency resources and the net demand on these resources) both predetermined and contingent demands on foreign currency resources resulting from short-term foreign currency liabilities and off-balance-sheet activities of national authorities.

the other hand, the European region, where the crisis hit harder, subsequently performed very poorly.

Reflecting this general deterioration in sovereign credit ratings, sovereign spreads widened significantly. However, some of these negative rating changes appear to have surprised markets, particularly the scale of the change. Specifically, the four-notch downgrade of Greece by Moody's in June 2010—a very significant move—seemed to have caught the market off guard, with spreads widening significantly following the event (see Box 3.6). Yet, when Moody's placed Greece on review for further possible downgrades in April, the potential for a multi-notch downgrade was clearly flagged. This suggests that insufficient attention was paid to the detailed analysis and information underlying the change in outlook. The importance of review and outlook changes for spreads is highlighted in the next section.

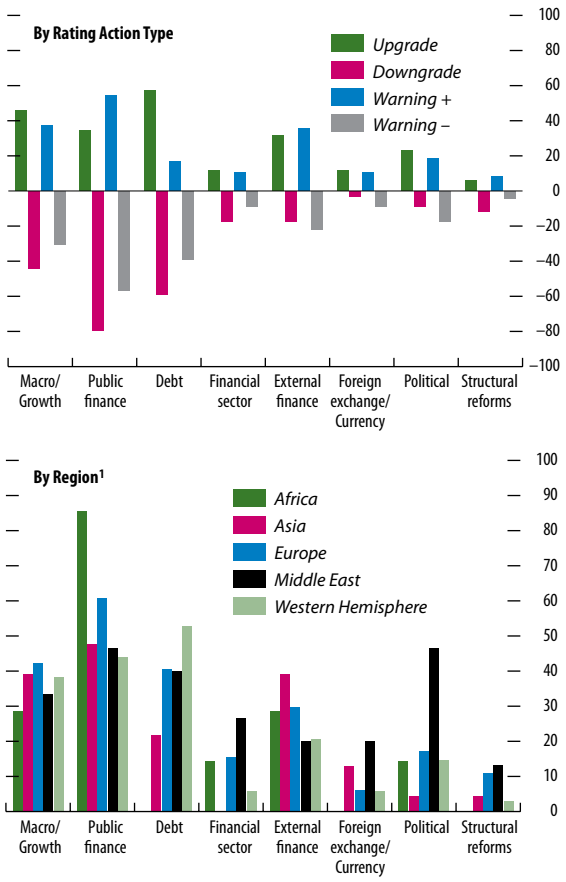
An examination of the analysis accompanying the announcement of each rating action by the "big three" CRAs shows that the drivers were not uniform across types of rating actions or geographic regions (Figure 3.4).[22] While traditional debt sustainability rating drivers such as the fiscal balance and debt level were the most commonly cited variables across rating action types and geographic distribution, they played a proportionally greater role in driving negative rating actions than positive ones. Conversely, external financing conditions and political factors seem to matter more in an upgrade/positive outlook decision.

The Accuracy and Informational Value of Sovereign Ratings

In the wake of the recent crisis and European sovereign downgrades, questions are being asked about the usefulness of CRAs and the accuracy of their credit risk assessments. Also, going back to the 1990s, CRAs have been accused of not only being too slow to change ratings, but also of being procyclical. For example, Larrain, Reisen, and von Maltzan (1997) argued that the Mexican crisis of 1994–95 "produced the sentiment that rating agencies react to events rather than anticipate them." During the 1997

[22]Figure 3.4 is based on a "count" of main ratings drivers mentioned in the rating action reports.

Figure 3.4. Rating Drivers, May 2007–June 2010
(In percent of total rating actions)



Sources: IMF staff calculations using data from Fitch, Moody's, and Standard & Poor's.
Note: See Box 3.4 for the definitions of the rating drivers.
[1]Both upgrades and downgrades.

Box 3.5. Empirical Studies of Rating Determinants

This box reviews some of the recent empirical work that has tried to reverse-engineer sovereign ratings from fundamental inputs. The results of these studies have implied that sovereign debt composition and contingent liabilities are not significant credit rating drivers, despite their key roles in recent crises.

An empirical study by Cantor and Packer (1996) indicated that a small number of well-defined criteria explained the sovereign ratings of both Moody's and S&P, with apparently similar weights across both agencies. Of the eight indicators considered, six were statistically significant in explaining the rating; surprisingly, the fiscal and external balances were not. It should be noted that this study effectively assessed what determined a sovereign rating at just one point in time—September 1995. Reflecting the fact that relative weights are likely to change over time, later studies (e.g., Jüttner and McCarthy, 2000) showed that the predictive power of a model declines in future years, suggesting that models designed to infer a "shadow rating" should ideally allow for structural breaks. This study was followed by a series of additional studies, some of which looked at the determinants of ratings across a longer time horizon.[1] These studies tended to focus on the experience of emerging market economies, reflecting the fact that ratings for advanced economies have not varied very much in the past. Given that focus, and reflecting the importance of accessing international capital markets for the emerging market countries, these studies often also explored the link between credit ratings and spreads (that is, the price of credit risk).

One surprising feature of many of these studies is the limited focus on the composition of debt, which is explicitly mentioned as a key indicator by both S&P and Fitch. Specifically, while many studies investigate the importance of the level of external debt (and find it significant), only Jaramillo (2010) explicitly considers the importance of domestic debt, also finding it significant, although less important. This suggests that many studies might have missed an important factor. In the same vein, none of these studies have explicitly considered information on the interest rate structure or the average maturity of debt, both of which are likely to affect a sovereign's medium-term prospects.

In contrast, many studies do consider the relative importance of short-term (external) debt in explaining ratings. Overall, with the exception of Mulder and Perrelli (2001), this does not appear to be a significant factor in determining the level of credit rating. This is surprising given the emphasis placed on liquidity risk in alternative approaches to sovereign credit risk assessment, such as the balance sheet approach (Allen and others, 2002) and the assertion by the credit rating agencies (CRAs) that they adapted their approach in the wake of the Asian crisis to put more emphasis on this factor.[2] The importance of short-term debt has increased significantly across advanced economies in this crisis. Its role as a determinant of sovereign credit risk is evident if we consider that the level of short-term debt is highly significant and explains close to 30 percent of the recent movement in credit default swap (CDS) spreads across a sample of developed countries.[3]

Similarly, no studies have sought to explicitly address the role that contingent liabilities play in determining ratings. Again, this is one of the key indicators highlighted by the CRAs in their rating methodologies and one which plays an important role in determining the level of sovereign risk using alternative approaches (for example, the contingent claims approach of Gray, Merton, and Bodie, 2007). This is potentially an important omission given the role the extraordinary support to the banking sector played in the current crisis. However, in this case, while there is some evidence of a relationship between the level of outstanding government-guaranteed debt and CDS spreads—with the stock of government-guaranteed financial sector debt explaining close to 40 percent of recent movements in CDS spreads across a subsample of European countries where guarantees comprise more than 1 percent of GDP—the sign on the coefficient is negative and counterintuitive.

Note: This box was prepared by Allison Holland.

[1]Mulder and Perrelli (2001), Rowland and Torres (2004), and Afonso, Gomes, and Rother (2007) all looked at determinants of ratings over a multi-period sample.

[2]In support of this, Mulder and Perrelli (2001) find a role for short-term debt in explaining ratings in the latter part of their sample. In contrast, Rowland (2004) explores the importance of a variety of liquidity factors in determining the level of ratings as of summer 2003; however, none are found to be significant.

[3]This was estimated using a pooled regression with fixed effects covering a sample of 17 countries that intervened heavily in the financial sector over the period 2006:Q1 to 2009:Q4.

Asian crisis, CRAs were accused both of being too slow initially to downgrade East Asian sovereigns, and subsequently of downgrading more than the worsening fundamentals justified.[23]

All of these concerns are relevant from a financial stability point of view if ratings (1) actually influence markets, and (2) are inaccurate and/or ill-timed. The empirical tests in the following subsections will show that sovereign ratings do in fact influence markets, although more via credit warnings ("outlooks," "reviews," and "watches") than through actual rating changes. However, actual rating changes do matter when they cross the investment-grade threshold, which supports reforms oriented toward reduced rating reliance, because these large "certification" effects do not necessarily fully reflect the impact of marginal new information.

Rating "accuracy" can be defined on an ordinal (rank ordered) or cardinal (absolute level) basis, with the CRAs professing that their ratings are supposed to reflect ordinal risk rankings. In fact, for sovereigns the CRAs make it clear that they do not aim for a mapping of default risk measures into rating grades.[24] In any case, the empirical analysis below shows that CRAs quite accurately rank sovereign default risk (that is, defaults tend to cluster in the lowest rating grades), particularly over short time horizons.

This suggests that in regulatory situations in which cardinal accuracy is important, such as the Basel II standardized approach, credit ratings should be subjected to the same rigorous calibration tests that are expected of the institutions that are allowed to use internal ratings.[25] At the very least, CRAs should be expected to be more transparent about how they calibrate ratings to default risk metrics (that is, the default probabilities, loss severities, and stability assumptions).

[23]See IMF (1999) and Ferri, Liu, and Stiglitz (1999). The latter authors came to their conclusion by comparing actual ratings with a rating model based on economic fundamentals.

[24]However, the CRAs did indeed map credit metrics such as default probabilities and expected losses into ratings in their pre-crisis structured finance models (Fender and Kiff, 2005).

[25]See Annex 2 of BCBS (2006) for an indication of the importance of cardinal accuracy in Basel II: "Supervisors will be responsible for assigning an eligible ECAI's credit risk assessments to the risk weights available under the standardized risk approach." An ECAI is an external credit assessment institution.

Empirical Tests of Rating Information Value: Do Ratings Matter and Why?

According to the theoretical literature, credit ratings potentially provide value to and influence markets in three ways. The "informational services" theory would be compatible with evidence pointing to a significant market reaction to rating actions (either changes in ratings or changes in outlook) regardless of the initial starting point on the scale. The "certification services" theory would point to a significant market reaction to upgrades and downgrades involving investment-grade threshold crossings versus other rating changes. If, instead, the "monitoring services" theory is a better explanation of the role played by CRAs, there should be a significant market reaction to downgrades that follow negative credit watches. This is because the downgrade is a signal that the CRA has come to the conclusion that, based on the private information it had access to during the credit watch period, any adjustments required by the CRA to maintain the pre-watch rating have not been met (Boot, Milbourn, and Schmeits, 2006).

These testable implications are analyzed using five-year credit default swap (CDS) spreads.[26] The CDS spreads measure the market price of creditworthiness and, as expected, higher spreads are associated with lower ratings. Figure 3.5 illustrates, for each year and each sovereign, the average CDS spread and average credit ratings. The figure also imposes an exponential trend line that shows that the rating/spread relationship is clearly nonlinear, and in line with the historical relationship between ratings and default probabilities (Table 3.1). It is notable that not only did spreads increase across the board during the recent crisis, but since 2007 the dispersion of spreads at the lowest rating grades has widened. This suggests that the market discriminates more among different risk profiles than the CRAs and that this additional discrimination takes place

[26]A CDS is a financial contract under which an agent buys or sells risk protection against the credit risk associated with a specific reference entity (or specified range of entities). For a periodic fee, typically expressed as a spread, the protection seller agrees to make a contingent payment to the buyer on the occurrence of a default or other specified credit event. Hence, the spread is considered a reflection of the market's perception of reference entity credit quality.

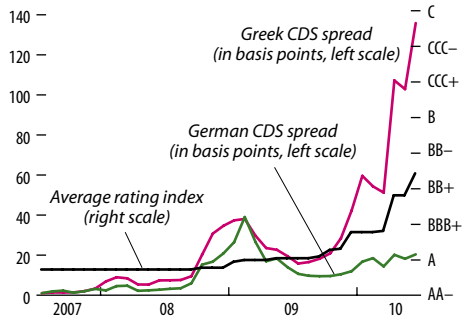
Box 3.6. Greece: An Examination of the Evolution of Rating Actions

In late autumn 2009, markets became increasingly concerned about the outlook for Greece and its creditworthiness. This was reflected in the market turmoil seen through 2010, and spreads remain elevated despite the support provided by the IMF program and European bailout. This box examines the information content of the rating actions undertaken for Greece and explores their links with observed changes in credit default swap (CDS) spreads.

The credit rating on Greece was relatively strong until October 2008—S&P had Greece's A rating on stable outlook since November 2004, while Moody's put Greece's A1 rating on positive outlook in January 2007, with Fitch following suit (from an A rating) in March 2007. However, beginning with Fitch, which cut the outlook back to stable in October 2008, the credit rating agencies became increasingly negative on Greece. Notably, S&P put Greece on negative outlook in January 2009, followed by Moody's cutting its positive outlook back to stable in February 2009. The full chronology of actions over this period is set out in the table. At the same time, CDS spreads on Greece began to diverge from the general market trend in the summer of 2009 (see figure).

Credit Default Swap (CDS) Spreads and Average Rating

(CDS: July 2007 = 100)



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

Note: The average rating shown on the right-hand side reflects the average of three rating agency (Fitch, Moody's, and S&P) levels (shown are Fitch and S&P symbols; see Table 3.1 for corresponding Moody's symbols). In addition, in order to capture more fully the information content of the outlook, the rating level is also adjusted by –0.3 (+0.3) for a negative (positive) outlook or negative (positive) watch.

To examine the information value of ratings in explaining Greek CDS spreads, a linear transformation is used to translate each rating into a number between 21 and 1. In addition, to capture more fully the information content of the outlook, following Monfort and Mulder (2000), the rating level is

Note: This box was prepared by Allison Holland.

mainly among the worst credits. This additional discrimination during crises has also been recognized in other studies (Sy, 2002).[27]

The analysis of credit rating events suggests that ratings do in fact reflect information beyond that generally available to market participants (Box 3.7). However, most of the incremental information value is delivered through negative credit warnings (see Figure 3.6), rather than actual rating changes. Yet even though rating changes in general have little market impact, crossings of the investment-grade threshold lead to statistically significant widening of CDS spreads. This suggests that some of the market impact associated with rating changes is related to their "certification" value. In contrast, the results provide no support for the monitoring theory.

How Accurately Do Ratings Measure Credit Risk?

There are two dimensions along which credit rating accuracy could be assessed, namely their ability to rank order default risk, and how well their mapped hypothetical default probabilities match true default

[27]The increasing influence of factors other than credit risk in spreads is evident in the declining explanatory power of ratings during the global crisis. For a decomposition of credit and noncredit components of spread changes, see Annaert and others (2010). See also the Bank of England (2010) discussion of the factors that might distort sovereign CDS spreads. All of this calls for some caution in interpreting CDS spread levels as indicators of the market's assessment of sovereign default probabilities.

Chronology of Greek Sovereign Credit Rating Actions, January 2009–August 2010

Date	Agency	Action
January 9, 2009	S&P	Outlook changed from stable to watch negative
January 14, 2009	S&P	Downgraded one notch to A–; outlook stable
February 25, 2009	Moody's	Outlook changed from positive to stable
May 12, 2009	Fitch	Outlook changed from stable to negative
October 22, 2009	Fitch	Downgraded one notch to A–; outlook remains negative
October 29, 2009	Moody's	Outlook changed from stable to review for downgrade
December 7, 2009	S&P	Outlook changed to watch negative
December 8, 2009	Fitch	Downgraded one notch to BBB+; outlook remains negative
December 16, 2009	S&P	Downgraded one notch to BBB+; remains on watch negative
December 22, 2009	Moody's	Downgraded one notch to A2; outlook negative
March 16, 2010	S&P	Outlook changed from watch negative to negative outlook
April 9, 2010	Fitch	Downgraded two notches to BBB–; outlook remains negative
April 22, 2010	Moody's	Downgraded one notch to A3; on review for downgrade
April 27, 2010	S&P	Downgraded three notches to BB+; outlook remains negative
June 14, 2010	Moody's	Downgraded four notches to Ba1; outlook stable

Sources: Fitch; Moody's; and Standard & Poor's.

adjusted by –0.3 for a negative outlook or watch and by +0.3 for a positive outlook or watch. The average of the three rating levels is shown in the figure.

Regressing the (log) level of CDS spreads indicates that there is significant explanatory power in the ratings.[1] Taking ratings as the sole explanatory variable, they appear to explain almost 70 percent of the CDS spreads, with the relationship contemporaneous rather than leading. However, taking into account that there are common market factors driving spreads using a two-stage process to isolate the idiosyncratic elements driving Greek CDS spreads (relative to German CDS spreads), ratings explain an additional 32 percent of the residual variation. Overall, these findings are in line with the aggregate findings on information content of ratings as reported in the main body of the chapter.

[1]As discussed in the main text, an exponential transformation is applied to each of the ratings series. The estimated coefficients have the expected sign and are statistically significant.

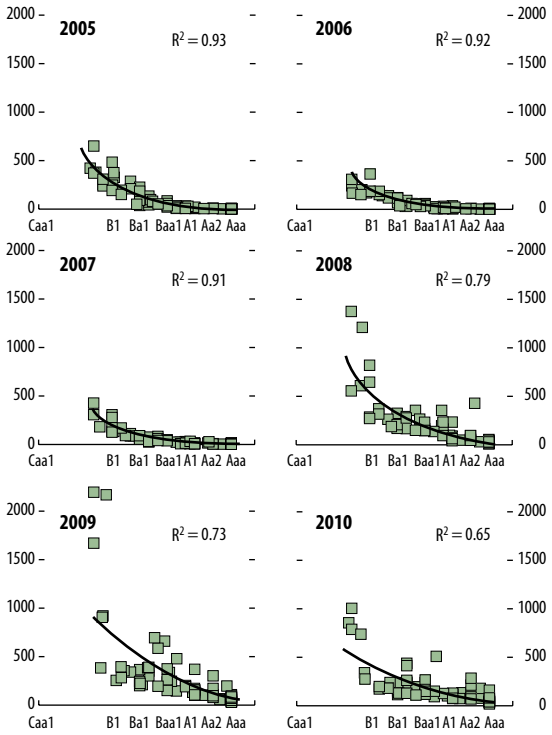
probabilities. When the CRAs evaluate their own performance, they focus on the first dimension—the discriminatory power of their rating system (that is, the power to differentiate ex ante between potential defaulters and nondefaulters) as well as on the stability of ratings. Their tests only intend to assess if defaults tend to take place among the lowest rating categories.

The discriminatory power of sovereign ratings is validated to some extent by the fact that all of the defaults are among noninvestment-grade sovereigns. Taking into account the difficulty in predicting rare events, Figure 3.7 shows that all 14 sovereign defaulters involving 12 countries between 1975 and 2009 had (S&P) ratings of BB- or below—that is, all noninvestment-grade one year prior to default, and none in the investment-grade categories.

The point made above can be tested more formally with cumulative accuracy profile (CAP) curves and accuracy ratios (ARs), as done by Moody's (Sobehart, Keenan, and Stein, 2000) and S&P (2010a). The CAP curve is derived by plotting out the cumulative proportion of issuers by rating grade (starting by the lowest grade on the left) against the cumulative proportion of defaulters by rating grade. "Ideal" CAP curves (the red lines in Figure 3.8) look almost like vertical lines because all the defaulters should be among the lowest-rated issuers.[28] In the "random" curve, all defaults occur

[28]In spite of the CAP curve's general use, it is not obvious that this ideal curve is a good estimate of "best" rating performance. Even good credits have positive default probabilities. This means

Figure 3.5. Average Credit Default Swap Spread and Ratings for Countries Rated by Moody's, 2005–10
(CDS spread in basis points)



Sources: Markit; Moody's; and IMF staff calculations.
Note: CDS = credit default swap. Each data point represents a different sovereign's average credit rating and average CDS spread throughout the year. R^2 shows the proportion of the average CDS spreads' movement that can be attributed to credit ratings. Data for 2010 are through June 30, 2010.

randomly throughout the rating distribution (admittedly an unrealistically low bar for a CRA), so it lies along the diagonal (the green lines in Figure 3.8). The closer the CAP curve to the ideal curve, the better the discriminatory power of that CRA's ratings. The AR is the ratio of two areas: (1) the area bounded by the CAP curve and the random curve; and (2) the area bounded by the ideal curve and the random curve. An AR equal to 1 is equivalent to perfect discriminatory power, while an AR equal to 0 implies no discriminatory power.[29]

The S&P CAP curves for sovereigns at different risk horizons tend to suggest that, as expected, discriminatory power is a function of time, since some power is lost as the risk horizon increases (Figure 3.8). This loss of power is indicated by the ARs: 92 percent over the one-year horizon, 82 percent over three years, 80 percent over five, and 84 percent over 10. Hence, the CRAs are better at predicting defaults over short horizons than long ones. ARs that were calculated for S&P corporate ratings suggest that they are better at pinpointing potential defaulters among sovereign issuers than among corporates. The corporate-rating ARs over a one-year horizon are 77 percent for financials and 81 percent for nonfinancials (versus 92 percent for sovereigns), and 63 percent and 71 percent over five years (versus 80 percent).[30]

A welcome contribution of the CRAs would be the calibration of ratings to target credit risk metrics, such as default probabilities, and the publication of validation tests against such standards. This would make the message embedded in a rating more transparent and would also allow more relevant tests of accuracy and—in the end—review of the quality of the work produced by CRAs. The Basel Committee on Banking Supervision (BCBS, 2005) suggests a number of cardinal accuracy tests, but they presuppose specific default probabilities for individual rating grades. However, the CRAs put little emphasis on such tests, preferring to

that the ideal curve (in which all defaults happen among the worst credits) does not measure "best" rating performance.

[29]Engelmann, Hayden, and Tasche (2003) propose a statistical test of the accuracy ratios that measures the quality of credit rating models. However, the test requires that the sample contain at least 50 defaults and thus cannot be applied to the sovereign dataset.

[30]The S&P sovereign ARs were estimated based on 1975–2009 data, and the corporate ARs based on 1981–2009 data.

focus on ordinal accuracy tests, because they do not target specific risk metrics for their ratings.[31]

An Examination of Rating Stability

There is an inevitable trade-off between rating accuracy and stability, but users have expressed a preference for stability. This is driven by the certification role played by ratings, and the transaction costs induced by trading when ratings change frequently. In an attempt to satisfy their users, CRAs use several mechanisms to promote stability. Though of less interest to CRAs, rating stability is important at a systemic level, since rating downgrades can be associated with forced sales.

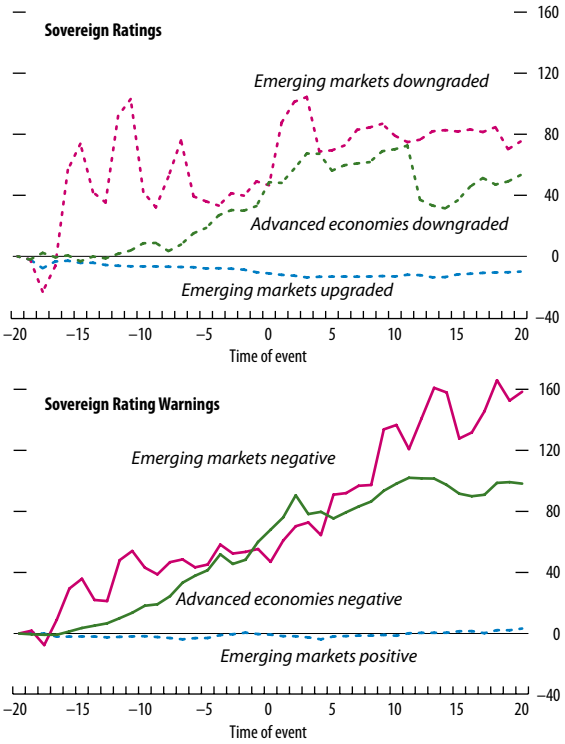
In practice, rating agencies seek to ensure rating stability by focusing on rank ordering credit risk, instead of rating to specific credit metrics. Hence, the impact of cyclical fluctuations on ratings is automatically muted. Also, CRAs generally try to rate "through the cycle," as opposed to rating based on "point in time" information. Conceptually, this means that they rate based on the issuer's ex-ante perceived ability to survive cyclical troughs, which provides a cushion against the impact of economic downturns. Lastly, the CRAs apply smoothing rules that, for example, change ratings only if (1) the anticipated rating change is expected to be persistent, and/or (2) the prescribed change is more than one notch (Cantor and Mann, 2007).

Figures 3.9 and 3.10 show that higher ratings are more stable than lower ones, and that sovereign ratings are more stable than corporate ones.[32] Using S&P data from 1975, Figure 3.9 shows the average percent of ratings that remain at the same level over one-year horizons by rating grade. For example, 82.1 percent of A-rated sovereigns were still A-rated at the end of each year, versus 77.5 percent of the corporates. It clearly shows that the percent of unchanged ratings decreases

[31]Nevertheless, Moody's, for example, conducts some cardinal accuracy assessments—investment-grade default rates over multiple horizons and average ratings of defaulting issuers up to three years prior to default (Cantor and Mann, 2003). Alternatively, cardinal accuracy tests could be conducted against the target default probabilities (in the case of Fitch and S&P) or expected losses (Moody's), which have been used to rate structured credit products (Fender and Kiff, 2005).

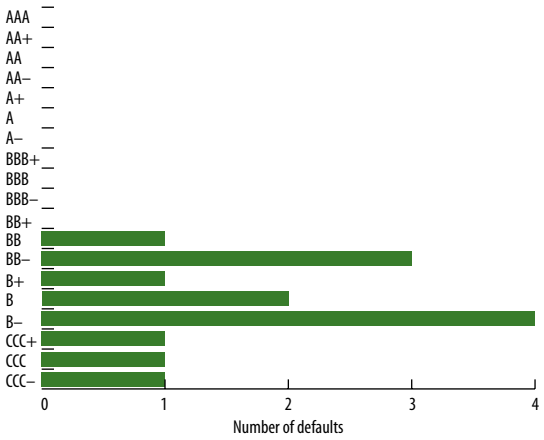
[32]Figures 3.9 and 3.10 are based on S&P ratings, but similar results were found for Fitch and Moody's ratings (see Kiff, Nowak, and Schumacher, forthcoming).

Figure 3.6. Impact of Change in Sovereign Ratings and Credit Warnings on Credit Default Swap Spread
(CDS spread in basis points)



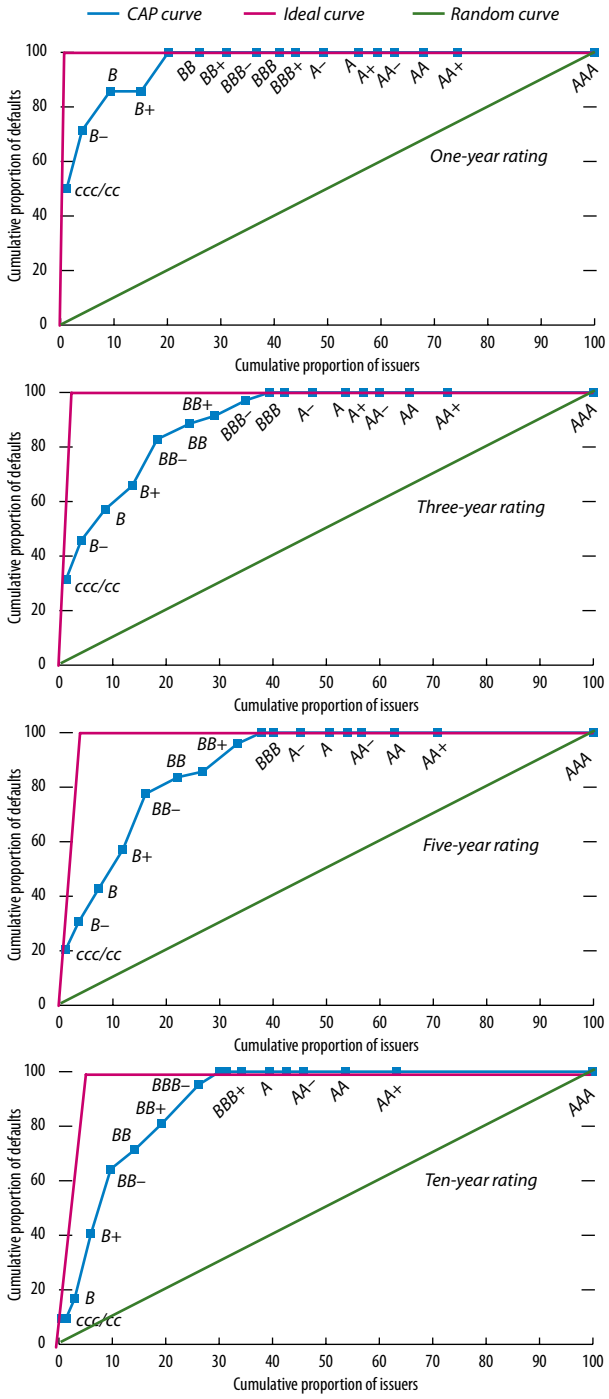
Sources: Markit; Moody's; and IMF staff estimates.
Note: CDS = credit default swap. Solid lines indicate rating events that have a statistically significant impact on CDS spreads; dashed lines indicate insignificant events.

Figure 3.7. Ratings One Year Prior to Sovereign Default, 1975–2009



Source: Standard & Poor's.

Figure 3.8. Sovereign Rating Performance by Standard & Poor's
(In percent)



Source: Standard & Poor's.
Note: CAP = cumulative accuracy profile.

as rating categories decline. Figure 3.10 shows the average percent of ratings that are downgraded by three or more notches, a definition of "rating failure" suggested by Bhatia (2002) and S&P (2010b).[33] For example, 1.8 percent of A-rated sovereigns were downgraded three or more notches, versus 6.9 percent of corporates.

However, Figures 3.11 and 3.12 show that these long-term averages hide signs of significant rating instability during periods of market stress, suggesting that smoothing techniques work less well during such times. The figures summarize Moody's upgrades and downgrades during the Asian crisis and the recent financial crisis. Sovereigns on the 45 degree line maintained their ratings, while those below (above) were downgraded (upgraded).[34] The figures show that 68 percent of ratings remained unchanged during the Asian crisis and 63 percent during the current crisis (so far). Similar conclusions would be drawn from a similar analysis of Fitch and S&P sovereign rating transitions (Kiff, Nowak, and Schumacher, forthcoming). Focusing on the magnitude of the rating changes, Tables 3.4 and 3.5 show that big downgrades (three or more notches) have been concentrated in the investment-grade categories, even though these higher rating categories are supposed to be more stable than lower rating categories by design. All of this highlights the fact that risk is a forward-looking measure that—to be meaningful—needs to be conditioned on specific scenarios. While CRAs condition ratings to surviving a cyclical trough, they do not condition on crisis survival, which is reflected in the data.

Confronted with these evident "failures," CRAs have been developing rating procedures that would condition a rating to the country's ability to survive a crisis. However, it is not clear whether this methodology enhances stability beyond that provided by the TTC approach. Although Box 3.8 shows that TTC ratings are inherently more stable than PIT assessments, some of this stability is undermined by the aforementioned rating change smoothing rules. If the smoothing rule's prescribed downgrade turns out to be persistent, and

[33]The three or more notch stability threshold is also in line with a practice used by CRAs in their stability studies (Moody's, 2010b).

[34]Some caution must be exercised in interpreting Figures 3.11 and 3.12. Although the equivalent Fitch and S&P figures are very similar, the number of rated sovereigns has grown significantly.

the creditworthiness of the issuer has possibly worsened, a more abrupt downgrade is required. In other words, by attempting to smooth ratings, typical TTC methodologies run the danger of actually exacerbating procyclical cliff effects. Even "through the crisis" methodologies will be prone to these smoothing-induced cliff effects, although perhaps with less frequency, because of the more severe ex ante stress tests.

Conclusions and Policy Implications

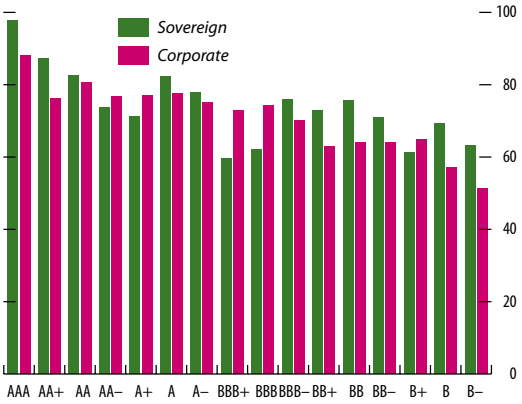
The empirical analysis shows that CRAs do have an impact on the funding costs of issuers and consequently their actions can be a financial stability issue. Also, the theoretical analysis suggests that the way that CRAs try to smooth their rating changes may make them prone to procyclical cliff effects. Furthermore, the market impact of these rating changes is exacerbated by the overreliance on ratings in legislation, regulations, and private sector contracts. Beyond this "certification role" the empirical work shows that sovereign ratings do provide useful informational value. However, most of this is delivered through "outlooks," "reviews," and "watches" that signal the likely direction and timing of future rating actions, as opposed to actual rating changes. Nevertheless, an examination of the widening of CDS spreads when ratings are downgraded through the investment-grade threshold confirms the importance of the certification role.

The empirical work has also shown that credit ratings quite accurately rank sovereign credit risk, but they should not be expected to be consistent with specific default probabilities or other quantitative default risk metrics. This is because CRAs do not target such specific metrics for their sovereign (or corporate) ratings, despite the fact that many ratings users, including regulators, assume that there are specific and stable relationships between ratings and these metrics.

While some advocate the elimination of the major CRAs' issuer-pay business model, this compensation model is expected to stay for the foreseeable future.[35]

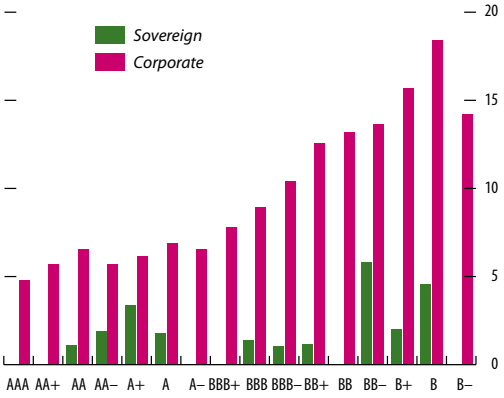
[35]It offsets a more prevalent free-rider problem that would arise if the CRAs were to return to an investor-pay business model in an information environment where it is difficult to limit access. Nevertheless, additional policy work and research should be carried out to examine whether it is feasible to have an investor-pay model without free riders.

Figure 3.9. Average Proportion of S&P Sovereign Ratings Unchanged over One Year
(In percent)



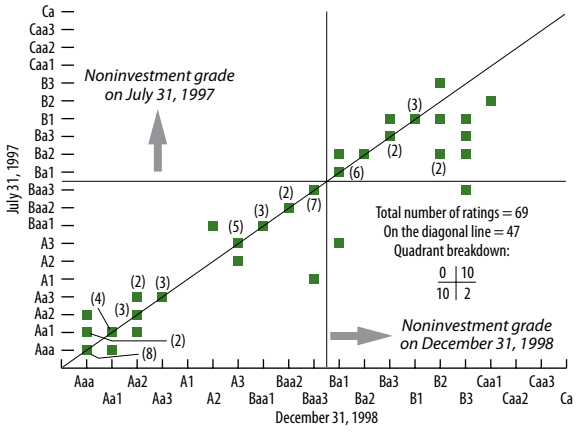
Source: Standard & Poor's.
Note: Sovereign ratings for 1975–2009, and corporate ratings for 1981–2009.

Figure 3.10. Average Proportion of S&P Sovereign Ratings Downgraded More Than Two Notches over One Year
(In percent)



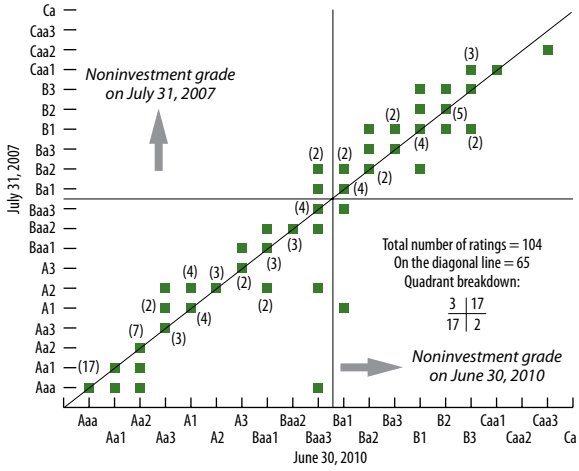
Source: Standard & Poor's.
Note: Sovereign ratings for 1975–2009, and corporate ratings for 1981–2009.

Figure 3.11. Asian Crisis: Sovereigns Rated by Moody's between July 31, 1997 and December 31, 1998



Source: Moody's.
Note: The numbers in parentheses indicate the number of issuers associated with that rating.

Figure 3.12. Current Crisis: Sovereigns Rated by Moody's between July 31, 2007 and June 30, 2010



Source: Moody's.
Note: The numbers in parentheses indicate the number of issuers associated with that rating.

Rather, a better way forward is a combination of gradually reducing the regulatory reliance on credit ratings to the extent possible, while at the same time enhancing CRA regulatory oversight. Also, the mitigation of procyclical cliff effects should be a priority. In that regard, key policies to deal with these issues include the following:

Reduce rating reliance. Policymakers should continue their efforts to reduce their own reliance on credit ratings, and wherever possible remove or replace references to ratings in laws and regulations, and in central bank collateral policies. They should discourage the mechanistic use of ratings in private contracts, including investment manager internal limits and investment policies. However, they should recognize that smaller and less sophisticated investors and institutions that do not have the economies of scale to do their own credit assessments will inevitably continue to use ratings extensively. Hence, any steps to reduce overreliance on ratings should differentiate both according to the size and sophistication of the institution, and the instruments concerned.

Increase the oversight of CRAs when their ratings are used in regulations. It is important that the authorities continue efforts to push CRAs to improve their procedures, including transparency, governance, and the mitigation of conflict of interest. In particular, CRAs whose ratings are used in the Basel II standardized approach should have to meet similar validation standards as those required for banks that use their own internal ratings. CRAs should be encouraged to calibrate ratings to target credit risk metrics, such as default probabilities, and publish validation tests against such standards. CRAs should also be transparent about the quantitative measures they calibrate in the rating process and how they validate their ratings.

Encourage accurate through-the-cycle approaches. CRAs should be discouraged from over-smoothing downgrades (and upgrades), which effectively merely delays what is likely to be inevitable. Encouraging more accurate smoothing methods could be part of the enhanced oversight and validation testing. If the rating change eventually does take place, it can be more abrupt and cliff-like if the credit's situation has continued to deteriorate (or improve). Remaining cliff effects and what may be labeled rating failures should be addressed by emphasizing that risk is a forward-looking dimension conditional on the

Table 3.4. Sovereign Rating "Failures" during the 1997–98 Asian Crisis

	Fitch			Moody's			S&P		
	Start	End	Notches	Start	End	Notches	Start	End	Notches
Indonesia	BBB–	B–	–6	Baa3	B3	–6	BBB	B–	–7
Korea[1]	AA–	B–	–12				AA–	B+	–10
Korea[1]	B–	BBB–	6				B+	BBB–	4
Malaysia				A1	Baa3	–5	A+	BBB–	–5
Romania				Ba3	B3	–3	BB–	B–	–3
Russia	BB+	B–	–5	Ba2	B3	–4	BB–	B–	–3
Thailand				A2	Ba1	–5	A	BBB–	–4
Venezuela				Ba2	B2	–3			

Sources: Fitch; Moody's; and Standard & Poor's.

Note: Table shows successive downgrades or upgrades by three or more notches in aggregate during any rolling 12–month period, excluding downgrades or upgrades into, out of, within, or between the CCC or Caa categories downward; 1997 through January 1999.

[1]Korea was downgraded by Fitch and S&P during October 1997–December 1997; and then a series of upgrades occurred between February 1998 and January 1999.

Table 3.5. Sovereign Rating "Failures" during the 2007–10 Crisis

	Fitch			Moody's			S&P		
	Start	End	Notches	Start	End	Notches	Start	End	Notches
Greece	A	BBB–	–4	A1	Ba1	–6	A–	BB+	–4
Iceland[1]	A+	BBB–	–5	Aaa	Baa1	–7	A+	BBB–	–5
Iceland[1]				A1	Baa3	–5			
Ireland	AAA	AA–	–3						
Latvia	BBB+	BB+	–3	A2	Baa3	–4	BBB+	BB	–4
Lithuania	A	BBB	–3						
San Marino	AA	A	–3						

Sources: Fitch; Moody's; and Standard & Poor's.

Note: The table shows successive downgrades or upgrades by three or more notches in aggregate during any rolling 12–month period, excluding downgrades or upgrades into, out of, within, or between the CCC or Caa categories downward; 2007 through June 2010.

[1]The Iceland downgrades by Moody's involve overlapping periods. The first period includes downgrades from May 2008 through end-December 2008, while the second period includes downgrades from December 1, 2008 through end-November 2009. That is, both periods include the three-notch downgrade on December 4, 2008.

macroeconomic and financial environment scenario, which may change more rapidly than typical TTC approaches accommodate.

The analysis of the factors that underlie sovereign ratings shows that CRAs take into account a broad array of fundamental factors and weigh them very dynamically. Although there are some methodological differences among the big three CRAs, their ratings do track each other very closely. Also, the recent Greek downgrades point to some important data issues, particularly with respect to accuracy and coverage (for example contingent liabilities as provided by sovereigns). Hence, as was also the case with structured credit product issuance, sovereigns should do more to provide relevant and timely information to CRAs and other market participants to enable them to conduct their own independent credit analysis. This should include disclosure of contingent liabilities. In that regard, the IMF encourages countries to prepare and make publicly available a fiscal risk statement (Everaert and others, 2009).

Credit ratings can play an important and positive role in capital markets, primarily by using their economies of scale to provide cost-effective information services that increase the pool of potential borrowers and promote liquid markets. For the most part, they have been a positive force in fixed-income markets, particularly in their traditional corporate markets, as well as in the markets for sovereign bonds. However, the structured finance rating crisis has exposed some flaws in the system (rating overreliance), and some concerning aspects of the CRAs' own rating philosophies (rating smoothing). However, these flaws can be rectified, although admittedly it will not be easy. In particular, reducing rating overreliance will require finding appropriate replacements, and it will be important that the authorities remain wary of unintended adverse consequences.

Box 3.7. Empirical Tests of Rating Information Value

In summarizing the empirical tests of rating information value, this box shows that credit rating agencies provide information and certification services to investors, with credit outlooks and watch lists as the main instruments to deliver information.

The theoretical literature asserts that credit rating agencies influence financial markets by providing three types of services: informational, certification, and monitoring. This box assesses the impact of sovereign rating events on credit default swap (CDS) spreads to gauge the importance of these services to market participants. The main analysis covers 72 sovereigns for which both Moody's ratings and the relevant CDS data are available from January 2005 to July 2010.[1] This includes 194 credit rating events: 26 downgrades, 57 upgrades, 71 positive outlooks/reviews for upgrade, and 40 negative outlooks/reviews for downgrade. In addition, the box reviews the impact of rating actions by S&P and Fitch. Both event studies and causality tests are used.

The event study measures the impact of rating changes and credit warnings (that is, "outlooks," "reviews," and "watches") by averaging cumulative changes in CDS spreads across individual rating events. Changes in CDS spreads are analyzed within an event window of 41 days, starting from 20 days before the event until 20 days after the event. Spread changes are calculated against the level at the beginning of the event window ($t = 0$) to make them comparable across events and sovereigns. For tractability, the sovereigns are divided into advanced economies and emerging markets. Hence, within each group, the relationship between credit ratings and CDS spreads can be assumed to be linear, so that a two-notch downgrade leads to spread widening that is twice as large as that associated with a one-notch downgrade. However, the results are robust to relaxing this assumption, as discussed below. The significance is tested using a standard one-sided *t*-test, with the hypothesis that negative rating actions (downgrades, negative outlooks, and reviews for downgrade) should lead to an increase in spreads, and positive rating actions (upgrades, positive outlooks, and reviews for upgrade) to a decrease.

The baseline results for Moody's (see first table) confirm the agencies' traditional role as information providers. However, most of the incremental information value is transmitted through negative credit warnings (see Figure 3.6), rather than actual rating changes.[2] The event study found very little market reaction to positive rating actions, in contrast to Cantor and Packer (1996), Reisen and von Maltzan (1999), and Ismailescu and Kazemi (forthcoming). Yet even though rating changes in general have little market impact, a downgrade through the investment-grade classification boundary is associated with a statistically significant widening of CDS spreads. This suggests that some of the market impact associated with rating changes is related to their "certification" value. In contrast, the results provide no support for the monitoring theory.[3]

The event study results are robust to (1) shortening or lengthening the event window to 10 days before and after or 45 days before and after, from the base of 20 days; (2) controlling for global volatility (as proxied by the S&P 500 VIX), the liquidity risk premium (as proxied by the U.S. LIBOR), and the daily business conditions in the United States (as tracked by the Aruoba-Diebold-Scotti business conditions index; see Aruoba, Diebold, and Scotti, 2009); (3) using natural logarithms of spreads to account for the nonlinear relationship between the CDS spreads and rating/credit warning events; (4) splitting the sample into the pre- and during-crisis periods; and (5) disaggregating announcements for investment/noninvestment-grade sovereigns as opposed to advanced economies and emerging markets.

Note: This box was prepared by Sylwia Nowak, based on Kiff, Nowak, and Schumacher (forthcoming).

[1]The countries are Argentina, Australia, Austria, Belgium, Bulgaria, Brazil, Canada, Chile, China, Colombia, Costa Rica, Croatia, Cyprus, Czech Republic, Germany, Denmark, Dominican Republic, Egypt, El Salvador, Estonia, Finland, France, Greece, Guatemala, Hungary, Iceland, Indonesia, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Korea, Latvia, Lebanon, Lithuania, Malaysia, Malta, Mexico, Morocco, Netherlands, Norway, New Zealand, Pakistan, Panama, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russia, Saudi Arabia, Singapore, Slovak Republic, Slovenia, South Africa, Spain, Sweden, Thailand, Trinidad and Tobago, Tunisia, Turkey, United Arab Emirates, United Kingdom, Ukraine, Uruguay, United States, Venezuela, and Vietnam.

[2]The predictive power of S&P "watch" and "outlook" notices has been documented in Hessol, Erturk, and Ontko (2007) and Chambers (2010). Hamilton and Cantor (2005) and Hartelius, Kashiwase, and Kodres (2008) document similar results for Moody's "outlook" notices.

[3]Hill and Faff (2008) reached a similar conclusion using national stock market indices instead of CDS spreads.

The Empirical Tests of Rating Information Value

	Information Services	Certification Services	Monitoring Services
Theory	Ratings include new information ➡ market prices react to rating actions.	Classifying securities into investment-grade and high-yield grade ➡ market prices react to rating changes in and out of the investment grade.	Rating warnings influence issuers to take corrective actions to avert downgrades ➡ market prices react to rating confirmations.
Test	Event study of the impact of credit rating and credit warning changes on credit default swap (CDS) spreads.	Event study of the impact of rating changes and downgrades/upgrades in and out of investment grade on CDS spreads.	Event study of the impact of downgrades/upgrades preceded/not preceded by a matching warning or review on CDS spreads.
Results	Negative credit warning announcements are followed by statistically significant spread widening; 100 basis points for advanced economies and 160 basis points for emerging markets. The impact of rating changes is insignificant (see Figure 3.5).	Downgrades through the investment grade threshold lead to statistically significant CDS spread widening of 38 basis points.	No evidence

Sources: Fitch; Moody's; and IMF staff estimates.

Multi-Agency Dynamics

	The first credit rating agency to take a negative rating action:			The last credit rating agency to take a negative rating action:		
	Fitch	Moody's	S&P	Fitch	Moody's	S&P
All countries	28	13	59	36	36	28
Advanced economies	22	4	74	30	52	17
Emerging economies	32	17	51	39	27	34

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

Note: The table reports the frequencies with which each credit rating agency (CRA) either acts first or last within each rating adjustment cycle, defined as either until three months following the initial rating adjustment or until the originating CRA takes another action, depending on which event comes first.

Statistical causality tests yield results consistent with event study results by finding information about preceding negative credit warning that helps predict changes in CDS spreads of emerging economies, even when the past values of CDS spreads are accounted for. The causality tests are panel Granger-causality tests (Granger, 1969; and Hurlin and Venet, 2001), estimated using the generalized method of moments with fixed effects. Instruments used are lagged S&P 500 VIX, lagged U.S. LIBOR, lagged Aruoba-Diebold-Scotti business conditions index for the United States, and CDS spreads lagged two periods.

An extension of the analysis to sovereign rating actions by S&P and Fitch largely confirms the above findings while pointing to two important differences. First, Moody's most frequently precedes its rating changes with credit warnings (27 percent of rating changes are preceded by corresponding credit watches, compared with 14 percent in the case of S&P and only 8 percent in the case of Fitch). This suggests different information value of downgrades and credit warnings across the CRAs. Second, Moody's tends to lag behind Fitch and S&P. An analysis of the dynamics of rating adjustments, as summarized in the second table, reveals that Moody's and Fitch tend to follow S&P negative rating actions more often than S&P follows the others. This is consistent with conclusions of Güttler (2009) and Alsakka and ap Gwilym (forthcoming) that Moody's is more likely to adjust its rating given a rating change by S&P. In addition, on occasions when Moody's leads the rating adjustment cycle, it tends to issue credit watches rather than actual downgrades. Consequently, Moody's downgrades have no significant impact on financial markets, while Fitch's and S&P's do. This result, consistent with Brooks and others (2004), indicates that markets react to new information, but not all CRAs convey new information through the same channels.

Box 3.8. Point-in-Time versus Through-the-Cycle Credit Ratings

This box uses a simple contingent claims analysis (CCA) framework to compare through-the-cycle (TTC) and point-in-time (PIT) credit ratings. It shows that although TTC ratings are more stable than PIT ratings, credit rating agency (CRA) attempts to smooth TTC-prescribed rating changes can generate procyclical cliff effects.

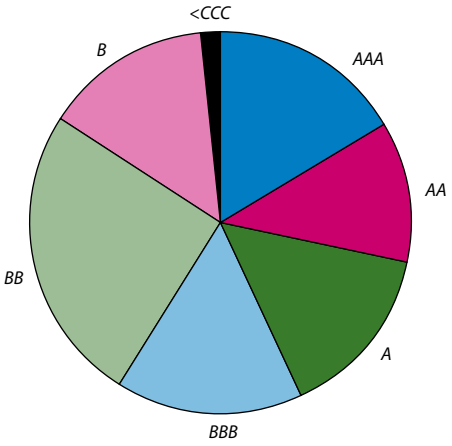
In the CCA framework, a sovereign defaults when the value of its assets falls through a distress threshold that is related to its liabilities (Gray, Merton, and Bodie, 2007).[1] The simple model used here is based on Loeffler (2004) and assumes that asset values are driven by (1) the sovereign's fundamentals and (2) cyclical factor fluctuations. Conceptually, the PIT rating process involves estimating the difference between future values of the assets and liabilities ("distance to default"), and mapping this difference into a default-probability-related credit rating.[2]

A TTC rating process estimates the distance to default based on fundamental values but imposes a stress scenario on the cyclical component. In a second stage, the CRAs typically apply a smoothing rule to rating changes to avoid overshooting or subsequent reversals. In other words, it is a two-step process in which ex-ante ratings are based on fundamentals and a stress scenario and ex-post rating changes are smoothed, and not adjusted immediately. For purposes of this box, the factor that represents the sovereign's "fundamentals" is assumed to follow a random walk, whereas the cyclical component is assumed to follow an autoregressive process.

The pie charts show the distribution of actual S&P sovereign ratings (top) and of the model-implied ratings under the TTC approach under various net asset value and volatility assumptions (bottom). One can see that the parameters underlying the model provide a realistic set of assumptions for the next set of experiments.

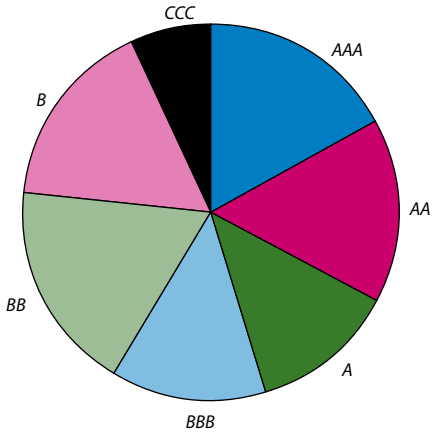
The main interest of this analysis lies in how ratings evolve over time and how well the two approaches predict future defaults. It therefore assumes that future asset values do not evolve according to their expected values but instead come in well below. While the PIT approach would imply immediate downgrades for this case, a CRA following the TTC approach would typically wait to see if the deviation is only of a cyclical nature. For example, in the case below downgrades are assumed to occur only if (1) the rating change is

Actual Rating Grade Distribution



Source: IMF staff estimates based on Standard & Poor's data.

Model-Implied Through-the-Cycle Rating Grade Distribution



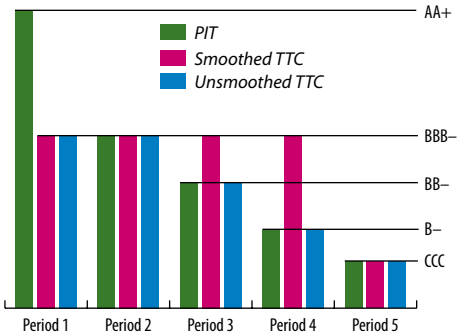
Source: IMF staff estimates.

Note: This box was prepared by Michael Kisser, based on Kiff, Kisser, and Schumacher (forthcoming).

[1]In the case of a sovereign, assets include foreign reserves and fiscal assets such as the present value of taxes and other revenues, and liabilities include base money, public debt (local and foreign currency), and guarantees (explicit and implicit).

[2]In this box the mapping of distance-to-default-derived default probabilities into ratings is done using Moody's idealized probabilities such as those in Table 3.1.

Impact of Rating Approaches on Downgrade Trajectories



Source: IMF staff estimates.
Note: PIT = point in time; TTC = through the cycle.

expected to be persistent and (2) the implied change is larger than one notch. This is one of several smoothing rules discussed in Cantor and Mann (2006), which also accounts for the empirically documented fact that CRAs are slow in adjusting their ratings (Loeffler, 2005). Clearly, other definitions could be employed.[3]

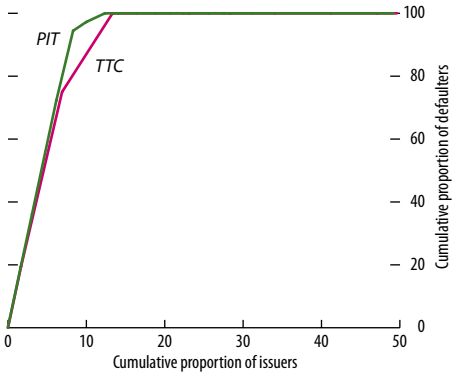
The figure above on stability visualizes rating downgrades under the PIT and smoothed TTC methodologies and compares them to the case in which a CRA switches from a TTC to a PIT rating method once the initial stress scenario is breached ("unsmoothed TTC"). One can see that ratings decline faster under the PIT approach whereas a downgrade is less likely if the CRA followed a TTC approach. The intuitive reason is that TTC ratings built in a pessimistic forecast so the rating is already lower and does not have to fall as much as the more "optimistic" PIT ratings would imply.

However, as time passes the PIT rating would eventually drop below the smoothed TTC rating (Period 3), which is precisely the point when the smoothed TTC approach becomes prone to potential cliff effects. By not reacting to new information in Periods 3 and 4, the TTC ratings would drop from BBB- to CCC in Period 5, thereby generating a rating downgrade of eight notches. From a stability perspective it would therefore be optimal if a CRA followed the TTC approach ex ante but would immediately adjust the rating once the initial forecast has been breached.

[3]Further details can be found in Altman and Rijken (2006), Loeffler (2004 and 2005), and Carey and Hrycay (2001).

Cumulative Accuracy Profile Curve for PIT and TTC Ratings for Defaults at the End of Period 1

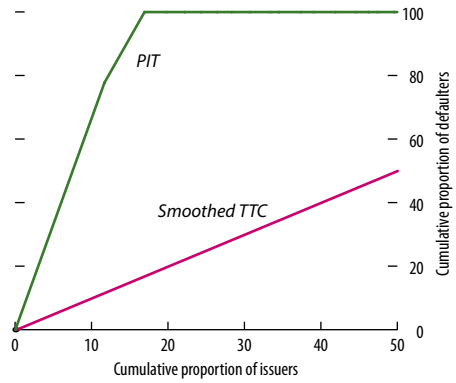
(In percent)



Source: IMF staff estimates.
Note: PIT = point in time; TTC = through the cycle.

Cumulative Accuracy Profile Curve for PIT and Smoothed TTC Ratings for Defaults at the End of Period 2

(In percent)



Source: IMF staff estimates.
Note: PIT = point in time; TTC = through the cycle.

Finally, the analysis looks at how well both approaches predict future defaults by computing the cumulative accuracy profile (CAP) for defaults taking place at the end of Periods 1 and 2. It turns out that initially the TTC approach is only slightly less accurate at forecasting future defaults (see top figure above), but as time passes the PIT approach becomes clearly more accurate (see second figure above) as it immediately incorporates new information into its

Box 3.8 *(concluded)*

ratings whereas the TTC approach only reacts with a lag due to its smoothing policy.

In summary, the experiment has shown that, from an ex-ante viewpoint, the TTC approach produces more stable and only slightly less accurate ratings when current net asset values are higher than in the stress scenario. However, once ratings drop below those implied by the stress scenario, the smoothed TTC approach is less accurate at predicting defaults and it runs the risk of generating rating cliff effects that may lead to dangerous second-round liquidity effects.

Current discussions on the usefulness of the TTC approach should therefore focus on the reaction to new information when net asset values drop below those implied by the initial stress scenario. The implementation of a "through the crisis" methdology, which has been mentioned by the CRAs themselves, seems to require a more severe stress test ex ante. However, it currently does not address the slow adjustment typically taking place once the cushion built in by a TTC methodology is eroded, nor does it address the potential for cliff effects created by smoothing policies.

Annex 3.1. Credit Rating Agencies around the World[1]

A.M. Best Company, Inc. (U.S.)
Agusto & Co. Ltd. (Nigeria)
Ahbor Rating (Uzbekistan)
Apoyo & Asociados Internacionales S.A.C. (Peru)
Bank Watch Ratings S.A. (Ecuador)
BRC Investor Services S.A. (Colombia)
Calificadora de Riesgo, PCA (Uruguay)
Capital Intelligence, Ltd. (Cyprus)
Caribbean Information & Credit Rating Services Ltd. (CariCRIS) (Caribbean)
Central European Rating Agency (CERA) (a/k/a: Fitch Polska, S.A., Poland)
Cerved Group (Italy)
Chengxin International Credit Rating Co., Ltd. (China)
China Lianhe Credit Rating, Co. Ltd. (China)
Clasificadora de Riesgo Humphreys, Ltda. (Chile)
Class y Asociados S.A. Clasificadora de Riesgo (Peru)
CMC International, Ltd. (Nigeria)
Companhia Portuguesa de Rating, SA (CPR) (Portugal)
Credit Analysis & Research Ltd (CARE) (India)
Credit-Rating Agency: A Ukrainian rating agency (Ukraine)
Credit Rating Agency of Bangladesh, Ltd. (CRAB) (Bangladesh)
Credit Rating Information and Services, Ltd. (CRISL) (Bangladesh)
CRISIL, Ltd. (a/k/a: Credit Rating Information Services of India, India)
Dagong Global Credit Rating Co., Ltd. (China)
Demotech, Inc. (U.S.)
Dominion Bond Rating Service (DBRS) (Canada)
Duff & Phelps de Colombia, S.A., S.C.V (Colombia)
Ecuability, SA (Ecuador)
Egan-Jones Rating Company (U.S.)
Equilibrium Clasificadora de Riesgo (Peru)
European Rating Agency, a.s. (Slovak Republic)
European Rating Agency (ERA) (U.K.)
Feller Rate Clasificadora de Riesgo (Chile)
Fitch Ratings, Ltd. (U.S./U.K.)
Global Credit Rating Co. (South Africa)
HR Ratings de Mexico, S.A. de C.V. (Mexico)
Interfax Rating Agency (IRA) (Russia)
Investment Information and Credit Rating Agency (ICRA) (India)
Islamic International Rating Agency, B.S.C. (IIRA) (Bahrain)
Istanbul International Rating Services, Inc. (a/k/a: TurkRating, Turkey)
Japan Credit Rating Agency, Ltd. (JCR) (Japan)
JCR Avrasya Derecelendime A.S. (a/k/a: JCR Eurasia Rating, Turkey)
JCR-VIS Credit Rating Co. Ltd. (Pakistan)

[1]The main source of this annex is DefaultRisk.com as of October 2009.

Kobirate Uluslararası Kredi Derecelendirme ve Kurumsal Yönetim Hizmetleri A.Ş. (a/k/a/ Kobirate, Turkey)
Korea Investors Service, Inc. (KIS) (Korea)
Korea Ratings Corporation (a/k/a: Korea Management Consulting and Credit Rating Corp. (KMCC) (Korea)
LACE Financial Corporation (U.S.)
Lanka Rating Agency, Ltd. (LRA) (Sri Lanka)
Malaysian Rating Corporation Berhad (MARC) (Malaysia)
Mikuni & Co., Ltd. (Japan)
Moody's Investors Service (U.S.)
National Information & Credit Evaluation, Inc. (NICE) (Korea)
Onicra Credit Rating Agency of India, Ltd. (India)
Pacific Credit Rating (PCR) (a/k/a: Clasificadora de Riesgo Pacific Credit Rating S.A.C., Peru)
Pakistan Credit Rating Agency, Ltd. (PACRA) (Pakistan)
Philippine Rating Services, Corp. (PhilRatings) (Philippines)
P.T. Kasnic Credit Rating Indonesia—Indonesia (Indonesia)
P.T. PEFINDO Credit Rating Indonesia (a/k/a: PT Pemeringkat Efek Indonesia, Indonesia)
RAM Rating Services Berhad (RAM) (f/k/a: Rating Agency Malaysia Berhad, Malaysia)
Rapid Ratings International, Inc. (Australia/New Zealand)
Rating and Investment Information, Inc. (R&I) (Japan)
Realpoint, LLC (U.S.)
Rus Ratings (Russia)
Saha Kurumsal Yönetim ve Kredi Derecelendirme Hizmetleri A.Ş. (Turkey)
Seoul Credit Rating & Information, Inc. (SCI) (Korea)
Shanghai Credit Information Services Co., Ltd. (China)
Shanghai Far East Credit Rating Co., Ltd. (China)
SME Rating Agency of India Limited (SMERA) (India)
Sociedad Calificadora de Riesgo Centroamericana, S.A. (SCRiesgo) (Costa Rica)
Standard and Poor's (S&P) (U.S)
Taiwan Ratings Corp. (TCR) (Taiwan Province of China)
TCR Kurumsal Yonetim ve Kredi Derecelendirme Hizmetleri A.S. (a/k/a: Türk KrediRating (TCRating), Turkey)
Thai Rating and Information Services Co., Ltd. (TRIS) (Thailand)
TheStreet.com Ratings, Inc. (a/k/a: Weiss Ratings, Inc., U.S.)
Veribanc, Inc. (U.S.)

References

Afonso, António, Pedro Gomes, and Philipp Rother, 2007, "What 'Hides' Behind Sovereign Debt Ratings?" ECB Working Paper Series No. 711 (Frankfurt: European Central Bank).

Allen, Mark, Christoph B. Rosenberg, Christian Keller, Brad Setser, and Nouriel Roubini, 2002, "A Balance Sheet Approach to Financial Crisis," IMF Working Paper 02/210 (Washington: International Monetary Fund).

Alsakka, Rasha, and Owain ap Gwilym, forthcoming, "Leads and Lags in Sovereign Credit Ratings," *Journal of Banking and Finance*.

Altman, Edward I., and Herbert A. Rijken, 2006, "A Point-in-Time Perspective on Through-the-Cycle Ratings," *Financial Analysts Journal*, Vol. 62, No. 1, pp. 54–70.

Annaert, Jan, Marc De Ceuster, Patrick Van Roy, and Cristina Vespro, 2010, "What Determines Euro Area Bank CDS Spreads?" National Bank of Belgium Working Paper No. 190.

Arezki, Rabah, Bertrand Candelon, and Amadou Sy, forthcoming, "Sovereign Ratings News and Financial Markets Spillovers," IMF Working Paper (Washington: International Monetary Fund).

Aruoba, S. Borağan, Francis X. Diebold, and Chiara Scotti, 2009, "Real-Time Measurement of Business Conditions," *Journal of Business and Economic Statistics,* Vol. 27, No. 4, pp. 417–27.

Bank of England, 2010, "Markets and Operations," *Quarterly Bulletin* (London, Q1).

Basel Committee on Banking Supervision (BCBS), 2005, "Studies on the Validation of the Internal Rating Systems," BCBS Working Papers No. 14 (Basel: Basel Committee on Banking Supervision).

———, 2006, "International Convergence of Capital Measurement and Capital Standards: A Revised Framework-Comprehensive Version" (Basel: Basel Committee on Banking Supervision).

Becker, Bo, and Todd Milbourn, 2010, "How Did Increased Competition Affect Credit Ratings?" April. Available via

the Internet: http://apps.olin.wustl.edu/faculty/milbourn/BeckerMilbournApril2010.pdf.

Bergevin, Philippe, 2010, "Addicted to Ratings: The Case for Reducing Governments' Reliance on Credit Ratings," C.D. Howe Institute Backgrounder No. 130 (Toronto: C. D. Howe Institute).

Bhatia, Ashok Vir, 2002, "Sovereign Credit Ratings Methodology: An Evaluation," IMF Working Paper 02/170 (Washington: International Monetary Fund).

Bongaerts, Dion, K. J. Martijn Cremers, and William Goetzmann, 2009, "Multiple Ratings and Credit Spreads," NBER Working Paper No. 15331 (Cambridge, Massachusetts: National Bureau of Economic Research).

Boot, Arnoud W. A., Todd T. Milbourn, and Anjolein Schmeits, 2006, "Credit Ratings as Coordination Mechanisms," *Review of Financial Studies,* Vol. 19, No. 1, pp. 81–118.

Brooks, Robert, Robert Faff, David Hillier, and Joseph Hillier, 2004, "The National Market Impact of Sovereign Rating Changes," *Journal of Banking and Finance,* Vol. 28, No. 1, pp. 233–250.

Cantor, Richard, and Christopher Mann, 2003, "Measuring the Performance of Corporate Bond Ratings," Moody's Investors Service Special Comment (New York: Moody's Investors Service, April). Available via the Internet: http://ssrn.com/abstract=996025.

———, 2007, "Analyzing the Tradeoff between Ratings Accuracy and Stability," *Journal of Fixed Income*, Vol. 16, No. 4, pp. 60–68.

Cantor, Richard, and Frank Packer, 1994, "The Credit Rating Industry," *FRBNY Quarterly Review*, Vol. 19, No. 2, pp. 1–26 (New York: Federal Reserve Bank of New York).

———, 1996, "Determinants and Impact of Sovereign Credit Ratings," *FRBNY Economic Policy Review*, Vol. 2, No. 2, pp. 37–54 (New York: Federal Reserve Bank of New York).

Carey, Mark, and Mark Hrycay, 2001, "Parameterizing Credit Risk Models with Rating Data," *Journal of Banking and Finance*, Vol. 25, No. 1, pp. 197–270.

Chambers, John, 2010, "Outlooks: The Sovereign Credit Weathervane, 2009/2010 Update," Standard & Poor's RatingsDirect, April 20. Available via the Internet (by subscription): www2.standardandpoors.com/portal/site/sp/en/la/page.topic/ratings_sov/2,1,8,0,0,0,0,0,0,3,1,0,0,50,0,0.html.

Davis Polk, 2010, "Summary of the Dodd-Frank Wall Street Reform and Consumer Protection Act, Passed by the House of Representatives on June 30, 2010," July 9. Available via the Internet: http://www.davispolk.com/publications/list.aspx.

Engelmann, Bernd, Evelyn Hayden, and Dirk Tasche, 2003, "Testing Rating Accuracy," *Risk*, January, pp. 82–86. Available via the Internet: www.german-zscore.de/docs/engelmann_2003.pdf.

European Central Bank (ECB), 2008a, "Technical Specifications for the Temporary Expansion of the Central Framework," ECB Press Release, October 17.

———, 2008b, "The Implementation of Monetary Policy in the Euro Area: General Documentation on Eurosystem Monetary Policy Instruments and Procedures," November.

———, 2009, "Guideline of the European Central Bank of 20 January 2009 Amending Guideline ECB/2000/7 on Monetary Policy Instruments and Procedures of the Eurosystem," Official Journal of the European Central Bank, February.

Everaert, Greetje, Manal Fouad, Edouard Martin, and Ricardo Velloso, 2009, "Disclosing Fiscal Risks in the Post-Crisis World," IMF Staff Position Note 09/18 (Washington: International Monetary Fund).

Federal Register, 2008, *Securities and Exchange Commission: References to Ratings of Nationally Recognized Statistical Rating Organizations; Security Ratings; Proposed Rules,* Part IV, July 11, Available via the Internet: www.federalregister.gov/articles/2008/07/11/E8-15280/references-to-ratings-of-nationally-recognized-statistical-rating-organizations.

Fender, Ingo, and John Kiff, 2005, "CDO Rating Methodology: Some Thoughts on Model Risk and its Implications," *Journal of Credit Risk*, Vol. 1, No. 3, pp. 37–58.

Ferri, Giovanni, Li-gang Liu, and Joseph E. Stiglitz, 1999, "The Procyclical Role of Rating Agencies: Evidence from the East Asian Crisis," *Economic Notes*, Vol. 28, No. 3, pp. 335–55.

Fitch Ratings, 2010a, "Sovereign Rating Methodology," Fitch Ratings Master Criteria Report, August 16. Available via the Internet (by subscription): www.fitchratings.com/creditdesk/reports/report_frame.cfm?rpt_id=547765.

———, 2010b, "Definitions of Ratings and Other Forms of Opinion," August. Available via the Internet: www.fitchratings.com/web_content/ratings/fitch_ratings_definitions_and_scales.pdf.

Fons, Jerome S., 2002, "Understanding Moody's Corporate Bond Ratings and Rating Process," Moody's Investors Service Special Comment, May. Available via the Internet: http://v3.moodys.com/sites/products/AboutMoodysRatingsAttachments/2001400000389218.pdf?frameOfRef=corporatefor.

———, 2004, "Tracing the Origins of 'Investment Grade'," Moody's Investors Service Special Report, January. Available via the Internet: www.moodys.com.br/brasil/pdf/InvGradeOrigins.pdf.

Granger, Clive W. J., 1969, "Investigating Causal Relations by Econometric Models and Cross-spectral Methods," *Econometrica*, Vol. 37, No. 3, pp. 424–38.

Gray, Dale F., Robert Merton, and Zvi Bodie, 2007, "Contingent Claims Approach to Measuring and Managing Sovereign Credit Risk," *Journal of Investment Management*, Vol. 5, No. 4, pp. 1–24.

Group of Twenty (G-20), 2009, *Declaration on Strengthening the Financial System,* London Summit Communiqué, Annex, April 2, Available via the Internet: www.londonsummit.gov.uk/en/summit-aims/summit-communique/.

———, 2010, *The G-20 Toronto Summit Declaration*, Annex 2, June 26–27, www.g20.org/pub_communiques.aspx/.

Güttler, Andre, 2009, "Lead-lag Relationships and Rating Convergence Among Credit Rating Agencies," European Business School Research Paper 09–14

Hamilton, David T., and Richard Cantor, 2005, "Rating Transitions and Defaults Conditional on Rating Outlooks Revisited: 1995–2005," Moody's Investor Service Special Comment, December. Available via the Internet: http://v2.moodys.com/cust/content/content.ashx?source=StaticContent/Free%20pages/Credit%20Policy%20Research/documents/current/2004700000425139.pdf.

Hartelius, Kristian, Kenichiro Kashiwase, and Laura Kodres, 2008, "Emerging Market Spread Compression: Is it Real or is it Liquidity?" IMF Working Paper 08/10 (Washington: International Monetary Fund).

Hessol, Gail I., Erkan Erturk, and Jason Ontko, 2007, "Credit Watch and Rating Outlooks Provide Powerful Warning Signals," Standard & Poor's RatingsDirect, August 7. Available via the Internet: www.alacrastore.com/research/s-and-p-credit-research-CreditWatch_And_Rating_Outlooks_Provide_Powerful_Warning_Signals-595377.

Hill, Paula, and Robert Faff, 2008, "Do Credit Watch Procedures Affect the Information Content of Sovereign Credit Rating Changes?" Paper presented at the Financial Management Association European Conference, Prague, Czech Republic, June. Available via the Internet: http://69.175.2.130/~finman/Prague/Papers/FMA-Euro_2008_Submission_HillnFaff.pdf.

Hurlin, Christophe, and Baptiste Venet, 2001, "Granger Causality Tests in Panel Data Models with Fixed Coefficients," Working Paper Eurisco 2001–09 (Paris: Université Paris IX Dauphine).

International Monetary Fund (IMF), 1999, *International Capital Markets* (Washington, July).

———, 2010, *Global Financial Stability Report*, World Economic and Financial Surveys (Washington, April).

International Organization of Securities Commissions (IOSCO), 2008, "Code of Conduct Fundamentals for Credit Rating Agencies," May. Available via the Internet: www.iosco.org.

———, 2009, "A Review of Implementation of the IOSCO Code of Conduct Fundamentals for Credit Rating Agencies," March. Available via the Internet: www.iosco.org.

———, 2010, "Objectives and Principles of Securities Regulation," June. Available via the Internet: www.iosco.org.

Ismailescu, Iuliana, and Hossein Kazemi, forthcoming, "The Reaction of Emerging Market Credit Default Swap Spreads to Sovereign Credit Rating Changes," *Journal of Banking and Finance*.

Jaramillo, Laura, 2010, "Determinants of Investment Grade Status in Emerging Markets" IMF Working Paper 10/117 (Washington: International Monetary Fund).

Joint Forum, 2009, *Stocktaking on the Use of Credit Ratings* (Basel: Bank for International Settlements). Available via the Internet: www.bis.org/publ/joint22.htm.

Jüttner, D.J., and J. McCarthy, 2000, "Modelling a Rating Crisis" (unpublished; Sydney: Macquarie University).

Kiff, John, Michael Kisser, and Liliana Schumacher, forthcoming, "An Inspection of the Through-the-Cycle Rating Methodology," IMF Working Paper (Washington: International Monetary Fund).

Kiff, John, Sylwia Nowak, and Liliana Schumacher, forthcoming, "Are Rating Agencies Powerful? An Investigation into the Impact and Accuracy of Sovereign Ratings," IMF Working Paper (Washington: International Monetary Fund).

Larrain, Guillermo, Helmut Reisen and Julia von Maltzan, 1997, "Emerging Market Risk and Sovereign Credit Rating," OECD Development Centre, Working Paper 124 (Paris: Organization for International Cooperation and Development).

Loeffler, Gunter, 2004, "An Anatomy of Rating Through the Cycle," *Journal of Banking and Finance*, Vol. 28, No. 3, pp. 695–720.

———, 2005, "Avoiding the Rating Bounce: Why Rating Agencies are Slow to React to New Information," *Journal of Economic Behavior and Organization*, Vol. 56, No. 3, pp. 365–81.

Monfort, Brieuc, and Christian Mulder, 2000, "Using Credit Ratings for Capital Requirements on Lending to Emerging Market Economies: Possible Impact of a New Basel Accord," IMF Working Paper 00/69 (Washington: International Monetary Fund).

Moody's Investors Service, 2001, "The Unintended Consequences of Rating Triggers," Moody's Investors Service

Special Comment, December. Available via the Internet (by subscription): www.moodys.com.

———, 2008, "Sovereign Bond Ratings," Moody's Investors Service, September. Available via the Internet (by subscription): http://v3.moodys.com/viewresearchdoc.aspx?docid=PBC_109490.

———, 2010a, "Sovereign Methodology Update: Narrowing the Gap – A Clarification of Moody's Approach to Local vs. Foreign Currency Government Bond Ratings," Moody's Investors Service, February. Available via the Internet (by subscription): http://v3.moodys.com/viewresearchdoc.aspx?docid=PBC_118820).

———, 2010b, "The Performance of Moody's Structured Finance Ratings: March 2010 Quarterly Update," Moody's Investors Service, June. Available via the Internet (by subscription): http://v3.moodys.com/viewresearchdoc.aspx?docid=PBC_125378.

———, 2010c, "Rating Symbols and Definitions," Moody's Investors Service, July. Available via the Internet: http://v3.moodys.com/researchdocumentcontentpage.aspx?docid=PBC_79004.

Mulder, Christian, and Roberto A. Perrelli, 2001, "Foreign Currency Credit Ratings for Emerging Market Economies," IMF Working Paper 01/191 (Washington: International Monetary Fund).

Partnoy, Frank, 1999, "The Siskel and Ebert of Financial Markets? Two Thumbs Down for the Credit Rating Agencies," *Washington University Law Quarterly*, Vol. 77, No. 3. Available via the Internet: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=167412.

———, 2009, "Rethinking Regulation of Credit Rating Agencies: An Institutional Investor Perspective," White Paper (Washington: Council of Institutional Investors). Available via the Internet: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1430608.

Reisen, Helmut, and Julia von Maltzan, 1999, "Boom and Bust in Sovereign Ratings," *International Finance*, Vol. 2, pp. 273–93.

Rowland, Peter, 2004, "Determinants of Spread, Credit Ratings and Creditworthiness for Emerging Market Sovereign Debt: A Follow-Up Study Using Pooled Data Analysis," *Borradores de Economía* 296 (Bogotá: Banco de la República de Colombia).

———, and José L. Torres, 2004, "Determinants of Spread and Creditworthiness for Emerging Market Sovereign Debt: A Panel Data Study," *Borradores de Economía* 295 (Bogotá: Banco de la República de Colombia).

Securities and Exchange Commission (SEC), 2003, *Report on the Role and Function of Credit Rating Agencies in the Operation of the Securities Markets* (Washington, January). Available via the Internet: www.sec.gov/news/studies/credratingreport0103.pdf.

Sobehart, Jorge R., Sean C. Keenan, and Roger M. Stein, 2000, "Benchmarking Quantitative Default Risk Models: A Validation Methodology," Moody's Investors Service Rating Methodology, March. Available via the Internet: www.moodyskmv.com/research/files/wp/53621.pdf.

Standard & Poor's (S&P), 2008, "Sovereign Credit Ratings: A Primer," Standard & Poor's RatingsDirect, May 19. Available via the Internet: www.investinginbondseurope.org/uploadedFiles/Learn_About_Bonds/What_You_Should_Know/Market_and_Economic_Influences_on_Your_Bond_Investments/Sovereign%20Credit%20Ratings%20Primer%20-%20SP.pdf.

———, 2009, "Understanding Standard & Poor's Rating Definitions," Standard & Poor's RatingsDirect, June 3. Available via the Internet: www2.standardandpoors.com/spf/pdf/fixedincome/Understanding_Rating_Definitions.pdf.

———, 2010a, "Another Perspective on Rating Comparability and Performance," Standard & Poor's RatingsDirect, April 9. Available via the Internet (by subscription): www.standardandpoors.com/ratings/articles/en/us/?assetID=1245209944177.

———, 2010b, "Methodology: Credit Stability Criteria," Standard & Poor's RatingsDirect, May 3. Available via the Internet (by subscription): www.standardandpoors.com/ratings/articles/en/us/?assetID=1245211382965.

Sy, Amadou N. R., 2002, "Emerging Market Bond Spreads and Sovereign Credit Ratings: Reconciling Market Views with Economic Fundamentals," *Emerging Markets Review,* Vol. 3, No. 4, pp. 380–408.

GLOSSARY

Asset-backed commercial paper (ABCP)	A secured money market debt instrument typically issued by a bank or other financial institution, usually with a maturity of between 90 and 180 days. ABCP is secured by the issuer with the cash flow from a pool of underlying assets such as trade receivables, car loans, or credit card loans.
Asset-backed security (ABS)	A security that is collateralized by the cash flows from a pool of underlying assets, such as loans, leases, and receivables. When the underlying asset is real estate, an ABS is called a mortgage-backed security (MBS). MBS collateralized by mortgages on commercial property are called commercial-mortgage-backed securities (CMBS).
Automatic stabilizer	An existing government tax or payment program in which revenues and expenses automatically increase or decrease to dampen fluctuations in real GDP without any explicit policy action. Examples are unemployment compensation and corporate and individual income taxes.
Basel II	A 2004 accord among national bank supervisory authorities (the Basel Committee on Banking Supervision) that revised the committee's 1988 adequacy standards for bank capital. Basel II proposals made the capital requirement more sensitive to variations in the riskiness of the bank's assets. Basel II also revised its recommended supervision processes and proposed increased disclosure by banks. Pillar 1 of the accord covers the minimum capital adequacy standards for banks; Pillar 2 focuses on enhancing the supervisory review process; and Pillar 3 encourages market discipline through increased disclosure of banks' financial conditions.
Carry trade	A leveraged transaction in which borrowed funds are used to take a position in which the expected interest return exceeds the cost of the borrowed funds. The "cost of carry" or "carry" is the difference between the interest yield on the investment and the financing cost (e.g., in a "positive carry" the yield exceeds the financing cost).
Charge-off	Declaration by a lender that a debt is unlikely to be paid in full.
Clearing	The process of transmitting, reconciling, and, in some cases, confirming payment orders or security transfer instructions prior to settlement. Clearing may include the netting of cash flows and the establishment of final positions for settlement. It can be bilateral or multilateral.
Cliff effect	An abrupt and outsized change (most commonly a drop) in the value of a financial asset or firm beyond expectations based on past prices and the variance around these prices.
Collateral	Assets pledged to a lender to secure a loan. The collateral may be seized by the lender if the borrower fails to meet the repayment terms of the loan.

Committee of European Banking Supervisors (CEBS)	Composed of high-level representatives from the bank supervisory authorities and central banks of the countries in the European Union. It gives policy advice to the European Commission on bank supervision and regulation, promotes the convergence of supervisory practice across the European Union, and facilitates consistent implementation of its guidelines.
Counterparty risk	The risk that one of the parties to a contract fails to meet its payment obligations.
Credit default swap (CDS)	A derivative of a credit instrument that offers protection against a "credit event" involving a weakening (or, most commonly for CDS, default) of the underlying credit instrument (the "reference asset"). The CDS buyer does not necessarily own the reference asset. Payouts under a CDS, which are triggered by a credit event, are "physical" or in "cash." In physical settlement, the protection seller buys the impaired reference asset from the protection buyer at its face value. In a cash settlement, the protection seller pays the protection buyer the difference between the face value of the reference asset and its current market price. In a single-name CDS contract, the reference asset is a single firm or government agency. CDS index contracts reference standardized indices based on baskets of liquid single-name CDS contracts.
Credit derivative	A financial contract that protects against the credit risk associated with a specific reference entity (or specified range of entities). For a periodic fee, the protection seller agrees to make a payment to the buyer in case of a "credit event" involving a weakening of the credit quality or default of the reference entity.
Credit rating	A rating of a debt issuer or debt instrument that measures the risk that repayment terms will not be honored. Ratings, which are issued by private credit rating agencies, are typically expressed as letter grades.
Credit rating outlooks, reviews, and watches	Credit rating agencies typically signal in advance their intention to consider rating upgrades and downgrades. "Reviews" or "watches" indicate that a change is likely within 90 days, and "outlooks" indicate the potential for a change within two years (one year in the case of speculative-grade credits).
Credit spread	The difference in yield between a benchmark debt security and another debt security that is comparable to the benchmark instrument in all respects except that it is of lower credit quality and hence, typically, of higher yield.
Cumulative accuracy profile (CAP), and accuracy ratio	CAP curves and accuracy ratios are statistical tools used by the credit rating agencies to validate the ability of their ratings to rank order default risk.
Delinquencies	Failure to make contractual payments on a loan, usually defined as a payment that is a certain number of days (or more) overdue (e.g., 90 days or more).
EMBIG	Emerging Market Bond Index Global, provided by JPMorgan Chase, which tracks the total returns for traded external debt instruments in 34 emerging market economies with weights roughly proportional to the market supply of debt.

European Financial Stability Facility (EFSF)	An institution set up by the 16 euro area countries to preserve financial stability. The EFSF can provide financial assistance to euro area national governments by selling bonds or other debt instruments on the open market. Such instruments are backed by an allocation of funds from the member countries. The EFSF's funds can be combined with loans from the European Financial Stabilization Mechanism (EFSM), with funds raised by the European Commission and guaranteed by the EU budget, and with funds from the IMF.
Event study	A statistical method to assess the short-term impact of an event, such as an announcement of a new credit rating.
Exchange traded fund (ETF)	An investment fund traded on stock exchanges. In many cases, the price tracks an index, such as the S&P 500. ETFs offer low costs and tax efficiency.
Financing gap	In this report, the gap between projected credit demand and projected credit supply. When the time of the projected credit demand arrives, changes in interest rates and the use of quantity rationing bring credit demand and supply into balance.
Foreclosure	The act of a mortgage lender that takes ownership of the residential or commercial real estate pledged as collateral on a loan that has become delinquent. The intention of the lender in foreclosing is to sell the real estate to recover part or all of the amounts due from the borrower.
Funding	In this report, the process by which banks issue or assume liabilities that are associated with assets on their balance sheets. In retail funding, the liabilities are to individual and business depositors. In wholesale funding, they are to institutional investors.
Funding liquidity risk	Risk that a financial institution will not be able to meet its short-term payment obligations by raising the funds from unsecured sources such as very short term loans from other banks or the issuance of certificates of deposits and commercial paper.
Generally accepted accounting principles (GAAP)	National guidelines for financial accounting.
Government-sponsored enterprise (GSE)	A financial institution established by government but privately owned to provide credit or credit insurance to specific groups, such as farmers, homebuyers, or students. In the United States, the housing-related GSEs Fannie Mae and Freddie Mac were placed under the conservatorship of the federal government in 2008.
Haircut	A discount applied by a lender to the current market value of collateral that it receives as security for a loan. The haircut reflects the risk that, at a later date, if the borrower defaults, the collateral may be worth less or be less easy to sell.
Hedge fund	An investment pool, typically organized as a private partnership or entity. Being only lightly regulated, hedge funds are more free than other types of investment vehicles to combine a variety of investment techniques—including short positions, transactions in derivatives, and high leverage.
Hedging	Offsetting an existing risk exposure by taking an opposite position in the same or a similar risk—for example, in related derivatives contracts.

Home Affordable Modification Program (HAMP)	A U.S. Treasury program providing incentives to qualifying mortgage borrowers and their servicers to modify the loan's terms, such as monthly payment amount or balance owed, to improve its affordability.
Home bias	The tendency to invest or spend in the domestic market rather than in the international market.
Intangible assets	See tangible assets.
Interest rate derivative	An investment contract whose yield is linked to that of one or more reference interest rates.
International Financial Reporting Standards (IFRS)	The business accounting framework adopted by the International Accounting Standards Board (IASB). Widely used in the European Union and Japan. U.S. and other national authorities using their own versions of generally accepted accounting principles (GAAP) are in various stages of conversion to IFRS.
Investment- and speculative grade	An entity or transaction is considered to be investment-grade if its credit rating is BBB- or better (Baa3 on the Moody's scale). Otherwise it is considered speculative, or high-yield, grade.
Jump-to-default risk	The risk that a credit counterparty defaults before a lender, bondholder, or exposed counterparty has time to sell or hedge its position.
Large and complex financial institution (LCFI)	A financial institution involved in a diverse range of financial activities and, often, geographical areas. Typically it is interconnected to other financial institutions and is thus considered systemically important.
Lender of last resort (LOLR)	An institution willing to extend credit when no one else will. Such an institution is usually a country's central bank, which acts as a wholesale lender of last resort. A lender of last resort serves as a stopgap to protect depositors, prevent widespread panic withdrawals from depository institutions, and otherwise avoid disruption in intermediation that can harm the real economy.
Leverage	The proportion of debt to equity (also assets to equity or capital to assets in banking). Leverage can be built up by borrowing (on-balance-sheet leverage, commonly measured by debt-to-equity ratios) or by using off-balance-sheet transactions. In this report, the term is also used to refer to the ratio of credit to GDP.
LIBOR	The London interbank offered rate, an index of the interest rates at which banks offer to lend unsecured funds to other banks in the London wholesale money market.
Loss-sharing (or loss allocation) agreement	An agreement among participants in a clearing or settlement system regarding the allocation of any losses arising from the default of a participant in the system or of the system itself.
Margin call	The additional collateral requested when the value of the original collateral falls below a specified amount.
Mark-to-market valuation	The act of recording the price or value of a security, portfolio, or account to reflect its current market value rather than its book value.

Market liquidity risk	Element of liquidity risk related to a financial institution's capacity to meet short-term payment obligations by means of secured funding sources. The risk is that the market value of collateral pledged as part of the institution's funding operations could rapidly decline.
Money market mutual fund	An open-ended mutual fund that invests in short-term securities.
Moral hazard	The incentive of individuals or firms to take unreasonable risks when the consequences will not be borne by them. For example, financial institutions have incentives to take excessive risks if they believe that governments will step in and provide support to them in crisis periods.
Mortgage-backed security (MBS)	A security that derives its cash flows from principal and interest payments on pooled mortgage loans. MBSs can be backed by residential mortgage loans or loans on commercial properties.
Nonbank financial institutions	A financial institution that does not have a full banking license or is not supervised by a national or international banking regulatory agency. These institutions facilitate bank-related financial services, such as investment, risk pooling, contractual savings, and market brokering, and can include money market mutual funds, investment banks, finance companies, insurance firms, pension funds, hedge funds, currency exchanges, and microfinance organizations.
Over-the-counter (OTC) derivative	A financial contract whose value derives from underlying security prices, interest rates, foreign exchange rates, commodity prices, or other market indices, and that is traded bilaterally rather than through an exchange.
Overnight index swap (OIS)	An interest rate swap in which the compounded overnight rate in the specified currency is exchanged for some fixed interest rate over a specified term.
Point-in-time (PIT) and through-the-cycle (TTC) credit ratings	With through-the-cycle ratings, credit rating agencies seek to ensure rating stability by assigning ratings based on the entity's or transaction's ability to survive cyclical troughs. Point-in-time ratings tend to focus on current conditions.
Primary dealer	Financial institutions that actively participate in the issuance of local and global equity and fixed income securities and derivatives and act as market makers. They are mainly large commercial and investment banks and securities houses.
Procyclicality	The tendency of asset prices to move in the same direction as changes in macroeconomic outlook and financial sector performance. In secured funding markets, the application of mark-to-market valuations of collateral causes large price movements, first with increases in collateral values and lower margin in the upswing of a financial or economic cycle and then to a rapid escalation of margin requirements and accelerating declines in prices in the downswing.
Quantitative easing	An expansion of a central bank's balance sheet through purchases of government securities, funded through the creation of base money (reserve balances of banks and cash).

Regulatory arbitrage	An action by a regulated institution to exploit differences in regulatory treatment across countries or different sectors, as well as differences between economic risk and risk measured by regulatory guidelines, to reduce regulatory burden—typically, in the case of financial institutions, to reduce regulatory capital requirements.
Repurchase (repo) agreement	A sale of securities coupled with an agreement to repurchase the same securities at an agreed price at a future date. This transaction occurs between a cash borrower (or securities lender), typically a fixed-income securities broker-dealer, and the cash lender (or securities borrower), such as a money market mutual fund or a custodial bank. The securities lender receives cash in return and pledges the legal title of a security as collateral.
Risk aversion	The degree to which an investor who, when faced with two investments with the same expected return but different risk, prefers the one with the lower risk. That is, it measures an investor's aversion to uncertain outcomes or payoffs.
Securities Markets Program (SMP)	A program under which the European Central Bank intervenes to restore depth and liquidity to dysfunctional segments of euro area public and private debt securities markets. The aim is to support the operation of the monetary policy transmission mechanism.
Securitization	The creation of securities from a reference portfolio of pre-existing assets or future receivables that are placed under the legal control of investors through special intermediaries created for the purpose, known as special-purpose vehicles or special-purpose entities. So-called synthetic securitizations are created from a portfolio of derivative instruments.
Segregation	A method of protecting client assets by holding them separately from those of a custodian, other clients, or other parties acting on behalf of the client.
Settlement	The act that discharges obligations involving funds or securities transfers between two or more parties.
Structured investment vehicle (SIV)	A legal entity whose assets consist of asset-backed securities and various types of loans and receivables. An SIV's funding liabilities are usually divided into segments of varying risk and include short-and medium-term debt. The solvency of the SIV is put at risk if the value of its assets falls below the value of its liabilities.
Sudden stop	A sudden slowdown in private capital inflows into emerging market economies. Sudden stops are usually followed by a sharp decrease in output, private spending and credit to the private sector, and real appreciation of the currency.
Swap	An agreement between counterparties to exchange periodic payments based on different reference financial instruments or indices on a predetermined notional amount.
Swap spread	The differential between the government bond yield and the fixed rate on an interest-rate swap of the equivalent maturity.

Systemic (solvency) risk	The risk that the failure of a financial institution would cause large losses to other financial institutions, thus threatening the stability of financial markets.
Tangible assets (TA)	Total assets less goodwill, deferred tax assets, and other intangible assets.
Tangible common equity (TCE)	Total balance sheet equity less preferred debt less intangible assets.
Through-the-cycle (TTC) credit ratings	See point-in-time (PIT) and through-the-cycle (TTC) credit ratings.
Tier 1 capital	The core capital supporting the lending and deposit activities of a bank. It consists primarily of common stock, retained earnings, and perpetual preferred stock.
Too-important-to-fail institutions	Private financial institutions believed to be so large, interconnected, or critical to the workings of the financial system that their disorderly failure would threaten the stability of the financial system and hence of the real economy.
Trade repository	A storage center where electronic records of trades are kept. It captures various contractual details, such as counterparty identifiers, payment dates, and calculation methods.
Tripartite (or tri-party) repo	A tri-party agent facilitates a repo transaction by providing operational services, such as custody of securities, settlement of cash and securities, valuation of collateral, and optimization tools to allocate collateral efficiently.
Value-at-risk (VaR)	An estimate of the loss, over a given period, that is unlikely to be exceeded at a given level of statistical probability, usually as calculated according to historical returns, covariances, and volatilities.
Writedown	A recognition by a financial institution that the value of an asset has declined.

ANNEX

SUMMING UP BY THE ACTING CHAIR

The Acting Chair made the following remarks at the conclusion of the Executive Board's discussion of the Global Financial Stability Report *on September 20, 2010.*

Executive Directors broadly agreed with the main messages and key policy recommendations of the *Global Financial Stability Report* (GFSR). They observed that further progress in financial system repair and reform is critical to ensure that the economic recovery remains on track. Directors noted that, although recent improvements in financial markets are encouraging, progress toward global financial stability has suffered a setback since the April 2010 GFSR. The market turmoil that occurred in late spring highlighted increased vulnerabilities of bank and sovereign balance sheets that could reignite a negative feedback loop to the real economy. In this context, Directors stressed that the outlook for financial stability remains uncertain, with risks skewed to the downside.

Directors concurred that the forceful response by policymakers has helped to stabilize and reopen bank funding markets and reduce tail risks. In particular, the results of European bank stress tests and additional transparency provided by the disclosure of sovereign exposures has contributed to rebuilding market confidence, although market access for some banks has not been fully restored. Directors recognized that the close linkages between sovereigns and the banking sector highlight the importance of addressing legacy problems in banks and bolstering sovereign balance sheets in crisis-hit countries over the medium term.

Directors agreed that economic fundamentals in emerging market economies have remained strong, showing resilience to banking strains in advanced economies. Cross-border spillover effects have been mostly confined to regions with significant economic and financial links to the euro area. Directors noted, however, that policymakers in many emerging market economies face significant policy challenges from a potential buildup of risks stemming from continued strong capital inflows. A number of Directors recommended further analysis of these issues and a continued assessment of appropriate policies.

Directors welcomed recent policy initiatives to strengthen the financial sector, particularly the European Financial Stability Facility and the agreement on capital requirements that was recently reached in Basel. They noted, however, that further policy actions are needed to address the legacy of the crisis in the banking system and provide greater clarity on the new financial regulatory landscape. Directors stressed that, to protect against potential downside risks, banks need to be better capitalized, have access to stable funding, and be able to earn self-sustaining margins. They highlighted the importance of reducing, over the medium term, the risks to financial stability from rising sovereign debt burdens and contingent liabilities, and stressed that advanced economy sovereigns need to bolster their balance sheets through a reduction of debt levels.

Directors concurred that the breakdown of funding markets during the financial crisis demonstrated the importance of addressing systemic liquidity risk as highlighted in Chapter 2. They noted the importance of addressing both institutions' own liquidity risk management processes and risks in funding markets more generally. Directors generally agreed with the proposed two-pronged approach of increasing the resilience of financial institutions against liquidity shocks, while buttressing market infrastructure. In this context, they were generally of the view that the quantitative liquidity proposals announced by the Basel Committee on Banking Supervision—requiring higher liquidity buffers and lower maturity mismatches in banks—are a first step toward achieving this goal. Directors also agreed that a number of other issues merit further examination, including strengthen-

ing collateral valuation and margin setting policies in the repo market, as well as greater use of central counterparties for clearing and collateral management. Improving the financial information available to market participants should also help the market better differentiate counterparty risk and improve the functioning of the interbank market. At the same time, consideration could be given to extending the liquidity guidelines, in some form, to nonbank financial institutions to help mitigate the potential buildup of liquidity risks outside the banking system.

Directors welcomed the analysis in Chapter 3 of the role of credit rating agencies and whether the information provided by these agencies has negative implications for financial stability. They endorsed the overarching recommendation to reduce legal, regulatory, and private contract reliance on ratings where possible. Directors supported the policy advice that rating agencies be encouraged to improve transparency, reduce conflicts of interest, and discontinue policies that attempt to over-smooth rating changes, as such policies could potentially lead to procyclical rating cliff effects.

Global Financial Stability Report, October 2010